

FRONT LINE DEMONSTRATION IN COTTON

ANNUAL REPORT (2005-06)
All India Coordinated Cotton Improvement Project
Coimbatore-641 003

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FOREWORD

Cotton, the crop of commerce and history, has a special place in Indian economy in earning valuable foreign exchange besides providing employment opportunities to 75 million people directly or indirectly. Even though India has the distinction of largest area under cotton with 9 m.ha and growing all the four cultivated species on commercial scale to a record production of 245 lakh bales, the per se productivity of cotton needs to be improved to a larger extent in order to cater to emerging requirements and international demands. In this regard, the All India Coordinated Cotton Improvement Project (AICCIP) & Central Institute for Cotton Research (CICR) of ICAR in close collaboration with State Agricultural Universities (SAUs) and State Departments of Agriculture play a vital role in the development of HYVs and hybrids, improved cotton production & protection technologies and transfer of improved cotton cultivation practices. Cotton Front Line Demonstrations (FLDs), the innovative TOT programme, act as an effective vehicle of transfer of proven and improved technologies to the farmers for enhanced cotton productivity and increased net returns.

Several newer technologies like improved cotton varieties with desirable fibre characteristics, conventional and Bt cotton hybrids, novel cotton-based cropping systems, improved combinations of micronutrients and growth regulators, newer soil, weed and water management practices, clean cotton cultivation have all been demonstrated in farmers' fields. The profitability of cotton farming has also been convincingly demonstrated in different agro climatic zones of the country through these FLDs.

I am happy to note that the cotton FLDs, funded by the Dept. of Agriculture & Cooperation, Ministry of Agriculture, Govt. of India and implemented under the aegis of AICCIP (ICAR) through State Agricultural Universities have resulted in greater awareness among the cotton farmers besides providing a platform for the Scientists with appropriate feedback to fine-tune their ongoing research programmes.

The Project Coordinator (Cotton), Scientists of AICCIP and CICR deserve special appreciation for their sincere efforts in carrying out the programme effectively.

(B.M.KHADI)

Director, CICR, Nagpur

ACKNOWLEDGEMENT

FLD in cotton is a joint venture transfer of technology activity by AICCIP and CICR of ICAR & Department of Agriculture & Co-operation, Ministry of Agriculture, Government of India. During the year 2005-06, a total of 1150 FLDs were conducted under the supervision of AICCIP Scientists in all the cotton growing tracts of the country with a budgetary outlay of Rs.60lakhs out of which Rs. 24 lakhs were earmarked for FLDs on cotton production technologies, Rs. 16 lakhs for implement demonstrations and Rs.20 lakhs for FLDs on IPM.

I consider it a very rare privilege to express my sincere gratitude to Dr.Mangala Rai, Hon'ble Director General, ICAR, New Delhi for his thoughtful guidance in the conduct of the programme. I am greatly indebted to Dr. Gautam Kalloo, the then Deputy Director General (CS & Hort.), ICAR, New Delhi who inspired the AICCIP Scientists in excelling their tasks.

I am extremely grateful to Dr.N.B.Singh, Agricultural Commissioner, Government of India, for his fruitful suggestions during the progress of this programme. I place on record the unstinted administrative help offered by Dr.H.C.Gautam, Additional Commissioner (Cotton), DAC, MOI, Govt. of India. I take this opportunity to thank Dr.Anupam Barik, Director, DOCD, Mumbai for his continued support and technical guidance.

I am immensely grateful to Dr.K.C.Jain, Asst. Director General (CC), ICAR, New Delhi for his constant guidance and useful suggestions. The meticulous support, encouragement and overall guidance by Dr.B.M.Khadi, Director, CICR, Nagpur during the conduct of the programme is sincerely acknowledged.

The dedicated efforts of the Scientists of participating centres of AICCIP and CICR in carrying out the trials and arranging Krishi Melas are commendable. On a personal wavelength, I extend my sincere thanks to Shri.K.N.Gururajan, Dr. Isabella Agarwal, Dr.Usha Rani, Dr.B.Dharajothi, Dr.A.H.Prakash and Shri. M.Sabesh, Scientists of CICR, Regional Station, Coimbatore, for their efforts in compilation of the report and other related activities. Last, but not the least, the overwhelming participation of FLD farmers deserve special mention for making the programme a success.

Dr. N. GOPALAKRISHNAN
PROJECT COORDINATOR (COTTON) & HEAD
CICR Regional Station, Coimbatore

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FRONT LINE DEMONSTRATIONS IN COTTON 2006

INTRODUCTION

The All India Coordinated Cotton Improvement Project (AICCIP) acts as the Nodal Agency for conducting the cotton Front Line Demonstration programme in the country to undertake demonstrations of frontier technologies of cotton production through funding from Mini Mission-II of Technology Mission on Cotton (TMC). The Project Coordinator (Cotton Improvement) coordinates and monitors the implementation of the FLD Programme with Headquarters at the Central Institute for Cotton Research, Regional Station, Coimbatore. The FLDs are organized through network centres of the AICCIP spread over ten cotton-growing states. Besides, Central Institute for Cotton Research, Nagpur and its Regional stations at Coimbatore and Sirsa also participated actively in the programme.

OBJECTIVES

- To demonstrate the usefulness of the latest improved crop production and protection technologies to the farmers as well as extension workers with a view to reduce the time gap between technology generation and its adoption.
- To enable Scientists obtain direct feed back from cotton farmers and suitably reorient their research programmes and develop appropriate technology packages.
- To create effective linkage among Scientists, Extension Personnel and Farmers.

FINANCIAL OUTLAY

The Ministry of Agriculture and Cooperation, Government of India has sanctioned Rs. 60 lakhs for conducting Front Line Demonstrations for the year 2005-06 out of which Rs. 24lakhs were earmarked for FLDs on cotton production technologies, Rs. 16lakhs for implement demonstrations and Rs.20 lakhs for FLDs on IPM.

LINKAGES WITH EXTENSION OFFICIALS

The FLDs offer a good opportunity for closer interaction between Scientists of different disciplines and the extension officials of cotton growing states. The coordinating centres organize Krishi Melas during the cropping season for highlighting the major achievements, packages of practices and newer technologies ready for transfer to farmers' fields. This has facilitated better feedback from the farmers to the scientists.

DETAILS OF FRONT LINE DEMONSTRATIONS

FLDs were conducted for transfer of modern / improved cotton production and protection technologies including demonstration of farm implements / machinery as well as improved cotton varieties and hybrids. It is to be highlighted that three types of FLDs were conducted i.e. FLDs on cotton production technology, FLDs on farm implements and FLDs on cotton IPM. It was a joint effort among co-ordinating extension unit of State Agricultural Universities (SAUs), State Departments of Agriculture and Directorate of Cotton Development (DOCD) and their field agencies. The main emphasis of the demonstrations include steps to enhance the production

of cotton in low productivity areas / problematic areas, where total improved package can be demonstrated. A list of beneficiaries and their plot numbers were to be compulsorily notified in the local Block Development / Panchayat Office. Farmers were selected in consultation with local Agricultural Officers and Panchayat Samiti. These officials form part of the FLD team. Bench mark survey was conducted before taking up the trial which includes information on the crops and cropping system of the area, inter cropping, the average yields of cotton and the local practices adopted in terms of irrigation, use of fertilizer, plant protection, etc., Information on the cost of cultivation was also collected for the area as a whole. An impact analysis after the harvest was carried out in the light of reduction in insecticide use, reduction in cost of cultivation, awareness of modern technology etc.,

During the year 2005-06, a total of 1150 Front Line Demonstrations were allotted to AICCIP network centres all over the country.

I. FLDs on Cotton Production Technology:

Under FLDs on Cotton Production Technology, each demonstration was conducted in one acre plot and Rs.2000 /- per acre (0.4ha.) was allocated. Out of this, Rs.1400 /- was used for essential inputs for demonstration and the rest was utilized for POL, hiring of vehicles, kisan melas / printed materials, reports and demonstration boards etc.,

II. FLDs on Farm Implements:

The area under demonstration was ensured that it should not be less than 25ha. The details of various farm implements recommended by Central Institute for Agricultural Engineering, Bhopal are as follows:

- i) Naveen dibbler, peg type dry land weeder, single wheel hoe, manually operated knapsack sprayer, cotton seed sorter, ultra low volume sprayer, cotton seed delinter, cotton seed treating drum.
- ii) Animal drawn equipments: Animal drawn patella harrow, Animal drawn cultivator, Animal drawn cotton planter (CICR), Jyithi planter, TNAU sweep, Brahma animal drawn sprayer.
- iii) Power tiller operated equipments: Power tiller operated weeder, Power tiller operated boom sprayer.
- iv) Engine operated equipments: Self propelled high clearance sprayer, Motorised knapsack sprayer (Mist blower), cotton stalk shredder, Lilliput gin (for cotton ginning).
- v) Tractor drawn equipments: Tractor drawn mould board plough, Tractor drawn rotavator, CIAE, Tractor drawn pneumatic cotton planter, Tractor drawn cultivator, Tractor drawn aero blast sprayer / electrostatic sprayers / boom sprayers, cotton stalk puller / up rooter (plough), cotton stalk puller / up rooter (wheel type) and Tractor operated roto slasher.

In the case of Implement Demonstration during the year 2005-06, Rs. 1.0 lakh (Rupees One Lakh Only) was earmarked for implement demonstration out of which Rs.95, 000/- was to be spent on implement purchase and Rs.5000/- for the expenditure on demonstration of the implements. No inputs e provided to the beneficiaries under this scheme on implement demonstration.

III. FLD on Integrated Pest Management (IPM)

In order to popularize the location specific IPM modules, this component was implemented in 50 or in smaller areas of 10 ha where cotton is not contiguous. The item wise break up for IPM demonstration is given below:

Item	Amount (Rs.)
Input cost (Rs.1000 /-per ha.)	50,000
Light traps/ IPM kits / pheromone traps/ bio-agent/bio-pesticides etc.,	38,000
POL/ hiring of vehicle for monitoring surveillance	7,000
Post harvest management (Ginning, Grading, Testing etc.,)	2,000
Literature / pamphlets / display materials	3,000
Total	1,00,000

Break up of Budget allocation for different centers and PC s cell are given in Table 1.

Table 1. Budget allocation for Front Line Demonstrations in Cotton during 2005-06

I. FLD on Cotton Production Technologies

Centre	No. of demonstrations	Area (0.4 ha)	Grant for input@Rs.1400 per 0.4ha.	Funds for POLand TA / Krishi Mela @ Rs.600 per 0.4 ha.	Total@ Rs.2000 Per 0.4ha.
North Zone					
PAU, Faridkot	60	60	84,000	36,000	1,20,000
CCSHAU, Hisar	125	125	1,75,000	75,000	2,50,000
RAU, Sriganaganagar	20	20	28,000	12,000	40,000
MPUAT, Banswara	25	25	35,000	15,000	50,000
CICR, Sirsa	47	47	65,800	28,200	94,000
North Zone Total	277	277	3,87,800	1,66,200	5,54,000
Central Zone					
NAU, Surat	50	50	70,000	30,000	1,00,000
JAU, Junagadh	35	35	49,000	21,000	70,000
SBBPUA&T, Meerut	3	3	4200	1800	6000
JNKVV, Khandwa	100	100	1,40,000	60,000	2,00,000
PDKV,Akola	75	75	1,05,000	45,000	1,50,000
MAU, Nanded	125	125	1,75,000	75,000	2,50,000
MPKV, Rahuri	50	50	70,000	30,000	1,00,000
OUAT, Bhavanipatna	100	100	1,40,000	60,000	2,00,000
CICR, Nagpur	50	50	70,000	30,000	1,00,000
Central Zone Total	588	588	8,23,200	3,52,800	11,76,000
South Zone					
ANGRAU, Guntur	50	50	70,000	30,000	1,00,000
CRIDA, Hyderabad	50	50	70,000	30,000	1,00,000

UAS,Dharwad	115	115	1,61,000	69,000	2,30,000
TNAU, Coimbatore	50	50	70,000	30,000	1,00,000
CICR, Coimbatore	20	20	28,000	12,000	40,000
South Zone Total	285	285	3,99,000	1,71,000	5,70,000
PC's Cell					1,00,000
Grand Total	1150	1150	16,10,000	6,90,000	24,00,000

II. FLD on Implement Demonstration:

(Area not less than 25 ha)

Centre	No. of demonstrations	Total @ Rs. 1,00,000 per centre
North Zone		
PAU, Faridkot	1	1,00,000
CCSHAU, Hisar	1	1,00,000
RAU,Sriganganagar	1	1,00,000
MPUAT, Banswara	1	1,00,000
CICR, Sirsa	1	1,00,000
North Zone Total	5	5,00,000
Central Zone		
NAU, Surat	1	1,00,000
JNKVV, Khandwa	1	1,00,000
PDKV,Akola	1	1,00,000
MAU, Nanded	1	1,00,000
MPKV, Rahuri	1	1,00,000
OUAT, Bhavanipatna	1	1,00,000
CICR, Nagpur	1	1,00,000
Central Zone Total	7	7,00,000
South Zone		
ANGRAU, Guntur	1	1,00,000
UAS,Dharwad	1	1,00,000
TNAU, Coimbatore	1	1,00,000
CICR, Coimbatore	1	1,00,000
South Zone Total	4	4,00,000
Grand Total	16	16,00,000

III. FLD on IPM:

Centre	No. of demonstrations	Area (ha.)	Grant for input @ Rs.1000 per ha	Grant for IPM modules* @ Rs.760 per ha	Funds for POL and TA / Krishi Mela @ Rs.140 per ha	Funds for Post Harvest Mgt. @ Rs.40 per ha	Funds for literature, pamphlets, display materials etc., @Rs.60 per ha	Total @ Rs.2000 per ha.
North Zone								
PAU, Faridkot	2	100	1,00,000	76,000	14,000	4000	6000	2,00,000
CCSHAU, Hisar	1	50	50,000	38,000	7,000	2000	3000	1,00,000
RAU, Sriganaganagar	1	50	50,000	38,000	7,000	2000	3000	1,00,000
MPUAT, Banswara	1	50	50,000	38,000	7,000	2000	3000	1,00,000
CICR, Sirsa	1	50	50,000	38,000	7,000	2000	3000	1,00,000
North Zone Total	6	300	3,00,000	2,28,000	42,000	12,000	18,000	6,00,000
Central Zone								
NAU, Surat	2	100	1,00,000	76,000	14,000	4000	6000	2,00,000
JAU, Junagadh	1	50	50,000	38,000	7,000	2000	3000	1,00,000
JNKVV, Khandwa	2	100	1,00,000	76,000	14,000	4000	6000	2,00,000
PDKV, Akola	1	50	50,000	38,000	7,000	2000	3000	1,00,000
MAU, Nanded	1	50	50,000	38,000	7,000	2000	3000	1,00,000
MPKV, Rahuri	1	50	50,000	38,000	7,000	2000	3000	1,00,000
OUAT, Bhavanipatna	1	50	50,000	38,000	7,000	2000	3000	1,00,000
CICR, Nagpur	1	50	50,000	38,000	7,000	2000	3000	1,00,000
Central Zone Total	10	500	5,00,000	3,80,000	70,000	20,000	30,000	10,00,000
South Zone								
ANGRAU, Guntur	1	50	50,000	38,000	7000	2000	3000	1,00,000
UAS, Dharwad	1	50	50,000	38,000	7000	2000	3000	1,00,000
TNAU, Coimbatore	1	50	50,000	38,000	7000	2000	3000	1,00,000
CICR, Coimbatore	1	50	50,000	38,000	7000	2000	3000	1,00,000
South Zone Total	4	200	2,00,000	1,52,000	28,000	8000	12000	4,00,000
Grand Total	20	1000	10,00,000	7,60,000	1,40,000	40,000	60,000	20,00,000

*Light traps, /IPM kits/ Pheromene traps/ bio-agent/ bio-pesticides etc.,.

The centre wise details of the technologies taken up for demonstrations are given in Table 2.

Table 2. Technologies Demonstrated under FLD during 2005-2006

Centre	No. of FLD demonstrations	Technologies demonstrated
NORTH ZONE PAU, Faridkot	60	<ul style="list-style-type: none"> Improved varieties / Hybrids-F-1861, LH-1556, F-1378, LD-694, LD-327 and Moti Optimal sowing time Plant population Proper weed control Nutrient management
CCSHAU, Hisar	125	<ul style="list-style-type: none"> Varieties/hybrid on farmer's fields (arboreum & hirsutum cotton) on released and pre-released genotypes Yield maximization of AAH-1, H 1117, HD 324, Yield maximization of H 1226, HHH 287, HHH 223
RAU, Sriganaganagar	20	<ul style="list-style-type: none"> Improved variety RS 2013 with Integrated Nutrient Management (INM) Improved variety RS 2013 with IPM

MPUAT, Banswara	25	<ul style="list-style-type: none"> Integrated crop production management practices with H-8.
CICR, Sirsa	47	<ul style="list-style-type: none"> Demonstration of hybrid CSHH-198 Demonstration of CISAA2 (CICR 2) Hybrid Seed production of CICR 2 and CSHH 198.
CENTRAL ZONE NAU, Surat	50	<ul style="list-style-type: none"> Improved varieties/ Hybrids G.Cot Hy-12, G.Cot.Hy-10 (New), G.Cot.MDH-11, G.Cot.23, G Cot 21.
JAU, Junagath	35	<ul style="list-style-type: none"> Improved varieties / hybrids Pro-agro-144, Bunny-145, G.Cot-13, Deviraj, MECH-12, and RCH2 Application of DAP Alternate furrow system. Intercropping with groundnut
JNKVV, Khandwa	100	<ul style="list-style-type: none"> Performance of JK-4 under partially irrigated and rainfed conditions Improved varieties / hybrids-H10, JKHy-1, H8, DCH32 Intercropping with maize (2:1) row ratio. INM
PDKV, Akola	75	<ul style="list-style-type: none"> G.arboreum var.AKA-8 vs.AKA-5 with their recommended package of practices G.hirsutum var. AKH-8828 Vs. PKV Rajat with their recommended package of practices. Desi hybrid AKDH-5 Vs PKV DH-1 Soil management-Sowing of AKH-081 on shallow soil In situ soil moisture conservation-opening of ridges & furrows. Crop canopy management Intercropping with short duration pulses
MAU, Nanded	125	<ul style="list-style-type: none"> Popularisation of desi cotton varieties PA-255/PA-402 with improved package of practices. Popularisation of American varieties NH-545/Ph-348. INM for rainfed cotton hybrid NHH-44. Demonstration of plant geometry in rainfed cotton with improved package of practices. Rainwater conservation techniques in rainfed cotton. Intercropping of blackgram (1:1) in rainfed cotton with improved package of practices. Strip cropping of redgram (6:2 ratio) in NHH-44 Spraying of 2%DAP at 45 and 75 DAS in rainfed cotton. Spraying of micro-nutrients i.e., MgSo4 @ 0.2% on seed cotton yield. Spraying of 2% MOP on rainfed cotton.
MPKV, Rahuri	50	<ul style="list-style-type: none"> Intercropping of summer groundnut in cotton Sequence cropping Weed management Yield maximization of hybrids Intercropping of redgram in rainfed cotton INM for rainfed cotton.
OUAT, Bhavanipatna	100	<ul style="list-style-type: none"> Integrated crop production practices with Arhar as an intercrop.
CICR, Nagpur	50	<ul style="list-style-type: none"> Integrated Nutrient Management in cotton Cotton based intercropping (cotton +soybean) Foliar application of DAP and detopping for yield improvement Opening of ridges and furrows for moisture conservation. Varietal trial of Surabhi (G.hirsutum) Bt cotton hybrids RCH-2 Bt and MRCH-6301Bt.
SOUTH ZONE ANGRAU, Guntur	50	<ul style="list-style-type: none"> Popularization of Bt hybrids- RCH2 Bt and Bunny Bt. And Straight varieties, Veena
CRIDA, Hyderabad	50	<ul style="list-style-type: none"> Popularisation of Brahma, Dusshera, Bunny and Bt cotton

UAS, Dharwad	115	<ul style="list-style-type: none"> • Popularization of newer hybrids / varieties viz., DHB-290, RCH-2Bt, MECH-162 and DLSa-17, Sahana, DDhc-11, RAHS-14, RAH-100 • Improved crop management practices. • Integrated nutrient management • Integrated Pest Management
TNAU, Coimbatore	50	<ul style="list-style-type: none"> • Popularization of MCU 12 and MCU 13. • Popularization of arboreum varieties-PA 255 and K11. • Demonstration of compartmental bunding. • Popularisation of improved agronomic practices for yield maximization.
CICR, Coimbatore	20	<ul style="list-style-type: none"> • Introduction of Bt cotton • Intercropping with vegetables • Application of Neem Cake • Foliar application of DAP & Potash • Seed, soil and foliar application of bio inoculants.

Zone wise number of FLDs under irrigated and rainfed conditions are provided in Table 3

Table 3. Zone wise Number of FLDs under Irrigated and Rainfed Conditions

Zones	Irrigated	Rainfed	Total
North	277	-	277
Central	78	486	564
South	41	244	285
Grand Total	396 (35.17%)	730 (64.83%)	1126 (100.00)

Out of 1126 FLDs conducted, 396 pertains to irrigated i.e around 35.17 per cent and 730 under rainfed conditions i.e., 64.83 per cent of the total.

Out of 1150 demonstrations allotted, 1116 demonstartions were successfully conducted. The major deviation was seen only at Bhavanipatna where out of 100 demonstrations allotted, only 75 were successful. Rest 25 got vitiated due to bad weather conditions.

Table 4. FLDs on Integrated Pest Management

Centres	Area allotted (ha)	Area demonstrated (ha)
North Zone		
PAU, Faridkot	100	30
CCSHAU, Hisar	50	18
RAU, Sriganaganagar	50	20
MPUAT, Banswara	50	50
CICR, Sirsa	50	50
North Zone Total	300	168
Central Zone		
NAU, Surat	100	vitiated
JAU, Junagadh	50	vitiated
JNKW, Khandwa	100	45
PDKV, Akola	50	20
MAU, Nanded	50	50
MPKY, Rahuri	50	50
OUAT, Bhavanipatna	50	50
CICR, Nagpur	50	50
Central Zone Total	500	265

South Zone		
ANGRAU, Guntur	50	16
UAS, Dharwad	50	40
TNAU, Coimbatore	50	50
CICR, Coimbatore	50	48
South Zone Total	200	154
Grand Total	1000	587

Out of 1000 ha allotted under IPM, 587 ha have been successfully conducted in seventeen centres during the year 2005-06. In Gujarat area, heavy and continuous rainfall after sowing of cotton resulted in water logging condition in FLD plots. So, most of the plants were damaged. Hence, those FLDs on IPM were treated as vitiated (Table 4).

RESULTS OF FRONTLINE DEMONSTRATIONS

I. PRODUCTION TECHNOLOGY

The results of the demonstrations conducted using improved package of practices are presented in Annexure I and percent increase in yield of demonstrated plots against check plots are depicted in Annexure II. The details of zone wise FLDs on cotton production technologies are as summarized below.

NORTH ZONE

Punjab Agricultural University (PAU), Faridkot

Season and its Effects

The weather conditions were quite favorable at the time of sowing. All the demonstrations were sown timely and the germination overall was good. The establishment of seedlings in most of the demonstrations was good due to dry weather conditions except for few cases where the rains adversely affected the germination. The high temperature during the early growth period resulted in the seedling burning and hence mortality of seedlings occurred in some fields. Weather conditions were favorable at the time of flowering. The incidence of insect pests was less. The high level of incidence of jassid was recorded in mid July. The whitefly population was higher during September end to October end. Aphid population also increased in 1st week of October and incidence was recorded up to 1st week of November. Negligible infestation of American bollworm was recorded through out the season. The spotted bollworm incidence was noticed in September. However, in trap catches, the numbers of moths were high up to November end. The incidence of cotton leaf curl virus was severe. Bacterial blight was found in 3.0 grade particularly on RCH134Bt, Ankur 651Bt and LHH144. Myrothecium and Alternaria leaf spot were found in traces to 3.0 grades on different varieties/hybrids of American cotton. Para wilt was also observed in traces to 6.0% on Bt cotton hybrids.

Progress of Work:

Punjab Agricultural University has recommended F-846, F-1378, LH-1556, F-1861 (varieties) and LHH-144 (hybrid) of American cotton and LD-327 and LD-694 (varieties) and Moti (hybrid) of desi cotton for general cultivation in the cotton growing regions of the state. A

number of improved production and protection technologies have also been recommended. To demonstrate the impact of improved varieties and package of practices on yield, 60 Front Line Demonstrations were conducted at farmers' fields during 2005-06.

Improved Varieties

In all the demonstrations, the recommended improved varieties of both *G. hirsutum* and *G. arboreum* recorded higher seed cotton yield than the respective check varieties. To demonstrate the impact of agronomic practices like balanced nutrition, weed control, time of sowing, plant population, few demonstrations were carried out with specific package of practices.

All the improved practices had considerable impact on the seed cotton yield which ranged from 7.1 to 55.8 per cent as compared to check i.e. farmers' practice. Among the 23 demonstrations conducted to demonstrate the effect of time of sowing, the increase in yield was 25.1, 28.9 and 32.5 per cent over the check for F-1861, LD-694 and Moti, respectively. Similarly, out of 12 demonstrations on weed control, the American cotton variety (F-1861) recorded the highest increase over the check plot (21.1 per cent) as compared to LH-1556 (7.1 per cent) and LD-327 (13.2 per cent).

Among 13 demonstrations conducted on optimum plant population for Moti, LD-694 and F-1861, 55.8, 33.5 and 22.1 per cent increase was seen in seed cotton yield. over the farmers' practice. A total of 18 demonstrations on balanced nutrition were conducted for the varieties Moti, F-1861 and LH-1556. A yield increment in the range of 8.2 - 36.2 per cent was recorded over all the check plots.

Four Krishi Melas, three Radio talks, 12 Popular articles and 14 Training lectures and two seminars cum Kisan gosthis were organised during the year to diffuse the cotton production and protection technologies.

CCS Haryana Agricultural University (CCSHAU), Hisar

One hundred and twenty five front line demonstrations were allotted to Main Cotton Research Station, CCS HAU, Hisar during 2005- 2006 crop season for transfer of technologies.

Season and the Effect:

During the Kharif 2005 season, the weather had been quite erratic with long breaks in rainfall. However, monsoon onset was in time and few heavy rain events were recorded during the season. The amount of rainfall received at onset was less in extreme western parts of Sirsa and Fatehabad districts and more in Rewari and Mahendergarh districts. At sowing and early growth stage, good rainfall resulted in good plant stand and growth. But strong storm in later resulted in crust formation, uprooting of plants and damaged the cotton crop adjoining Rajasthan border areas in Sirsa, Fatehabad and Hisar districts. The western zone of Haryana received 196 mm rainfall in July as against normal rainfall of 133 mm. Cotton leaf curl virus disease appeared with varying intensities (traces to 97%) in recommended and non-descript varieties. There was less incidence of American boll worm through out the crop season but spotted and pink boll worms remained during the whole crop season. In August, the crop experienced stress and suffered because of dry and hot weather conditions in almost entire state. In September, widespread

rainfall occurred in the state and standing crop that was in reproductive phase, got a fillip and showed good recovery. Sudden wilt was observed in hybrids/varieties in light sandy soils of Haryana State.

A. Yield Maximization of Desi Cotton Hybrid (AAH-1)

Fifteen demonstrations were conducted on yield maximization of desi cotton hybrid AAH-1 in Sirsa, Hisar and Fatehabad districts of Haryana State. The average yield of AAH-1 was around 1670 kg/ha as compared to 1196 kg/ha of local check variety with 39.69 per cent yield increase. Highest yield of 2400 kg/ha was obtained by Sh. Om Parkash S/o Harphool Singh of Dhani Issar, Fatehabad.

B. Yield Maximization of Desi Cotton HD 324

Five demonstrations were carried out for yield maximization of new desi cotton variety HD 324. The average seed cotton yield of 1731 kg/ha was obtained which was 30.16 per cent higher as compared to local check variety (1330 kg/ha). Har Krishan Lal S/o Jiwan Ram of Village Malewale, Sirsa recorded the highest yield of 2300 kg/ ha.

C. Performance of American Cotton H 1226

Newly released G.hirsutum variety H1226 was demonstrated in 18 fields with recommended package of practices. The average yield obtained was 2007kg/ ha which was 7.7 per cent higher than the local check variety (1864 kg/ha). The highest yield of 2600 Kg/ha was obtained in the field of Shri. Hari Singh S/O Sh.Krishna Ram of village Shahpur district, Hisar.

D. Performance of American Cotton hybrids HHH 287 & HHH 223

Fifteen demonstrations were conducted on newly released hybrids HHH 287 (14) and HHH 223 (1) to compare against local hybrids. The seed cotton yield of HHH 287 ranged from 700 to 2360 kg/ha as compared to local hybrids 600-2200 kg/ha. On average basis, HHH 287 (1705 kg/ha) recorded 7.30% and HHH 223 gave 4.70% higher seed cotton yield as compared to local checks respectively. Highest yield of HHH 287(2360 kg/ha) was obtained by Shri. Pankaj Mehta of village Kabrel, Hisar.

E. Comparative Performance of Desi Cotton HD 123 and HD 324

Eighteen trials were conducted in Sirsa, Hisar, Rewari & Sonapat districts with the newly released desi variety HD 324. The hybrid was compared with HD 123 and local check variety. HD 324 recorded a mean seed cotton yield of 1722 kg/ha as against 1630 kg/ha recorded by HD123 and 1434 Kg/ha by the local variety. The increase in seed cotton yield was of the order of 5.6 per cent over HD 123 and 20 per cent over the local variety. Highest seed cotton yield of 2550 kg/ha (HD 324) was obtained by Mahabir S/o Sh. Kanshi Ram of Dhani Pal, district Hisar which was 27.5% higher than local variety adopted by him.

F. Comparative Performance of American Cotton varieties H 1226 & H 1117

Twenty nine hirsutum varietal demonstrations were conducted with H 1226 and recommended variety H 1117 alongwith farmers' own variety. It was observed that H 1226 gave

highest yield (2600 kg/ha) in the field of Buta Singh 5/0 Gajan Singh of village Jalalana in Sirsa district. On an average H 1226 gave 3.27 and 14.07 per cent higher seed cotton yield as compared to H 1117 and farmer's local variety, whereas, H 1117 gave 10.79% higher seed cotton yield (1218 kg/ha) than farmers practice. On an average, H 1226, H 1117 and local check gave 2027, 1969 and 1777 kg/ha seed cotton yield respectively.

G. Yield Maximization of American variety H 1117

Twenty Five demonstrations of H 1117 were carried out in light sandy soils of south Haryana for yield maximization of H 1117 to popularize the improved cotton cultivation technology. It was observed that H 1117 gave highest seed cotton yield (1625 kg/ ha) on the field of Ram Singh S/o Sh Ramji Lal of village Nahar in Mohindergarh district. On an average, H 1117 gave 10.42 % higher seed cotton yield of 1218 kg/ha as compared to farmers' local variety.

Extension Activities

State level Training

Two state level trainings on hybrid seed production of intra arboreum and intra hirsutum hybrids (AAH-1 and HHH 287) were organized at the main campus CCSHAU, Hisar. About 300 farmers benefited from the training programme. On 21-7-2005, State level practical field training was organized on seed production techniques of Desi and American hybrids i.e. AAH-1 and HHH 287 at Cotton Research Area, Department of Plant Breeding, CCSHAU, Hisar. More than 200 farmers participated in the camp.

Cotton field day/Kapas Diwas

During 2005-2006 crop season nine cotton field day/Kapas Diwas were organized to transfer knowledge to large number of farmers in cotton growing areas of Haryana State.

A farmer training camp was arranged on 23.03.05 at village khajuri district Hisar in collaboration with Wheat Section/Department of Plant Breeding, CCS HAU, Hisar. Vice-Chancellor Sh. M.K. Miglani Retd. IAS was the Chief Guest of the function.

Two cotton Gyan Diwas on Front Line Demonstration in collaboration with Cotton Research Station and K.V.K., Sirsa were organized on 23.3.2005 at Shahpur Begu and Phoolkan villages of Distt. Sirsa. Drs. B. P. S. Lather, Chief Scientist Cotton, P.P.Jain, Scientist Incharge, CRS, Sirsa, L.K.Bishnoi, K.L.Chhabra, B.S.Chhabra and B.S.Sheokan were present on these occasions. They delivered appropriate message to the farmers to use good variety/hybrid, quality seed, proper agronomical management, integrated pest and disease management to obtain maximum good quality yield with minimum expenditure.

Six cotton Gyan Diwas were organized in collaboration with Cotton Corporation of India (CCI) at Dhiranwas, Panihar, Rawalwas Kalan, Siswal, Kabrale, Chapla mori villages of Hisar and Fatehabad districts. Drs. R.K.Malik (D.E.E.), B.P.S.Lather (S.C.B.), Sh. V.P.Nagpal (G.M, CCI Haryana) addressed on these occasions. Farmers got acquainted with technical know how in the form of literature, lectures and practical demonstrations. In each programme, 250 farmers actively participated.

RAU, SRIGANGANAGAR

Maximum and minimum temperatures during crop season ranged from 23.8 to 46.1 and 7.51 to 31.4 OC, respectively. Similarly the maximum and minimum relative humidity during crop season ranged from 39.2 to 86.7 and 14.9 to 69.0 per cent, respectively. Weather through out crop season was dry. The maximum temperature remained above 40 OC from mid May to mid September (18 weeks) except in 27th, 28th, and 32nd weeks. Total rainfall during crop season was 56.2 mm. During kharif 2005, insect-pest population remained very low due to prolonged dry and hot weather conditions. Jassid population remained below ETL during crop season. White fly appeared in 25th week and crossed ETL level in 36th week. Among boll worms Spotted boll worms remained active during square and boll formation stage. Very low incidence of Heliothis was recorded. Pink bollworm larvae were recorded in the end of season. CLCV was severe in this season.

Twenty front line demonstrations were conducted during Kharif season of 2005 in different farmers' fields of Sriganganagar and Hanumangarh district. Variety RS-2013 and RS-810 were planted for demonstration at farmers' field in improved package whereas in local package Bikaneri nerma, RST-9 and F-846 and others were used by the farmers at their own level. One training programme on Cotton was organized at Agricultural Research Station, Sriganganagar dated 02.08.2005. On this occasion, cotton scientists delivered their lecture on improved technology to the FLD farmers. Two field day programmes on cotton crop were organized at village 15ML and 6-LNP Sriganganagar on 11.11.2005.

Farmers of the area and KVK staff participated in the field day programme. Front line demonstration areas were visited by Scientists, KVK staffs, State Department of Agriculture of Sriganganagar and members of NALMOT.

In front line demonstrations improved package recorded on an average 29.22 per cent higher seed cotton yield over local package.

MPUAT, BANSWARA

The year with regard to climatic condition was normal. The monsoon commenced in the last week of June and a total of 895.5 mm rains was received in 41 rainy days. There was a spell of heavy rains that broke in the first week of August which shaded the initial flush of flowering which ultimately delayed crop maturity period. The season with regard to pest and diseases was normal one and routine pest incidence was observed.

Demonstration on Integrated Crop Production Management Practices

Twenty five demonstrations were conducted to demonstrate integrated crop production management practices on hybrid H-8. The higher yield was observed in the field of Roopeng/Tajeng Patidar (2430 kg/ha) followed by Parbhulal/Galji (2410 kg/ha). The yield of control plot ranged from 1400 kg/ha to 2200 kg/ha. The highest per cent increase was observed in demonstration field of Manilal/Deva Yadav (22.22 per cent). On overall basis, the per cent increase with this technology was observed as 11.98 per cent. Because of improper use of chemical fertilizer and nutrient management, tribal farmers did not obtain a higher level of production in cotton fields. Twenty five demonstrations on integrated crop production practices in cotton was demonstrated this year. The highest monetary gain by adopting improved

technology was realized at Roopeng's field (Rs. 6450/- per hectare). On overall basis, 11.98% yield superiority was observed with monetary gain of Rs 3430/ - by following improved crop production technology at farmers' field.

One field day on 21-10-2005 in village Amarpura and two farmers' trainings under ICDP programme were conducted.

CICR, SIRSA

The popular cotton varieties and hybrids being cultivated are: varieties: H-1098, H-1117, H 1226, F 1861, RS 2013, RG 8, HD 123, HD 107, LD 327 and LD 694. Hybrids –AAH-1, LHH-144, CSHH 198, CICR 2, etc and hybrids from private sector – Ankur 651, Bunny, Sandcot 35, Ganga Kaveri, Rashi etc. Bt cotton hybrids namely Rasi 134, Rasi 317, MRC 6301, MRC 6304, Ankur 2534 and Ankur 651 and some nondescript hybrids were also grown by the farmers of the region.

In the present season, a heavy storm was received during June which damaged the crop by uprooting and burning the plants. Later in the months of July to September, continuous rain during flowering and square formation stage, has affected the yield a lot resulting in low yield particularly in *G. hirsutum*. The incidence of American bollworm and leaf curl virus disease was seen in pockets. In general the weather remained favourable for cotton crop throughout the season i.e. kharif 2005. The temperature was favourable for sowing during second fortnight of April, and first fortnight of May with maximum temperature approaching more than 40°. During second week of May, with maximum of 44.3 °C. On 23rd MW. This has created the problem of sun burning of seedlings especially in late sown crop particularly desi. The whole of May was dry without any rainfall. However, 4.6, 8.6 and 71.4 mm of rainfall was received in first and last week of June and first week of July, respectively. This had helped in the good vegetative growth of crop followed by dry period which did not favour the build up of any pest population. A dust storm caused severe burning of crop which was late sown especially in sandy areas and 10-15% area was damaged due to this storm. This area was later resown with other crops like guar, bajra, moth, moong, etc. However, the heavy rainfall (178.8 mm) spread over 7 rainy days from 36-39 MW has hampered the growth of the crop. The cloudy climate coupled with rainfall created a severe abiotic stress to crop which caused lot of shedding of fruiting bodies & boll rotting.

The incidence of jassid and spotted bollworm was observed during the end of July and continued throughout August and beginning of September. However, american bollworm population was noted in traces randomly. At isolated localities, the incidence of Spodoptera was observed. However, the natural enemies such as Spider, Coccinellids, Chrysoperla, etc. were also noted very rarely.

The severe incidence of CLCuV was noticed in many of the non-descript varieties such as Raja Sikander, Baadsha, etc. However, very less incidence of 1-2% was noted in H-1117 and in some non descript Bt cotton entries also. The incidence of other foliar diseases was not observed.

- Demonstration of high yielding and tolerant to pest and diseases newly released *hirsutum* Hybrid CSHH 198.
- Demonstration of newly released *arboreum* Hybrid CICR 2, which is high yielding and tolerant to pest and diseases in farmers' fields.

- Hybrid seed production of CICR 2 and CSHH 198 at farmers' field

The main objective was to educate farmers to produce their own good quality F1 hybrid seed at a lower price with their limited resources. Training for sowing procedures and desired spacing for successful crossing programme was imparted to the farmers at research station as well as at their fields. Parents of Hybrid CSHH 198 and CICR 2 were sown on farmers' fields under supervision of the scientists and good hybrid seed was obtained. The farmers were trained for every important step involved in crossing programme for hybrid seed production such as rouging of off types, emasculation, pollination, crop management, etc. In case of CICR 2, the process of hand emasculation of flowers was avoided due to male sterility. From this and last two years' experience, the other farmers have also decided to take up hybrid seed production programme at their own field.

Hybrid CSHH198 was demonstrated at eighteen farmers' field. Under farmers' practice, some farmers have used Bt. Cotton (RCH-134) hybrids. On an average 4.94 sprays were used under FLD programme as compared to FP where 5.16 sprays were used. In case of yield of hybrid CSHH198, a maximum of 1100kg/acre was obtained. The average yield/acre over nineteen locations was 846 kg/acre where as under FP it was 714 kg/acre with an increase of 18.49%. Hybrid CICR2 was demonstrated at nineteen locations. Maximum yield/acre (1500 kg/acre) was obtained by Sat Pal of Rattakhera village. The average yield/acre over nineteen locations was 918kg/acre where as under FP it was 709 kg/acre with an increase of 29.66%. The maximum net profit of Rs.7535 was obtained by Bhoop Singh at village Jandwala Bishnoian. The farmers preferred the hybrid CICR 2 as greater demand is expected in the ensuing season.

Ten farmers were given the seed of female and male of hybrid CICR 2 and CSHH 198. The farmers showed eagerness to adopt the technology. They participated in the training organized at CICR, RS, Sirsa. They were also trained in their fields on roguing and pollination details. Maximum income of Rs. 81000/- per ha was obtained by Trilok Chand of Dhani Trilok Chand, Fatehabad district followed by Bharpur Singh of Sangaria (Raj.) who got Rs. 70500/- per ha as total income with a net income of Rs. 31800 and Rs. 20180 respectively. The programme was appreciated by the farmers and they felt it as a profitable venture besides getting pure seed for themselves. Kisan Melas /Field days/ Extension activities were conducted.

A field day was organized on 9.7.05 at Rangri, Sirsa on IPM technologies. A large number of farmers attended the mela. Dr. B.M.Khadi, Director, CICR, Nagpur was the chief guest of the function. He lauded the work done by the CICR, Regional Station, Sirsa. All the scientists attended the mela and interacted with the farmers and got the feedback. Dr. Khadi released a pamphlet on recently released hybrids CSHH 198 and CICR 2.

Success Story:

Sh. Jeet Singh of Rangri village got maximum yield of 3500 kg/ha of CICR 2, recently released hybrid from CICR, RS, Sirsa, as compared to AAH 1, (2500kg/ha). There was a significant difference of 1000 kg/ha. Sh. Jeet Singh earned higher net income (Rs.24750/-) over the farmers' practice due to less cost of cultivation as the hybrid CICR 2 is tolerant to insect-pest and diseases. The farmers were much impressed by the performance of CICR 2 hybrid at farmers' field. At other locations also, it surpassed the prevailing hybrid variety in the region. Farmers were even ready to book the seeds of this hybrid in advance.

NAU, Surat

In Gujarat, at most of the places, monsoon commenced from 2nd week of June, 2005. The first shower was followed by heavy rainfall all over the State. Timely sowing of FLD plots was possible. Germination in most of the plots was satisfactory. Plant population was maintained by gap filling. Looking to overall situation, the rainfall was well distributed over the season.

As regards pests and diseases attack of aphid was low to medium. The incidence of jassids and thrips crossed ETL two to three times during cropping season. High incidence of whitefly was observed in North Gujarat. The attack of Earias and Helicoverpa was low to medium. At later stage of the crop, the incidence of Pectinophora was noticeable in non-Bt cotton varieties.

Looking to overall situation of the state, the season was favourable for good crop growth and yield.

Sr. No.	Centre	Variety / hybrid	Number of FLD allotted			Successful FLD plots
			Varietal	Agronomical	Total	
A.	Navsari Agril. University					
1.	Surat	G.Cot.Hy-12	1	--	1	1
		G.Cot.Hy-10 (New)	1	2	3	3
		G.Cot.MDH-11	1	2	3	1
2.	Bharuch	G.Cot.Hy-12	2	--	2	2
		G.Cot.23	10	3	13	13
3.	Hansot	G.Cot.Hy-10 (New)	1	--	1	1
B.	Anand Agril. University					
4.	Devgadhbaria	G.Cot.23	3	--	3	2
5.	Viramgam	G.Cot.21	5	3	8	7
6.	Arnej	G.Cot.MDH-11	--	1	1	--
		G.Cot.21	3	--	3	2
7.	Dhandhuka	G.Cot.MDH-11	--	1	1	1
		G.Cot.21	3	--	3	3
C.	Sardar Krushinagar-Dantiwada Agril. University					
8.	Talod	G.Cot.Hy-12	1	--	1	1
		G.Cot.MDH-11	2	--	2	2
9.	Khedbrahma	G.Cot.Hy-12	1	--	1	1
		G.Cot.Hy-10 (New)	2	--	2	2
10.	Bhachau	G.Cot.MDH-11	1	--	1	1
		G.Cot.21	1	--	1	--
	Total		38	12	50	43

A total of 50 demonstrations were conducted on cotton production technologies, 38 under varietal and 12 under agronomical trials. Out of 50, seven trials got vitiated. Varietal demonstrations were made on G.Cot.Hy-12, G.Cot.Hy-10(New), G.Cot.Hy-10, G.Cot.MDH-11, G.Cot.23 and G.Cot.21 with an average yield of 2180,2290, 1563, 1524, 1223 and 1226 kg/ ha respectively against local variety to the tune of 1052kg/ ha.

Farmers' Shibirs:

The scientists of different disciplines of Main Cotton Research Station, Surat and Sub-centres often visited the FLD plots with the aim to explain the production and protection aspects of cotton cultivation. A farmers' Shibir at Laliyana village of Kutch District was arranged in collaboration with a NGO on 6th September, 2005 and guidance was given to 200-250 participants.

JAU, Junagadh

The first shower of rain was received on 20th June 2005. 156.4 mm rain was received during 25th Std. week i.e. from 20th to 24th June. Majority of the demonstrations (FLDs) were sown in time. There was continuous rainfall from 27th June to 3rd July. Germination in all FLDs was satisfactory, however, required gap filling was done to maintain proper plant stand. Distribution of rain during the months of June, July, August and September '2005 was quite satisfactory and hence initial crop growth was satisfactory. But during the month of September, there was a cyclonic heavy rain with very high wind velocity (452.3 mm rains in 12 rainy days), which has severely affected the crop growth resulting in heavy shedding of first flush. During the season, total of 1112.1 mm rainfall was received in 40 rainy days.

The incidence of aphid started from last week of July and continued up to harvest but severe incidence was recorded during the month of November. The incidence of jassid started from last week of July and observed up to 3rd week of December, however, it was below ETL. Thrips incidence started from second week of August and continued up to 2nd week of December. Severe incidence of thrips (above ETL) was recorded from 3rd week of August to 2nd week of September. The severe incidence of whitefly was recorded during the month of November. They were controlled by spraying of proper systemic insecticides.

The bollworm incidence was moderate throughout the season. Spotted bollworm incidence reached ETL during the last week of November. The incidence of *Helicoverpa* was severe during the flowering stage of the crop i.e. from 2nd week of September to 1st week of October. The pink bollworm incidence started from third week of November and continued up to harvesting of the crop, but it was very low (below ETL). Whenever bollworms had crossed ETL, they were controlled by spraying of proper insecticides.

In general, the weather condition was favourable to cotton crop. A total of 35 demonstrations were earmarked to this centre for conduct of FLD on production technologies. They were categorised under varietal trials and agronomic trials as detailed under:

Varietal: RCH 2 was demonstrated against MECH 12, Mallika, Ganga, G.Cot Hy-10 and Nav Bharat. The average yield of RCH 2 was 2786 kg/ha against 2514 kg/ha of check varieties. Results of varietal FLDs indicated 9.58 % average yield increase over check with a range of -20 to 50 %.

Fertilizer: Application of DAP to cotton crop did not reflect any effect on seed cotton yield. However, trial without use of DAP clearly showed saving of Rs.1637 per hectare.

Cropping system: Intercropping of cotton with ground nut gave increased yield to the tune of 2850kg/ha when compared to sole crop of 2693kg/ha. FLD on intercropping revealed on an

average 5.83 per cent increase in seed cotton equivalent yield.

Irrigation: Surface irrigation gave higher seed cotton yield of 2492kg/ha as compared to alternate furrow of 2392 kg/ha (-3.77 %). Difference in seed cotton yield was comparatively less as compared to water saving through alternate furrow irrigation.

JNKVV, Khandwa

A total of 100 demonstrations were conducted by the centres at Khandwa and Indore. Varietal and agronomic trials have been conducted under this programme.

Improved Varieties /Hybrids

The performance of JK.4 was demonstrated under irrigated and rainfed conditions which yielded an average of 1347 kg/ha and 1145 kg/ha, respectively against their check variety yield of 870 to 989 kg/ha. Around 30 to 35 per cent increase in yield over the check could be obtained from the demonstrated fields.

At Indore centre, varieties / hybrids like DCH-32, H-10, H-8 and JKHy-1 were demonstrated in farmers' fields. The average yields obtained were 1498 kg/ha in DCH32, 1400 kg/ha in H-10, 1393 kg/ha in JKHy-1 and 1370 kg/ha in H-8 against local check variety with 1174 kg/ha. The result indicated that the improved technology recorded on an average 15-22 per cent higher kapas over farmers' practices.

Suitability of cotton Improved Varieties / hybrids of cotton for intercropping with maize, (2:1) row ratio.

Intercropping with maize (2:1) row ratio was found more remunerative (Rs. 17050-20500/ ha) as compared to (Rs 3300-5200/ ha) over sole cotton as well as farmers' practices.

Yield Enhancement with INM over Farmers' Practices

The results revealed that INM practices helped in realization of seed cotton yield of 1193 kg/ha an increase of 22-37 per cent higher over farmers' practices (915 kg/ha).

PDKV, Akola

During 2005-06, 75 FLDs were conducted in the area of cotton growing districts of Vidarbha region viz., Akola (31), Amravati (4), Washim (1), Buldhana (23), Yavatmal (9), Wardha (6) and Nagpur (1) under rainfed condition.

1) Varietal Demonstration of released var. AKA-8 Vs. AKA-5 with their recommended package of Practices

Released desi cotton *G. arboreum* variety AKA-8 with its recommended package of practices was demonstrated at 14 locations on farmers' fields to test the yield potential in comparison with desi cotton variety AKA-5 under rainfed condition. Variety AKA-8 (2864 kg/ha) recorded 11.71 per cent increased seed cotton yield over AKA-5 (2557 kg/ha) under rainfed condition.

2) Varietal Demonstration of released var. AKH-8828 Vs. PKV Rajat with their recommended package of Practices

Fifteen demonstrations on released *G. hirsutum* cotton variety AKH-8828 with its recommended production technology were conducted on farmers' fields to test the yield potential in comparison with PKV Rajat. The yield data indicated that pre-release variety AKH-8828 (300 kg/ha) registered 9.09 per cent more seed cotton yield than PKV Rajat (275 kg /ha). Besides better yield potential, this newly released cotton genotype AKH-8828 is having high ginning outturn and big boll size.

3) Varietal and Cotton Seed Production Technology Demonstration of pre-released Desi Hy. AKDH-5 Vs. PKV DH-1 with their recommended package of Practices

Training in hybrid seed production technology in desi cotton was also imparted to the farmers. Parental seeds of AKDH-5 and PKV DH-1 were supplied to the farmers. Detailed guidelines for hybrid seed production using genetic male sterility system were given to these farmers. Field visits were also organized to impart practical training.

4) Demonstration on Soil Management - Sowing of AKH-081 on Shallow Soil with recommended package of Practices

Though cotton cultivation on shallow soils is being discouraged, farmers are growing cotton on shallow soils. This is one of the major reasons for lower productivity in this area. This center has identified an early dwarf *G. hirsutum* variety AKH-081 suitable for shallow soils. In order to popularize this technology, improved American variety AKH-081 with its recommended package of practices was demonstrated at ten locations on farmers' fields to test the yield potential in comparison with farmers' practices with other varieties/hybrids on shallow soil. The yield data reported showed an average of 419 kg/ha in the demonstrated fields against check fields (388 kg/ha). On an average, this recommended package of practices produced 7.99 per cent higher seed cotton yield over check.

5) In Situ Soil Moisture Conservation - Opening of Ridges and Furrows

In order to see the benefit of opening of ridges and furrows at 30 DAE and to popularize this low cost production technology for in situ soil moisture conservation, seven demonstrations were organized on farmers' field. On an average, this technology has given 10 per cent higher seed cotton yield than farmers' practice.

6) Demonstration on Crop Canopy Management- 2 % Urea at flowering and 2 % DAP at Boll Development Stage

Front line demonstration on foliar application of 2 % urea at flowering and 2 % DAP at boll development stage were conducted on farmers' fields in comparison with control (no spraying). On an average, this technology produced 10 per cent more yield than control (no spraying).

7) Inter-cropping with short duration Pulses

Front line demonstration on cotton based inter-cropping system with short duration

pulses (green gram) was conducted on farmers fields at five locations to assess the performance of this technology in comparison with control (sole cotton crop). Seed cotton yield in cotton + green gram intercropping system was less over sole cotton crop (monocropping system), however, due to additional yield of green gram in cotton + green gram intercropping system, the gross income was more than sole crop.

Cotton + intercropping system gave average Rs 4395/- per ha additional gross monetary return as compared to sole cotton.

Farmers' Opinion and Suggestions on different Cotton Production Technologies

Sr.No	Name of cotton technology	No of FLDs	Farmers opinion and suggestions
1	G.arboreum var.AKA-8	14	High yield potential as compared to AKA-5, big boll, non locule shedding, sturdy habit, vigorous growth and non lodging; hence accepted by the farmers
2	G.hirsutum var.AKH-8828	15	Big boll, fluffy opening, high ginning outturn, tolerant to pink bollworm and high yield potential. Due to higher ginning outturn, lint, yield potential is more in AKH-8828 than PKV Rajat.
3	Performance of AKDH-5	13	15 per cent higher seed cotton yield and lint yield as compared to PKV DH-1. Non lodging, sturdy main stem and vigorous growth.
4	AKH-081 on shallow soil	10	Nearly 30 % soils of this region belongs to shallow type soils (less than 25 cm soil depth)
5	In situ soil moisture conservation by opening of ridges & furrows.	2	Non-cash input technology, widely accepted by the farmers for insitu soil moisture conservation & improvement in yield. Ridges and furrows can be prepared at the time of interculturing. No additional expenditure required.
6	Crop canopy management- 2 % Urea at flowering and 2 % DAP at boll development stage	3	Low cost production technology, very well accepted by the farmers, having 6-7 % increase in seed cotton yield. Foliar spray of 2 % Urea & 2% DAP can be undertaken along with the insecticidal sprays.
7	Inter-cropping with short duration pulses	5	Though the yield of seed cotton in intercropping technology intervention is lower than sole cropping system (sole cotton), due to additional gain of intercrop, (cotton + green gram), this cropping system is widely accepted by the farmers because of increased monetary returns. Improvement in soil fertility status with incorporation of biomass is additional benefit.

Krishi Melawas:

One Krishi Melawa (Field day) was organized by this Research Unit, at Bharuad, Dist. Akola, on dt. 14-12-05. About 175 farmers from Bharuad & surrounding villages attended the field day. Hon'ble Vice Chancellor and the Scientists addressed the farmers and explained various production technologies which could be adopted by the farmers for increasing cotton production. Authorities from State Agric Deptt. and University Scientists were also present.

Another Krishi Mela was organized at village Lohari (Bk) Dist. Akola on 23.12.05. About 165 farmers in the Lohari (Bk) & near by villages actively participated. On this occasion, Hon'ble Vice Chancellor emphasised on different techniques of cotton production to the farmers. Taluk Agricultural Officer and Scientists from the University participated in this Melawa.

MAU, Nanded

Seventy Demonstrations were conducted on farmers field on cotton crop during kharif 2005- 2006. Demonstration of improved desi cotton varieties PA-255 / PA-402 with improved package of practices in comparison with intra hirsutum hybrid NHH 44/PHH-316. On an average in nine FLDs, variety PA-255 gave 1085 kg/ha and NHH-44 973 kg/ha seed cotton yield. The desi variety PA-255 (Turab) gave 11.51 % increased seed cotton yield over NHH-44. In another set, on an average of ten FLDs of PA-402 and NHH-44. The variety PA-402 and NHH-44 gave 1185 and 972 kg/ha seed cotton yield respectively. The desi cotton variety PA-402 gave 21.78% increased seed cotton yield over hybrid NHH-44. The hybrid PHH-316 gave 13.07 % increased seed cotton yield over hybrid NHH-44.

Demonstration of desi varieties PA-255/PA-402 with improved packages of practices in comparison with American cotton varieties (NH-545/PH-348)

Nine FLDs were conducted to demonstrate the performance of newly released American cotton variety PH-348 and NH-545 in comparison with desi variety Fertilizer dose and plant protective schedule for each group was adopted. On an average of 5 FLDs, variety PA-255 gave 1040 Kg/ha and NH-545 gave 1169 Kg/ha seed cotton yield. The desi cotton variety PA-255 (Turab) gave 9.7% increased seed cotton yield over the American variety NH-545. While on an average of four FLDs of desi cotton variety PA-402 and American variety PH-348 the seed levels of 1088 and 1169 Kg/ha seed cotton yield could be noticed.

Demonstration of american varieties NH-545/Ph-348 with improved packages of practices in comparison with american hybrids (NHH-44/PHH-316)

Results indicated that on an average of eight FLDs, variety PH-348 gave 1111 Kg/ha and NHH-44 969 Kg/ha seed cotton yield. The hirsutum variety PH-348 gave 18.19 % increased seed cotton yield over the seed cotton yield of NH-545.

In another set on an average of eight FLDs, the variety NH-545 and PHH-316 gave 940 Kg/ha and 1226 Kg/ha seed cotton yield respectively. The hybrid cotton variety PHH-316 gave 30.42 % seed cotton yield over hirsutum cotton variety NH-545.

Demonstration on Plant Geometry in Rainfed Cotton with improved package of Practices

Adoption of recommended plant population of 27,777 pl/ha (60cmx60cm) increased the seed cotton yield ranging from 10.25 % to 48.38 % over adoption of farmers local practice of 90cmx90cm spacing (12345 pl/ha).

Demonstration on Integrated Nutrient Management for Rainfed Cotton Hybrid NHH-44.

Eleven trials were demonstrated on integrated nutrient management for rainfed cotton. Average yield of 1254 kg/ha was recorded in the demonstrated fields against check fields (1006 kg /ha). The seed cotton yield increase ranged from 12.19 to 45 per cent over non adoption of INM practices. The average increase in seed cotton yield due to INM was 25 per cent over check fields.

Demonstration on Rainwater Management Techniques for Rainfed Cotton

Supplemented with tying of ridges at an interval of 6 to 8 meters across the slope at the last hoeing has helped to increase cotton yields. Nine FLDs were conducted to demonstrate this practice. The results clearly showed the benefit of rainwater conservation practice. The seed cotton yield was increased ranging from 11.58 % to 28.05 % due to adoption of rain water conservation practice over non-adoption of rain water conservation practice. The average seed cotton yield increase of 16.81 % was obtained over control.

Demonstration on inter cropping of black gram (1:1) in Rainfed Cotton with improved packages of Practices

Results indicated that additional monetary returns ranging from Rs. 952/- to Rs. 1846/ - ha without affecting seed cotton yield was obtained due to adoption of intercropping of black gram in cotton over sole cotton crop. On an average, additional monetary returns Rs.1513/ha has been obtained due to adoption of intercropping of blackgram in cotton over sole crop of cotton.

Demonstration on Strip cropping of Red gram (6:2 ratio) in Rainfed Cotton Hybrid NHH-44.

Results showed that the additional monetary returns ranging from Rs. 1861/ - to Rs. 3196/ - ha was obtained without affecting seed cotton yield by adopting strip cropping of red gram in cotton. On an average, additional monetary returns Rs. 2382/- ha has been obtained by the farmers by adopting strip cropping of Red gram in rainfed cotton over sole cotton crop.

Demonstration on Spraying of 2% DAP at 45 and 75 days after Sowing in Rainfed Cotton

Spraying of 2% DAP at 45 and 75 days after sowing in rainfed cotton resulted in average yield of 1030 kg/ha against no spray (846 kg/ha). The average increase in seed cotton yield was 21.75 percent over control.

Demonstration on Spraying of Micronutrients i.e. MgS04 @ 0.2% at 45 and 75 days after Sowing for the Control of reddening in Cotton

The results of demonstrations indicated the beneficial effects of spraying of micronutrients Mgs04 @ 0.2% at 45&75 days after sowing on seed cotton yield of hybrid NHH-44. The seed cotton yield increased ranging from 2.73% to 14.08% over non spray of micronutrient Mgs04 @ 0.2% at 45 &75 days after sowing.

Demonstration on Spraying of 2% MOP on Rainfed Cotton

The result indicated that the seed cotton yield ranged from 13.52 % to 25.06 % over non spray of MOP @ 2 % at 45 and 75 days after sowing. The average increase in seed cotton yield was 18.66% over control.

Krishi Melawa:

Krishi melawa on Cotton crop was organized at Naigaon Dist. Nanded on 26.11.2005. Dr. K.K. Zote, Director of Extension Education, M.A.U., Parbhani was the chairman of Krishi Melawa. Dr. L.A. Deshpande, Cotton Specialist, C.R.S., Nanded. Shri. V.S. Dahale, Agril.

Development Officer, State Agril. Department and progressive farmer, Shri Devrao Dajiba Kale attended Krishi Melawa. About 500 farmers participated. The Scientists explained the improved cultivation practices including INM and IPM and the need to bring down cost of cultivation.

MPKV, Rahuri

Cotton is the principal cash crop of the Deccan Canal Tract of Western Maharashtra. Cultivation of irrigated cotton is confined to the districts of Pune, Solapur, Satara, Ahmednagar and some parts of Nasik where cotton is sown in March-April and harvested up to August - Sept. In Jalgaon and Buldhana districts, pre seasonal irrigated cotton is sown in the first fortnight of May. In some parts of Solapur district, cotton is grown in Rabi season.

Intercropping of Summer Groundnut in Cotton:

In the six demonstrations organized on inter cropping groundnut in cotton, the groundnut was dibbed on one side of the ridge at the time of sowing of cotton. Crop growth was normal during the season. In the demonstration plot, the yield of seed kapas (main crop) and groundnut (inter crop) varied between 13.8 to 15.5 Q/ha and 7.8 to 10.00 Q/ha. However the yield of control plot (sole cotton) varied between 15.10-17.20 Q/ha. The cost of cultivation per intercrop demonstration was Rs.28460/- and that of control was Rs.26960/- per /ha. By considering prevailing market rate @ Rs.2000/- for seed kapas and Rs.2200/- for groundnut pods, farmers are getting a gross return of Rs.48500/- per /ha. The B.C.ratio of inter crop demonstration (1.72) was higher than non intercrop demonstration (1.22) indicating the importance of intercropping in cotton.

Sequence cropping (Growing of cotton after harvest of sugarcane without preparatory tillage):

To avoid the cost of preparatory tillage, as well as to get the benefit of residual effect of fertilizer and moisture, direct sowing of cotton without preparatory tillage after harvest of sugarcane is recommended. In these demonstrations, cotton was dibbed on one side of the ridge in the month of April. The average yield is to the tune of 2000 kg/ha in sequence cropping against the check plot (1866 kg/ha) resulting in an increase yield of 7.18 per cent over the check. A saving of Rs. 6000/- against cost of preparatory tillage could be seen.

Integrated Weed Management in Cotton:

Cotton is wide spaced crop and being slow in growth it gives scope for growth of weeds during the early stage of crop growth. The weeds compete with cotton for light, nutrient, water, air and reduce the growth and yield of cotton crop. This project recommended Basalin, 1.5 kg a.i./ha as pre emergence spray to control the weeds in cotton crop. One pre emergence spray of Basalin helps to suppress the growth of weeds and reduce the cost of one weeding and required only two weedings. Integrated weed management plots gave an average yield of 1782 kg/ha against non treated plots (1500 kg/ha) resulting in 18.8 per cent increase over check fields.

O.U.A.T., BHAWANIPATNA

Cotton is grown as a non-traditional commercial crop in the western and southern parts of Orissa under rainfed condition during Kharif season. Cotton is grown by resource poor marginal

farmers with small holdings and limited know-how of the improved technologies of cotton based production system. Since low cost of cultivation and higher return per rupee invested is one of the solutions to compete in the international market and for sustainable cotton production for farmers, the following technologies were demonstrated:

1. Integrated crop production practices with Arhar as an inter crop
2. Integrated pest management technology.

Season and Crop Situation

The cotton crop encountered with a rainfall of 923.70 mm spanning over 49 rainy days. During the early stages of crop growth there was low and intermittent rainfall. But in the 37th standard week (10 to 16th September, 2005) there was heavy rainfall of 333.9 mm resulting in dropping of fruiting bodies.

The entire cotton areas of Orissa are covered by only long staple hirsutum hybrids / varieties and the area under hybrids is more than 90 per cent. The crop growth during the entire season was normal with yield ranging between 12.5 to 15.0 q/ha and the price offered ranged between Rs.2150 /- to Rs.2600 /- per quintal of seed cotton.

The crop was not affected by any disease initially but towards maturity bacterial leaf blight, anthracnose, grey mildew appeared in patches. As regards the pest scenario, there was low incidence of both sucking pests and boll worms which never crossed ETL throughout the cropping season... However due to incessant rain during September, there was high incidence of foliage feeders like Semi-looper and leaf folder.

A total of 100 demonstrations each of one acre on production technology was implemented at village Sujanpur of Bhawanipatna block. The critical inputs demonstrated were application of 12 cart loads of FYM, supply of arhar seeds for inter-cropping, fertilizer application based on soil test report, azotobacter and PSB as bio-fertilizer, foliar spray of NAA at flowering period, foliar spray of DAP at boll formation stage and clean picking. All other recommended management practices were followed.

The plants appeared healthy and vigorous in the demonstrated plots and could withstand occasional moisture stress during the cropping season. Results indicated that the FLD farmers obtained gross return of Rs.31 ,888 / - for a lower cost of cultivation of Rs.11, 945 compared to Rs.28,202/ - for an investment of Rs.12,545/-.The cotton equivalent yield advantage was 13 per cent in the demonstrated plots compared to the farmers practice. The return per rupee invested was 2.67 in the production technology plots and 2.25 in the farmers' plots.

Extension Activities

Krishimela was conducted one each for Front Line Demonstrations of Production Technology and Front Line Demonstration on Integrated Pest Management at villages Sujanpur and Yamanabahal on 16th November, 2005 which was attended by the NALMOT team members.

CICR, Nagpur

During the crop season 2005-06, the onset of monsoon was normal. However, the rainfall distribution was not satisfactory in this area. Continuous rains during July, August and September with more number of rainy days and excess rainfall hampered the intercultural operations resulting in suppression of cotton growth. However, intercultural operations and 2 - 3 times hand weeding helped in management of weeds. Farmers were advised to drain out the excess stagnated water from their fields and also advised to maintain the crop free from weed by regular intercultural operations as well as hand weeding. Continuous rainfall and cloudy weather till September affected the crop growth. Rains from 15th - 17th October, 2005 resulted in higher incidence of bacterial blight and grey mildew diseases due to favorable weather for disease development.

Thirty three demonstrations on NHH 44 with the recent technologies for cotton improvement viz. integrated nutrient management, cotton based inter - cropping system (cotton + soybean), foliar application of DAP and detopping for yield improvement and opening of ridges and furrows for moisture conservation have been demonstrated in comparison with the conventional farmers' practices of crop production. Five Front Line Demonstrations were conducted with a popular variety Surabhi released for Southern cotton growing areas in comparison with variety Anjali. Five demonstrations each were conducted with cotton hybrid RCH-2 Bt and MRCH 6301 Bt in comparison with the traditional hybrid NHH-44.

Integrated nutrient management was demonstrated with the reduced dose of fertilizer supplemented with the use of bio fertilizers in comparison with farmers practice of lower dose of fertilizers. The average seed cotton yield of 888 kg /ha was registered with INM practice as against the farmers' practice of 753 kg/ha under rainfed condition. The per cent increase in seed cotton yield ranged from 15.15 - 23.08 per cent with an average increase of 17.93 per cent seed cotton yield.

Twelve demonstration were conducted on inter-cropping of soybean with hybrid NHH 44 under rainfed conditions in comparison with sole cotton as well as sole soybean crop. An increase of profitability of 33.57 per cent was observed by adopting intercropping of soybean in cotton over sole cotton crop. On an average, additional monetary return of Rs 5199/ha has been obtained by adopting intercropping of soybean in cotton over sole crop of cotton.

Frontline demonstration on IPM technologies with varied components of IPM was undertaken in two blocks of 25ha, in two different locations with 43 farmers from the adopted villages. Sucking pest tolerant hybrid NHH 44 was selected with use of trap crops, release of trichoparasitoids, pheromone traps and need based application of selective insecticides/ fungicides. In cotton hybrid NHH 44, the IPM components were quite effective in checking the insect pests and disease incidence. With the adoption of complete module of Integrated Pest Management, an increase in seed cotton yield ranging 6.45- 25.93 per cent and an average increase in seed cotton yield of 15.16 per cent as compared to sole dependence on insecticides.

Six demonstrations were conducted with spraying of 2.0 per cent DAP as foliar application and detopping at 80-90 days old crop of hybrid NHH-44 for improvement of seed cotton yield in comparison with farmers practice without spraying of any nutrient and without detopping as control (check). The foliar applications of 2.0 per cent DAP and detopping at 80-90 days of crop has increased the seed cotton yield to 873 kg/ha compared to farmers practice of

721 kg/ha. The increase in seed cotton yield was to an extent of 12.76 per cent.

Five demonstrations were conducted with opening of ridges and furrows at first inter cultural operation and subsequently maintained them for soil moisture conservation in comparison with farmers' practice of without opening of ridges and furrows. The opening of ridges and furrows increased the seed cotton yield up to 9.62 per cent as compared to farmers' practice of without following ridges and furrows.

Demonstration on hybrid cotton RCH 2 Bt was conducted at five locations in comparison with traditional hybrid NHH 44. Since, RCH – 2 Bt suffers due severe incidence of jassid and reddening of leaves, an average reduction of 3.26 per cent seed cotton yield was registered as compared to hybrid NHH 44.

Cotton hybrid MRCH-6301 Bt was compared with hybrid NHH -44 at five locations. MRCH – 6301 Bt clearly showed its yield advantage by registering higher seed cotton yield to an extent of 11.56 percent, ranging between 6.45-17.14 per cent. MRCH -6301 Bt has recorded seed cotton yield 965 kg/ha as compared to 865 kg/ha in hybrid NHH 44.

Variety Surabhi, popular in Southern cotton growing area, was demonstrated at seven locations in comparisons with variety Anjali. The average seed cotton yield of Surabhi ranged between 625-875 kg/ha with an average seed cotton yield of 743 kg/ha. On an average, 6.75 per cent increase in seed cotton yield ranging between 3.23 to 19.05 per cent was obtained as compared with variety Anjali.

Farmers' Opinions

1. Application of more nitrogen but less of phosphorus as fertilizer resulted in higher incidence of insect pest and diseases. Farmers have expressed satisfaction in judicious use of fertilizers along with biofertilizers for improvement of seed cotton yield.
2. Farmers generally faced the problem of intercultural operations of cross hoeing for weed management in cotton based inter-cropping with soybean. Farmers were convinced that single way cross hoeing and proper growth of soybean as intercrop suppressed the weeds and improved the soil health.
3. Farmers usually spray the insecticides as per the instructions of pesticides dealer. Reduced number of spray and need based sprays under the IPM module could help the farmers to minimize the expenditure on management of insect pest and diseases for higher returns.
4. Farmers have shown keen interest in foliar spary of 2% DAP and detoping at 80-90 days crop, which improves the seed cotton yield by increasing the boll size and more fruiting points.
5. Opening of ridges and furrows helps in moisture conservation which improves the seed cotton yield. However, the farmers expressed the difficulties in maintaining ridges and furrows during continuous and heavy rains in July, August and September.
6. Surabhi performed well when compared to Anjali. Higher incidence of pink bollworm was the concern of the farmers and about its susceptibility to pink boll worm.

Two training programmes on "use of bioagents and pheromone traps in integrated pest management in cotton" and "use of power sprayer for efficient management of pest in cotton". were conducted at village Rampur and Panchgaon, respectively. Around 50 farmers participated in each training programme.

Krishi Mela was organized on 28-01-2006 at village Rampur and around 300 farmers have participated in the programme. Dr. P. Singh, Head, Crop Improvement Division, CICR, Nagpur was chairman of the programme and cautioned the farmers about spurious Bt seed. Dr. M.R.K. Rao, Head, Crop Production Division, CICR, Nagpur and Shri Deoraoji Gedam, Zilla Parishad Member, Zilla Parishad, Chandrapur also guided the farmers about sustainable cotton production.

SOUTH ZONE

LAM, Guntur

50 FLDs were conducted in traditional cotton growing districts of Guntur, Kurnool and Adilabad in A. P during 2005-06.

S. No.	Name of the district	Res. Station Involved	Total No.of FLD's	Technologies Adopted
1.	Guntur	RARS, Lam, Guntur	25	Popularizing Bt. Hybrids
2.	Kurnool	RARS, Nandyal	20	Improved production Technology
3.	Adilabad	ARS, Mudhol	10	Popularising desi cotton hybrids.
	Total		50	

In addition to the above, another two FLDs were conducted each at Siripuram, Guntur district on Farm Implements in 25 hectares with three farmers and at Konededu in Karnool district on IPM in 40 acres with 8 farmers.

FLDs in Guntur District (RARS, Lam)

A total of 20 FLDs were organized on performance of Bt. hybrids Vs hybrids under recommended package of practices in as many as 5 villages and one FLD in 25 ha with three farmers on Farm Implements at Siripuram village in Guntur district, A.P. The sowings were done in the month of July, 2005.

Season and Crop Condition

A total rainfall of 887.0mm was received through 53 rainy days as against decennial average of 893.4mm and 47.9 rainy days. There was delay and uncertainty in the beginning of cotton season due to complete failure of precipitation in June'05. The heavy rainfall in July revived the hopes and major sowing of cotton took place during July. Once again, scanty rainfall in August month affected the cotton crop growth and encouraged the build up of thrips. Cyclone during September has brought in copious precipitation resulting in water logging conditions in several places and consequently resulted in root rot and wilt in patches. Though the total precipitation of 887mm was received during the crop season, the erratic distribution has resulted in extreme moisture stress in the early stage of the crop and excess moisture conditions during

the active reproductive stage. Shedding of early formed squares and bolls was observed due to prolonged precipitation during September and October months (538.1 mm in 29 rainy days).

Among the sucking pests, jassid incidence was moderate but crossed the economic threshold level many a times during September to December requiring interventions. The aphid incidence was low to moderate during the season except in the month of September. Whitefly infestation was absent in the early part of the season and remained low through out the crop season. With regards to bollworms, incidence of *Helicoverpa* was very low compared to the previous seasons. In case of *Spodoptera*, the incidence was high in the month of September, it declined during first fortnight of November and at later stages of the crop. The pink bollworm infestation though appeared in the early part of the season, its activity progressively increased from mid October and remained at high level from the last week of November till the end of season.

Tobacco streak virus transmitted by thrips was reported from certain parts of Warangal in the month of September but the presence of virus could not be confirmed. Rust and grey mildew was also reported.

Progress and Result of FLDs

(a) Varietal Performance

Twenty demonstrations were organized on the performance of RCH 2 and Bunny Bt. hybrids in Medikonduru, Siripuram, Lam, Jonnalagadda and Lingarao Palem villages of Guntur district, Andhra Pradesh. of which 4 Flds were organised with RCH -2Bt Vs RCH -2 hybrid and the remaining 16 FLDs with Bunny Bt. Vs Bunny hybrid under rainfed condition.

RCH-2Bt. hybrid cotton recorded mean seed cotton yield of 30q/ha with net returns of Rs. 34,000/- per hectare as compared to RCH -2 hybrid, where the mean seed cotton yield was 21.5q/ha and realized only Rs.13,450/ - per hectare. The magnitude of increase in yield was 39.5% with higher Benefit Cost Ratio of 1.31 as compared to hybrid RCH -2.

The mean seed cotton yield of 29.5q/ha was recorded with Bunny Bt., which was 48.5 per cent more than that of Bunny hybrid. The mean BCR of 1.2 was recorded with Bunny Bt. as compared to 0.7 in Bunny hybrid. Therefore, FLD farmers are happy with Bt. cotton cultivation as they obtained higher yields with almost same cost of cultivation. This might be due to early setting of bolls and negligible incidence of *Helicoverpa* and pinkbollworm. As a result, clean kapas with undamaged locules was obtained from Bt. cotton hybrids.

RARS, NANDYAL

A total of twenty Frontline Demonstrations on Improved Production Technology of cotton under rainfed and Irrigated dry conditions were organized at Balapanur, Konidedu and Racherla villages and one FLD IPM in 40 acres with 8 farmers in Konidedu of Kurnool district during the year 2005-06.

Season and Crop Condition

A total of 639.6 mm rainfall in 33 rainy days was received as against the decennial

average of 799 mm in 42 rainy days. The cotton crop was sown in July 2005. Dry spell prevailed for about one month after sowing and terminal drought prevailed from November second fortnight to January first fortnight.

Progress and Economics of Demonstrations

Straight varieties Aravinda and Narasimha were demonstrated against check Bunny hybrid. On an average, the demonstrated varieties recorded higher seed cotton yield to the tune of 1762 kg/ha against the check plot (1555kg/ha) i.e an increased yield of 13.31 per cent.

Training Programmes organized

Various training programmes on Importance of Seed treatment and Intercropping, INM and IPM were conducted at intervals in the villages of Konidedu and Balapanur.

FLDs in Adilabad District (ARS, Mudhol)

A total of ten Frontline Demonstrations on varietal performance in cotton were organized by AICCIP sub-centre, ARS, Mudhol at Bhainsa, Bolsa, Jukkal, Mudhol and Kotgir villages of Adilabad district during the year 2005-06 under rainfed condition.

The desi variety Veena, even though recorded less yield than the hybrid Bunny because of lesser fertilizer and pesticide requirement, recorded a better benefit cost ratio of 1.76 than Bunny (1.73). One training programme was organized at Bhainsa on high yielding desi cotton Veena Vs hirsutum hybrids dated 31.12.2005.

CRIDA, Hyderabad

Fifty demonstrations were allotted during 2005-06 under FLD on production technology. Tallapally, Muddemguda and Machanapalle villages in Rangareddy district were selected for implementation of the programme.

Varietal Trials in Cotton FLDs

Varieties, Brahma, Dussera and Bunny were demonstrated for their performance. Bt cotton RCH2 Bt was also demonstrated.

Technologies introduced at this centre are as detailed below:

1. Fertilizers: 40-60 N : 20- 35 P : 10-25 K (Farmers' practice) Vs 48 N : 24 P: 24 K
2. Application of fertilizers i.e. ,Basal + 3 top dressings
3. Spacing: 100cmx60 cm against 120cmx60 cm (improved practice)
4. Weeding: 30 days, 60 days and 90 days after sowings (3 times)
5. Plant protection: Farmers' practice of application of insecticide 6-8 times (Endosulphan, Monocrotophos, Confidar). Improved technologies with 3 rows of maize as a boarder crop for increase of beneficiary insects and control incoming insects, Calotraphis spreading for managing the red hairy cater pillar, Pheromone traps @ 4/acre for monitoring pink bollworm and helicoverpa, spodoptera, Bird perches @ 15/acre to attract birds, Application of Monocrotophos to stem was practiced to control aphids, NSKE (Neem Seed Kernel

Extract) was sprayed twice at the age of 25-30 days and 55-60 days of the crop, Acephate @ 2 gm/lit of water was sprayed once at the age of 100 days of the crop.

6. Farming system: Flat sowing Vs Bed and furrow system.

Impact / Reaction of New Technologies

The improved technologies were demonstrated on Brahma, Dussera, Bunny and RCH2 Bt. An overall yield of 2600 kg/ha against farmers' practice (2322 kg/ha) was recorded with yield increase of 11.98 per cent over the control. Bt. Cotton also attracted the attention of farmers due to higher yields compared to other varieties and insect attack was also abysmally low. However, seed price is about Rs.1650-1850 per 450 gm as against Rs.425-500 in other varieties.

Among other varieties, Bunny is preferred due to more branching and higher yield.

Success Story-I

Frontline demonstrations on cotton were conducted in the field of Shri M. Malla Reddy at Machanapally village of Rangareddy district during last kharif season, 2005-06. After initial training in cotton production technology, he has sown the crop during the first week of July. He has been advocated to follow the improved package of practices like variety, spacing, timely weeding and application of recommended fertilizer doses besides the systematic pest monitoring and control by following IPM technologies like fixation of pheromone traps and bird perches. The farmer was trained in tipping of cotton plants between 90-95 days of crop to manage Helicoverpa and to induce more branches. The white fly menace was reduced with just one spray of Endosulphan. Because of farmer's timely taking of various field operations, the cost on fertilizer and weeding was reduced. The farmers could harvest a higher yield of 3125 q/ha by following the cultivation. The neighbouring farmers were impressed with the inputs, cultivation practices adopted by Shri Malla Reddy and decided to follow the same for their next cotton crop.

Success Story-II

The FLD on Bt cotton were taken up on the fields of Shri S. Sreedhar Reddy and Sh.K. Yadagiri Reddy at Tallapally village of Rangareddy district. The farmers were given training in improved cultivation practices of Bt cotton. Though the marketing prices of Bt cotton were less compared to other cotton, the farmers adopted Bt cotton because they were convinced about the low occurrence of pest incidences in Bt cotton. They have followed all improved practices like recommended spacing, fertilizer doses and timely weeding and plant protection. The IPM practices like Pheromone traps and bird perches were adopted by them. Bed and furrow system with better drainage system was followed. The crop was relatively free from pest problems. The other farmers from the village were impressed by the cotton crop cultivated by the two progressive farmers. They got maximum yields of 41.25 and 40.75 q/ha respectively by successfully following the improved package of practices for Bt cotton as advocated by the scientists of KVK, CRIDA.

Field Days / Kisan Melas

A Field Day on Cotton was conducted on October 25, 2005 at Tallapally village of Shabad Mandal. About 250 farmers attended the field day. Kisan Mela was organised on 30.09.2005 at Machanapally village of Shabad Mandal.

Training Programmes

Six training programmes were conducted on cotton IPM, improved production technology and weed management in cotton.

UAS, Dharwad

Season and Crop Conditions

During 2005, a total 1080 mm of rainfall has been received. During July, August and September there was more cloudy weather and excess soil moisture due to which the crop growth was stunted. The prevalence of excess rainfall did not permit to do inter culturing and pest control measures effectively as a result of which bearing of the reproductive structures were less and more shedding was observed. The yield was lower than normal yield of cotton due to the following reasons: Though timely infant protection measures were taken, the efforts count futile due to incessant rainfall; High incidence of myriad beings during first fortnight; Bacterial blight, grey mildew, Alternaria Oct. blight and rust were severe; Physiological shedding of fruiting parts due to excessive soil moisture received after October 15th.

In the areas surveyed for disease intensity, Alternaria blight and grey mildew were severe at ARS, Sirguppa. Alternaria grey mildew and bacterial blights were severe at Regional Agricultural Research Station, Raichur and Alternaria at ARS, Gangavati. Similarly bacterial blight, grey mildew and Alternaria were severe at MARS, Dharwad. Among the farmers fields', grey mildew, Alternaria and bacterial blights have been found in more intensive form.

Pest scenario:

The population of sucking pests was low at the beginning of the season. By second fortnight of August, thrips incidents reached ETL and persisted at higher level for a month. The incidence of jassids was moderate (3.2 /leaf) during September and slightly increased further. From the beginning of the season, aphid incidence was almost below ETL. The incidence of boll worms was low to moderate during the season. A new insect pest named mirid bug belonging to family miridae of Homoptera (*Ragnus* spp.) suddenly appeared during September second fortnight and remained for a month. It led to heavy dropping of squares and small bolls due to sucking of sap from the squares/bolls. Since pest usually resides (protected) in square bract, it was difficult to control with insecticides.

The trap catches for *Helicoverpa armigera* moths was more during August second fortnight and October onwards (6-10/ trap /day). In farmers field, the pink boll worm moth catch was 14-50 per trap per night during October / November months indicating high incidence.

TECHNOLOGIES DEMONSTRATED

List of Technologies for FLD from Breeding

Category	Name
Interspecific Hybrid	DHB-290,RAHB-87 vs. DCH-32
Hirsutum variety	Sahana/RAH-100
Arboreum variety	DLSA-17
Herbaceum variety	DDhC-11 & RAHS-14
Inter hirsutum hybrid	RAHH-95

Package of practice followed:

- Pre-released / new genotype
- Early sowing of hirsutum/hybrids
- FYM @ 10t/ha
- RDF -Hybrids: 80:40:40 (Assured rainfall (IMC 8)
- Varieties: 40:25:25
- Spacing 90 x 30 cm Hybrids
- 60 x 30 cm or 90 x 20 cm for variety
- Pre-emergent application of weedicides -Pendamehalin @ 1.5 kg ai/ha
- Foliar spray of DAP 2% or urea 2% at 90% 110 DAS.
- For leaf reddening in cotton - MgSO₄ 1 % spray at 90 to 110 DAS.
- I PM practice for effective plant protection.
- Foliar spray of NAA 10 PPM at 60 and 75 DAS to reduce shedding of reproductive parts.

Results:

115 FLDs were allotted under production technologies to UAS Dharwad. At ARS Dharwad, 40 front line demonstration were conducted with new hybrid / varieties like Sahana, DHB-290,RAHH95, RAHH92, RAHB-87, RCH-2 Bt, DLSA-17, DDhc11, RAHS-14 in different districts Dharwad, Raichur, Gulbarga, Bagalkot, Gadag in different agro climatic regions of UAS, Dharwad. Their average yields were of the order of 1188 (1056); 1742(1350); 3913(2840); 3250(2500); 3903(3013); 3380(3070); 575(488); 692 (600) and 705 (620) kg /ha respectively.

In general, there was an increase in yield from 10 to 14 per cent in the demonstration plots vs farmers' practices.

TNAU, Coimbatore

Centre	No. of Demonstrations	Season	
		Winter	Summer
Coimbatore	10	3	7
Kovilpatti	20	20	-
Aruppukottai	20	20	-

Coimbatore centre

Technologies demonstrated

- Yield potential of new varieties over the existing varieties
- Designer seed

Out of ten demonstrations allotted three demonstrations were organized during winter' 05 to demonstrate high yielding potential of new varieties, viz., MCU 12 and MCU 13. In all these trials IPM practices were followed. On an average, MCU12 recorded 1800kg/ha and MCU13 1780kg/ha against local check yielding 1600kg/ha.

Farmers Mela

A field day was organized at Malliyakarai on 08.02.2006. The Director, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Director of Extension Education, Tamil Nadu Agricultural University, Deputy Director of Agriculture, Salem delivered technical speech during the field day. A total of 170 farmers attended the Mela.

AGRICULTURAL RESEARCH STATION, KOVILPATTI

A total of 20 FLDs were organized. The technologies demonstrated are

- a) Demonstrating yield potential of long linted arboreum variety PA 255 against K 11 the existing variety.
- b) Demonstration of compartmented bunding.

The FLD trial was laid out by compartmental bunding as one of the dry land technology. PA255 recorded an yield of 710kg/ha against K11 with 527 kg/ha resulting in 35 per cent yield increase over the control.

REGIONAL RESEARCH STATION, ARUPPUKOTTAI

Demonstration of the yield potential of the new varieties over the old varieties

The demonstrations were organized to popularize the high yielding and desirable quality possessing G. arboreum variety PA255 among the rainfed cotton growers of Virudhunagar district. Twenty FLDs each covering a total area of one acre with the varieties PA255 (improved variety - half acre - 0.25 acre for normal agronomic practices & 0.25 acre for improved agronomic practices) and K11 (ruling check variety - half acre - 0.25 acre for normal agronomic practices & 0.25 acre for improved agronomic practices) in equal area were conducted in different blocks of farmers holdings at Virudhunagar district under complete rainfed condition.

Popularisation of improved agronomic practices for yield maximization

The following improved agronomic practices were advised as against the normal practice of farmers for adoption through Front Line Demonstrations

- Coarse tilth preparation

- Resorting to pre-monsoon sowing
- Seed treatments with fungicides Carbendazim @ 2gm/kg of seeds or Trichoderma viridae @ 4gm/kg of seeds
- Bio-fertilizer application - 2kg Azospirillum/ha
- Application of either enriched farmyard manure @750 kg/ha or farm yard manure @ 12.5 t/ha
- Application of recommended dosage of inorganic fertilizer @ 40:20:0 NPK Kg/ha
- Pre emergence application of herbicides like fluchoralin @ 2.2 litres/ha or pendimethalin 3.3 litres/ha followed by one hand weeding on 35-40th day after sowing.
- Application of 12.5 kg of micronutrient mixture after mixing in 37.5 kg of sand
- Nipping the top at 90, 120 and 150 days to arrest terminal growth

Season and crop condition

In early stage, the crop suffered due to moisture stress. After flowering, there was a good rain. The mixed farming is being practiced in this tract from time memorial as this type of farming serves as a source to fetch an additional income to the farmer when monsoon failure occurs. There was no major pest and disease damage observed since integrated pest management practices was resorted. The adoption of improved agronomic practices and improved variety led to increase in yield in demonstration plots.

Pest and Disease Management

All the FLD farmers have been guided to adopt IPM technologies for effective pest and disease management.

Results

The yield of variety PA255 ranged from 350 kg/ha to 450 kg/ha in normal agronomic practices and from 450 kg/ha to 500 kg/ha in improved agronomic practices. The yield of check variety K11 ranged from 330 kg/ha to 430 kg/ha in normal agronomic practices and from 390 kg/ha to 470 kg/ha in improved agronomic practices.

PA255 recorded 7 per cent increased yield as compared to check K11 irrespective of both improved / conventional agronomic practices imposed. Thus yield performance of PA255 was adjudged superior as compared to check K11. The adoption of improved agronomic practices recorded 11 per cent increased yield irrespective of both the varieties.

On overall basis, the FLD results conducted at various farmers holdings revealed 7 per cent increased yield through improved variety PA255 and 11 per cent increased yield through improved agronomic practices.

Farmers' Opinion

The farmers are very much impressed with the performance of G.arboreum cotton variety PA255 as compared to K11. It is also felt that improved agronomic practices are better than the farmers' conventional agronomic practices.

Field days:

Field days were organized in collaboration with State Department of Agriculture on 10.11.05. Joint Director of Agriculture, Virudhunagar District, Assistant Director of Agriculture, Sattur and Assistant Director of Agriculture, Srivilliputtur participated as dignitaries.

CICR, Coimbatore

Cotton growing areas of Velamadai and Keeranatham of S.S.Kulam block and Thondamuthur block of Coimbatore district were selected for conducting Front Line demonstration on cotton during the year 2005-06. Preliminary surveys were made in these cotton growing areas. Velamadai area is almost rainfed whereas Thondamuthur had both irrigated and rainfed farmers. Thondamuthur was once a primary cotton growing area of Coimbatore district but for the past few years the area under cotton is shifted to vegetables, onion, turmeric and sugarcane. At Velamadai area, the cotton farmers face acute shortage of labour and the area is rapidly drifting towards maize. LRA 5166 is the ruling variety in these areas. Farmers are totally unaware of other cotton varieties / hybrids other than MCU 5. Almost fifty per cent of the farmers from Thondamuthur area had agreed to take up cotton after a gap of three years as the inputs were supplied free of cost.

Regarding the weather and pest condition, a total of 350mm of rainfall was received during the months August to October which was enough to cater to the needs of the farmer in sowing the cotton crop / intercrop. The weather during the month of October was almost cloudy. Incidence of sucking pests has been noticed in few fields. Over all, the crop condition was good. Maximum temperature of 34°C and minimum temperature of 23°C has been recorded during these three months. Date of sowing commenced from last week of July to first week of September based on the rainfall and water availability. Incidence of American bollworm was almost nil but it was not the same in case of pink bollworm attack. Incidence of downy mildew was noticed in few fields during the month of January. Jassid attack was prominent invariably in all the fields. Due to heavy rainfall, weed infestation was high in some of the fields which could not be cleared on time and resulted in loss of yield.

Following technologies have been demonstrated during the current crop season by involving 20 selected farmers under cotton production technologies from the adopted villages.

- Introduction of Bt cotton.
- Intercropping with vegetables.
- Application of Neem Cake.
- Foliar application of DAP & Potash.
- Seed, soil and foliar application of bio inoculants

Introduction of Bt Cotton:

With regard to Bt cotton, it is totally unheard of amongst the cotton farmers in both the selected areas. In spite of giving Bt seeds free, they were reluctant to take up in their fields. Initially five farmers were selected for taking up Bt cotton but finally only two farmers agreed to introduce RCH2Bt cotton in their fields, one at Thondamuthur and the other at Velamadai. The Bt field at Velamadai area was totally infested with Spodoptera and pink bollworm. Heavy rainfall hampered the growth of the crop resulting in yield of 12.5q/ha. The farmer at

Thondamuthur area could get an yield of 15q/ha. One farmer took up RCH20 Bt cotton on his own which was taken as control plot. He could get an yield of 11 q/ha.

Intercropping with Vegetables

Risk is involved in taking up single crop at a time. Intercropping in cotton would give value added benefits and prevents the farmer from total loss. With this idea, vegetables like beetroot, carrot, coriander and cluster beans were given to the farmers to be sown as intercrop along with cotton. It was found to be useful technology but weeding operation was found difficult for the farmers as they felt that during that operation, it might affect the main as well as the intercrop. A total of five demonstrations were taken up under this programme. The cotton yield ranged from 12.5 to 15 q per ha with an additional income of Rs.3000 to Rs.5000 per acre from the intercrops. The B.C ratio ranged between 1.6 to 1.9 compared to solo cotton crop.

Application of Neem Cake

Three demonstrations were taken up in the application of neem cake. An average of 7 to 11 per cent enhanced yield could be obtained in the treated field against the check plot.

Foliar application of DAP & Potash

Six demonstrations were conducted on foliar application of DAP and Potash. Soil test based fertilizer application helps to reduce the use of large amount of fertilizers which in turn helps to reduce the cost of cultivation. The farmers were taught to apply fertilizers in split doses as per CICR recommendation. Foliar application of nutrients like DAP and Potash prevents square dropping and enhances boll development. Hence the farmers were recommended to spray DAP and Potash at the rate of 2kgs and 1 kg respectively in order to get high yield by preventing square dropping and enhancing boll development .. There was an increase in yield to the tune of 12 to 20 per cent against the farmers' practice.

Seed, Soil and Foliar application of Bio inoculants

On Farm demonstration of microbial consortium consisting of Azospirillum + phosphate solubilizing bacterium + PPFM (Azophosmet) on variety LRA5166. Azophosmet was applied @200g/ac (1500 g/ha) i.e Azospirillum 500g + PSB 500g + PPFM 500g for 1 ha of seeds (8 kg seeds/ha) and @800g each/ac i.e 6 kg /ha (2 kg each) for soil application. Also one foliar spraying of PPFM was given during flowering to boll development. The boll numbers/plant enhanced from 17.3 to 20.5 bolls and the boll weight from 3.52 to 3.63 g/boll due to the application of bioinoculants +75 % NP fertilizers as compared to chemical fertilizers alone. The enhancement in yield attributes were reflected in final seed cotton yield as evidenced from 11.61 to 23.4 % enhancement in yield due to the combination of chemical fertilizers + bioinoculants. Thus it is confirmed through FLD, a saving of 25 % NP fertilizers due to the addition of bioinoculants.

FLD ON INTEGRATED PEST MANAGEMENT IN COTTON

NORTH ZONE

PAU, Faridkot

The FLDs on Integrated Pest management were conducted in an area of 30 hectares constituting two units of 10 and 20 hectares each. The IPM module demonstrated was as per the specific package of practices (i.e seed treatment, acid delinting of seeds, destruction of alternate host plants like Kangi buti, Peeli buti) and growing of bhindi, arhar were avoided. Mechanical destruction of egg masses and young larvae of *Spodoptera litura*, use of pheromone traps for monitoring of pest population, need based sprays as per specified windows etc was also followed. The data revealed that IPM demonstrations recorded higher seed cotton yield than respective check. The per cent increase in seed cotton yield over check for F 1861, F 1378, LHH 144 and Ankur 651 were 16.6, 11.1, 13.2 and 13.3 per cent, respectively. Due to impact of these FLDs, the use of pheromone traps became so popular in the village that some farmers purchased the pheromones at their own and used them in their fields covering an area of about 30 hectares.

CCSHAU, Hisar

Eighteen demonstrations of IPM was carried out on farmers' field of Sirsa & Hisar districts. Balanced use of fertilizers, selection of variety and monitoring based pesticide use was adopted by the selected farmers. Highest seed cotton yield of H 1226 (2400 kg/ha) was obtained against (2000 kg/ha) in the field of Jagdish Mehta S/o Hukam Chand of village Natar district Sirsa. It was 20 per cent higher against local farmers' practices.

RAU, Sriganagar

A total of 20 farmers were selected with an area of 20 ha. The seed of improved varieties viz. RS2013 and RS-810 was distributed among the selected farmers. Five ha. cotton crop area was selected in the same village under Non –IPM/ farmers' practice.

During Kharif-2005 insect-pests population could not be observed as usual in the cotton crop season which may be due to prolonged dry and hot weather conditions. During the season, the mean maximum temperature remained high and due to this immature boll bursting/bad opening was observed in IPM as well as non-IPM demo plots. Among the cell sap sucking pests, jassid was a problem at vegetative phase and whitefly at reproductive (boll development) stage. In the beginning, cotton leaf curl virus was also seen in non-IPM cotton fields while in IPM, the disease could not appear due to CLCV resistant variety. Pink bollworm incidence was noticed comparatively lower than spotted bollworm in the season. However, *H. armigera* and *Spodoptera* sp. incidence appeared in traces in some of the non-IPM demo plots.

Participatory farmers cleaned their fields at their own level from time to time through hoeing and weeding usually in the months of March-April and July-August. Sowing was completed by the farmers in second fortnight of May '2005. Row to row and plant to plant spacing was 67.5 cm X 30 cm, respectively, in case of varieties. No weedicide was applied for the control of weeds like itsit (satha) etc. The farmers applied fertilizers as per package of 80 N, 40 P and 0 K. Nitrogen was applied in split doses i.e. as basal, on 1st irrigation and flowering

stage of the crop. Phosphorus was given to the crop in the form of DAP as a basal dose. All participatory farmers planted a mixture of the seeds (Bajra + cowpea + maize + sorghum) in and around their cotton crop fields so as to conserve the natural enemies of insect-pests and also to provide site for the birds to perch upon them particularly on Bajra and sorghum plants. Pheromone traps (delta sticky, funnel, and plastic bucket type) were installed in the IPM crop area for monitoring the population of pink, spotted and American bollworms. Traps and lures were changed as and when required. In IPM Fields, Neem based insecticides (neem oil & NSKE) and Endosulfan, and triazophos were distributed to the selected farmers and in all four sprays were given during the crop season. Under non-IPM (farmer practice), to check the early incidence of cell sap sucking insect-pests, confidor 200 SL @ 0.3 ml and alfamethrin @ 1 ml/lit of water was applied and, thereafter, 5 sprays (Profenophos+ Alfamethrin, Spinodad, Triazophos+ Alfamethrin, Acetamiprid and Alfamethrin) were given to control bollworms and whitefly.

Observations:

Sucking Pests:

During the season the population of jassid in the IPM crop fields remained 0.76 to 1.24 nymph / 3 leaves as compared to 0.80 to 1.81 of non-IPM (Table-1). Whitefly reached at ETL Level in the month of Sept both in IPM (22.78) and Non-IPM (29.21) crop fields and starts decline in the last week of October. Mean population of thrips remained high in Non-IPM (13.66) as compared to IPM (12.47) adults / 3 leaves.

Month*	Jassid / 3 leaves		Whitefly / 3 leaves		Thrips / 3 leaves	
	IPM	Non-IPM	IPM	Non IPM	IPM	Non IPM
July	1.24	1.34	4.35	6.02	9.99	11.16
August	1.08	1.81	7.15	10.33	14.49	14.06
September	0.99	1.10	22.78	29.21	17.26	19.17
October	0.76	0.80	14.80	18.24	8.15	10.25
Mean	1.02	1.26	12.27	15.95	12.47	13.66

*Mean of two observation recorded at fortnightly interval.

Bollworms Damage to Fruiting Bodies:

During the kharif-2005, *H. armigera* could not appear in severe form. The damage due to *Helicoverpa* was recorded only in traces in Non-IPM crop plots. Hence, the damage in the fruiting bodies was more confined to spotted bollworms and pink bollworm. Damage due to bollworms complex in square damage was observed more in Non-IPM (6.97%) crop fields as compared to IPM (5.49%). Green boll damage in IPM field was lower ranging in between 3.35 to 8.21 % as compared to 3.30 to 10.26 % of N-IPM field crop (Table-2.)

Table-2: Bollworms damage in IPM and Non IPM plots

Month*	Square damage %		Green boll damage %	
	IPM	Non-IPM	IPM	Non IPM
July	4.55	4.80	0.00	0.00
August	8.44	10.32	3.35	3.30
September	6.65	8.99	6.58	9.31
October	2.33	3.78	8.21	10.26
Mean	5.49	6.97	4.54	5.72

* Mean of two observation recorded at fortnightly interval.

Open Boll Damage:

Per cent bolls and loculi damage in the opened bolls was observed at two sampling dates both in IPM and non-IPM crop fields. It was found that boll and locule damage were comparatively lower in IPM crop as compared to non-IPM. The bolls and locule damage in IPM field crops ranged in between 16.20 to 21.30 and 5.80 to 8.20 per cent, respectively whereas in case of non-IPM the respective figures were 18.17 to 22.40 and 8.30 to 11.60 per cent Table-3.

Table-3: Open boll damage

S.No.	Sampling date	% Damaged bolls		% Damaged locules	
		IPM	Non-IPM	IPM	Non-IPM
1.	15.10.05	16.20	18.17	5.80	8.30
2.	30.10.05	21.30	22.40	8.20	11.60

Population of Natural Enemies of insect-pests in IPM and Non IPM plots.

Regarding population of natural enemies Spiders were dominating over the others early in the season or during vegetative crop growth stage. During the crop season in IPM plots, the population of spider was found ranging in between 0.88 to 1.45 as against 0.25 to 0.68 of N-IPM, Table-4. A higher population of Chrysopa was recorded in the month October. The mean population of Chrysopa / plant was higher in IPM (0.76) as against 0.31/plant in N-IPM crop fields. The coccinellids could only be recorded in the last week of October and the population was 0.25 and 0.10/plant in IPM and N-IPM crop fields, respectively.

Table-4: Natural enemies population in IPM and Non IPM plots

Month*	Spiders / plant		Chrysopa / plant		Coccinellids	
	IPM	Non-IPM	IPM	Non IPM	IPM	Non IPM
July	0.88	0.50	0.15	0.00	0.00	0.00
August	0.75	0.36	0.10	0.05	0.00	0.00
September	0.92	0.25	0.15	0.10	0.00	0.00
October	1.45	0.68	2.65	1.10	0.25	0.10
Mean	1.00	0.45	0.76	0.31	0.06	0.03

*Mean of two observation recorded at fortnightly interval.

Cost of Cultivation and Cost/Benefit ratio

Average yield of seed cotton: The average seed cotton yield was recorded 19.50 q/ha in IPM as compared to 17.90 q/ha of non-IPM.

Table-5: Cost of cultivation and cost/ benefit ratio:

S.No.	Parameters	IPM	Non-IPM
1.	Cost on cultivation/ha	12080	14125
2.	Yield q/ha	19.50	17.90
3.	Total income Rs* /ha	34,320	31504
4.	B. C. Ratio	1:2.84	1 :2.23

*The Govt. supporting price of cotton - Rs. 1760/ qt.

MPUAT, Banswara

One unit of front line demonstration for IPM with integrated crop production management practices was allotted to this centre. These demonstrations were conducted in villages Tamtia and Amarpura. The Astha model of IPM was adopted to demonstrate IPM technology. One setaria row after every ninth row of cotton was conducted to attract birds for biological control of insects. The higher seed cotton yield was observed in field of Kodar /Dhulji Bunkar (2510 kg/ha) followed by Vithla/Dhanji Gari (2420 kg/ha) and others. The yield of control plot ranged between 2200 and 1450 kg/ha whereas, the highest per cent increase was observed in demonstration field of Rajesh/Shankar Bhoi (28.65). The highest profit in term of Rs. on sale basis of produce was 10,200/- per hectare observed on Heera/THawara's field. On overall basis 19 per cent yield superiority was observed with monetary gain of Rs 5179/- by following improved IPM technology at farmers' field.

CICR,Sirsa

The IPM programme was demonstrated on 50ha area covering five villages (Arniawali, Dhingtania, Rangri, Bakeriawali & Chpburja of Sirsa district). Both the varieties/hybrids of American & desi cotton were implemented. The IPM components included were deep ploughing after harvest of the wheat, application of FYM or decomposed compost, avoiding higher doses of nitrogenous fertilizers, resistant / tolerant hybrid/variety against insect- pest & diseases, use of pheromone or light traps, application of pest management interventions based on pest surveillance and Economic Threshold Levels (ETL) and use of plant products & bio-agents depending on availability.

In many cases, more than 50 per cent higher yield was obtained than farmers' practice. Different villages under IPM had variable net returns from Rs. 2100 to a maximum of Rs. 24750/- obtained in village Choburja. The numbers of sprays were also restricted to five or less than five where as under FP they used 7 or more. Maximum yield of 22 qt /ha of american cotton was obtained in village Rangri and in case of desi cotton hybrid CICR 2 recorded a yield of 35qt/ha. The overall net return and increase in yield over FP was Rs. 5565 (13788) and 19.84 per cent (41.61 per cent) respectively under IPM programme.

CENTRAL ZONE

JNKVV, Khandwa

IPM demonstrations were conducted in Jogibeda and Pipiliyakalan villages of Khandwa region. An increase of 13.05 per cent in yield was observed in IPM fields over non IPM fields.

PDKV, Akola

At two locations, IPM demonstrations were conducted each on 10 ha. At village Gaiwad, Bt cotton was included as one of IPM component. It could be seen that in IPM plot, pesticide consumption was 3.62 times and plant protection cost 1.13 times less with 13.33 per cent higher seed cotton yield over farmers' practice (FP)/non-IPM.

MPKV, Rahuri

Farmers harvested more seed cotton by adoption of Integrated Pest Management modules which was more by 8.46 per cent and also B:C ratio recorded more i.e, 1.48 as compared to Non IPM plots. In this demonstration pheromone trap were used along with two sprayings of Heliokil and Endosulfan alternately. Maize was grown as a trap crop. The farmers adopting IPM practices recorded 1920 kg/ha seed cotton as against 1770 kg/ha yield recorded by the non IPM farmers. The IPM modules resulted to produce 19.23 Q kapas yield/ha as against that of control (17.73Q/ha) which was 8.46 per cent higher. The cost of cultivation by adopting IPM was lower (Rs.25970/-) than non IPM (Rs.26960/-) resulted in high B: C ratio (1.48).

OUAT, Bhavanipatna

A single 50 hectare block demonstration on IPM was conducted at village Yamanabahal of Bhawanipatna block. The different IPM components included seed treatment with imidacloprid, use of bio-rational, neem/HaNPV, use of endosulfan before 90 days, monitoring of bollworms with pheromone traps, growing of border, and trap and eco-feast crops like marigold, castor, cow pea and maize. The results indicated that though there was no significant difference in the cost of cultivation in the IPM plots and farmers' practice, the farmers of the entire village gained quality cotton production. The beneficiaries obtained an additional yield of 23.2 per cent over farmers practice .and the return per rupee invested was also higher (1: 2.84) than the farmers practice (1: 2.28).

CICR, Nagpur

Front line demonstration on IPM technologies with varied components of IPM was undertaken in two blocks of 25ha. in two different location with 43 farmers from the adopted villages. Sucking pest tolerant hybrid NHH 44 was selected with use of trap crops, release of trichoparasitoids, pheromone traps and need based application of selective insecticides/fungicides. In cotton hybrid NHH 44, the IPM components were quite effective in checking the insect pests and disease incidence. With the application of complete module of Integrated Pest Management, an increase in seed cotton yield was ranged between 6.45 to 25.93 per cent with an average increase in seed cotton yield of 15.16 per cent as compared to sole dependence on insecticides.

LAM, Guntur

IPM Technologies Demonstrated were Seed treatment with Imidacloprid/thiomethoxam @5g/ kg seed, Stem application (1:4 Monocrotophos or 1: 20 Imidacloprid) at 20,40 and 60DAS, Border crops viz.,Sorghum/Maize, Trap crops viz., Marigold for, Helicoverpa/Castor for Spodoptera, Bird perches 10/acre, Use of Pheramone traps for pest monitoring, Deep summer ploughing, Clean cultivation burninig crop stubbles, trimming bunds, destruction of weeds, Detopping at 70-90 DAS, Hand picking of grown up larvae and destruction and handpicking of Rosette flowers and destruction, Separation of bad opened bolls from good opened bolls during picking to prevent PBW, Allowing farm animals into fields for grazing.

Progress and Economics of Demonstrations

The mean seed cotton yield of 24.53 q/ha was recorded under IPM practice with an income of 10.7% over farmers practice under irrigated dry conditions (Table 6). An additional income of Rs. 1808/ha was realized on adoption of IPM technology as compared to Farmers practice.

UAS, Dharwad

The incidence of leaf hoppers was low to average or just around ETL (0.25 to 2.25 / leaf). Population of aphids was above ETL (10 / leaf) from the beginning of the season (July) and reached to a peak of 54 / leaf during January. The problem of thrips was quite persistent with higher population (12 to 20 / leaf) during July, August and September months. It warranted for repeated protection against sucking pests. During September the damage due to fruiting bodies was high (> 10 %) due to higher incidence of spotted boll worm (Earias Spp.) as well as Helicoverpa armigera. The incidence of American boll worm persisted further and reached peak incidence leading to increased damage. Pink bollworm status is alarming in the state and from November onwards its incidence was increasing (up to 6.7 larvae / 20 bolls) leading to higher green boll damage. Mirid bug Creontides biseratensis (Distant) appeared during October first fortnight leading to heavy dropping of squares.

Location of village	:	Naganur (Kalagatagi taluk)
Number of FLD conducted	:	Forty
Target	:	Fifty
Number of farmers involved	:	Forty
Area under FLD	:	Forty hectare

Number of sprays in IPM plots	:	Six sprays
a) Spray for sucking pest	:	Two
b) Spray for bollworm	:	Four

Number of sprays in Non IPM

a) Sprays for sucking pest	:	Three
b) Sprays for bollworm	:	Five

Treatment Intervention and Cost of Protection in both IPM and non IPM

S. No	ITEMS	IPM (in Rs./ha)	Non IPM (in Rs/ha)
1	Seed treatment with Imidacloprid @ 10 g/kg. (Rs 16000 1 kg)	450.00	450.00
2	Cost of okra @ 500 gms (Rs. 100/kg)	50.00	
3	Installation of pheromone traps @ 10/ha and changing lures 4 times.	380.00	380.00
4	Tricho release @ 2.5 lakh / ha (Rs. 6.0/ 20000 tricho parasites)	75.00	
5	Spraying systemic insecticide for sucking pest control (Acetamiprid 20 SP) @ 50 g/ha.	--	337.00
6	Spraying Confidar 200 SL @ 100 ml/ha (310/100 ml)	310.00	310.00
7	Spraying of Acetamiprid 20 SP @ 50 g/ha (Rs.337.50/50 gms)	337.00	337.00
8	Spraying of NSKE @ 50 kg/ha (Rs.440/q)	220.00	--
9	Spraying Indoxacarb 15 SC @ 0.5 l/ha @ Rs 3300/l.		1650.00
10	Acephate @ 1 kg/ha	--	410.00
11	HaNPV @ 500 LE/ha	1250.00	--
12	Spraying of Spinosad 48 SC @ 100 ml/ha (Rs. 9000/l)	1050.00	1050.00
13	Spraying of Cypermethin 10 EC @ 500 ml/ha (Rs. 560/l)	280.00	280.00
14	Detopping (Rs. 560/ L)	100.00	--
	Total	4502.00	5204.00

Yield Parameters and Economics

SI No.	Particulars	HH-11	
		IPM	Non IPM
1	GOB per plant	48.00	38.00
2	BOB per plant	9.00	11.00
3	Yield (q/ha)	18.61	17.57
4	Value of yield (Rs.)	46,525	43,925
5	Protection cost (Rs/ha)	4502	5204
6	Cost of production (Rs/ha)	6000	6000
7	Total cost of cultivation (Rs/ha)	10,502	11,204
8	Returns per rupee spent (B:C)	1:4.43	1:3.92

Current average market rate for kapas DHH-11: Rs.2500/ q,

In the genotype DHH-11 used, IPM interventions were effective in controlling the insect pest incidence, which resulted in higher yield of seed cotton over recommended plant protection (RPP) or non IPM. Returns for every rupee of investment was more from IPM blocks due to lesser cost of protection compared to the RPP blocks. In DHH-11 Bt, 18.61 q/ha seed cotton was harvested from one hectare area by incurring Rs.10502 with B:C of 1 :4.43 through IPM against a B:C of 1 :3.92 in RPP from 17.57 q/ha with Rs.11204 cost of cultivation.

TNAU, Coimbatore

COTTON RESEARCH STATION, SRIVILLIPUTTUR

Out of total allotment area of 50 ha, 16.4 ha was completed in Winter 2005 (rainfed). The remaining area of 33.6 ha has been laid out during Summer 2006 under irrigated condition.

The imposed components in Adoptable Srivilliputtur IPM (ASIPM) module were:

- Basal application of neem cake@ 150 kg/ha
- Sowing in ridges and furrows
- Acid delinting of cotton fuzzy seeds with 100 ml of sulphuric acid per kg of seeds
- Seed treatment with imidacloprid 70 WS@ 5 g/kg and Trichoderma viride @4g/kg of seeds
- Drenching with 1 % neem oil at 20 DAS
- Trap crops - Castor, Sunflower, Bhendi
- Ecofeast crops- Maize, Cowpea
- Installation of pheromone and yellow sticky traps
- Release of Trichogramma twice
- Clipping of terminals at 75 DAS
- Need based application of safer insecticides

The incidence of leafhopper prevailed throughout the season. The mean population of sucking pests viz., leafhoppers, aphids, thrips and whiteflies, bollworms viz., spotted bollworms, American bollworm and pink bollworm and the incidence of stem weevil were minimum in ASIPM plots compared to the farmers plant protection practices.

Seed treatment with imidacloprid and the intercrops have provided good niche to the population of natural enemies viz., coccinellids, syrphid, chrysopa, spiders and braconids and kept the population of sucking pests under check upto 40 DAS whereas under the adoption of farmers practices plots, the population of natural enemies was low and there was no sufficient niche for the development and augmentation of natural enemies. An array of intercrops/ trap crops / eco feast crops planted in ASIPM module, played significant role in decreasing the population of pest incidence by acting as reservoir for natural enemies in augmentation under ASIPM based cotton growing ecosystem. Maize and cowpea served as ecofeast crops. These crops harboured the aphids, which were preyed upon by coccinellids, and thus population of coccinellids was increased considerably. Trap crops viz., castor and sunflower served as indicators of pest damage and trapped the pests at appreciable level.

The intercrops not only acted as niche for the development and augmentation of natural enemies, but also acted as indicators for pest incidence. The first incidence of *Spodoptera litura* was noticed on castor crop and thus it was able to manage the pest easily by manual destroying. The spotted bollworm preferred the bhendi crop for egg laying and food. The American bollworm preferred bhendi, redgram, sunflower and maize for egg laying and food. Hence the incidence of these bollworms in cotton was considerably reduced under ASIPM based cotton ecosystem compared to cotton as role crop in farmers' plant protection practices. More over under ASIPM based cotton ecosystem it was able to get additional revenue through the intercrops.

Crop	Type	Target pest
Bhendi	Trap crop	Leafhopper and spotted bollworm
Castor	Trap crop	Spodoptera litura
Sunflower	Trap crop	American bollworm, leafhopper and whitefly
Maize	Ecofeast crop	Aphids
Cowpea	Ecofeast crop	Aphids
Redgram	Trap crop	American bollworm

Application of neem cake @ 150 kg/ha and sowing the seeds in ridges and furrows reduced the incidence of stem weevil under ASIPM plots compared to the plots under farmers plant protection practices, where the plants were grown in beds and channels and without basal application of neem cake. Acid delinting of cotton fuzzy seeds, a component in ASIPM module, removed the ill filled and pink bollworm larvae affected seeds and the germination was good compared to the farmers plant protection practices.

For effective monitoring and control, pheromone traps for bollworms were kept in the field. The lures for spotted bollworm (*Earias* spp.), American bollworm (*Helicoverpa armigera*) and pink bollworm (*Pectinophora gossypiella*) were supplied to the FLD farmers along with the traps. The farmers were explained about the trap catch of bollworm adult moths, handling of pheromone traps, and their role in monitoring and pest management. They were also advised to keep yellow sticky traps @ 12 Nos. / acre to monitor as well as to control the sucking pests especially the whiteflies. Release of egg parasitoid, *Trichogramma chilonis* twice during flowering phase decrease the incidence of bollworms and the intercrops under ASIPM based cotton ecosystem provided suitable microclimate and for efficient parasitization by the parasitoids.

Need based plant protection measures under ASIPM helped in reducing the plant protection cost and also which may not give a pathway for the development of resistance, resurgence and residue problems.

Yield in ASIPM based FLD plots:

The yield in ASIPM based FLD plots, ranged from 810 to 1062.5 kg/ha, whereas under farmers' plant protection practices the yield varied between 570 and 780 kg/ha. Higher incidence of leafhoppers, bollworms and stem weevil attributed for yield loss under farmers plant practices. The location wise B:C ratio is given in Table II. The B:C ratio ranged from 1.88 (Kummilankulam) to 1.98 (Naranapuram) where as under farmers practices it ranged from 1.04 (Naranapuram) to 1.06 (Kummilankulam).

Table II Location wise B:C ratio

S. No.	Location	B:C ratio		No. of units (ha)
		ASIPM	Non-IPM	
1.	Naranapuram	1.98	1.04	5.6
2.	Kummilankulam	1.88	1.06	10.0
3.	Maharajapuram	1.92	1.05	0.8
			Total	16.4

Training:

One day training was organized for FLD farmers. Scientists of Cotton Research Station, Srivilliputtur gave special lectures on cotton production technologies and IPM.

CICR, Coimbatore

IPM demonstration was conducted in 48 ha for the year 2005-06 at Sarkar Samakulam and Thondamuthur blocks. The IPM modules followed were growing Castor as Trap crop, Maize as a border crop, Black gram as a Inter crop and Cowpea as a Bund crop., Erecting pheromone taps (3-4) at 45 DAS., Spraying of 5% NSKE at 45 DAS., Hand collection of larvae from 60th DAS, need based insecticide. Usable technology since black gram is a leguminous crop and fixes the atmospheric nitrogen. The application of nitrogenous fertilizers would be reduced. Helped to reduce the pesticide spray and encouraged the need based application of pesticides and in turn reduced the cost of cultivation. Cultivation of cowpea and black gram as intercrop and Castor as a Border crop was a very good technology to manage the cotton pests by Integrated Pest Management method. Cultivating Cowpea and Black gram encouraged the colonization of beneficial insects' population which acted as predators for aphids and parasitoids for bollworms like *Earias* sp. and by growing castor crop as trap crop the larval incidence in the crop was identified well in advance, based on observation. The bund crop, intercrop and trap crops was sown at the time of sowing of cotton. The pest problem was also managed by hand collection of grown up larvae, Neem Seed Kernel Extract sprays at right time, erection of bird perches, keeping pheromone traps, tying *Trichogramma* egg cards, etc., also helped in curtailing the pest population.

As such, the incidence of heliothis was almost nil. Sucking pest was more in non IPM fields when compared to IPM fields. Pink bollworm attack was also noticed in few IPM as well as non IPM fields. IPM was demonstrated in Surabhi, Sumangala and LRA 5166 fields. The yield ranged from 1265 to 1715 kg per ha in IPM fields and 755 to 1100 kg per ha in non IPM fields with a B:C ratio of 1.4 to 1.6 in IPM fields against non IPM fields ranging between 0.98 to 1.2 respectively. On an average, there was an increase in yield to the tune of 28 per cent in IPM fields against non IPM fields.

In general, highly erratic rainfall in the FLD areas resulted in overall yield loss unlike the actual yield which can be achieved under normal conditions. Few fields were totally infested with weeds due to continuous rainfall coupled with labour shortage which are treated as vitiated.

FLD ON IMPLEMENT DEMONSTRATION NORTH ZONE

PAU, Faridkot

The FLDs on implement (Hybrid cotton planter and Disc harrow) demonstrations were conducted in an area of 228.5 hectares while demonstrations on Aeroblast sprayer were conducted in area of 85 ha during the period under report. The increase in seed cotton yield to the tune of 12.2 % was observed over that of check plots for demonstrations on Hybrid cotton planter and Disc harrow. Similarly demonstrations on Aeroblast sprayer indicated an increase of 16.1 % seed cotton yield over the check plot due to uniform applications and timely sprays besides saving in application cost.

CCSHAU, Hisar

Thirty two cotton demonstrations/trials were laid out on farmers field on farm implements in Sirsa and Hisar districts. H 1226 and H 1117 varieties of hirsutum cotton were sown & all recommended practices were adopted by the farmers. It was observed that average seed cotton yield of H 1226 (1892 kg/ha) was obtained against farmers's practice (1747.8 kg/ha). It was 8.25% higher against local practices. Whereas, H 1098 gave average seed cotton yield 1598 kg/ha which was 10.75 % higher than farmer practice.

RAU, Sriganagar

Location : Farmers field (Kaluwala & 12 SPM)

Farmers Name : Sh. Ram Singh and Sh. Omprakash

Area covered : 25 Ha. (5 ha area selected where spray was done through knapsack sprayer)

Details of the activities done under Aeroblast sprayer & Knapsack sprayer:

S. No.	Particulars	Aeroblast sprayer	Knapsack sprayer
1	Crop	Cotton	Cotton
2	Thrips/3 leaves*	18.90	21.10
3	Aphid/3 leaves *	0.00	0.00
4	Jassid/3 leaves*	0.83	1.20
5	Whitefly /3 leaves*	18.60	22.50
6	Fruiting bodies damage %*	9.60	12.40
7	Open Boll damage % **	20.90	24.80
8	Open Locule damage %**	8.40	11.80
9	No. of sprays	5	5
10	Yield (q/ha.)	19.80	16.75

* Mean of five observations

** Boll & Locule damage taken at the time of harvest

The experiment of implement demonstration (aeroblast sprayer) conducted at farmers' field and it was compared with knapsack sprayer that is commonly popular among the farmers. The observation recorded on sucking pests population/3 leaves and damage per cent caused by bollworms complex under aeroblast sprayer and knapsack sprayer field. The data presented in table indicate better results of the aeroblast sprayer with the minimum pest population recorded after the five days of each spray. Due to uniform spray & good control of pests, the seed cotton under aeroblast sprayer plots was also recorded high (19.80q) as against 16.75 q/ha in the plots where spray was done through knapsack sprayer.

RAU, Banswara

Regarding the performance of farm implement demonstrations in terms of seed cotton yield and monetary gain, the higher seed cotton yield was observed in field of Maneg/Kuria (2450 kg/ha) followed by Laloo/Kachru Charpota (2420 kg/ha) and others. The yield of control plot ranged between 2200 and 1400 kg/ha. Whereas, the highest per cent increase was observed in demonstration field of Heera/Thawra (42.50%). On overall basis the per cent increase with this technology was observed as 15.40 per cent.

Self Propelled Powder Weeder

The hand/manual weeding is the most common practices adopted by farmers in this region. The capacity of weeding is restricted to 400-500 sqm per-man-days depending upon the density of weeds, field conditions, type of weeds etc. The power weeder is beneficial for weeding and hoeing in wide spaced crops like cotton. The weeder has been operated in cotton crop at farmers' field as well as ARS farm. On an average basis 50-70% cost of weeding can be saved by operating this implement in cotton fields. On the basis of the data collected at farmers field during demonstration period following observations were recorded

Field capacity	:	0.13-0.18 ha/hr
Weeding efficiency ranges	:	78.5-86.3%
Fuel consumption	:	0.85-0.95 lit/hr
Saving in cost of operation	:	50-70%

Improved Weeder (T/D)

This implement was operated at farmers field in the cotton fields. On an average basis 40-70 % cost of weeding can be saved by following this implement in cotton fields. On the basis of the data collected at farmers field during demonstration period following observations were recorded

Field capacity	:	0.25-0.32 ha/hr
Weeding efficiency ranges	:	75-81%
Fuel consumption	:	3.0-4.0 lit/hr
Saving in cost of operation	:	40-70%

Farmers preferred the weeding equipment specially the power weeder as the cost of operation is much less than the traditional operation. The weeding and hoeing is completed in the single operation. The movement of the tractor drawn implement is restricted due to small field sizes and boundaries.

Power Sprayer

The power sprayer has been extensively used in farmers' fields. In comparison to the traditional knapsack sprayer, the power sprayer is preferred by the farmers. The time of operation is reduced by 40-60% while the labour saving is upto 45-65%. The cost of operation is reduced by 25-35 per cent. The high cost of sprayers and the recurring cost of fuel (Petrol) restricted the use of power sprayers among the poor tribal farmers.

JAU, Junagadh

Demonstration of Tractor drawn two row under Root Cutter:

A new implement, Two row under root cutter was demonstrated on farmers field. Previously, farmers were using manually operated uprooter for uprooting the cotton stalks. Under close crop spacing, it was laborious and time consuming. Thereafter, bullock drawn harrow was used to uproot the cotton stalks. Nowadays, farmer are normally using tractor drawn “V” pass. Therefore the new implement was compared with "V" pass.

This implement was developed by Head Deptt of Farm Power and Machinery, Dr. PDKV, Akola. As per row spacing of crop, the blades are to be adjusted. The blades of the implement are thrust to the surface of soil near roots and accordingly roots are cut down, thereafter cotton stalks can be collected manually. Here, mainly power is used for cutting the roots and simultaneously soil is also harrowed. This new implement when compared with 'V' pass, it requires 5 lit diesel where as "V" pass require 7.5 lit diesel/ha i.e. approx. 2.5 lit less diesel than V pass: Operation of under root cutter also require less time than “V” pass.

LAM, Guntur

FLD in 25ha was conducted at Siripuram to popularise the Thai wan sprayer use for effective coverage and energy saving. Spraying with Thai wan sprayer only 2% increase in yield as compared to conventional spraying but the net benefit was 8.3% more than that of conventional spraying. This might be due to better efficiency of spraying without spray drift, which ultimately reduced cost and improved chemical impact on pest attack by covering more surface area with fine spray.

TNAU. Coimbatore

The following implements purchased during last year were utilized for demonstration.

1. Tractor operated roto slasher
2. Self propelled porer weeds

These implements were demonstrated in Malliyakarai and Seeliampatti villages in Salem district through KVK, Sandhiyur to the FLO farmers.