

Introduction

India is the largest cultivator and producer of cotton in the world for the second consecutive year. The improved genotypes, yield enhancing technologies and protection strategies developed by the Public and Private research industries are the major contributors for the country to reach the top position in cotton production. Similarly, the various efficient and effective Transfer of Technology (TOT) mechanisms formulated by the Public and Private Research and Development institutions also favored our Indian cotton to achieve the first place. The Influence of TOT programs in Indian cotton sector is time immemorial, influential and imperative. The visible changes created in the production were the evidences for the effectiveness of the cotton extension programs executed in the country to disseminate the efficient cotton varieties / hybrids, production and protection technologies. Regularly, the Indian cotton researchers develop the best technologies to improve the yield and income of the crop and there is always a pressing need for TOT innovations to translate the technologies for the benefit of cotton growers. Among the various attempts of technology transfer in cotton in India, few programs implemented by the ICAR-CICR and ICAR-AICRP on cotton created desirable changes in the cultivation behavior and socio economic status of cotton growers. One such program is Front Line Demonstration in Cotton.

Front Line Demonstration is a proven extension mechanism with the objectives of demonstrating 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. It also enables the scientists to obtain direct feedback from cotton farmers and suitably reorient their research programs, develop appropriate technology packages and to create effective linkage among scientists, extension personnel and farmers. This novel programme was implemented in 1996-97 for cotton crop to demonstrate cotton production technologies through the net working centres of All India Coordinated Research Project (AICRP) on Cotton. Since then AICRP on cotton has been conducting FLD on cotton through its network centers and by the ICAR- Central Institute for Cotton Research, Nagpur and its regional stations in Coimbatore and Sirsa. Until 2013, these demonstrations were conducted on Production Technology, Integrated Pest Management and on Farm implements

under Technology Mission on Cotton, Mini Mission II. During the year 2017-18, under national Food Security Mission on Cotton (NFSM) – Commercial Crops, the FLDs were conducted with the following objectives.

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 to obtain direct feedback from cotton farmers and suitably reorient their research programmes and develop appropriate technology packages.
- ★ To create effective linkage among scientists, extension personnel and farmers.

Implementing Agencies and Fund Flow Mechanism

In 12th Five Year Plan under the National Food Security Mission (NFSM), cropping system approach is being adopted by including commercial crops like cotton to meet the demand of both food and cash crops. In general, cotton is cultivated under different cropping system i.e., mono-cropping, mixed cropping, relay cropping, intercropping and rotation or sequence cropping in India (Table 1). The common traditional practice adopted in cultivation of cotton in central and south India is strip cropping i.e., one or two rows of pigeon pea, three to five rows of finger millet after every eight to ten rows of cotton. Hence to increase the production of cotton without affecting the production of food crops, FLDs were planned to conduct in three different ways viz., FLDs on Integrated Crop Management on Cotton (ICM), FLDs on Desi cotton, Extra Long Staple (ELS) cotton and seed production of ELS and FLDs on intercropping in cotton.

Table 1 - Cotton Crop Based Cropping System linked with food crops

State	Cropping System
Punjab, Haryana and Rajasthan	Cotton – Wheat, Cotton – Mustard
Madhya Pradesh, Maharashtra and Gujarat	Mono-cropped cotton, Cotton-Jowar (two year rotation), intercropping with Blackgram, Greengram, Soybean, Groundnut and Pigeon pea
Andhra Pradesh	Mono-cropped cotton, Cotton – Rice (sequence), Cotton – Jowar
Tamil Nadu	Mono-cropped cotton, Rice-Cotton, Rice – Rice – Cotton, Cotton- Jowar, Cotton – Pulses – Jowar, Intercropping with Onion, Groundnut and Blackgram
Karnataka	Mono-cropped cotton, Cotton – Wheat, Intercropping with Chilli, Groundnut, Blackgram and Greengram

(Source: NFSM – Commercial Crops Operational guidelines, 2014)

NFSM - FLDs on cotton was implemented by Department of Agriculture and Cooperation (DAC) through Directorate of Cotton Development, Mumbai through AICRP on cotton. All the components of NFSM-Cotton FLD were 100% funded. The funds were released by Department of Agriculture and Cooperation, Ministry of Agriculture with the approval of NFSMEC. Submission of action plan, physical and financial progress reports to the DAC, Ministry of Agriculture through DOCD facilitated the release of fund. The number of demonstrations allocated during the year 2017-18 for conduct of NFSM-FLDs by AICRP on cotton and its networking centres and the centre-wise budgetary outlay are as follows (Table 2).

Table 2 - Approved Physical and Financial Targets of Cotton Front Line Demonstrations under NFSM-Commercial Crops for the centres of ICAR- AICRP on cotton during 2017-18

S. No	Centres	FLDs on ICM		FLDs on Desi / ELS cotton / ELS cotton seed production		FLDs on Inter cropping in cotton		Total (Rs.)
		No	Budget (Rs.)	No	Budget (Rs.)	No	Budget (Rs.)	
1.	PAU, Faridkot	30	2.10	30	2.40	-	-	4.50
2.	CCSHAU, Hisar	-	-	70	5.60	-	-	5.60
3.	ICAR- CICR, Sirsa	80	5.60	40	3.20	-	-	8.80
4.	SKRAU, Sriganganagar	20	1.40	20	1.60	-	-	3.00
5.	NAU, Surat	20	1.40	20	1.60	20	1.40	4.40
6.	JAU, Junagadh	20	1.40	-	-	20	1.40	2.80
7.	PDKV, Akola	20	1.40	-	-	20	1.40	2.80
8.	MAU, Nanded	20	1.40	20	1.60	20	1.40	4.40
9.	MPKV, Rahuri	20	1.40	20	1.60	20	1.40	4.40
10.	CICR, Nagpur	20	1.40	20	1.60	20	1.40	4.40
11.	UAS, Dharwad	30	2.10	20	1.60	20	1.40	5.10
12.	UAS, Raichur	30	2.10	-	-	-	-	2.10
13.	UAS, Chamrajnagar	30	2.10	-	-	-	-	2.10
14.	TNAU, Coimbatore	20	1.40	20	1.60	20	1.40	4.40
15.	CICR, Coimbatore	20	1.40	20	1.60	20	1.40	4.40
Total		380	26.60	300	24.0	180	12.60	63.20
							Grand total	

Implementation of FLDs

Out of the allotted FLDs, a total of **432** Front Line Demonstrations on Integrated Crop Management (ICM) on cotton, **170** Front Line Demonstrations on Desi / ELS cotton / ELS

cotton seed production and **138** Front Line Demonstrations on intercropping with cotton were conducted by **fifteen** centres of All India Coordinated Research Project (Table 3) on Cotton with a budget outlay of **53.50** lakh rupees. Out of the allotted budget an amount of Rs. **53.92** lakh was released during the year 2017-18 (As first Installment –Rs. 31.58 lakh and second installment – Rs. 22.34 lakh).

Table 3 - Achieved Physical Targets of Cotton Front Line Demonstrations under NFSM - Commercial Crops by the centres of ICAR- AICRP on Cotton during 2017-18

S. No	Centres	FLDs on ICM		FLDs on Desi / ELS cotton / ELS cotton seed production		FLDs on Intercropping in cotton		Total In (Rs.)
		A	C	A	C	A	C	
1.	PAU, Faridkot	30	30	30	30	-	-	450000
2.	CCSHAU, Hisar	-	20	70	20	-	-	300000
3.	ICAR - CICR, Sirsa	80	120	40	-	-	-	840000
4.	SKRAU, Sriganaganagar	20	20	20	20	-	-	300000
5.	NAU, Surat	20	20	20	20	20	20	440000
6.	JAU, Junagadh	20	20	-	-	20	20	280000
7.	PDKV, Akola	20	15	-	-	20	5	140000
8.	MAU, Nanded	20	20	20	20	20	20	440000
9.	MPKV, Rahuri	20	20	20	-	20	20	280000
10.	ICAR - CICR, Nagpur*	20	-	20	-	20	-	-
11.	UAS, Dharwad	30	30	20	20	20	20	510000
12.	UAS, Raichur	30	30	-	-	-	-	210000
13.	UAS, Chamrajnagar	30	30	-	-	-	-	210000
14.	TNAU, Coimbatore	20	20	20	20	20	20	440000
15.	CICR, Coimbatore	20	20	20	20**	20	-	300000
16.	ANGRAU, Guntur***	10	17	10	-	10	13	210000
Grand Total		390	432	310	170	190	138	5350000

(A – No. of FLDs allotted in hectare; C – No. of FLDs conducted actually in hectares)
(* - not conducted, ** under summer irrigated, *** added one)

Main emphasis was given to the demonstrations for enhancing the production of cotton in low productivity areas / problematic areas. A baseline survey was conducted by the participating centres to know the resource endowments of the farmers and the level of cotton productivity. For selecting the beneficiaries and identifying the priority areas, Panchayati Raj Institutions were

actively utilized. A list of beneficiaries and their plot numbers were notified in the local Block Development / Panchayat Office. Farmers were selected in consultation with local Agricultural Officers and Panchayat Samiti. These officials formed part of the FLD team. Bench mark survey was conducted before taking up the demonstration which included 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., Further in accordance with the decision of Government of India (GOI) regarding implementation of Special Component Plan (SCP) for Scheduled Caste and Tribal Sub Plan (TSP) for Scheduled Tribes and Gender Budgeting, the beneficiaries were selected for the year's front line demonstration programme.

FLDs on Integrated Crop Management on Cotton

Under FLDs on ICM on cotton, a total of **432** demonstrations were conducted during the year 2017-18. Each demonstration was conducted in one hectare plot. High yielding varieties and hybrids suited for various agro-climatic conditions, Integrated Nutrient Management (INM), Integrated Pest Management (IPM), use of bio-fertilizers, bio-pesticides, water management etc., were the production technologies demonstrated through this component. An amount of Rs.7000/- was allocated per hectare of demonstration. Out of this, Rs.6000/- was used for essential inputs for demonstration and the remaining Rs.1000/- was earmarked as contingencies for field day, publicity material, POL, visit of Scientists etc., The critical inputs for FLD included the cost of seed (non-Bt), bio-fertilizer, micronutrients, bio-pesticides, seeds of intercrops, pheromone traps/light traps etc.,

FLDs on Desi / ELS cotton / seed production of Desi / ELS cotton

In order to popularize the cultivation of desi / ELS cotton and produce the seeds of Desi / ELS cotton, this component was implemented in **170** hectares. An amount of Rs.8000/- was allocated per hectare of demonstration. Out of this, Rs.7000/- was used for essential inputs for demonstration and the remaining Rs.1000/- was earmarked as contingencies for field day, publicity material, POL, visit of Scientists etc., The critical inputs for FLD included the cost of seed (non-Bt), bio-fertilizer, micronutrients, bio-pesticides, pheromone traps/light traps etc.,

FLDs on intercropping with cotton

To increase the production of food crops along with cash crops, this component was introduced. In this component along with cotton crop, various intercrops like cowpea, black

gram, green gram, groundnut, soybean, onion etc., were demonstrated. An amount of Rs.7000/ was allocated per hectare of demonstration. Out of this, Rs.6000/- was used for essential inputs for demonstration and the remaining Rs.1000/- was earmarked as contingencies for field day, publicity material, POL, visit of Scientists etc., The critical inputs for FLD included the cost of seed (non-Bt), bio-fertilizer, micronutrients, bio-pesticides, seeds of intercrops, pheromone traps/light traps etc., During the year 2017-18, a total of **138** hectares demonstrations were conducted under this component.