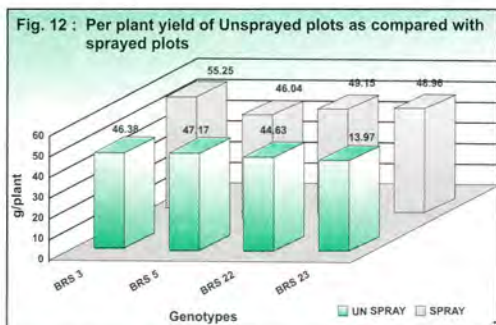


established.



**P1-97/1-ICR-F60/0430:**

**Studies on developmental bio-chemistry of cotton pest / disease interaction** (N. Gopalakrishnan, T. Surulivelu, K. Natarajan and P. Chidambaram).

Induced systemic resistance due to application of *P. fluorescens* Pf1 was studied prior to inoculation with isolates of *Ramularia areola* in cotton genotypes. Two fold increase in peroxidase activity and superoxide dismutase could be noticed in susceptible genotypes and enhanced activity was also seen during challenge inoculation with isolates of *R. areola* in susceptible genotypes.

Seed dressing insecticides like Carbo-sulfan, Chlothianidine, Thiomethoxam and Imidacloprid led to enhanced NR activity and soluble protein content during early growth stages and higher levels of secondary metabolites as compared to water control. Repeated applications of insecticides like Endosulfan, Monocrotophos and pyrethroids lowered NR activity and also gossypol and phenols besides increasing reducing sugar content.

Application of *Kamadhenu Kitniyantrak*, a natural insect repellent was seen to enhance peroxidase activity (10 -15%) in leaves of germplasm lines studied. The photosynthetic rate increased from 18.4 to 23.4  $\mu\text{mol CO}_2/\text{m}^2/\text{s}$  by second day and started declining gradually by sixth day given as foliar spray. There was a significant increase in the activity of photosynthesis during the first two sprays.

## National Agricultural Technology Project

**RCPS3 : Assessment of gossypol content in working collections of cotton germplasm** (M. Chakrabarty).

A total number of 152 samples have been estimated and 350 analyses have been carried out. Results obtained during the period can be summarized as below :

- Gossypol content of four grey mildew immune *G.arboreum* lines appeared to be on the higher side compared to the local check indicating that presence of gossypol may be one of the factors imparting disease resistance.
- The CLCuV resistant culture CNH 123 has seed gossypol content close to the value of LRA 5166 (check), but lower than the check.
- Thirty five seed samples related to different advanced breeding cultures received from MAU, Parbhani showed a wide variation in their gossypol content ranging from 0.7484% to 3.4550% and it has been observed that eight cultures possess very high gossypol content in the range of 2.5-3.5% .

## Extension and Economics

Nagpur

**A study on structure of agriculture and social dynamics of cotton production** (Hemchandra Gajbhiye).

The data collected during 2003 from 107 cotton growers from Mangli, Mohagaon, Kawadas, and Adegaon villages in Hingna taluka of Nagpur district reveal that perceived quality of life which means the degree of satisfaction with all aspects of life among cotton growers has become somewhat worse for more than 60 per cent of cotton growers. A prediction model for





perceived quality of life was tested and was found to be significant and explains 43 per cent variation in the explanatory variable.

**A study on technology adoption behaviour of cotton growers : structural perspective** (Hemchandra Gajbhiye).

This study was undertaken to understand the pattern of diffusion of some selected technologies related to cotton production through market and infrastructure perspective. Following model was tested for the explanation of adoption behaviour of cotton growers in relation to Integrated Pest Management.

$$Y = o + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e_i$$

Where Y = Technology adoption behavior;

X<sub>1</sub> = Spatial distribution;

X<sub>2</sub> = Availability of technology;

X<sub>3</sub> = Marketing strategy;

X<sub>4</sub> = Pricing;

X<sub>5</sub> = Promotional communication

This model can explain a large portion of variance in adoption behaviour of cotton growers related to IPM technology. However, there seem to be some interaction effect among independent variables. An attempt has been made to explore the complex reciprocal relationship among all of the explanatory variables that cannot be disentangled through prediction equation alone.

The change in R<sup>2</sup> indicate that the spatial distribution has a significant interaction with availability of technology and both the variables do influence the marketing strategy of the propagator of the technology. The pricing policy and promotional communication do not seem to have significant interaction effect in the prediction model.

**Impact of cotton front-line demonstrations on technological advancement of cotton growers** (S M Wasnik, H L Gajbhiye and S Usha Rani).

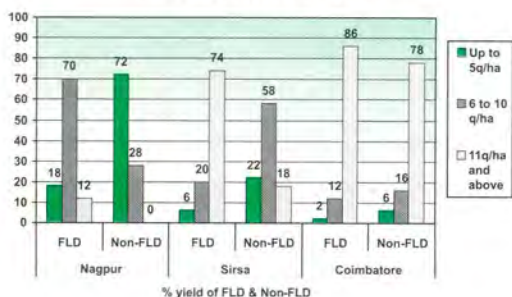
The overall data compiled for all the 300 farmers (150 FLD and 150 non-FLD) for CICR Nagpur, CICR Sirsa and CICR Coimbatore for the parameters knowledge, adoption, productivity levels, technology discontinuance, consultancy patterns followed by non-FLD cotton growers in seeking information of cotton production technologies, technological practices contributing higher yields and relationship of socio-economic and psychological characteristics and productivity levels shows that there has been tremendous increase in technological aspects of cotton growers as a result of FLD programme launched by CICR Nagpur in all the three locations of the country. It has helped greatly not only to FLD growers but non-FLD farmers also in adoption of cotton technologies and improving the yield levels in all the three districts of Nagpur, Coimbatore and Sirsa as majority of the respondents belonged to high category level (more than 11.8q/ha) to medium category (1 to 10 q/ha). The improvement in productivity levels may be attributed to increased awareness, knowledge and adoption of key technological practices by the growers realizing the potentiality in various cotton management practices.

Correlation analysis was done in order to study the nature and extent of relationship of socio-economic and psychological characteristics of farmers with productivity levels. The coefficient correlation of independent variables with productivity level analysis indicate that among the 13 variables studied knowledge, adoption, economic motivation, social participation, socio-economic status, land holding status and education established significant relationship with productivity levels in all the three districts and emerged as the potent factors affecting the productivity. The finding warrants that extension agents should consider the attributes responsible for this to induce them to match ahead in improving the productivity levels.





PRODUCTIVITY LEVELS



District	Yield (q/ha)	Yield (q/ha)		% increase
		FLD	Non FLD	
1 Nagpur		7.75	4.5	41.94
2 Sirsa		16.5	8.35	49.36
3 Coimbatore		21.0	17.54	16.71

P1-94/1-ICR-E10/0430 :

Economic analysis of cotton cultivation in India (P. Ramasundaram and H. L. Gajbhiye).

Data collected from 120 farms across Maharashtra (Nagpur, Wardha and Akola districts), A. P (Guntur) and North Zone revealed that 2003-04 was one of the good seasons for the crop from farmers' points of view - performing genotypes, assured rainfall/irrigation, dependable power supply, remunerative prices and less incidence of pests.

The decreased variability in terms of CV in cases of yield (18-24%) and price (16-21%) indicated lack of crop failures and the high percentage of farmers realising yield and price close to the mean, the high variability in the cost (32-35%) indicated that good or bad year, pest or no pest, cultivators have continued to incur the same expenditures on cotton. The high cost characterised the technological constraints - use of non-certified seed, lack of seed treatment, acid delinting, proper spacing, scientific plant protection and fertilizer use etc. The extent of use of non-notified varieties in vogue was to the extent of 33%, ranging from 15% in Bhatinda and 55% in Hisar. Concomitant

to this was the varietal proliferation in all the sample farms.

Panel data of 60 farmers from Saoner, Hingna and Arvi Tehsils of Nagpur and Wardha district on cotton marketing revealed that no sample farmer has sold cotton to the Federation. The State Govt. decision to allow private trade has only legitimized their other wise clandestine selling to private.

Coimbatore

Present status, constraints and future strategies of cottonseed production in Tamil Nadu (Isabella Agarwal).

Collection of data from four cotton seed companies in and around Coimbatore district has been completed. Around 60 cotton seed growers and 40 cottonseed dealers have opted the data for the above said project out of which data collection has been completed from 30 cotton seed growers and 20 cotton seed dealers. Data entry and analysis of the data is under process.

Impact assessment of IPM / IRM technology adoption by cotton farmers (Isabella Agarwal)

Data collection from a total of 60 IPM farmers from surrounding villages of Annur taluk with emphasis on plant protection and 30 non IPM farmers from the distant neighboring villages where chemical pest control was the dominant approach to pest management was made to compare the technical and economic parameters of IPM. The IPM measures included were intercropping with blackgram / cowpea, trap cropping with castor/maize, use of Neem Seed Kernel extract and Trichograma egg cards, erecting bird perches, use of pheromone traps, hand picking of larvae, need based application of specific insecticides like Metasystox for sucking pests, Monocrotophos for stem weevil,



Endosulfan for American bollworm and Larvin for pink bollworm. The number of pesticides application ranged from 3 to 4 under IPM situation and from 7 to 12 under non IPM conditions. The per-hectare yield on IPM farms was around 2500 to 3000 kg/ha when compared to 1500 to 1750 kg/ha in non IPM farms. The average cost of variable inputs on IPM farms was estimated to be Rs.9054/ha when compared to non IPM farms which is marginally higher to the tune of Rs.9521/ha. The expenditure on plant protection inputs was 12 per cent less on IPM farms compared to non IPM farms but the expenditure on human labour on IPM farms was higher by 18 % than non IPM farms. Per hectare net returns on IPM farms were 41 % higher. Overall analysis on economic efficiency shows that IPM is a cost reducing strategy. The only constraint faced by the IPM farmers was the labour use. In labour scarce area, IPM is to be still thought of as per the inference derived by the sample farms in this study.

### **Farm level economic benefits of Bt cotton in Tamil Nadu** (Isabella Agarwal)

40 Bt farmers in and around Avinashi taluk and 30 non Bt farmers from Annur taluk have been interviewed for the present study. Two years data (2002-03 & 2003-04) is to be compared as a part of the analysis. Data entry has been completed. Analysis is in process.

## **National Agricultural Technology Project**

Nagpur

**TAR-RFIVLP-15 :**

**Technology assessment and refinement of rainfed cotton based production system in Nagpur district (M.S.) through Institute Village Linkage Program** (Hemchandra

Gajbhiye, M. K. Meshram, P. Ramasundaram, G. Majumdar, Gulbir Singh, S. S. Patil, A. S. Tayade and U. V. Galkate).

This research project is executed in two villages viz. Telgaon and Tishti in Kalmeshwar Taluka of Nagpur District involving 247 farmers. During the year 24 technological interventions were administered. Twenty two were assessed and 2 technologies were refined. The interventions included crop varieties, plant nutrient, IPM, horticulture and animal science. In the crop based interventions it was revealed that Bt cotton (MECH-184) gave 25 per cent higher yield and 17 per cent more profitability over prevailing hybrid. Dry sowing of cotton one week ahead of monsoon gave 13 per cent more yield over sowing after the arrival of monsoon. Desi cotton (AKA-7) has given 14 per cent more profit to cotton growers over *Chamatkar*. Use of integrated nutrient management (INM) in cotton has increased the yield up to 16 per cent over farmers' practice. It was also observed that the yield of soybean has increased up to 20 per cent by appropriate plant population and approach. Due to early withdrawal of monsoon, two applications of 2 per cent DAP as foliar spray, first at flowering and second at boll formation stage increased the cotton yield up to 13 per cent. Productivity of cotton increased up to 16 per cent with the application of module. Pesticide Application Technology (PAT) developed by CICR may increase the profitability by 7 per cent. With the use of new approach towards Insecticide Resistance Management, the profitability in cotton production may be increased up to 24 per cent. Bacterial blight in cotton may be successfully managed with the use of delinted seed and foliar application of Copper oxychloride. *Fusarium* wilt in pigeon-pea can be managed by using wilt resistant variety (ICPL-87119) and seed treatment with *Tricoderma viride*.







Under the horticultural interventions, a new commercial crop of marigold was introduced as intercrop in orange orchards under delayed arrival of monsoon, and it was found to give higher profitability over cotton or soybean as intercrop in orange orchards. However, a crop of chilli as intercrop in orange orchard seems to be more profitable. The new high yielding variety of marigold (Golden Sierra) can give 21 per cent higher yield than usually grown varieties like Giant Suman and also fetches better price in market. The INM approach increases the productivity upto 28 per cent in mandarins.

Under animal based interventions, it was observed that de-worming of cattle with Morantol Citrate 1 bolus/100kg body weight has increased the productivity of milch animals by 18 per cent. Milk production can also be increased up to 18 per cent by supplementing the diet of dairy cattle with mineral mixture @ 50gm/ animal/ day + Vitablend AD3 @ 25g/100 kg feed. With the introduction of *Osmanabadi* buck in local herds of goat, the twining percentage of goats has increased by 20 per cent. Body weight of kids by *Osmanabadi* bucks was also significantly higher than kids by local bucks. Lucerne as a new leguminous fodder crop was also introduced in both the villages and it was found that milk production has increased by 13 per cent.

**MM-ITK : Use of botanicals for pest and disease management in cotton, pigeon pea and sorghum** (Hemchandra Gajbhiye, M. K. Meshram and S. S. Patil).

Three experiments were laid with 10 replications each involving 30 farmers in two villages of Nagpur district to validate the indigenous technical knowledge (ITK) of managing the pest and diseases in cotton, sorghum and pigeon-pea with the use of botanicals. The matrix ranking done by QuIK Screening method reveal that botanicals as eco-friendly ranked very high on efficacy in controlling pests and

persistence of effect. The results of experiments revealed that mixture of garlic (mixed in kerosene), tobacco, green chillies and asafoetida provide excellent support for managing the pests like aphids, jassids, spotted bollworm and *Heliothis*. Profitability also increased up to 24 per cent in cotton, 27 per cent in sorghum and 23 per cent in pigeon-pea by resorting to the use of this ITK.

Coimbatore

**TAR 18: Technology assessment and refinement of irrigated agro-eco system for Coimbatore region in Tamil Nadu) through Institute Village Linkage Programme** (Isabella Agarwal)

Seven technological interventions have been taken up in the Chinnaputhur village of Dharapuram involving 40 cotton farmers. The technologies on evaluation of Bt cotton, Surabhi variety, integrated weed management, fertiliser management, proper spacing, integrated disease management and intercropping in cotton. An increase of 15 to 35 per cent yield was recorded due to the above interventions. Present adoption level is around 60 per cent in the IVLP village.

A total of 14 trainings have been imparted to the project farmers. Though the technologies are economically viable which was proved last year, the farmers could not enjoy the same potential benefit this year due to poor irrigation facility or lack of rainfall at the crucial period. Regarding the attitude and perception of farmers, they are well aware of all the technologies implemented in their fields and are keen in following the modern and refined technologies made available to them through this project.

## Technology Mission on Cotton

**MM-5.1 : Evaluation of cotton production technologies for yield,**





**fibres quality and economic viability.**

Nagpur - (Hemchandra Gajbhiye and P. Ramasundaram)

More than 100 farmers from two villages (Telgaon and Tishti in Nagpur district) are involved in this project. The technological interventions carried out on the fields of cotton growers revealed that dry sowing has increased the yield up to 20 per cent and large number of farmers are convinced that this simple technology can bring significant increase in yield. Therefore, the farmers in Vidarbha region can safely go for dry sowing as soon as the monsoon reaches Mumbai. Opening of ridges and furrows at 30 days after sowing has increased the cotton yield up to 18 per cent. Integrated Pest Management has increased the productivity up to 16 per cent and B : C ratio is 1.46 as compared to farmers practice of 1.31. The B:C ratio for Integrated Nutrient Management is 1.18. On economic viability it was observed that BC ratio was higher for Bt cotton (1.12) as compared to farmers practice of growing another popular hybrid. The technological interventions like IPM, INM and IRM also made the difference in quality parameters like staple length, bundle strength and tenacity as compared to cotton produced by farmers' practices.

Coimbatore - (Isabella Agarwal)

Ten technological interventions viz., popularization of varieties Surabhi and Sumangala, cotton production technologies

on IPM, INM, IRM and IDM have been taken up in Annur taluk of Coimbatore district encompassing 100 cotton farmers. The farmers could get seed cotton yield, hovering around 2000 to 3000 kg / ha due to the interventions disseminated in their fields out of this project.

**APCESS : Identification and quantification of constraints, risks and policy impacts in cotton cultivation** (P. Ramasundaram and H. L. Gajbhiye).

Secondary data on district-wise cotton area, production and productivity for 40 years were collected for all the nine major cotton growing states and the decomposition and stability analyses revealed that by and large the productivity during the post-hybrid era has posted significant increase (2.324 % vs 1.927 % pre-hybrid) but accompanied by high variability too (14.47 vs 10.70). The analysis done in 217 districts including 56 intensive cotton districts, showed that only 17 have recorded significantly positive growth in area, 11 in yield and 23 in both.

Three years data on varietal proliferation in irrigated (panel data of 400 farms) and rainfed conditions (700 farms with one-point data), revealed that the strategy worked during disaster years like 2001-02, with a direct linear relationship between number of varieties and yield up to four genotypes (table 13).

**Table 13 : Strategizing varietal proliferation for risk aversion in cotton**

Number of varieties	Average yield realised (q/ha)							
	Irrigated				Rainfed			
	% of farms	2001-02	2002-03	2003-04	% of farms	2001-02	2002-03	2003-04
One	19.5	10.75	14.5	16.5	8.75	5.34	7.14	8.63
Two	23.00	12.35	13.75	16.0	20.50	6.75	7.10	9.45
Three	36.00	13.45	15.25	17.5	27.0	7.25	8.61	8.80
Four	18.5	14.60	16.00	16.5	26.0	7.70	9.05	8.63
>Four	3.0	14.50	15.75	17.0	17.75	7.56	8.76	9.25







**Bt Cotton:** Data collected from 85 farm households from Hingna, Phulgaon and Arvi taluks in Maharashtra and Guntur district of A.P. and compared with last year data of 46 respondents showed that repeat adoption was less in the second year (4% in Nagpur and 12% in Guntur). MECH 184 performed better in Vidarbha and MECH-12 in A.P. The level of awareness has gone high simultaneously bringing down unrealistic expectations as reflected by a reduced risk co-efficient to 1.94 % from 2.53 % last year though the yield remained at the same level (11.73 and 11/48 q/ha vs 9.72 and 9.63 q/ha in non-Bt cotton).

#### **Performance of contract farming in cotton:**

Data of 219 participants in Integrated Cotton Cultivation Scheme promoted by M/s. Appachi Company, Coimbatore during 2002-03 in 280 ha were obtained and primary information were collected from 30 cultivators. The institutional interventions and initiatives have substantially supplemented crop productivity (by 1.48 q/ha), cost reduction by 12-15% and price premium by 8-10%. Garette scoring of respondents revealed remunerative price, reduced inputs cost, assured and high demand for quality cotton, market information and access to technical counseling as the major reasons for group cotton farming in the order. Data collected from 40 farmers in similar programme started during 2003-04 in Saoner tehsil, Nagpur district showed poor forward and backward linkage.

#### **Performance of organic cotton**

Historical data collected from 40 organic cultivators registered with two promoters in Vidarbha revealed that organic cotton production is a mode of risk aversion, cost reduction motivated by premium prices and cash payment. Though the yield after stabilization period was only 5.63 q/ha against the 7.14 q/ha in synthetic farming, the loss was more than compensated by the

price premium of Rs.230-700/q and cost reduction of Rs.1900/ha. Further, the yield and price stability were high among organic farms. However, only the popular hybrids like NHH44, PKVHy-2, Ankur 651 were being cultivated in the organic mode.

#### **Major production constraints reported:**

##### **Bt cotton:**

High seed cost, poor refugia management, poor monitoring and education, lack of sucking pest tolerance, incidence of wilt, small boll size, and high rates of discontinuance.

##### **Contract farming:**

Breach of honour of contract by participants, and incomprehensive insurance cover (did not cover the drought during the year).

##### **Organic cotton:**

Lack of suitable genotypes and technologies, lack of availability of quality organic inputs, and delay in premium payment.

Coimbatore

## **Computer Applications**

#### **Expert System on Cotton pest/insect**

(M. Sabesh, S. Vennila and B. Dhara Jothi).

Damage Symptoms of various pests and diseases including their control measures by chemical and biological means were collected and categorized and put to use in the flow diagram. Photographs of the symptoms of damage and pests were collected for visual identification by the user for selection of appropriate solution for their problem in the system to be developed. With the collected knowledge base, schematic algorithm was developed and attempt has been made to develop preliminary shell using the software Visual Basic .NET.



## Technologies Assessed and Transferred

- Bt cotton has been introduced to reduce the excessive use of chemical pesticides against *Heliothis*. Hybrid Bt cotton MECH-184 was assessed on farmers fields in Telgaon and Tishti villages of Nagpur district. It was observed that MECH-184 Bt has given 234 kg more seed cotton yield per hectare over other widely grown hybrid.
- Dry sowing of cotton one week in advance of onset of monsoon has given 21 per cent more yield of seed cotton as compared to monsoon sowing. Dry sowing favours early canopy cover and the crop often escapes damage due to insect pests as well as soil erosion due to heavy rains.
- The large area under cotton has been diverted to soybean over the years in Nagpur district due to several reasons. However, it was observed that instead of sole crop of cotton or soybean cotton-soybean inter-cropping is quite remunerative. By this combination, 18 per cent profitability has increased over sole cotton and 22 per cent profitability increased over sole soybean.
- Rain water conservation is very crucial in rainfed areas. In this regard opening of ridges and furrows at the time of first inter-culture was found to be effective for improving moisture status of soil and increasing the yield up to 18 per cent.
- Integrated approach to nutrient management (INM) which includes organic manures, green manures, balance use of chemical fertilizers based on soil testing, use of bio-fertilizers and appropriate time of application seems to increase the yield up to 16 per cent with reduced spending on chemical fertilizers and higher profitability.
- The adoption rate of IPM strategy in cotton is quite slow because use of only few elements of IPM rather than the whole package. The complete package of IPM in cotton which includes chemical, biological and mechanical methods of managing pest complex was assessed at IVLP villages and it was revealed that input output ratio has increased from 1.31 (farmers practice) to 1.46.

