

August 29, 2006

**Environmental and Social Impact of  
Cotton Cultivation and Use  
with Special Reference to India**

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**1. Environmental and Social Concerns**

Environment and ecology are two aspects of the surroundings we live in. Any imbalance in the environment and ecology will imperil the health and life of human beings as well as of other creatures and vegetation. Ironically, environmental damage remained inseparable from human progress particularly due to industrialization in the last few centuries. Air pollution, water pollution, new diseases, ground water depletion, land contamination, global warnings, deforestation, acid rains, climatic changes, ozone layer depletion, etc. have been the result of mindless lifestyles of modern man.

The terminal decades of the last century, however, witnessed the emergence of environmental awareness worldwide, compelling human society to initiate steps to protect the elements of nature from savage exploitation. Environmental and social concerns are increasingly reflected in all present-day economic endeavours of man. Leaving the ecosystem undisturbed and promoting human health are two aspects of the environmental concern while upliftment of the less privileged among human beings underscores the social concerns. Many countries have enacted laws in this regard and the International Standards Organization has evolved wide ranging standards with emphasis on the environment and the society.

Social activist groups have started looking for violations if any of antipollution and safety regulations worldwide. All these events have generated need for evolving newer technologies in agriculture and industry keeping in view human health considerations and sustainability of natural resources.

**2. The Indian Scene**

Environmental and social issues are very relevant to cotton production and utilization as these two constitute a major economic activity in many countries. It is particularly so for India where 60 million people are directly or indirectly connected with cotton cultivation and related industries. The textile sector in which the share of cotton fibre is about 58% contributes to nearly 14% of industrial production and accounts for

The country with the largest area under cotton cultivation (90 m ha), India stands third in total production (>4.2 mt). Over 4 million cotton farmers are engaged in cotton cultivation, which is largely rainfed (70%). Productivity (460 kg/ha) is lower than the world average (750 kg/ha) but the increasing trend in productivity witnessed in the last 3 years in India is quite promising. Hybrids account for about 50% of cotton area and 60% of production. Cotton is ginned in over 3400 ginning factories most of which are small units. Roller gins dominate the Indian gineries now under modernization through Technology Mission on Cotton.

The Indian textile industry consists of mills in both large and small scale sectors. Spinning mills make use of over 37 million spindles and 500,000 rotors and are mostly in the non-SSI sector. Power looms in India number over 2.0 million of which 95% are in the SSI sector. In addition, 3.8 million handlooms are used by rural weavers. Textile processing houses are a whopping 13,000 of which 90% are in the SSI sectors. Over 30,000 small apparel manufacturing units are also part of the Indian textile industry.

From the gigantic dimensions of India's cotton production and processing scenario outlined above, it would be apparent that the environmental and social impact of cotton production and utilization would be more spectacular in India than in any other country. This paper is an attempt to make a close look at the ramifications of this impact and to list out the various steps initiated by the Government of India and other agencies to ensure that cotton industry is in harmony with nature and the society.

### 3. Environmental Impact

#### **3.1 *Integrated Pest Management:***

Cotton cultivation has been a pesticide-intensive activity worldwide. Indiscriminate use of chemical pesticides has caused a wide range of problems such as escalation of cultivation cost, destruction of beneficial insects, development of insecticide resistance and consequent surge of pest intensity, pollution of the environment, presence of pesticide residues in cotton and value-added products endangering human health, etc. The quest for alternative and supplementary means to combat pests has been a research priority for farm scientists who have evolved several eco-friendly ways of cultivating cotton.

Boll worm and sucking pests are the major enemies of cotton crop in India. Although cotton occupies only 5% of the cultivated land, over 50% of the pesticides consumed in Indian agriculture went into cotton farms till a few years ago. Many Indian farmers used pesticide application even as a prophylactic measure to avert crop damage!

Seized of the problem of atmospheric pollution and health hazards due to pesticide residues in cotton, the Government of India has banned the use of 25 pesticides and 6 formulations. The Indian Council of Agricultural Research (ICAR) has promoted researches in pest management through Institutes under its tutelage and through Agricultural Universities in cotton growing States. These researches have yielded location-specific IPM packages.

IPM is being promoted by the Government through the following instruments:

- (i) Technology Mission on Cotton (TMC): Under Mini Mission – II of TMC launched in 2000, financial assistance is given for setting up demonstration plots to enlighten farmers on crop protection through IPM.
- (ii) All India Co-ordinated Cotton Improvement Project (AICCIP) of the ICAR: The AICCIP conducts over 1000 FLD programmes to demonstrate new farm technologies including IPM.

Participants in the above schemes include ICAR Institutes, State Agricultural Universities (SAUs), Krishi Vigyan Kendras (KVKs), State Departments of Agriculture, the Cotton Corporation of India Ltd. and Non-Government Organizations (NGOs). Significant contribution to popularization of IPM is also made by private bodies like Conference of Indian Textile Industry (CITI), Southern India Mills Association (SIMA), South India Cotton Association (SICA) and many textile mills and voluntary organizations.

As a result of the above, the pesticide use on cotton seems to have significantly come down in the last few years. Although quantitative data on pesticide consumption specific to cotton are not available, most cotton farmers have admitted that they have reduced the number of sprays. Analysis of pesticide consumption in India shows a marked decrease in consumption in cotton growing States. It would appear safe to conclude that pesticide application on cotton is indeed declining and that the Government's efforts to educate the Indian farmers

**Pesticides consumption in the last quinquennium**

(Figures in metric tons)

|                                     | <b>2001-02</b> | <b>2002-03</b> | <b>2003-04</b> | <b>2004-05</b> | <b>2005-06 (Est.)</b> |
|-------------------------------------|----------------|----------------|----------------|----------------|-----------------------|
| Total for Cotton growing States     | 33741          | 35548          | 27702          | 27218          | 24672                 |
| Total for all States in India       | 47020          | 48350          | 41020          | 40672          | 39773                 |
| Total for non cotton growing States | 13279          | 12802          | 13318          | 13454          | 15101                 |

**3.2 Bt Cotton - New Hope for Clean Environment**

The most formidable enemy of cotton crop in India is the bollworm. Major part of pesticides applied on cotton in India is to combat bollworms. Encouraged by the success of GM cotton in USA and other countries, an Indian seed company sought permission in 2002 for the cultivation of three hybrids developed through the Bt technology of Monsanto, USA, employing Cry 1 Ac gene.

The Government of India proceeded with extreme caution amidst sceptics of various hues and colours. The Bt hybrids were made to undergo stringent regulatory trials under the supervision of the Department of Bio-technology and the Indian Council of Agricultural Research. Elaborate bio-safety tests were conducted to ensure that Bt cotton cultivation does not adversely affect soil microflora, earthworms, and other non-target organisms like cattle, fish and poultry. Also put to rigorous tests was allergenicity of Bt cotton. Extensive field trials were organized to confirm the economic benefits from Bt cotton such as higher boll weight, increased yield, superior fibre quality and reduced number of sprays.

That Bt cotton has come to stay in India is evident from the following facts:

- i) The area under Bt cottons has increased from a mere 38,000 ha. in 2002-03 to as much as 1.35 million ha. in 2005-06 and is expected to reach 4.0 million ha. in 2006-07.
- ii) While in 2002-03 just one seed company was in possession of Bt hybrid, today this technology is being used by 15 seed companies.
- iii) The total number of Bt hybrids available for the Indian farmers in the current year is 60 while it was just 3 when the technology first came to India.

With the rapid spread of Bt cottons along the length and breadth of this country and the patronage they have received from farmers, one can confidently say that the pollution load in cotton farms in India is bound to show a sharp decline. It will be logically right to expect that the environment around the Indian farms is slated for a rapid makeover.

### **3.3 Organic Cotton Farming**

Modern pesticide-based agricultural technologies have revolutionized cotton production and productivity worldwide in the last 4-5 decades. At the same time these technologies have left indelible scars of exploitation of the environment. The vicious circle of indiscriminate application of insecticides causing resistance in pests thereby necessitating higher and higher doses of chemicals has not only damaged the eco-system but has inevitably jacked up the cost of cotton cultivation. Moreover, the marketability of cotton and its value-added products has suffered a setback in developed countries particularly in Europe where human health considerations prevail over commercial interests. Cultivation without the use of chemical fertilizers and pesticides advocated by organizations like the International Federation of Organic Agriculture Movements (IFOAM) is slowly but steadily gaining popularity worldwide. Market for organic cotton products is growing in size in European countries. Commercial cultivation of organic cotton has been initiated in India.

#### **3.3.1 Organic Cotton in India:**

Over 5-6 decades ago, cotton cultivation in India was organic, since no chemicals were used either as fertilizers or as pesticides. Even today, cotton is unintentionally grown as organic in many pockets as shown below:

| <b>Sl.No.</b> | <b>Variety</b>    | <b>Location</b> |
|---------------|-------------------|-----------------|
| 1             | Wagad/V-797       | Gujarat         |
| 2             | Y-1               | Khandesh        |
| 3             | Maljari           | M.P.            |
| 4             | Jayadhar/Suyodhar | Karnataka       |
| 5             | Nandicum          | A.P.            |

Inherent drought and pest resistance of the above varieties render them suitable for green farming. These growths do not have the official stamp of organic cotton because the cultivation is not subjected to mandatory monitoring and certification by accredited agencies. The data above nevertheless highlight the potential of Asiatic varieties (G-arboreum and G-herbaceum) for organic

### 3.3.2 R & D in Organic Farming:

Skyrocketing cost of chemical-based cotton cultivation stimulated interest in the search for alternative means of pest suppression such as by use of bio-agents and bio-pesticides. The results of a study at the Central Institute for Cotton Research (CICR), Nagpur, India using a hirsutum variety LRA-5166 demonstrate the relative merits of organic farming *vis-à-vis* agro-chemical farming. Although in the initial years, the organic farm gives lower yield than non-organic, after a few years of cultivation, the situation is reversed. It has also been reported that in successive years the soil in organic farm gets richer in carbon and phosphorus. Results were similar for a hirsutum hybrid also. (NHH-44)

#### Yield (qtl/ha) for Variety LRA 5166 in Organic Farming

| Year    | Organic | Non-organic |
|---------|---------|-------------|
| 1993-94 | 4.64    | 11.59       |
| 1994-95 | 5.30    | 6.52        |
| 1995-96 | 8.49    | 6.51        |
| 1996-97 | 8.98    | 6.23        |

Many farmers, NGOs and Agricultural Universities in India are practising the use of bio-fertilizers, vermicompost, bio-pesticides, farm yard manure, green manure, crop residues etc, and are able to derive long-time benefits.

### 3.3.3 Commercial Organic Cotton :

Farmers of Yavatmal district in Maharashtra have been front-runners in commercial cultivation of green cotton. Exploratory projects in organic cultivation were taken up by Environmental Protection Encouragement Agency of Hamburg in parts of Maharashtra and by the Dutch company MAIKAAL in Madhya Pradesh in 1995 involving hundreds of farmers. German Interest in organic cotton inspired farmer groups to form organizations like the Vidarbha Organic Farmers Association (VOFA) and The Maharashtra Organic Farmers Association (MOFA). These organizations have farms registered with them, and are procuring and marketing organic cotton. They also help farmers in soil analysis, pest monitoring, bio-control methods and keeping records. Certification is done by IFOAM –accredited overseas agencies some of whom have now set up offices in India. Varieties commercially cultivated at present in Maharashtra are listed below, together with their fibre length ranges.

| Varieties                               | Staple length (mm) |
|---|--------------------|
| AHH 468    DHY 286<br>LRA 5166    Rajat | 27-29              |
| Bunny      MCU 5<br>Tulasi              | 29-31              |
| DCH 32                                  | 34-36              |

### 3.3.4 Future Scope :

Till recently a major impediment in the promotion of organic cotton farming was the absence of a local accredited certifying agency and the need to engage overseas companies at high cost. Certifying agencies are now available in India. The growth of organic cotton cultivation in this country will depend on the following conditions:

- (i) Assessment of market demand for organic cotton worldwide
- (ii) R & D for identifying varieties suitable for organic farming and for preparing location-specific organic protocols for commercial cultivation keeping in view the need for conservation and optimal utilization of natural resources while maximizing productivity.
- (iii) Development of "Brand India" specifically for textile products from organic cotton.

## 3.4 Textile Processing

### 3.4.1 Safety Regulations in India:

Environment protection is underscored in Article 51 A (g) of the Indian Constitution which states "*The fundamental duty of every citizen is to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures.*" Several regulations of extensive scope and impact have been brought into force by the Government of India in order to protect and improve the environment and natural resources.

Environment Protection Acts of the Government of India define industry-specific standards (limits) for various components in industrial effluents including those from textile mills. The implementing agency for these standards is the Central Pollution Control Board. In addition, States pollution control boards are entrusted with the responsibility of curbing pollution of local environment, keeping in view the carrying capacity of the eco-system.

### 3.4.2 Textile Products and the Environment:

Safety considerations will apply not only to effluents from textile processing but also the textile products. Ecosafe and environment-friendly textiles are being preferred. Textiles which do not contain any hazardous or toxic substance and which are certified as manufactured by process that comply with emission norms are insisted upon by many European countries. Germany, Sweden and Netherlands have banned the import of textiles with azo dyes that can release any of the over 20 carcinogenic amines.

Following the European ban on azo dyes between 1990 and 1995, the Government of India has taken steps to ensure production of eco-safe textiles in the country. These steps are listed below:

- (i) Ban on the use of as many as 70 carcinogenic dyes in textile applications
- (ii) Launch of ecolabelling scheme by the Bureau of Indian Standards under instruction from the Government of India permitting the use of "Eco-mark" tag on textiles processed with safe chemicals.
- (iii) Setting up of a chain of eco-testing laboratories in all textile production centres in the country.
- (iv) Launch of Technology Upgradation Fund scheme to encourage textile industry to invest in a effluent treatment plants.
- (v) Financial assistance for setting up common effluent treatment plants to benefit small processing units.

### 3.4.3 Implementation of Eco-regulations - challenges:

The chemical processing industry in India is segmented into 4 classes – (a) high tech processing facilities forming part of composite textile mills; (b) independent high-tech facilities, (c) independent units with moderate technology and (d) decentralized sector with poor technology. In the first 3 segments, regulations are, by and large, complied with. Difficulty is with the last segment which comprises a large number of tiny units. Common effluent treatment plants are recommended for such small units. Awareness about pollution laws is lacking in these units. Enforcement agencies indeed have a challenging task ahead.

Effluent control is often regarded as prohibitively expensive. Emphasis needs to be on cost reduction through several approaches such as :

- minimization of the quantity of waste water through improved process control;
- appropriate waste segregation and "early capture" of one waste before it gets mixed with others thus facilitating easy recovery;
- adoption of "cleaner" methods like substitution of one chemical by a safer chemical, substitution of a chemical process by physical or biological process.

Through judicious application of the above approaches many mills have been able to comply with regularly laws while at the same time minimizing expenditure thereon.

#### 4. Social Impact

##### **4.1 *Role of Women***

The strength of a society is decided by the status and role of its womenfolk. Rural India has had a long tradition of women's participation in agriculture, and cotton cultivation is no exception. Women play a major role in almost all the operations in the cotton farm. Except land preparation operations such as ploughing, harrowing, manure spreading, etc. which involve the use of bullocks or tractors, most of the other farm operations are carried out by women.

##### **Women in Cotton Production:**

The following are the specific tasks in which the participation of women is prominent:

- Cleaning the field
- Sowing
- Applying fertilizers
- Hand weeding
- Spraying of pesticides
- Cutting top of plants
- Harvesting

Except insecticide spraying, all the above operations are done exclusively by women. When all operations are put together, about 80-90% of farm labour days

### **Women in Hybrid Seed Production:**

The first country to commercialize cotton hybrids, India can today boast of cultivating hybrids in 50% of its 9 million hectares under cotton. Huge quantities of hybrid seeds are required every year. Hybrid seed production involves hand emasculating and pollination that are done exclusively by rural women.

### **Women in Cotton Ginning:**

Cotton ginning remains a labour-intensive industry in India despite modernization being attempted on 1000 out of the over 3400 ginneries through TMC. While an unmodernized factory of standard size (24 gins) employs about 125 workers, about 25 need to be retained even after modernization.

Women constitute a major group in the labour force required in a ginnery. In an unmodernized factory the share of women could be more than that of men while it is reduced in modernized units. This is so because modernized units would not need many women workers traditionally employed for feeding cotton into each ginning machine. Even so, the share of women would be equal to that of men.

## ***4.2 Social Security for the Farmer through Contract Farming:***

In many developing countries, the community of cotton farmers constitutes a significant segment of population. The welfare of cotton farmers and the well-being of cotton economy will therefore be important measures of social security established in these countries. Over the last many decades, most cotton producing countries have witnessed significant erosion of farm income resulting from the escalation of input costs and decline in the price of cotton. Governments particularly of developing countries need to view cotton cultivation from the social angle and ensure that the farmer finds this vocation adequately remunerative.

### **4.2.1 Contract Farming in India:**

The Indian farm scenario is characterized by a large number of farmers, (ca 4.5 million), tiny land holdings (ca 2 ha per capita), a multiplicity of varieties/hybrids (over 200), and farmers' freedom to choose any variety of seeds for sowing. The Indian farmer has several handicaps, too. Being unfamiliar with market trends, he is unable to make judicious selection of varieties for cultivation.

available with him in marketing, he is easily exploited by traders. The nett result is poor returns from cotton cultivation.

Solution to farmers' woes lies in contract farming which is being promoted by the Ministry of Textiles, Government of India since 2002. Designated as Integrated Cotton Cultivation (ICC), this style of farming is being popularized by the Cotton Corporation of India in association with other stakeholders in cotton. In its catalytic role in contract farming, CCI facilitates linkage between the farmer group on the one hand and textile mills on the other. Input suppliers and technology providers are also called upon to play their roles.

Increased yield, reduced expenditure on pesticides, improved cotton quality and higher nett income for the farmer constitute the outcome of CCI's contract farming schemes. The area covered under contract farming has increased from 3,000 ha at the launch of the scheme to as much as 20,000 ha in 2005-06. The target for 2006-07 is 38,000 ha. It is hoped that textile mills, cotton traders and ginners will take the initiative in spreading the concept of contract farming that will benefit the farming community and the textile industry alike.

#### **4.3 *By-products and Waste Utilization – Potential for social Impact***

Exploitation of cotton seed and cotton stalk will offer scope for rural employment generation and additional income for millions of cotton farmers and thus help their economic and social well-being. Of the several components of the biomass other than the cotton fibre, the seed alone is being exploited at present. Although R & D work has been going on in many centers for appropriate utilization of all components, there is need for vigour both in R & D as well as transfer of technology work in the following areas:

##### **4.3.1 Cottonseed Oil:**

Oil forms 20% of the weight of whole seed and 30% of the weight of kernel. In India oil extraction is done in small units where whole seed is crushed, thereby losing linter and seed hull. Yield is low as much of the oil is lost in the cake. Delinting, dehulling and crushing of kernel followed by solvent extraction of meal would be the right sequence for both yield and quality. Edible grade oil needs refining to get rid of toxic pigments like gossypol.

#### **4.3.2 Linters:**

Short fibres left on ginned seed referred to as linters weigh upto 10% of seed weight. High grade pulp suitable for speciality paper can be made from linters available in India to the tune of 30,000 tonnes. Indigenous mechanical delinting machines are available but very little of this material is extracted from seeds. As of now, this rich resource remains untapped.

#### **4.3.3 Seed Hull:**

Several applications exist for seed hull, prominent among them being the manufacture of furfural needed by the plastic industry. CIRCOT has the technology for furfural manufacture but there have been no takers till today.

#### **4.3.4 Plant Stem:**

Dried cotton plant stem left in the field after harvest can be used for making particle boards and paper pulp much like many other crop residues now in use. Indigenous technologies are available for manufacture of a wide range of products but they are yet to be put to use by the industry.

Plant stalks can also be used as substrate for growing edible mushrooms and many rural households can earn extra income from this. At present, the application of this technology is limited to a few tribal villages in Gujarat.

### **Conclusion:**

In the wake of mounting awareness about the need to protect the environment and ensure the well-being of the society, the Government of India has taken steps with regard to cotton cultivation and utilization. They include regulatory measures as well as a series of schemes that will foster economic development without damage to the environment. With the willing support received from non-government agencies and other stakeholders in cotton economy, the Government of India has every reason to feel confident that cotton production and use in India will grow in harmony with nature in the years to come.

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**ENVIRONMENTAL & SOCIAL  
IMPACT OF COTTON  
CULTIVATION AND USE  
WITH SPECIAL REFERENCE  
TO INDIA**

**SUDRIPTA ROY  
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MINISTRY OF TEXTILES, GOVT. OF INDIA**

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**Environmental & Social Concerns**

- ❖ **Our Surroundings**
  - Environment
  - Ecology
- ❖ **Imbalance of the two will affect the life & health of**
  - Human beings
  - Other creatures
  - Vegetation.
- ❖ **Environmental damage & human progress remained inseparable.**

**Environmental & Social Awareness**

- \* **Reflected in current human endeavors**
- \* **Laws enacted in many countries**
- \* **I.S.O. standards**

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**Indian Scene**

- \* **Environmental & Social issues very important to India**
- \* **60 m people connected with cotton**
- \* **Share of cotton: about 58%**
- \* **Cotton's contributions:**
  - 14% of industrial production
  - 4% of GDP

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*Indian Scene contd...*

- \* **Largest in cotton area (Ca 90 mha)**
- \* **3<sup>rd</sup> in cotton production (4.2 mt)**
- \* **4 m cotton farmers**
- \* **70% area is rainfed**
- \* **Yield : Ca 470 kg/ha (World: 750 kg/ha)**
- \* **Hybrids dominate**
  - cover 50% of area
  - account for 60% of production
- \* **No. of ginneries > 3400 (mostly roller gins)**

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**Indian Textile Industry**

**Highlights**

**Includes large and small scale sectors**

**Spinning**

- \* 37 m spindles
- \* 5,00,000 rotors



Mostly non-SSI

**Weaving**

- \* 2.0 million powerlooms (mostly in SSI sector)
- \* 3.8 m handlooms (rural weavers)

## Indian Textile Industry

### Highlights contd...

#### **Processing**

- \* 13,000 processing houses (mostly in SSI sector)

#### **Garmenting**

- \* 30,000 units (mostly in SSI sector)

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## Environmental & Social Impact

- \* Industry's dimensions truly gigantic
- \* Impact to be most spectacular in India
- \* Steps by GoI & other agencies to ensure textile industry's harmony with nature & society

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## Integrated Pest Management

- \* Excessive pesticide use leads to
  - Environmental pollution
  - Cost increase
  - Destruction of predators
  - Insecticide resistance
  - Residues in cotton

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## GoI Initiatives

- \* Steps to reduce the use of pesticides (50% of pesticides were used in cotton farms till recently).
- \* Govt. has banned the use of 25 pesticides and 6 formulations.
- \* Researches under ICAR on pest management
  - at Institutes of ICAR
  - at Agri Universities
- \* IPM packages developed for each location

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## GoI Instruments to promote IPM

- \* Technology Mission on Cotton
  - Launched in 2000
  - Mini Mission II for Extension
  - Demonstration plots for IPM
  - Training of farmers in IPM
- \* All India Coordinated Cotton Improvement Project
  - Launched 1966 (continuing)
  - Thousands of Frontline Demonstration plots

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## Participants in IPM Promotion

- \* ICAR Institutes
- \* Agri Universities
- \* Krishi Vigyan Kendras
- \* State Depts. of Agriculture
- \* Cotton Corpn. of India
- \* Many NGOs

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Participants in IPM Promotion Contd.

**Significant contribution by**

- \* Confederation of Indian Textiles Industry (CITI)
- \* Southern India Mills Association (SIMA)
- \* Southern India Cotton Associations (SICA)
- \* Many Textile Mills
- \* Many voluntary Organizations

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Downslide in Pesticide Use

- \* No. of sprays has reduced since 2000
- \* Pesticide use in cotton States has come down in the last 2-3 years

|                   | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|-------------------|---------|---------|---------|---------|---------|
| All India         | 47.0    | 48.3    | 41.0    | 40.7    | 39.8    |
| Cotton States     | 33.7    | 35.5    | 27.7    | 27.2    | 24.7    |
| Non-Cotton States | 13.3    | 12.8    | 13.3    | 13.5    | 15.1    |

- \* Govt. Steps on IPM seems to be taking effect

Bt Cotton

**New Hope for Cleaner Environment**

- \* The most formidable enemy of cotton crop in India is the bollworm.
- \* Major part of pesticides applied on cotton in India is to combat the bollworm.
- \* Bt cotton cultivation permitted by GoI in 2002-03 after stringent regulatory trials

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Bt Cotton contd...

- \* Area in the current year (2006-07) expected to touch 4 m ha
- \* Bt technology being used by 15 seed companies
- \* 60 Bt hybrids under cultivation today
- \* Cotton farm environment in India becoming cleaner

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Organic Farming

- \* Cotton cultivation without the use of chemicals being promoted by organizations like IFOAM
- \* Market for organic cotton seems to be growing.
- \* India too has started organic cotton farming.

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Organic Cotton in India

- \* Unintentionally grown in the last many years

| Variety  | Location  |
|----------|-----------|
| V-797    | Gujarat   |
| Y-1      | Khandesh  |
| Maljari  | M.P.      |
| Jayadhar | Karnataka |
| Nandicum | A.P.      |

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### R & D in Organic Farming

- \* Merits of organic cultivation identified
- \* Soil gets richer year after year.
- \* Bio-fertilizer, vermicompost, bio-pesticides, etc. found effective
- \* Production cost is reduced.
- \* Yield is low in initial years but improves after 3 or 4 years.

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### Commercial Organic Cotton

- \* Front runners : Vidarbha Organic Farmers' Association (VOFA)
  - \* Certification agencies available in India
  - \* Area covered : 50,000 acres
  - \* Locations: M.P., Maharashtra, Orissa
  - \* Varieties cultivated
- |                      |          |
|----------------------|----------|
| AHH 468, DHY 286     | 27-29 mm |
| LRA 5166, Rajat      |          |
| Bunny, MCU-5, Tulasi | 29-30 mm |
| DCH-32               | 34-36 mm |

### Future Perspectives

- \* India has high production potential for organic cotton.
- \* Market demand needs to be assessed.
- \* R & D must be intensified.

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### Indian Regulations

- Several regulations enforced by Government of India
- \* National level standards for waste water evolved by Central Pollution Control Board
  - \* Pollution control responsibility vested on Pollution Control Board of each State

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### Regulations contd.....

#### Textile Products

- \* Eco-safety considerations apply to textile products as much as to textile mill effluents.
- \* As many as 70 carcinogenic dyes have been banned in textile application.

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### Other Government Initiatives

- \* Eco labelling scheme launched by Bureau of Indian Standards permitting "Eco-mark" tag on "safe" textiles
- \* Setting up of eco-testing labs all over the country
- \* Technology Upgradation Fund Scheme to promote effluent treatment plants in mills
- \* Scheme for setting up common effluent treatment plants for small processing units.

### Compliance of Regulatory Norms

|  |                     |
|--|---------------------|
| Composite mills                            | Good                |
| Independent high tech processing units     | Good                |
| Independent Units with moderate technology | Good                |
| De-centralized sector of small units       | Poor, but improving |

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### Social Impact

Status of women will define the strength of a society

- \* **Women in Cotton Farming – Women’s Exclusive Roles**
    - Cleaning the farm
    - Applying fertilizers
    - Cutting top of plants
  - Sowing seeds
  - Hand weeding
  - Harvesting cotton
  - \* **Women’s Partial Role** -Pesticide application
- Women’s nett share: 80-90% of farm labour days**

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### Status of women contd...

- \* **Women in Hybrid Seed Production**
  - 50% of area under hybrids in India
  - 8700 tons of hybrid seeds required annually
  - Hybrid seed production involves hand emasculatation and pollination for each flower
  - Work done exclusively by women in India

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### Status of women contd...

- \* **Women in Cotton Ginning**
  - 1000 out of 3200 Indian ginneries slated for modernization through TMC
  - An unmodernized ginnery of standard size (24 DR gins) employs 125 labourers in each shift.
  - Modernized ginnery employs 25 workers in each shift.
  - Women form a major group in gin labour.

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### Social Security through Contract Farming

- \* Farmers form a significant section of population.
- \* Farmers’ welfare is a measure of social securities.
- \* Farm income is, however, on the decline on account of
  - decrease in price of cotton
  - escalation of input costs.
- \* **There is need to reverse the situation.**

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### Indian Farm Scenario

- \* **Farm scenario in India is characterized by**
  - a large no. of farmers (4 m)
  - small land holdings (2 ha/capita)
  - multiplicity of Varieties
  - freedom to choose any variety

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*Farm Scenario Contd...*

- \* **Indian farmer is handicapped:**
  - Is unclear about choice of variety.
  - Spends too much on inputs.
  - Lacks marketing skills.
  - Is exploited by cotton traders.
  - Fails to make reasonable profit.

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**Contract Farming-  
Integrated Cotton Cultivation (ICC)**

- \* **Solution to farmers' woes through contract farming designated as ICC**
- \* **Promoted by the Ministry of Textiles**
- \* **CCI acting as facilitator**
- \* **Input suppliers and technology providers to play their roles.**

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**ICC Benefits**

- \* **Improved yield**
- \* **Reduced Expenditure on inputs**
- \* **Better quality of cotton**
- \* **Higher nett income**

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**Growth of Contract Farming  
in India**

| Year    | Area Covered (Ha) |
|---------|-------------------|
| 2002-03 | 2996              |
| 2003-04 | 3767              |
| 2004-05 | 5496              |
| 2005-06 | 20000             |
| 2006-07 | 38000<br>(Target) |

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**Utilization of By-products & Wastes  
– Potential for Social Impact**

- \* **Proper exploitation of**
  - Cottonseed oil (Edible uses)
  - Cotton linter (pulping)
  - Seed hull (furfural making)
  - Plant stem (boards, pulp, mushrooms)
- \* **Immense potential for rural employment & income generation**

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**Looking Ahead**

*With the various initiatives being taken up by Government of India and Non-Government agencies, cotton production and utilization in India are set to grow in harmony with nature ensuring the economic well-being of the society in the years to come.*

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