

## 1. **Introduction**

Cotton is one of the most important fiber and cash crop of India and plays a dominant role in the industrial and agricultural economy of the country. It provides the basic raw material (cotton fibre) to cotton textile industry. Cotton in India provides direct livelihood to 6 million farmers and about 40 -50 million people are employed in cotton trade and its processing.

In India, there are ten major cotton growing states which are divided into three zones, viz. north zone, central zone and south zone. North zone consists of Punjab, Haryana, and Rajasthan. Central zone includes Madhya Pradesh, Maharashtra and Gujarat. South zone comprises Andhra Pradesh, Telangana, Karnataka and Tamil Nadu. Besides these ten States, cotton cultivation has gained momentum in the Eastern State of Orissa. Cotton is also cultivated in small areas of non-traditional States such as Uttar Pradesh, West Bengal & Tripura.

## 2. **Cultivated Species**

There are four cultivated species of cotton viz. *Gossypium arboreum*, *G. herbaceum*, *G. hirsutum* and *G. barbadense*. The first two species are diploid ( $2n=26$ ) and are native to old world. They are also known as Asiatic cottons because they are grown in Asia. The last two species are tetraploid ( $2n=52$ ) and are also referred to as New World Cottons. *G. hirsutum* is also known as American cotton or upland cotton and *G. barbadense* as Egyptian cotton or Sea Island cotton or Peruvian Cotton or Tanguish Cotton or quality cotton. *G. hirsutum* is the predominant species which alone contributes about 90% to the global production. Perhaps, India is the only country in the world where all the four cultivated species are grown on commercial scale.

## 3. **Major Constraints in Cotton Production**

- Nearly 65 percent cotton area is rainfed, mainly in the Central and Southern States
- Cotton crop is highly prone to pests and diseases.
- Wide fluctuation in cotton prices, inadequate market infrastructure and cotton export policy.

4. **Area, Production & Yield of Cotton in India**

Area, production & yield of cotton in major States during last 6 years & current year is at **Annexure I**. State wise normal area, production & yield of cotton is at **Annexure II**. Area, Production & Yield of major cotton growing countries during 2012-13 to 2016-17 is at **Annexure III**.

5. **Seed rate & Spacing of cotton**

Species	Growing conditions	Cotton Zone	Seed rate (kg. / ha.)	Spacing ( Cm )	
<i>G.hirsutum</i>	Irrigated	Northern	20 - 22	75 x 15	
		Southern	10 - 15	75 x 30 75 x 45	
	Rainfed	Northern	18 - 20	60 x 30	
		Central	18 - 20	60 x 30	
		Southern	18 - 20	60 x 30	
	<i>G.arboreum</i>	Irrigated	Northern	10 - 12	60 x 30
Central			10 - 12	60 x 30	
<i>G.herbaceum</i>	Rain fed	Central	12 - 15	45 x 30	
		Southern	12 - 15	60 x 30	
<i>G.barbadense</i>	Irrigated	Southern	8 - 10	90 x 30	
			12 - 15	75 x 30	
Hybrids	Irrigated	Southern	2 - 3	45 x 60 90 x 60 45 x 30	
			Central	2 - 3.5	120 x 40 120 x 60
				Northern	3 - 3.5
	Rain fed	Central	3 - 3.5	150 x 60	
		Southern	2.5 - 3	120 x 60	
		Bt hybrids	Irrigated	1.5*	90 x 60** 120 x 40 120 x 60

\* Which includes 150 gm of non Bt seed \*\*spacing differ depending on growth habit of particular hybrid.

6. **Climate & Soil Requirement**

Cotton, a semi-xerophyte, is grown in tropical & sub tropical conditions. A minimum temperature of 15°C is required for better germination at field conditions. The optimum temperature for vegetative growth is 21-27°C & it can tolerate temperature to the extent of 43°C but temperature below 21°C is detrimental to the crop. Warm days of

cool nights with large diurnal variations during the period of fruiting are conducive to good boll & fibre development.

Cotton is grown on a variety of soils ranging from well drained deep alluvial soils in the north to black clayey soils of varying depth in central region and in black and mixed black and red soils in south zone. Cotton is semi-tolerant to salinity and sensitive to water logging and thus prefers well drained soils.

#### 7. **Crop Season**

The sowing season of cotton varies considerably from tract to tract and is generally early (April-May) in northern India and is delayed as we proceed to down south (monsoon based in southern zone). Cotton is a Kharif crop in the major parts of the country viz. Punjab, Haryana, Rajasthan, Uttar Pradesh, Madhya Pradesh, Gujarat, Maharashtra and parts of Andhra Pradesh & Karnataka. In these areas, the irrigated crop is sown from March-May and the rain fed crop in June-July with the commencement of the monsoon. In Tamil Nadu, the major portion of the irrigated and rain fed crop is planted in September-October, whereas the sowing of the rain fed crop in the southern districts is extended up to November. In parts of Karnataka and Andhra Pradesh, the desi cotton is usually sown in August-September. In addition, summer sowings in Tamil Nadu are done during February-March. The sowings of cotton in the rice fallows of Andhra Pradesh and Tamil Nadu extent from the second half of December to the middle of January.

#### 8. **Preparation of land**

The time available for land preparation following the harvest of wheat is limited in the north zone. Pre-sowing irrigation is undertaken after the harvest of wheat. The land is worked upon with tractor-drawn implements, then levelled & planked before preparing ridges upon which sowing is done.

In central and southern zone of India where cotton is a rainfed crop, deep ploughing recommended to destroy perennial weeds once in 4 years. The field is prepared by repeated harrowing with a blade harrow prior to the onset of pre-monsoon rains. Sowing is undertaken on ridges & furrows in drylands for moisture conservation & weed management.

9. **Method of sowing**

Cotton is sown using tractor or bullock drawn seed drill or by dibbling. Hand dibbling of seeds at recommended spacing is commonly practiced in rainfed areas particularly for hybrids. This system ensures proper plant stand, uniform geometry and also saves seeds. This is now main system of sowing of Bt. Hybrids. Cotton cultivation on ridges across the slopes conserves more water, reduces soil erosion and improves yield.

10. **Irrigation Scheduling**

Depending upon the climate & crop-growing period, cotton needs 700-1,200 mm water to meet its maximum water requirement. The water requirement is low during first 60-70 days after sowing & highest during flowering & boll development.

Cotton is commonly flood irrigated although irrigation by furrow or alternate furrow method is more effective and water saving. Drip irrigation is becoming popular particularly in the hybrids for central and southern zones. Cotton needs to be irrigated at 50-70% depletion of available soil moisture. On sandy loam soils of northern zone 3-5 irrigations are commonly given. On red sandy loam soils of Tamil Nadu with low water retention capacity, 4-13 light irrigations may be necessary.

11. **Fertilizer doses and method of application recommended for cotton crop in different zones**

Cultural Practices	Northern cotton zone	Central cotton zone	Southern cotton zone
Fertilizers	N - 60 - 100 kg / ha. P and K dose as per soil test. No P need be applied if previous wheat received recommended P. 5.5 kg.Zn / ha. as ZnSo4 once in two cotton - wheat cycles	N : P : K 40 - 20 - 20, 50 - 25 - 25, 80 - 40 - 40 for varieties 100 - 50 - 50, 160 - 80 - 80, 240 - 120 - 120, for hybrids	N : P : K 40 - 20 - 20, 60 - 30 - 30, 90 - 45 - 45 for varieties 100 - 50 - 50, 120 - 60 - 60, 150 - 60 - 60 for hybrids

Method of fertilizer application	i) Half N at thinning and remaining at first flowering; ii) Half N at sowing time in late sown crop; iii) Foliar application of N if needed; P to be drilled at sowing.	N in three splits at sowing, squaring and peak flowering stages. ( P & K according to soil test). Application of 2 % urea or DAP at flowering and early boll development.	N at squaring and peak flowering, P & K at sowing. In Karnataka entire NPK at planting ( rain fed cotton ), Half N and entire P & K at planting, remaining N at flowering (irrigated cotton ) N in 4 splits in irrigated hybrid cotton.
Bio fertilizer		Seed treatment with azotobacter is beneficial.	Seed and soil treatment with Azospirillum in Tamil Nadu.

## 12. Inter cultivation & weed control

Inter-cultivation is done fairly regularly by either a blade harrow with a three tined hoe or a desi plough. In the crop sown by broadcasting, one or two hand hoeing's are given to remove weeds, inter-cultivation not only checks the growth of weeds but also leads to better soil aeration and soil moisture conservation.

Weeds compete with cotton crop for nutrients, light and moisture. Cotton is susceptible to weed competition from sowing to about 70 days when the canopy covers the inter-spaces. Cotton yields are reduced by 50 to 85% if weed growth is unchecked. Fluchloralin or pendimethalin @ 1 kg ai/ha. as pre-plant incorporation with one hand weeding and crosswise hoeing has been recommended for satisfactory weed control. Deep rooted perennial weeds are removed by summer ploughing.

The thinning of the cotton crop is a special feature of the irrigated crop sown on ridges in Peninsular India and in parts of southern Gujarat. Thinning is desirable for maintaining the optimum population of plants to obtain a high yield. During thinning, the vigorous seedlings are retained and weak seedlings and off types are removed.

13. **Cropping system & Intercropping in Cotton**

<b>State</b>	<b>Cropping system</b>	<b>Intercrop</b>
Punjab, Haryana, Rajasthan	Cotton - Wheat, Cotton – Mustard, Cotton – Berseem	No intercropping
Madhya Pradesh	Cotton ( Monocrop), Cotton-Jowar (two yr. rotation), Cotton –Wheat	Cotton + Black gram ( 1:1 or 2:1) Cotton +Soybean ( 2:1)
Gujarat	Cotton ( Monocrop), Cotton-Jowar (two yr. rotation), Cotton –Wheat	Hy Cotton + Groundnut Desi Cotton + Black gram
Maharashtra	Cotton ( Monocrop), Cotton-Jowar (two yr. rotation)	Cotton + green gram, black gram Cotton + Soybean Cotton + Groundnut Mixed cropping with red gram
Karnataka	Cotton ( Monocrop), Cotton –Wheat	Cotton+ Chilly/Onion (irrigated) Cotton ( DCH-32) + Rice (high rainfall area)
Tamil Nadu	Cotton (Monocrop), Rice - Cotton , Rice-Rice-Cotton, Cotton- Jowar, Cotton-Pulse-Jowar	Cotton + Onion Cotton + Groundnut Cotton + Blackgram (paired row) Mixed cropping with horse gram & minor millets
Telangana & Andhra Pradesh	Mono cropped, Cotton-Rice(Sequence), Cotton-Chilli and Cotton-Tobacco( two yrs rotation)	Cotton + Blackgram (1: 2) Cotton + pigeon pea Cotton+ Chilli Mixed cropping with Soyabean

14. **Management of insect pests & diseases**

<b><u>S. No.</u></b>	<b><u>Insect/Disease</u></b>	<b><u>Management Practices</u></b>
	<b><u>Insect Pests</u></b>	
<b><u>1</u></b>	Jassids /Aphids	Methyl demeton or Dimethoate @ 400-600 ml/ha
<b><u>2</u></b>	Thrips	Endosulfan @ 1.5 litre/ha should be sprayed.
<b><u>3</u></b>	White flies	Triazophos @ 600-800 ml/ha. Or neem product @ 2.5 litre /ha.
<b><u>4</u></b>	Bollworms	One spray of either Endosulfan or Chloropyriphos or quinalphos @ 2.5 lit / ha. One spray of synthetic pyrethroids (10 EC) @ 500 ml/ha. and HNPV @ 250 LE/ha. should be sprayed.
	<b><u>Diseases</u></b>	
<b><u>1</u></b>	Bacterial blight	Spray with streptocycline (0.01%)
<b><u>2</u></b>	Fungal leafspots	Copper oxychloride (0.25%)
<b><u>3</u></b>	Grey mildew	Spray wettable sulphur (0.2%) or carbendazim (0.1%)
<b><u>4</u></b>	Boll rot	Copper oxychloride or carbendazim should be sprayed along with recommended insecticide.
<b><u>5</u></b>	Root Rot	Drench the plants in affected patch with carbendazim (0.1%). Inter crop mothbean in such areas. ZnSO <sub>4</sub> @ 24 Kg./ha should be applied in soil. Grow recommended resistant varieties.
<b><u>6</u></b>	Leaf Curl	Spray recommended insecticide for the control of whitefly, grow deshi cotton & resistant varieties like LRK-516, LRK-5166, HS-875, LHH-144.
<b><u>7</u></b>	Leaf reddening	Irrigate the field and spray MgSO <sub>4</sub> 1%, Urea 2% followed by DAP 2% at the time of initiation of leaf reddening.

15. **Schemes for Cotton Development**

***I. MM-II of TMC***

Government of India launched a Centrally Sponsored Scheme of Technology Mission on Cotton (TMC) during 2000. Mini Mission-II (MM-II) of TMC was on cotton development with the aim to increase the production & productivity of cotton. MM-II of TMC was implemented by the Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) in 13 States viz. Andhra Pradesh, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal and Tripura from 2000-01 to 2013-14. The sharing of funding of the components was 75:25 between Central and State Governments. However, in some of the components implemented by ICAR/ other central agencies, 100 per cent share was borne by the Central Government. Under the scheme, assistance was provided for transfer of

technologies through field demonstrations, training of farmers & extension workers as well as supply of critical inputs such as certified seeds, pheromone traps, bio-agents & water saving devices like sprinklers & drip irrigation system, etc.

## **II. National Food Security Mission- Commercial Crops (Cotton) Programme:**

Cotton Development Programme is being implemented under National Food Security Mission - Commercial Crops (NFSM-CC) for enhancing production and productivity w.e.f 2014-15 in 15 States viz., Assam, Andhra Pradesh, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Telangana, Tamil Nadu, Tripura, Uttar Pradesh & West Bengal. Under this scheme thrust has been given on transfer of technology through frontline demonstrations and training in order to extend benefits to the farmers. From, 2015-16, in view of increased devolution to the States on account of implementation of recommendations of 14<sup>th</sup> Finance Commission, NFSM is being implemented on sharing basis between Government of India and States on 60:40 basis for general category states & 90:10 basis for North East & hilly states. However, the Central Agencies are funded 100% by GOI. Pattern of Assistance under NFSM-CC-Cotton is at **Annexure-IV**. Allocation of funds under NFSM-Cotton is at **Annexure-V**.

## **III. Cotton Development under Rashtriya Krishi Vikas Yojana (RKVY)**

There is no earmarked allocation of funds for cotton under RKVY. However, the States can undertake cotton programme under RKVY with the approval of State Level Sanctioning Committee (SLSC) under the chairmanship of Chief Secretary of the State.

### **16. Strategy for Management of incidence of whitefly on Cotton during 2016-17**

- a. A meeting was held on 8.2.2016 at Central Institute for Cotton Research, Regional Centre, Sirsa (Haryana). The meeting was attended by officials of the Ministry of Agriculture & Farmers Welfare, Government of India, scientists of Indian Council of Agricultural Research (ICAR) and senior officers of the Department of Agriculture, Punjab, Haryana and Rajasthan. It reviewed the steps to be taken to save the crop from whitefly infestation.
- b. A comprehensive advisory has been sent to these three states comprising of timely sowing, use of recommended seeds, monitoring of insects, insecticides spray schedule etc along with other instructions.
- c. ICAR has recommended insect resistant varieties/hybrids so that farmers can be advised properly in these states.
- d. Timely Advisories are being issued to these States to manage whitefly.
- e. A Committee has been formed in the Ministry to monitor Status of whitefly in cotton continuously & to ensure timely & regular dissemination of advisories through electronic, print & mobile platforms to stakeholders. The committee will also undertake need based visit to the infected regions.



17. **Minimum Support Price (MSP) of Cotton**

The MSP of Cotton during last five years & current year is as under:

(Rs. Per Quintal)

Variety	2011-12	2012-13	2013-14	2014-15	2015-2016	2016-17
Medium Staple*	2800	3600	3700	3750	3800	3860
Long Staple**	3300	3900	4000	4050	4100	4160

\*Staple length (mm) of 24.5-25.5 & Micronaire value of 4.3-5.1

\*\* Staple length (mm) of 29.5-30.5 & Micronaire value of 3.5-4.3

18. **Cotton Balance Sheet: Cotton Advisory Board (CAB)**, Ministry of Textiles estimates the statistics and prepare balance sheet of cotton situation. Cotton Balance Sheet for the year 2011-12 to 2016-17 is at **Annexure-VI**.

19. **Statistics on Cotton:**

**State-wise Arrivals of cotton for the year 2016-17**

(As on 21.10.2016)

(Quantity in bales)

S.No.	States	Arrivals
1	Punjab	103000
2	Haryana	310000
3	Rajasthan	87500
4	Gujarat	212000
5	Maharashtra	103500
6	Madhya Pradesh	114000
7	Andhra Pradesh	4900
8	Telangana	50600
9	Karnataka	58000
10	Tamil Nadu	0
11	Orissa	0
12	Others	0
	<b>Total</b>	<b>1043500</b>

(Source: Website of Cotton Corporation of India)

## State-Wise MSP Operations of Cotton

(quantity in bales)

State	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Punjab	52389	-	-	1043814	86597	-	-	-	-	127722	-
Haryana	4429	-	-	255342	21763	-	-	-	-	79903	-
Rajasthan	70159	-	-	155217	4495	-	-	-	-	87870	-
Gujarat	293167	-	-	1236114	162	-	-	-	-	666457	51501
Maharashtra	295206	539754	-	1997091	509	-	-	41572	-	1763192	116799
M.P	118267	89844	-	736526	-	-	-	3551	-	281875	29104
Telangana										3690948	595159
A.P	350058	527646	218694	3275754	445589	-	7570	2174886	40813	1755559	39967
Karnataka	62564	4954	-	163123	4763	-	-	16363	-	139280	-
Tamil Nadu	-	-	-	-	-	-	-	-	-	-	-
West Bengal	248	-	-	132	137	152	124	262	-	-	-
Orissa	6064	16257	4611	71717	16581	-	-	50051	-	102987	11633
<b>Total</b>	<b>1252551</b>	<b>1178455</b>	<b>223305</b>	<b>8934830</b>	<b>580596</b>	<b>152</b>	<b>7694</b>	<b>2286685</b>	<b>40813</b>	<b>8695793</b>	<b>844163</b>

## Kapas Prices

The monthly average kapas prices alongwith MSP for main varieties grown in the country during 2014-15 & 2015-16 is as below:

(Prices in Rs per quintal)

Month	J-34		S-6		Bunny, Brahma		H-4		DCH-32	
	14-15	15-16	14-15	15-16	14-15	15-16	14-15	15-16	14-15	15-16
<b>MSP</b>	<b>3950</b>	<b>4000</b>	<b>4000</b>	<b>4050</b>	<b>4050</b>	<b>4100</b>	<b>3950</b>	<b>4000</b>	<b>4450</b>	<b>4500</b>
Oct	4142	4566	4212	4418	4013	4058	4002	4168	4587	5118
Nov	4005	4415	4071	4298	4019	4098	3913	4066	4608	5209
Dec	4088	4467	4014	4596	4014	4110	3910	4250	6308	5374
Jan	4068	4738	4011	4766	4013	4227	3819	4543	6649	5355
Feb	4102	4724	4059	4669	4015	4145	3823	4444	4734	5270
Mar	4063	4698	4042	4684	4042	4196	3894	4432	4647	5006
Apr			4151	4804	4151	4512	4093	4598		
May			4744	4910	4060	4799	4233	4635		

(Source: Website of Cotton Corporation of India)

**Export to Top 5 countries from India**

Country	Unit	Qty	Oct'15 to Sep'16 Value (INR)
PAKISTAN	TON	462822	44222072213
BANGLADESH	TON	375711	37726206122
CHINA	TON	124294	11283937679
VIETNAM	TON	111798	10466266459
INDONESIA	TON	49371	4642020934

**Import from Top 5 countries to India**

Country	Unit	Qty	Oct'15 to Sep'16 Value (INR)
AUSTRALIA	TON	133869	16653785862
U S A	TON	69122	10597889109
MALI	TON	38432	4153201526
EGYPT	TON	12300	2168782376
COTE D' IVOIRE	TON	18777	1994787646

(Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S), Kolkata)