

## Approved Package of Practice for Cotton in Karnataka State

Cotton is a major commercial crop grown in almost all the Agro-climatic zones of Karnataka. All the four cultivated species of cotton viz., *Gossypium arboreum*, *G. herbaceum*, *G. barbadense*, and *G. hirsutum* are grown in the state where in *Gossypium hirsutum* has the major share of the hybrid cotton grown. Area under cotton during the year 2007-08, was 3.7 lakh hectares with a production and productivity of 6.0 lakh bales and 365 kg lint/ha respectively. Area under Bt cotton was to the extent of 0.8 lakh hectares during 2007-08.

The package of practices developed for different species of cotton and agro-climatic situations is summarized as below.

### 1. CROP IMPROVEMENT

#### 1.1 Cotton varieties / hybrids released for cultivation in the state

Varieties/ hybrids	Zone and situation	Crop duration ( days)	Time of sowing	Special characters	Yield (q/ha)	
					Irrigated	Rainfed
<b>Inter specific hybrids</b>						
Varalaxmi	2, 3, 8, 9 Irrigated / rainfed	190	May –15 <sup>th</sup> July	Extra long staple (ELS) cotton	15 – 20	12 – 15
DCH – 32	2, 3, 8, 9 Irrigated / rainfed	190	May –15 <sup>th</sup> July	Extra long staple (ELS) cotton	15 – 20	12 – 15
DHB- 105	2, 3, 8, 9 Irrigated/ rainfed	180	May –15 <sup>th</sup> July	Long staple cotton and tolerant to leaf reddening	20 – 25	15 – 18
<b>Intra hirsutum hybrids</b>						
NHH – 44	2, 3, 8, Irrigated / rainfed	160	May –15 <sup>th</sup> July	Having better regenerative character	18 – 20	12 – 15
DHH – 11	2, 3, 8, Irrigated / rainfed	160	May –15 <sup>th</sup> July Feb-Mar	Bigger boll size and good boll opening.	20 – 25	15 – 18
Suvida (DHH – 543)	2, 3, 8, Irrigated / rainfed	160	May –15 <sup>th</sup> July	Average boll size good boll opening	20 – 25	15 – 18
Bunny (NCH – 145)	2, 3, Irrigated / rainfed	165	May –15 <sup>th</sup> July	Bigger boll size and good boll opening	20 – 25	15 -- 18
<b>Hirsutum varieties</b>						
Abadhita	2, 3, 8, Rainfed	160	May –15 <sup>th</sup> July	Tolerant to bollworm	--	15 – 18
RAMPBS 155	2, Irrigated	170,	May –15 <sup>th</sup> July	Round boll shape, Tolerant to leaf reddening	18 – 20	--
Sahana	2, 3, 8, Irrigated / rainfed	160	May –15 <sup>th</sup> July Feb-Mar	Tolerant to bollworm	18 – 22	15 – 18

LRA - 5166	3, Irrigated	160	Feb-Mar	Suitable for summer season also.	15 – 18	--
Ganesh - (ACP - 71)	3, Irrigated	170	Feb-Mar	Suitable for intercropping with maize	18 – 20	--
Gouri – (AH – 107)	3, Irrigated	160	Feb-Mar	Suitable for double cropping system	18 – 20	--
RAH – 100	2, 3, Irrigated	165	May –15 <sup>th</sup> July	--	18 – 20	--
<b>Desi cotton varieties</b>						
Jayadhar	2, 3, 8 Rainfed	200	July – Sept.	Resistant to pest and diseases. Suitable for intercropping under rainfed conditions	--	08 – 12
Renuka	2, 3, Rainfed	190	July – Sept	--	--	08 – 12
DDHC – 11	2, 3, 8 Rainfed	180	July – Sept	--	--	10 – 12
RAHS – 14	2, 3, Rainfed	180	July – Sept	Suitable for saline soils.	--	10 – 12
DLSA – 17	2, 3, 8 Rainfed	160	May –15 <sup>th</sup> July	Long Staple cotton with good boll opening	--	12 – 15

## 2. CROP PRODUCTION

### 2.1 Seed, seed treatment.

Use delinted seeds for uniform and higher germination. Adopt the following method for delinting of cotton seeds.

- Soak 1 kg of cotton seeds in 100 ml commercial grade Sulphuric acid (H<sub>2</sub>SO<sub>4</sub>) for ten minutes.
- Wash the acid treated seeds with 2% Calcium Chloride (CaCl<sub>2</sub>), then with clean water and dry the seeds under sunlight and use for sowing after recommended seed treatment.
- Treat the seeds required for one hectare area with 500g Azospirillum and 500g Phosphorous Solubilising Bacteria (PSB) before sowing which can save 20 kg N and 10 P<sub>2</sub>O<sub>5</sub> /ha.
- Treat the seeds with 10 g Imidacloprid 70WS or 5 g Thiomethaxam 70 WS to reduce the sucking pest incidence up to 35-40 days of sowing.

### 2.2 Seed rate and methods of sowing

Methods of sowing	Seed rate (kg / ha)	
	Varieties	Hybrids
Drill sown	7.5 – 10	--
Hand dibbling	5 – 6	2.5 – 3

## 2.3 Time of sowing

- Early sowing in the season is recommended for higher yields.

Situation	Time of sowing
<b>I. Rainfed</b>	
a. Herbaceum varieties (Jayadhar/DDHc-11 etc. )	July - September
b. Arboreum varieties (DLSa-17)S	May – July
c. Hirsutum varieties/hybrids (Inter specific and Intra hirsutum)	May – 15 <sup>th</sup> July
<b>II. Irrigated</b>	
a. Hybrids	May – 15 <sup>th</sup> July
b. Summer cotton	February – March

## 2.4 Planting geometry.

Planting geometry can be modified and adopted based on soil type and fertility. Following planting geometries have been recommended under different soils and various growing situations.

1. Rainfed situation (For varieties)	60cm x 30 cm or 90cm x 20 cm
2. Irrigated ( For varieties and summer cotton )	75 cm X 30 cm ( Average soils) 90 cm x 30 cm (Fertile soils)
3. Transitional Zone (Zone-8, Assured rainfall areas for Hybrids)	
a. Interspecific hybrids	90 cm x 60 cm
b. Intra hirsutum hybrids	90 cm x 60 cm or 90 cm x 30 cm
4. Heavy rainfall tract (zone 9 - Malanad) and Irrigated areas	
a. Interspecific hybrids	90 cm x 60 cm (Average fertility soils) 90 cm x 60 cm or 90 cm x 30 cm
b. Intra hirsutum hybrids	120 cm x 60 cm ( Fertile soils)

## 2.5 Integrated Nutrient Management (INM)

### 2.5.1 Organic Fertilizer:

- Apply FYM/Compost @ 10 t/ha and 5 t/ha under irrigated and rainfed conditions respectively
- Apply Poultry manure @ 2t/ha instead of FYM under irrigated conditions only.
- Incorporate cotton stalks (Crop residues) @ 2 t/ha along with FYM @ 3 t/ha and Vermicompost @ 1 t/ha. 2-3 weeks before sowing under irrigated conditions.
- Grow sunhemp (as green manure) between two rows of cotton and incorporate *in situ* after 30 DAS in irrigated and assured rainfall areas which helps in increasing the soil fertility and reducing weed population.
- Incorporate FYM @ 3 t/ha along with green leaf manures @ 2t/ha (*Ex situ*), 2 to 3 weeks before sowing in irrigated and assured rainfall areas

### 2.5.2 Bio fertilisers

- Treat the seeds required for one hectare area with 500 g Azospirillum and 500 g Phosphorous Solubilising Bacteria (PSB) before sowing which can save 20 kg N and 10 kg P<sub>2</sub>O<sub>5</sub> /ha.

### 2.5.3 Inorganic fertilizers

Zones/ Varieties/Hybrids	Recommended quantity nutrients (kg/ha)		
	Nitrogen	Phosphorus	Potash
<b>I. Rainfed (varieties)</b>			
1. Northern dry tract (zone 1, 3)	30	15	15
2. Transitional tract (zone 8)	40	25	25
<b>II. Rainfed (hybrids)</b>			
1. Malanad tract (zone 9)	100	100	100
2. Transitional tract (zone 8)	80	40	40
<b>III. a. Irrigated (varieties)</b>			
In all zones	80	40	40
<b>III. a. Irrigated (hybrids)</b>			
1. Inter specific hybrids	150	75	75
2. Intra hirsutum hybrids	120	60	60
<b>IV. Summer cotton</b>			
1. Varieties	80	40	40
2. Intra hirsutum hybrids	120	60	60

### 2.5.4 Split application of fertilisers

- Incorporate organics (FYM/Compost/Crop residues) into the soil 2-3 weeks before sowing.
- For rainfed cotton apply entire recommended nutrients as basal at the time of sowing.
- Under assured rainfall conditions apply 50% N, entire dose of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O as basal at the time of sowing and top dress remaining 50% N at 60 DAS.
- Under irrigated conditions, apply 50 % N & K<sub>2</sub>O and entire P<sub>2</sub>O<sub>5</sub> as basal at sowing and top dress 50 % N & K<sub>2</sub>O at 30 DAS and remaining 25% N & K<sub>2</sub>O at 60 DAS.
- Under irrigated conditions in Zone -3 apply 25 % N & K<sub>2</sub>O and entire P<sub>2</sub>O<sub>5</sub> as basal at sowing and top dress 50 % N & K<sub>2</sub>O in three equal splits at 50, 80 and 110 DAS.
- Under heavy rainfall areas (Malanad), apply N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O in three equal splits i.e Basal, 60 and 90 DAS.
- In all the situations give foliar sprays of 2% Urea or DAP + 1% MOP at 80, 100 & 120 DAS

### 2.6. Post sowing operations and weed management

- Keep the plots weed free up to 60 days as the crop growth is slow during this period and this is the critical crop growth stage for crop weed competition.
- Three – four intercultivations at an interval of 15 days after 30 DAS helps in controlling weeds and acts as dust mulch in conserving the available soil moisture.
- In rainfed situations weeds can be managed effectively by 2-3 intercultivations followed by hand weeding.
- In transitional and irrigated areas integrated weed management proved effective in controlling the weeds. Pre emergent application of Diuron (80%) @ 1.25 kg/ha or Pendimethalin (30 EC) @ 3 lit/ha in 500-750 lits of water, immediately after sowing (with sufficient soil moisture) coupled with one hand weeding and intercultivation is recommended.

## 2.7 Irrigation

### 2.7.1 Water requirement and number of irrigations.

Soil type	Crop duration	Irrigation interval	No. of irrigations	Depth of each irrigation (cm)	Total crop water requirement (cm)
Black soils	180 days	20 days	5 - 6	6 cm	80 – 90 cm
Light/red/sandy loam soils	170-180 days	15 days	8 - 10	5 cm	80 – 90 cm

- Schedule irrigation at 0.6 IW/CPE through out the crop growth.

### 2.7.2 Methods of irrigation

- Adopt **furrow method** of irrigation with following specifications.
- Adopt **Alternatively Alternate Furrow Irrigation (AAFI)** in heavy soils (Vertisols), which saves time, labour, irrigation water (to the extent of 30%) and minimizes the long term ill effects of irrigation on soil properties.

Particulars	In heavy or black soils	In light or red soils or sandy loam soils
Furrow length	100-150 m	60-90 m
Slope in furrows	0.1 – 0.2 %	0.2 - 0.4%
Stream size	2 – 3 lit/sec	3 – 4 lit/sec

### 2.7.3 Critical stages of irrigation

Critical Stages of crop growth	Days after sowing (DAS)
Sympodial branching and square formation stage	45 - 50
Flowering and fruiting stage	75 – 85
Peak boll formation	95 – 105
Boll development and boll opening stage	115- 125

- Heavy and frequent irrigation enhances the vegetative growth leading to ineffectiveness
- of plant protection measures, resulting in higher incidence of pest/diseases
- Provide drainage in heavy soils to avoid water logging due to low infiltration rate
- Under canal command areas where in the canal opening is not assured at scheduled time, ensure early sowing with protective irrigation by open/bore well water.
- Under constraints of irrigation water, foliar spray of Kaolin (60 g/lit) with 1 g teepol or soap, at 3 days after last irrigation reduces transpiration losses from the crop canopy, thus helps the crop to utilize the available soil moisture efficiently.

## 2.8 Drip irrigation in cotton

- Drip irrigation can be a viable option under constraints of irrigation water in zone 3 and 8 for hybrid cotton cultivation.
- It can save electricity, labour and 50% of irrigation water as against the surface furrow irrigation
- Planting geometry of 90 cm x 60 cm (Normal planting) can be adopted under drip irrigation, but paired row planting at 60 cm – 120 cm – 60 cm can save 50% laterals as against the normal planting

- Operate drip system daily or once in three days and replenish 75 per cent cumulative ET of corresponding days by drip for hybrid cotton and 50 percent for hirsutum varieties.(Table.1)

**Table. 1: Time schedule of drip operation based on daily ET (Zone 3 and 8)**

Month	Evaporation (mm/day)		*Time of drip operation based on ET (Minutes)			
			Zone 3		Zone 8	
	Zone 3	Zone 8	Hybrids	Varieties	Hybrid	Varieties
January	6.1	5.1	16	10	13	9
February	6.3	6.2	17	11	16	11
March	8.1	7.3	21	14	19	12
April	9.7	7.2	25	17	19	12
May	10.1	5.9	26	17	15	10
June	7.4	3.1	19	13	8	5
July	5.2	1.9	13	9	5	3
August	4.7	1.7	12	8	5	3
September	4.8	2.3	12	8	6	4
October	5.2	2.8	13	9	8	5
November	4.7	3.4	12	8	9	6
December	4.5	4.3	11	8	11	7

- Replenishing 75% and 50% daily ET for hybrids and varieties respectively.
- Drippers having discharge capacity of 4 lit/sec to be used.
- Laterals to be placed at 90 cm apart and drippers at 60 cm under normal planting
- In case of paired row planting (60 cm – 120 cm – 60 cm) the above time of drip operation has to be doubled as the number of laterals and drippers are reduced to 50 % as compared to normal planting of 90 cm x 60 cm

### 2.8.1 Fertilizer management in drip irrigation system

- Apply 10 percent of recommended fertilizers as basal at the time of sowing and apply remaining fertilizers in equal splits through fertigation between 30 to 120 DAS at six days interval.
- Urea, MOP and DAP can be used for fertigation instead of costly liquid fertilisers.
- Follow weed, pest and diseases management practices as mentioned in irrigated cotton

## 2.9 Cotton based cropping systems.

### 2.9.1 Crop rotations.

I year	II- Year	III-Year
Cotton	Groundnut – Rabi Jowar or wheat	Cotton
Cotton	Green gram – Rabi Jowar or Wheat	Cotton
Cotton	Soyabean – Wheat or Rabi Jowar	Cotton
Cotton	Maize – Chickpea	Cotton
Cotton	Sunflower – Chickpea	Cotton

### 2.9.2 Intercropping and mixed/relay cropping systems.

In rainfed situations cotton based intercropping and mixed cropping systems are remunerative and act as insurance against the risk of erratic rainfall.

- Under rainfed conditions adopt the following intercropping systems.
  1. Cotton + onion (1: 5)
  2. Cotton + chilli (1: 1)
  3. Cotton + groundnut (1: 3)
  4. Cotton + green gram (1: 3)
  5. Cotton + soybean (1: 3)
  6. Cotton + peas (1: 2)
- Under irrigated conditions following inter cropping systems are recommended.
  1. Cotton + chilli (1: 1)
  2. Cotton + onion (1: 5)
  3. Cotton + soybean (1: 2).
  4. Cotton + Sunhemp(As green manure) (1: 2)
  5. In black soils of Tung Bhadra Project (TBP area), Cotton + onion (1: 2) and Cotton + chilli (1: 1) are recommended.
- Under low rainfall areas Cotton (desi) + Onion + Coriander, Cotton (desi) + onion + chilli mixed/relay cropping systems are recommended.
- In heavy rainfall areas (Malanad) (zone-9), Cotton + paddy (1:6) intercropping system is recommended.

### 2.10 Physiological disorders in cotton.

Square drying, flowers and premature boll dropping and leaf reddening are the major Physiological disorders in cotton. These can be effectively managed and minimized by the following measures.

- Squares, flowers and boll dropping can be minimized by foliar sprays of Planofix @ 0.25ml/lit of water during pre flowering (55-60 DAS) and peak flowering stage ( 80-90 DAS) of the crop.
- Twice foliar sprays of 1% MgSO<sub>4</sub> or 2% urea or DAP at 90 DAS and 110 DAS reduces the leaf reddening during winter season.

### 3 CROP PROTECTION

#### 3.1 Major diseases, symptoms and their control measures.

Sl No.	Name of the disease	Symptoms of the disease	Suggested control measures
1	Seedling rot	Decay of the seedlings before emergence, girdling of the seedling stems and root rot. Some times mustard like seeds appear on the roots.	Drenching of Thiram @ 2 g/litre of water around the diseased seedlings.
2	Grey mildew / areolate mildew	A whitish mycelial growth appears chiefly on the under surface of the leaves. Under congenial conditions defoliation is observed in diploid cottons.	Foliar sprays of Carbendazim @ 1g /litre of water as and when symptoms seen.
3	Bacterial blight	Water soaked angular leaf spots appear on the leaves, later spread to the veins and vein lets	Foliar sprays of Streptocycline Sulphate @ 0.5 gm/litre and Copper-Oxychlode @ 3 g / litre of water as and when symptoms seen
4	Rust	Circular brown to reddish pustules appear during boll maturation stage on lower surface of leaves and later on they coalesce in to large spots lowering photosynthesis, affecting nutrient supply from source to sink thus affecting the yields..	Foliar sprays of Copper-Oxychloride @ 3g/litre or Mancozeb @ 2gm/litre of water, as and when symptoms are seen.
5	Wilt	Adult plants become weak coupled with yellowing of leaves with senescence and drying	Drenching of Carbendazim @ 2g/litre of water around the diseased plants
6	Boll rot	The bolls nearer to the ground becomes decay, with mycelial growth and some times bacterial ooze comes out of the bolls	Efficient pest management is the best method to control the boll rot. Yet, foliar sprays of Copper-oxychlode @ 3g/litre and Streptocycline Sulphate @ 0.5 gm/litre or Mancozeb @ 2g /litre and Chlorothalonil @ 2g/litre of water at boll initiation stage and a second need based spray after 10-12 days in heavy rainfall /irrigated areas on interspecific hybrids

### 3.2 Major insect Pests, symptoms and their control measures.

Sl. No	Pests	Damage Symptoms	Management strategies
<b>I. Sucking Pests</b>			
1.	Jassids	Yellowing, reddening along the leaf margin and complete drying of leaves	* Treat the seeds with 10 g Imidacloprid 70WS or 5 g Thiomethaxam 70 WS * Foliar application if needed further with NSKE(5%) or 0.5 ml Imidacloprid 17.8 SL or 1.5ml Oxydemton methyl 25EC or 2.0ml Dimethoate 30 EC or 1.0 ml Monochrotophos 36 SL or 0.2 g Thiomethoxam 25WG or 0.2g Acetamiprid 20 SP per liter of water <b>OR</b> * Smear with 1.0 ml Imidacloprid 17.8 SL in 20 ml water approximately to a length of an inch at top tender green portion of the stem.
2.	Thrips	White streaks on leaves and complete drying of leaves	
3.	Aphids	Yellowing, crinkling and development of black sooty mildew on leaves	
<b>II. Other Sucking pests</b>			
4.	Serpentine leaf miner	Makes zig zag tunnels or mines on leaves. Infestation starts at very early stage of plant growth ( two leaf stage)	Spraying of any systemic insecticides mentioned above.
5.	White flies	Yellowing, crinkling and development of black sooty mold on leaves. Premature dropping of squares and bolls	Erection of yellow sticky traps @ 50 /ha, Foliar sprays of NSKE @ 5.0% or 1.5 ml Triazophos 40 EC per liter of water.
6.	Mites	White streaks on leaves, yellow spots on lower side of the leaves.	Sprays of water soluble sulphur @ 5 g or 2.5 ml Dicofol 20 EC per liter of water
7.	Dusky cotton bugs	Bad boll opening and deterioration of seed quality	Any contact insecticides
8.	Red cotton bugs	Suck the sap from the matured bolls. Quality of the lint deteriorates.	

III. Bollworms			
1.	Spotted bollworm	Feeds on squares, flowers and bolls. Flaring up of squares and damage holes on bolls	* Installation of pheromone traps @ 5/ha for monitoring of bollworm moths activity. Use separate traps for each kind of boll bollworms. Change the lure at every 15-20 days.
2.	American bollworm	Feeds on squares, flowers and small as well as big sized bolls. Flaring up symptoms and dropping of squares. Bored entry holes on boll.	* Release egg parasitoid i.e. <i>Trichogramma chilonis</i> @ 2.5 lakh/ha (Tricho card) twice a week at 45-50 DAS * Spraying of neem based insecticides or Endosulfon 35 EC @ 2.75 ml/liter after 5-7 days of <i>T.chilonis</i> release.
3.	Pink bollworm	Feeds on squares, flowers and developing bolls. Rosetted flowers. No damage symptoms on bolls as it feeds inside.	* If <i>T.chilonis</i> is not available pray ovicides like Profenophos 50 EC @ 2.5ml/lit or Thiodicarb 75WP @1.0 g/lit. * Under irrigated situations spray Methomyl 40 SP @ 0.6g/lit. * Spray Ha NPV @ 500 LE/ha + 5 % jaggery water + 0.1% Boric acid (Spray during morning or evening hours) at 60-70 DAS * Nipping and disposal of terminal shoots at 70-90 DAS to reduce egg laying by bollworm moths and to prevent aphid breeding. * Selective use of following insecticides based on incidence of bollworms: Emamectin benzoate 5 SG @ 0.25g/lit or Indoxcarb 14.5 SC @ 0.5 ml/lit or Spinosad 48 SC @ 0.2 ml/lit or Carbaryl 50% WP @ 3.0 g/lit or Quinolpho 25 EC @ 2.0 ml/lit or Cholpyriphos 20 EC @ 2.5 ml/lit.water * Spray with recommended synthetic pyrethroids in severe cases of bollworm incidence (0.5ml of Decamethrin 2.8 EC or Cypermethrin 10 EC or Fenvalrate 10 EC or $\beta$ - Cyfluthrin 25 SC or 0.25ml/lit Alphamethrin 10 EC, however its use should be avoided or restricted to one or two spays after 100 days of sowing alternating with Insecticides of other groups.  <b>Specific recommendations for Pink Boll Worm (PBW) management:</b> * Use delta traps (5.0/ha) for monitoring PBW activities * Twist tying of PB Ropel sticks @ 200/ha at 30-40 DAS Or Mass trapping and killing of moths through pheromone traps @ 30/ha * Supervisory control by spraying recommended Pyrethroides or Profenophos or thiodicarb in addition to regular boll management activity.

### 3.3 Integrated Pest Management in Bt- Cotton under Irrigated conditions

- Seed treatment with 0.5ml Imidacloprid 17.8SL or 0.2 g Thiomethaxam 25WG or 0.2g Acetamiprid 20 SP per lit. of water for sucking pest management. **OR** Stem smearing with 1ml Imidacloprid 17.8 SL in 20ml water.
- Monitoring bollworm moth activity with pheromone traps @ 5.0/ha
- Erecting of bird perches @ 20-25/ha to sustain insectivorous birds in the field.
- Hand collection and disposal of grownup larvae.
- Spry Ha NPV @ 500 LE/ha+5% jaggery in water+ 0.1% Boric acid (Spray in morning or evening hours) when early stage larval incidence is persisting.
- Apply stomach and contact insecticide when larval incidence cross ETL.
- Apply recommended synthetic parathyroids at 110-130 days after sowing for Bt resistant population of American bollworm and pink boll worms.
- Erection of yellow sticky traps @ 50 /ha and application of NSKE 5.0% or 1.5 ml Triazophos 40EC per liter of water for whitefly management
- Manage mite, dusky cotton and red cotton bugs with application of suitable insecticide/acaricide
- Conservation of soil moisture till boll opening stage is essential.

#### Economic Threshold Level for Chemical Application.

Insect Pests	ETL
Jassids	2.0 nymphs/leaf
Aphids	10 aphids/leaf
Thrips	10 thirps/leaf
Whitefly	5 whiteflies/leaf
American bollworm	1.0 larvae/plant
Spotted bollworm	5.0% damage
Pink bollworm	10 % damage

#### 4. Economics of cotton cultivation

4.1 The details on cost of cultivation, gross and net returns of hybrid cotton-Non Bt are given in the following table.

Cost of cultivation of Hybrid cotton - Non Bt. (Per Acre) -2007-08

Sl. No	Particulars	Physical unit per acre		Unit cost (Rs)		Total cost per Acre (Rs/acre)	
		Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed
1	Tractor ploughing	5hrs	5hrs	750	750	750	750
2	Tractor cultivator	2hrs	2hrs	300	300	300	300
3	Twice harrowing (by bullocks)	1 pair	1 pair	300	300	300	300
4	FYM application	6 L	4 L	50	50	300	200
5	Opening seed line (by bullocks)	0.5 pair	0.5 pair	300	300	150	150
6	Seed dibbling	5 L	5 L	50	50	250	250
7	Weedicide application (Optional)	--	--	--	--	--	--
8	Fertiliser application	5 L	5 L	50	50	250	250
9	Thinning	2 L	2 L	50	50	100	100
10	Twice intercultivation	1 pair	1 pair	300	300	300	300
11	Twice hand weeding	15 L	10 L	50	50	750	500
12	Irrigation (4-5 times)	12 L	--	50	--	600	--
13	Spraying(6-Irri, 5-rainfed)	18 L	15 L	50	50	900	750
<b>A. Total cost of cultural operations (Rs).</b>						<b>4950</b>	<b>3850</b>
1	* Kapas picking	1500	1000	Rs.2 /kg	Rs.2/kg	3000	2000
<b>B. Total cost of kapas picking (Rs)</b>						<b>3000</b>	<b>2000</b>
1	Cost of seed	0.75 kg	0.75 kg	Rs.800/kg	Rs. 800/kg	600	600
2	N: P: K(Basal + Top dress + Rec. Foliar sprays of DAP, MgSO <sub>4</sub> , planofix)	60:30:30 N : P: K (kg/ac)	32:16:16 N : P: K (kg/ac)	N-Rs. 11/kg P- Rs. 24/kg K-Rs. 8 /kg	N-Rs. 11/kg P- Rs. 24/kg K-Rs. 8 /kg	1800	1100
3	Weedicide cost (optional)	--	--	--	--	--	--
4	Additional micronutrient Foliar sprays(Optional)	--	--	--	--	--	--
5	FYM	4 tons	4 tons	Rs.300/t	Rs.300/t	1200	1200
6	PPchemicals	6 sprays	5 sprays	--	--	2150	1750
<b>C. Total cost of inputs (Rs).</b>						<b>5750</b>	<b>4650</b>
1	Grading& kapas packing in docras/ transportation to market	--	--	800	500	800	500
2	Land rent	--	--	1500	1000	1500	1000
<b>D. Total post harvest management cost (Rs)</b>						<b>2300</b>	<b>1500</b>
<b>E. Total cost of cultivation (Rs)/acre</b>						<b>16,000</b>	<b>12,000</b>

\* Varies as per the actual quantity of kapas obtained from an acre.

- **Total cost of cultivation:** Irrigated -- Rs. 16,000 per acre. ( Rs.40,000 per hectare)  
Rainfed -- Rs. 12,000 per acre. ( Rs.30,000 per hectare)
- **Gross returns:** Irrigated -- 15q/ac kapas @ Rs.2000/q = Rs.30,000/ac ( Rs.75,000/ha)  
Rainfed -- 10q/ac kapas @ Rs.2000/q = Rs.20,000/ac ( Rs. 50,000/ha)
- **Net returns:** Irrigated : (30,000 – 16,000) = Rs. 14000/ac ( Rs. 35,000/ha)  
Rainfed : ( 20,000 – 12,000) = Rs. 8000/ac ( Rs. 20,000/ha)

4.2 The details on cost of cultivation, gross and net returns of hybrid cotton- Bt are given in the following table.

Cost of cultivation of Hybrid cotton - Bt. (Per Acre) - 2007-08.

Sl. No	Particulars	Physical unit per acre		Unit cost (Rs)		Total cost per Acre (Rs/acre)	
		Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed
1	Tractor ploughing	5hrs	5hrs	750	750	750	750
2	Tractor cultivator	2hrs	2hrs	300	300	300	300
3	Twice harrowing (by bullocks)	1 pair	1 pair	300	300	300	300
4	FYM application	6 L	4 L	50	50	300	200
5	Opening seed line (by bullocks)	0.5 pair	0.5 pair	300	300	150	150
6	Seed dibbling	5 L	5 L	50	50	250	250
7	Weedicide application (Optional)	--	--	--	--	--	--
8	Fertiliser application	5 L	5 L	50	50	250	250
9	Thinning	2 L	2 L	50	50	100	100
10	Twice intercultivation	1 pair	1 pair	300	300	300	300
11	Twice hand weeding	15 L	10 L	50	50	750	500
12	Irrigation (4-5 times)	12 L	--	50	--	600	--
13	Spraying(4-Irri, 3-rainfed)	12 L	9 L	50	50	600	450
<b>A. Total cost of cultural operations (Rs).</b>						<b>4650</b>	<b>3550</b>
1	* Kapas picking	1500	1000	Rs.2 /kg	Rs.2/kg	3000	2000
<b>B. Total cost of kapas picking (Rs)</b>						<b>3000</b>	<b>2000</b>
1	Cost of seed	0.75 kg	0.75 kg	Rs1500/kg	Rs1500/kg	1125	1125
2	N: P: K(Basal + Top dress + Rec. Foliar sprays of DAP, MgSO <sub>4</sub> , planofix)	60:30:30 N : P: K (kg/ac)	32:16:16 N : P: K (kg/ac)	N-Rs. 11/kg P- Rs. 24 /kg K-Rs. 8 /kg	N-Rs. 11/kg P- Rs. 24 /kg K-Rs. 8 /kg	1800	1100
3	Weedicide cost (optional)	--	--	--	--	--	--
4	Additional micronutrient Foliar sprays(Optional)	--	--	--	--	--	--
5	FYM	4 tons	4 tons	Rs.300/t	Rs.300/t	1200	1200
6	PPchemicals	4 sprays	3 sprays	--	--	1450	1050
<b>C. Total cost of inputs (Rs).</b>						<b>5575</b>	<b>4475</b>
1	Grading& kapas packing in docras/ transportation to market	--	--	800	500	800	500
2	Land rent	--	--	1500	1000	1500	1000
<b>D. Total post harvest management cost (Rs)</b>						<b>2300</b>	<b>1500</b>
<b>E. Total cost of cultivation (Rs)/acre</b>						<b>15,525</b>	<b>11,525</b>

\* Varies as per the actual quantity of kapas obtained from an acre.

- **Total cost of cultivation:** Irrigated -- Rs. 15,525 per acre. ( Rs. 38,813 per hectare)  
Rainfed -- Rs. 11,525 per acre. ( Rs. 28,813 per hectare)
- **Gross returns:** Irrigated -- 15q/ac kapas @ Rs.2000/q = Rs.30,000/ac ( Rs.75,000/ha)  
Rainfed -- 10q/ac kapas @ Rs.2000/q = Rs.20,000/ac ( Rs. 50,000/ha)
- **Net returns:** Irrigated : (30,000 – 15,525) = Rs. 14,475/ac ( Rs. 36,188/ha)  
Rainfed : ( 20,000 – 11,525) = Rs. 8,475/ac ( Rs. 21,188/ha)

4.3 The details on cost of cultivation, gross and net returns of desi cotton are given in the following table

Cost of cultivation of desi (*Herbaceum/Arboreum*) Cotton (Per Acre) – 2007-08.

Sl.No.	Particulars	Physical unit per acre	Unit cost (Rs)	Total cost per acre (Rs)
1	Tractor cultivator *	2 hrs	300	300
2	Twice harrowing (by bullocks)	1 pair	300	300
3	FYM application	2 L	50	100
4	Opening seed line (by bullocks)	0.5 pair	300	150
5	Seed dibbling	5 L	50	250
6	Fertiliser application	2 L	50	100
7	Intercultivation	1 pair	200	200
8	Hand weeding	5 L	50	250
9	Spraying (One spray)	3 L	50	150
<b>A. Total cost of cultural operations (Rs)</b>				<b>1800</b>
1	**Kapas picking	400	Rs. 2/kg	800
<b>B. Total cost of kapas picking (Rs/acre)</b>				<b>800</b>
1	Cost of seed	2 kg	Rs. 40/kg	80
2	N : P: K (kg/acre)	16:10:10 N : P: K (kg/acre)	N-Rs. 11/kg P- Rs. 24 /kg K-Rs. 8 /kg	500
3	FYM	2 tons/ha	Rs.300/t	600
4	PPchemicals	1 spray	1 spray	250
<b>C. Total cost of inputs (Rs).</b>				<b>1430</b>
1	Grading& kapas packing in docras/ transportation to market	--	250	250
2	Land rent	--	1000	1000
<b>D. Total post harvest management cost (Rs)</b>				<b>1250</b>
<b>E. Total cost of cultivation (Rs)/acre</b>				<b>5280</b>

\* Ploughing once in 3 years

\*\* Picking cost varies as per kapas picked from the area.

**Total cost of cultivation:** Rs. 5280 per acre ( Rs. 13,200 per hectare)

**Gross returns:** 4q/acre kapas @ Rs.1700/q = Rs.6,800/acre ( Rs.17,000/ha)

**Net returns:** ( 6,800 – 5280) = Rs. 1520/acre ( Rs.3,800/ha)