

CROP PRODUCTION STRATEGIES FOR LONG STAPLE COTTON

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The increase in cotton production has been achieved through the modern technological inputs and partly through increase in acreage. The cotton growing area in the country can be broadly divided into 3 regions on the basis of agro climatic conditions and the cotton species grown.

- Northern *hirsutum – arboreum* region comprising Punjab, Haryana, North West Rajasthan and Western Uttar Pradesh
- Central *herbaceum – arboreum - hirsutum* region, comprising of Maharashtra, Madhya Pradesh, Gujarat and southern Rajasthan
- Southern *hirsutum – arboreum – herbaceum* region, comprising Tamil Nadu, Andhra Pradesh and Karnataka

India is the only country in the world where all the four cultivated species of cotton are grown on a commercial scale besides hybrids.

The long staple varieties are mainly from *hirsutum* and *barbadense* species of cotton. The extra long staple (> 35 mm) Bt hybrids are MRC-6918 and RCHB-708, while non Bt hybrids are DCH-32, Varalaxmi, Kashinath, and TCHB – 213. ELS variety is Suvin.

To meet the requirement ELS cotton can be promoted in Tamil Nadu, Karnataka, Western Maharashtra, Anand area of Gujarat and Ratlam area of Madhya Pradesh.

Cotton production strategies

Soils

Growing of cotton on shallow soils is one of the major constraints in improving the crop productivity. Cotton being a deep rooted crop it should be necessarily grown on soils having more than 60 cm depth.

Cotton species and different varieties within species show wide variability for adaptability to various soil types. In places, where annual rainfall is < 50 cm / year, fine textured – soil (loam – clay loam) are more productive because of their ability to store water in the profile. Wherever rainfall exceeds 76 cm / year, however, a coarse – textured soil will provide better internal drainage and hence higher productivity.



Sowing time

Sowing of cotton during optimum time period is very important in cotton from increasing productivity point of view. It has been observed that with delay of even one day in sowing beyond the optimum time, it leads to reduce the yield of seed cotton @ 25 kg / ha.

The sowing season begins with the onset of monsoon in June in the assured rainfall areas of Karnataka (Dharwad, Belgaum, Chitradurga district), June / July in the red soil region of Krishna – Godavari zone of coastal Andhra and August / September in the dry central tracts of Andhra. In the black soil areas of Tamil Nadu, September / October is the most optimum time for sowing.

Plant population and geometry

The plant population and geometry varies with plant type and soil depth. Results have shown cotton yields to be uninfluenced over a range of population density 48, 300 – 1,11,000 plants / ha. This is due to the plasticity of cotton plant to adopt itself to various spacing. Present day cultivars are grown with wide row spacing and narrow plant to plant distance as this system is found suitable for mechanical harvesting.

Planting method

Square planting is the most common practice as it facilitates in better weed control. In this case dibbling is done at the intersection points. Rainfed cotton usually suffers from moisture stress during boll development stage. This moisture stress can be overcome by early sowing. Studies have indicated crow bar method of planting and transplanting of seedlings raised in polybags to give significantly higher yields than the normal sowing with onset of monsoon.

Nutrient Management

Most of the cotton growing soils are deficient in N and low in P. Sulphur is the other important nutrient which is reported to be deficient. Deficiency symptoms of the micronutrients such as Zinc and Boron have also surfaced up in intensive cropping zones. Balanced fertilization of cotton is recommended for achieving high yields. A summary of the recommended fertilizer schedules is given in Table 1. Long term studies have indicated the importance of balanced fertilization and have underlined the necessity of applying FYM to a crop. Recycling of organic residues and *in situ* green manuring help to stabilize yield levels, particularly in marginal soils.



Table-1 : Fertilizer (NPK Kg/ha) recommendation for cotton in different zones

Cotton genotypes	Northern cotton zone	Central cotton zone	Southern cotton zone
Varieties			
Rainfed	--	50 – 25 - 25	60 – 30 - 30
Irrigated	100 – 50 – 50	100 – 50 – 50	90 – 45 – 45
Hybrids			
Rainfed	--	90 – 45 - 45	100 – 50 - 50
Irrigated	150 – 60 – 60	120 – 60 – 60	150 – 60 – 60
Method of fertilizer application	Half N at thinning and remaining at first flowering P and K to be drilled at sowing	N applied in 3 splits, 50 % at sowing, 25 % at square formation, 25 % at peak flowering. P and K at sowing	N at squaring and peak flowering. P and K at sowing. In Karnataka entire NPK at planting (rainfed cotton). Half N and entire P and K at planting remaining N at flowering (irrigated cotton) N in four splits in irrigated hybrids

Studies on nutrient management indicated that:

- Seed cotton yield significantly increased when grown in cotton – soybean / short legumes crop rotations as compared to continuous cotton after cotton.
- Integrated nutrient management with application of recommended dose of fertilizers (RDF) with 50 % N through organics and 50 % through inorganic fertilizers and the biofertilizers recorded significantly higher productivity (30-35 % more) as well as improved fibre properties.
- Application of RDF with 20 kg ZnSO₄ / ha as well as foliar spray of B @ 0.5 % (the limiting nutrient) significantly increased the seed cotton yield (20 %).
- Similarly significant response to foliar application of potassium @ 1 % KCl at boll formation was noted and it increased seed cotton yield by 18%.
- Significant response has been recorded for two foliar application of 2 % urea alternated with 2 % DAP sprays at 8-10 days interval during flowering to boll development stages.
- Site specific nutrient management approach was found better and increased 20 to 30 % seed cotton yield and 4 % fibre length than existing recommended practice of fertilizer application at Nagpur and Coimbatore

Water management

The water requirement of cotton varies from 50 to 65 cm depending on the soil moisture availability and evaporative demands.



Under rainfed farming,

- Dry seeding just before the onset of monsoon i.e. mostly between 10-15 June avoid the risk of soil water stress during boll development stage and improves the seed cotton yield by 20-30% in central cotton zone.
- The *in situ* rain water conservation practices such as opening furrows in alternate cotton row increased seed cotton yield by 17 to 20 %.
- Highest water use efficiency was recorded under cotton – soybean intercropping.
- Rain water harvesting in a field pond helps to irrigate about 30% donor area.
- Application of one irrigation at early boll development stage increases yield by 30-35 % and recorded the highest irrigation water use efficiency.

Under irrigated condition –

- Irrigation scheduling at 0.8 IW/CPE ratio recorded the highest seed cotton yield (25 % increase).
- Under limited irrigation supply two irrigations at flowering and boll formation stages are recommended for optimum productivity.
- Irrigation with drip method at 0.8 ETc and fertilizer application through fertigation recorded significantly higher productivity over furrow irrigation and also improved span length and fibre strength in northern and southern zones.

Weed management

In the northern cotton – wheat regions, the major weeds are *Trianthema sp.*, *Echinochloa sp.*, *Digera arrensis* and *Cyperus sp.* while in southern zone the predominant weeds are *Trianthema portulacstrum* and *Cynadon dactylon*. In Central region, *Celosia argentea*, *Cyanotis axillaris*, *Digitaria Sanguinalis*, *Dinebra retriflexa*, *Euphorbia sp.*, *Echinochloa Sp.*, *Ipomea* and *Cyprus sp.* are commonly found.

Hand weeding and intercultural operations are the predominant methods of weed control. Cotton needs to be maintained free from weed critically during the first nine weeks from sowing. Use of pre emergence herbicides will take care of weeds during first two months. Weed control during the later stages can be done by hand weeding or intercultural operations. Pre – emergence herbicides recommended for effective weed control are *Pendimethalin*, *Fluchoralin* and *Trifluralin* @ 1 kg to 1.25 kg a.i./ha. This group of dinitroaniline herbicides offer very good control against grassy weeds. Against broad leaved weeds, Diuron is effective. Since its range is selective, a post emergence directed spray method has to be followed.

Scientific crop production practices with integrated nutrient and water management approaches shall help in realization of higher yields with assured productivity, even under adverse situations.

