

Indian cotton presents a complex case study — ‘on the surface -all is well’ but yields are low. Cotton is grown in three distinctly different agro-ecological zones each with its own soil types and weather. India grows all four of the cultivable cotton species. It has the largest acreage under cotton, which is grown in 11 to 12 million hectares by 8 to 10 million farmers in small holdings of 1 to 2 hectares mostly.

India is unique also because it is the only country in the world that has chosen to grow hybrid cotton, which now occupies 90% to 94% of the planted area. India has mechanised farms and irrigated farms. India probably has the largest cotton research network and also the largest number of cotton scientists in the world.

Nonetheless, cotton yields remain low and have been stagnant for at least 15 years. India’s 15-year average yield of 511 Kg/ha is 44% lower than the global average and the country ranks 37th in yields — below least-developed countries such as Myanmar, Ethiopia and Bangladesh but also below a few rainfed and resource-poor African nations such as Cameroon and Cote D’Ivoire. That’s in spite of the fact that India:

- Is essentially saturated with cotton hybrid technology and double-gene-*Bt*-cotton,
- Has high fertiliser use and ready access to pesticides,
- Cultivates 4.2 million hectares of irrigated cotton, and
- Utilises mechanisation and other technologies.

There are several African countries that don’t to have those advantages yet are ahead of India in yields. It is therefore a mystery why cotton yields are low in India. Some experts argue that the low yields are because of the large area (8.0 million hectares) that is rainfed. Others argue that it’s due to the vast number of resource-poor small holder farms. Some even go so far as to argue that the weather, climate, monsoon and soils are unsuitable for cotton in a majority of the regions in the country. Unfortunately, none of these arguments appear valid. As mentioned above, Cameroon and Cote D’Ivoire are completely rainfed and use almost negligible quantities of fertilisers and pesticides, and have no access to hybrids or *Bt*-cotton, but post better yields than India. The average land holding size in China is half that of India but the cotton yields are three times higher.

India receives very good rainfall, from 800mm up to 1200 mm, in rainfed regions during the cotton growing season. Sadly, the 15-year average yields in the fully irrigated 1.5 million hectares of northern India are also low at 567 Kg/ha, which is 37% lower than the world average (of which, only 45% of cotton irrigated). The weather and climate in India are ideally suited for cotton production, which is why it has been grown in the sub-continent over thousands of years. So, what is wrong with Indian cotton? Why are the yields so low? A correct diagnosis is critical to tearing down the yield barriers because if the diagnosis is right, solutions are possible — but if the diagnosis is wrong there can be no solution.

Theoretically, Indian yields should be very high, but they are not.

- Cotton plants need good sunshine, warm conditions and water — especially during the boll formation stage for good yields — and India has all these conditions in abundance.
- The country has access to all technologies that are available to the cotton sector elsewhere in the world.
- Commendable scientific progress has been made by 200+ cotton scientists over the past 50 to 60 years and many excellent varieties and hybrids were developed in India. Government policies are farmer-oriented and protect growers from risk and uncertainty.

But the lint yields remain stubbornly low. If everything is so ideal for cotton cultivation what could be going wrong? We certainly can’t change the weather to suit cotton, but we can change the cotton agronomy to suit the weather, and we can ensure that the crop water requirements match the monsoon pattern.

For example, a critical analysis shows that India opted for a long-duration crop (>180 days) that, unfortunately, suffers from extreme thirst when it needs water the most — during boll formation. In other words, India implemented a long-season system that render plants vulnerable to drought and insects. That needs to change. In Australia, Brazil, China, Mexico, Turkey and USA, the cotton season rarely extends beyond 160-170 days and cotton agronomy is designed to match monsoon patterns in rainfed regions. Yields in these countries are 2-5 times higher than in India. Could a reductionist approach help to unravel the mystery of low yields in India and explain why some countries achieve 3 to 5 times higher yields than India using the same level or even fewer inputs?

This edition of the Recorder is an attempt to do exactly that. India’s complexity manifests in its long-term trends and the diversity of agronomic practices in its eleven cotton-growing states. This special issue on Indian cotton will walk you through the production trends used in each of India’s 11 cotton-growing states to enable readers to conduct their own independent analysis and diagnosis. Though the article sounds prescriptive in its terminal part, my intention was only to balance the narrative so that the reader wouldn’t blame me for having pointed out the failings without attempting to guide towards possible solutions.

- Keshav Kranthi