



Cotton Production in India

For Prelims: [Cotton](#), Bt (Bacillus thuringiensis) technology, [Pink bollworm](#), [Genetically-modified crops](#), PBKnot, SPLAT-PBW,

For Mains: Significance of Cotton for India, Reason Associated with Subsequent Decline in Cotton Production in India.

[Source: IE](#)

Why in News?

[Cotton](#) is a versatile crop that provides **food, feed, and fiber for various uses, including textiles, cooking oil, and livestock feed**. It is also a major source of income and employment for millions of farmers in India.

- However, in recent years, [cotton production](#) and yields have **declined significantly**, posing a challenge for the country's agriculture and textile sectors.

What is the Significance of Cotton for India?

- **About:**
 - Cotton is one of the most important [commercial crops](#) cultivated in India and accounts for around **25% of the total global cotton production**.
 - Due to its economic importance in India, it is also termed as **"White-Gold"**.
 - In India, around **67% of India's cotton is grown on rain-fed areas** and 33% on irrigated areas.
- **Growing Conditions:**
 - Cotton cultivation necessitates a hot, and sunny climate with a **long frost-free period**. It is most **productive in warm and humid climatic conditions**.
 - Cotton can be successfully grown in a range of soil types, including **well-drained deep alluvial soils in northern regions, variable-depth black clayey soils** in the central region, and **mixed black and red soils in the southern zone**.
 - While cotton exhibits some tolerance to salinity, it is highly sensitive to waterlogging, emphasizing the **importance of well-drained soils in cotton farming**.
- **Species of Cultivated Cotton:**
 - India is the country to grow all four species of cultivated cotton ***Gossypium arboreum* and *Herbaceum* (Asian cotton), *G. barbadense* (Egyptian cotton) and *G. hirsutum* (American Upland cotton)**.
 - Majority of the cotton production comes from ten major cotton growing states, which are grouped into three diverse **agro-ecological zones**, as under:
 - **Northern Zone:** Punjab, Haryana and Rajasthan
 - **Central Zone:** Gujarat, Maharashtra and Madhya Pradesh
 - **Southern Zone:** Telangana, Andhra Pradesh, Karnataka and Tamil Nadu

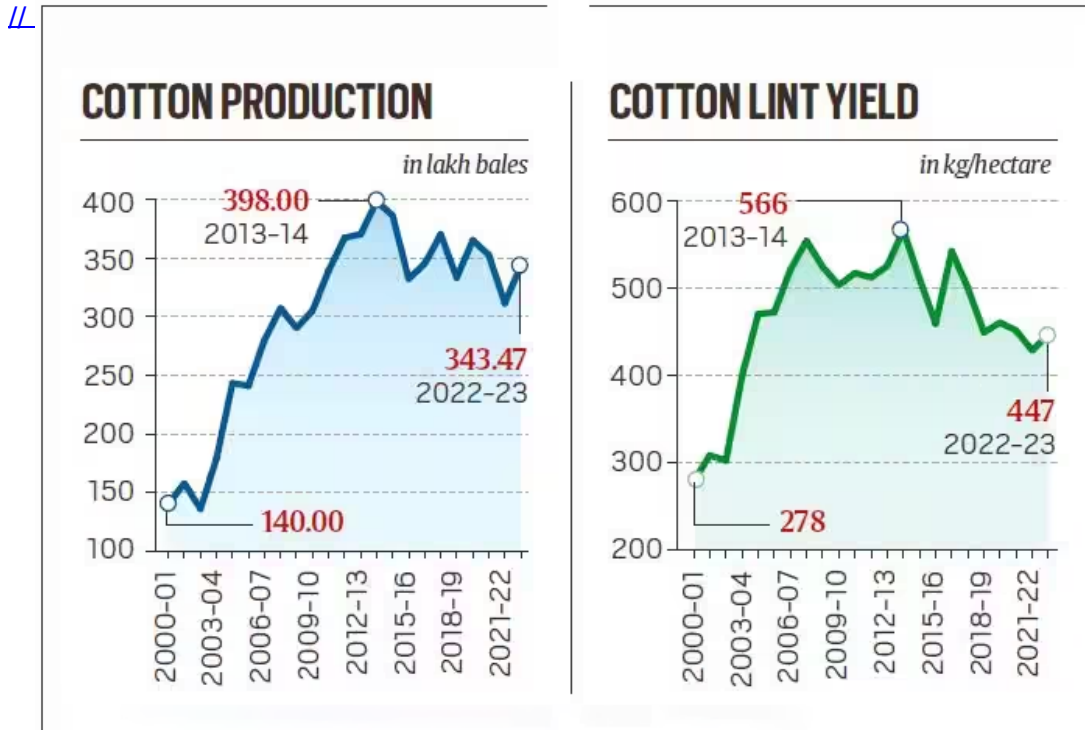
▪ Significance:

- Cotton, often likened to coconut, serves as a source of three essential components:
 - **Fiber:** The **white fluffy fiber or lint**, constituting about 36% of the raw unginned cotton, is the **primary source for the textile industry**. The rest is seed (62%) and wastes (2%) separated from the lint during ginning.
 - Cotton commands a **two-thirds share in India's total textile fiber consumption**.
 - **Food:** Cottonseed contains **13% oil**, which is commonly used for cooking and frying.
 - Cottonseed cake/meal is **India's second-largest feed cake**, following soybean.
 - **Feed:** The **leftover cottonseed cake**, comprising **85% of the seed**, is a valuable, protein-rich feed ingredient for livestock and poultry.
 - Cottonseed oil ranks as the **country's third-largest domestically-produced vegetable oil**, following mustard and soybean.

What led to Rapid Increase and Subsequent Decline in Cotton Production in India?

▪ Surge:

- Between 2000-01 and 2013-14, India witnessed a remarkable surge in cotton production, primarily attributed to **Bt (*Bacillus thuringiensis*) technology**. Key developments include:
 - Adoption of **genetically-modified (GM) cotton hybrids with Bt genes**, designed to **combat the American bollworm insect pest**.
 - It led to a surge in lint yields from **278 kg per hectare in 2000-01 to 566 kg per hectare in 2013-14**.
 - A corresponding increase in cottonseed oil and cake production.
 - However, the gains achieved through **Bt technology were short-lived**. **Post-2013-14**, cotton production and yields began to decline.



▪ Decline:

- The primary factor responsible for decline was the **emergence of the pink bollworm (*Pectinophora gossypiella*)**.

- When pink bollworm(PBW) larvae invade cotton bolls, it causes **cotton plants to produce less cotton** and the **cotton produced is of lower quality**.
- Unlike the polyphagous American bollworm, **PBW is monophagous**, feeding mainly on cotton, which contributed to the **development of resistance against Bt proteins**.
 - Continuous cultivation of **Bt hybrids led to PBW populations developing resistance**, replacing susceptible ones.
- In 2014, **Gujarat experienced an unusual surge in PBW larvae survival on cotton flowers 60-70 days after planting**. In 2015, **Andhra Pradesh, Telangana, and Maharashtra** also reported PBW infestations.
 - In 2021, even Punjab, Haryana and northern Rajasthan saw heavy infestation of the pest for the first time.

Note: Monophagous means an organism that primarily feeds on a single specific type of food or host.

▪ **Current Methods Employed to Manage the PBW Pest:**

- Traditional insecticides had limited success in controlling PBW larvae. Instead, a different method called "**mating disruption**" has been used.
 - It entails the use of **Gossyplure, a pheromone signaling chemical** that is secreted by female PBW moths to attract male adults. In this case, the pheromone is artificially synthesised and filled into pipes or lures.
 - This method hinders **male moths from locating females** and engaging in mating, thereby causing disruption in their reproductive cycle.
- There are two approved products for mating disruptions:
 - **PBKnot**, which uses ropes with these chemicals on cotton plants to **reduce infestation** and boost yields.
 - **SPLAT-PBW**, which is a **special emulsion** that disrupts PBW mating with synthetic chemicals.

What are the Other Issues Associated with the Cotton Sector in India?

- **Yield Fluctuations:** Cotton production in India can be quite unpredictable due to several factors.
 - Limited access to [irrigation systems](#), **declining soil fertility**, and [erratic weather patterns](#), including unexpected droughts or excessive rainfall, contribute to the uncertainty surrounding cotton yields.
- **Smallholder Dominance:** The majority of cotton farming in India is **carried out by small-scale farmers**.
 - These farmers **often rely on traditional agricultural practices** and have limited access to modern farming technologies, which in turn affects overall cotton production.
- **Limited Market Access:** A significant number of cotton growers in India face constraints in reaching markets and are **compelled to sell their [harvest](#) at reduced rates to intermediaries**.

Way Forward

- **Integrated Pest Management:** There is a need to advocate for [integrated pest management \(IPM\) strategies](#) that combine **natural controls, trap crops, and beneficial insects** to reduce pesticide dependency while effectively managing pests.
- **Community-Based Seed Banks:** Establishing seed banks at the community level to **conserve and share traditional cotton seed varieties**, preserving genetic diversity and promoting higher-yielding strains.
- **Market Linkage Platforms:** Establishing digital platforms that **directly connect cotton farmers with buyers and textile manufacturers**, reducing middlemen involvement and ensuring fair pricing.
- **Value Addition Through Local Processing:** Promoting **value addition by establishing local cotton processing units** that **can gin, clean, and process cotton fiber**, creating employment opportunities and adding value to the cotton supply chain.

UPSC Civil Services Examination Previous Year Question (PYQ)

Prelims

Q1. The black cotton soil of India has been formed due to the weathering of (2021)

- (a) brown forest soil
- (b) fissure volcanic rock
- (c) granite and schist
- (d) shale and limestone

Ans: (b)

Q2. A state in India has the following characteristics: (2011)

1. Its northern part is arid and semi-arid.
2. Its central part produces cotton.
3. Cultivation of cash crops is predominant over food crops.

Which one of the following states has all of the above characteristics?

- (a) Andhra Pradesh
- (b) Gujarat
- (c) Karnataka
- (d) Tamil Nadu

Ans: (b)

Mains

Q. Analyze the factors for the highly decentralized cotton textile industry in India.

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