



P.L.RAJ IAS & IPS ACADEMY

Building Bureaucrats Since 2006

3. India's Cotton Mission – Economy

In 2026, the Union Cabinet approved the Mission for Cotton Productivity with an outlay of Rs 5,659 crore, to run from 2026–27 to 2030–31.

1. The mission aims to raise lint productivity from 441 kg per hectare (in triennium ending 2025–26) to 755 kg/ha by 2031, a 71% increase.
2. Experts argue that India's Cotton Productivity Mission may struggle to achieve targets unless next-generation genetic technologies and science-led reforms are adopted alongside traditional approaches.

1.Bt Cotton Introduction and Impact

Historical Context

1. In 2002, the government approved commercial cultivation of Bt cotton as cleared by the Genetic Engineering Appraisal Committee (GEAC), marking India's entry into GM crops.
2. The first Bt hybrids incorporating the cry1Ac gene were approved to resist the bollworm complex, a major pest causing substantial crop losses.
3. By 2006, GEAC had approved Bollgard II, a second-generation hybrid with two stacked genes providing more comprehensive pest resistance.

Technology and Mechanism

1. Bt cotton has two alien genes from soil bacterium *Bacillus thuringiensis* (Bt) that allows the crop to develop a protein toxic to the common pest pink bollworm.
2. Till now, it is the only Genetically Modified (GM) crop legally allowed in India despite research into other GM varieties.

Production Revolution

1. Cotton production rose from 13.6 million bales in 2002–03 to 39.8 million bales in 2013–14, a 193% increase demonstrating Bt cotton's transformative impact.
2. Annual output grew at 10%, and area expanded by 56%, from 7.6 million hectares to 11.9 mha reflecting both productivity and acreage gains.
3. India became the largest producer and second-largest exporter of cotton establishing global prominence in cotton trade.

Further Hybrid Development

1. After Bollgard II, India developed next-generation variants – Bollgard II with Roundup Ready Flex, and Bollgard III incorporating three stacked genes.
2. These variants incorporated herbicide-tolerant traits designed to address evolving pest resistance and rising weed-management costs.
3. However, these advanced hybrids were never released for commercial cultivation due to regulatory uncertainties and policy concerns.

2. Decline in Cotton Production Since 2014–15

Production Trend

1. Since 2014–15, production has declined at an average annual rate of 2% reversing the growth momentum of the Bt cotton era.

2. India shifted from being a major net cotton exporter to importing 4 million bales in 2025-26, a significant change in trade status.
3. This reversal threatens India's global cotton market position and farmer incomes.

Reasons for Decline

Regulatory Hurdles for GM Technology

1. New-generation cotton technologies were not commercialized due to regulatory uncertainties and delays in GEAC approvals preventing technology upgrades.
2. Bureaucratic delays prevented farmers from accessing advanced disease and pest-resistant varieties.

Price Controls on Cotton Seeds

1. Government-imposed seed price caps and reduction of trait fees reduced incentives for private-sector R&D and innovation.
2. Price controls discourage companies from investing in expensive research creating new varieties.

Declining Productivity

1. Cotton yields have stagnated due to pest resistance to Bt toxins developing over time, climate stress from irregular rainfall patterns, and lack of access to advanced technologies.
2. Pest resistance particularly to pink bollworm reduces Bt cotton effectiveness requiring alternative management strategies.

Increasing Imports

1. India has shifted from being a major exporter to importing cotton because domestic production growth has slowed.
2. Import dependence exposes India to global price volatility and supply chain disruptions.

3.Way Forward

1. **Develop Climate-Resilient Varieties** – Invest in research for drought-tolerant, pest-resistant, and high-yielding cotton varieties suited to changing climatic conditions in different agroecological zones.
2. **Strengthen Public-Private R&D Partnerships** – Encourage collaboration between research institutions, universities, and private sector to accelerate development and dissemination of advanced technologies.
3. **Reform Regulatory Framework** – Streamline GEAC processes and develop clear policies enabling faster commercialization of improved varieties while maintaining safety standards.
4. **Enhance Seed Quality and Availability** – Ensure timely access to certified high-quality seeds through robust seed production and distribution systems addressing farmer access issues.
5. **Improve Cotton Value Chains** – Modernize ginning, processing, storage, and marketing infrastructure enhancing cotton quality and global competitiveness.
6. **Implement Cotton Productivity Mission Effectively** – Focus on outcome-based implementation with regular monitoring and convergence with existing agricultural schemes ensuring productivity and income gains.

Source – <https://indianexpress.com/article/opinion/columns/in-cotton-fields-policy-is-undoing-what-science-built-thats-the-challenge-for-the-cotton-productivity-mission-10728759/>