



Transgenic Crops

For Prelims: Transgenic Crops, [GEAC](#), [Genetically Modified Crops](#), Environment (Protection) Act, 1986, Bt Cotton.

For Mains: Transgenic Crops.

Why in News?

Recently, Gujarat, Maharashtra and Telangana, have deferred a proposal, approved by the **Centre's Genetic Engineering Appraisal Committee (GEAC)**, to test a new kind of Transgenic Cotton Seed that contains a gene, Cry2Ai.

- Gene Cry2Ai purportedly makes cotton **resistant to pink bollworm**, a major pest. The conflict shows that a **broad acceptance of genetically modified crops** continues to be elusive.

Note: Agriculture being a State subject means that, in most cases, companies interested in testing their seeds need **approvals from the States for conducting such tests**. Only Haryana gave permission for such tests.

- Telangana requested an extension to **consider the proposal and later responded that trials would not be allowed in the current cropping season**. Gujarat, on the other hand, simply stated that the proposal was unacceptable without furnishing reasons.

What are Transgenic Crops?

- **About:**
 - Transgenic crops are plants that have been modified through genetic engineering techniques. These crops have had **specific genes inserted into their DNA** to give them new characteristics or traits that are not naturally found in the species through traditional breeding methods.
- **GMO vs Transgenic Organisms:**
 - Genetically Modified Organism (GMO) and transgenic organism are two terms that are used interchangeably.
 - However, there is a **slight difference** between GMO and transgenic organism. Although both have altered genomes, a transgenic organism is a **GMO containing a DNA sequence or a gene from a different species**. While a GMO is an animal, plant, or microbe **whose DNA has been altered** using genetic engineering techniques.
 - Thus, all transgenic organisms are GMOs, but not all GMOs are transgenic.
- **Status in India:**
 - In India, only [Cotton](#) is **currently commercially cultivated as a GM crop**. Trials are underway for other crops like brinjal, tomato, maize, and chickpea using transgenic

- technology.
- The GEAC approved the **environmental release of [GM mustard hybrid DMH-11](#), bringing it closer to full commercial cultivation.**
 - However, there is an ongoing legal case in the **Supreme Court** questioning the permission for transgenic food crops. They seek a **stay on GM mustard, citing concerns about farmers using banned herbicides.**
 - Previous instances include the GEAC's approval of GM mustard in 2017 with additional tests and the government's indefinite moratorium on GM brinjal in 2010.

How Are Genetic Modified Crops Regulated in India?

- **Regulation:** In India, the regulation of all activities related to GMOs and products are **regulated by the Union Ministry of Environment, Forest and Climate Change (MoEFCC)** under the provisions of the **[Environment \(Protection\) Act, 1986](#).**
 - **[Genetic Engineering Appraisal Committee \(GEAC\)](#)** under MoEFCC is authorised to review, monitor and approve all activities including import, export, transport, manufacture, use or sale of GMO.
 - GEAC recently approved commercial cultivation of **[genetically modified mustard](#).**
 - GM foods are also subjected to regulations by the **[Food Safety and Standards Authority of India \(FSSAI\)](#)** under the Food Safety and Standards Act, 2006.
- **Acts and Rules that Regulate GM Crops in India:**
 - Environment Protection Act, 1986 (EPA),
 - Biological Diversity Act, 2002,
 - Plant Quarantine Order, 2003,
 - GM policy under Foreign Trade Policy, Food Safety and Standards Act, 2006,
 - Drugs and Cosmetics Rule (8th Amendment), 1988.

What is the Process of Regulating Transgenic Crops in India?

- Developing transgenic crops involves **inserting transgenic genes into plants to achieve a sustained, protective response**
- The process involves a mix of science and chance.
- **Safety assessments by committees are conducted** before open field tests.
- Open field tests are done at agricultural universities or **[Indian Council for Agricultural Research \(ICAR\)](#)**-controlled plots.
- Transgenic plants **must be better than non-GM variants and environmentally safe** for commercial clearance.
- **Open field trials assess suitability** across multiple seasons and geographical conditions.

What is the Significance of Genetic Modification (GM) Technique?

- **Safer and Affordable Vaccines:** The GM has revolutionized the **pharmaceutical sector by enabling the production of safer** and more affordable vaccines and therapeutics. It has facilitated the **mass production of drugs like human insulin**, vaccines, and growth hormones, making life-saving pharmaceuticals more accessible.
- **Control Weeds:** GM technology has also played a crucial role in **developing herbicide-tolerant crops. Crops like soybean, maize, cotton**, and canola have been genetically modified to withstand specific broad-spectrum herbicides, allowing farmers to effectively control weeds while preserving the cultivated crop.
- **Ensuring Food Security:** GM crops are being developed to adapt to **changing environmental conditions**. Researchers are working on strains of rice, maize, and wheat that can tolerate longer droughts and wetter monsoon seasons, ensuring food security in challenging climates.
- **Solution for Growing Crops in Salty Oils.** GM has also been **used to create salt-tolerant plants, offering** a potential solution for growing crops in salty soils. By inserting genes that remove **sodium ions from water and maintain cell balance**, plants can thrive in high-salt environments.

What are the Concerns related to Transgenic Crops?

- **Lack Nutritional Value:** GM foods can sometimes **lack nutritional value despite their increased production** and pest resistance focus. This is because the emphasis is often placed on enhancing certain traits rather than nutritional content.
- **Risks to Ecosystems:** GM production can also **pose risks to ecosystems and biodiversity**. It may disrupt gene flow and harm indigenous varieties, leading to a loss of diversity in the long run.
- **Trigger Allergic Reactions:** Genetically modified foods have the potential to **trigger allergic reactions** since they are biologically altered. This can be **problematic for individuals accustomed** to conventional varieties.
- **Endangered Animals:** Wildlife is also at risk due to GM crops. For instance, genetically modified plants used for producing plastic or pharmaceuticals can **endanger animals like mice or deer** that consume crop debris left in fields after harvest.

Way Forward

- In the face of new advances, the **regulatory regime needs to be strengthened**, for the sake of domestic as well as export consumers.
- **Technology approvals must be streamlined** and science-based decisions implemented.
- Rigorous monitoring is needed to ensure that **safety protocols are followed strictly**, and enforcement must be taken seriously to prevent the spread of illegal GM crops.

UPSC Civil Services Examination Previous Year Question (PYQ)

Prelims

Q1. Other than resistance to pests, what are the prospects for which genetically engineered plants have been created? (2012)

1. To enable them to withstand drought
2. To increase the nutritive value of the produce
3. To enable them to grow and do photosynthesis in spaceships and space stations
4. To increase their shelf life

Select the correct answer using the codes given below:

- (a) 1 and 2 only
- (b) 3 and 4 only
- (c) 1, 2 and 4 only
- (d) 1, 2, 3 and 4

Ans: (c)

Q2. Bollgard I and Bollgard II technologies are mentioned in the context of (2021)

- (a) clonal propagation of crop plants
- (b) developing genetically modified crop plants
- (c) production of plant growth substances
- (d) production of biofertilizers

Ans: (b)

Mains

Q. How can biotechnology help to improve the living standards of farmers? (2019)

[Source: TH](#)

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