Challenges of GMO

Why in news?

Hybrid Bt cotton, the only commercialised Genetically Modified crop in India has shown evidence of impact on human and animal health.

Genetically Modified Crops

• **GMO**- A genetically modified organism (GMO) is any living organism whose genetic material has been modified to include certain desirable techniques.
• **GM crops**- In crops, genetic modification involves the manipulation of DNA instead of using controlled pollination (conventional method to improve crops) to alter certain characteristics of the crop.
• **Examples**- Soyabean, maize, cotton, and canola with herbicide tolerance and insect resistance are the most widely grown GM crops around the world.

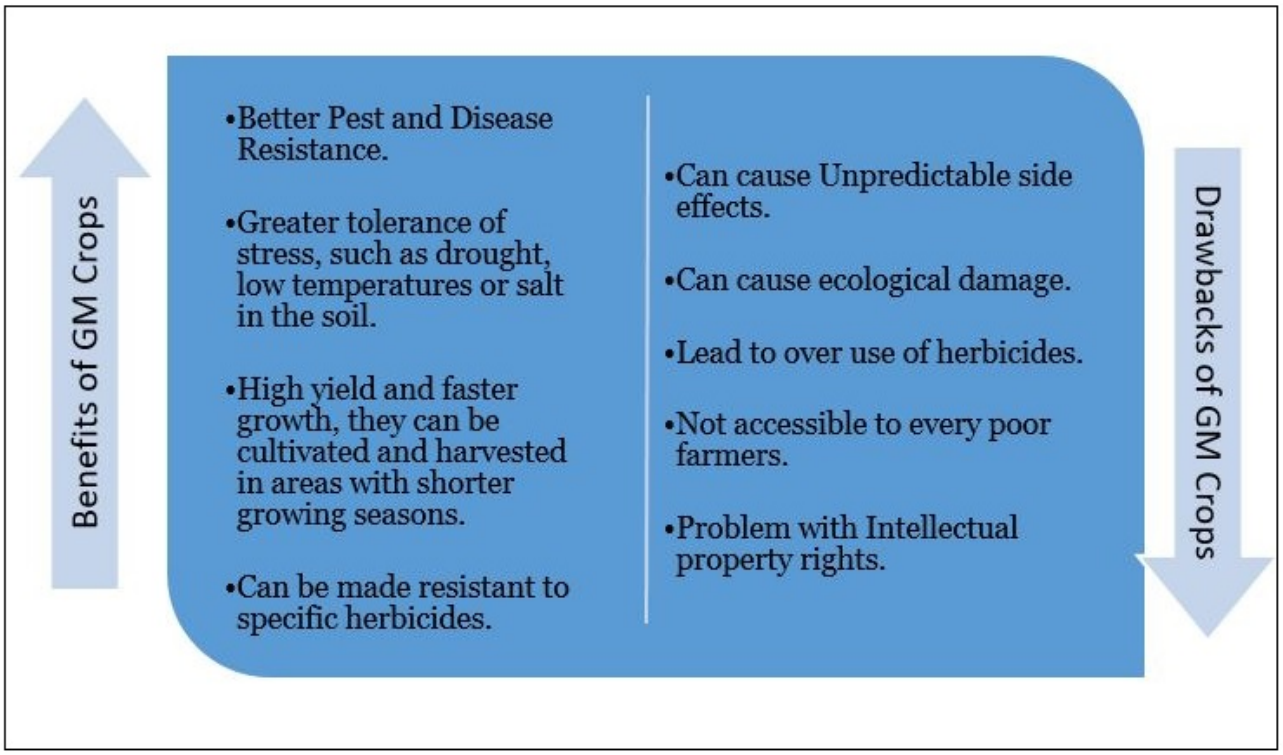
GM crops in India

GM crop	About
Bt Cotton	It was introduced in 2002 and remains the *only GM crop* that is allowed in India.
Ht Bt cotton	It is the Herbicide Tolerant Bt cotton, it has unapproved genes hence *not permitted in India*.
DMH-11 mustard	It is the *first GM food crop* that India has permitted for commercial release, it confers tolerance to *glufosinate ammonium*, a herbicide that kills weeds.
Bt Brinjal	Genetic Engineering Commercial Appraisal (GEAC) recommended for its commercial release but it was blocked in 2010.

• **Characteristics-** Herbicide resistant, insect resistant, virus resistance, drought resistance and fruit and tuber quality.
• **Procedure**-To genetically modify a crop, the gene of interest is identified and isolated from the host organism, it is then incorporated into the DNA of the crop to be grown.

What are the challenges present in GM crops?

- **Unnatural-** GMOs does not use traditional breeding and selection, they may produce unintended effects as the impacts are not immediately visible.



- **Against Rules of 1989**- It describes GMOs as hazardous.

Rules of 1989 is the Rules for the Manufacture/Use/Import/Export and Storage of Hazardous Microorganisms/ Genetically Engineered Organisms or Cells, 1989" under the Environment (Protection) Act, 1986

- **Environmental contamination**- It is caused by cross-transfer of pollen by bees to wild or other domestic crop varieties.
- **Impact on biological diversity-** India is one of the 17 listed international hotspots of diversity which includes mustard, brinjal and rice, with commercialised GM crop contamination is unavoidable.

Convention on Biological Diversity underscores the need to consider the impacts on biological diversity, and this concern is particularly relevant for India as a signatory.

Concerns of Bt Cotton

- **Value capture mechanism**- It prevents farmers from saving seeds and increases their costs of buying seeds and paying royalties to the developers.
- **High cost**- There was also a phenomenal three-fold increase in labour costs in hybrid cotton cultivation, there are adverse effects on farmer revenues leading to increased distress and suicides among farming community.
- **Ecological impact**- It requires more water, fertiliser, and insecticide, and is vulnerable to pests and diseases.
- **Low yield**- It also has a long season and low density that reduces yield potential and increases pest pressure.
- **Monopoly-** Bt Cotton seeds have become unaffordable to farmers due to high royalties charged by Monsanto company which has a near monopoly on Bt cotton seeds which led to market failure.
- **Hinders research**- It has hindered the development of non-GM high-density short-season varieties that could perform better in rainfed conditions.
- **Ineffective-** Hybrid Bt cotton has lost its effectiveness against the pink bollworm, the main target pest leading to increased usage, induced secondary pests and crop failure.
- **Introduction of other GM crops**- The regulators have ignored the failure of hybrid Bt cotton and tried to introduce other GM crops, such as hybrid Bt brinjal and hybrid HT mustard, which pose similar risks to the environment, health, and biodiversity.

Concerns with Bt Brinjal

- **Toxicity**- Bt Brinjal contains a toxic gene from a soil bacterium, which has been confirmed by several experts.
- **Regulatory issues-** GEAC and the developer did not follow the proper safety protocols and transparency norms, as ordered by the Supreme Court in 2007.
- **Lack of surveillance**-Bt brinjal was the first GM vegetable food crop in the world to be approved for commercialisation, without adequate oversight and scrutiny by the international scientific community.
- **Outdated studies mechanism**- Bt Brinjal was found to have serious flaws and

deficiencies in its safety studies, testing methods and environmental risk assessment.
- **Narrow scope of risk assessment**- Bt Brinjal has a narrow scope set by GEAC, leading to an inadequate evaluation of potential environmental risks.

India is the centre of the world's biological diversity in brinjal, with over 2,500 varieties grown in the country and as many as 29 wild species.

Concerns with DMH-11 Mustard

- **Unproven yield enhancement**- Both HT and Bt crops account for most of the GM crops planted worldwide, but neither has a trait for yield enhancement.
- **Lack of transparency**-The details of DMH-11 mustard has not been made public, raising concerns about transparency and compliance with Supreme Court orders.
- **Invalid field trials-** The field trials for non-GMO mustard were not conducted in accordance with norms, and DMH 11 was out-yielded by non-GMO varieties and hybrids by more than the specified norm of 10%.
- **Harmful chemical**- Gulfosinate ammonium is a harmful chemical that causes birth defects, damages plants and aquatic life and contaminates water and food.

Glufosinote ammonium is not permitted in crop plants in India under the Insecticides Act, 1968.

- **Non-selective herbicide**- It affects the whole plant, kills all kinds of plants, and does not discriminate between weeds and crops which also induces resistance in weeds, making them harder to control.
- **Impact on Non-GMO Mustard-** Introduction of GM HT mustard could contaminate non-GMO mustard varieties, impacting Indian mustard agriculture, which is predominantly non-GMO.

As per National Bureau of Plant Genetic Resources India is a secondary centre of origin of rape-seed mustard with over 9,000 accessions in our gene bank.

- **Experts recommendation**- The Technical Expert Committee (TEC) recommends a double bar on GM Mustard, citing its status as an HT crop and its presence in a center of mustard diversification and/or origin.

References

1. Wire- GMOs destroy Indian agriculture
2. Down To Earth- GM Mustard case starts afresh in Supreme court

SHANKAR
IAS PARLIAMENT
Information is Empowering