



Analysing the concerns and likely impact of adopting GM crops in India

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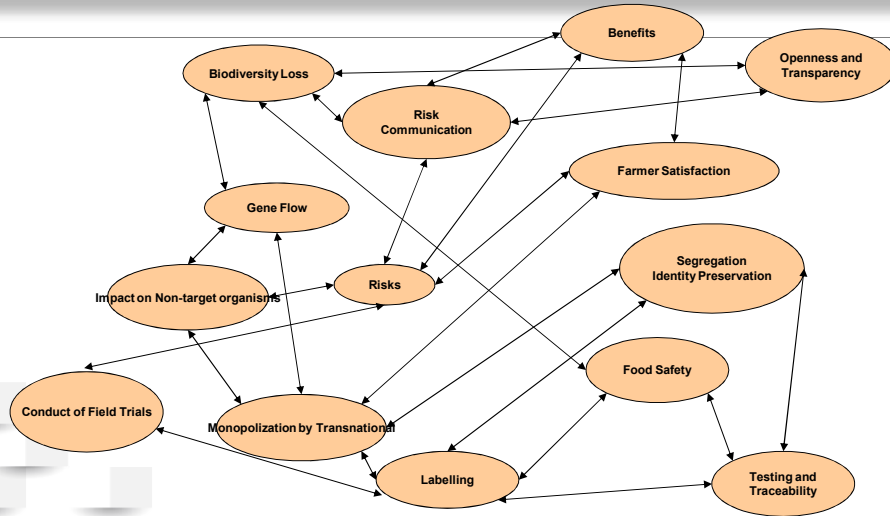
GM crops in India: Concerns by stakeholders

- Subject of debate at various levels
- Parliamentary Committee Reports
- Decision documents by regulatory agencies
- Legal cases in Supreme Court
- Media Reports

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Issues and concerns raised



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Biosafety and ethical concerns

➤ Scientific

- Potential harm to human health; Risk of introducing toxins, allergens and other anti-nutrition factors in foods.
- Potential damage to the environment;
 - Potential likelihood of transgenes escaping from cultivated crops into wild relatives
 - Changes in weediness potential
 - Interaction with non-target organisms
 - Resistance/tolerance of target organisms

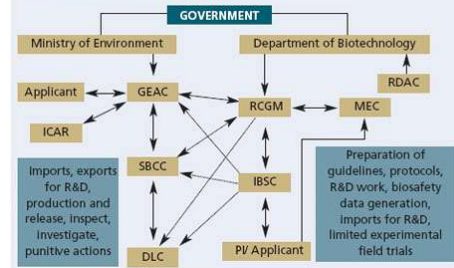
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Addressing scientific concerns

- Internationally accepted safety assessment methodologies for GM crops
- Rigorous data requirements for pre-market safety assessment
- Review of data by experts and regulators

How biosafety works in India



Addressing non-scientific concerns

- Based on apprehensions
- Not unique to GM crops but applicable to agriculture in general



Impact of polarized debates: Delay in approval of GM crops

- ❑ Bt cotton – Approved in 2002
- ❑ High adoption rates, >95% under Bt-cotton cultivation.
- ❑ Benefits include:
 - ✓ Tripled Cotton production (13 million bales in 2003 to 37.1 million bales in 2021, Yield gain-31%)
 - ✓ Reduced Insecticide sprays (Usage decreased by 39%)
 - ✓ Increased production of Cotton seed, and its byproducts -oil and meal (0.46 million tons in 2002-03 to 1.5 million tons in 2014-15)
- ❑ Despite highly successful experience, no further approvals



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Impact of polarized debates: Delay in approval of GM crops

- ❑ Bt brinjal moratorium, but being grown and consumed in Bangladesh
- ❑ GM mustard on hold despite urgent need to increase productivity
- ❑ Illegal cultivation of HT cotton in large acreage being reported

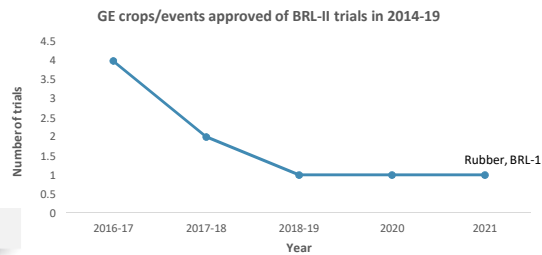
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Impact of polarized debates: Number of field trials reduced

- ❑ Number of trials significantly reduced
- ❑ No trial conducted in last three years
- ❑ Requirement of NOC from states
- ❑ Data requirement increased significantly



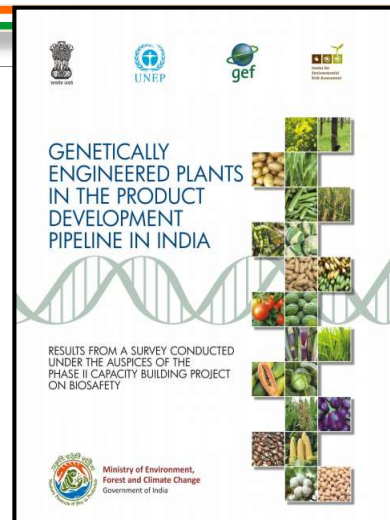
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Impact of polarized debates: Limited research

- ❑ Research activities reduced significantly
- ❑ Several project terminated
- ❑ Students not interested in agricultural biotechnology



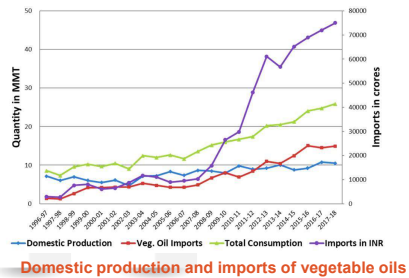
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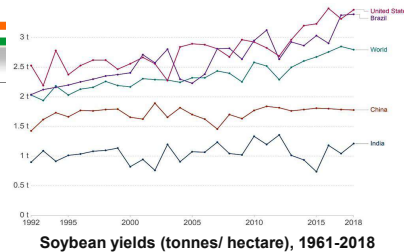


Impact of polarized debates: Stagnation in production and increase in prices

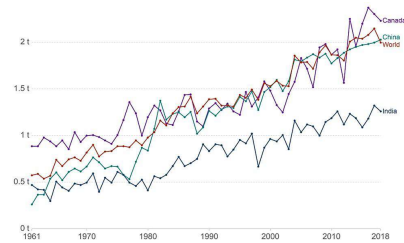
- ❑ Stagnation in production
- ❑ Increase in prices
- ❑ Increase in Imports



Domestic production and imports of vegetable oils



Soybean yields (tonnes/ hectare), 1961-2018



Rapeseed/Mustard yields (tonnes/ hectare), 1961-2018

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Innovative technologies for addressing challenges in agriculture

- ❑ Increased Food Security to counter hunger in post-pandemic era
- ❑ Nutritional enhancements to address malnutrition
- ❑ Resilience to climate change
- ❑ Resistance to abiotic and biotic stresses

Applications of (CRISPR) genome editing in crops

Genome editing has many applications in crops - the plants we grow for food. CRISPR genome editing is particularly useful because it can be used to alter DNA sequences in crops. Precise DNA alterations can give crops many improved characteristics. These have the potential to increase the amount of nutrient-dense food available to people around the world. Some of the applications of genome editing in crops include:

- Improving nutritional value:** Increase the amount of nutrients in crops.
- Enhancing disease resistance:** Protect crops from viruses, fungi, insects, and other pests.
- Domesticating crops:** Make new and old crops easier to farm.

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Way forward for GM Crops

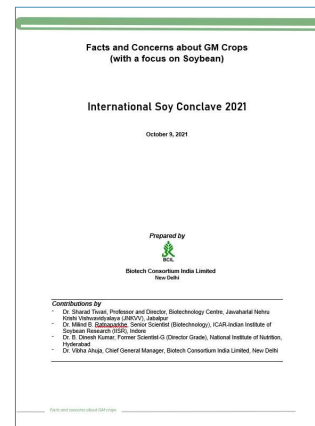
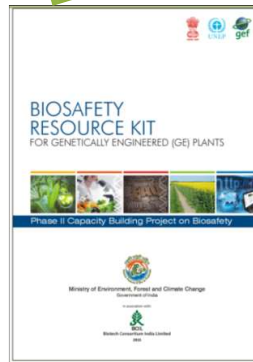
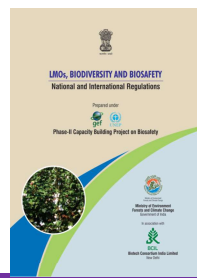
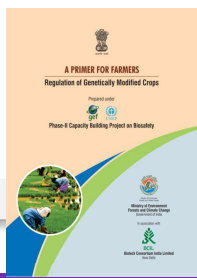
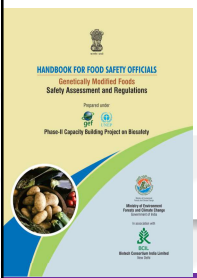
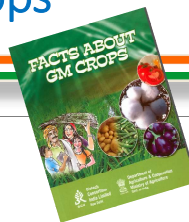
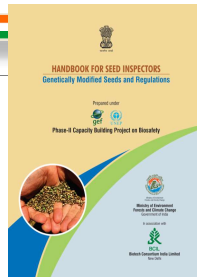
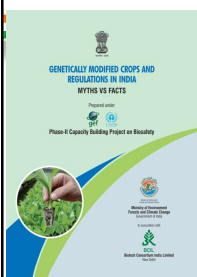
- Urgent approval for field testing and cultivation
- Consideration of processed products as non-LMOs
- Enhancing investments in research
- Enabling environment required to make use of advances in technologies such as new plant breeding techniques

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Know more about GM crops



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E-course on "Biosafety Aspects of Genetically Engineered (GE) Plants" at SWAYAM Portal

The screenshot displays the SWAYAM portal interface. At the top, the course title "Awareness on 'Biosafety Aspects of GE Plants'" is shown, along with the preparer information: "By Prepared under Phase II Capacity Building Project on Biosafety | Dr. Vibha Ahuja, Dr. Vimal Ram". A "Join" button and "Learners enrolled: 845" are visible. The main content area features a video player with the title "e - Learning Resource on Biosafety aspects of Genetically Engineered Plants". To the right of the video is a "Summary" section with the following details:

Course Status:	Upcoming
Course Type:	Not Applicable
Duration:	
Start Date:	01 Sep 2020
End Date:	
Exam Date:	
Category:	↳ Multidisciplinary
Level:	Continuing Education

Below the summary are social media sharing icons for Facebook, Twitter, Email, LinkedIn, WhatsApp, and a plus sign for more options. A small text block below the video provides background information: "The course on 'Biosafety Aspects of GE Plants' has been prepared as part of UNEP/GEF supported Phase II Capacity Building Project on Biosafety implemented by the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India. Biosoft Consortium India Limited (BCIL) served as the Project Coordination Unit (PCU). The objective of the project is to strengthen biosafety management system in India with a view to ensure adequate level of protection for transfer, handling and use of living modified organisms also referred to as genetically modified organisms. The project activities focused on four thrust areas viz: risk assessment and risk management (RA/RA), handling, transport, packaging and identification (HTPI), socio-economic consideration (SEC) and enhancing public awareness (PA). The course modules are based on the 'Biosafety Resource Kit' consisting of five brochures on important biosafety aspects and guidance documents prepared under the project. BCIL is the technical agency for development of e-course. Centre for e-Learning, Shri Guru Tegh Bahadur Khalsa (SGTB) College, University of Delhi designed the course. The following aspects are covered: 1. Introduction to GE plants 2. Regulatory Framework for GE plants 3. Guidelines based on Biosafety"

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Thank you for your attention!

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