GM Crops in India : Challenges and Opportunities

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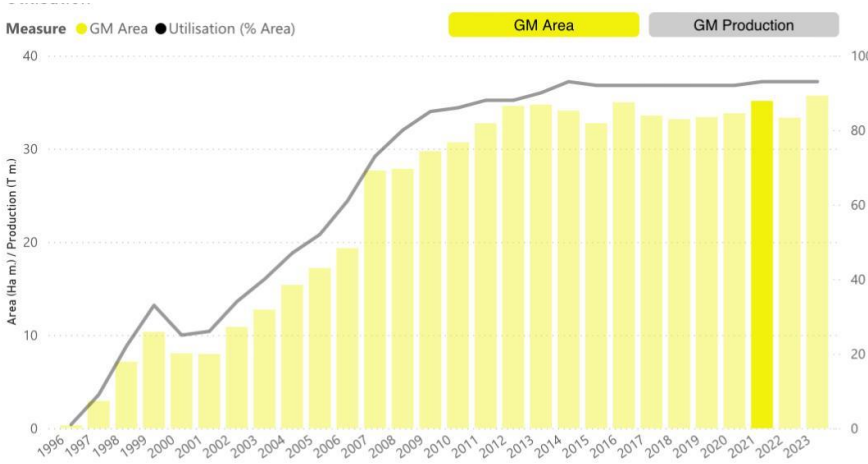
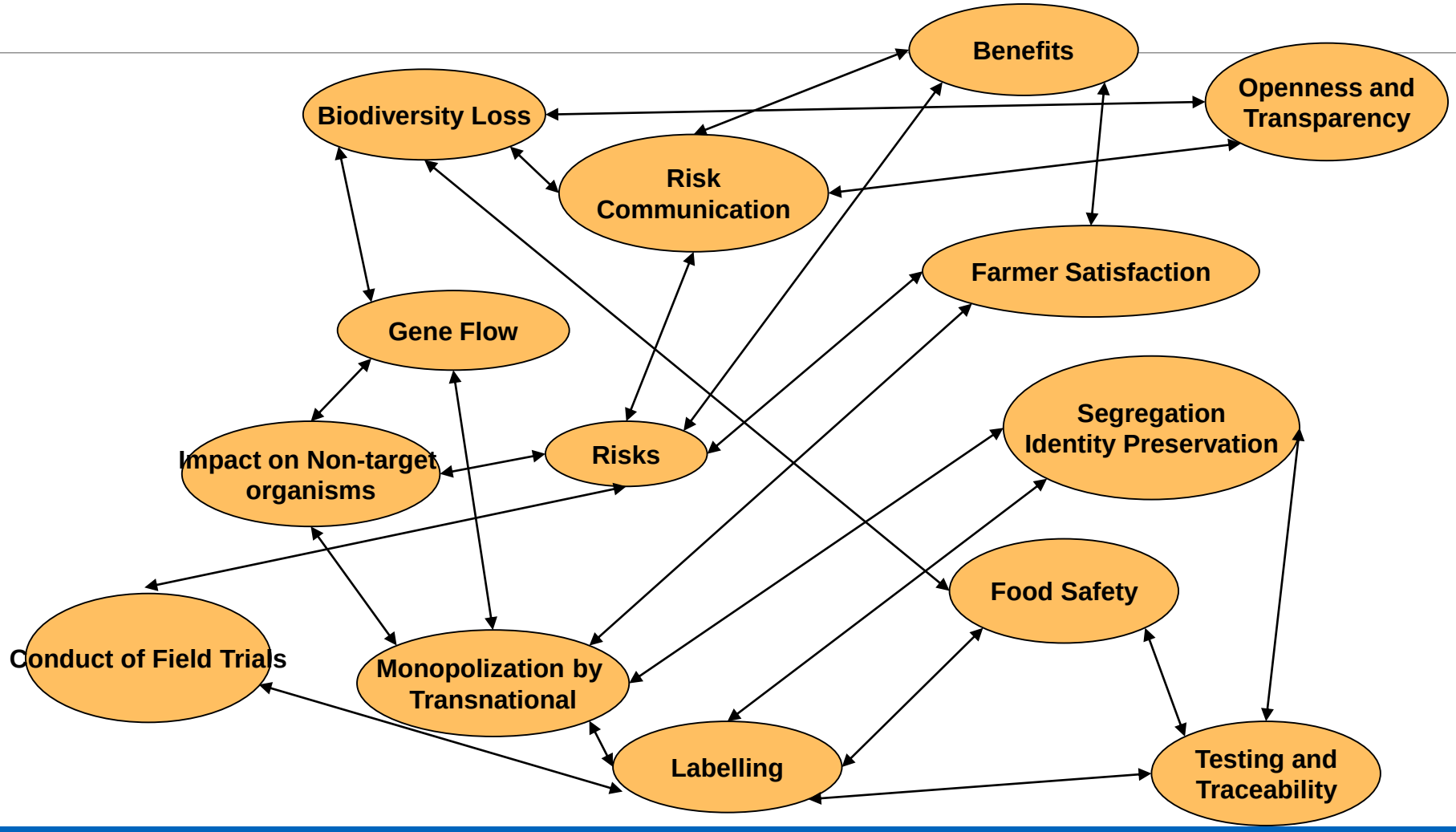
GM crops : Status

- 20 crops, area > 203 million acres in 27 countries in 2023 : Consumed in 71 countries
- Major crops : Corn, Soybean, Canola and Cotton
- High adoption rates wherever approved , >90%
- More than 70% biomass used for animal feed
- In India only one GM crop, Bt cotton – Approved in 2002 ; >95% under Bt-cotton cultivation.
  - Tripled Cotton production (13 million bales in 2003 to 37.1 million bales in 2021, Yield gain-31%) –
  - 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)



GM crops: Subject of debate



Analysing Concerns

- **Scientific**
  - Potential harm to human health; Risk of introducing toxins, allergens and other anti-nutrition factors in foods.
  - Potential damage to the environment; gene flow,weediness,impact on non target organisms,biodiversity

- **Non Scientific**
  - Monopolization by MNCs
  - Impact on exports
  - Increase in prices etc.
  - Regulations not strict

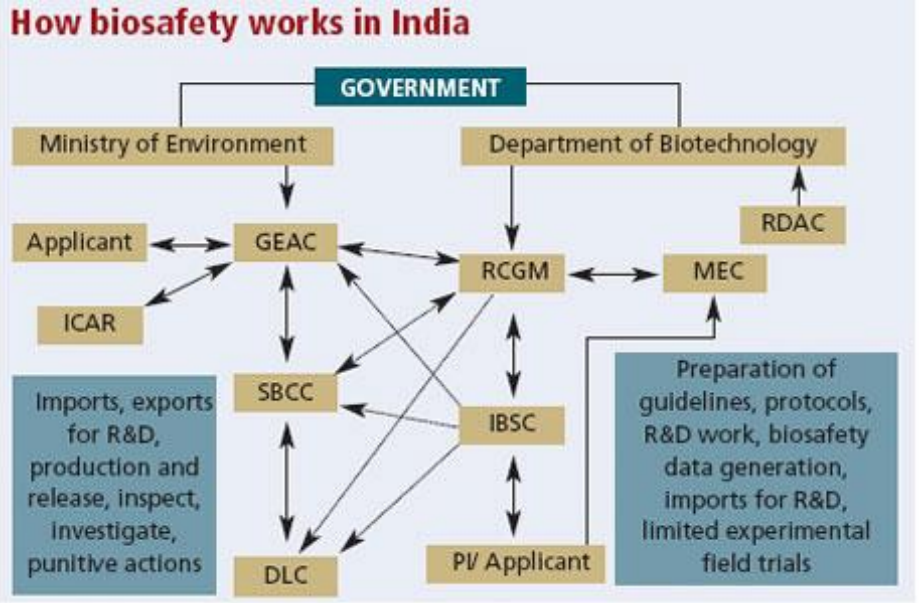
Addressing concerns

➢ Scientific

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

➢ Non-Scientific

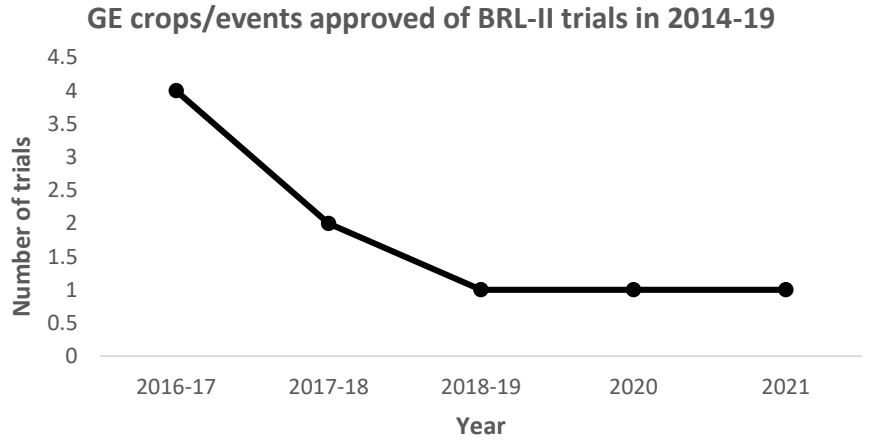
- ❑ Based on apprehensions
- ❑ Not unique to GM crops but applicable to agriculture in general



OECD Convention on Biological Diversity CODEX ALIMENTARIUS International Food Standards World Health Organization Food and Agriculture Organization of the United Nations

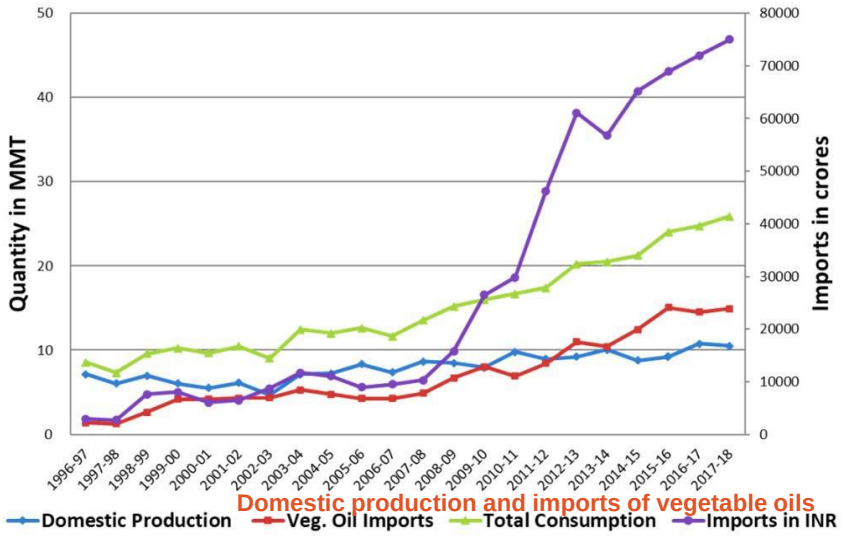
Impact of debates: Delay in approval of GM crops

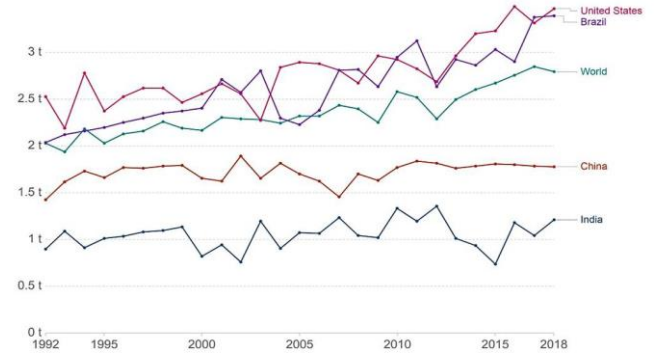
- Despite highly successful experience, no further approvals
- Bt brinjal moratorium, but being grown and consumed in Bangladesh
- GM mustard on hold despite urgent need to increase productivity
- Illegal cultivation of HT cotton in large acreage being reported
- Number of trials significantly reduced
- Research activities reduced significantly



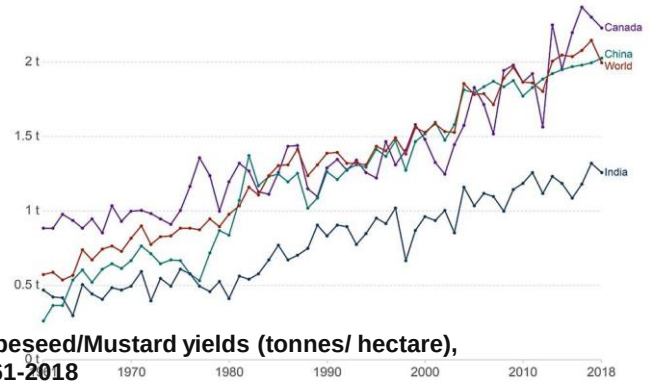
Stagnation in production and increase in prices

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





Soybean yields (tonnes/ hectare), 1961-2018



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

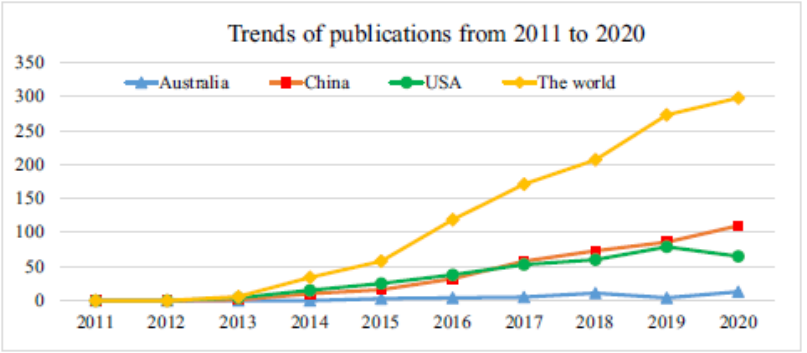
Challenges

- Opposition by few activist organisations
- Ongoing Supreme case since 2004
- Split judgement delivered by two- judge bench
- Clarity in Regularity pathways for products/

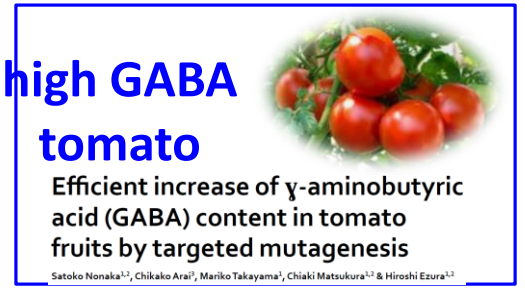
  Role of various agencies leading to delays in decision making
- Limited awareness about benefits among users

Gene editing: A new technology on horizon

- CRISPR/Cas is one of the most powerful technology of this Century: 2020 Nobel Prize
- Developing at a very fast pace with wide application in agriculture, healthcare and biomanufacuring
- Not regulated as GM crops if no foreign genes
- In case of plants referred as SDN1 and SDN 2 technologies
- In March 2022, MoEFCC exempted such plants from GM regulations
- Extensive research underway gobally and in India
- Mostly being used for improved crop characteristics
- Commercially approved products include High GABA tomato,non browning banana, high oleic acid soybean, red bream fish etc.

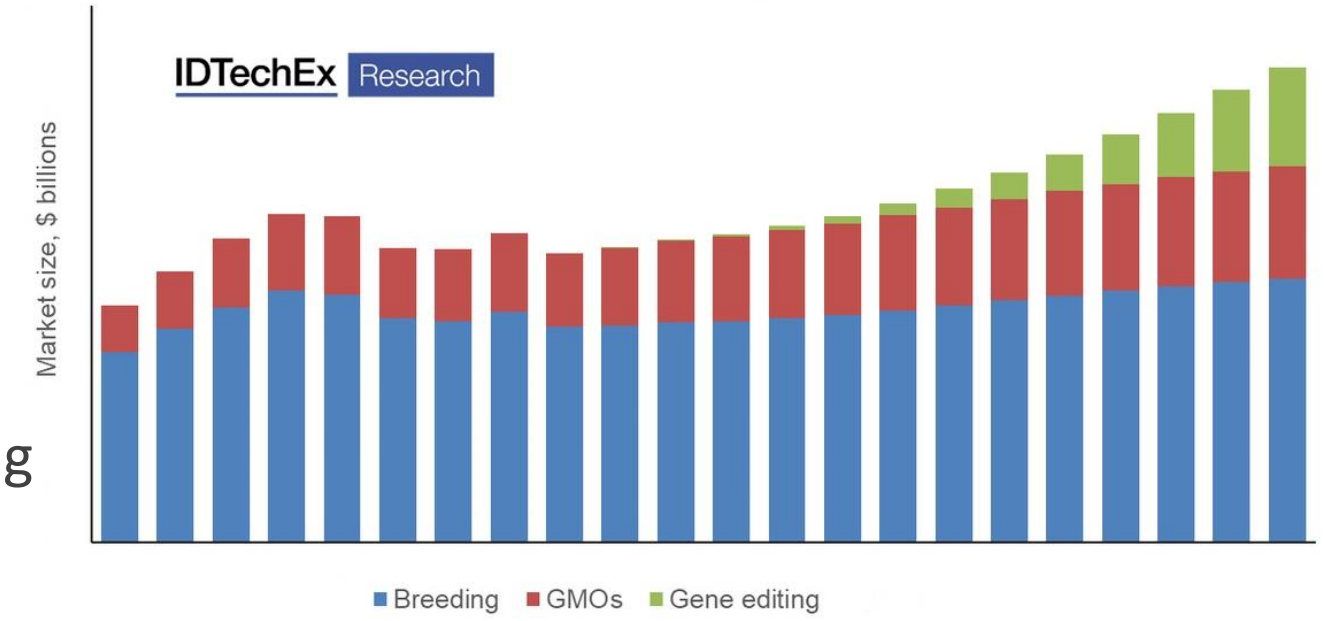


high oleic oils



Contribution of biotech crops to food security, sustainability and climate change solutions

- Increasing crop productivity
- Conserving biodiversity
- Providing a better environment
- Reducing CO2 emissions
- Helping alleviate poverty through uplifting the economic situation



Global crop biotech seed market by method 2010-31

Source: Genetic Engineering in Agriculture 2021-2031

Projections 2010-2031

ThePrint

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Agriculture

China approves 81 GM seeds to boost maize & soybean as Indian biotech is blocked & crop yields languish

Since October, China has approved 64 varieties of GM maize & 17 varieties of GM soybean. India's Bt brinjal & GM mustard remain delayed by activist hurdles, litigation & Luddite fears.

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Gene-edited mustard: Less pungent, more useful

Indian scientists have developed the first ever low-pungent mustard that is pest and disease-resistant. It is based on CRISPR/Cas9 gene editing, while being non-GM and transgene-free. Why does this hold significance for consumers and oilseed producers?

Written by Harish Damodaran Follow

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Way forward

- Enabling environment required to make use of advances in genetic technologies for crop improvement just as in case of gene editing
- Expediting research and field testing of GM crops for meeting the increasing requirements
- Transportability of safety data for regulatory review
- Streamlining procedures for import /export of GM derived products like DDGS, animal products in view of urgent demand
- Awareness among stakeholders, particularly users and consumers about genetic engineering and gene editing

Thank you!