THE UNIVERSITY of EDINBURGH
Global Academy of
Agriculture and Food Systems

DDI Data-Driven Innovation
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Genetically modified foods

Photo by henry perks on Unsplash

Amelia B Finaret, Honorary Lecturer

Myths and oversimplifications

- GM foods are unsafe
- GM foods are unhealthy
- GM foods are "unnatural"
- GM foods are always bad for the environment
- GM foods are only good for increasing profit for agritech companies
- GM foods alone can fix world food production
- GM foods are necessary to increase crop yields

Photo by Sangharsh Lohakare on Unsplash

GM crops are in the news, and there are many interested groups of people

Genetically modified crops in the news

NATIONAL GEOGRAPHIC | Education

ARTICLE

Are Genetically Modified Crops the Answer to World Hunger?

Hunger is a major world crisis for which a solution has not yet been found. Since their advent, genetically modified crops have been hailed as the key to solving world hunger.

More GM crops in the news

healthychildren.org
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from the American Academy of Pediatrics

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Healthy Children > Healthy Living > Nutrition > Are GMO Foods Safe for My Child? AAP Policy Explained

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HEALTHY LIVING

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Are GMO Foods Safe for My Child? AAP Policy Explained

By: Steven A. Abrams, MD, FAAP & Philip J. Landrigan, MD, FAAP

With so many conflicting messages about diet in the world today, you may wonder about the healthiest way to feed your child. Nutrition labels are stuffed with facts, but many parents and

Definitions and concepts

- **Agricultural Biotechnology** uses biological systems and living organisms to improve crops by altering them for desirable improvements.
- **Genetic modification** uses several methods to change an organism's genes, which can include selective breeding, inducing mutagenesis, or nanotechnology.
- **Genetic engineering** uses biotechnology to manipulate an organism's DNA, which might include inserting, deleting, or changing genes
- **Transgenic crops** (sometimes referred to as broader GM crops) have genes inserted from other organisms using recombinant DNA technology to improve beneficial attributes of the crop.
- GM crops may provide increased productivity for many crops, but they remain controversial for their effects on human health and the environment.

Photo by Deneen LT from Pexels

Types of traits

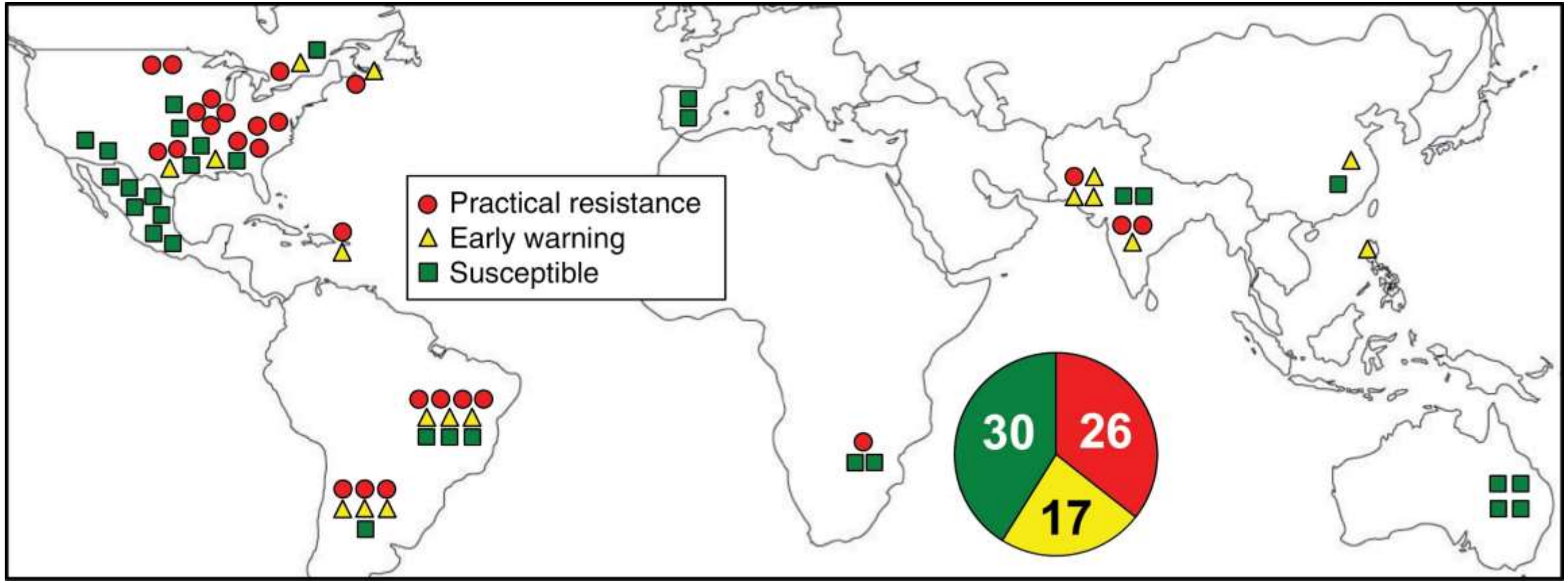
- Herbicide tolerance
  - Cotton, Soybean, Maize, Alfalfa
- Insect resistance
  - Cotton, Soybeans, Maize
- Drought tolerance
  - Sugarcane, Maize, Rice
- Flood tolerance
  - Rice
- Increased nutrients
  - Soybean, Pineapple, Rice
- Reduced anti-nutrients
  - Potatoes, Alfalfa
- Reduced spoilage
  - Apples
- Virus resistant
  - Papaya, Squash

Photo by Markus Winkler on Unsplash

Risk assessment for GM crops

- Human health risks
  - GM foods go through animal testing, compositional analysis, and allergenicity testing.
  - GM foods and their conventionally bred counterparts are compared for nutrient content, anti-nutrients, allergens, and toxins.
  - The WHO states that "…no effects on human health have been shown as a result of the consumption of (GM foods)."
- Risks to the environment
  - Requires observing the GM crop interacting with its environment and with other crops in the natural world and in contained, lab-like plots.
  - Check for any intended or unintended consequence of growing the GM crop, like cross-pollination with wild plants or cultivated plants.

Global status of pest resistance to ‘Bt’ crops



Source: Tabashnik, B.E., Fabrick, J.A. and Carrière, Y., 2023. Global patterns of insect resistance to transgenic Bt crops: The first 25 years. *Journal of Economic Entomology*, *116*(2), pp.297-309. Fig. 3.

About 190 million hectares of cropland are planted with GM crops

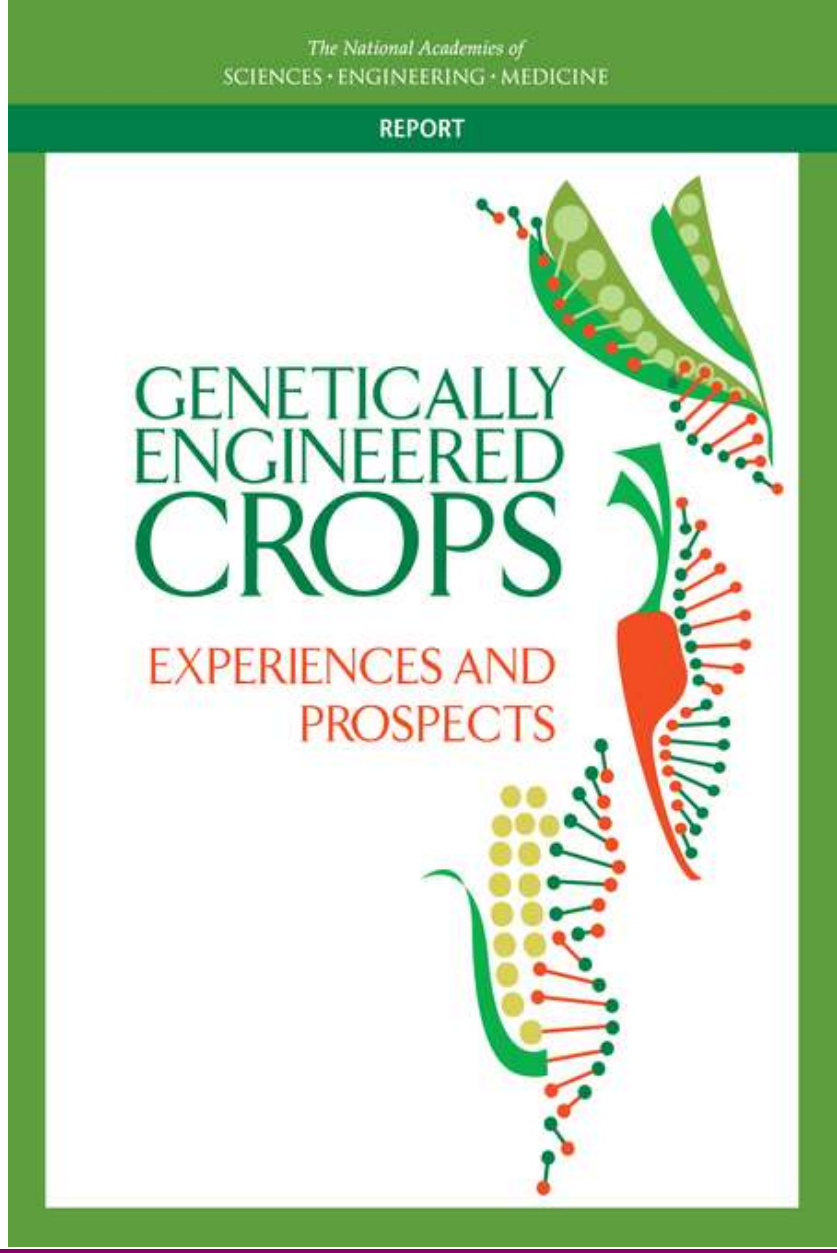
Source: Figure 3-4 of Genetically Engineered Crops: Experiences and Prospects (2016)

What does the FAO say about GM crops?

- "Genetic modification has had limited but real success in modifying a few simple input traits in a small number of commercial commodity crops, which have also been adopted by farmers in some developing countries."
- "We do not need GMOs to resolve the current world hunger problem."
- "The responsibility for formulating policies and making decisions regarding GMOs lies with individual governments....FAO provides advice, assistance with capacity development, information and a meeting place for its member governments."

Findings from a massive 2016 study from National Academies of Science

- "The committee found little evidence to connect GE crops and their associated technologies with adverse agronomic or environmental problems.... however, the complex nature of assessing long-term environmental changes often made it difficult to reach definitive conclusions."
- "...understanding the health effects of any food, whether non-GE or GE, can be difficult..."
- Acute effects are easier to examine/study than long-term effects
- No adverse effects seen in long-term feeding of GM crops to livestock
- No health differences in the data between US versus UK and Europe after introduction of GM foods in the 1990s in the US but far less adopted in UK/EU.



The FAO has information about safety assessment for GM foods

Food safety and quality

GM Foods Platform

FAO GM Foods Platform

Welcome to the FAO GM Foods Platform

A platform for all

The FAO GM Foods Platform is a simple online platform to share information on safety assessment of foods derived from recombinant-DNA plants authorized in accordance with the Codex Guideline for the conduct of food safety assessment of foods derived from recombinant-DNA plants (CAC/GL 45-2003, annex III adopted in 2008). This Platform also facilitates the effective utilization of food safety assessment in situations of Low Level Presence (LLP) of r-DNA plant materials in food.

How it works

The FAO GM Foods Platform is freely accessible for those who want to browse the information. Registration is required for those who need to upload information. Only officially nominated Focal Points can register to the Platform thus only official information/data are shared.

Contact us

If you need help, visit the FAQ for visitors page where you will find answers to many common questions. User guide is also available. If you're still unable to find what you're looking for, contact us at GM-Platform@fao.org.

Final report of the global community meeting of the Platform (2019).

Data and resources

- National Academies of Sciences, Engineering, and Medicine. 2016. Genetically Engineered Crops: Experiences and Prospects. Washington, DC: The National Academies Press.
- FAO GM Foods Platform
- Fact Sheet from the World Health Organization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Thank you

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