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The Global Scientific Consensus on Genetically Modified Crop Risk Assessments

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2026

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Published paper

GM CROPS & FOOD
2026, VOL. 17, NO. 1, 2704430
<https://doi.org/10.1080/21645698.2026.2704430>



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The global scientific consensus on genetically modified crop risk assessments

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ABSTRACT

Initial risk assessments of genetically modified (GM) crops began in the early 1990s, focusing on herbicide tolerance and insect resistance, with approvals by the mid-1990s. These assessments compare GM crops to non-GM equivalents, a framework unchanged for over 30 years. Since the first assessment in 1994, over 4,400 evaluations have been conducted across more than 70 countries for both cultivation and food/feed use. To date, none have identified increased risk relative to conventional varieties. This article analyzes three decades of GM crop approvals, highlighting the consistency of scientific assessment processes. Fourteen crops underwent 692 cultivation and 1,891 food-release assessments for herbicide tolerance, while insect resistance accounted for 523 cultivation and 1,396 food-release assessments, largely involving *Bacillus thuringiensis* (Bt). The findings underscore that GM crops are equivalent in risk to conventional varieties, supporting reliance on established international scientific expertise, particularly in resource-constrained regions.

ARTICLE HISTORY

Received 26 March 2026
Revised 2 July 2026
Accepted 8 July 2026

KEYWORDS

Barriers to innovation;
biotechnology regulation;
herbicide tolerance; insect
resistance; regulatory
barriers



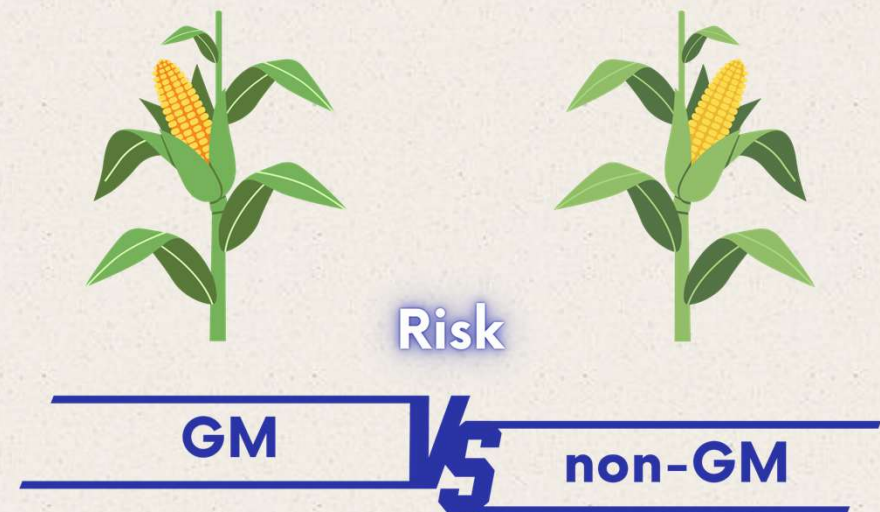
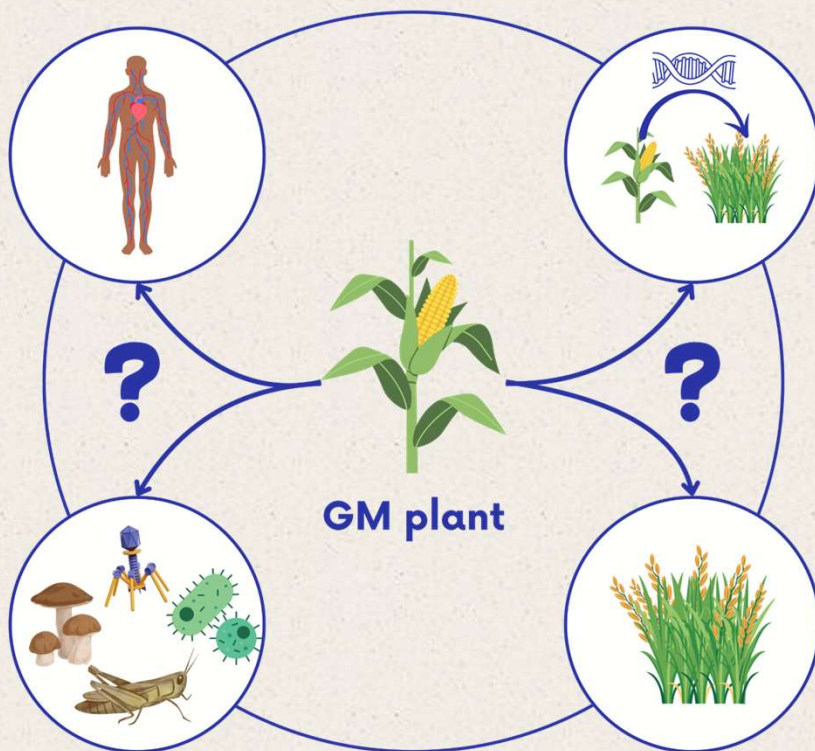
Importance of GM adoption

- GM Crops in the market for 30 years
- Main goal of GM crops: increase yield
- ~ 10% of the World's population is food Insecure
- There are 21 different crops species approved in 72 countries
- 548 GM crop events approved worldwide
- Regulation costs are still high
- Genetically edited crops with exogenous DNA are still regulated as GM

Risk Assessment

OECD 1982:

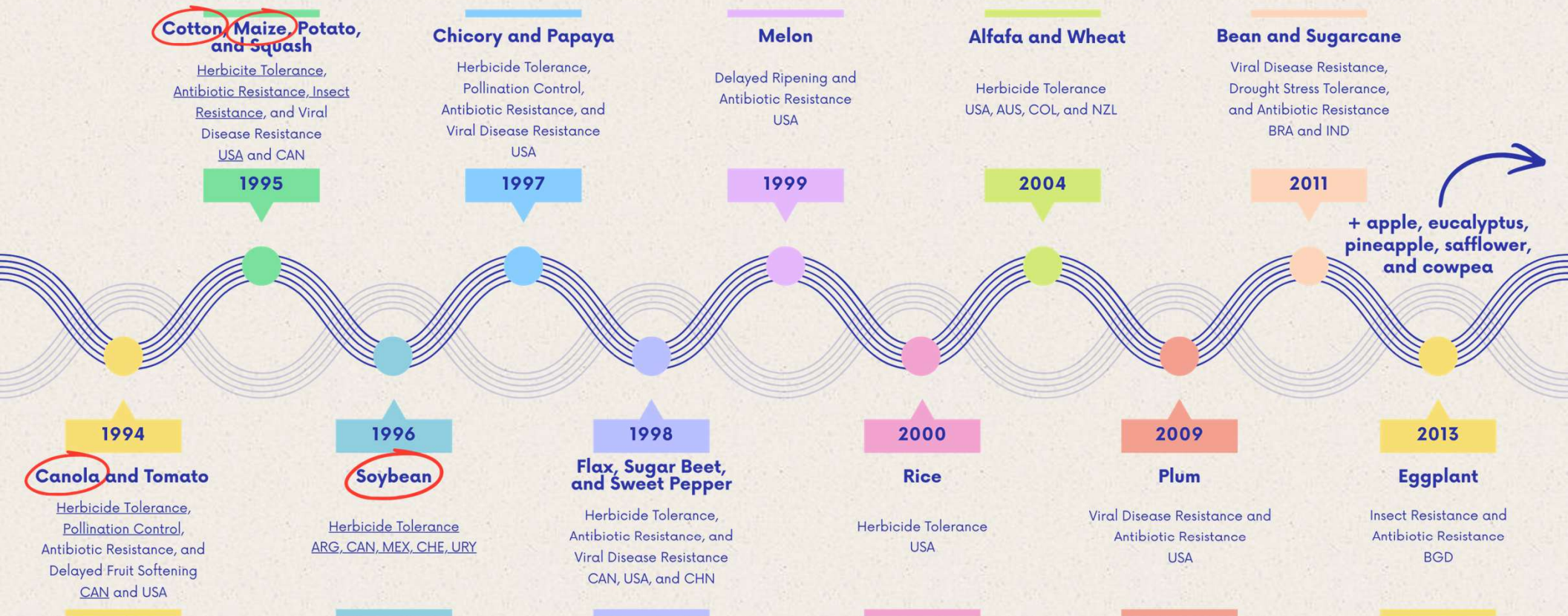
Standardization of risk assessments



Major GM Crops and Producing Countries



First time each crop had a GM event approved for food



Methodology

Data from:

ISAAA

FAOSTAT



Risk assessment calculation

$$RA_c = \sum_e A_e$$

where RA is the total number of risk assessments for crop c, e is the GM event, and A_e is the number of countries that have approved event e for food or cultivation

Considered as one RA:



Bangladesh



Bhutan



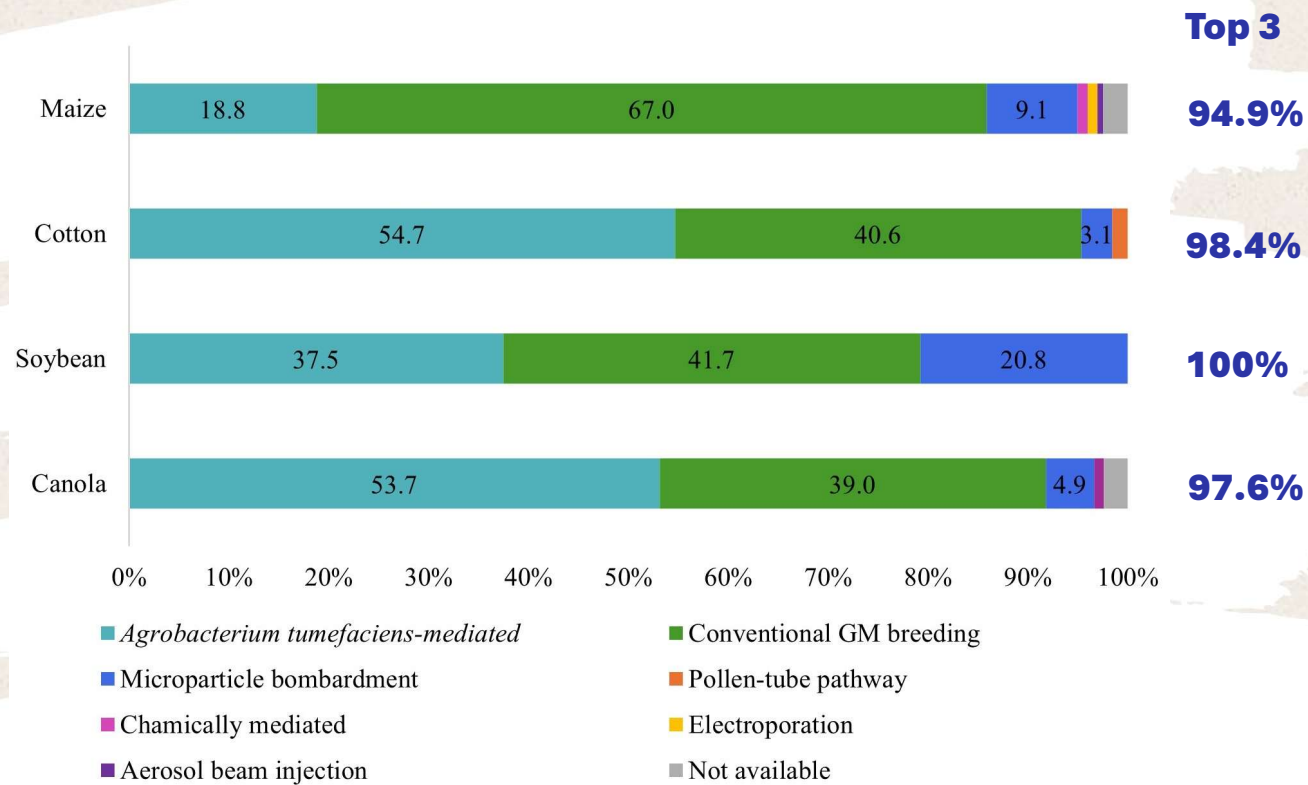
India



Sri Lanka

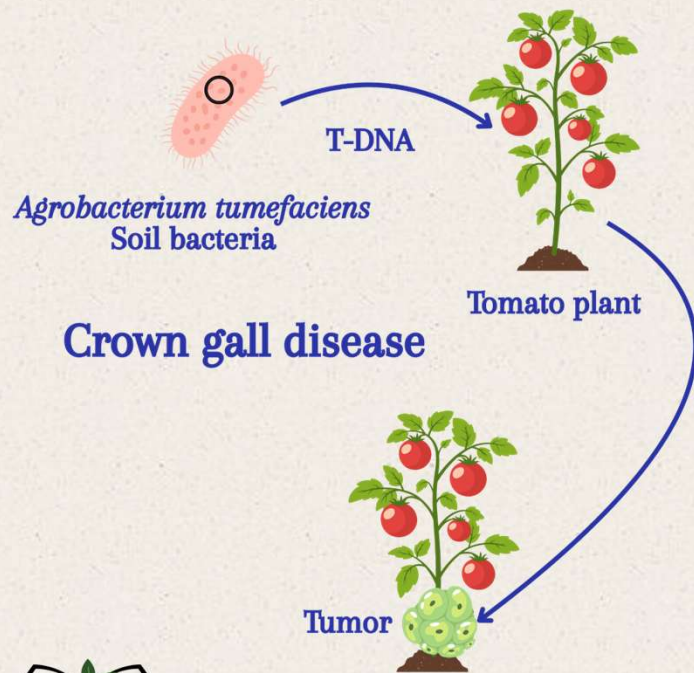


Method of trait introduction on GM maize, cotton, soybean, and canola approved for food

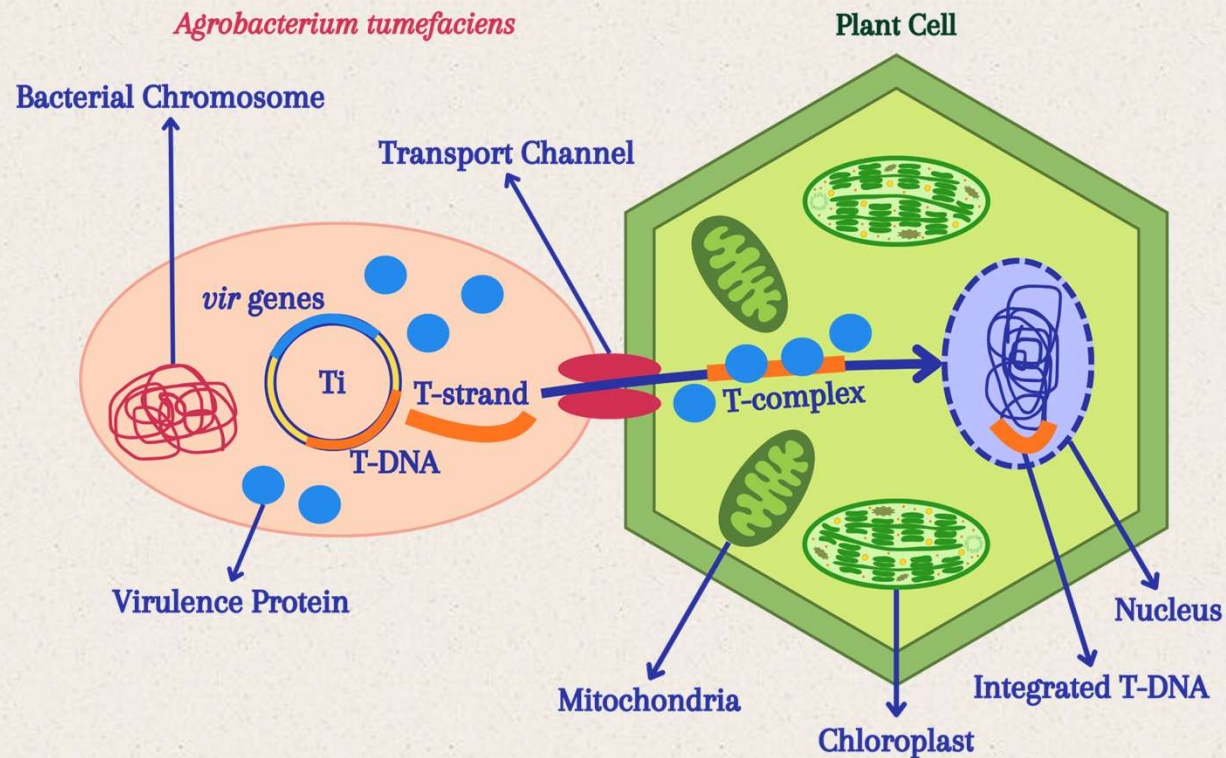


Development of GM Techniques

1897:



1980s:

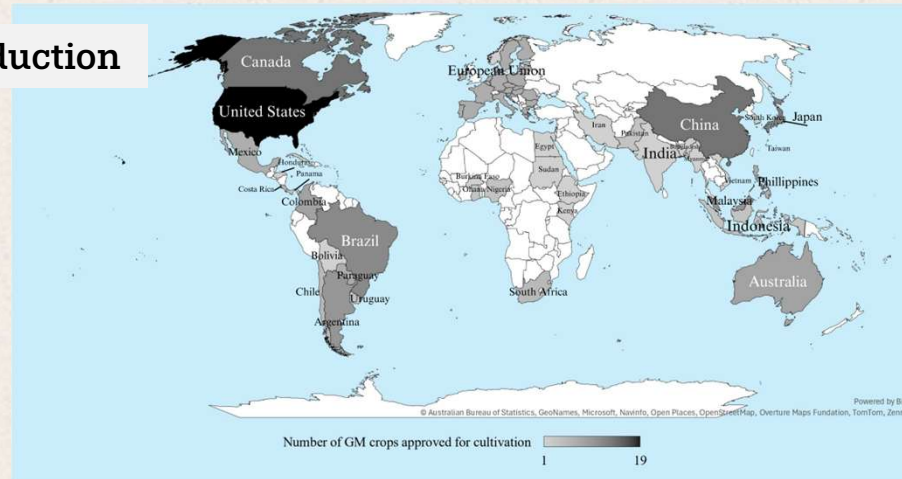


Also used in gene editing

Countries that have adopted GM crops

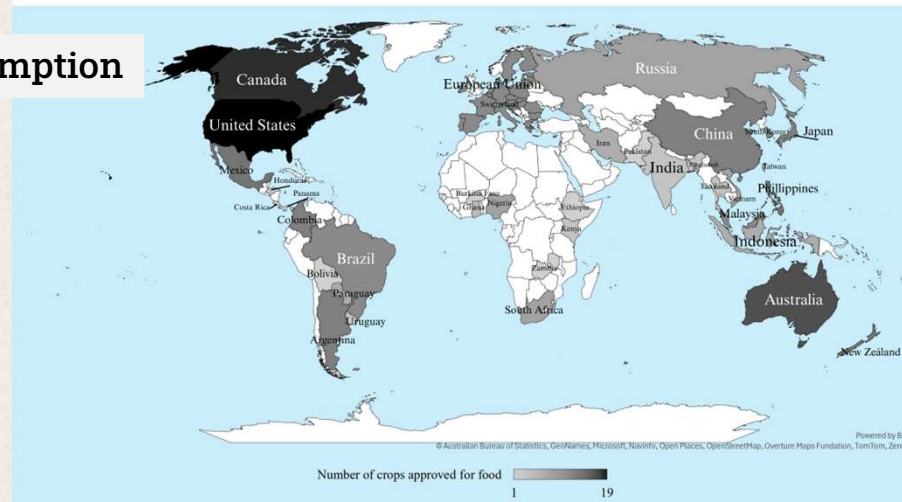
Field Production

443 GM events
64 countries

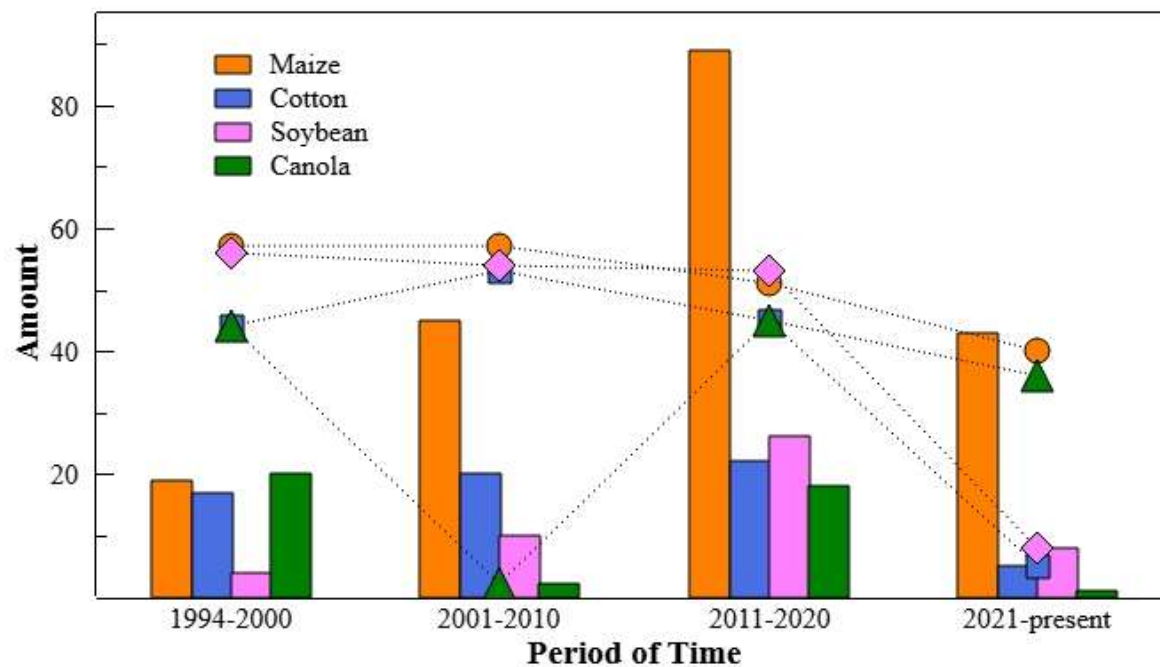


Food Consumption

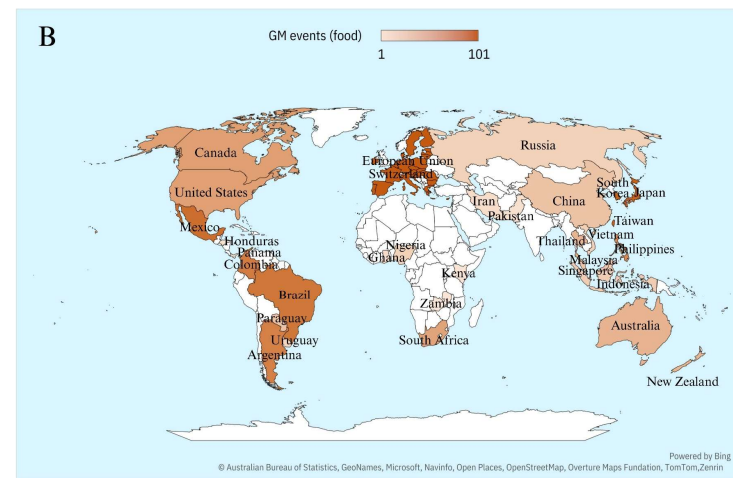
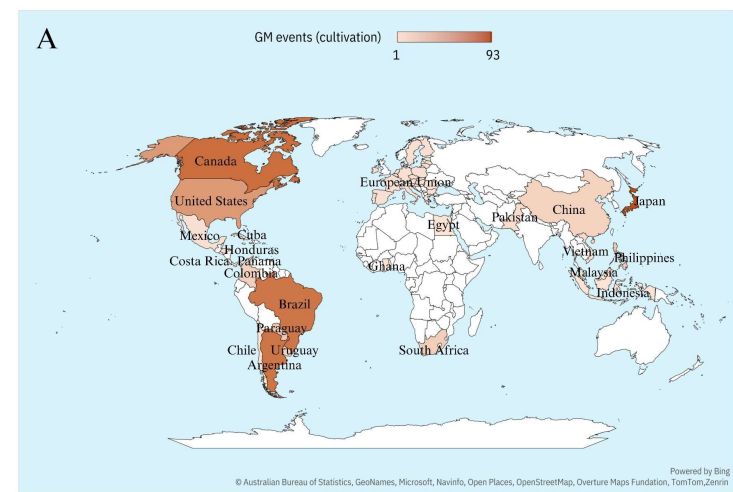
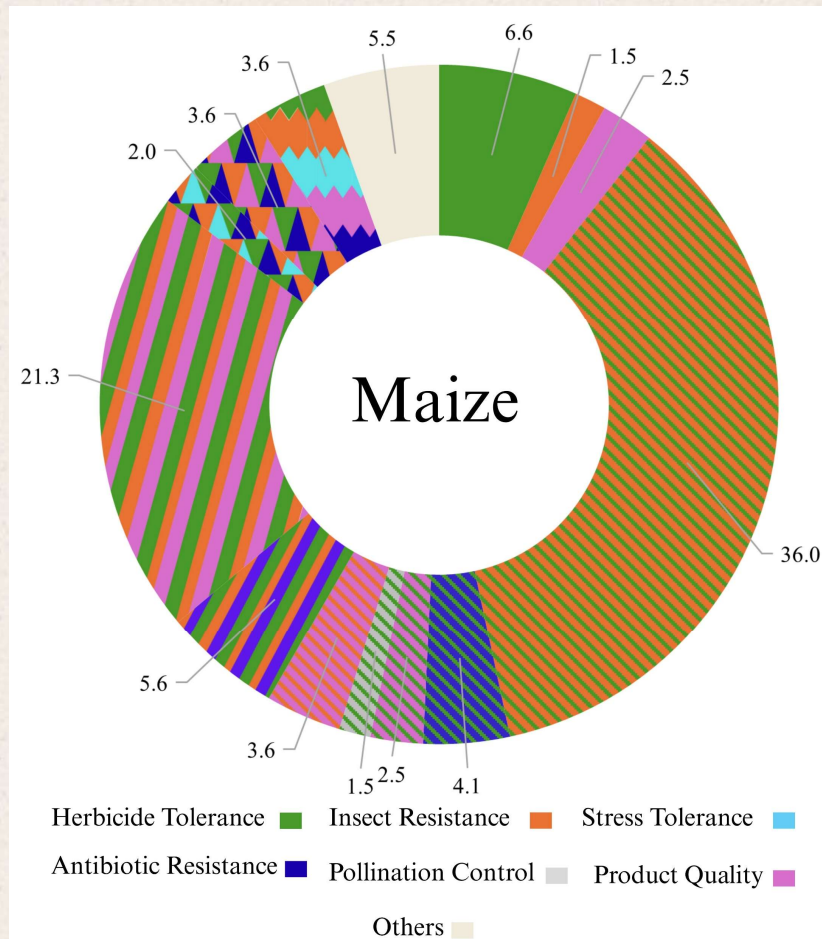
469 GM events
65 countries



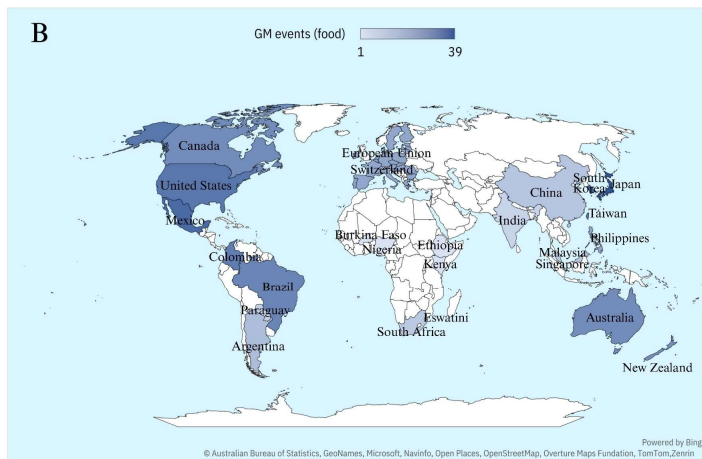
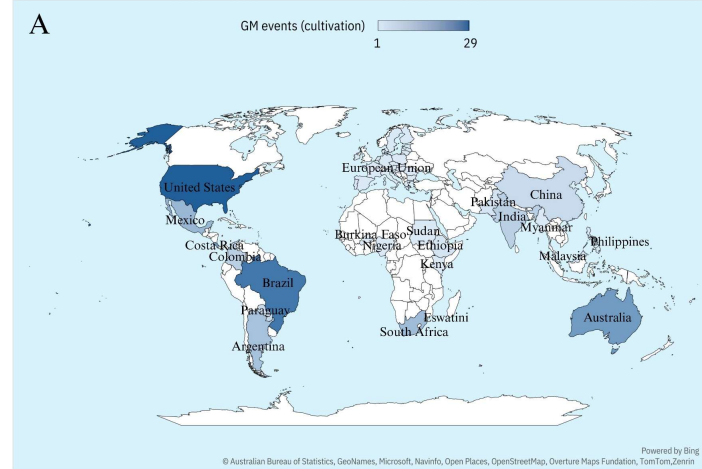
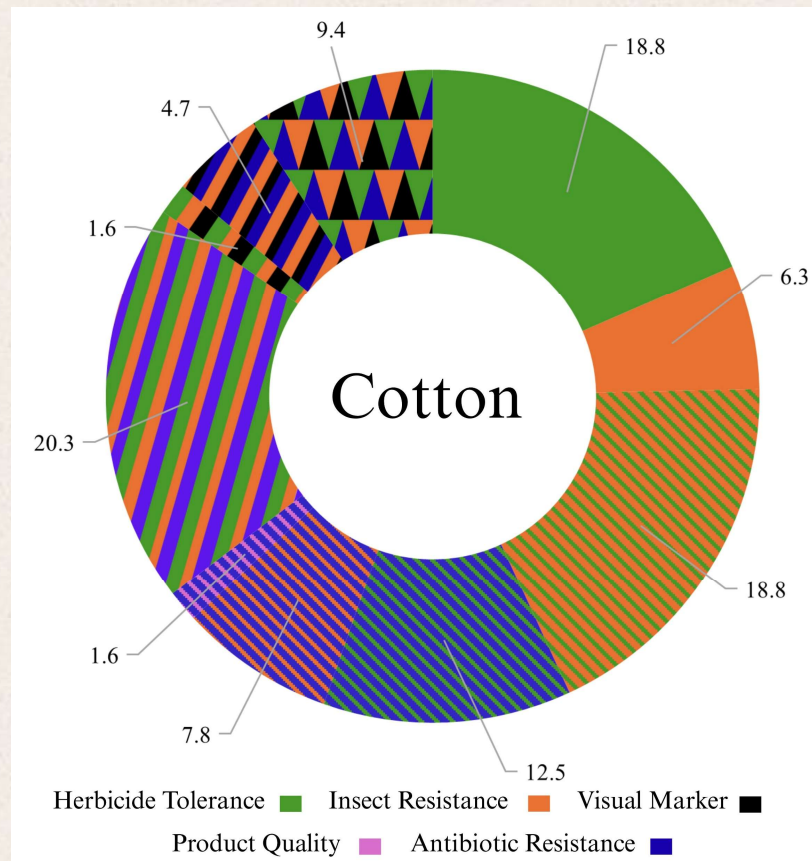
Number of GM event approvals (bars) and number of countries that approved those events (dotted line + symbol)



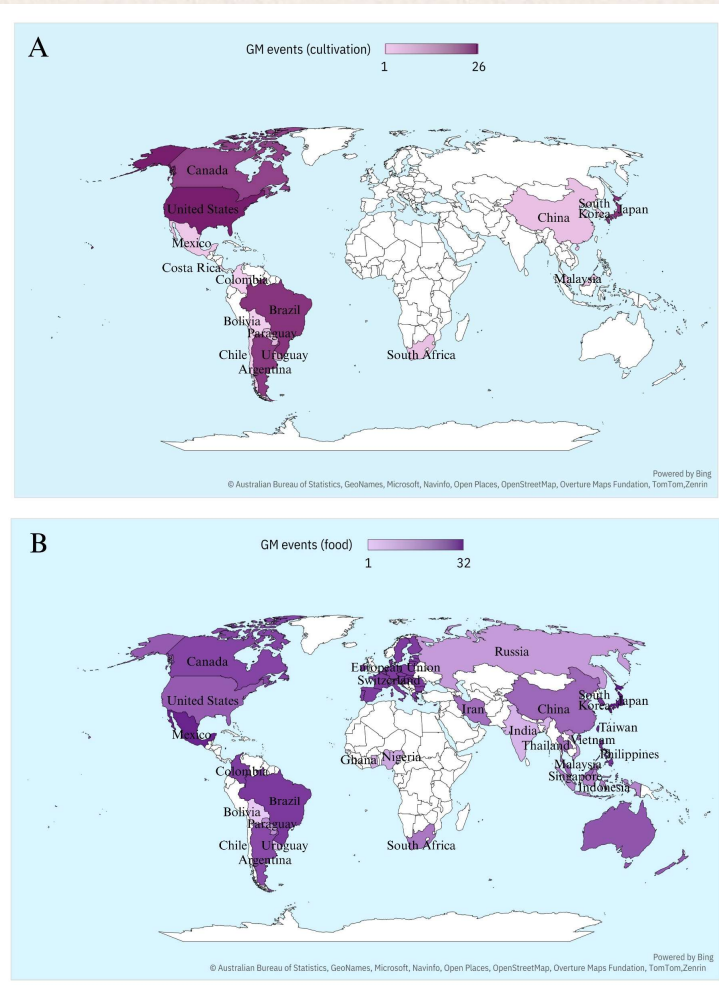
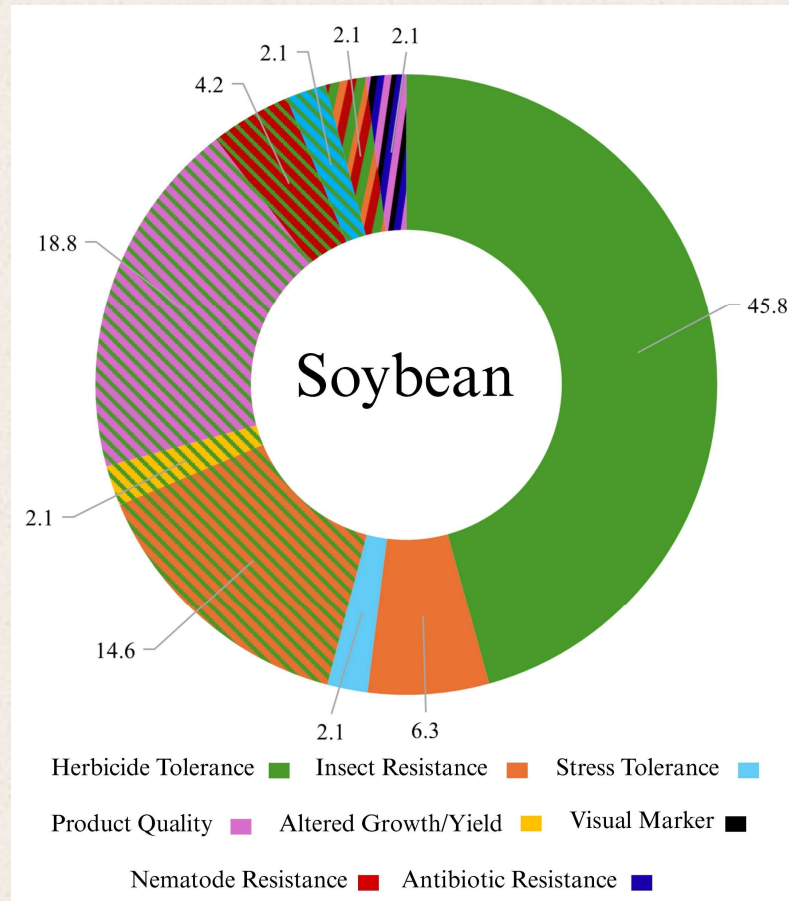
Stacked and singular GM maize traits approved for food



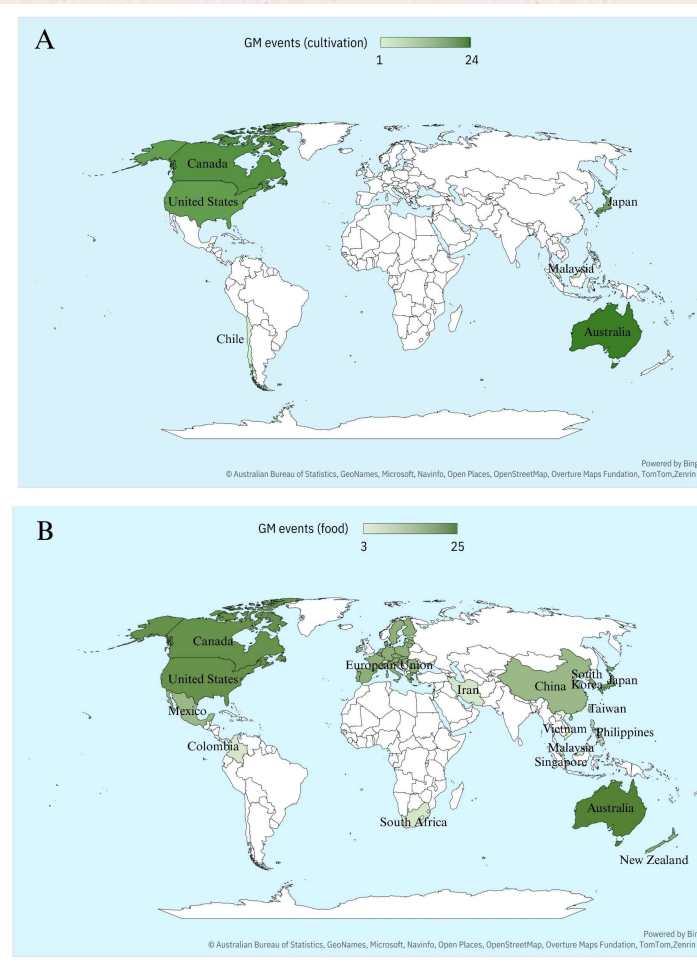
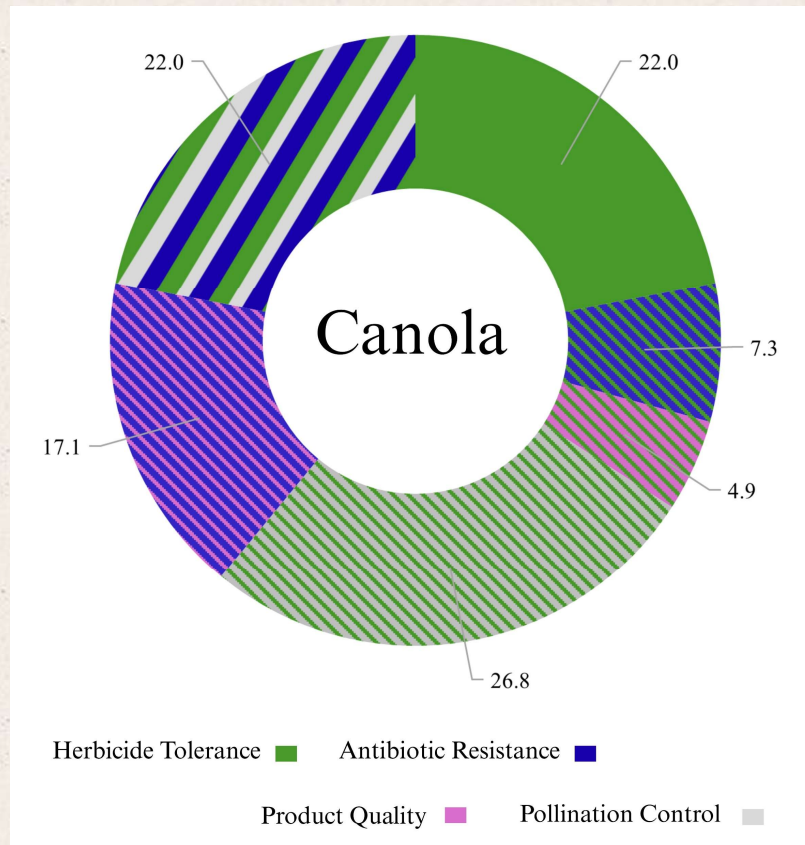
Stacked and singular GM Cotton traits approved for food



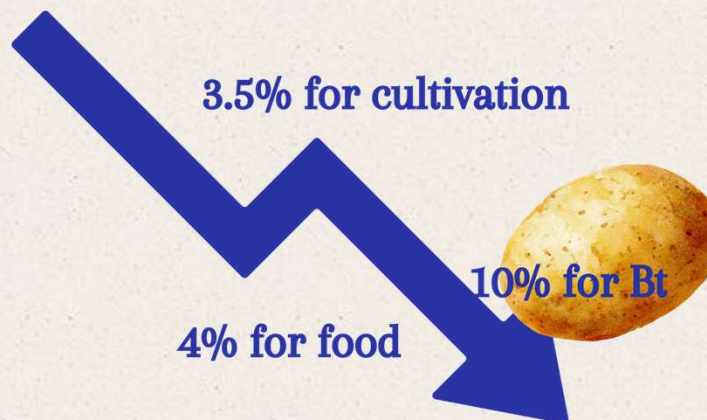
Stacked and singular GM Soybean traits approved for food



Stacked and singular GM Canola traits approved for food



Risk Assessments



HT

1994

440 GM events

17 crops

1,896 RAs for food

695 RAs for cultivation

Bt

1995

372 GM events

11 crops

1,398 RAs for food

520 RAs for cultivation

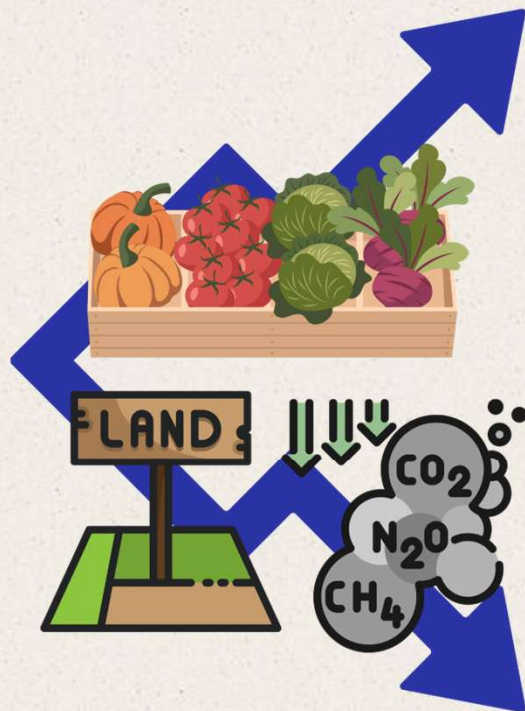
97% *Bacillus thuringiensis*

Risk Assessments

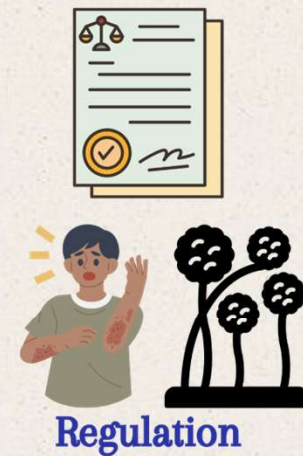
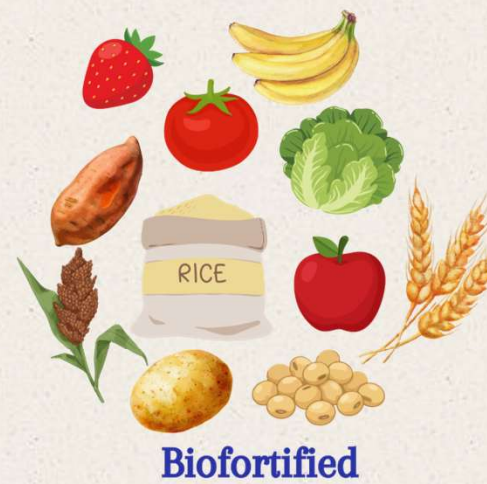
	RAs for Herbicide tolerance			RAs for Insect resistance		
	Food	Cultivation	Events	Food	Cultivation	Events
Alfalfa	26	12	4	0	0	0
Argentine Canola	192	74	37	0	0	0
Carnation	0	14	4	0	0	0
Chicory	3	3	3	0	0	0
Cotton	278	93	52	247	99	53
Cowpea	0	0	0	2	2	1
Creeping Bentgrass	0	1	1	0	0	0
Eggplant	0	0	0	2	2	1
Eucalyptus	7	7	7	1	1	1
Flax	2	2	1	0	0	0
Maize	997	374	267	932	346	260
Polish Canola	0	4	4	0	0	0
Poplar	0	0	0	0	2	2
Potato	10	2	4	98	38	30
Rice	11	3	3	3	3	3
Soybean	344	97	46	101	25	11
Sugar Beet	22	7	4	0	0	0
Sugarcane	1	0	1	12	5	8
Tobacco	0	0	1	0	0	0
Tomato	0	0	0	2	1	1
Wheat	3	0	1	0	0	0
Total	1,896	693	440	1,400	524	371

Impacts

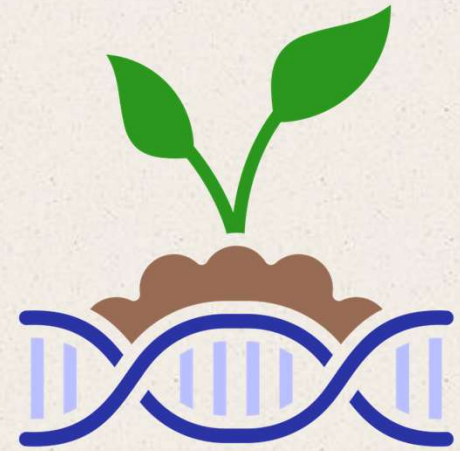
Environment and Crop Yield



Human Health



Benefits of RA Consensus





Thank you,
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