

# Navigating the Controversies over GMO Crops

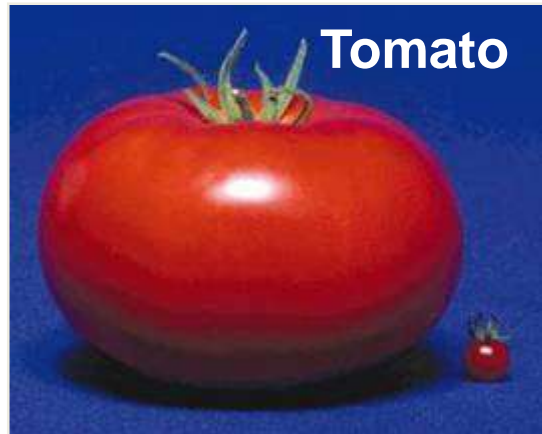
The good, the bad, and the  
righteous



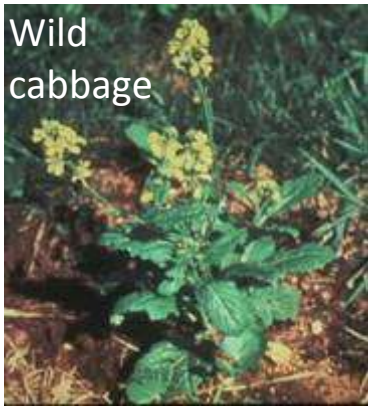
Steve Strauss  
Oregon State University



# Aren't most food crops already genetically engineered?



# Mutants are some of our best friends: Domestication of *Brassica oleracea*



Ornamental kale  
Late 1900's





# Many plant varieties derived from induced mutations

Over 2,000 crop varieties derived from mutagenesis have been commercialized



Calrose 76 semi-dwarf rice

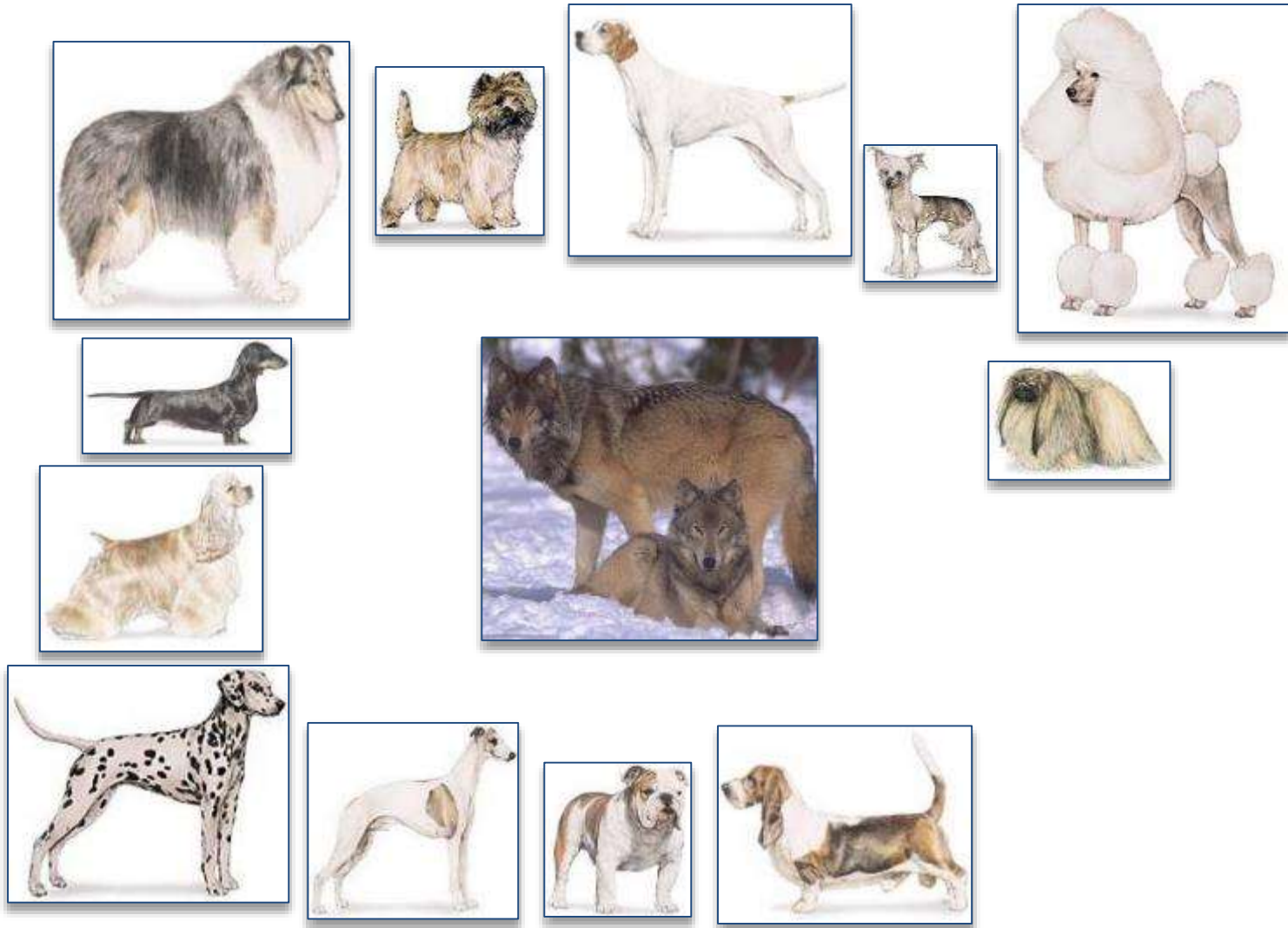


High oleic sunflower



Rio Red grapefruit

# Radical changes in domesticated animals: All dogs derived from the wolf by breeding



# Breeding continues and is accelerating in age of massive DNA sequencing



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### Plant-Indigo Rose Tomato

80 days. Unlike any tomato that we have seen! Indigo Rose is the first high-anthocyanin tomato commercially available anywhere in the world. The high amount of anthocyanin (a naturally occurring pigment that has been shown to fight disease in humans) creates quite a vibrant indigo, almost blue skin on the 2 inch, round fruit. The purple coloring occurs on the portion of the fruit that is exposed to light, while the shaded portion starts out green and turns deep red when mature. Inside, the flesh reveals the same rosy tone with a superbly balanced, multi-faceted tomatoey flavor. The indeterminate plants have an open habit and are very vigorous producers. Bred at Oregon State University.

Available only within the contiguous US.

[More Live Transplant Information](#)

OP Open Pollinated

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Yet GMOs, and only GMOs, have remained powerfully controversial for ~two decades



# Recently passed Oregon bill motivated by anti-GMO activism at county level

77th OREGON LEGISLATIVE ASSEMBLY--2013 Special Session

**Enrolled  
Senate Bill 863**

Sponsored by JOINT COMMITTEE ON SPECIAL SESSION

CHAPTER .....

AN ACT

Relating to preemption of the local regulation of agriculture; and declaring an emergency.

Be It Enacted by the People of the State of Oregon:

**SECTION 1.** Sections 2 and 3 of this 2013 special session Act are added to and made a part of ORS 633.511 to 633.750.

**SECTION 2.** (1) As used in this section, "nursery seed" means any propagant of nursery stock as defined in ORS 571.005.

(2) The Legislative Assembly finds and declares that:

(a) The production and use of agricultural seed, flower seed, nursery seed and vegetable seed and products of agricultural seed, flower seed, nursery seed and vegetable seed are of substantial economic benefit to this state;

(b) The economic benefits resulting from agricultural seed, flower seed, nursery seed and vegetable seed and seed product industries in this state make the protection, preservation and promotion of those industries a matter of statewide interest that warrants reserving exclusive regulatory power over agricultural seed, flower seed, nursery seed and vegetable

(c) The agricultural seed, flower seed, nursery seed and vegetable seed and seed product industries in this state will be adversely affected if those industries are subject to a patchwork of local regulations.

SECTION 3. (1) It is the intent of the Legislature to create a



# Jackson County, Oregon GMO ban - on ballot next month

## Proposed GMO crop ban in Jackson County attracts opposing farm interests from around country



# Effort underway to standardize and prohibit Balkanization of GE regulations throughout USA

- American Bakers Association
- American Beverage Association
- American Farm Bureau Federation
- American Feed Industry Association
- American Frozen Food Institute
- American Seed Trade Association
- American Soybean Association
- American Sugarbeet Growers.....

AND 20 MORE



## Broad-Based Coalition Launched to Advocate for Congressional Action on a Federal GMO Labeling Solution

February 5, 2014

### Broad-Based Coalition Launched to Advocate for Congressional Action on a Federal GMO Labeling Solution

*Legislation Needed to Protect Consumers by Eliminating Confusion and Advancing Food Safety*

(Washington, D.C.) American farmers and representatives from a diverse group of almost thirty industry and non-governmental organizations today announced the formation of the Coalition for Safe Affordable Food ([www.CFSAF.org](http://www.CFSAF.org)) and urged Congress to quickly seek a federal solution that would establish standards for the safety and labeling of food and beverage products made with genetically modified ingredients (GMOs).

# Views are polarized

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FEATURE

## US public opinion divided over biotechnology?

**Although a majority of US citizens remain supportive, opposition to biotechnology is on the rise.**

*Susanna Hornig Priest*

Conventional wisdom judges the people of the United States to have few concerns about biotechnology in comparison to people in other parts of the developed world. According to data from a new survey, this picture is at once both accurate and misleading. At least one other major comparative study using data from 1996–1997 published this year appeared to indicate generally more favorable attitudes in the US than in Europe<sup>1</sup>. But recent data reflect mixed opinions in the US consistent with other evidence suggesting moderate declines in US support. While the proportions may be different, the US increasingly resembles Europe in having significant amounts of opposition.

### **A changing climate**

Several reports have suggested that the con-



greater than benefit rose from 20% in 1995 to 24% in 1997 to 29% in 1999<sup>2</sup>. Other indicators suggest US opinion has grown increasingly negative. According to figures released by the US Office of Technology Assessment, in 1986 only 22% of the US public thought genetic engineering would make “the quality of life” worse, and in 1982 only 16%<sup>3</sup>.

In this context, the Public Policy Research Institute at Texas A&M University conducted a telephone survey for the author between April 10 and May 3 that explored current public attitudes to biotechnology. The nationwide survey was limited to US citizens aged 18 and over, and was based on standard random digit dialing procedures, resulting in 1002 completed interviews out of 3182 qualified contacts (a cooperation rate of 31.5%).

sure does not reach the levels of positive responses obtained in this survey for similar questions about other technologies ranging from computers and information technology (with 87.8% expecting improvement), to solar energy (87.7%), telecommunications (82.3%), the Internet (72.1%), and even space exploration (62.2%). Of the technologies included in this study, only nuclear energy (with just 43.0% expecting it to improve life) scored lower. And of all seven technologies, only nuclear energy (with 32.4% expecting it to “make things worse”) was similar to genetic engineering in garnering close to one-third negative responses. In other words, despite different levels of overall support, the two technologies are very similar in the proportion of people who hold the more pessimistic view. The conventional wisdom that says that genetic engineering is non-controversial in the US is difficult to sustain in the light of these figures, as is the assumption that opposition is limited to the extremist “fringe.”

*Susanna Hornig Priest is associate professor in the Department of Journalism, Texas A&M University, College Station TX 77843-4111 ([susanna@tamu.edu](mailto:susanna@tamu.edu)).*

NATURE BIOTECHNOLOGY VOL 18 SEPTEMBER 2000



# Broad views predict acceptance-rejection


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5 October 2013, 2:25pm AEST


## How values affect our attitudes to genetically modified food

**AUTHOR**  
 **Craig Corrick**  
Communication Adviser, Corporate Communication at CSIRO

**DISCLOSURE STATEMENT**  
Craig Corrick undertook the CSIRO research project for the Department of Innovation.



Provides funding as a Founding Partner of The Conversation.  
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Our attitudes to genetic modification are based on how we feel about risk, technology and the pace of change. [CSIRO Corrick](#)

As Rod Lamberts reminded us [here recently](#), when it comes to debates on genetically modified (GM) foods, opinions about the validity of the science or about its effectiveness are

## Australia - October 2013

Broad attitudes towards science, technology and nature influence consumer attitudes towards GM foods

Pro-science and technology values are a strong predictor of support for GM foods

# Not just polarized, but entrenched and tribalized



See also his TED talks

# And pervasive online filters of information further entrench

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# Tree Biotechnology Conference at Oxford in 1999 - Vandalism against lignin modified trees to “welcome” conferees, Euro-press attacks

## FRANKENSTEIN'S FOREST

The tree-top protesters, who condemned the Government's wood-building programme by camping in the path of bulldozers, are now poised to target the very trees they might once have called home.

While public attention has been focused on the threat of 'Frankenstein Foods', the same corporations who now strive to ingest genetically modified (GM) meals have been quietly perpetrating yet another crime against the environment.

The biotech industry has been undeniably right-angled about its latest phase of the genetic revolution. But it is currently preparing to take over the world's forests - or what's

left. Campaigners fear that GM trees will sap up water, nutrients and light, leaving indigenous trees to die out along with the host of insects, plants and fungi which rely upon them. In turn, birds and animals would lose many of their natural prey. These surviving creatures would fall victim to herbicide weed-killers, liberally applied once the GM trees become resistant. The result, opponents fear, will be a silent forest, cleared of natural life.

This month, activists are targeting the Forest Biotechnology '99 conference, hosted by Oxford Forestry Institute from July 11 - 16. It will bring together some of the world's top

1997. The trees, engineered by the University of Derby, to be disease- and insect-resistant, were destroyed by removing the bark. A growing spine of raids on food crops caused AstraZeneca to make a statement to the press before a Genentech lawsuit action earlier this year, forcing change to their GM papers.

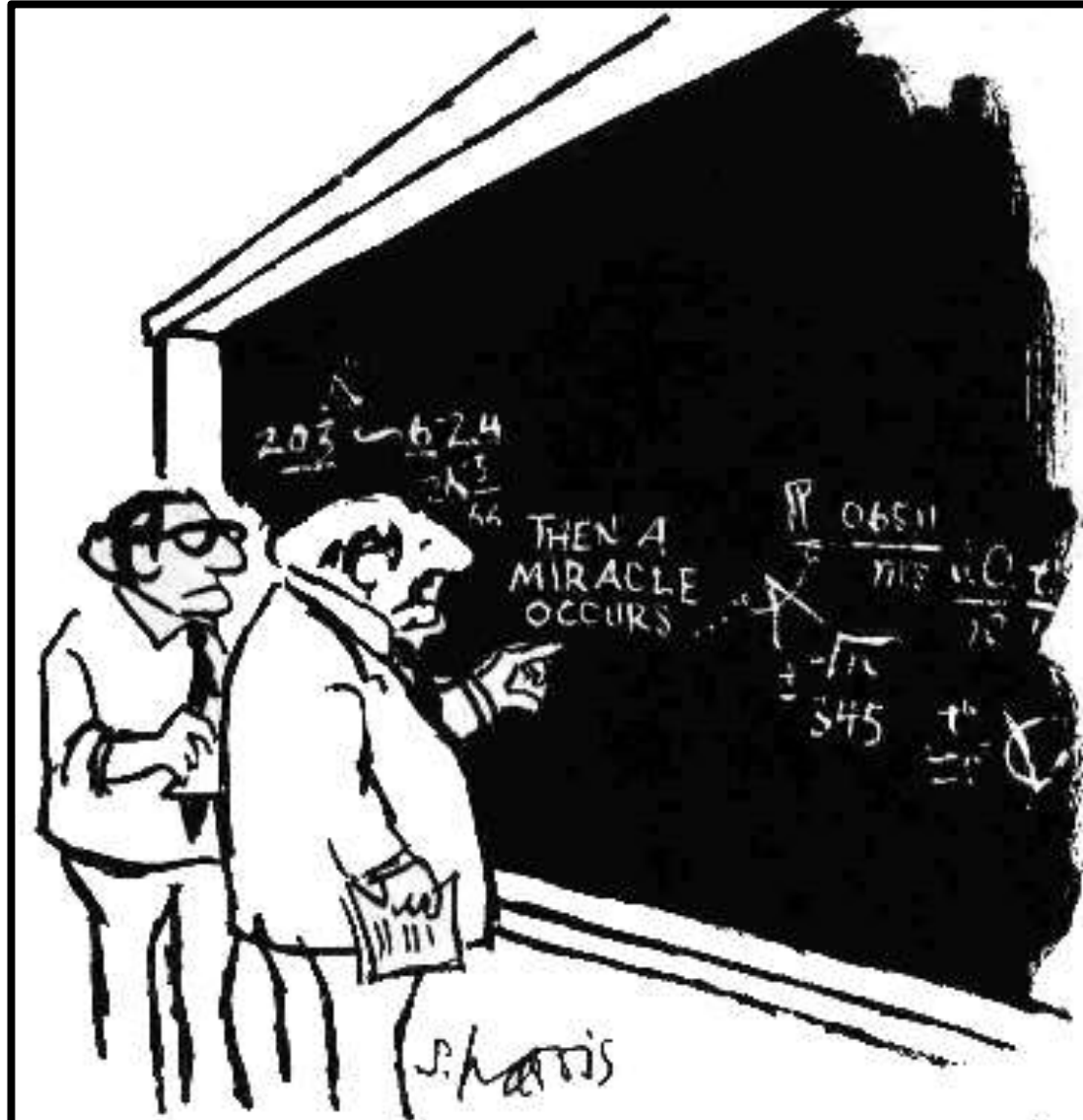
In April, Monsanto teamed up with two of the world's biggest forest and paper corporations, International Paper and Westmaco. They also get New Zealand company, Fletcher Challenge, in on the deal as they own the all-important patents on newly developed genes which will give the consortium the monopoly on GM trees that they're after. Having sunk

greenhouse gases, came into force after the 1997 Kyoto conference, industrialised countries have been forced to clean up. However, the corporations agree that by planting more trees, they should be awarded 'carbon credits', because trees absorb carbon dioxide.

Recently, naturally rich native forests have fallen to the chainsaw, only to be replaced by invasive foreign plantation species such as eucalyptus. To the unfortunate, the forest is indistinguishable from another, allowing corporations to bait about how well they are managing their operations. Look behind the greenwash and corporate such as Shell are

Whilst public attention has been focused on the threat of 'Frankenstein Foods', the same corporations who are forcing us to ingest genetically modified (GM) meals have been quietly perpetrating yet another crime against the environment.





"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

# Roadmap for talk

- Orientation
  - The context, definition of GE
- The good, bad, and the righteous
  - Good: Status in world, a few examples, humanitarian promise
  - Bad: Mismanagement, regulation/trade
  - Righteous: A la Jonathan Haidt – “Moral certainty” that polarize and impede collaborative solutions



# A sense of scale

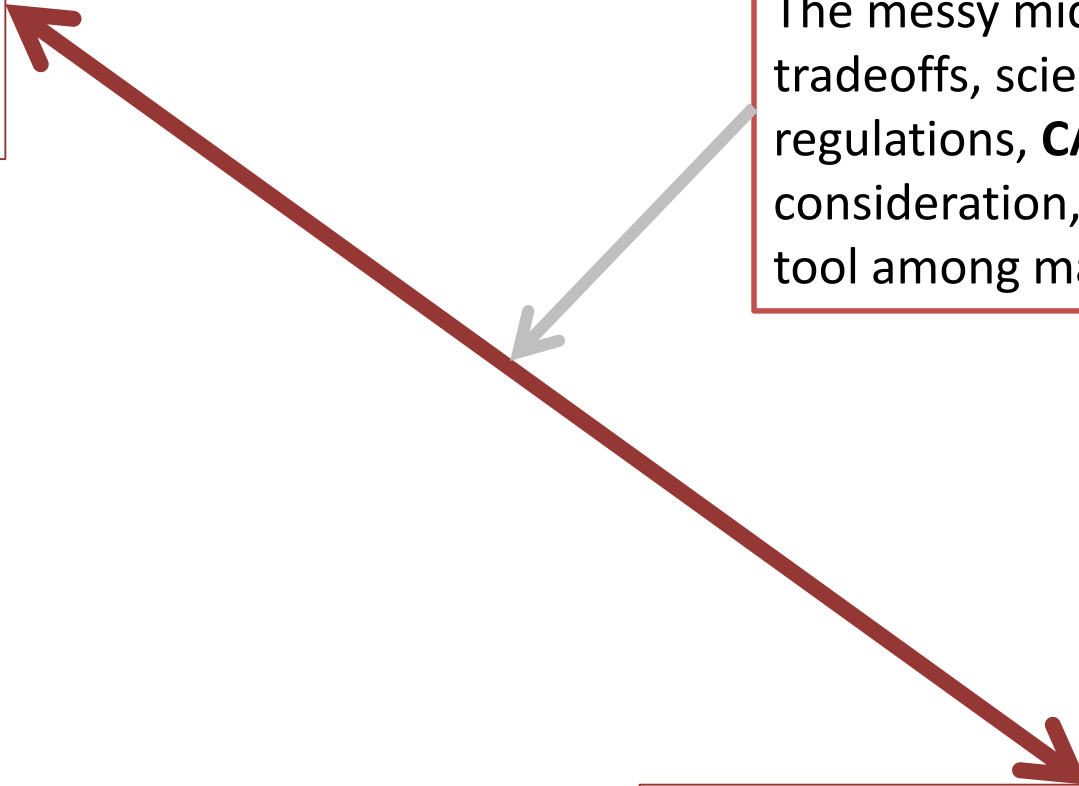
Libertarian:  
Free market,  
unfettered  
technology,  
**anything goes**

## Where science is at

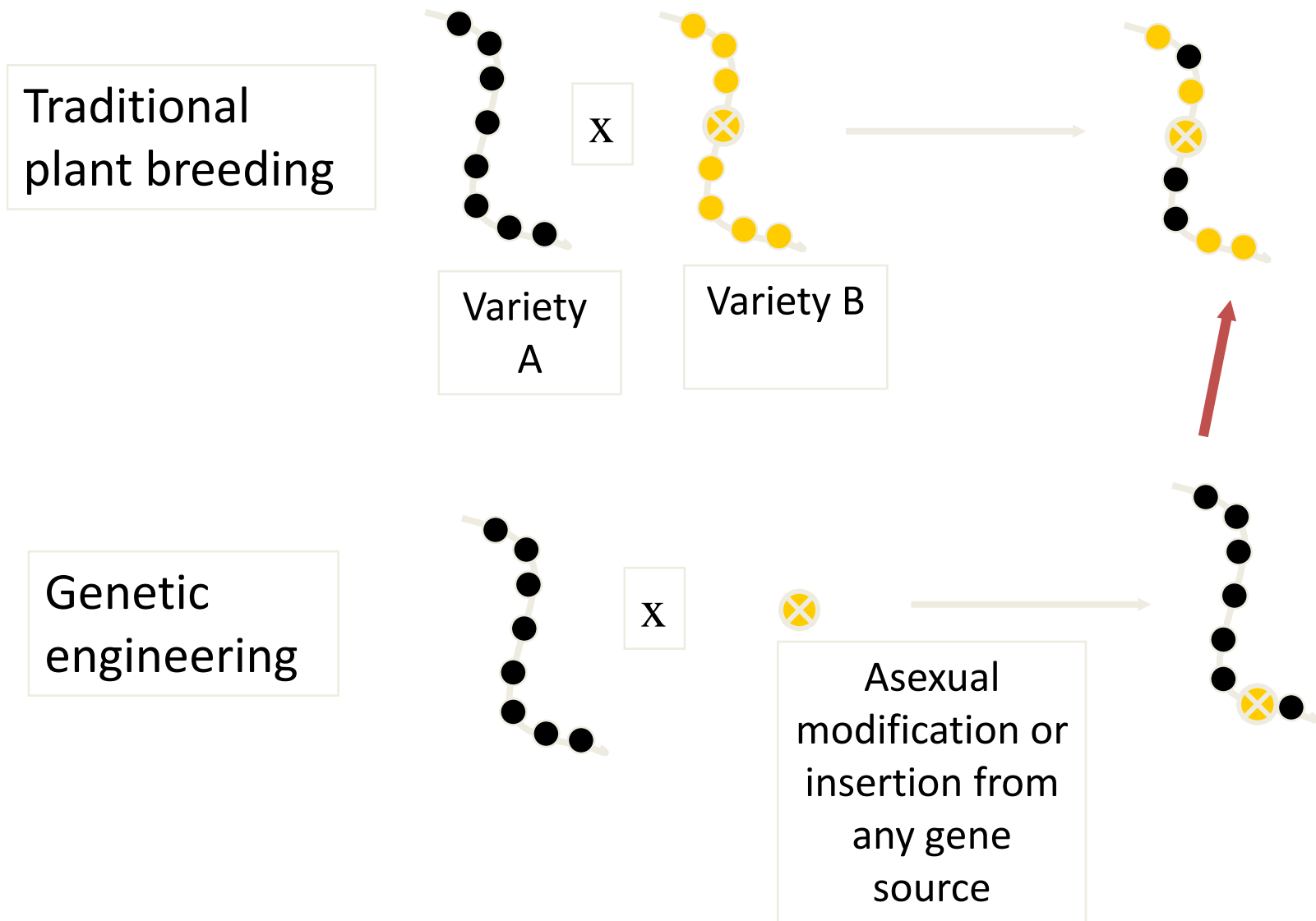
The messy middle – complex tradeoffs, science not political regulations, **CASE-BY-CASE** consideration, GMOs a valued tool among many others

**Where much of  
the world is  
today**

There is never enough regulation, biotech is opening a Pandora's Box, go back to "nature," all industrial scale food production is bad, patents are wrong,  
**all GMOs are dangerous**



# Genetic engineering defined



# The GMO acronyms

- **GE (genetic engineering) = GM (genetic modification) = transgenic = asexual modification and/or insertion of DNA**

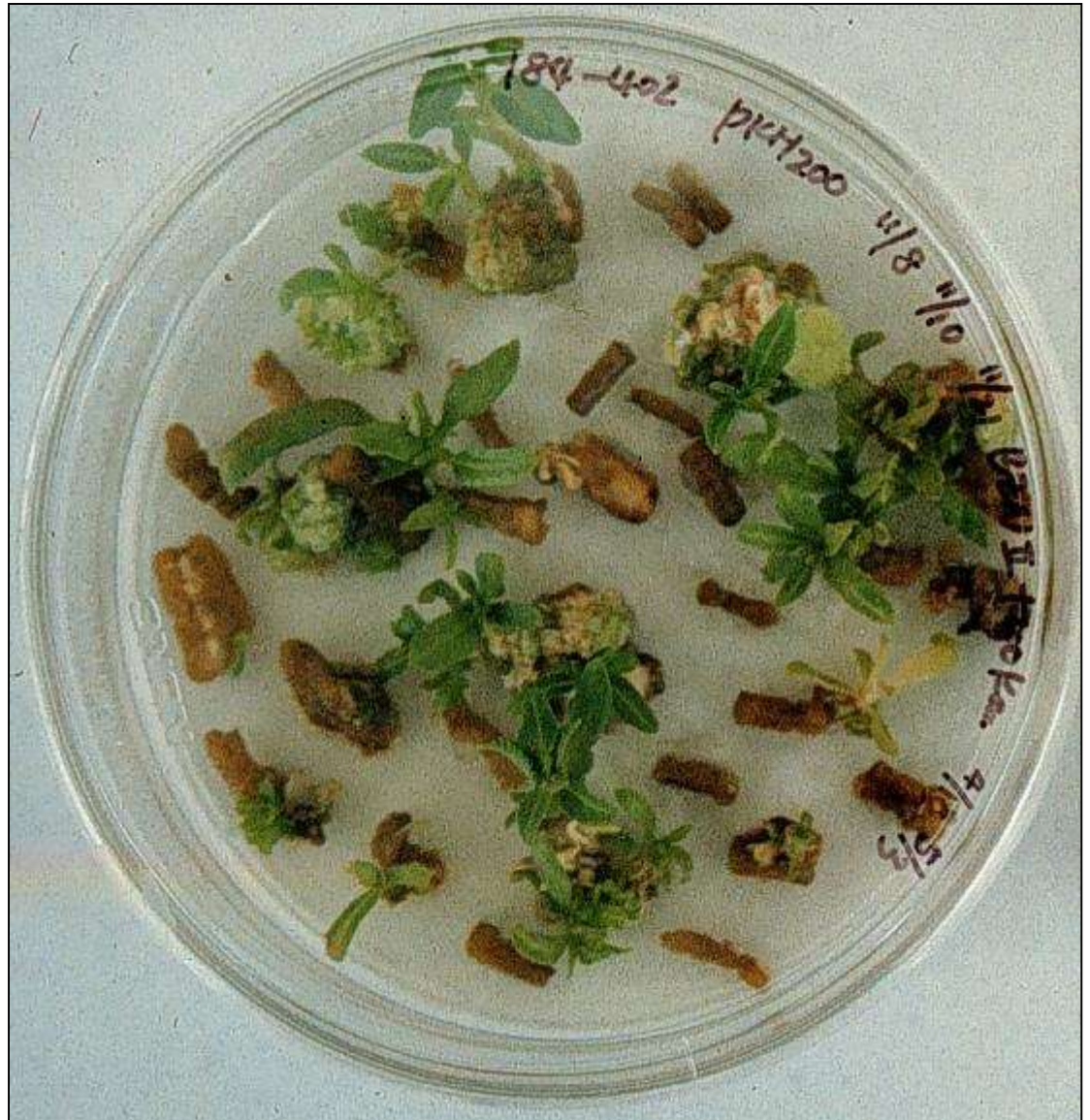
**GMO = genetically modified organism**

**GEO = genetically engineered organism**

**The terms “biotechnology” or “modern biotechnology” often equated with GE or GM methods in public media**



# Regeneration of GE plants



Then propagated normally (seeds, cuttings) and tested for health and new qualities, incorporated into breeding programs



**Propagation of poplars in tissue culture**

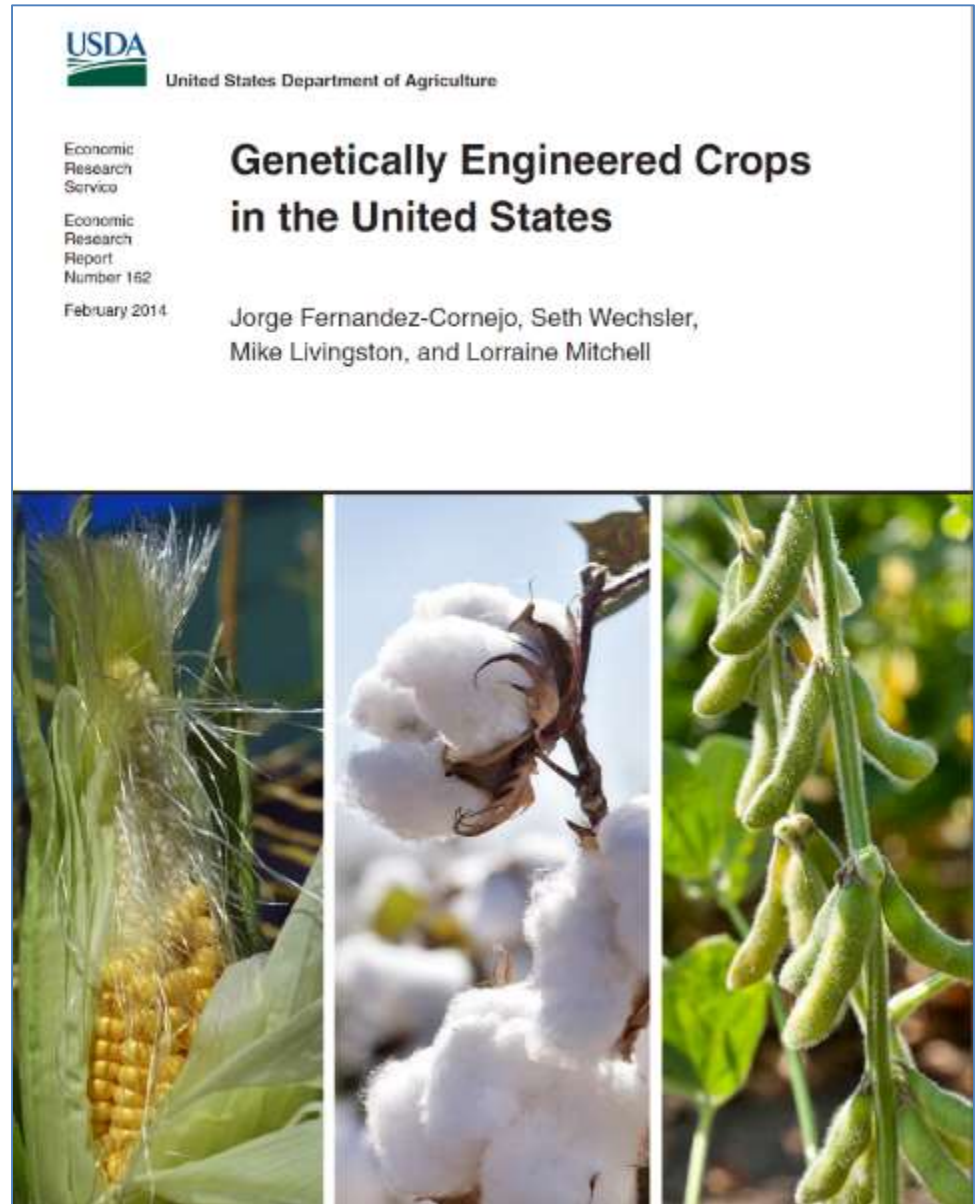


**Growth in the field**

**The good**



# Recent USDA report on GE crops in USA – published 2014



<http://www.ers.usda.gov/ersDownloadHandler.ashx?file=/media/1282246/err162.pdf>

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**ISAAA in Brief:**

- Mission
- Structure and Governance
- Donor Support Groups
- Regional Centers

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**See Also:**

- Knowledge Center Brochure
- ISAAA Corporate Video

## ISAAA in Brief

### Mission

Food, feed, fiber, and fuel for the world's 800 million people who suffer from hunger and poverty – this is the formidable task for many countries, development agencies, and other interest groups. Of the many strategies that have been forwarded to address the issues of global poverty and environmental degradation, crop biotechnology is seen as a viable contribution to the solution. As early as 1991, the International Service for the Acquisition of Agri-biotech Applications (ISAAA) saw the potential of crop biotechnology to improve the lives of small-scale farmers in developing countries. By sharing and disseminating scientific knowledge to the global community, and by facilitating the transfer of technologies to developing countries through public-private partnerships, ISAAA has established its role and contribution in world efforts to help achieve agricultural sustainability and development.

### ISAAA's Niche

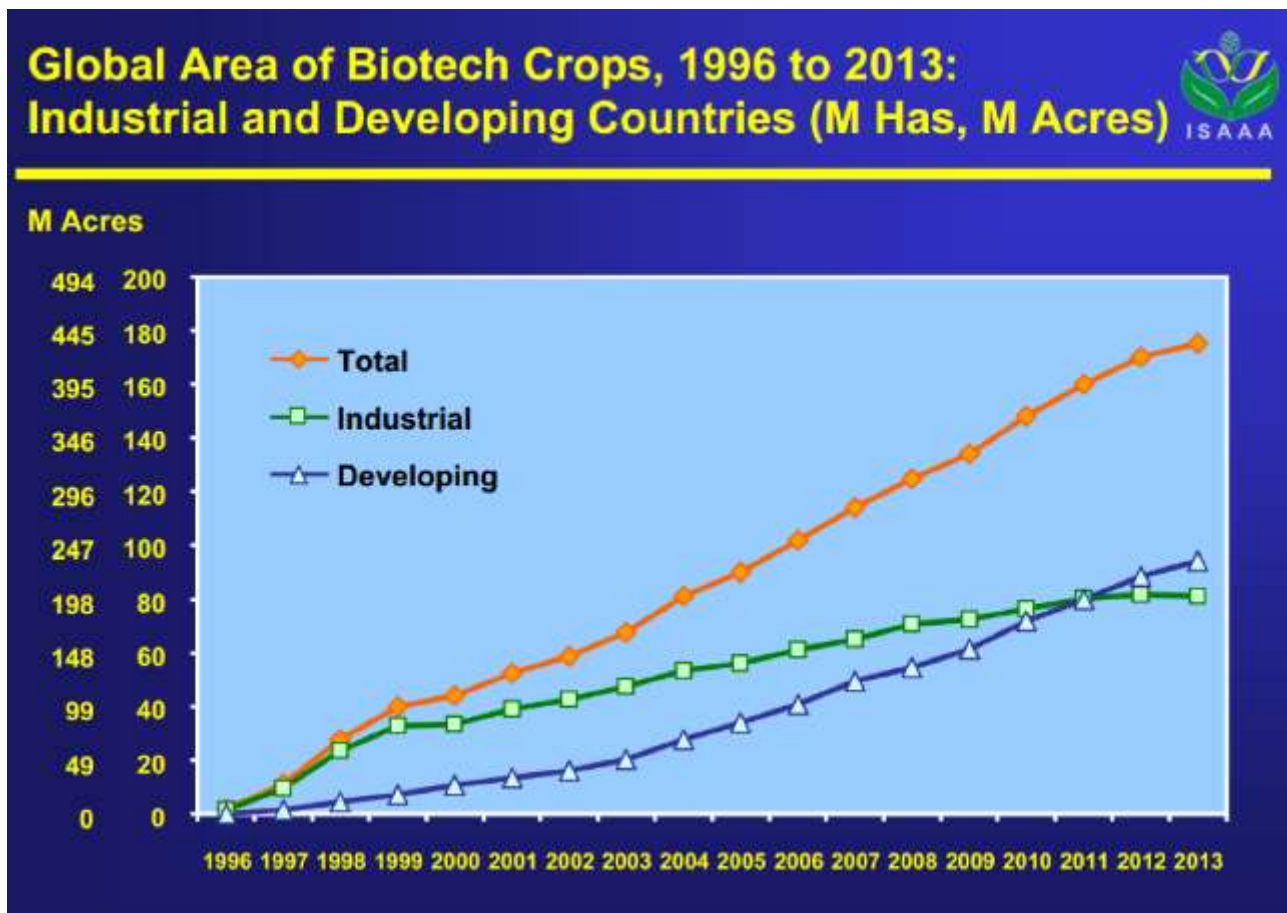
ISAAA is a not-for-profit international organization that shares the benefits of crop biotechnology to various stakeholders, particularly resource-poor farmers in developing countries, through knowledge sharing initiatives and the transfer and delivery of proprietary biotechnology applications. ISAAA's global knowledge sharing network and partnerships in the research and development continuum,

<http://www.isaaa.org/inbrief/default.asp>

# GMO crops widespread

~Most rapidly adopted innovation in history of agriculture, grown on >10% arable land on planet

\* *Extensive uptake in developing world*



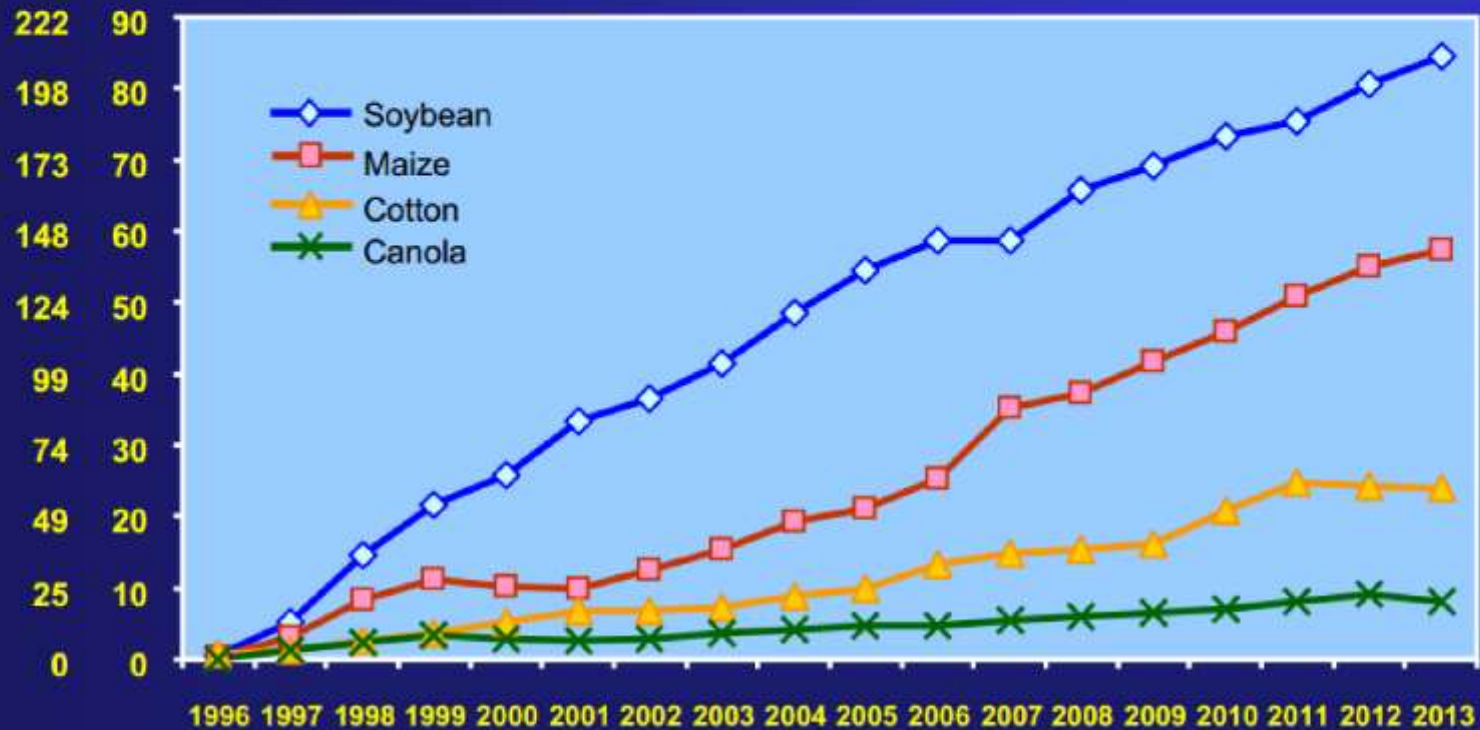


# Four crops dominate

## Global Area of Biotech Crops, 1996 to 2013: By Crop (Million Hectares, Million Acres)



M Acres



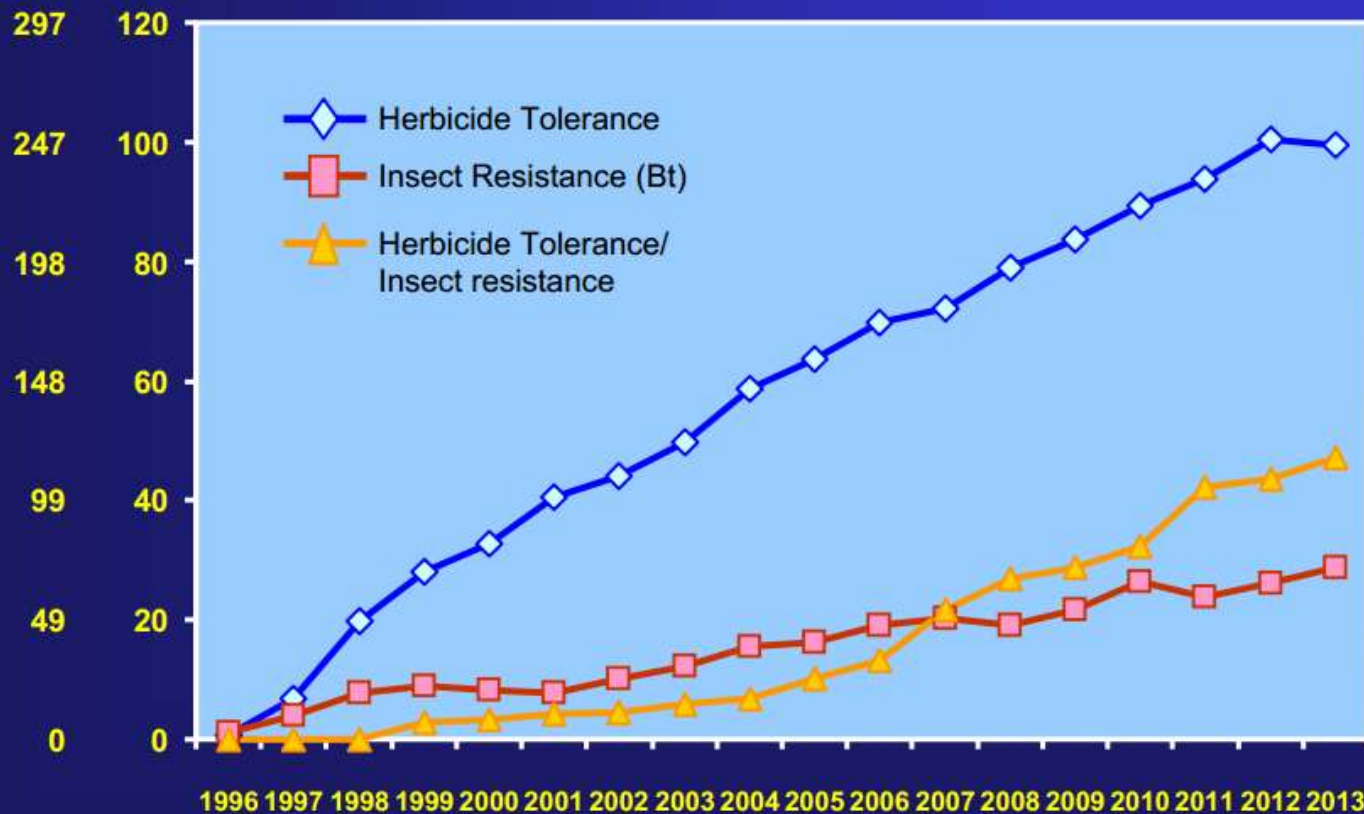


# Two traits dominate

## Global Area of Biotech Crops, 1996 to 2013: By Trait (Million Hectares, Million Acres)

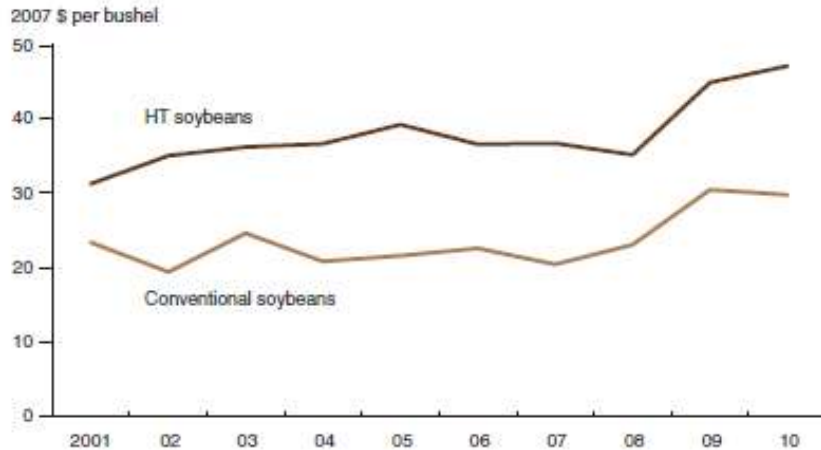


M Acres

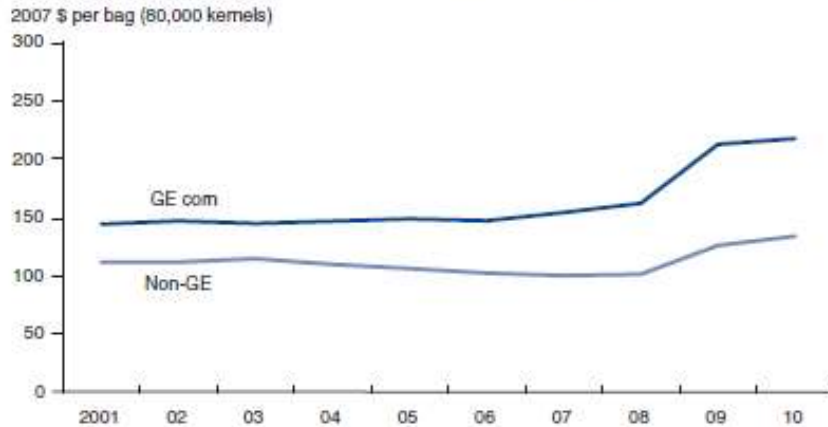


# GE seed cost ~50% higher in USA

Figure 11  
Prices of genetically engineered (GE) seed are higher than those of non-GE seed, soybeans

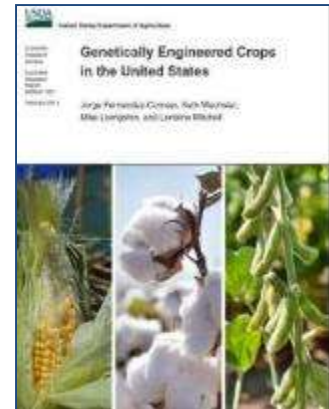


Prices of genetically engineered (GE) seed are higher than those of non-GE seed, corn



HT crops have herbicide tolerance traits.

Source: USDA Economic Research Service using data from USDA National Agricultural Statistics Service *Agricultural Prices*, various years.



# Major reports on GMO crops show very large positive impacts on economics, sustainability, in USA and worldwide

**THE NATIONAL ACADEMIES**  
DIVISION ON EARTH AND LIFE STUDIES

## The Impact of Genetically Engineered Crops on Farm Sustainability in the United States

Public Briefing  
NAS Lecture Room  
April 13, 2010

**THE NATIONAL ACADEMIES**  
Division on Earth and Life Studies  
National Academy of Sciences  
National Academy of Engineering  
Institute of Medicine  
National Research Council

 Review in Advance first posted online on August 14, 2013. (Changes may still occur before final publication online and in print.)

## Agricultural Biotechnology: Economics, Environment, Ethics, and the Future

Alan B. Bennett,<sup>1,2</sup> Cecilia Chi-Ham,<sup>2</sup>  
Geoffrey Barrows,<sup>3</sup> Steven Sexton,<sup>4</sup>  
and David Zilberman<sup>1</sup>

<sup>1</sup>Department of Plant Sciences, <sup>2</sup>Public Institutional Property Resource for Agriculture, University of California, Davis, California 95616; email: abennett@ucdavis.edu, cchiham@ucdavis.edu  
<sup>3</sup>Department of Agricultural and Resource Economics, University of California, Berkeley, California 94720; email: gbarrows@berkeley.edu, schar11@berkeley.edu  
<sup>4</sup>Department of Agricultural and Resource Economics, North Carolina State University, Raleigh, North Carolina 27697; email: ssexton@ncsu.edu

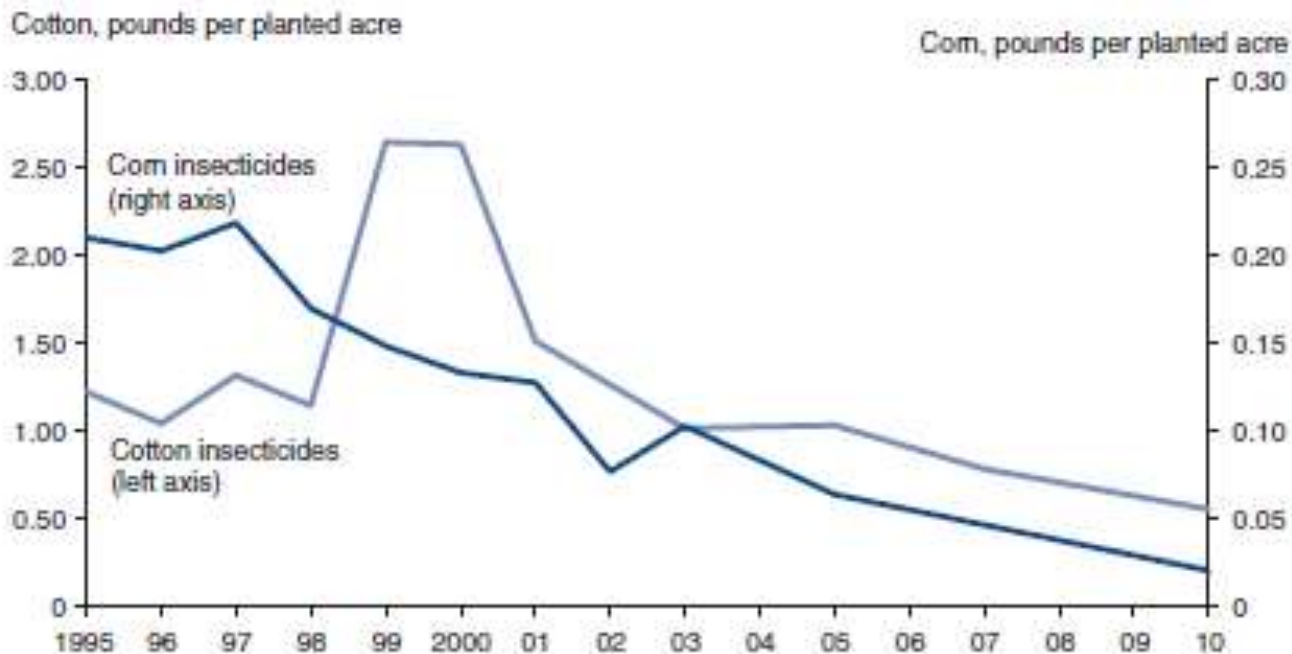
**Keywords**  
genetic modification, genetic engineering, GMO, GM crops, food security

**Abstract**  
Agricultural biotechnology and, specifically, the development of genetically modified (GM) crops have been controversial for several reasons, including concerns about safety, environmental impact, and

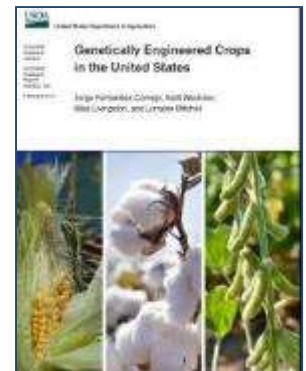
Ann. Rev. Environ. Econ. 2014. 46:193-212  
The Annual Review of Environment and Resources is online at <http://www.annualreviews.org>.  
This article's doi: 10.1146/annurev-environ-011912-124842  
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# Hundreds of millions of pounds less insecticide use due to GE crops in USA: Maize and cotton

Figure 12  
Insecticide use in corn and cotton production, 1995-2010



Source: USDA Economic Research Service using data from USDA National Agricultural Statistics Service Agricultural Chemical Usage reports.





# Herbicide tolerant plants promote conservation tillage – With many environmental benefits thereof

Conservation Technology Information Center

- In USA 2002
  - Used 306 million gallons less fuel
  - \$3.5B savings in sedimentation costs
- Lowers greenhouse gas emissions
- Improves soil organic matter
- Reduces erosion and fertilizer runoff into water
- Often provides better wildlife habitat



**Global: In 2012 reduced CO2 emissions by ~27 billion kg, equivalent to ~13 million cars off the road**

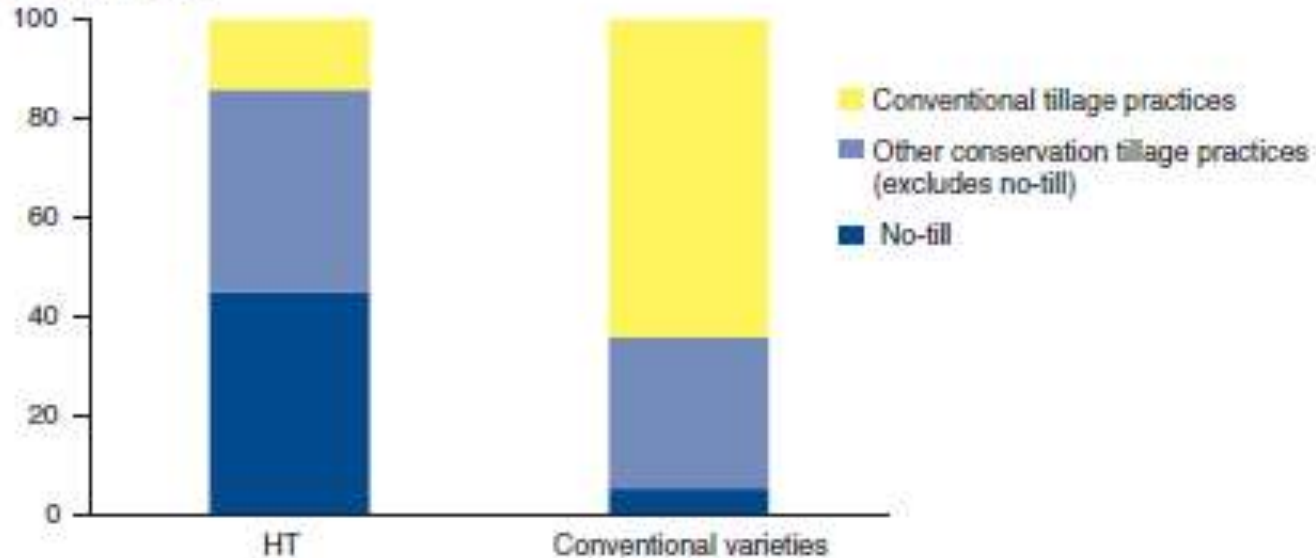
<http://www.isaaa.org/resources/publications/briefs/46/topfacts/default.asp>

# Increased conservation tillage due to GE crops in USA: Soy 2006

Figure 15

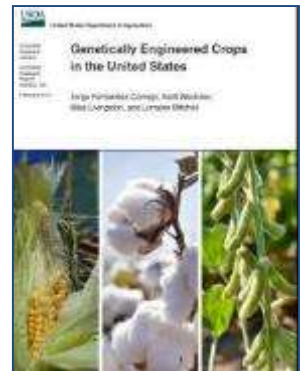
Adopters of herbicide-tolerant crops used conservation tillage more than did growers of conventional varieties: soybeans, 2006

Percent of acres



Conservation tillage includes no-till, ridge-till and mulch-till.

Source: USDA Economic Research Service using data from 2006 ARMS Phase II soybean survey.



# Yield benefits significant

## Peer-reviewed surveys indicate positive impact of commercialized GM crops

### To the Editor:

The benefits of genetically modified (GM) crops continue to be disputed, despite rapid and widespread adoption since their

farmers report yield increases that range from no change for herbicide-tolerant cotton to a 7% increase for herbicide-tolerant soybean and insect-resistant

The results show the variability of benefits from region to region and year to year. A survey of Indian cotton farmers in crop harvest years 2005–2006 through

**Table 1** Number and direction of results comparing yields of GM adopters to those of non-adopters, by country

| Country                     | Positive | Neutral | Negative | Total |
|-----------------------------|----------|---------|----------|-------|
| <i>Developed countries</i>  | 36       | 18      | 7        | 61    |
| Australia                   | 0        | 2       | 2        | 4     |
| Canada                      | 7        | 0       | 1        | 8     |
| Spain                       | 3        | 6       | 0        | 9     |
| United States               | 26       | 10      | 4        | 40    |
| <i>Developing countries</i> | 88       | 13      | 6        | 107   |
| Argentina                   | 5        | 1       | 0        | 6     |
| China                       | 15       | 0       | 0        | 15    |
| Colombia                    | 4        | 1       | 0        | 5     |
| India                       | ...      | ...     | ...      | ...   |
| Mexico                      | ...      | ...     | ...      | ...   |
| Philippines                 | ...      | ...     | ...      | ...   |
| Romania                     | ...      | ...     | ...      | ...   |
| South Africa                | ...      | ...     | ...      | ...   |

**Table 2** Average impact on yield, by technology, for developed and developing countries

| Technology                                     | Difference in yield (%) | Number of results | Minimum (%) | Maximum (%) | Standard error of the mean (%) |
|--|-------------------------|-------------------|-------------|-------------|--------------------------------|
| <i>Developed countries</i>                     | 6                       | 59                | -12         | 26          | 1.0                            |
| Herbicide-tolerant cotton                      | 0                       | 6                 | -12         | 17          | 3.8                            |
| Herbicide-tolerant soybean                     | 7                       | 14                | 0           | 20          | 1.7                            |
| Herbicide-tolerant and insect-resistant cotton | 3                       | 2                 | -3          | 9           | 5.8                            |
| Insect-resistant corn                          | 4                       | 13                | -3          | 13          | 1.6                            |
| Insect-resistant cotton                        | 7                       | 24                | -8          | 26          | 1.9                            |
| <i>Developing countries</i>                    | 29                      | 107               | -25         | 150         | 2.9                            |
| Herbicide-tolerant corn                        | 85                      | 1                 | ...         | ...         | ...                            |
| Herbicide-tolerant soybean                     | 21                      | 3                 | 0           | 35          | 11                             |
| Insect-resistant corn                          | 16                      | 12                | 0           | 38          | 4                              |
| Insect-resistant corn (white)                  | 22                      | 9                 | 0           | 62          | 6.9                            |
| Insect-resistant cotton                        | 30                      | 62                | -25         | 150         | 3.5                            |

Yield difference for adopters was calculated as (GM yield - conventional yield)/conventional yield, averaging yields across surveys, geographies, years and methodologies. The difference in the number of results reported in **Tables 1** and **2** is due to two results reported as 'positive' with no numerical value. A two-tailed *t* test shows a significant difference between the average yields of developed and developing countries ( $t = 7.48$ ,  $df = 134$ ,  $P < 0.0005$ ).

6% mean yield improvement in developed countries

29% in developing countries

Also strong economic, environmental toxicity, and social benefits

# Yield benefits in USA growing with stacked traits: USDA report

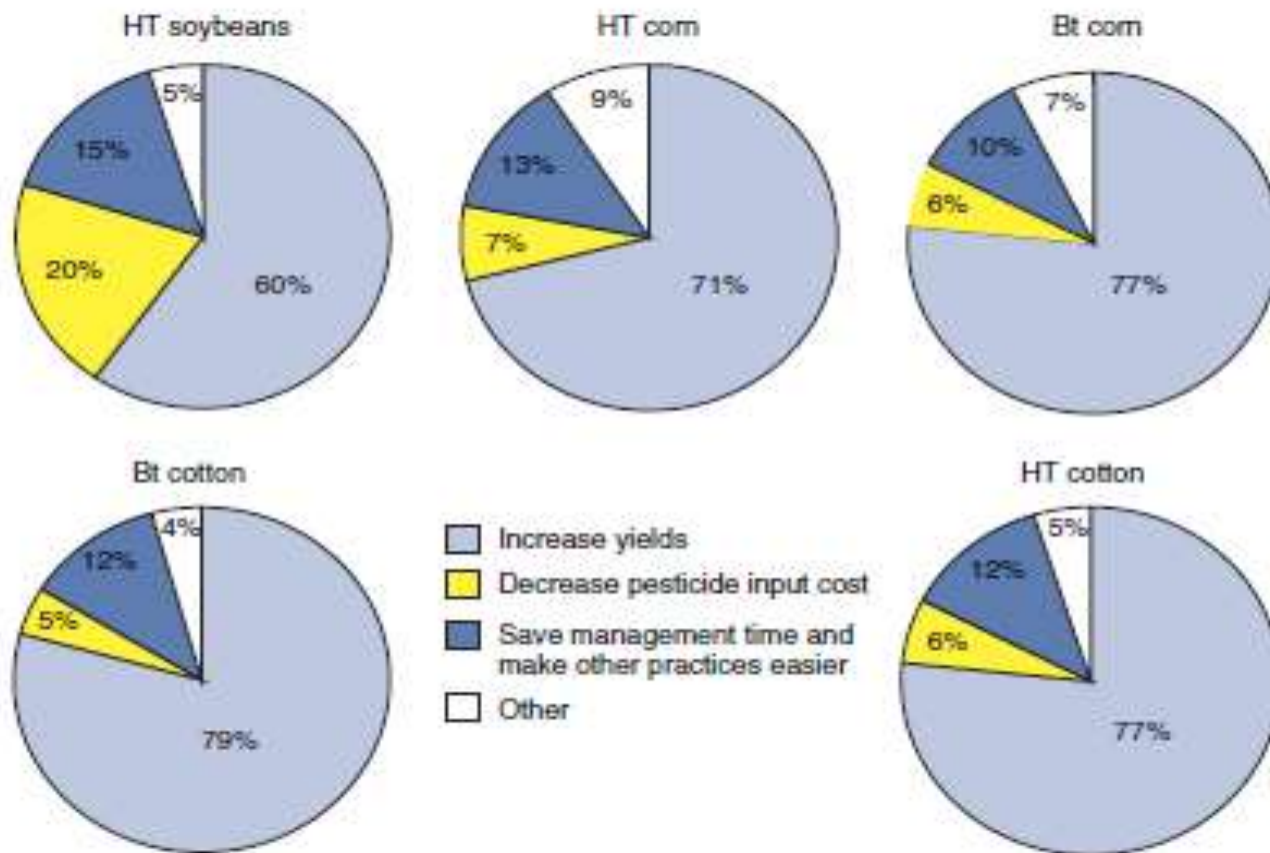
“The yield advantage of Bt corn and Bt cotton over conventional seed has become larger in recent years as new Bt traits have been incorporated and stacked traits have become available. Planting Bt cotton and Bt corn continues to be more profitable, as measured by net returns, than planting conventional seeds.”





# Survey: USA farmers regard yield benefits as a major reason for use of GE crops

Figure 7  
Farmers' reasons for adopting genetically engineered crops



Bt crops have insect resistant traits; HT crops have herbicide tolerance traits.

Sources: USDA Economic Research Service using data from Agricultural Resource Management Survey (ARMS) Phase II surveys: 2010 for corn, 2007 for cotton, and 2006 for soybeans.



# Benefits provided by biotech crops, on a global scale, large: 1996-2012

- Increased crop production valued at US\$116.9 billion
- Conserved biodiversity (indirectly) by saving 123 million hectares of land from 1996-2012
- Helped alleviate poverty for >16.5 million small farmers and their families totaling >65 million people, who are some of the poorest in the world

# Its not all mega-crops or mega-traits

*Numerous innovations have been demonstrated in lab or field research, but never make it to market*

*Below are a few that have or might soon....*

# Its not all mega-crops or mega-traits

Virus-resistant papaya saved the Hawaiian industry in the mid-1990s / ~70% of papaya today

- \* Nobel prize winning RNAi - “Immunization” via by implanting a viral gene in the papaya genome

- \* Great humanitarian potential due to wide use of papaya in developing world



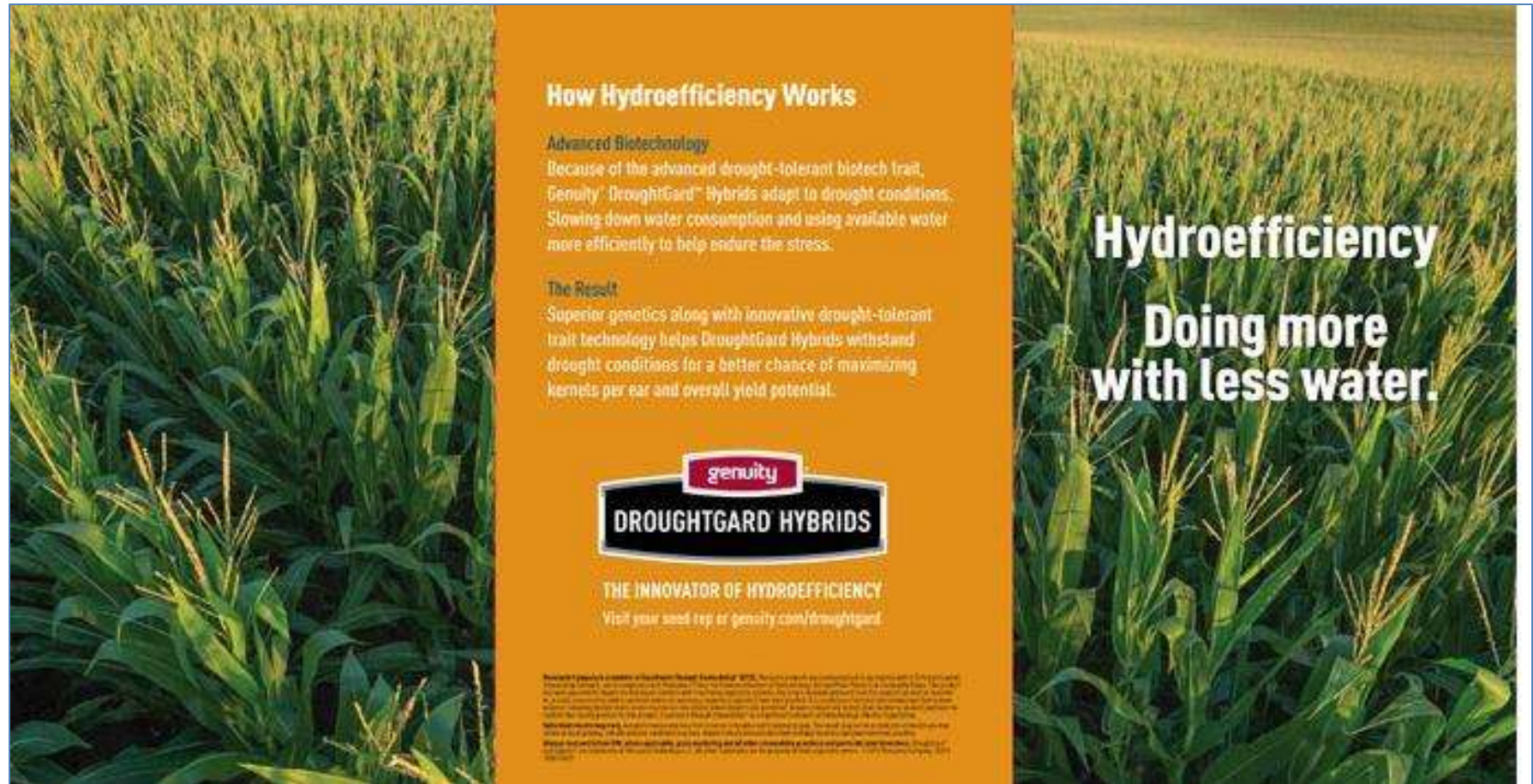
Courtesy of Denis Gonsalves, formerly of Cornell University



**GMO, virus-resistant trees**



Drought-tolerant maize – Planted on  
~150,000 acres – Also tested in Africa  
*Important tool given climate change, water  
shortages?*



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Because of the advanced drought-tolerant biotech trait, Genuity® DroughtGard™ Hybrids adapt to drought conditions. Slowing down water consumption and using available water more efficiently to help endure the stress.

**The Result**  
Superior genetics along with innovative drought-tolerant trait technology helps DroughtGard Hybrids withstand drought conditions for a better chance of maximizing kernels per ear and overall yield potential.

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# Purple GM tomatoes with increased antioxidants and rot resistance

Current Biology 23, 1094–1100, June 17, 2013 ©2013 Elsevier Ltd All rights reserved. <http://dx.doi.org/10.1016/j.cub.2013.04.011>

## Anthocyanins Double the Shelf Life of Tomatoes by Delaying Overripening and Reducing Susceptibility to Gray Mold

Yang Zhang,<sup>1</sup> Eugenio Butelli,<sup>1</sup> Rosalba De Stefano,<sup>2</sup> Henk-Jan Schoonbeek,<sup>1</sup> Andreas Magusin,<sup>1</sup> Chiara Pagliarani,<sup>2</sup> Nikolaus Wellner,<sup>4</sup> Lionel Hill,<sup>1</sup> Diego Orzaez,<sup>5</sup> Antonio Granell,<sup>6</sup> Jonathan D.G. Jones,<sup>6</sup> and Cathie Martin<sup>1,\*</sup>

<sup>1</sup>John Innes Centre, Norwich Research Park, Norwich, NR4 7UH, UK

They are produced by plants that disperse anthocyanin pigments [9]. Anthocyanin production is induced under stress conditions [11]. Besides physiological functions, anthocyanins are associated with protection against [12], cardiovascular diseases [13], and cancer [14].



# Improved soy oil


## *Suppression of native gene*

HOME PAGE TODAY'S PAPER VIDEO MOST POPULAR U.S. Edition ▼

**The New York Times** **Business Day**

WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCIENCE HEALTH SPORTS OPINION AI

### In a Bean, a Boon to Biotech



DuPont Pioneer

DuPont Pioneer's oil compared with soybean oils with partly hydrogenated oils, the source of trans fats

By ANDREW POLLACK  
Published: November 15, 2013

A new federal push to purge artery-clogging trans fats from foods could be just what the doctor ordered — not only for public health but for the unpopular biotechnology industry, specifically, two developers of genetically modified crops.

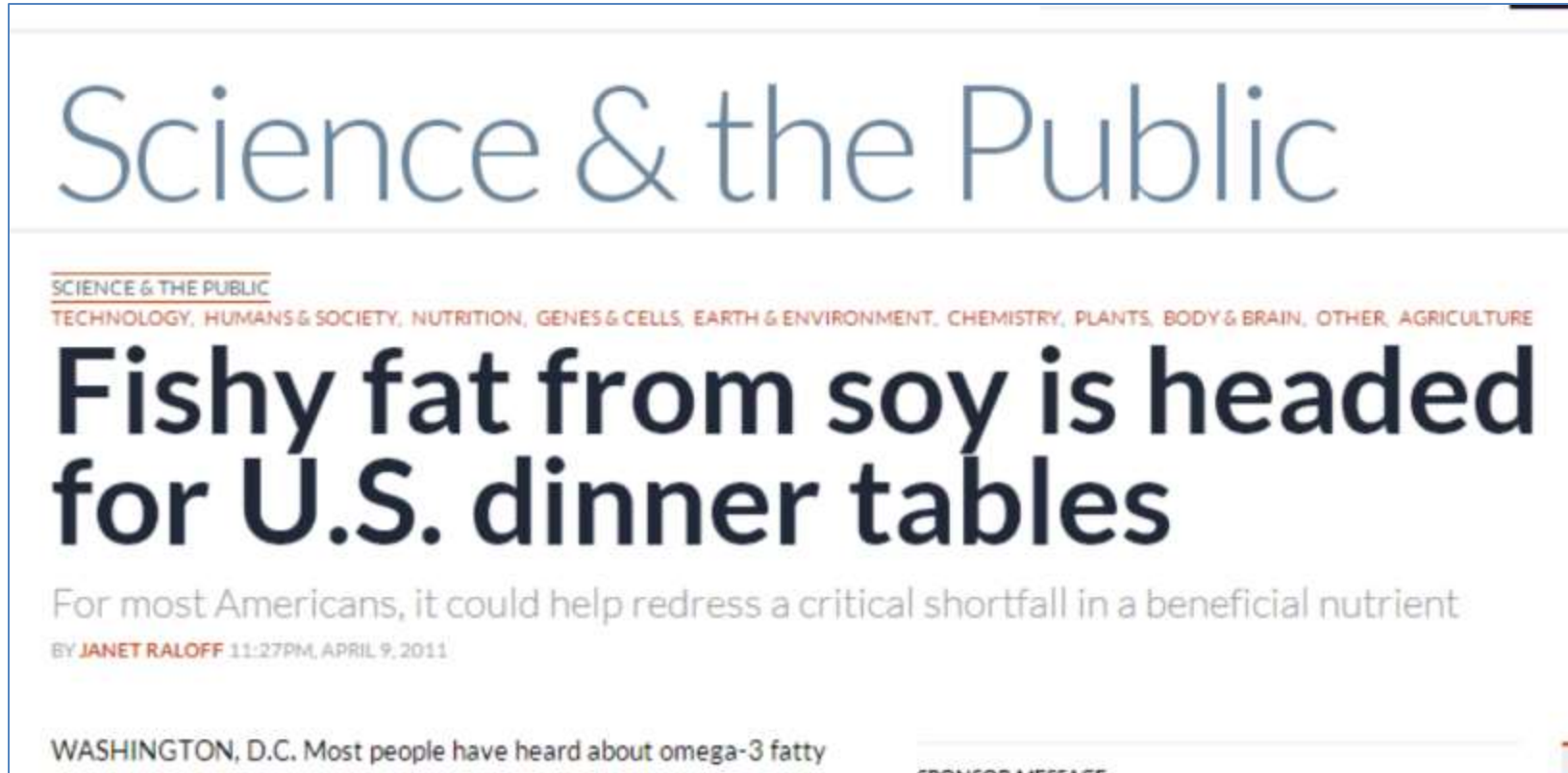
FACEBOOK TWITTER GOOGLE+

“The developers, Monsanto and DuPont Pioneer, have manipulated the genes of the soybean to radically alter the composition of its oil to make it longer-lasting, potentially healthier and free of trans fats.”

“It almost mirrors olive oil in terms of the composition of fatty acids.”



# Omega-3 enhanced GM soy oil to promote health, replace fish oils



Science & the Public

SCIENCE & THE PUBLIC  
TECHNOLOGY, HUMANS & SOCIETY, NUTRITION, GENES & CELLS, EARTH & ENVIRONMENT, CHEMISTRY, PLANTS, BODY & BRAIN, OTHER, AGRICULTURE

## Fishy fat from soy is headed for U.S. dinner tables

For most Americans, it could help redress a critical shortfall in a beneficial nutrient.

BY JANET RALOFF 11:27PM, APRIL 9, 2011

WASHINGTON, D.C. Most people have heard about omega-3 fatty

<https://www.sciencenews.org/blog/science-public/fishy-fat-soy-headed-us-dinner-tables>



# Potato – reduced browning and acrylamide by gene suppression (↓waste, ↑safety)

## Trait #1 - Silenced PPO (Enzyme)

- Non-browning when cut
- Reduced black spot bruise

## Trait #2 - Reduced Asparagine (Amino Acid)

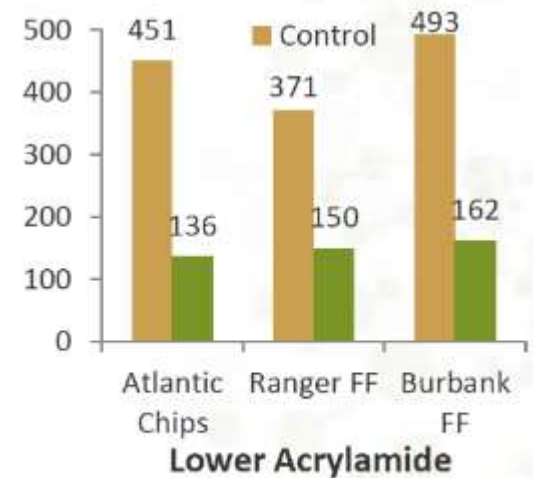
- Yields a 50-80% reduction in acrylamide when baked or fried
- Meets Prop 65 in California

## Four Improved Varieties

- Russet Burbank, Ranger Russet, Atlantic, Snowden
- No effect on taste, texture, or performance
- USDA approval expected in 2014

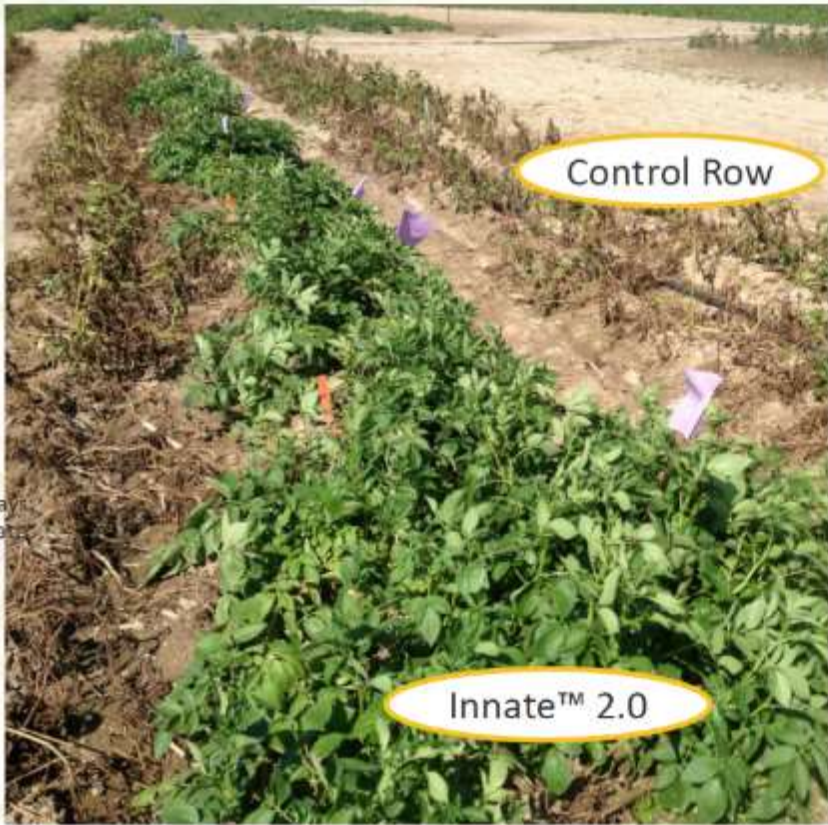


Non-Browning



# 2<sup>nd</sup> gen – blight resistant, less sprouting & over-ripening (↓pesticide, ↓waste, ↑yield)

Midwest - Sept 4<sup>th</sup> 2013



Control

Innate™ 2.0

Zebra Chip



Burbank



Innate™  
Burbank





# American Chestnut restoration – genetic engineering a key tool?

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### The American Chestnut's Genetic Rebirth

A foreign fungus nearly wiped out North America's once vast chestnut forests. Genetic engineering can revive them

By William Powell

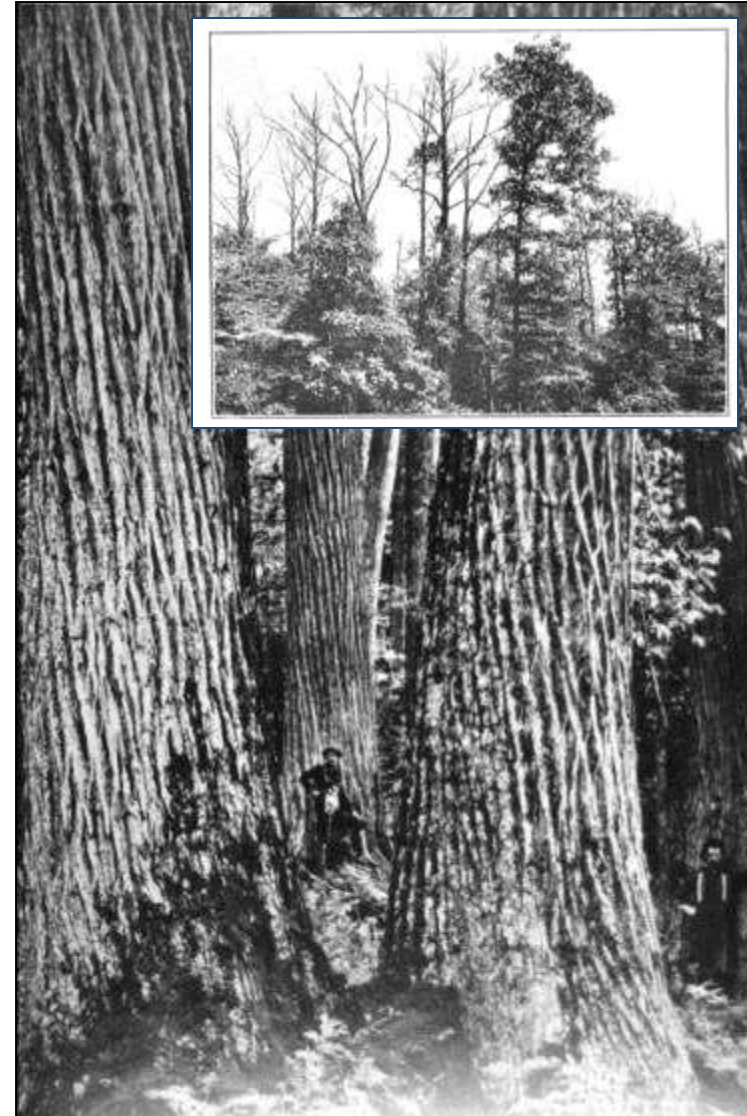
In 1876 Samuel B. Parsons received a shipment of chestnut seeds from Japan and decided to grow and sell the trees to orchards. Unbeknownst to him, his shipment likely harbored a stowaway that caused one of the greatest ecological disasters ever to befall eastern North America. The trees probably concealed spores of a pathogenic fungus, *Cryphonectria parasitica*, to which Asian chestnut trees—but not their American cousins—had evolved resistance. *C. parasitica* effectively strangles

More In This Article



A New Generation of American Chestnut Trees May Redefine America's Forests

March 2014 issue - Scientific American



# Biofortified plants are improving nutrition for many, and can do much more

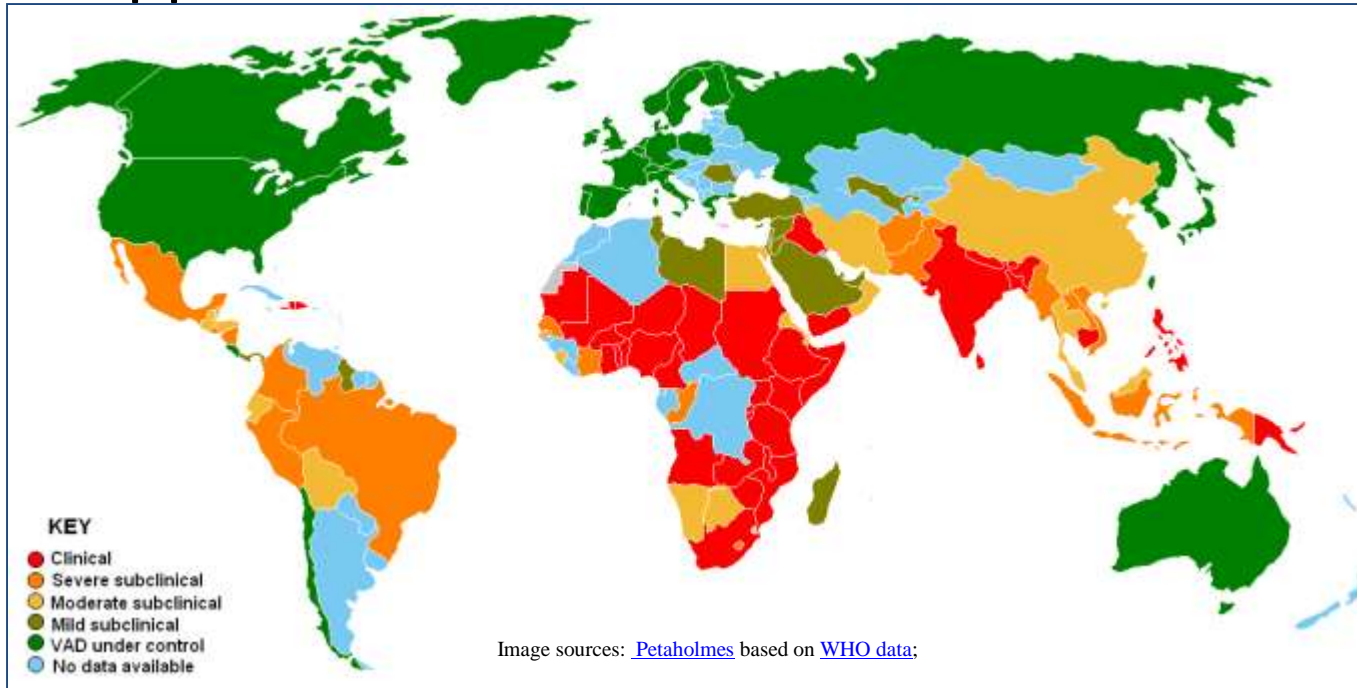


The non-profit organization HarvestPlus focuses on the development of biofortified crops for the developing world, including a provitamin A enriched sweet potato that is **currently** being grown by half a million families. Other biofortification projects are underway to increase levels of protein, iron, zinc, antioxidants, and other beneficial components in food.



# Why use breeding and biotechnology for $\beta$ -carotene (pro-vitamin A) enrichment?

Deficiency is widespread, impacts severe, and decades of supplements are unable to overcome



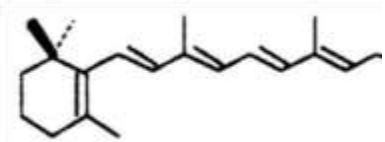
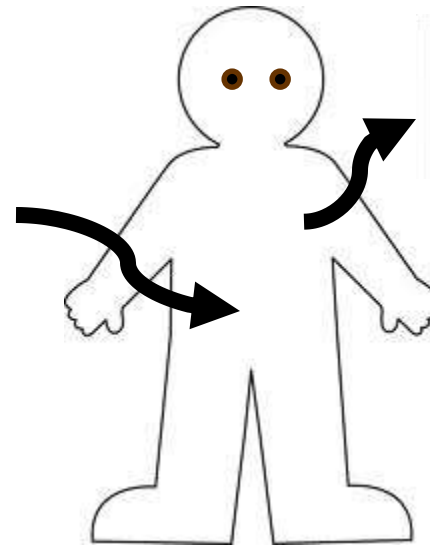
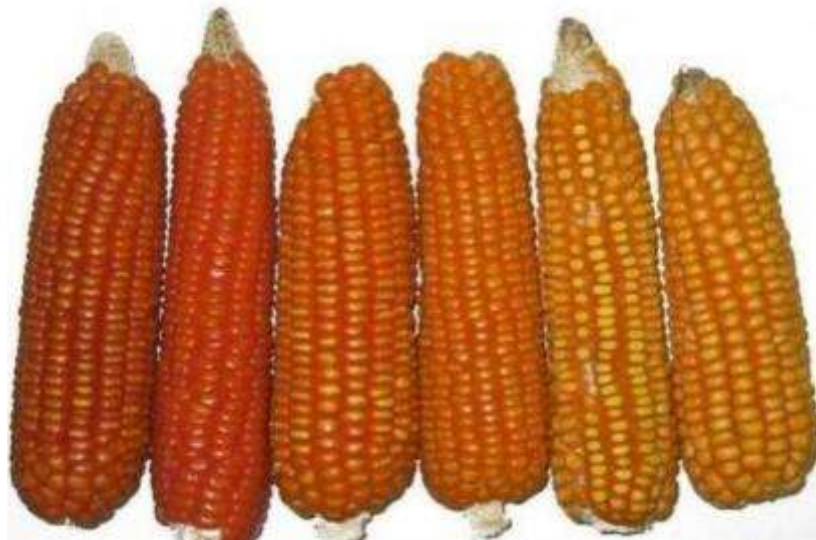
Young women suffering blindness due to Vit A deficiency

Vitamin A deficiency is estimated to affect approximately one third of children under the age of five around the world. It is estimated to claim the lives of 670,000 children under five annually. Approximately 250,000-500,000 children in developing countries become blind each year owing to vitamin A deficiency.... night blindness due to vitamin A deficiency is also high among pregnant women in many developing countries.

# Breeding and GMO methods can enhance plant nutritional quality



$\beta$ -carotene

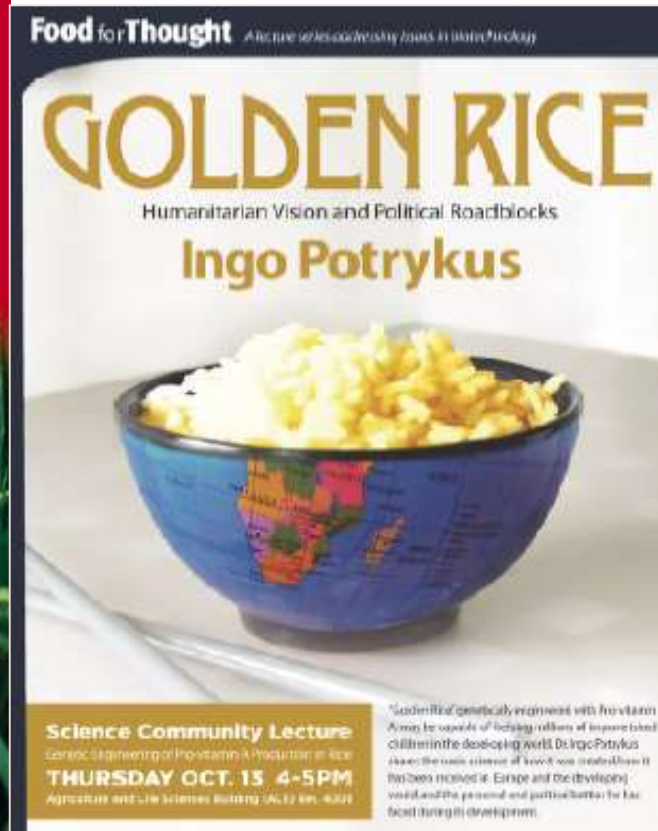
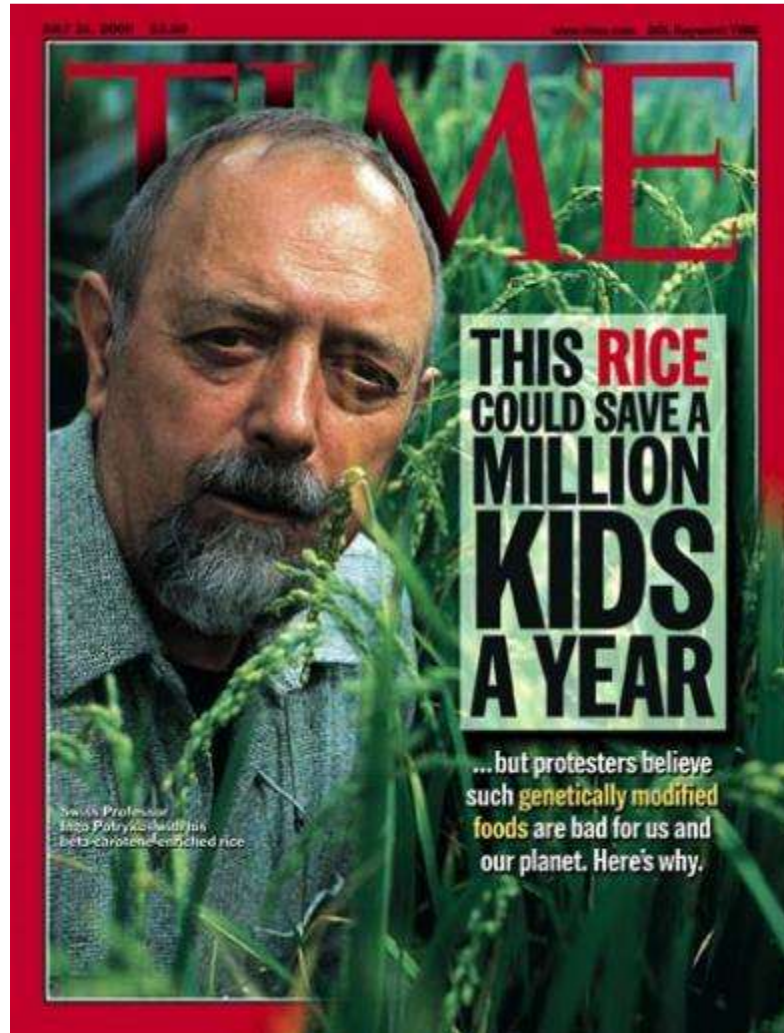


Vitamin A

The  $\beta$ -carotene enriched foods shown here have been produced using GM and non-GM approaches

# Golden Rice is the most prominent GMO biofortification product under development

$\beta$ -carotene makes the rice look golden





# Vitamin A enrichment for the poor in Africa?

## DuPont reports breakthrough in introducing beta carotene in Sorghum



In Africa, up to half a million children become blind from Vitamin A Deficiency (VAD) with increased risk of cognitive impairment, disease and death from severe infections. Furthermore, nearly 600,000 women die from c..

20 Feb 2014

**IOWA, USA:** Dupont has achieved a breakthrough in introducing pro-vitamin (beta carotene) into sorghum, a staple food in Africa which is naturally deficient in key nutrients.

This is expected to help improve nutrition for nearly 300 mn people in Africa dependent on Sorghum. DuPont said that the ability to achieve 100 % of the recommended daily allowance of vitamin A in children from Sorghum has never been achieved before.

In Africa, up to half a million children become blind from Vitamin A Deficiency (VAD) with increased risk of cognitive impairment, disease and death from severe infections. Furthermore, nearly 600,000 women die from childbirth-related causes, many from complications that could be reduced through more vitamin A in their diet.



**The bad**

# Poor weed management has led to rapid development of herbicide tolerant weeds

**nature  
biotechnology**

nature.com > journal home > archive > issue > news > full text

NATURE BIOTECHNOLOGY | NEWS

## Glyphosate resistance threatens Roundup hegemony

Emily Waltz

Nature Biotechnology 28, 537–538 (2010) | doi:10.1038/nbt0610-537  
Corrected online 13 October 2010  
Corrigendum (October, 2010)

PDF Citation Reprints Rights & permissions Article metrics

Weeds are becoming increasingly resistant to glyphosate, a report from the US National Academy of Sciences (NAS) released in April has found. The driving force, according to the report, is farmers' dependence on the weed killer accompanied by the widespread adoption of genetically modified (GM) herbicide-tolerant crops. Seed makers are hoping to forestall the problem by developing GM crops with 'stacked' traits that tolerate multiple herbicides. But weed scientists warn that if farmers manage these new crops in the same way as they managed their glyphosate-tolerant predecessors, weeds will simply become resistant to the new technologies.



\*The number of weed species evolving resistance to glyphosate

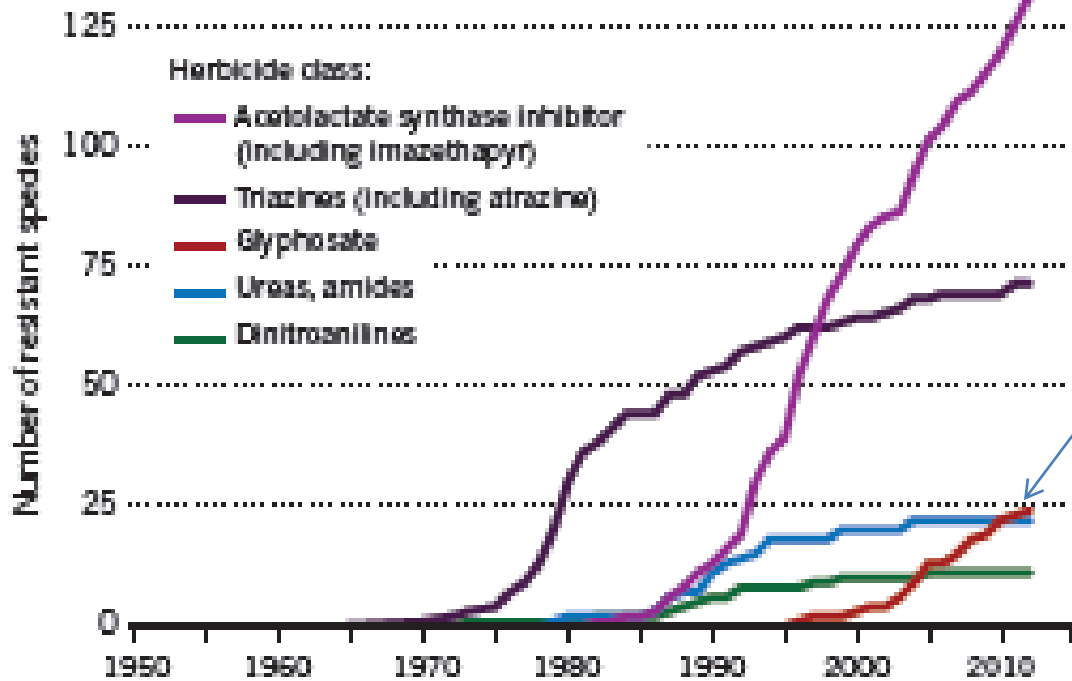


# Herbicide-resistant weeds are an old problem in agriculture

## THE RISE OF SUPERWEEDS

Weed species often become resistant to herbicides. Glyphosate resistance, once deemed unlikely, rose after genetically engineered crops were introduced in the mid-1990s.

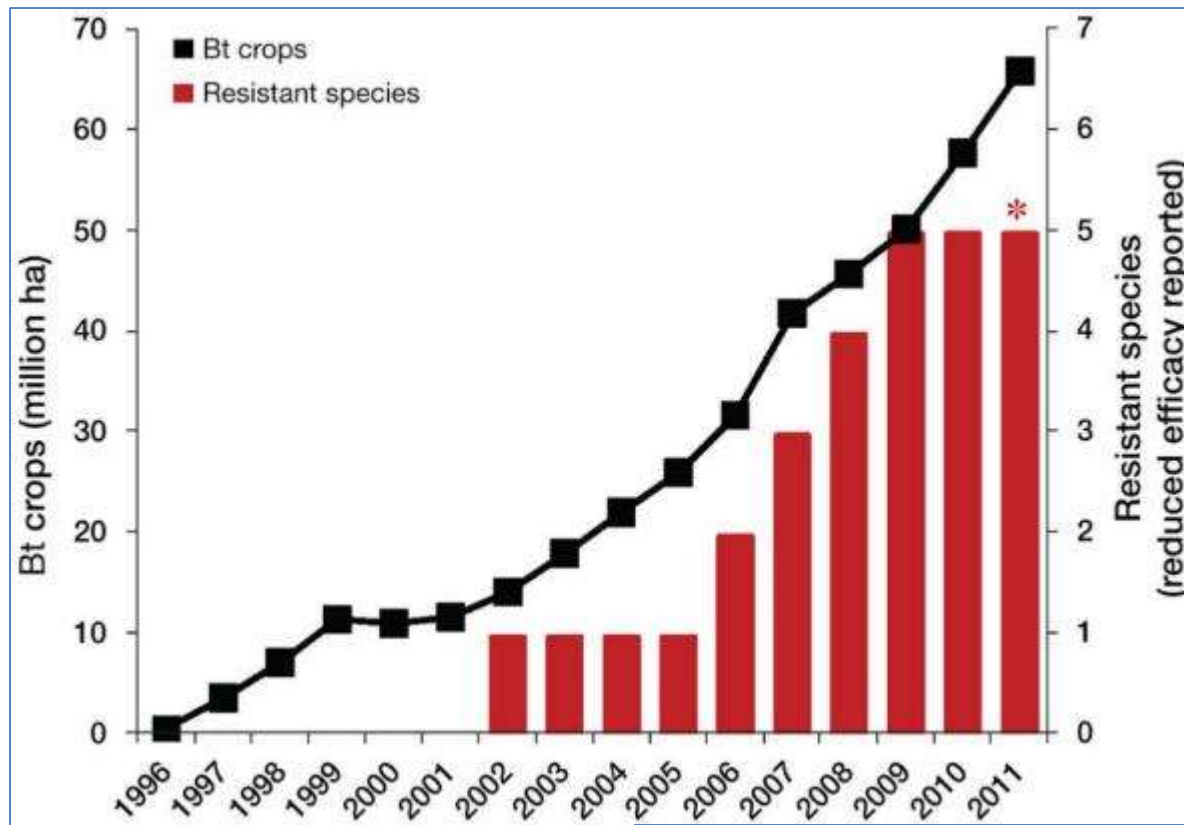
SOURCE: INTERNATIONAL JOURNAL OF HERBICIDE RESISTANT WEEDS WWW.IJHRW.EDU/ISSN/ISSN1546-0191/ISSN1546-0191



Accelerated by GE Roundup-tolerant crops



# Insect resistance has developed too, but has been much better managed



**70 million hectares =  
~ 2.8  
Oregons**

[Insect resistance to Bt crops: lessons from the first billion acres](#)  
*Nature Biotechnology*, 31, 510–521 (2013)

*Analogous to antibiotics, continued benefits require integrated management, and inputs of new genes/traits*



# Insecticide resistant crops not new – first noted 100 years ago

**EntomologyToday**  
THE LATEST NEWS ABOUT ENTOMOLOGY, BROUGHT TO YOU BY THE ENTOMOLOGICAL SOCIETY OF AMERICA

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## The First Journal Article on Insecticide Resistance was Published 100 Years Ago this Month

April 8, 2014 by Entomology Today   Leave a Comment



One hundred years ago this month, an entomologist at the Washington Agricultural Experiment Station named A. L. Melander published an article in the *Journal of Economic Entomology* called "Can Insects Become Resistant to Sprays?" It is widely regarded as the first ever published article on arthropod resistance to insecticides.

Are declines in monarch butterflies-- associated with reduced milkweed populations-- due to improved weed control from herbicide-tolerant crops?



Opinion, Analysis, Reporting & Debate

01 APR 2013: INTERVIEW

## Tracking the Causes of Sharp Decline of the Monarch Butterfly

*A new census found this winter's population of North American monarch butterflies in Mexico was at the lowest level ever measured. Insect ecologist Orley Taylor talks to Yale Environment 360 about how the planting of genetically modified crops and the resulting use of herbicides has contributed to the monarchs' decline.*

BY RICHARD CONNIFF

University of Kansas insect ecologist Orley R. "Chip" Taylor has been observing the fragile populations of monarch butterflies for decades, but he says he has never been more concerned about their future.

Monarchs are beloved for their spectacular migration across Canada and the United States to overwintering sites in central Mexico — and back again. But a new census taken at the monarchs' wintering grounds found their population had declined 59 percent over the previous year and was at the lowest level ever measured.

In an interview with *Yale Environment 360* contributor Richard Conniff, Taylor — founder and director of Monarch Watch, a conservation and outreach program — talked about the factors that have led to the sharp drop in the monarch population. Among them, Taylor said, is the increased planting of genetically modified corn in the U.S. Midwest, which has led to greater use of herbicides, which in turn kills the milkweed that is a prime food source for the butterflies.



Monarch Watch/Catherine T. Shannon  
Orley Taylor

### ABOUT THE AUTHOR

**Richard Conniff**, who conducted this interview for *Yale Environment 360*, is a National Magazine Award-winning writer whose articles have appeared in *Time*, *Smithsonian*, *The Atlantic*, *National Geographic*, and other publications. He is the author of several books, including *The Species Seekers: Heroes, Fools, and the Mad Pursuit of Life on Earth*. In previous articles for *Yale Environment 360*, he has written about the pricing of ecosystem services and about new advances that could help produce food crops that can thrive as the



### RELATED ARTICLES

#### Into the Heart of Ecuador's Yasuni

*Few places on earth harbor as much biodiversity as Ecuador's Yasuni Biosphere Reserve, which sits atop vast deposits of oil and now faces intense development pressure. In a Yale Environment 360 video, filmmaker Ryan Killackey travels to the heart of Yasuni with scientists inventorying its stunning wildlife and plants. The researchers hope their work will bolster initiatives to preserve this threatened land.*

[READ MORE](#)

# Continued worry over safety of approved GMO food for human health

## FEATURE

### How safe does transgenic food need to be?

Laura DeFrancesco

Disputes over how to assess a foodstuff's safety continue to play into public fears about transgenic crops.

Transgenic crops are the most highly regulated foods in the world. In recent years, there have been calls in the United States to relax some of the rules for their oversight. And yet controversies over the safety of transgenic food products continue to rumble, particularly in Europe, Africa and now further afield in the Far East. Despite the fact that numerous national and international scientific panels have concluded that food derived through transgenic approaches is as safe as food produced in other ways and that food-borne pathogens pose a much greater threat to human health<sup>1</sup>, scare stories continue to

any finished food placed on the market meets the safety levels implicit in the definition of adulterated foods. FDA is authorized to seek sanctions against foods that do not adhere to these standards through seizure, injunction or criminal prosecution," writes Emily Marden of the University of British Columbia's Faculty of Law in Vancouver<sup>3</sup>. This holds for all new foods, whether transgenic or not.

Notwithstanding the absence of legal underpinnings, a *de facto* regulatory process (called a consultation) exists at the FDA, whereby companies submit information on new genetically modified foods destined for the market



Laura DeFrancesco is Senior Editor at Nature Biotechnology.

Regulation of Biotechnology was laid out (51 Fed. Reg. 23302, June 26, 1986)<sup>5</sup>. Depending on the exact nature of the change made to

Nutrition that is responsible for oversight of the safety of food derived from transgenic crops destined for human consumption.



Very weak  
science in a  
number of  
highly  
publicized  
GMO  
toxicity  
studies

**nature** International weekly journal of science

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News & Comment > News > 2014 > February > Article


NATURE | NEWS Share Email Print


## Study linking GM maize to rat tumours is retracted

Publisher withdraws paper despite authors' objections, citing weak evidence.

**Barbara Casassus**

28 November 2013

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# Is GM food safe?

if an overwhelming majority of experts say something is true, then any sensible non-expert should assume that they are probably right.



**AAAS**  
The American Association for the Advancement of Science (AAAS) is an international non-profit organization that serves some 261 affiliated societies and academies of science. "The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe."

**AMA**  
The premier body of physicians in the United States. "There is no scientific justification for special labeling of genetically modified foods."

**WHO**  
The World Health Organization (WHO) is the directing and coordinating authority for health within the United Nations system. "No effects on human health have been shown as a result of the consumption of GM foods by the general population in the countries where they have been approved."

**European Commission**  
The European Commission (EC) is the executive body of the European Union. "The main conclusion to be drawn from the efforts of more than 130 research projects, covering a period of more than 25 years of research, and involving more than 500 independent research groups, is that biotechnology, and in particular GMOs, are no more risky than e.g. conventional plant breeding techniques."

**YACSH**  
The American Academy of Child and Adolescent Psychiatry (AACAP) is an independent educational organization for child and adolescent psychiatrists. "The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe."

**ISF**  
The International Society for Food Safety (ISF) is a non-profit organization that promotes food safety and quality. "The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe."

**CAST**  
The Center for the Assessment and Management of Technology (CAST) is a non-profit organization that provides independent, objective, and credible information on the risks and benefits of emerging technologies. "The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe."

**ASAC**  
The American Society for Animal Care (ASAC) is a non-profit organization that promotes the humane treatment of animals in research. "The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe."

**SOT**  
The Society of Toxicology (SOT) is a non-profit organization that promotes the scientific study of toxicology. "The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe."

**ICMUN**  
The International Council of Medical Universities (ICMUN) is a non-profit organization that promotes the education and training of medical professionals. "The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe."

**ICSU**  
The International Council for Science (ICSU) is a non-profit organization that promotes international cooperation in science. "The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe."



# Is GM food safe?

if an overwhelming majority of experts say something is true, then any sensible non-expert should assume that they are probably right



**The American Association for the Advancement of Science is an international non-profit organization AAAS serves some 261 affiliated societies and academies of science.**

**"The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe."**

**The premier body of physicians in the United States**

**"There is no scientific justification for special labeling of genetically modified foods.**

**Bioengineered foods have been consumed for close to 20 years, and during that time, no overt consequences on human health have been reported and/or substantiated in the peer-reviewed literature."**

**The World Health Organization (WHO) is the directing and coordinating authority for health within the United Nations system.**

**"No effects on human health have been shown as a result of the consumption of GM foods by the general population in the countries where they have been approved."**



**The National Academy of Sciences is a non-profit organization in the United States. It is the premier scientific body in the United States**

**"To date more than 98 million acres of genetically modified crops have been grown worldwide. No evidence of human health problems associated with the ingestion of these crops or resulting food products have been identified"**

**England's top medical society, the Royal Society of Medicine is an independent educational organisation for doctors, dentists, scientists and others involved in medicine and health care**

**"Foods derived from GM crops have been consumed by hundreds of millions of people across the world for more than 15 years, with no reported"**

**The European Commission (EC) is the executive body of the European Union**

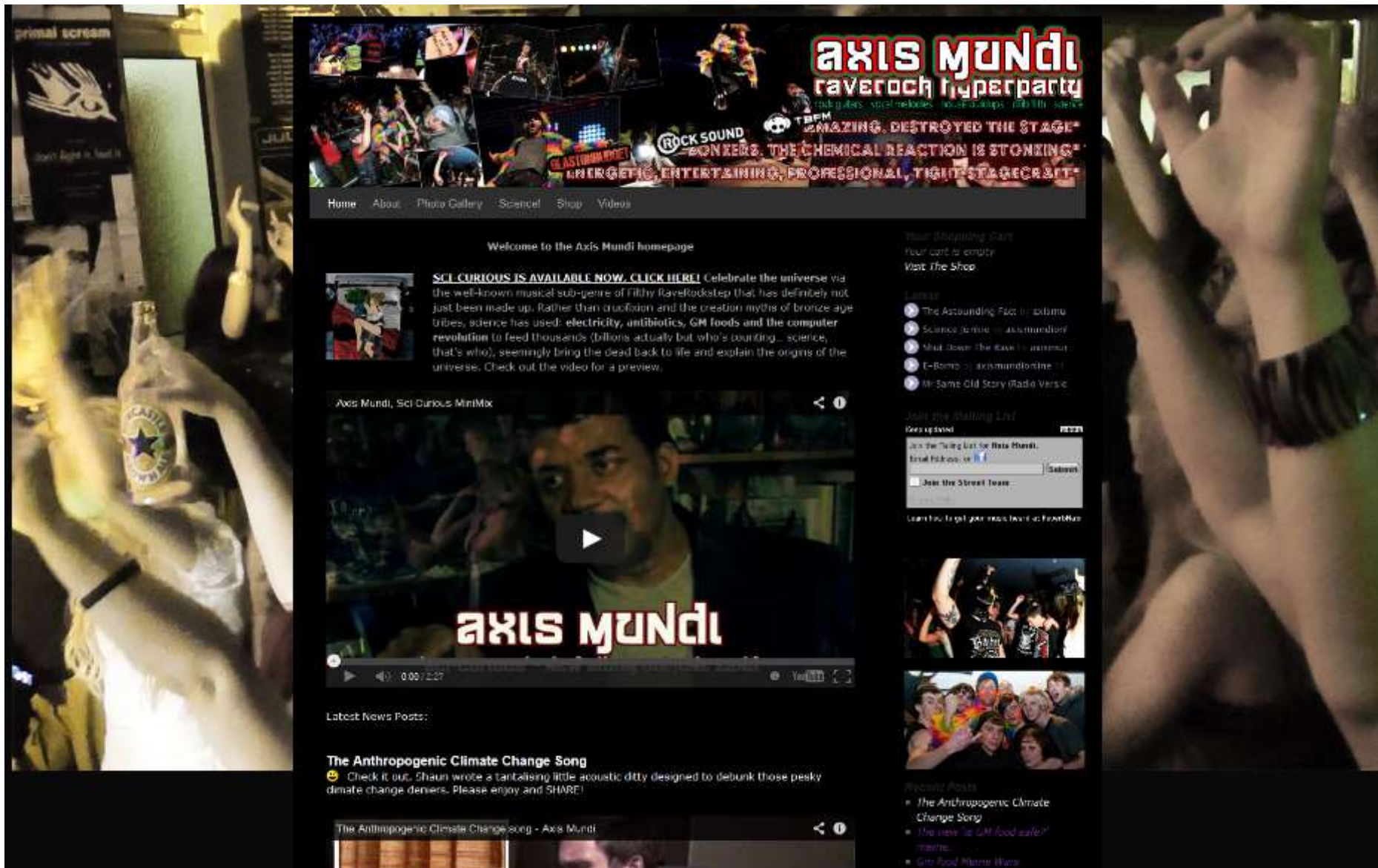
**"The main conclusion to be drawn from the efforts of more than 130 research projects, covering a period of more than 25 years of research, and involving more than 500 independent research groups, is that biotechnology, and in particular GMOs, are no more risky than e.g. conventional plant breeding techniques."**

<http://www.axismundionline.com/blog/the-new-is-gm-food-safe-meme/>

Our full album of science based memes are in our facebook page album [HERE](#). Our manifesto on MemeWars is [HERE](#) Let's not allow moronic groups like Greenpeace to dominate the meme world with lies on important issues.

The scientific consensus around the safety of genetically modified foods is as strong as the scientific consensus around climate change. These foods are subjected to more testing than any other, and everything tells us that they're safe.





On “About” page: Axis Mundi are a Rave-Rockstep ultra-party. Described as “a cross between **System of a Down** and the **Prodigy**”... just add “**Brian Cox**” and you’re about there. New album “**Sci-curious**” (released June 2013)

# Hundreds of scientific studies of GM crop food and environmental safety

**Critical Reviews  
in Biotechnology**

<http://informahealthcare.com/crb>  
ISSN: 0738-8551 (print), 1549-7801 (electronic)  
CR Rev Biotechnol, Early Online 1-12  
© 2011 Informa Healthcare USA, Inc. DOI: 10.3109/07388551.2011.623595

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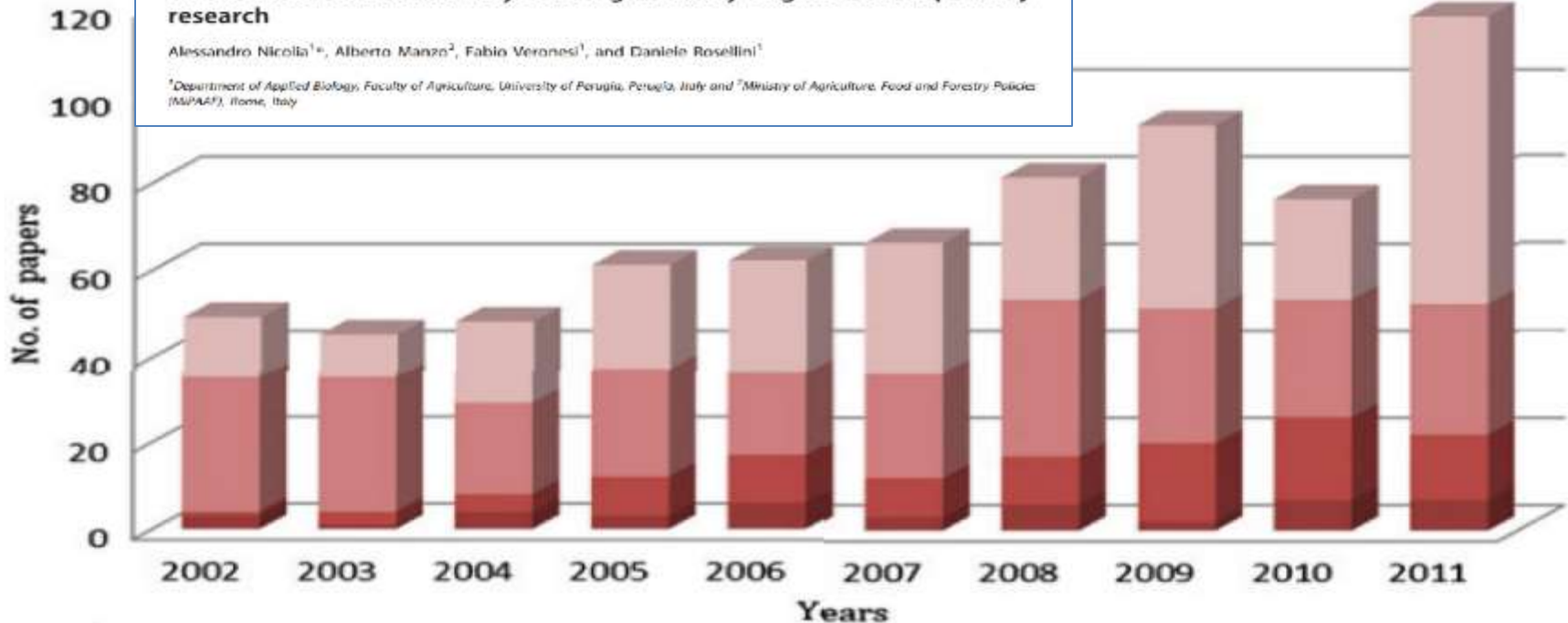
REVIEW ARTICLE

## An overview of the last 10 years of genetically engineered crop safety research

Alessandro Nicolai<sup>1\*</sup>, Alberto Manzo<sup>2</sup>, Fabio Veronesi<sup>1</sup>, and Daniele Rosellini<sup>1</sup>

<sup>1</sup>Department of Applied Biology, Faculty of Agriculture, University of Perugia, Perugia, Italy and <sup>2</sup>Ministry of Agriculture, Food and Forestry Policies (MIPAAF), Rome, Italy

*GE crop safety research* 5



Substantial equivalence  
(6%)

Non-targeted assessment  
(13.9%)

GE food/feed consumption  
(40.5%)

Traceability  
(39.6%)

# Overwhelming conclusion of food/feed safety

“The experimental data collected so far on authorized GE crops can be summarized as follows: (a) there is no scientific evidence of toxic or allergenic effects.....”

**Critical Reviews  
in Biotechnology**

<http://informahealthcare.com/bty>  
ISSN: 0738-8551 (print), 1549-7801 (electronic)

Crit Rev Biotechnol, Early Online: 1–12  
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REVIEW ARTICLE

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<sup>1</sup>Department of Applied Biology, Faculty of Agriculture, University of Perugia, Perugia, Italy and <sup>2</sup>Ministry of Agriculture, Food and Forestry Policies (MiPAAF), Rome, Italy



# Prof Parrott / GMO crop information and misinformation web page

tinyurl.com/GMLinks

## The GMO Crop (*mis*)Information Page

Providing centralized information resources on GMO crops. Updated 12 December 2013



**Featured Websites:**

- [GMO Compass](#) - comprehensive information on GMOs
- [BioEconomics](#) - information on environmental impact & economics of GMOs
- [Advocacy of EU funded GMO research](#)
  - "The main conclusion to be drawn from the efforts of more than 120 research projects, covering a period of more than 25 years of research, and involving more than 500 independent research groups, is that biotechnology, and in particular GMOs, are not per se more risky than e.g. conventional plant breeding techniques."

**Statistics & Databases:**

- [Center for Environmental Risk Assessment](#): A database of all deregulated GM crops & their safety documentation
- [ISAAA - Global statistics of GMO crops](#)
- [Information Systems for Biotechnology](#): Field trials and crop approvals for the USA
- [Biosafety Clearing House](#): Global list of approved living GMOs

**Blogs, News & Commentaries:**

- [Biofortified](#)
- [Illumination](#), by Kevin Folta
- [Scoop It - Ag Biotech News](#) by A.J. Stein
- [Tomorrow's Table](#)
- [GMO Pundit](#)
- [Keith Kloor](#) at SLATE
- [United Soybean Board on Biotech](#)
- [Genetic Literacy Project](#)
- [GMO Mondays](#)
- [GM news](#), by SciDevNet

**Resources for Educators:**

- [Introduction to Biotechnology](#), Ray Herren
- [GMO Crop Photo Depot](#)
- [DNA Ahead](#) Game & More

**Refereed Literature Compend**

- [Feeding transgenic crops to livestock](#)
- [Transgenic DNA and protein and animal products \(meat, milk, eggs\)](#)
- [GENERA](#) - Refereed safety literature, with safety in the process of being written
- [GMO Pundit](#) - 600+ published assessments of foods and feeds
- [ChileBio](#) - A list of 600+ published assessments of GM foods and feeds: refereed articles only

**US Food & Drug Administration**

- [Role](#)
- [Q&A](#)
- [Completed Consultations](#)
- [Guidance to Industry](#)

**Authorities endorsing GM safety and use:**

- [List of authorities](#), by Axis Mundi
- [Links to position statements](#), by ChileBio
- [Statement by the Pontifical Academy of Sciences](#), Vatican City

**FAQs and Answers on Safety**

- [Free eBook: The Lowdown on GMOs: Accessible Science to All](#), *A Layman's Guide to GMOs*
- [Health Canada](#)

**Professor Parrott singles out some GMO articles that earn a fail!**

Because the peer review system is not perfect, and some articles that shouldn't get being sent because just science never takes a rest.

For more resources, see the [GMO Information Page](#) and [Academic Review](#)

**GMO-fed pigs have irritated stomachs and thicker uteruses**

[Source](#): Carmon JJ, Hill Winger LJ, Wu Sheng, VE Swisher, GW Robinson, CA Clack James, Edwards. 2013. A long-term toxicology study on pigs fed a combined genetically modified (GM) diet. *Journal of Organic Systems* 5(1): 35-54

[Why does this article fail?](#)

**GMO corn gives rats cancer**

[Source](#): Washin DE, El Chaz, RANewspaper, S Gless, N Cellegos, M Malabado, D Herveguez, Verdineas. 2012. Long term toxicity of a Roundup herbicide and a Roundup tolerant genetically modified (GM) corn. *Journal of Organic Systems* 5(4): 4251-4257

[Why does this article fail?](#)

**93% of pregnant women and 69% of non-pregnant women derived Bt protein in their blood**

[Source](#): Ahn A, S Cepeda. 2011. Maternal and fetal exposure to pesticides associated to glyphosate. *Environ Toxicol and Chem: Canada: Reproductive Toxicology*. 20(6): 528-33

[Why does this article fail?](#)

**GMO corn kills monarch butterflies**

[Source](#): Losey JE, L.S. Rayor, ME Carter. 1999. Transgenic pollen harms monarch larvae. *Nat*

[Why does this article fail?](#)

**GMOs cause intestinal issues in rats**

[Source](#): Feron V, A Puelin. 1999. Effect of diets containing genetically modified potatoes on health of rats of small intestine. *Lancet* 354(9167): 1253-1254

[Why does this article fail?](#)

<http://parrottlab.uga.edu/parrottlab/forum2.htm>

**The righteous**

# Corporate hyperbole

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## Who We Are

**Monsanto at a Glance**

**Our Commitments**

- Our Pledge
- Sustainable Agriculture**
- Timeline of Our Commitments

Fighting Rural Hunger

Corporate Social Responsibility and Sustainability Report

Human Rights

Corporate Giving

America's Farmers

Youth and Education

**Company Leadership**

**Corporate Governance**

**Company History**

**Partnering & Licensing**

**Our Locations**

**Contact Us**

## Our Commitment to Sustainable Agriculture

Producing More. Conserving More. Improving Lives.

Our vision for sustainable agriculture strives to meet the needs of a growing population, to protect and preserve this planet we all call home, and to help improve farmers' lives by 2030. We have made a commitment to sustainable agriculture – pledging to improve farmers' lives by 2030.

### PRODUCING MORE

Monsanto works with farmers from around the world to make agriculture more sustainable. Our technologies enable farmers to get more from their land.

Specifically, we are working to double yields in our core crops. This will come from a combination of [advanced plant breeding](#), [biotechnology](#), and [improved farm-management practices](#).

### CONSERVING MORE

We've strengthened our goal of double crop yields by conserving [resources such as land, water, and energy per unit produced](#).

We're continuing to develop better seeds and improved on-farm practices to better manage weeds, pests, and environmental stresses.

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## MONSANTO'S 2012 SUSTAINABILITY REPORT

Experience our commitment to improve agriculture, told through a series of vignettes, profiles and facts that unfold every day.

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# Corporate complicity in unsustainable management

nature  
biotechnology

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NATURE BIOTECHNOLOGY | NEWS

## Glyphosate resistance threatens Roundup hegemony

Emily Waltz

*Nature Biotechnology* 28, 537–538 (2010) | doi:10.1038/nbt0610-537

Corrected online 13 October 2010

[Corrigendum \(October, 2010\)](#)

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Weeds are becoming increasingly resistant to glyphosate, a report from the US National Academy of Sciences (NAS) released in April has found. The driving force, according to the report, is farmers' dependence on the weed killer accompanied by the widespread adoption of genetically modified (GM) herbicide-tolerant crops. Seed makers are hoping to forestall the problem by developing GM crops with 'stacked' traits that tolerate multiple herbicides. But weed scientists warn that if farmers manage these new crops in the same way as they managed their glyphosate-tolerant predecessors, weeds will simply become resistant to the new technologies.



\*The number of weed species evolving resistance to glyphosate

BILL BARKSDALE / @GETSTOCKUSA /

## Confirmed Glyphosate Resistant Weeds in the U.S.



-  Horseweed (Marestail)
-  Common Ragweed
-  Giant Ragweed
-  Palmer Amaranth
-  Common Waterhemp
-  Hairy Fleabane

-  Italian Ryegrass
-  Rigid Ryegrass
-  Johnsongrass

 UW  
Extension



# Left vs. right senses of justice, social systems, roles for corporations, a major reason for outrage

- Profit vs. public good
- Socialist vs. capitalist
- Global vs. local food
- Monsanto vs. small farmers
- Patents vs. open source
- **Major reason for US vs. EU schism**



# Are organically certified crops so “righteous” to warrant purity






# Gene flow is ubiquitous in agriculture – with or without GMOs



“Genetic drift” (i.e., seed and pollen movement) does not entitle Monsanto to take over your farm – nor do they try to!

# Organic nor conventional is ideal: Coexistence needed



04 SEP

## Organic farms not necessarily better for environment

Science

04 Sep 12



Organic cereals generate higher greenhouse gas emissions per unit of product than their conventionally farmed counterparts, the researchers found.

Organic farming is generally good for wildlife but environmental impacts than conventional farming, scientists has shown.



Education   Research   Patient Care   Community

Stanford Medicine - School of Medicine - News - Inside Stanford Medicine

SEPT. 3, 2012

## Little evidence of health benefits from organic foods, Stanford study finds

BY MICHELLE BRAVAT

You're in the supermarket eyeing a basket of sweet, juicy plums. You reach for the conventionally grown store fruit, then decide to spring the extra \$1/pound for its organic cousin. You figure you've just made the healthier decision by choosing the organic product — but new findings from Stanford University cast some doubt on your thinking.

"There isn't much difference between organic and conventional foods, if you're an adult and making a decision based solely on your health," said [Dana Bravata](#), MD, MS, the senior author of a paper comparing the nutrition of organic and non-organic foods, published in the Sept. 4 issue of *Annals of Internal Medicine*.

A team led by Bravata, a senior affiliate with Stanford's [Center for Health Policy and Crystal Smith-Spangler](#), MD, MS, an instructor in the school's Division of General Medical Disciplines and a physician investigator at VA Palo Alto Health Care System, did the most comprehensive meta-analysis to date of



Robert van der Groen

Crystal Smith-Spangler and her colleagues reviewed many of the studies comparing organic and conventional grown food, and found little evidence that organic foods are more nutritious.

## GENETIC LITERACY PROJECT

WHERE SCIENCE TRUMPS IDEOLOGY

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### The organic hepatitis outbreak: We need organic field testing

Melinda Popoff | June 17, 2013 | Genetic Literacy Project

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*This is organic consumer: is well informed. They have made the connection between quality of life and their own personal responsibility as far how it's going to play out for them. They understand the risks - the effects of*



May have become ill after eating organic from berries. ©2013 Flickr-Bob-Near

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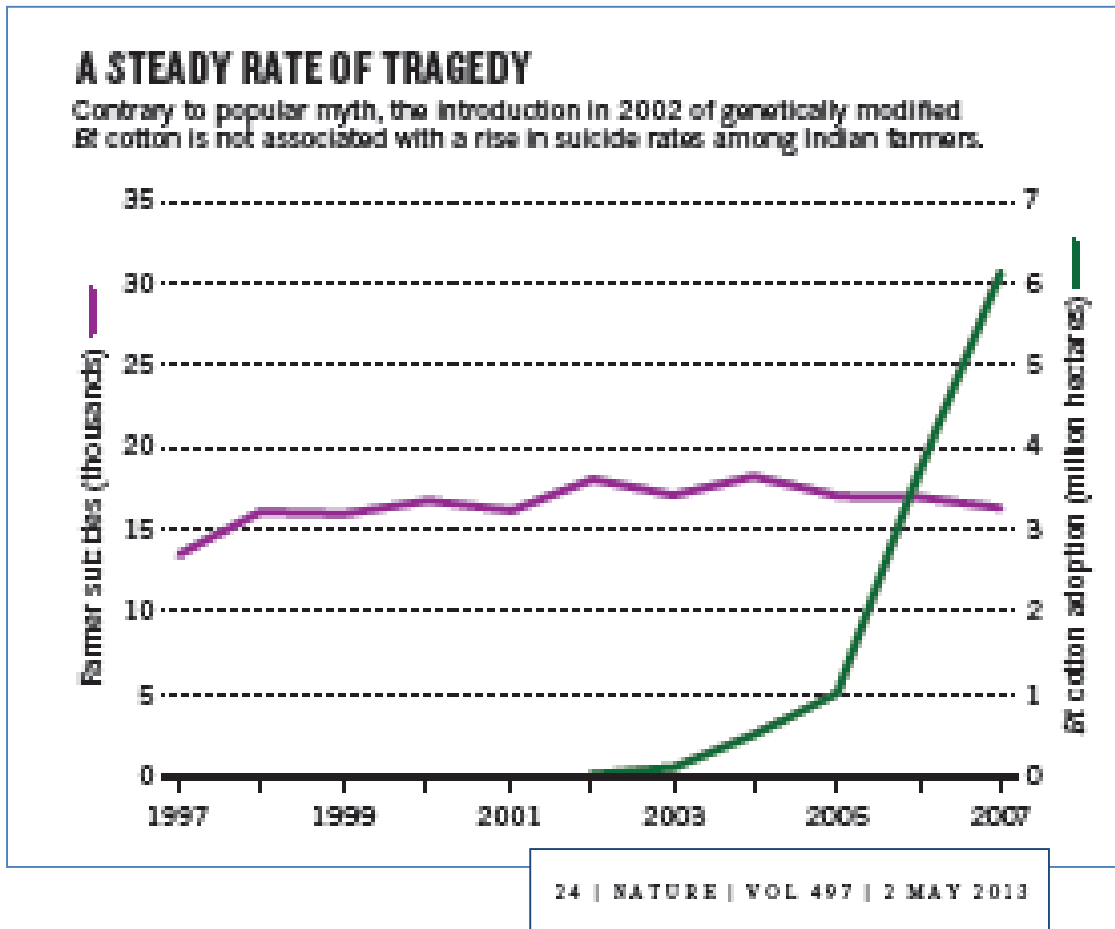
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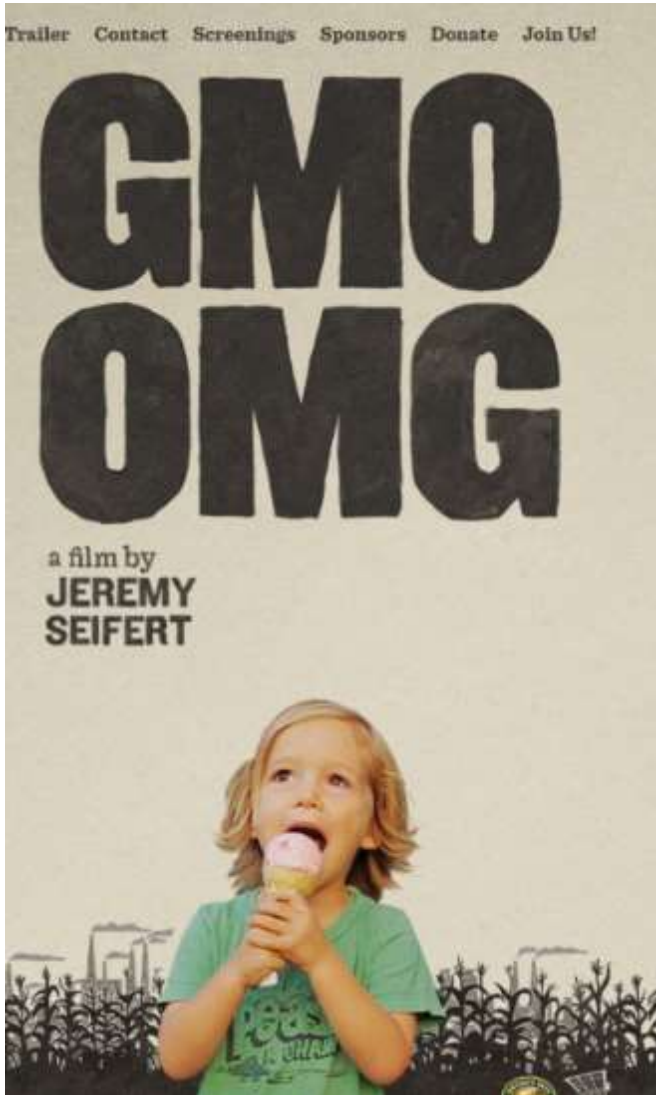


# Abundant myths, amplified in righteous books, movies, and documentaries

*Farmer suicides in India and GMO cotton among the most infamous*



# “Entertaining” documentaries



The image is a screenshot of the New Yorker website. At the top, the masthead features the New Yorker logo (a man in a top hat) and the title "THE NEW YORKER". Below this is a navigation bar with categories: SUBSCRIBE, MAGAZINE, NEWS, CULTURE, POLITICS, BOOKS, and SCIENCE & TECH. A secondary navigation bar includes ARCHIVE, PHOTO BOOTH, DAILY SHOUTS, CURRENCY, DAILY COMMENT, and AMY DAVIDSON. The main content area has a header for "ELEMENTS" with the subtitle "Science, technology, and the things that make up our world." Below this is a breadcrumb trail: "Horse\_ebooks Is Human After All | Main | Microsoft's Tablet Surfaces Again". The article title is "SEPTEMBER 24, 2013 'OMG GMO' SMDH" by "POSTED BY MICHAEL SPECTER". Social sharing options for Facebook, Twitter, and YouTube are visible. The main image is a video player for "GMO OMG Official Trailer" from "Canopie Pictures", featuring large, bold, black letters spelling "GMO" and "OMG" stacked vertically. The video player shows a play button, a progress bar at 02:04, and a volume icon.

“...genetically engineered crops—which are, in his view, such barely concealed poisons that he actually dressed his children in full hazmat gear before letting them enter a field of genetically modified corn...

...[Director] Seifert’s message of fear and illiteracy has now been placed before millions of television viewers....

...By themselves, genetically engineered crops will not end hunger or improve health or bolster the economies of struggling countries. They won’t save the sight of millions or fortify their bones. But they will certainly help. First, though, we have to adopt reality as our principal narrative. For [people like Jeremy Seifert](#), that may be too much to ask.”



# IS LABELING REALLY ABOUT OUR "RIGHT TO KNOW" ?

"We are going to force them to label this food. If we have it labeled, then we can organize people not to buy it."

—Andrew Kimbrell, Executive Director, Center for Food Safety

"Personally, I believe GM foods must be banned entirely, but labeling is the most efficient way to achieve this. Since 85% of the public will refuse to buy foods they know to be genetically modified, this will effectively eliminate them from the market just the way it was done in Europe."

—Dr. Joseph Mercola, Mercola.com

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Once examined seriously, labeling does not look so appealing – serious issues include science, cost, choice, and overall ethics

**“Legally mandating such a label can only serve to mislead and falsely alarm consumers”**

## Statement by the AAAS Board of Directors On Labeling of Genetically Modified Foods

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE  
20 October 2012

There are several current efforts to require labeling of foods containing products derived from genetically modified crop plants, commonly known as GM crops or GMOs. These efforts are not driven by evidence that GM foods are actually dangerous. Indeed, the science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe. Rather, these initiatives are driven by a variety

conclusion: consuming foods containing ingredients derived from GM crops is no riskier than consuming the same foods containing ingredients from crop plants modified by conventional plant improvement techniques.

Civilization rests on people's ability to modify plants to make them more suitable as food, feed and fiber plants and all of these modifica-

added, the protein must be shown to be neither toxic nor allergenic. As a result and contrary to popular misconceptions, GM crops are the most extensively tested crops ever added to our food supply. There are occasional claims that feeding GM foods to animals causes aberrations ranging from digestive disorders, to sterility, tumors and premature death. Although such claims are often sensationalized and receive a

Approved by the AAAS Board of  
Directors on 20 October 2012



# Major newspapers agree

Tuesday, October 8, 2013 | TRAFFIC | 53°F

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Originally published Saturday, October 5, 2013 at 4:00 PM

## Editorial: Vote No on Initiative 522, the GMO labeling initiative

Efforts to label foods with GMOs have failed in Oregon and California. Shoppers want useful information not scare tactics. Vote No on I-522.

Seattle Times Editorial

INITIATIVE 522 is a clumsy, emotion-based campaign to require labeling of selective food products containing genetically modified organisms.

The issue for proponents of I-522 seems to be less about outcomes — the products themselves — but rather finding the modern processes offensive.

Farmers and science have nurtured and bred hybrid versions of plants and animals for selective characteristics for centuries. But the efforts of the last few decades have stirred critics whose alarmist concerns are not supported by the mainstream scientific community.

Multistate efforts to require labeling of products as containing genetically modified organisms are ostensibly about a bold warning on packaging. The intent is more pointed, if a bit more subtle.

Labeling is one part of an effort to make the use of GMOs more expensive, arduous and complicated for farmers, processors, shippers, inspectors and regulators.

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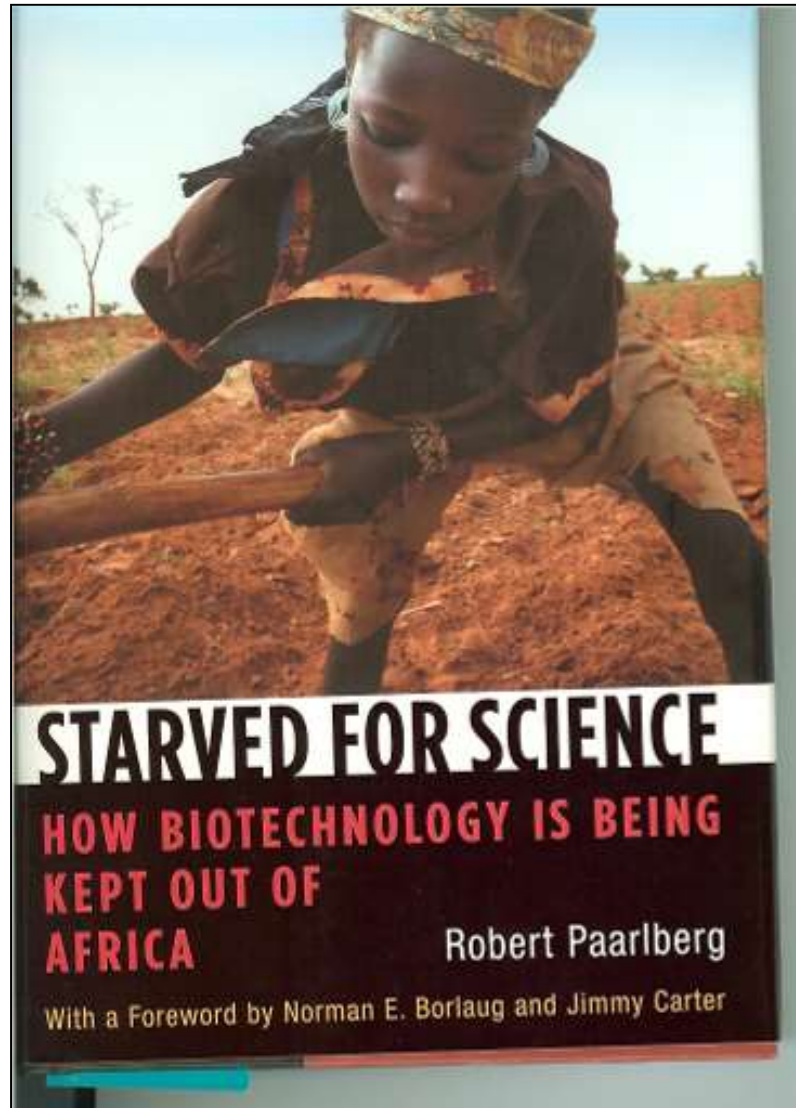
 E-mail article

 Print





Is it righteous to protect the developing world from GMO crops?



# Golden rice and the Philippines

Vitamin A deficiency is a serious problem among the poor there. Field trials are underway to test, develop, and provide access to it for poor farmers



Intl Rice Research Inst: In the Philippines, vitamin A deficiency affects approximately 1.7 million children (15%) aged 6 months to 5 years

Subclinical vitamin A deficiency affects one out of every ten pregnant women

With funding and organization from European NGOs, field trials were vandalized in August 2013  
*Vandalism protested by >6,000 scientists*

The New York Times

August 24, 2013

## Golden Rice: Lifesaver?

By AMY HARMON

ONE bright morning this month, 400 protesters smashed c

EDITORIAL

### Standing Up for GMOs

ON 8 AUGUST 2013, VANDALS DESTROYED A PHILIPPINE "GOLDEN RICE" F staff of the Philippine Department of Agriculture that conduct r tional Rice Research Institute (IRRI) and the Philippine Rice Rese had gathered for a peaceful dialogue. They were taken by surpris the compound, overwhelmed police and village security, and transp uprising of farmers, the destruction was actually carried out by pr night in a dozen jeepsneys.

The global scientific community has condemned the wanton d trials, gathering thousands of supporting signatures in a matter of a clear-cut cause for outrage, it is the concerted campaign by Gro governmental organizations, as well as by individuals, against G

is a strain that is genetically modified by m therefore labeled a genetically modified crop. It contains a dose of  $\beta$ -carotene, a precursor of vitamin A. It is a vital component of the light-absorbing mo eye. Severe vitamin A deficiency results in b roughly half-million children who are blind. Vitamin A deficiency also compromises im exacerbating many kinds of illnesses. It is a poor diet, responsible for 1.9 to 2.8 million ally, mostly of children under 5 years old an

Rice is the major dietary staple for alm white rice grains lack vitamin A. Research and Peter J



newsblog

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## Swedish scientists decry government links to anti-GMO 'vandals'

13 Nov 2013 | 12:31 GMT | Posted by Davide Castelvecchi | Category: Biology & Biotechnology, Earth, environment & ecology, Policy

Posted on behalf of Marta Paterlini.

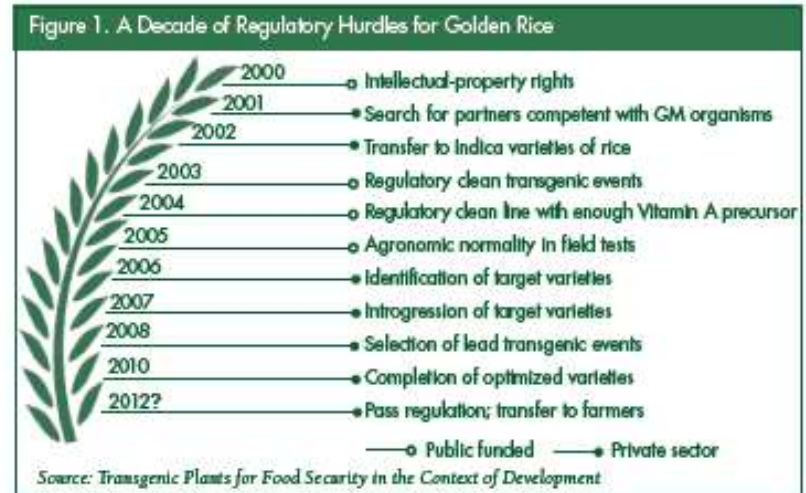
A group of Swedish scientists challenged their government in an [open letter](#) on 22 October in which they alleged that Swedish foreign aid has supported vandalism in the Philippines against research plots of genetically modified crops.



# What have delays in use of Golden Rice cost? *A crime against humanity to obstruct it?*

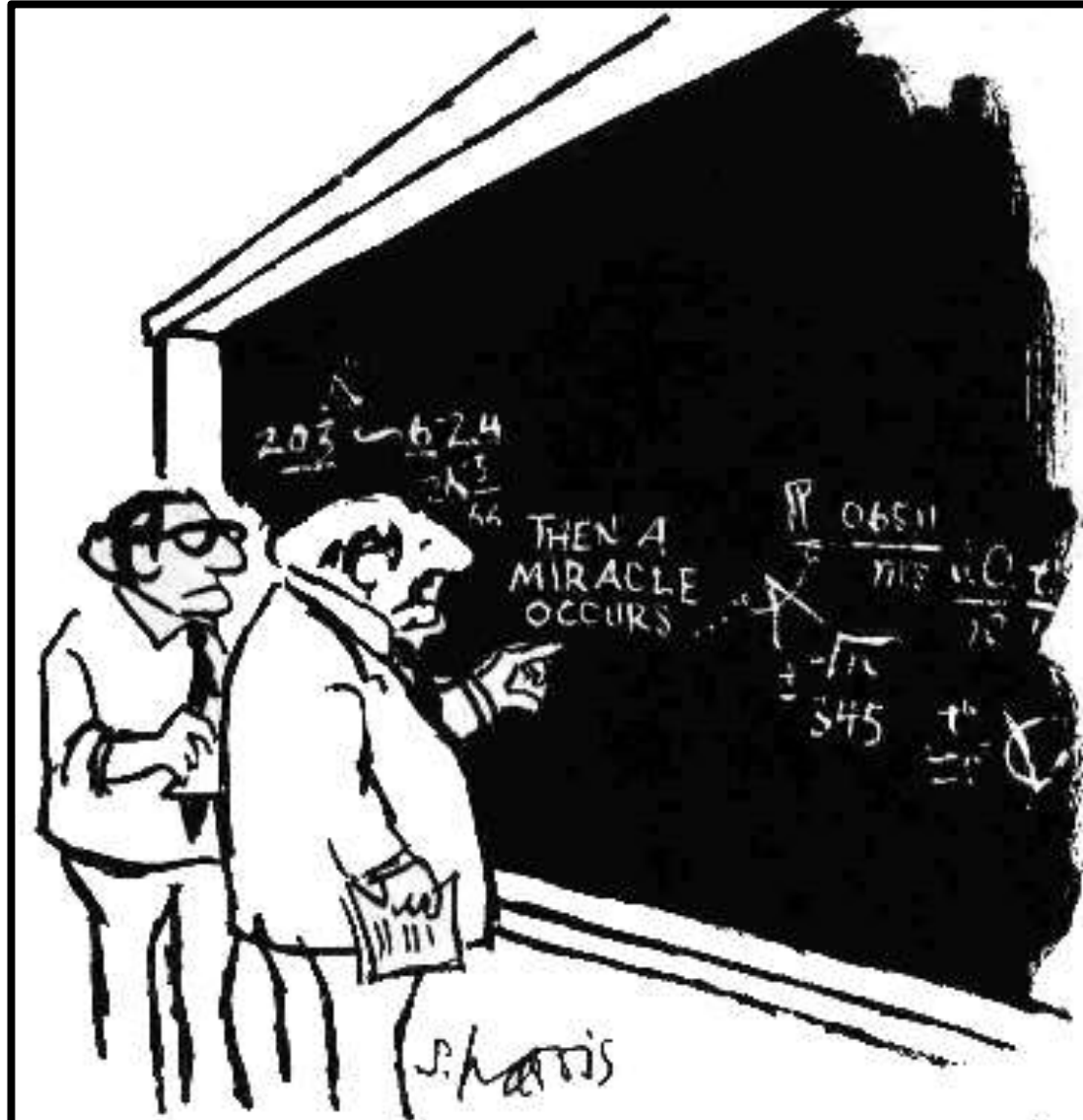
**Agricultural and Resource Economics**  
**UPDATE**  
GIANNINI FOUNDATION OF AGRICULTURAL ECONOMICS • UNIVERSITY OF CALIFORNIA  
V. 17 no. 3 • Jan/Feb 2014

**The Cost of Delaying Approval of Golden Rice**  
*Justus Wesseler, Scott Kaplan, and David Zilberman*



## Cost of 10 years of regulatory (political) delays

- ~\$1 billion in lost productivity
- ~1 million cases of blindness
- Several-hundred thousand deaths



"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

# Two big narratives to choose from

- Unethical, irreversible, and unpredictable impacts on food safety and environment
  - Stop it, label it, or otherwise regulate it to where it does not matter
- Studied and regulated smartly, it is an essential tool
  - For helping people in dire need right now, and for managing a very scary future on this planet