



**economicthinking**  
Understanding and Creating Prosperity

# *Benefits and Risks of GMO food*

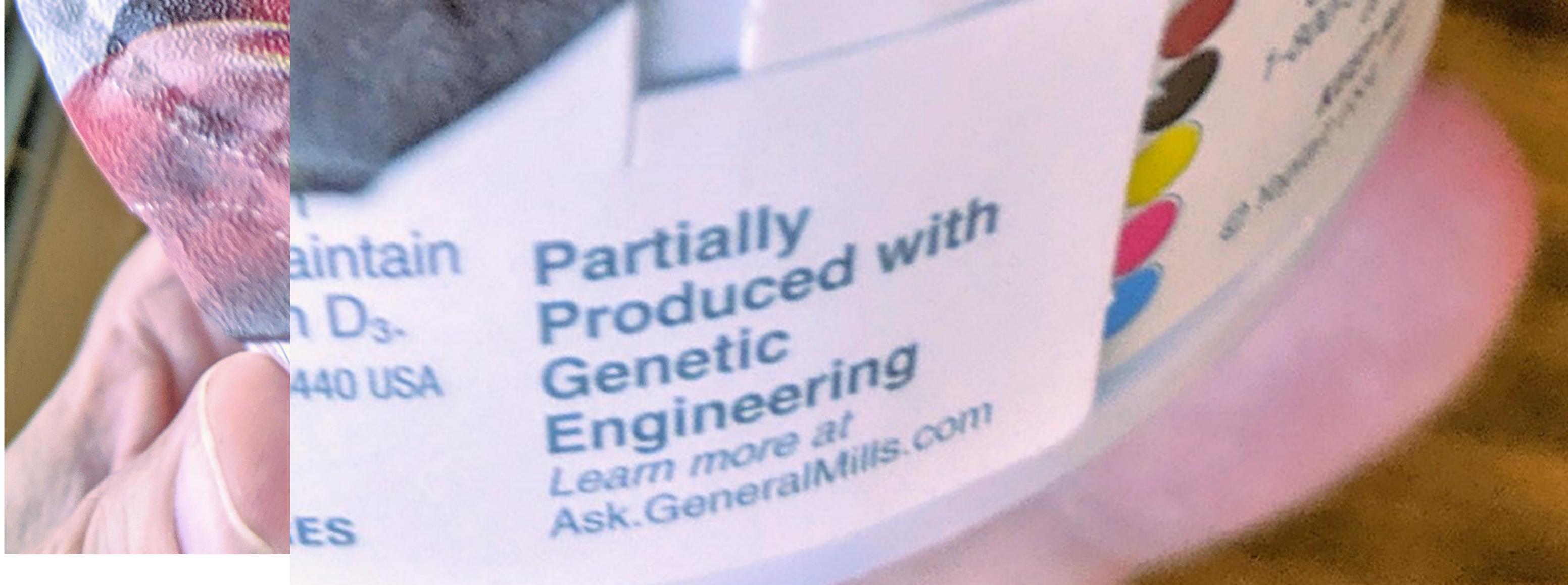


## Fall 2019 LD Debate Topic

**RESOLVED: The benefits of genetically modified food outweigh the risks.**

Gregory Rehmke

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# FOOD|EVOLUTION



FROM ACADEMY AWARD® NOMINEE **SCOTT HAMILTON KENNEDY**  
**FOOD|EVOLUTION**  
NARRATED BY **NEIL deGRASSE TYSON**

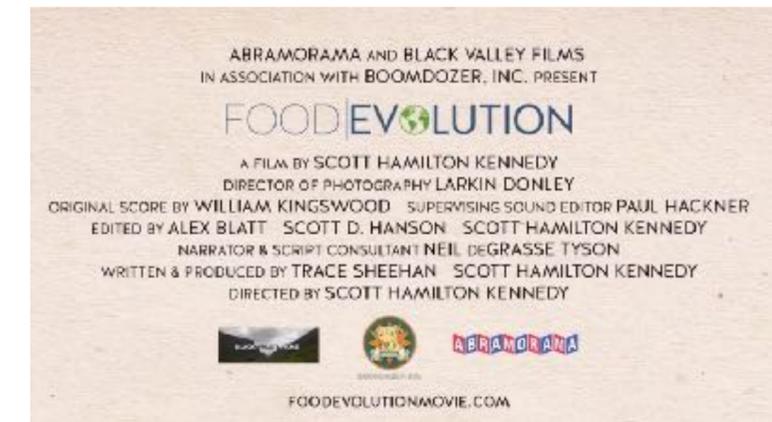
BLACK VALLEY FILMS IN ASSOCIATION WITH BOOMDOZER, INC. "FOOD EVOLUTION" A FILM BY SCOTT HAMILTON KENNEDY  
DIRECTOR OF PHOTOGRAPHY LARKIN DONLEY ORIGINAL SCORE BY WILLIAM KINGSWOOD SUPERVISING SOUND EDITOR PAUL HACKNER EDITOR ALEX BLATT SCOTT D. HANSON SCOTT HAMILTON KENNEDY  
NARRATOR & SCRIPT CONSULTANT NEIL deGRASSE TYSON WRITTEN & PRODUCED BY TRACE SHEEHAN SCOTT HAMILTON KENNEDY  
DIRECTED BY SCOTT HAMILTON KENNEDY



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"...the film explores all the ways science has been used and abused in public discourse surrounding the genetic engineering of food. In a world of misinformation and disinformation, nothing can be more timely."

- Neil deGrasse Tyson





## Food Evolution

The documentary film, *Food Evolution*, explores food-related challenges we face globally, the critical role that science will play in addressing them, and the public perceptions and misperceptions involving the science of food.

IFT funded the documentary *Food Evolution* to inspire discussion and show the critical role science and innovation play in building a safe, nutritious, and sustainable food supply for everyone. This film is intended to contribute to a rational conversation about science, facts, and food.

The world faces the challenge of feeding an estimated population of nine billion people in 2050. Because of the magnitude of this projection and the demand for safe and nutritious food that it brings, this issue needs to be considered from a thoughtful, global perspective. IFT approached several high-quality filmmakers, including Scott Hamilton Kennedy, and ultimately chose to work with Kennedy because he is known for his skill and integrity.

© Institute of Food Technologists



[www.ift.org](http://www.ift.org)

### *Food Evolution* Statement

IFT funded the documentary *Food Evolution* to inspire discussion and show the critical role science and innovation play in building a safe, nutritious and sustainable food supply for everyone. This film is intended to contribute to a rational conversation about science, facts and food.

The documentary was funded through IFT's financial reserves, derived from revenue generated primarily through membership dues, scientific publishing, events and advertising, and without contribution from any other organization or company.

## On the Origin of Food Evolution



On the farm with Blake Hurst

**So, we did our due diligence and what we found was that IFT is a non-profit, scientific society that publishes peer-reviewed scientific journals and consists of over 17,000 food scientists around the world, spanning across academia, the public sector and the private sector.**

<https://www.foodevolutionmovie.com/about/the-film/>

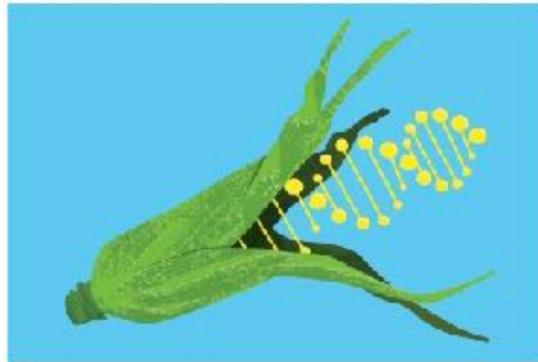
**ABRAMORAMA**

<https://www.foodevolutionmovie.com/>



December 3, 2014

## Genetically Modify Food



Genetically modified (GM) foods have been around for decades. Created by modifying the DNA of one organism through the introduction of genes from another, they are developed for a number of different reasons—to fight disease, enhance flavor, resist pests, improve nutrition, survive drought—and are mainly found in our food supply in processed foods using corn, soybeans, and sugar beets, and as feed for farm animals. Across the country and around the world, communities are fighting the cultivation of genetically engineered crops. Are they safe? How do they impact the environment? Can they improve food security? Is the world better off with or without GM food?

### About The Debaters

#### FOR THE MOTION



**Robert Fraley** – Executive VP & Chief Technology Officer, Monsanto

Dr. Robert Fraley is executive vice president and chief technology officer at Monsanto. He has been with Monsanto... [read bio](#)



**Alison Van Eenennaam** – Genomics and Biotechnology Researcher, UC Davis

Alison Van Eenennaam is a genomics and biotechnology researcher and cooperative extension specialist in the... [read bio](#)

#### AGAINST THE MOTION



**Charles Benbrook** – Research Professor, Center for Sustaining Agriculture and Natural Resources

Charles Benbrook is a research professor at the Center for Sustaining Agriculture and Natural Resources, Washington... [read bio](#)



**Margaret Mellon** – Science Policy Consultant & Fmr. Senior Scientist, Union of Concerned Scientists

Margaret Mellon is a science policy consultant in the areas of antibiotics, genetic engineering and sustainable... [read bio](#)

# CONTEMPORARY & COSTLY BIOTECHNOLOGY REGULATION



Plant biotechnology is a **heavily regulated science** both in the United States and the global marketplace, **costing independent researchers and companies, alike, millions of dollars and years of time.**

Biotechnology varieties are subject to strict scrutiny by **three U.S. government agencies** before they can be approved for commercialization.

## EPA

Regulates the use of pest-resistant traits which have been genetically engineered into plants, and which the Agency refers to as “plant-pesticides.”

## USDA

Regulates field tests of genetically engineered crops and interstate shipments of genetically engineered plants.

## FDA

Regulates the safety of new crop plants, with special emphasis on genetically engineered varieties in the nation’s food and drug supplies.

World Trade Organization, World Health Organization, Food and Agriculture Organization, European Commission, European Union Member States, Association of South East Asian Nations, Asia-Pacific Economic Cooperation, International Advisory Committee on Animal Health (Argentina), National Service for Food Safety and Quality (Argentina), National Institute of Health (Australia), Food Safety and Inspection Service (Australia), Australian Pesticides and Veterinary Medicines Authority (Australia), Ministry of Agriculture, Livestock and Fisheries (Brazil), National Biosafety Council (Brazil), Ministry of Health (Brazil), Canadian Food Inspection Agency (Canada), Environment Canada (Canada), Ministry of Health (China), State Environmental Protection Administration (China), State Food and Drug Administration (China), State Science and Technology Commission (France), Comité Biovigilance (France), Federal Ministry for Food and Agriculture (Germany), Federal Ministry of Health (Germany), Ministry of Labour (Italy), Interministerial Evaluation Committee (Italy), Ministry of Health, Labour and Welfare (Japan), Ministry of Education, Culture, Sports, Science and Technology (Japan), Malaysian Agricultural Research and Development Department (Malaysia), Ministry of Health (Malaysia), Ministry of Health (New Zealand), New Zealand Food Safety Authority (New Zealand), Inter-Agency Commission for Genetic Engineering (Spain), Ministry of Agriculture (Spain), Swiss Expert Committee (Switzerland), Federal Office of Public Health and Safety Executive (United Kingdom), Department for Environment, Food and Rural Affairs (United Kingdom), Food Standards Agency (United Kingdom), Advisory Committee on Novel Foods and Processes (United Kingdom), Advisory Committee on Novel Foods and Processes (United Kingdom)

Internationally, regulatory approval is extensive with **more than 70 international agencies** analyzing and regulating biotechnology varieties for commercial use or export.

U.S. farmers won’t grow crop varieties unless they are approved for export.

Science falls victim to the abundance of regulations as seed companies must **spend millions of dollars and years\* of their time** to bring a trait through regulatory approval to market. **The costs and time put the process virtually out of reach for independent researchers.**

\* This is in addition to several years and millions spent to develop and test the trait.

**\$6 million to \$15 million**



regulatory market approval cost estimate for crops that are shipped in international commerce to top producing and importing countries.

**\$35.1 million**



collective costs of meeting international regulatory requirements, or **25.8% of total costs** of discovery, development and authorization.

**\$136 million**

cost of discovery, development and authorization of a new plant biotechnology trait introduced, internationally, between 2008 and 2012.



**1992–1999**

USDA took an average of **5.7 months to approve 50 biotech crop applications**



**2000–2007**

USDA took an average of **14.3 months to approve 24 biotech crop applications**



**2008–2013**

USDA took an average of **26.4 months to approve 25 biotech crop applications**

The average time associated with registration and regulatory affairs, internationally, is increasing.



Average number of years required to **discover, develop and authorize** a new plant biotech trait in the global market:



**Sources:**

McDougall 2011: <http://www.croplife.org/PhillipsMcDougallStudy>

Kalaitzandonakes et al. 2007

Journal of Agrobiotechnology Management & Economics (<http://agbioforum.org/v3n4/v3n4a15-belson.htm>)

On Overview of Regulatory Tools and Frameworks for Modern Biotechnology: A Focus on Agro-Food, 2007

(<http://www.oecd.org/futures/long-termtechnologicalsocietalchallenges/40926623.pdf>)

USDA, Petitions for Determination of Nonregulated Status,

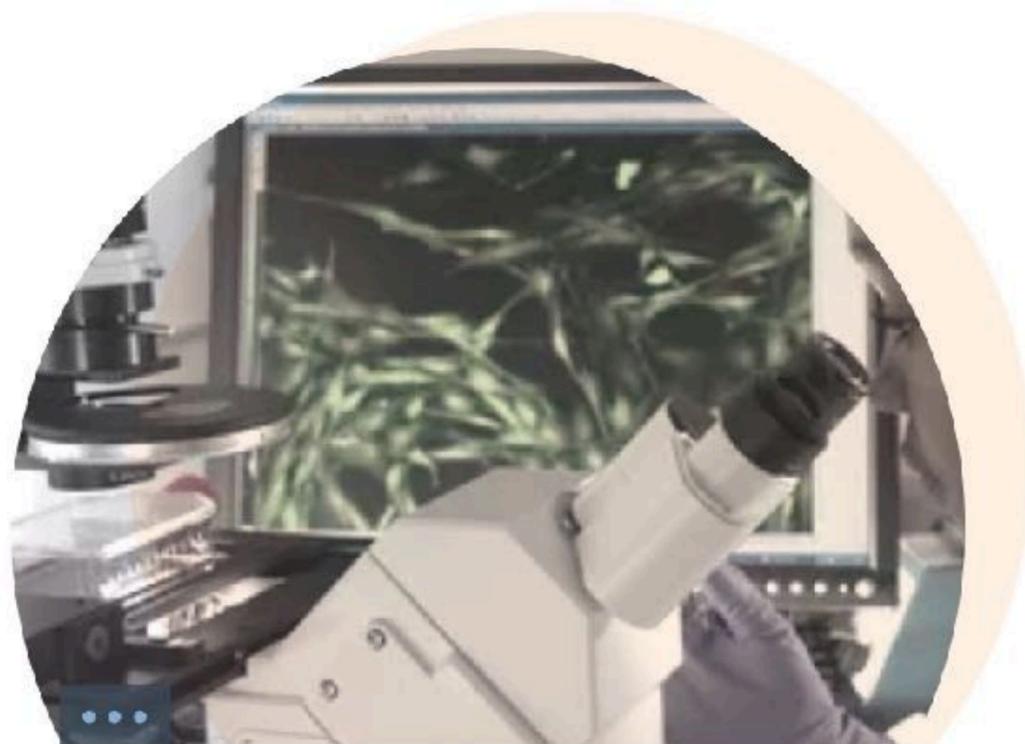
[http://www.aphis.usda.gov/biotechnology/petitions\\_table\\_pending.shtml](http://www.aphis.usda.gov/biotechnology/petitions_table_pending.shtml)



COMPETITIVE  
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# What Are GMOs and How Are They Made?

The Basics of Genetic Modification



- GMO Mosquitos (sterile)
- Golden Rice (w/ Vitamin A)  
<http://www.goldenrice.org>
- AquaAdvantage Salmon
- Rainbow Papaya
- Apples and tomatoes

# Laureates Letter Supporting Precision Agriculture (GMOs)

June 29th 2016



**To the Leaders of Greenpeace, the United Nations and Governments around the world**

The United Nations Food & Agriculture Program has noted that global production of food, feed and fiber will need approximately to double by 2050 to meet the demands of a growing global population. Organizations opposed to modern plant breeding, with Greenpeace at their lead, have repeatedly denied these facts and opposed biotechnological innovations in agriculture. They have misrepresented their risks, benefits, and impacts, and supported the criminal destruction of approved field trials and research projects.

We urge Greenpeace and its supporters to re-examine the experience of farmers and consumers worldwide with crops and foods improved through biotechnology, recognize the findings of authoritative scientific bodies and regulatory agencies, and abandon their campaign against "GMOs" in general and Golden Rice in particular.

Scientific and regulatory agencies around the world have repeatedly and consistently found crops and foods improved through biotechnology to be as safe as, if not safer than those derived from any other method of production. There has never been a single confirmed case of a negative health outcome for humans or animals from their consumption. Their environmental impacts have been shown repeatedly to be less damaging to the environment, and a boon to global biodiversity.



# Nobel Laureate: EU politicians ignore 'politically unwelcome' GMO science

Home | Science & Policymaking | Interviews

By Sarantis Michalopoulos | EurActiv.com

📅 Sep 26, 2016 (updated: Sep 27, 2016)



The petition wonders how many poor people in the world will have to die before we consider this a “crime against humanity”. Seriously?

Very seriously! Many people in the developing world are deliberately being denied the opportunity to use modern agricultural techniques to raise their quality of life.

Just golden rice alone, if its development was not being hampered, has the possibility to save many children from blindness and developmental defects. Currently, as many as 2 million children die every year from vitamin A deficiency.

In Uganda, the banana crops are being hit by a wilt for which there is no natural resistance in any species of banana. 30% of the population's calories derive from bananas. If they lose that important food source millions across sub-Saharan Africa could die.

Yet there is a GMO solution. How many people must die before it becomes inescapable that the Green parties' positions on GMOs are killing people?



SCIENCE

THE STATE OF THE UNIVERSE.

JULY 15 2015 5:45 AM

# Unhealthy Fixation

The war against genetically modified organisms is full of fearmongering, errors, and fraud. Labeling them will not make you safer.



By William Saletan

[http://www.slate.com/articles/health\\_and\\_science/science/2015/07/are\\_gmos\\_safe\\_yes\\_the\\_case\\_against\\_them\\_is\\_full\\_of\\_fraud\\_lies\\_and\\_errors.html](http://www.slate.com/articles/health_and_science/science/2015/07/are_gmos_safe_yes_the_case_against_them_is_full_of_fraud_lies_and_errors.html)



- *Although agriculture is sometimes under fire from environmental critics—as this paper will discuss—the increase in farm production has been accompanied by major environmental improvements.*
- *New technologies have limited the environmental damage of greater production. For example, the shift from conventional tillage to no tillage has reduced erosion. Most modern chemicals and fertilizers break down in short periods with sunlight.*
- *Larger field equipment and advanced technologies speed up planting and harvesting. The shorter disturbance times and the high yields leave a smaller footprint on the natural landscape, giving more room and time for wildlife to thrive.*

**Organic pesticides?**

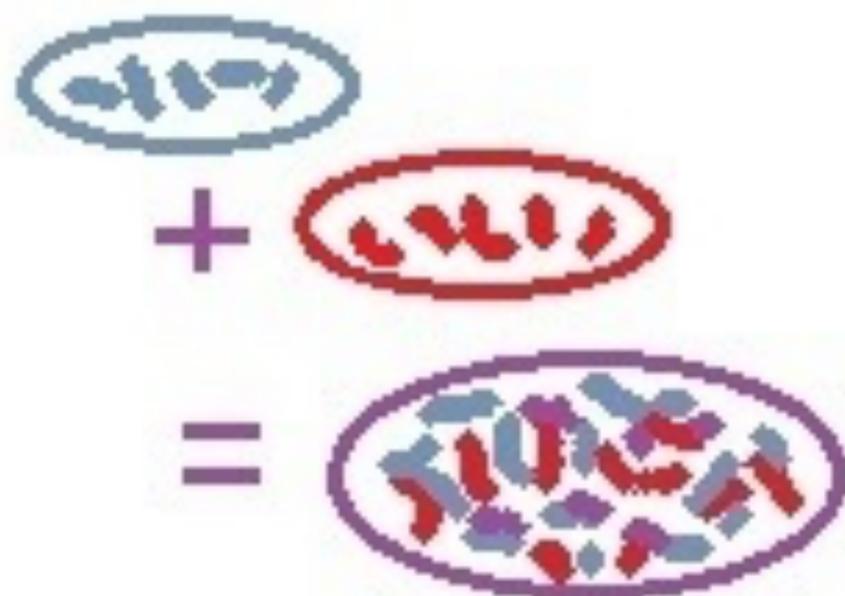
"GMO" is an abbreviation for "Genetically Modified Organism" and is a scientific and confusing term used to describe plants and animals improved through genetic engineering and to distinguish them from crops bred through conventional methods.

The United Nations Food & Agriculture Organization's definition:

"Genetically engineered/modern organisms are produced through techniques that have altered in a way that does not occur naturally through recombination."

But there is no "GMO", nor any clear description. Genetic modification has been part of life on earth. Every GMO ever created has used techniques discovered by researchers. Scientists figured out how to do genetic modification in the real world, understanding it and learning from it. We discovered that the movement of genes is commonplace and widespread in nature, as seen in sweet potatoes which have been never imagined. It is, in fact, a natural part of life's makeup. We are all "GMOs" as is every organism on Earth.

## Conventional plant breeding



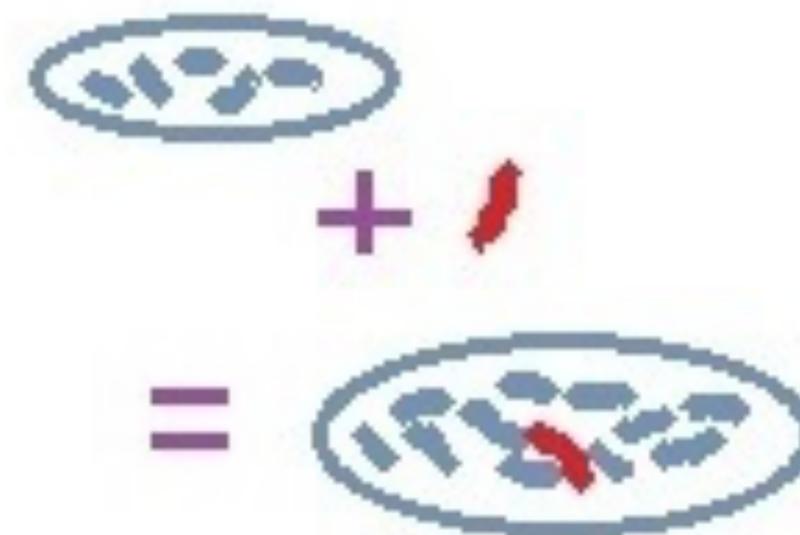
Mixing hundreds of genes

and if that doesn't work there's always  
Chemical mutagenesis irradiation

Greenpeace says

this is safe!

## GM plant breeding



One single gene

Precision Agriculture

and this is dangerous!

# How the Sugar Industry Shifted Blame to Fat

By  
ANAHAD O'CONNOR SEPT. 12, 2016



The sugar industry paid scientists in the 1960s to play down the link between sugar and heart disease and promote [saturated fat](#) as the culprit instead, newly released historical documents show.

The internal sugar industry documents, recently discovered by a researcher at the University of California, San Francisco, and [published Monday in JAMA Internal Medicine](#), suggest that five decades of research into the role of nutrition and heart disease, including many of today's dietary recommendations, may have been largely shaped by the sugar industry.



Vernon L. Smith

Yesterday at 9:37am · LA Times ·

"The truth is that from the 1950s onward, many scientists truly believed that saturated fat and cholesterol were the primary cause of heart disease. Nutritionis...

[See More](#)



Don't scapegoat Big Sugar. Lots of food producers profited from the demonization of fat

The recent revelation that Harvard scientists were paid off to downplay sugar's harms in the 1960s shows how the food industry shockingly manipulated nutrition science...

LATIMES.COM | BY LOS ANGELES TIMES

[http://www.latimes.com/  
opinion/op-ed/la-oe-  
teicholz-big-sugar-saturated-  
fats-20160927-snap-  
story.html](http://www.latimes.com/opinion/op-ed/la-oe-teicholz-big-sugar-saturated-fats-20160927-snap-story.html)

All the “carbohydrate industries” profited from the demonization of fat, exactly as anticipated. Consumption of flour and cereal products increased by 41%, including a 183% increase in products from corn.

Overall, as [Americans cut their consumption of fat by 25% from 1965 to 2011, they increased carbohydrate intake by more than 30%.](#)