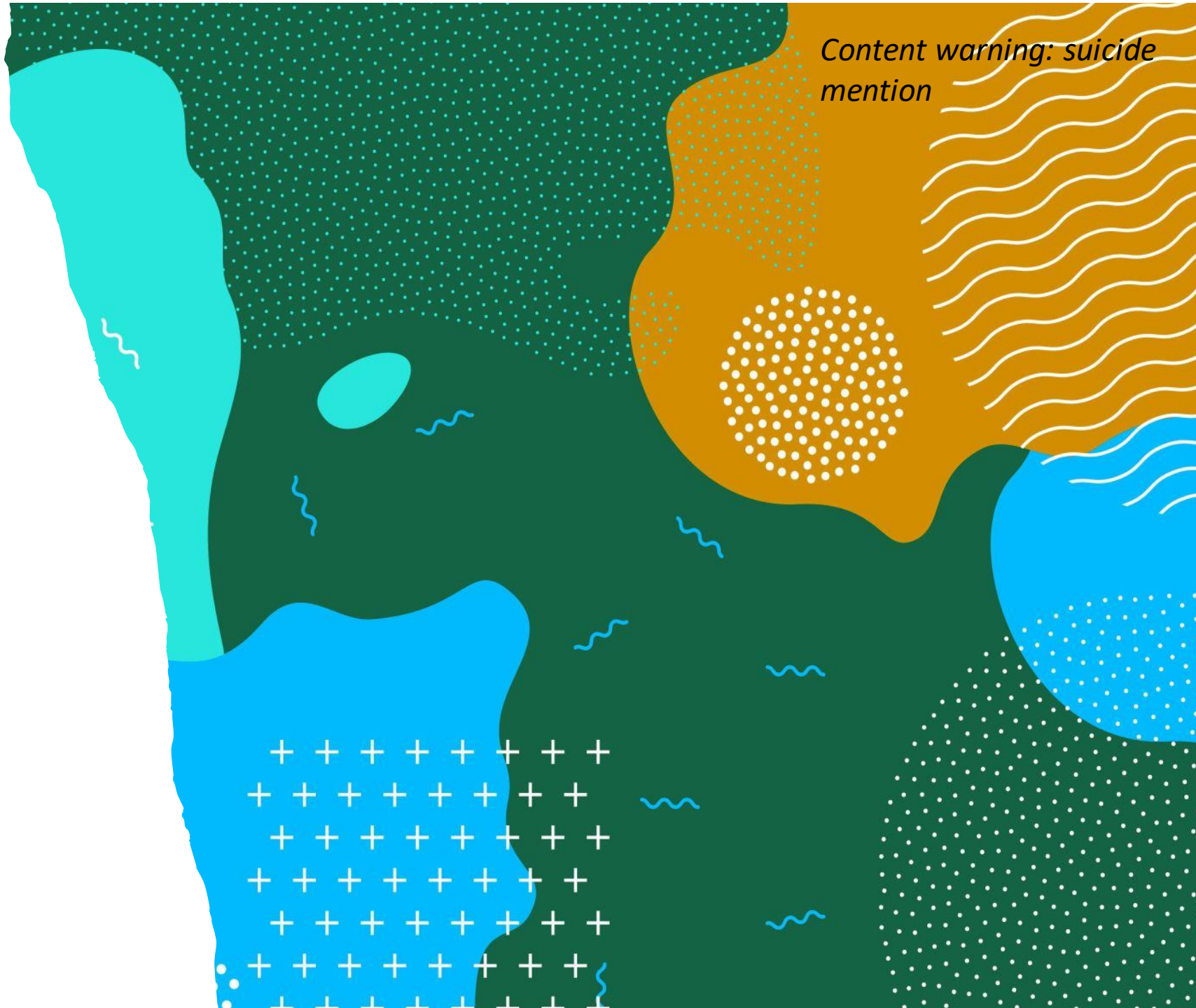
GMOs

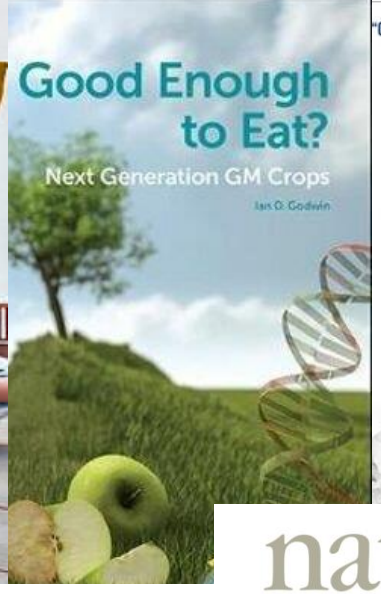
...It's Complicated

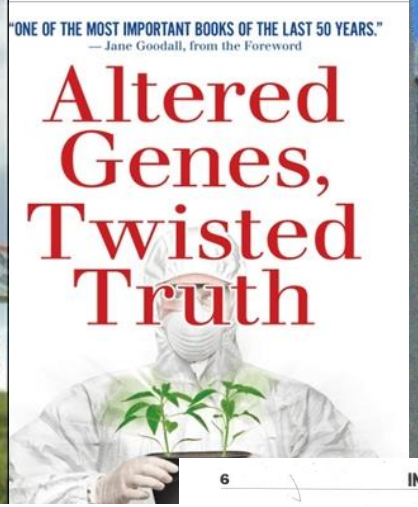
By
Emma Coons
Val Dingman
Sarah Dyer
Yolanda Heermann
Ashley Lewis
Corrine Stewart




Methods
Strawberries
Breeding
Unknown
Topic
Man-Made
Healthy
Food
Strange
Health
Unwanted
Controversial
Monsanto
Manual
Potential
Insulin
Selective
Good
Unnatural
Diverse
Synthetic
Controversy
Unhealthy
Future
Harmful
Unneeded
Ready
Chemicals
Corn
Man-made
Biodiversity
Icky
Poison
Bad
Science
Strawberry
Organic
Money
Helpful
Confusion
Bees
Roundup
Hybrids
Suicide
Waste
Pollination
Misused


Old Monsanto had a Farm
G-M-G-M-O
NO-NO-NO ! NO GMO!!


Good Enough to Eat?
Next Generation GM Crops
Ian D. Godwin


"ONE OF THE MOST IMPORTANT BOOKS OF THE LAST 50 YEARS."
— Jane Goodall, from the Foreword
Altered Genes, Twisted Truth


HIMALANIA
Fine Pink Salt
NON GMO Project
VERIFIED
nongmoproject.org

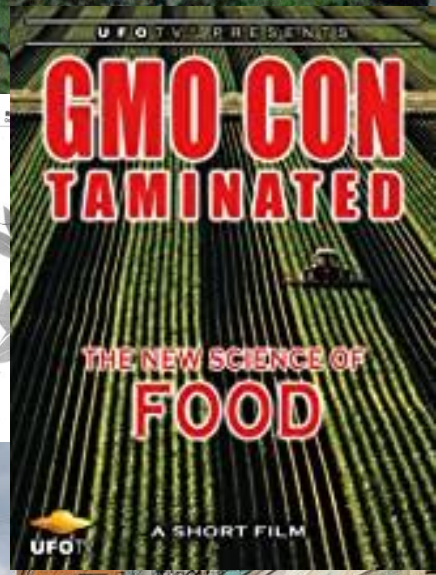

GMO OMG
Is this the end of
REAL FOOD?

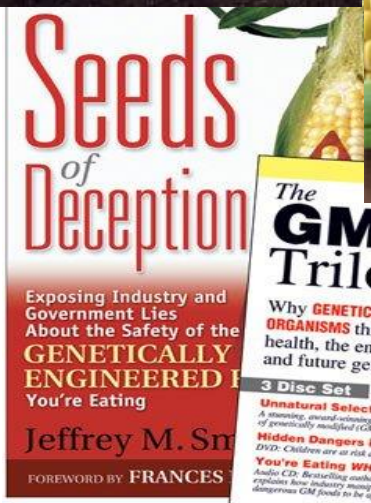

GMO

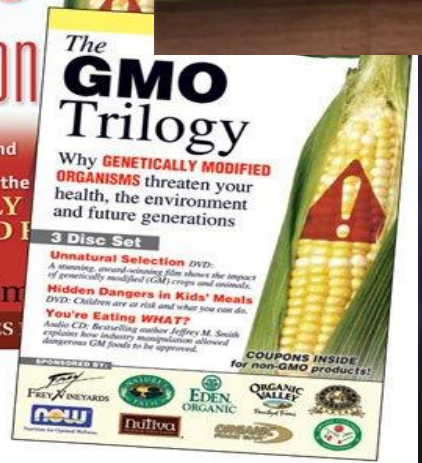

GMO FREE
Genetically Modified


nature
THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE
GMOs
The promise. The reality.
LOOK AROUND YOU
RECIPE FOR DISASTER
MONEY FROM THE MASSES


6
INTERVIEW
Just say no to
GMO
Jeffrey Smith, author of Genetic Roulette and Seeds of Deception, talks about how the fight against genetically-modified organisms is changing the future of food


GMO CON TAMINATED
THE NEW SCIENCE OF FOOD
A SHORT FILM


Seeds of Deception
Exposing Industry and Government Lies About the Safety of the
GENETICALLY ENGINEERED
You're Eating
Jeffrey M. Sm
FOREWORD BY FRANCES


The GMO Trilogy
Why GENETICALLY MODIFIED ORGANISMS threaten your health, the environment and future generations
3 Disc Set
Unnatural Selection DVD:
Hidden Dangers in Kids' Meals
You're Eating WHAT?
COUPONS INSIDE for non-GMO products!


SERIES
unnatural selection
Play


I SAY NO TO GMO
SAVE OUR PLANET
STOP
SOP
One World, One Humanity, Share the Worlds Resources


SAY NO TO GMO

What is GMO?

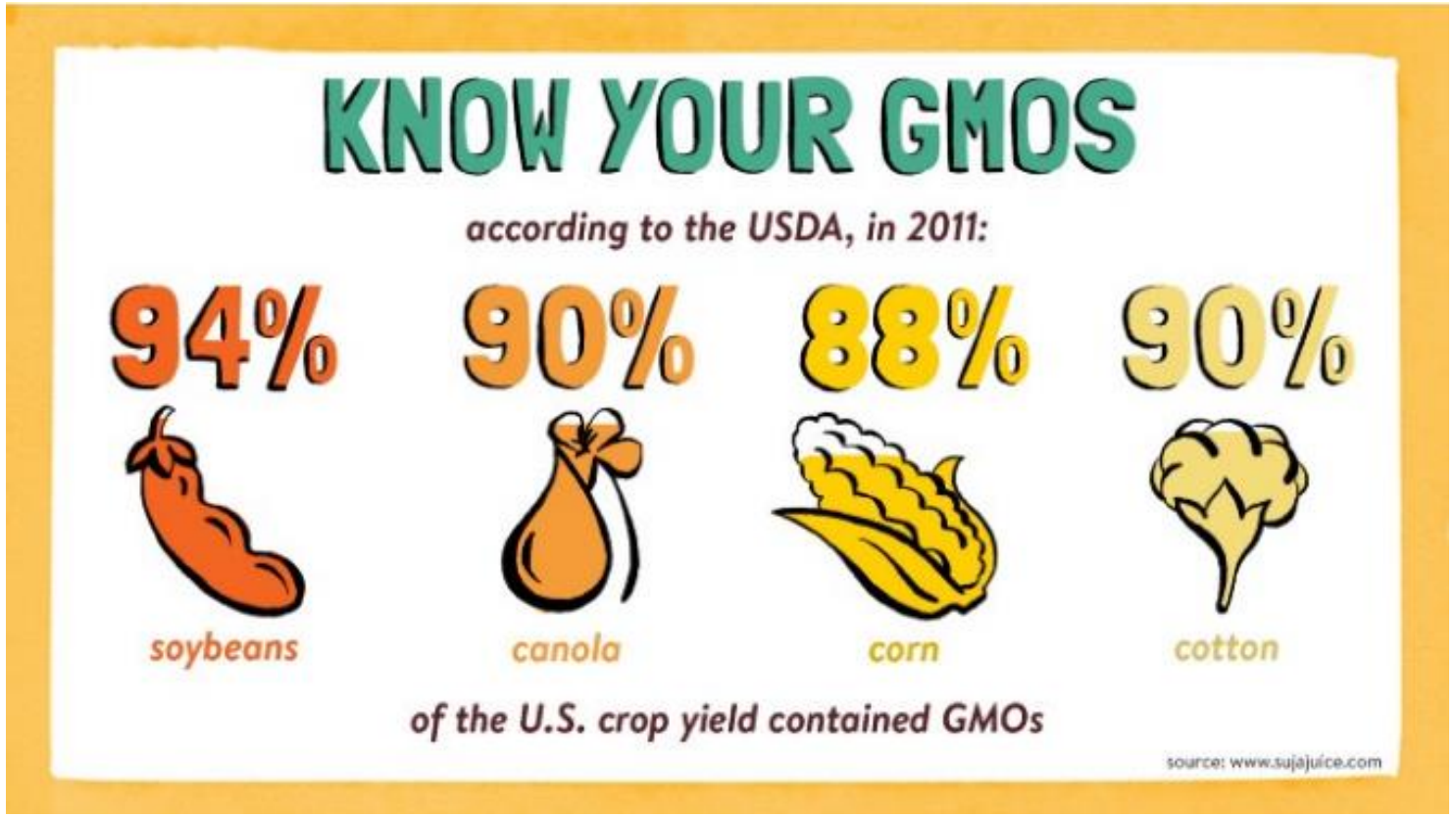
Genetic modification: The production of heritable improvements in plants or animals for specific uses, via either genetic engineering or other more traditional methods. Some countries other than the United States use this term to refer specifically to genetic engineering.

Genetically modified organism (GMO): An organism produced through genetic modification.

Types of Genetic Modification

- **Selective breeding**: Making **deliberate crosses or matings of organisms** so the offspring will have desired characteristics derived from one or both parents.
- **Marker-assisted breeding**: a combined product of traditional genetics and molecular biology. MAS allows for the **selection of genes that control traits of interest.**

- **Genetic engineering**: Manipulation of an organism's genes by **introducing, eliminating or rearranging specific genes** using the methods of modern molecular biology
- **Gene editing:** the manipulation of the genetic material of a living organism by **deleting, replacing, or inserting a DNA sequence,** typically with the aim of improving a crop or farmed animal or correcting a genetic disorder.


KNOW YOUR GMOS
according to the USDA, in 2011:
94%
90%
88%
90%
soybeans
canola
corn
cotton
of the U.S. crop yield contained GMOs
source: www.sujajuice.com


Insulin


PEOPLE
PLANET
PROFIT

Navdanya

Navdanya means “nine seeds” and the “new gift”.

- Indian NGO, founded in in 1987 as a seed saving movement by Vandana Shiva.
  - Italian NPO, Navdanya International founded in 2011 to strengthen Navdanya's global outreach in its mission.
- Mission: Food, Seed, Water, Soil, and Knowledge Sovereignty.
- Primary membership of more than 650,000 farmer families in 22 states of India, as well as the secretariate of the Dahli Lama.
- 120+ community centered, decentralized, indigenous seed banks across India
- Earth University - Navdanya Biodiversity Conservation Farm.

“A patent on seed implies that a farmer saving seed is an ‘intellectual property thief ‘. But it means more. A system in which seed has become a corporate monopoly, a system in which a few companies control the seed supply is in effect a system of slavery for farmers. Where the freedom of seed disappears, the freedom of farmers disappears.”

—NAVDANYA, DR. VANDANA SHIVA

Why is Vandana Shiva so anti-GMO? What is her reasoning?

Seed Sovereignty

Biopiracy

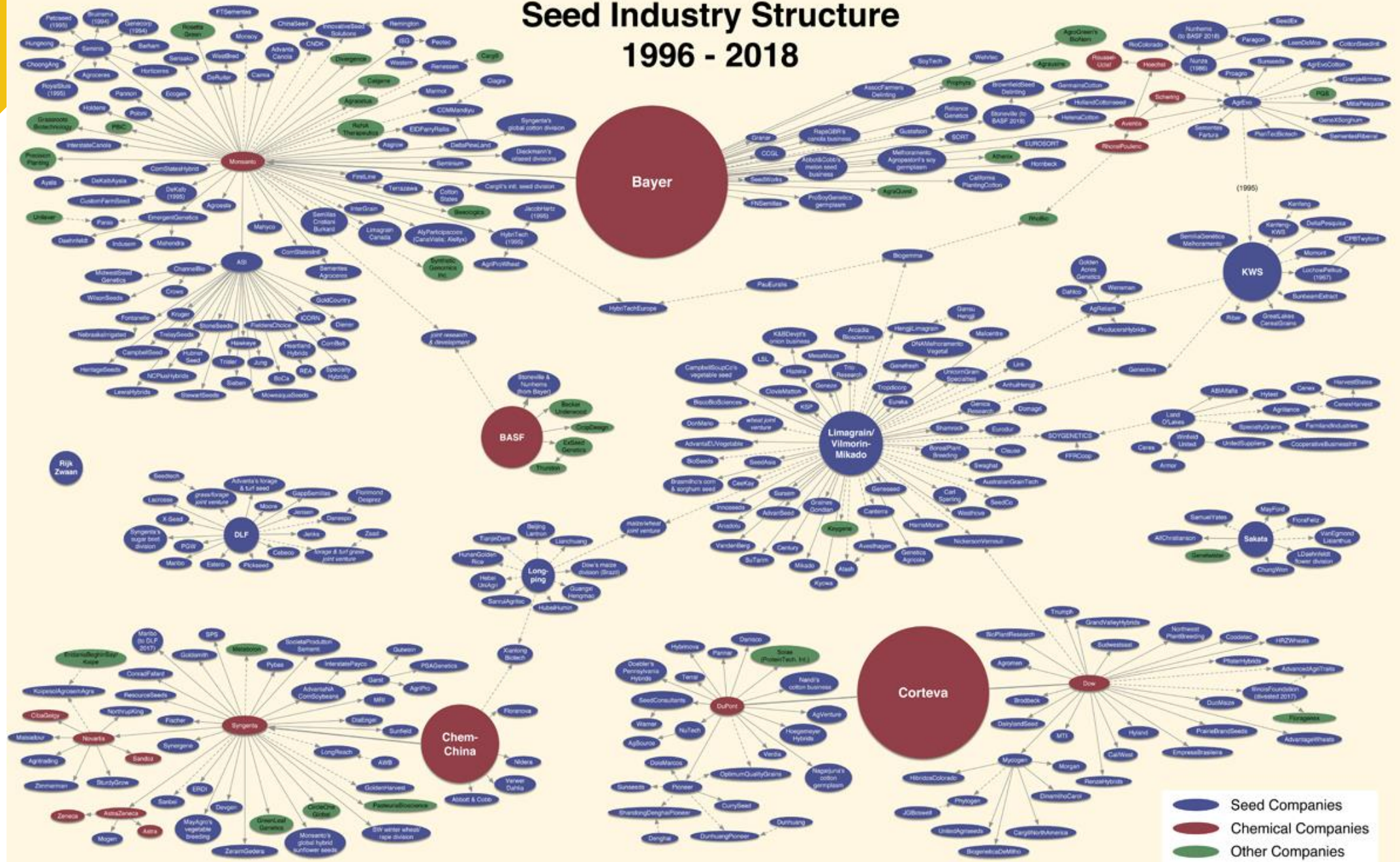
Diversity

Health and Well Being

GMO Companies ARE Chemical Fertilizer Companies

https://www.pbs.org/video/independent-lens-seed-untold-story-perils-chemical-farming-clip/

Seed Industry Structure
1996 - 2018



Phil Howard, Associate Professor, Michigan State University
https://philhoward.net

Monsanto's History

1901
Founded as a saccharine company

1920s
Start making chemicals later implicated in human health problmes

1940s
Manufactures synthetic plastics and fibers

1960s
Gets into agriculture with a focus on herbicides

1962-71
One of the companies supplying agent orange to the US Miliary for use in Vietnam war

1976
Commercializes roundup

1982
First to genetically modify a plant cell – giving birth to agricultural biotechnology

1994
Creates posila, biotech cow hormone

1996
Engineers roundup ready biotech soybeans and pest resistant cotton

1997
Biotech canola, cotton, and corn
Buys “foundation seed companies

1997
Separates from their synthetic fibers and checmical manufacturing to become just an ag company

1998
Roundup ready corn

2002-2003
Jury finds Monsanto guilty of polluting Alabama with PCBs

2004
Forms American Seeds Inc. holding company

2006 – 2007
Buys several regional seed companies

2008
Sells posilac cow hormone amidst controversy

2008 – 2009
DOJ states that its looking into monopoly in the seed industry

2009
Donates cotton technology to acedemic research

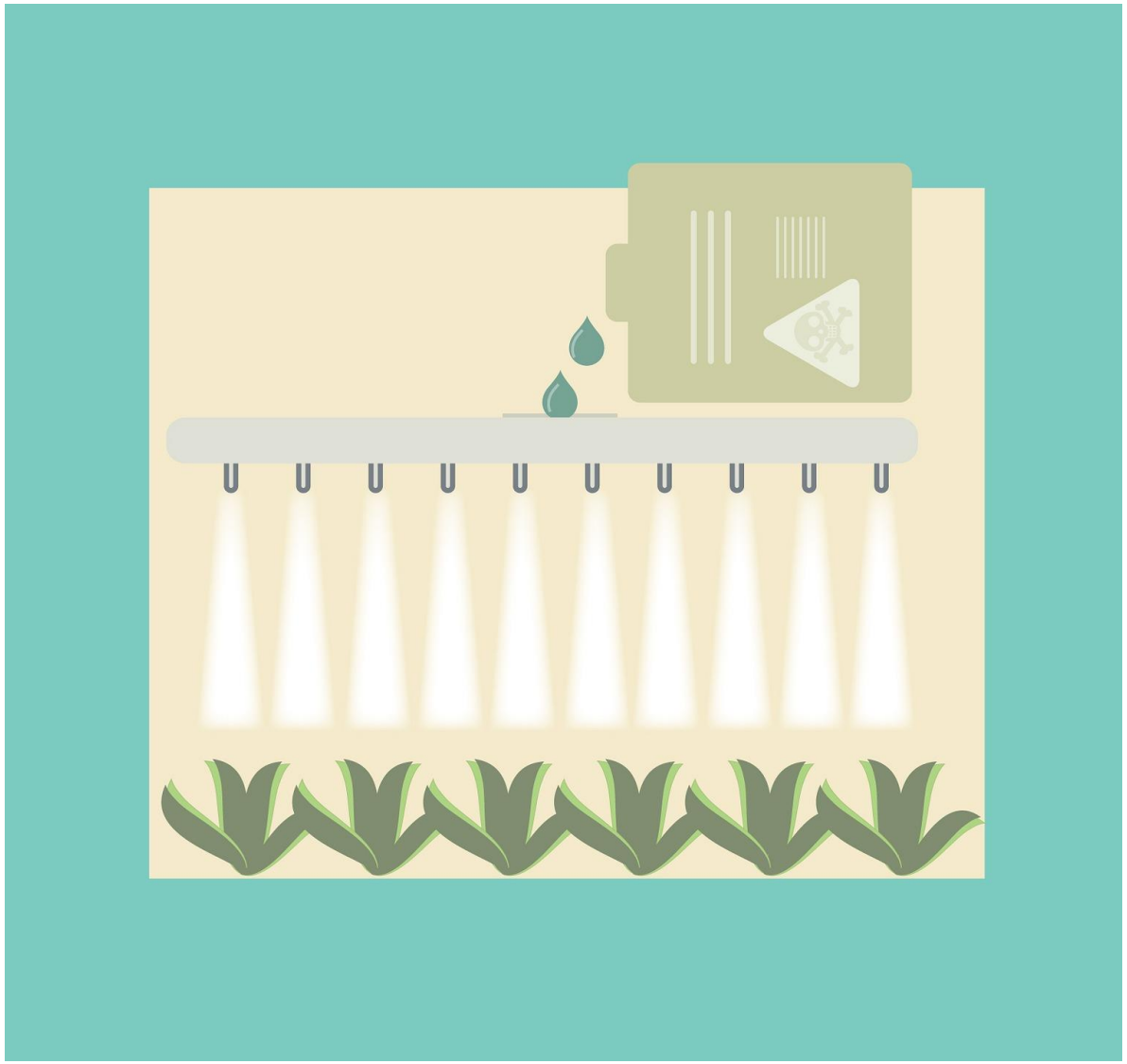
2009
Announces project to improve the lives of Indian farmers

2018: Acquired by Bayer

MONSANTO

Roundup Herbicide

- Active ingredient: **Glyphosate**
- Designed to kill all plants besides Roundup Ready crops



Roundup Ready Crops

Genetically modified

Resistant to Roundup

Added gene from a bacteria species

Broken Promises

- High yield
- Less work
- Decreased costs
- Less herbicide needed
- "So safe you can drink it"
- Superweeds unlikely

Pros of Roundup

- Closer rows, more per acre
- Not as much tilling
- In some instances, better yield

Cons of RR Crops & Herbicide

- Increased use of herbicide
- Superweeds
  - More effort
  - Costs
  - Harder to quit
- No clear yield increases
- Crop failures
- Seeds more expensive than conventional

- Milkweed decline
- Non-hodgkins lymphoma
- Soil health
- Perpetuates monoculture
- Patenting
- Farmers
  - can't save or share seed
  - Must buy Roundup herbicide if growing RR crop

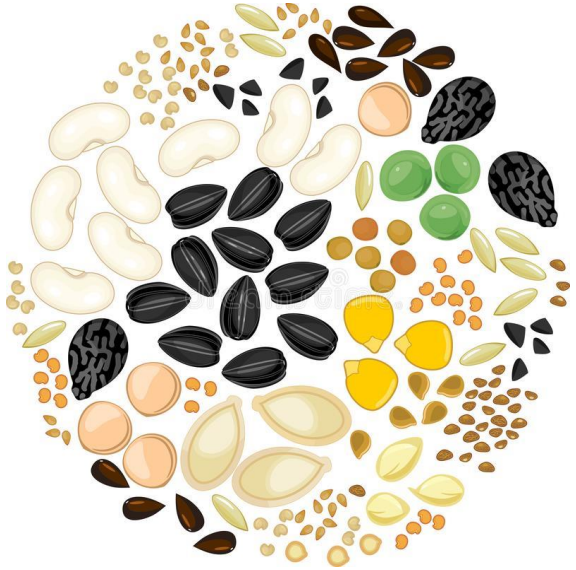
“G.M.O. crops are not a silver bullet, but they are a very important and productive tool for modern and sustainable agriculture. With a global population expected to grow to nearly 10 billion by 2050, farmers need every available tool to produce more food sustainably. G.M.O.s are a vital part of the solution, and the voice of the farmer should be represented.”

Robert Fraley, Monsanto VP to New York Times, 2016

MONSANTO

Uprising seeds

"All our seeds are Certified Organic, Open-Pollinated, and grown by small family farms in the Pacific Northwest."



- Uprising Seeds produces over 70% of all the seeds they sell, and sources the rest from other family farms in Washington, Oregon, Northern California and Idaho.
- Committed to preserving and improving open pollinated seed varieties to help keep biodiversity strong, adaptive, and resilient.
- Open pollinated varieties have shown to outperform imported seeds by adapting to the area in which they are being grown in.
- Many varieties Uprising Seeds sells have been bred and/or improved upon by their local and skilled growers who all have extensive experience in growing and saving high quality seeds.
- These growers breed rare, diverse, and resilient seed varieties that are adapted to the Pacific Northwest with its short growing season.

- Uprising seeds, along with the other family farms that provide them seeds, use a method called selective plant breeding.

- Selective breeding is done by choosing the plants that have particular characteristics that are found desirable, these plants are then breed together to hopefully produce more plants with these same desirable characteristics.

https://youtu.be/q02g_OKTByM?t=24

Uprising Seeds is currently partnering with the Culinary Breeding Network and Smarties.Bio.

Smarties.Bio is a company that works with local Northern Italian farmers to help preserve, maintain, and distribute local native varieties in a modern market. They do this by intersecting the knowledge of rural tradition and modern genetic improvement techniques. This provides for genetic improvement in disease resistance, tastes and flavors now ancient, and adaptability to stressers.

SMARTIES.BIO
GROWDIFFERENT

Culinary Breeding Network is a group that has a mission of building communities of plant breeders, seed growers, farmers, produce buyers, and chefs to improve quality of veggies, fruits, and grains. The events that the Culinary Breeding Network puts on provides opportunities for eaters and breeders to see and taste new veggie and grain cultivars. Here they can share their opinions and be an active part of the breeding process. This helps break down the wall between eaters, buyers, and breeders by letting them get to know each other in the process of actively participating in the breeding process.

This collaboration is to help further establish radicchio in the Northwest. Later this month Uprising Seeds will be offering a special line of certified organic radicchio, along with regional specialty brassica that were bred by Smarties.Bio.

Uprising Seeds offers a Slow Foods Ark of Taste sampler: 11 varieties that have been picked by RAFT (Restoring American Food Traditions) for the American Ark of Foods. Hutterite Bush Dry Bean, Jacobs Cattle Bush Dry Bean, Lina Cisco's Bird Egg Bush Dry Bean, Rockwell Bush Dry Bean, Roveja Pea, Aunt Molly's Ground Cherry, Grandpa Admire’s Lettuce, Speckled Butterhead Lettuce, Tennis Ball Lettuce, Red Fig Tomato, and Sheboygan Paste Tomato.

- **Ruth Oniang'o** founded **Rural Outreach Program (ROP)** in Kenya in 1993 to connect resources with and to improve the quality of life in rural areas.

- ROP partners with the **African Agricultural Technology Foundation (AATF)**, who collaborates with Monsanto, to oversee **WEMA, Water Efficient Maize for Africa.** Producing and testing Monsanto's high tech maize seeds and supplying to local distributors, WEMA reaches 200,000 rural farmers in 6 countries.

DroughtTego Maize

- High tech maize called Drought Tego
  - **Tego** is Latin for shield
- Robb Fraley former Monsanto CTO says Monsanto donated “our most advanced breeding technology and our best genetics so that WEMA scientists can develop seeds specifically targeted for their soil and climates.”
- Drought Tego seeds are gene altered but not technically GMO. The GMO version is Draught Tela, which is drought tolerant and pest resistant.

Tego Maize

Drought Tego	Drought Tela – variation of ->	Drought Gard – USA
Non-GMO – drought resistant and rapid maturity	GMO – drought and pest resistant	GMO – drought and pest resistant
"Marker Assisted" breeding Allows for precise changes to seed's genome by coding desired traits from the same species	Transgenic – contains genes from a different organism, in this case bacterium *Bacillus Subtilius* – found in soil and human gut, helps plant manage water stress *Bacillus Thuringiensis* – found in soil, helps plant produce its own insecticide	Grown on 3 million acres in USA, 90% of the corn grown in USA is GMO
WEMA scientists developed over 100 varietals for different soil types and regions, all sold with DroughtTego brand – associated with high yields and resilience	Producing yields about 40% higher than non-GMO	Results have been mixed: crop has performed well in drought events in NW, yet done poorly in similar situations in MW
20% to 30% higher yields than commercial varieties under moderate drought conditions	Dr. Dickson Liyago, head of the maize breeding program for WEMA, says that in 15 years of testing has shown no harm to beneficial insects. **	Dr. Martha Herbert states, "Manufacturers of genetically altered foods have exposed us to one of the largest uncontrolled experiments in modern history."

Can corn engineered to be drought and pest resistant benefit the populations in the driest climates? At what cost to native varieties and traditional knowledge?

Miriam Mayet

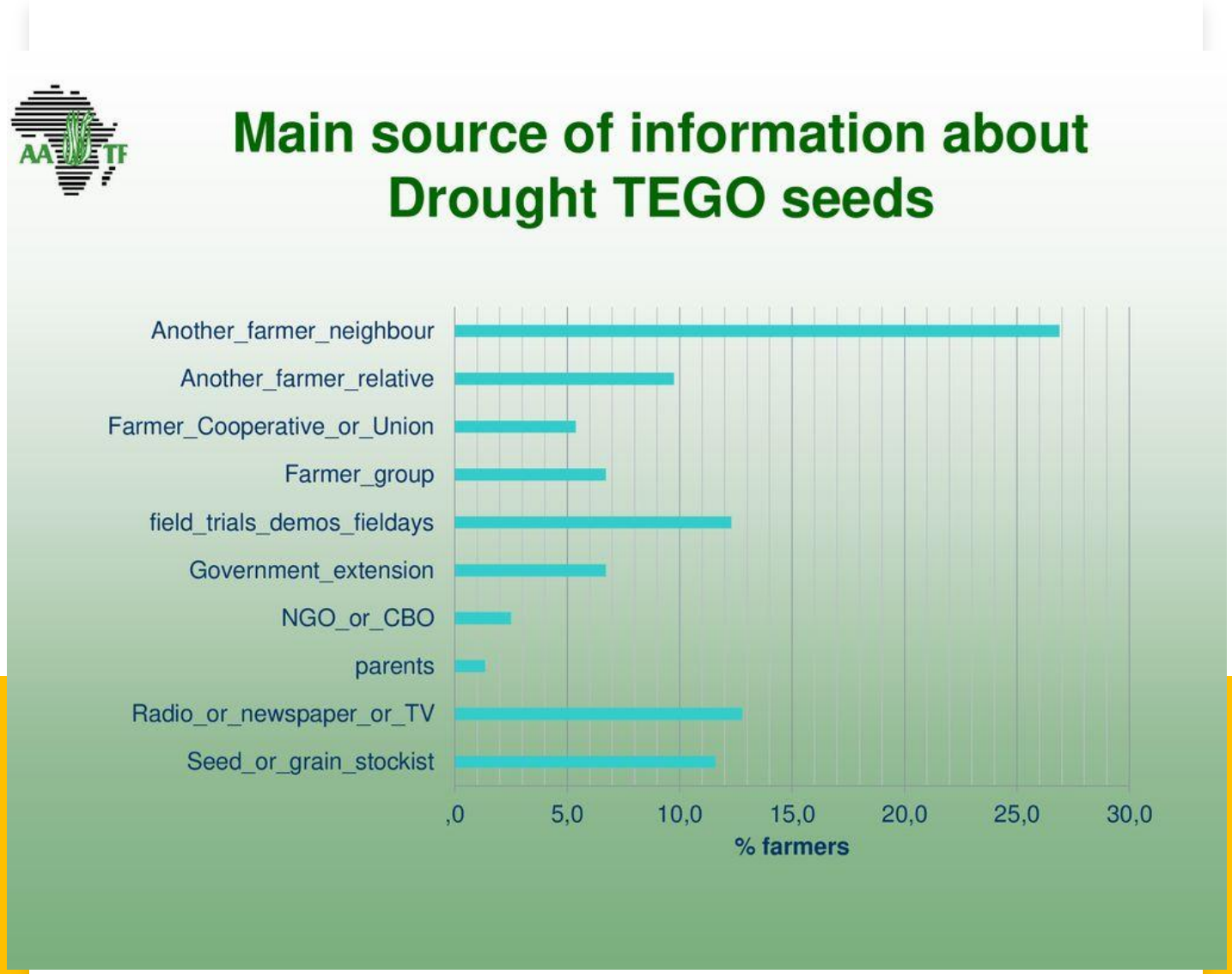
Director of African Center for Biodiversity

"WEMA and Monsanto are engaging in "profiteering disguised as philanthropy"

"Monsanto is engaging in a devious form of agricultural imperialism, playing up short-term humanitarian ambitions when it is really a long-term effort to capture and control new markets."

Mary and Robert Matete joined ROP in 2012. On 1.5 acres, the group helped her revive her soil and converted her crop to Tego Maize and in four years, she was able to increase yields 400% from 18 bushels per year to 74. This sounds like progress, but it is still not enough. **In 2016, she grossed $990 but invested more than ¾ for the following season, she netted about $180 to support her family of 11 for a year.**

At the moment, small holder farmers are paying the standard prices of local seed markets for these biotech seeds, but as markets improve, Monsanto will begin to sell the seeds at a higher profit.

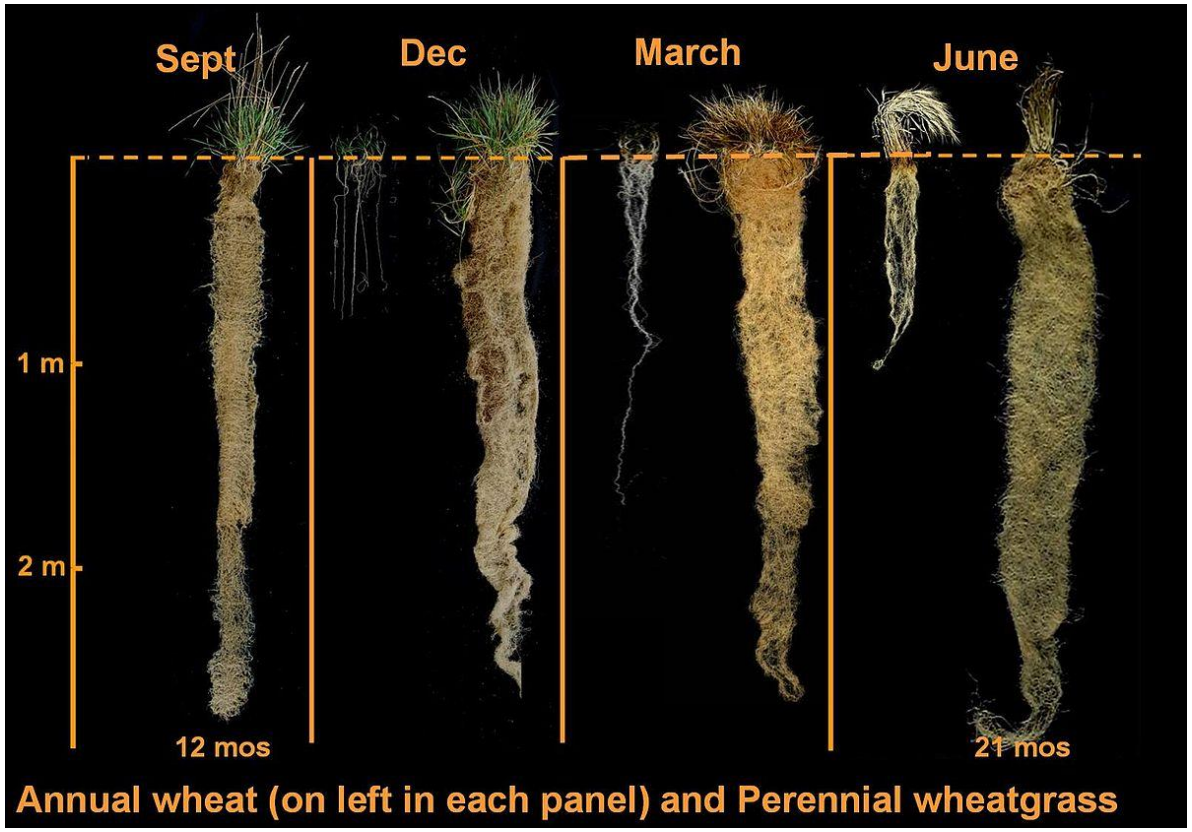


The Future of GMOs Through Perennial Wheat

How can modifying an annual staple crop into a perennial crop represent our current understanding of modern agriculture?

Considering Soil and Root Systems

When you look at annual root systems, compared to perennial root systems of wheat, what do you see?



Grains take up 70% of our global caloric consumption and over 70% of our global crop lands.

WSU's Bread Lab

http://thebreadlab.wsu.edu/the-bread-lab-collective/

How do they perennialize wheat?

- Selective breeding
- Genetic engineering

What are the considerations?

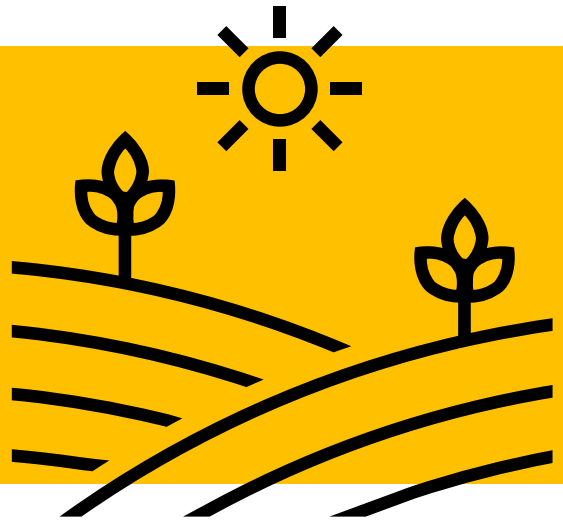
- Searching for a good quality fermentation process through...
  - Looking at the bran and germ
  - Protein strength
- What do these traits determine?

- Why would this bread be cheaper for consumers?
- How has industrialization impacted our grain industry?

How are we going to use GMOs for the future?

How is this better than annual wheat? Monocultures?

The Future of GMOs Through Perennial Wheat



- Questions:
  - How can GMOs be used as a tool for flavor in our food crops?
  - How does the current number of mills we have in the US relate to the future of perennial grains?
  - How might perennial wheats affect our “glocal” food systems by genetically modifying staple crops?
  - How would perennial wheats impact the meat industry established today? For better or worse?

Health

- Genetically modified crops have the potential to be full of vitamins and minerals which has increased marketing methods.

  Scientific studies are providing consumers with positive feedback which is increasing the sale of genetically modified foods.

Using GMOs:

Pros:

Resistance to insects
Disease resistance
Tolerance for heat, Cold, or drought
Crop yield
Easier to cultivate
Fewer pesticides used
Nutritional values
Lower carbon emissions
Less water waste
No tillage or minimal tillage
Not proven unsafe (WHO)
Allows accelerated adaptation to climate change

Cons:

Tolerance to herbicides
Strenghtens pests
Monopolies and seed control
GMO contamination of other crops
Produce super weeds
Not yet proven safe for human consumption
Unknown long-term effects
Possibilities of allergic reactions and cancers
Not always thoroughly tested
Not always clearly labeled
Loss of biodiversity
Prepetuates monocultures
Suicide
Increased chemical use

Amanda Little on genetic engineering

Reflective discussion

- Can corn engineered to be drought and pest resistant benefit the populations in the driest climates? At what cost to native varieties and traditional knowledge?
- How can GMOs be used as a tool for flavor in our food crops?
- How does the current number of mills we have in the US relate to the future of perennial grains?
- How might perennial wheats affect our “glocal” food systems by genetically modifying staple crops?
- How would perennial wheats impact the meat industry established today? For better or worse?

- Do you think that GMOs crops designed for drought resilience and heat tolerance are a reasonable way to counteract the increasing pressures of climate change on global food production? What are some alternatives?
- If all seeds and seed technologies became open-source public domain material (free for anyone to use and save, no patents, no corporate control), how might that change public opinion on the use of breeding methods using molecular biology tools that transfer specific genes between organisms?
- How can we change public opinion on GMOs, especially since a lot of the opposition seems driven by a vision of nature as being pure and vulnerable?
- Have you changed your mind about GMOs?
- What might the word seed look like now?
- How does the examples of GM, that we introduced, meet sustainability standards?

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