



# **Status of Food Fights in the Marketplace: Is There a Path Forward?**

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# **What will be covered?**

**1. What is genetic engineering?**

**2. What GE crops are in the commercial market?**

**3. What has been the consumer response?**

**4. Will labeling change attitudes?**

**5. Other approaches to introduction of GE foods?**

# How is the genetic information in a plant manipulated to create a new plant variety... by classical breeding?



**Tangerine**

X

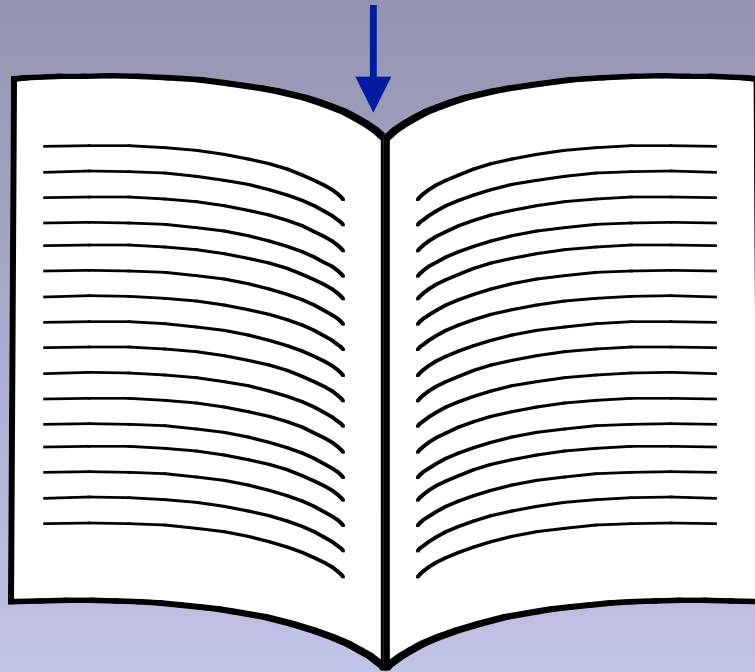


**Orange**

# Information in the citrus genome

Chemical units represented by alphabetic letters

...CTGACCTAATGCCGTA...



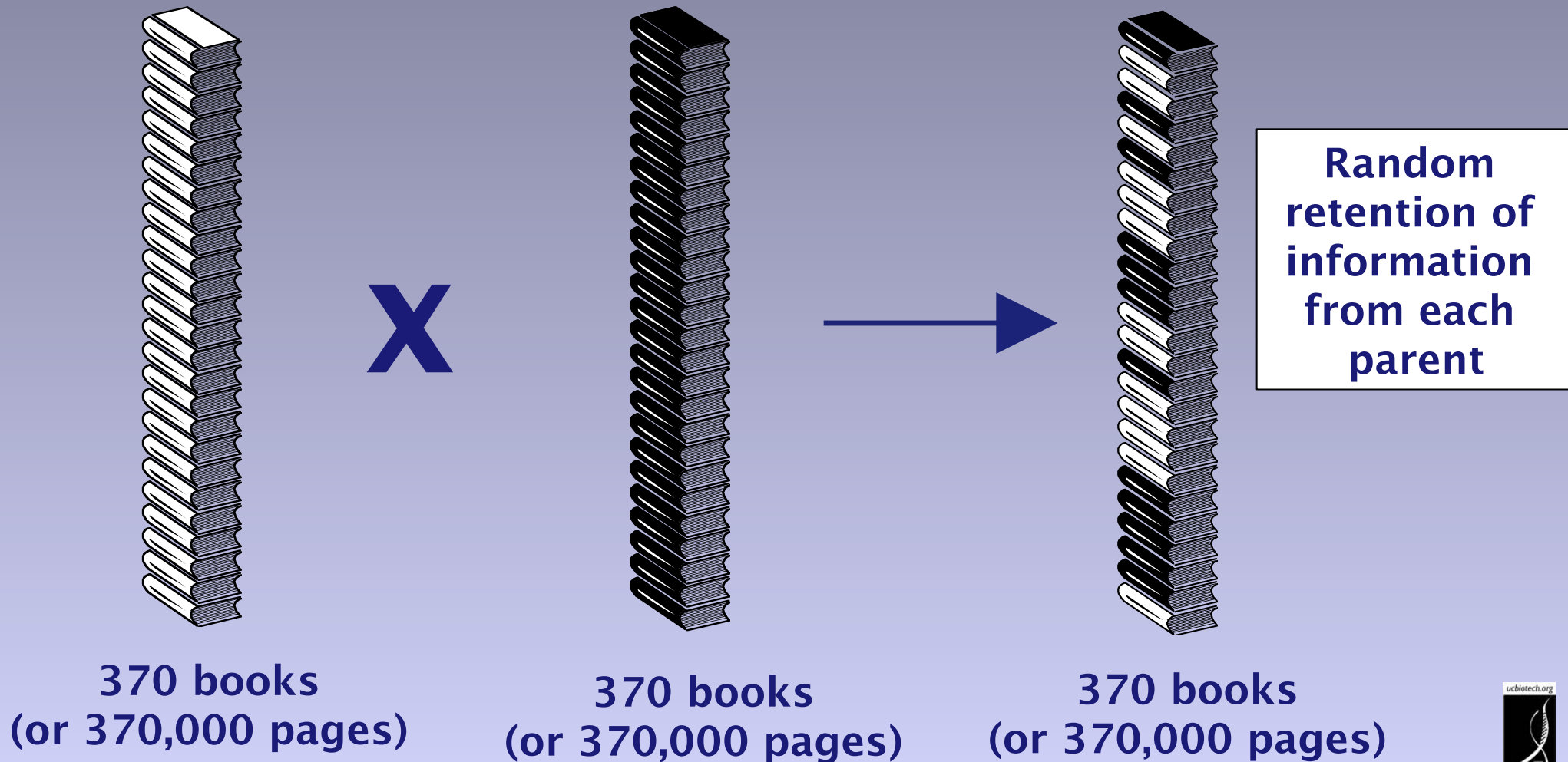
370 books  
1000 pages each




370 books  
(or 370,000 pages)



# Hybridization or cross breeding of citrus

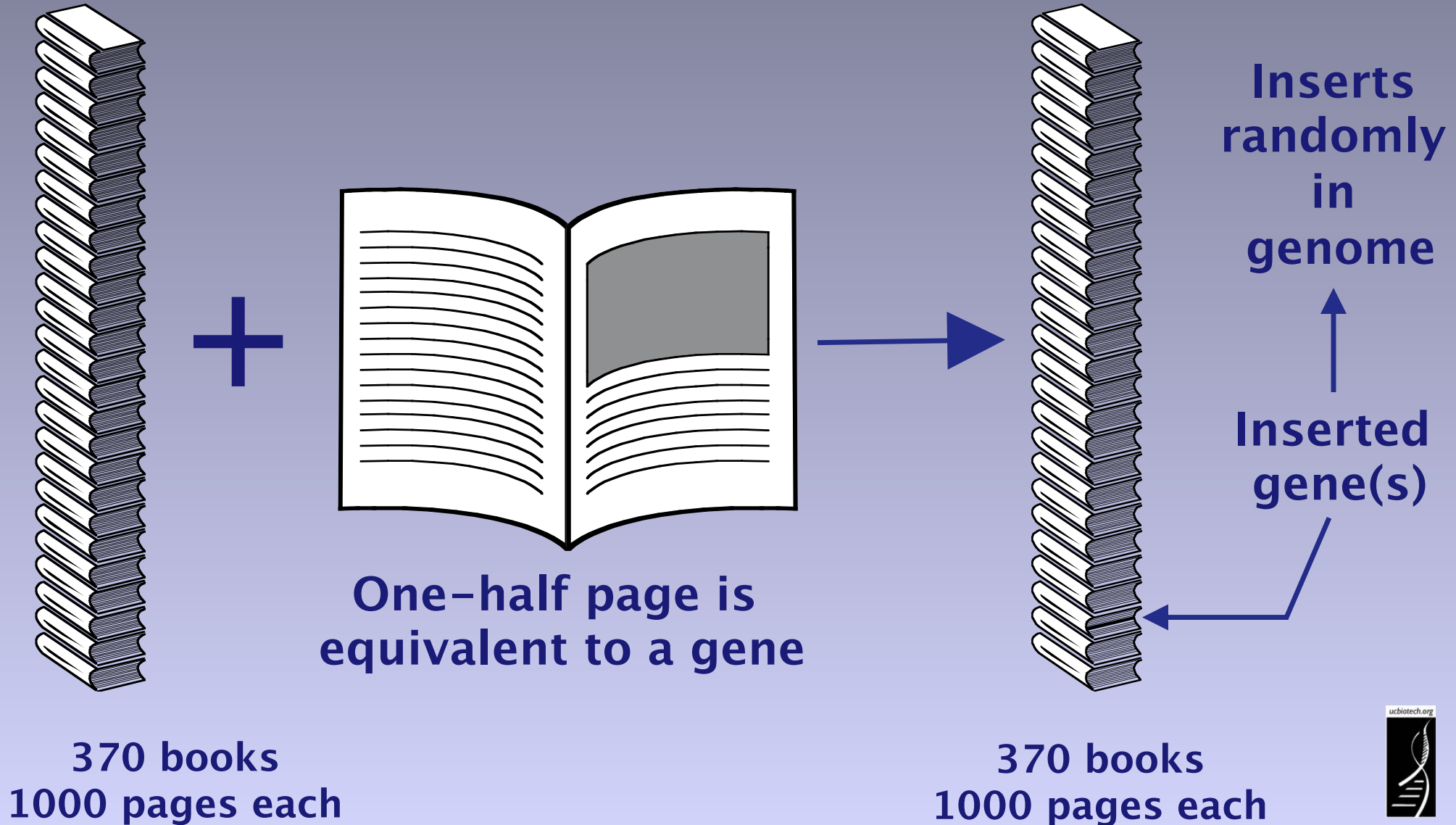




**But there are other ways to create  
new varieties using the modern  
tools of genetics**



# Genetic Engineering Methods



# What GE crops are currently commercially available?

## **GE Cotton**

94% of 2012 acreage

(Insect Resistant: 14% Herbicide tolerant: 17% Stacked gene: 63%)

Source: USDA-ERS, 2012

## **GE Canola**

88% of 2010 acreage

Source: ISAAA, 2011

## **GE Soybean**

93% of 2012 acreage

(Herbicide resistant: 93%)

Source: USDA-ERS, 2012

## **GE Corn**

88% of 2012 acreage

(Insect Resistant: 15% Herbicide resistant: 21% Stacked gene: 52%)  
1% of corn with Bt (ECB) + Bt (rootworm) + herbicide

Source: USDA-ERS, 2012

## **GE Sugarbeet**

96% of 2010 acreage

Source: ISAAA, 2011

## **GE Alfalfa**

20% of 2012 acreage

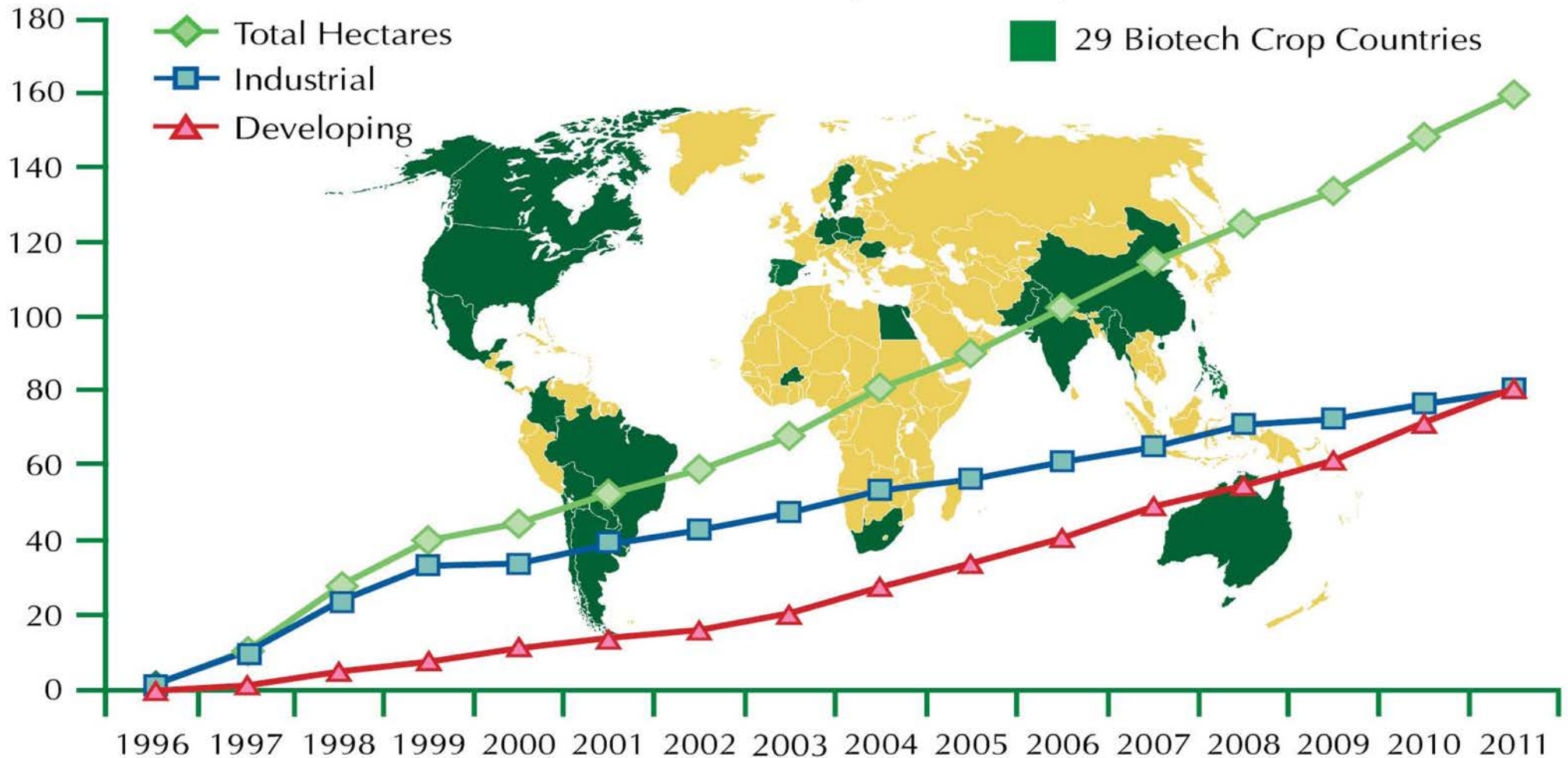
Source: Dan Putnam, UC ANR, 2013

Number of major GE crops grown commercially is limited

And number of different traits available is also limited –  
herbicide-tolerant and insect-resistant



# Despite limited crop and trait types, worldwide acreage is increasing



Total worldwide area cultivated = Areas of  
Texas + California + Colorado + Louisiana

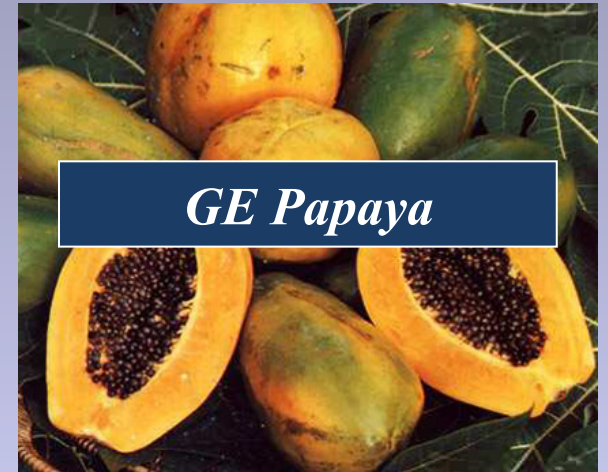
There are just a few whole, GE foods in the U.S market today



*GE Sweet Corn*



*GE Squash*



*GE Papaya*



## The New York Times

***Thinking about the fruits and vegetables you purchase at the grocery store, how many do you think are genetically modified or genetically engineered?***

	<b><u>June</u></b> <b><u>2012</u></b>	<b><u>January</u></b> <b><u>2013</u></b>
Most	21%	23%
A lot	21%	16%
Some	31%	37%
Very little	13%	14%
None	5%	4%
Don't know/No answer	9%	6%

Despite the small number, almost 40% of consumers think there are a lot of GE fruits and veggies in the market!

SOURCE: "Strong support for labeling modified foods. Poll conducted January 24-27, 2013.  
[http://www.nytimes.com/2013/07/28/science/strong-support-for-labeling-modified-foods.html?ref=science&\\_r=0](http://www.nytimes.com/2013/07/28/science/strong-support-for-labeling-modified-foods.html?ref=science&_r=0)



What is true? Use of ingredients from corn, soybean, canola, sugarbeet results in ~75% of U.S. processed foods with GE ingredients





# *How have these foods been received by consumers?*



These were the kinds of flyers and images that were seen at rallies and in marketplaces in the early 2000's





NEW YORK TIMES

SUNDAY, AUGUST 25, 2013

NEWS ANALYSIS

## Golden Rice: Lifesaver?

By AMY HARMON

Published: August 24, 2013 [408 Comments](#)

STEVE CARELL  
TONI COLLETTE

ONE bright morning this month, 400 protesters smashed down the high fences surrounding a field in the Bicol region of the Philippines and uprooted the genetically modified rice plants growing inside.

[Enlarge This Image](#)



[Joaquín Aznar for The New York Times](#)

Genetically engineered Golden Rice grown in a facility in Los Baños, Laguna Province, in the Philippines.

**Fast forward to today.  
In late August 2013  
activists destroyed a  
field trial in the  
Philippines of GE rice  
with increased  
Vitamin A**

**What leads  
individuals to destroy  
field trials of a  
nutritionally  
enhanced GE rice  
variety? Also an  
engineered wheat in  
Australia, sugar beets  
in Oregon, grapes in  
France?**



# Comments capturing some of the essence of concerns

## Comment on NYT article on Golden Rice

What happens to DNA when one component is altered, thus altering the entire genetic information,

- **Awakening dormant viral sequences,**
- **Changing the way DNA now works.**
- **Allergies** to GMO's, due to **unnatural alteration of gene interaction with genes from other species**
- GMO ingredients are **not labelled**
- Round Up, herbicide to which crops are resistant, shown to cross placenta and damage fetus, **linked to sarcoma**, a form of cancer

Editor of NaturalNews.com Friday, September 21, 2012

The GMO debate is over

There is **no longer any legitimate, scientific defense of growing GM crops** for human consumption.

- **Only people still clinging to the outmoded myth that "GMOs are safe"** are **scientific mercenaries** with financial ties to Monsanto and the biotech industry.
- **GMOs threaten the continuation of life on our planet.** They are a **far worse threat than** terrorism, or even the threat of **nuclear war**.
- As a shocking new study has graphically shown, **GMOs are the new thalidomide**. When rats eat GM corn, they develop horrifying tumors.

# There are new publications showing food safety of GE foods ...but do people listen?

12 long-term (>90d to 2yr) and 12 multigenerational (2 to 5 generations) feeding trials in animals of GE feed

Conclusion: GE foods are nutritionally equivalent to non GE foods and can be safely consumed in food and feed



maize

potato



soy

rice



triticale

A close-up photograph of two ripe, orange-colored fruits, likely oranges, hanging from a green leafy branch. Each fruit has a green oval label with the text "GM Free" in bold black font. The background is a soft-focus green.

**GM Free**

**GM Free**

**Will labeling solve the problem?  
Or create another one?**



All Natural!



## FDA asked to clarify 'natural'

And the labeling issue has extended beyond just GE or not to use of the term, "natural". Recent lawsuit questioned use of "natural" to describe products with GE ingredients (tortilla chips made with GE corn). U.S. District judge referred question to FDA.

istration to determine whether food made with genetically engineered crops can be labeled as "natural."

The request springs from a lawsuit against the Gruma Corp. that accuses the company of falsely labeling its Mission tortilla chips as "natural" even

DNA that would not normally be in them, and are thus not natural, thereby causing the product to fail to be 'All Natural,'" the complaint said.

U.S. District Judge Yvonne Gonzalez Rogers in Oakland, Calif., has decided to stay the litigation for six months and

The FDA's policy has been that foods can be labeled as "natural" as long as they're free of artificial or synthetic substances that wouldn't normally be expected to found in the product, Gonzalez Rogers said.

"Under these circumstances,

# But, do consumers act on labeling information?



***66% of UK consumers think GE food labeling is important...***

***But only 2% actively look for GE content when buying foods***

SOURCE: "FSA survey: Majority of UK consumers back GM labelling", Food Navigator, January 10, 2013. <http://www.foodnavigator.com/content/view/print/728839>  
Link to report: <http://www.food.gov.uk/science/research/ssres/foodsafetyss/gm-labelling/#.UPXkHaHr7jm>





In Nov 2012 California voted on a GE food labeling law. Over \$40M was spent influencing consumers.  
Proposition was defeated 51.4% to 49.6%

End of story? Not in CA, nor numerous other states





## THE HUFFINGTON POST

### GMO Labeling Bill Voted Down In Senate

Posted: 05/23/2013 11:31 am EDT | Updated: 05/23/2013 4:08 pm EDT

And now the labeling issue has moved to the national stage...via numerous proposed bills and amendments

could sue the states on the grounds that they are preempting federal authority. He said his bill would make clear that states can do what they want on the issue.

But Sen. Debbie Stabenow (D-Mich.), the chair of the Agriculture Committee, argued that the measure "is not germane to the farm bill" in the first place. She also said the labels run counter to science and the public interest in healthy food.

"This particular amendment would interfere with the FDA's science-based process to determine what food labeling is necessary for consumers," Stabenow said.

"It's also important to note that around the world now we are seeing genetically modified crops that have the ability to resist crop diseases and improve nutritional content and survive drought conditions in many developing countries," she added. "We see wonderful work being done by foundations like the Gates Foundation and others, that are using new techniques to be able to feed hungry people," she said, although it was not clear how labeling would affect such efforts.

Sanders' office pointed out that 64 countries around the world require GMO labeling.

SOURCE: "GMO Labeling Bill Voted Down In Senate", Huffington Post, 5/22/13  
[http://www.huffingtonpost.com/2013/05/23/gmo-labeling-bill-genetically-modified-food\\_n\\_3325972.html](http://www.huffingtonpost.com/2013/05/23/gmo-labeling-bill-genetically-modified-food_n_3325972.html)





One approach to labeling, approved for the first time in June 2013 by the USDA, is a voluntary GMO-free label

## USDA approves voluntary GMO-free label

The USDA Food Safety and Inspection Service (FSIS) recently approved a label for meat and liquid egg products that would inform consumers about whether the product contains **genetically modified ingredients**. The approval marks the first time the department has approved a non-GMO label from a third party.

The verification seal comes from the **Non-GMO Project**, a non-profit organization “committed to preserving and building sources of non-GMO products, educating consumers and providing verified non-GMO choices.” The seal allows consumers to know if the animal product they’re about to consume was fed genetically engineered crops like soy, corn and alfalfa. (The FDA has not approved any genetically modified animals for the food supply, but some animals do eat GMO feed.)



Some companies are not waiting for the labeling issue to be resolved.



## The New York Times

March 8, 2013

### Major Grocer to Label Foods With Gene-Modified Content

By STEPHANIE STROM

Whole Foods Market, the grocery chain, on Friday became the first retailer in the United States to require labeling of all genetically modified foods sold in its stores, a move that some experts said could radically alter the food industry.

A. C. Gallo, president of Whole Foods, said the new labeling requirement, to be in place within five years, came in response to consumer demand.

"We've seen how our customers have responded to the products we do have labeled," Mr. Gallo said. "Some of our manufacturers say they've seen a 15 percent increase in sales of products they have labeled."

Genetically modified ingredients are deeply embedded in the global food supply, having proliferated since the 1990s. Most of the corn and soybeans grown in the United States, for example, have been genetically modified. The alterations make soybeans resistant to a herbicide used in weed control, and causes the corn to produce its own insecticide. Efforts are

By 2018 Whole Foods Market will label foods with GE ingredients

SOURCE: "Major Grocer to Label Foods With Gene-Modified Content", New York Times, 3/8/13  
[http://www.nytimes.com/2013/03/09/business/grocery-chain-to-require-labels-for-genetically-modified-food.html?ref=opinion&\\_r=0](http://www.nytimes.com/2013/03/09/business/grocery-chain-to-require-labels-for-genetically-modified-food.html?ref=opinion&_r=0)







There are two new approaches to introducing GE whole foods into the market.

Simplot has created a low acrylamide, low sugar, bruising-resistant potato engineered with only potato DNA – under consideration for deregulation

SOURCE: "Comment period opens on biotech potato", Truth About Trade & Technology, 5/2/13  
<http://www.truthabouttrade.org/2013/05/03/comment-period-opens-on-biotech-potato/>





# GMO debate stretches from farm to table

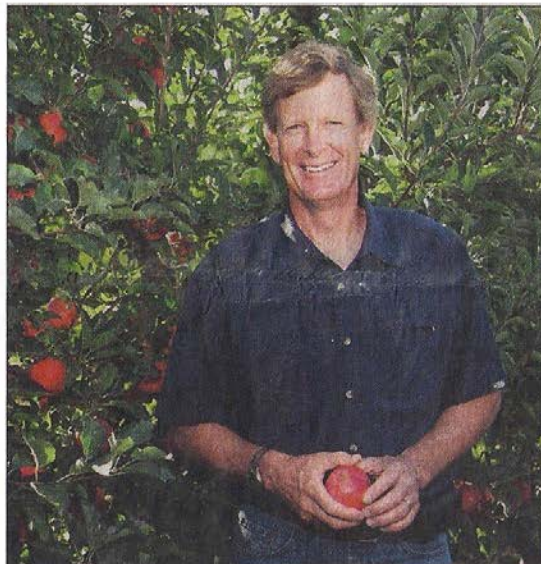
*While proponents feel public will accept biotech food, others fear resistance*

By JOHN O'CONNELL  
Capital Press

Among the 20 genetically modified crops now awaiting USDA approval, two stand out — a new potato and an apple.

While most of the biotech crops being evaluated will be fed to livestock or crushed for biofuel feedstock, the potato and apple are intended for human consumption, sparking keen interest among both the farmers who will grow them and the public who will eat them.

Simplot Plant Sciences introduced the biotech potato, called Innate, that is engineered to resist browning and black



Submitted by Okanagan Specialty Fruits  
Okanagan Specialty Fruits President Neal Carter holds an Arctic apple, a genetically modified crop that doesn't turn brown after it is sliced.

stay white after slicing. That makes them good for a vari-

ified wheat growing in an Oregon field has escalated the in-

## Arctic Apple survey

Okanagan Specialty Fruits provided details of its new Arctic Apple to a survey group and posed the question:

*"Now that you've read some additional information, please indicate how likely you would be to buy a non-browning apple like the Arctic Apple if it were available at your supermarket."*

### Survey results\*

Response	Before info	After info
Don't know	4%	2%
Not at all likely	14%	12%
Not likely	10%	7%
Neutral	23%	19%
Somewhat likely	24%	27%
Extremely likely	25%	32%

\* Survey conducted by a third-party research company of 1,000 self-identified apple eaters in the U.S. in October 2011.

Source: Okanagan Specialty Fruits

Capital Press graphic

ments they receive for genetic modification.

trillion servings of GMO foods have been served without a single health incident. At some point, people have to realize the safety thing is just not a concern."

Though 60 to 70 percent of U.S. processed foods contain at least one biotech ingredient, Bill Freese, science policy analyst for the Center for Food Safety, which opposes genetically modified crops, doubts consumers will turn a blind eye to genetic engineering in basic staples such as potatoes and apples.

49% of respondents extremely or somewhat likely to buy a nonbrowning apple

peace environmental group have convinced developing nations not to feed malnourished citizens golden rice, a vitamin A-rich biotech vari-

Okanagen Specialty Fruits has decided to voluntarily label their GE apples based in part on consumer surveys.

gan Specialty Fruits, introduced Arctic apples, which

crops, the recent discovery of unauthorized genetically mod-

some purchases of soft white wheat and are testing the ship-

when it becomes a media story that it gathers attention. Three

Turn to BIOTECH, Page 10

And how was the possible introduction of the “Artic Apple” into the market treated in the media by the New York Daily News?

## GMO ‘botox apples’ that do not bruise or brown could soon be in stores

The genetically modified apples are produced by Canadian company Okanagan Specialty Fruits, have been under review by U.S. regulatory agencies since 2010. If approved, they would become the second GMO fruit to be allowed in the country.

Comments (6)

BY DAVID KNOWLES / NEW YORK DAILY NEWS

FRIDAY, MAY 10, 2013, 6:18 PM



FLICKR/GETTY IMAGES

Developed by scientists at Okanagan Specialty Fruits, the new, genetically modified apples do not bruise or brown.



# Another example of a bump in the road in marketing a product containing GE ingredients

## Chobani wins USDA contract to supply schools

*Greek yogurt will be delivered in bulk and single-serve containers*

By CAROL RYAN DUMAS  
Capital Press

Chobani Greek yogurt has won a USDA contract to supply its product to the National School Lunch Program this fall.

berry, strawberry, vanilla and plain Greek yogurt from September through November to schools in Idaho, New York, Tennessee and Arizona.

That's good news for Chobani and Idaho dairy producers, said Bob Naerebout, executive director of Idaho Dairymen's Association.

Dairy Farmers of America supplies all of Chobani's needs for its Twin Falls and New Berlin, N.Y., plants but is buy-

ing berry, strawberry, vanilla and plain Greek yogurt from September through November to schools in Idaho, New York, Tennessee and Arizona.

Chobani's contract with USDA will impact Idaho's thriving dairy industry and communities, said Sen. Mike Crapo, R-Idaho.

Chobani's Twin Falls plant is the largest yogurt facility in the world, producing nearly 1 million cases of Greek yogurt per week, processing 2 million to 2.5 million pounds of milk per day and employing 600 workers.

In a press conference in Twin Falls, Idaho, Chobani CEO George Athanasiou said the bid price, \$1.40 per pound, will be the amount paid by school districts, said Lindsay Nothern, communications director for Crapo.

The Greek yogurt will be in bulk containers and in single-serve containers and can be offered for snacks, breakfast and lunch as a high protein item. If it proves popular, USDA could expand Greek yogurt's inclusion in the program nationwide, he said.

Nutrition and Consumer Services.

The contract includes 4 ounce servings of flavored yogurt and 32-ounce containers of plain yogurt and can be served in lunch or breakfast programs. The pilot states determine delivery locations, which may be state or school warehouses.

Because yogurt is highly perishable, USDA limited the pilot program to regions of the

## Group pressures Chobani over GMO feed

July 19, 2013

By CAROL RYAN DUMAS

An anti-GMO group is pressuring Chobani Greek Yogurt to stop using milk from cows that eat feed containing genetically modified ingredients.

After this contract was announced, anti-GM group pressured this young company to switch to milk from cows not fed GM feed.

and poultry feed, said Elizabeth O'Connor, campaign director for Americans for Safe Food. "Cows are also fed grains, cottonseed and sugar beets that might also be genetically modified," she said.

**The New York Times**

December 21, 2012

## **Engineered Fish Moves a Step Closer to Approval**

By ANDREW POLLACK

Government regulators moved a big step closer on Friday to allowing the first genetically engineered animal — a fast-growing salmon — to enter the nation's food supply.

Engineered salmon has been awaiting approval after submitting its first request for approval to FDA in 1995!

FDA's preliminary finding: this product, under the specific conditions proposed in the application, would not have a significant impact on the U.S. environment. But it still awaits approval

Environmental and consumer groups quickly criticized the federal agency's conclusions.

SOURCE: "Engineered Fish Moves a Step Closer to Approval", New York Times, 12/21/12  
[http://www.nytimes.com/2012/12/22/business/gene-altered-fish-moves-closer-to-federal-approval.html?\\_r=2&](http://www.nytimes.com/2012/12/22/business/gene-altered-fish-moves-closer-to-federal-approval.html?_r=2&)





**The New York Times**

July 27, 2013

## **A Race to Save the Orange by Altering Its DNA**

By AMY HARMON

CLEWISTON, Fla. — The call Ricke Kress and every other citrus grower in Florida dreaded came while he was driving.

“It’s here” was all his grove manager needed to say to force him over to the side of the road.

*Now the question: Is there a path forward for a GE orange and its products? At this stage, it is an open question of how it will be received by consumers.*

OK, he said finally on that rain day in 2005, let's make a plan.

*For the industry it could be an issue of whether you will have enough oranges to make juice — if you don't use an engineered variety — or you have enough engineered oranges to make juice but you have to wait and see if consumers will accept it.*

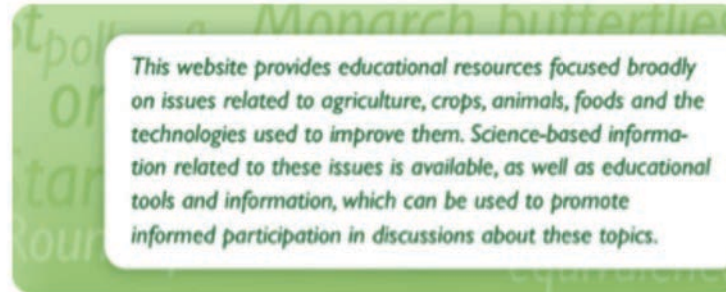
SOURCE: “A Race to Save the Orange by Altering Its DNA”, New York Times, July 27, 2013.  
<http://www.nytimes.com/2013/07/28/science/a-race-to-save-the-orange-by-altering-its-dna.html?pagewanted=all>





# Where to get more information on GE issues?

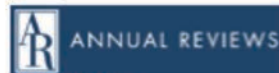
<http://ucbiotech.org>



## BIOTECHNOLOGY INFORMATION



**Labeling:**  
Informational resources available.



**Review articles:**  
Focused on food, environmental and socioeconomic issues of GE crops and foods.  
[Part 1](#) | [Part 2](#)

## RESOURCES FOR OUTREACH & EXTENSION, RESEARCHERS & TEACHERS

**DNA for Dinner 4-H curriculum:**  
For grades 5-8, covers topics from plant diversity to genetic engineering. Each of the five lessons has 3 to 5 activities.



**New Game: Who's In Your Family?**  
A free educational game to teach participants about the diversity of fruits and vegetables, and how they are related.

**Slide Archive:**  
Extensive collection of PP slides on agriculture & biotechnology.

**Available on loan:**

**Teaching Aids:** Handouts and cards available, in both English and Spanish.



**Educational displays:** "Genetics and Foods" and "Genetic Diversity and Genomics" available with companion educational cards and teacher worksheet in English and Spanish.

**Gene-IE Juice Bar:** Interactive activity to isolate DNA from common fruits and vegetables.

## HELPFUL SITES

**Academics Review**  
[Academics Review website](#)  
Testing popular claims against peer-reviewed science.

**Biofortified website**  
Provides factual information to foster discussion about agriculture, especially plant genetics and genetic engineering.

**Animal Genomics & Biotechnology Cooperative Extension Program, UC Davis**  
Provides education on use of animal genomics & biotechnology in livestock production.

