

Consumer Perceptions of Genetically Modified Food

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- Since the beginning of agriculture, some 28,000 years ago, humans have sought to improve plant and animal species.
- Long before we began to understand evolution and genetics, we've been improving plant species through a variety of techniques including selective breeding and cross breeding

Genetic Engineering



- Agricultural products can be improved in a faster, more accurate way.
- GE allows scientists to select specific genetic traits from one plant or animal and insert them into the genetic code of another plant or animal.
- The process permits the transfer of genetic material between species that is not possible using conventional methods.

What to Call this Process?

- Genetic Engineering?
- Genetic Modification?
- Biotechnology?

- What you call it matters.
 - 1/3 have no first thought or image related to the terms
 - Biotechnology evokes the most neutral responses
 - GM and GE evoke more negative images

What to Call this Process?

Most of the world refers to the technology as Genetic Modification (GM) and to its products as GMOs

GMO – Free Labels



Google Trends

Compare Search terms ▼

gmo

Search term

genetically modified

Search term

genetically engineered

Search term

bioengineered

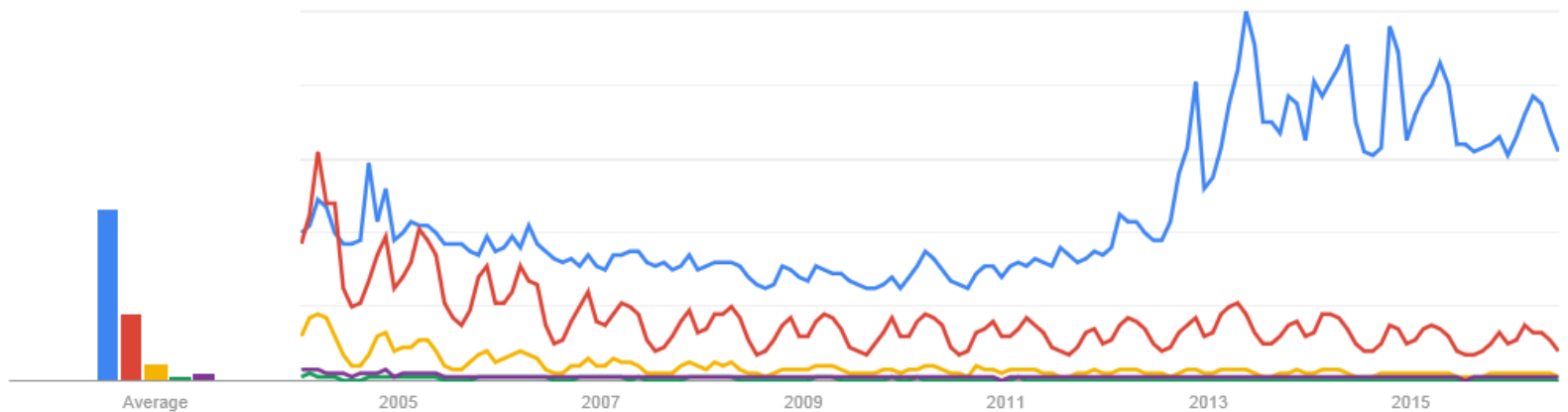
Search term

Agricultural biotechnology

Search term

Interest over time ?

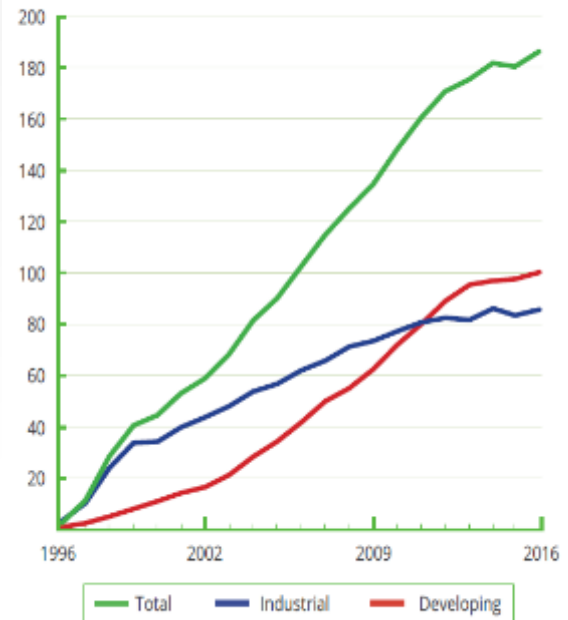
News headlines ? Forecast ?



Rapid Adoption Worldwide

- GM crops have been adopted faster than any other crop technology in the history of modern agriculture.
 - 185 million hectares (457 million acres) planted in 2016
 - ~18 million farmers in 26 countries.

Figure 1. Global Area of Biotech Crops, 1996 to 2016: Industrial and Developing Countries (Million Hectares)

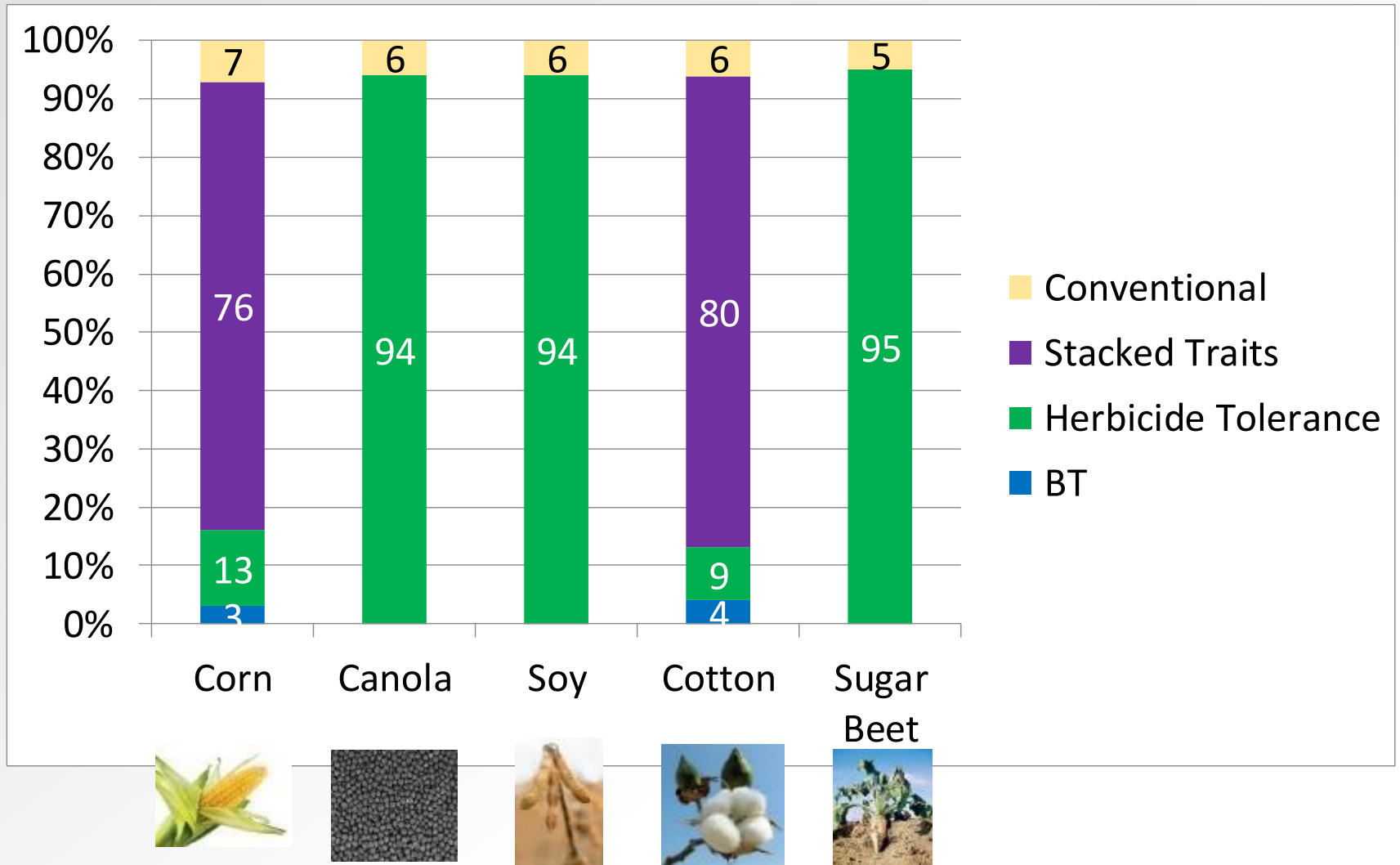


Source: ISAAA, 2016

Rapid Adoption in the US

- The United States remains the largest producer of GM agricultural products
 - More than 72 million hectares (178 million acres) planted in GM crop varieties
 - US harvests about 39% of the world's GM crops.

US Crop Estimates - 2016



Other GM Crops in the US

- Herbicide Tolerant Alfalfa
- Virus Resistant Squash and Papaya



GM Crops in the US

- Potatoes that resist bruising, browning, and produce low levels of acrylamide when cooked at high heat
- Potatoes resistant to late blight pathogens and have enhanced cold storage capability



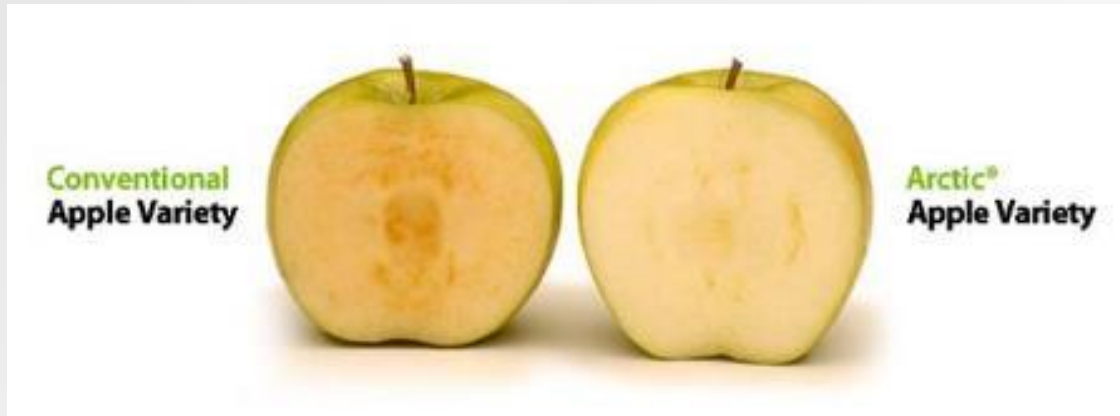
Innate Gen2

Conventional



GM Crops in the US

- Apples (Granny, Golden, Fuji) that resist browning
- Mushrooms that resist browning



GM Crops in the US (on the way)

- “Extra Sweet Pink Fleshed Pineapple”
 - Developed by Del Monte Fresh Produce with lower levels of the enzymes that convert pink pigment lycopene to the yellow pigment beta carotene



Prevalence of GM Ingredients?

The U.S. government does not track GM ingredients.

However:

1. Corn, soy, sugar, and canola are four of the most common ingredients in processed foods.
2. The majority of soy, corn, canola, and sugar beet used in processed foods in the US is genetically modified.



- Bottom Line:
Most of the processed foods Americans eat likely contain ingredients derived from GM crops.

Rutgers Survey

- Conducted using the GfK online survey panel
- Designed to be nationally-representative
- 1148 respondents
- October 23-27, 2013
- Margin of error +/- 3.1%
- Data weighted to project to the US population

Preamble

- Survey began with questions about reading food labels and what additional information people thought should be on them.

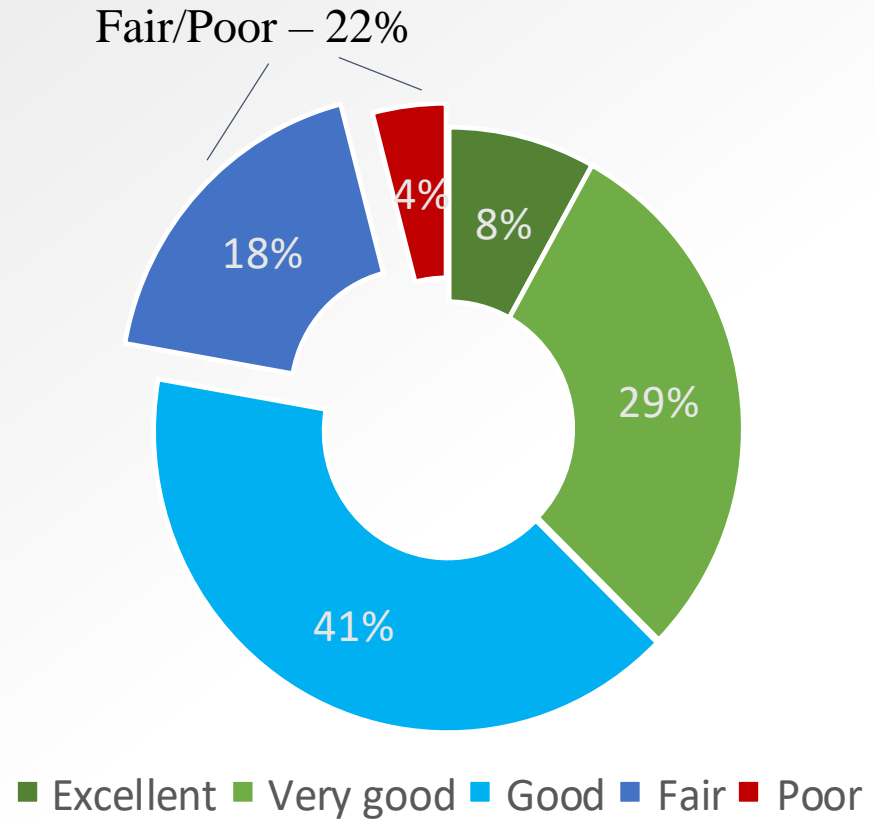
- **Introduction to GM:**

“The remainder of this survey will focus on genetically modified foods. Genetic modification involves methods that make it possible for scientists to create new plants and animals by taking parts of the genes of one plant or animal and inserting them into the cells of another plant or animal.

This process is sometimes called **genetic engineering** or **biotechnology**, and the plants and animals that result are sometimes called GMOs, or genetically modified organisms. Foods using ingredients made from these are often referred to as **genetically modified** foods or GM foods.”

What Do People Think They Know?

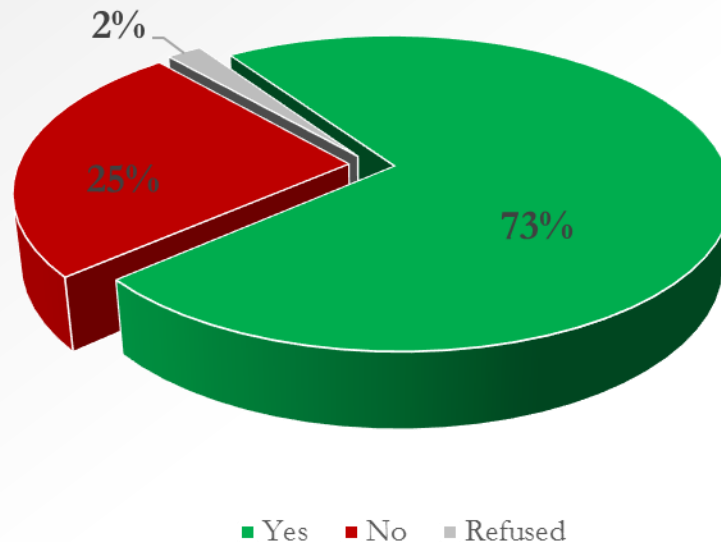
- *How would you rate your own basic understanding of how food is grown and produced?*



Much of the American public knows little or nothing
about GMOs

Awareness of the Existence of GM Foods

- *Before this survey, were you aware that genetically modified foods existed?*
 - 25% say no



Heard or Read?

- *How much have you heard or read about genetically modified foods?*
 - A great deal 4%
 - A fair amount 13%
 - Some 33%
 - Very little 29%
 - *Nothing at all* 19%
 - Refused 2%

50%



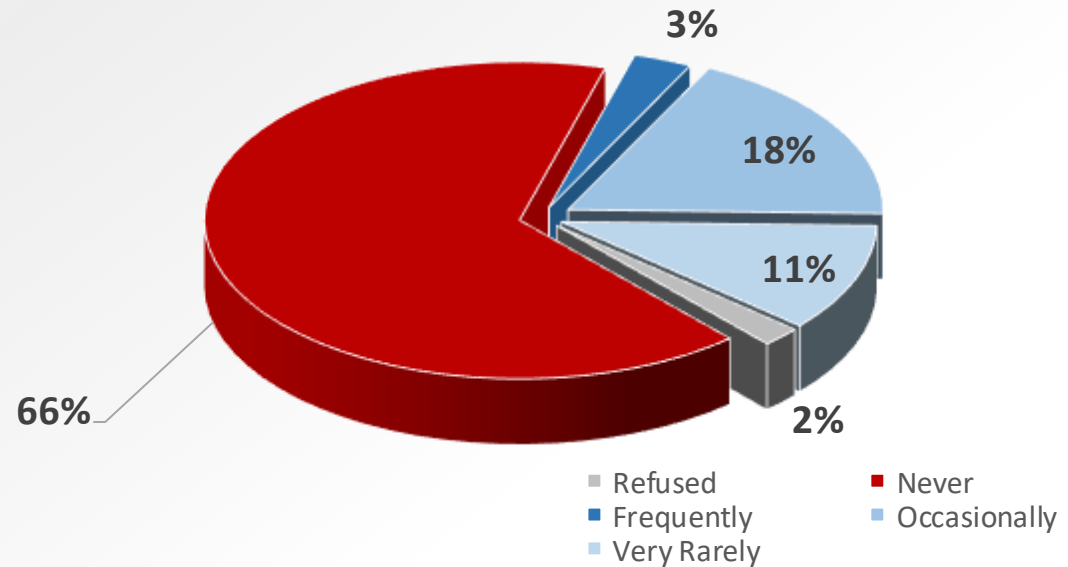
How Much Do You Know?

- *How much do you know about genetically modified foods?*
 - A great deal 2%
 - A fair amount 11%
 - Some 32%
 - Very little 32%
 - *Nothing at all* 21%
 - Refused 2%

55%

Frequency of Discussion of GM Foods?

- *How often have you discussed GM foods?*
 - 3% Frequently
 - 18% Occasionally
 - 11% Very Rarely
 - **66% Never**



Who is on first,
What is on second,
I Don't Know is on third.



Most Americans do not know that there are foods
with GM ingredients in American supermarkets
right now

GM Foods in Stores Now?

- *As far as you know, are there any foods containing genetically modified ingredients in supermarkets right now?*
 - Yes 43%
 - No 4%
 - **Don't know 51%**
 - Refused 2%

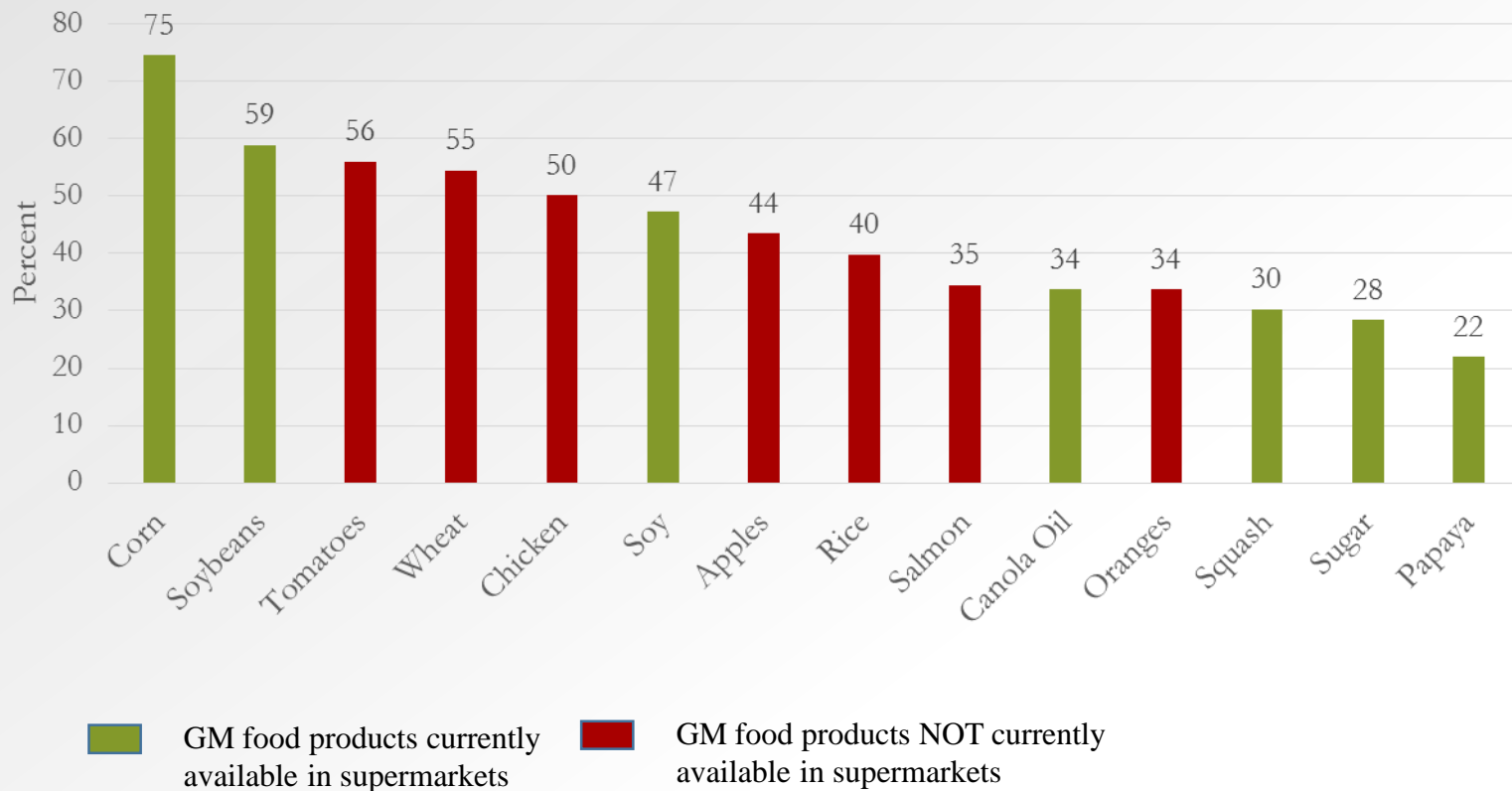
57%



Many are confused about *which* GM products
are in US supermarkets

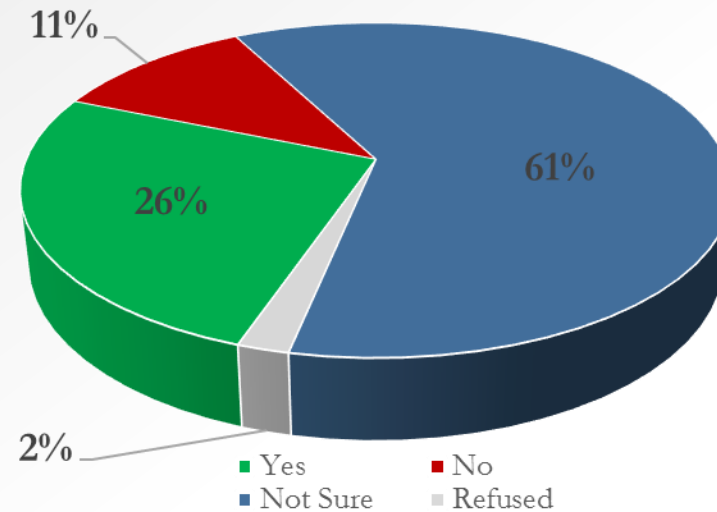
Perceived Availability of GM Foods

Percent of 491 Consumers who said that GM foods are Available in U.S. Supermarkets



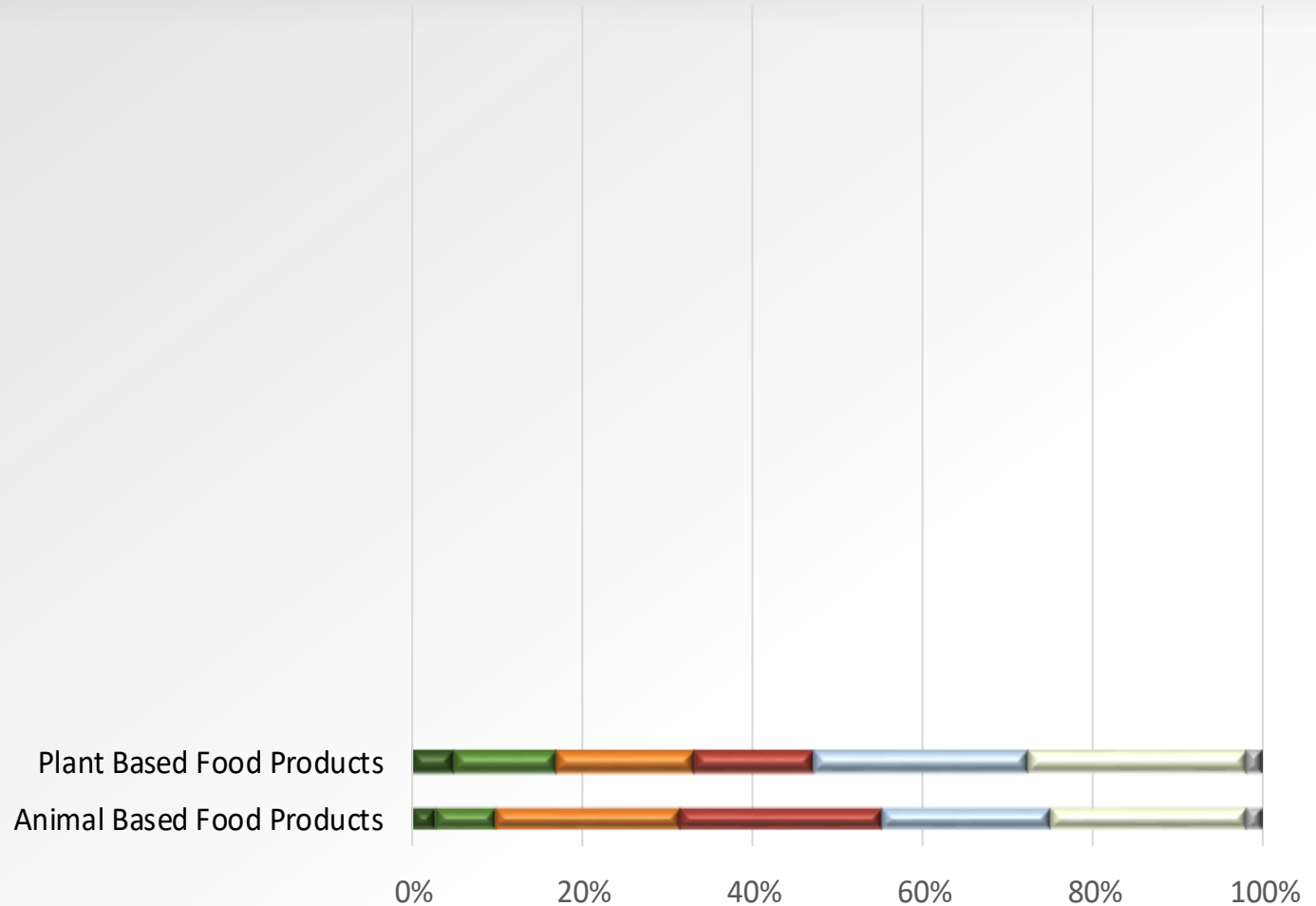
Ever Eaten GM Foods?

- *As far as you know, have you ever eaten any food containing genetically modified ingredients?*
 - Only 26% say yes



Not knowing is *not* the same
as acceptance

Approval of the Use of GM to Create:



■ Strongly Approve

■ Somewhat Approve

■ Somewhat Disapprove

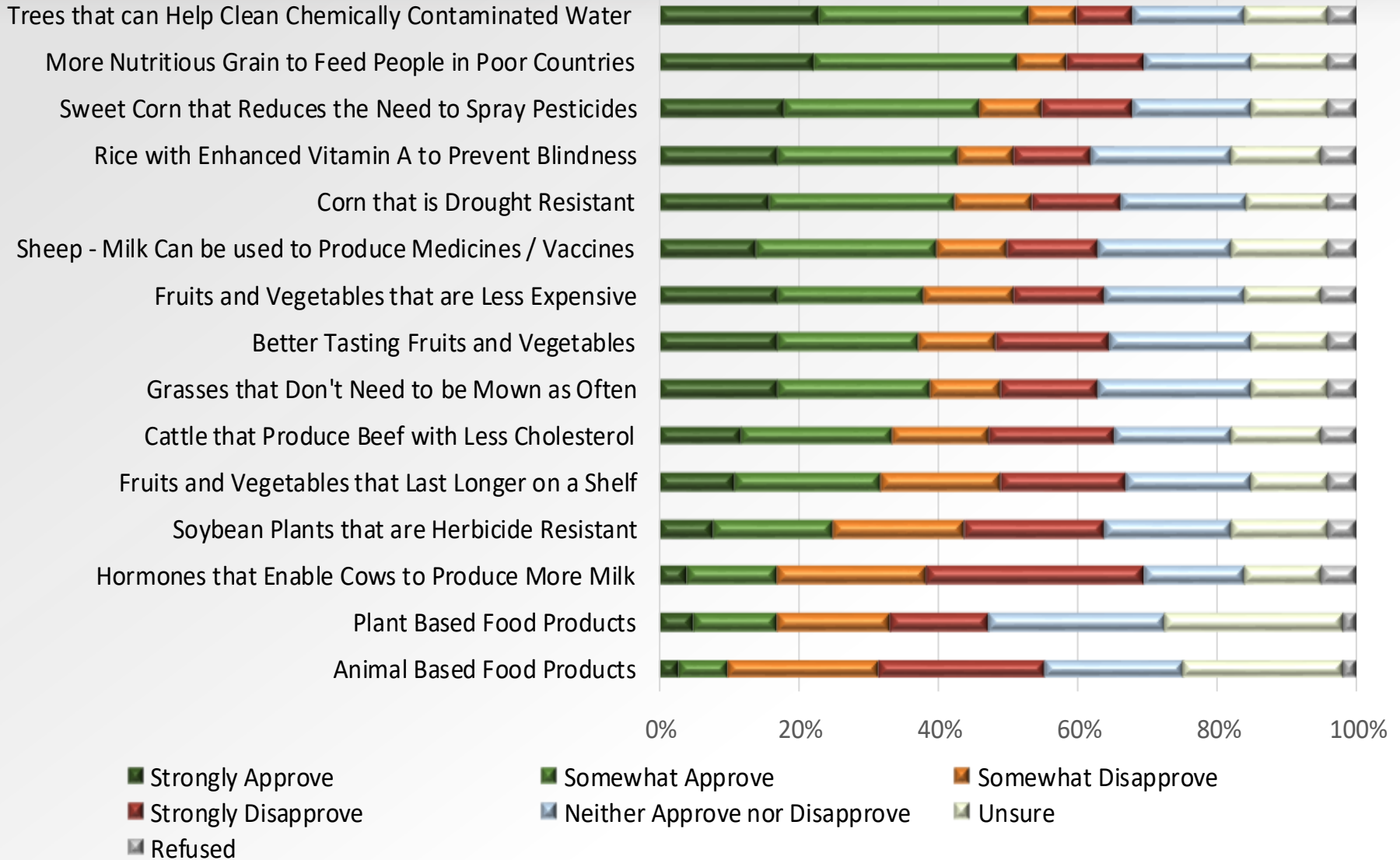
■ Strongly Disapprove

■ Neither Approve nor Disapprove

■ Unsure

■ Refused

Approval of the Use of GM to Create:



Products, Not Process

- Two-thirds (67%) of the participants (n=769) gave higher levels of approval to specific applications of GM than to general applications
- The characteristics of the applications are important
 - Plant vs. Animal
 - Food vs. Non-Food
 - Health vs. Environment
 - Who would be affected

Affect plays an important role in public perceptions
of GMOs

Basis for Opinions

- *Would you say your opinion of genetically modified foods is based on a general feeling or specific issues?*



- **General feeling – 50%**
- Both – 34%
- Specific issues – 15%

Even the best science can be overwhelmed
by people's worst fears



KFC Sues Over Alleged Eight-Legged Chicken Rumors



Apple Readies New Plan to Stream Music



The 109,894-Word Annual Report



Altera Deal Accelerates Intel Shift From PCs



Con Agra Abernethy Apples Scarf



1117



239



BUSINESS

KFC Sues Chinese Companies Over Alleged Eight-Legged Chicken Rumors

Restaurant says three companies 'misleading the consumer' on Internet



Lies only have to be plausible to be accepted

Sometimes Intuitive Plausibility is Enhanced

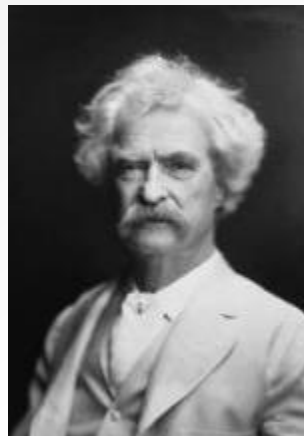


© Snopes

Internet hoax: KFC said one of the best-known fake rumors was that chickens used by the company are genetically modified and have six wings and eight legs (computer generated image)

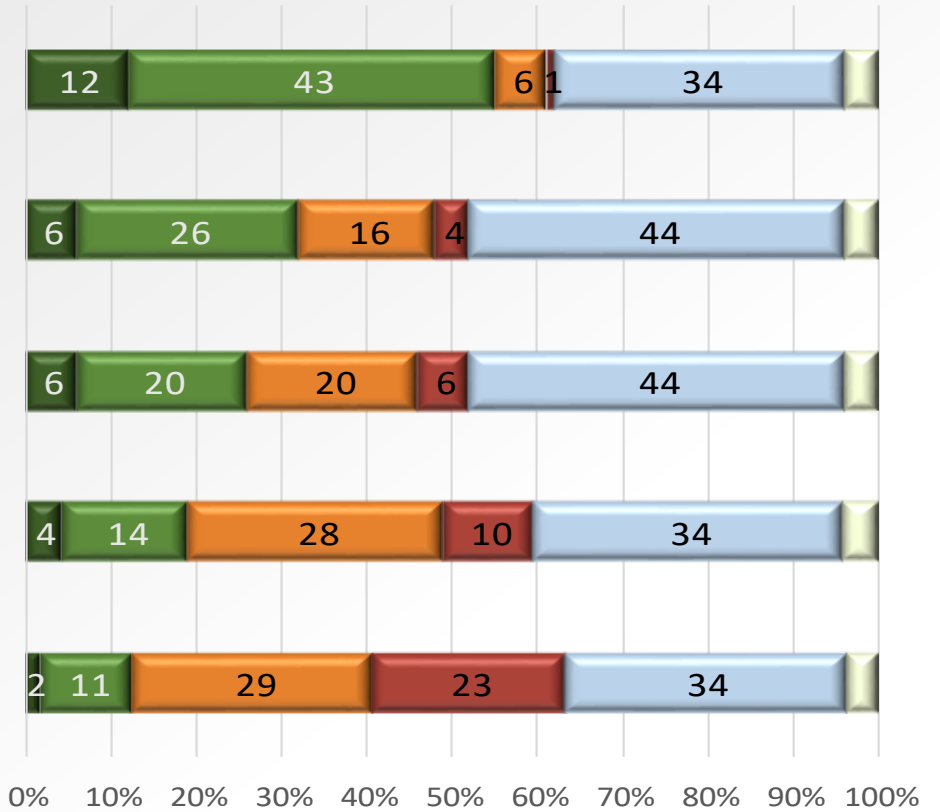
“A lie can travel halfway around the world while the truth is putting on its shoes.”

- Mark Twain



Beliefs about Eating GM Foods

- Some people have had allergic reactions to genetically modified foods.
- Eating genetically modified wheat has caused more people to become sensitive to gluten.
- Eating genetically modified foods has caused an increase in cancer.
- Eating genetically modified foods is more likely to cause obesity than eating non-genetically modified foods.
- By eating a genetically modified fruit, a person's genes could also become modified.



■ TRUE
 ■ Likely True
 ■ Likely false
 ■ FALSE
 ■ Unsure
 ■ Refused

Beliefs about GMOs

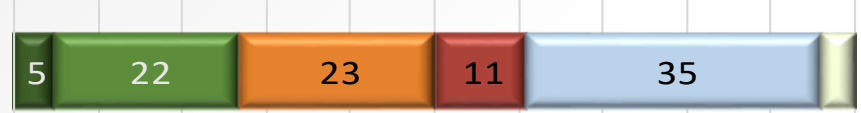
Sugar made from genetically modified sugar beets is different from sugar made from regular sugar beets.



Genetically modified crops are harmful to bees.



A large fast-food company used chickens so altered by genetic modification that they can't be called chicken anymore.



Tomatoes genetically modified with genes from catfish would probably taste fishy.



0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

■ TRUE
 ■ Likely True
 ■ Likely false
 ■ FALSE
 ■ Unsure
 ■ Refused

Mandatory Labeling Legislation

Public Law 114–216
114th Congress

An Act

To reauthorize and amend the National Sea Grant College Program Act, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. NATIONAL BIOENGINEERED FOOD DISCLOSURE STANDARD.

The Agricultural Marketing Act of 1946 (7 U.S.C. 1621 et seq.) is amended by adding at the end the following:

“Subtitle E—National Bioengineered Food Disclosure Standard

Mandatory Labeling Legislation

- Establishes a national mandatory disclosure standard.
 - Preempts any State Laws (i.e. Vermont, Act 120).
- Gives the Secretary of Agriculture responsibility for the regulatory requirements and procedures
 - Gives USDA two years to establish these.
 - Should be completed by the end of June, 2018

Mandatory Labeling Legislation

- Defines bioengineering with respect to food as, referring to a food:
 - (A) that contains genetic material that has been modified through in vitro recombinant deoxyribonucleic acid (DNA) techniques;
 - And*
 - (B) for which the modification could not otherwise be obtained through conventional breeding or found in nature



Mutation Breeding

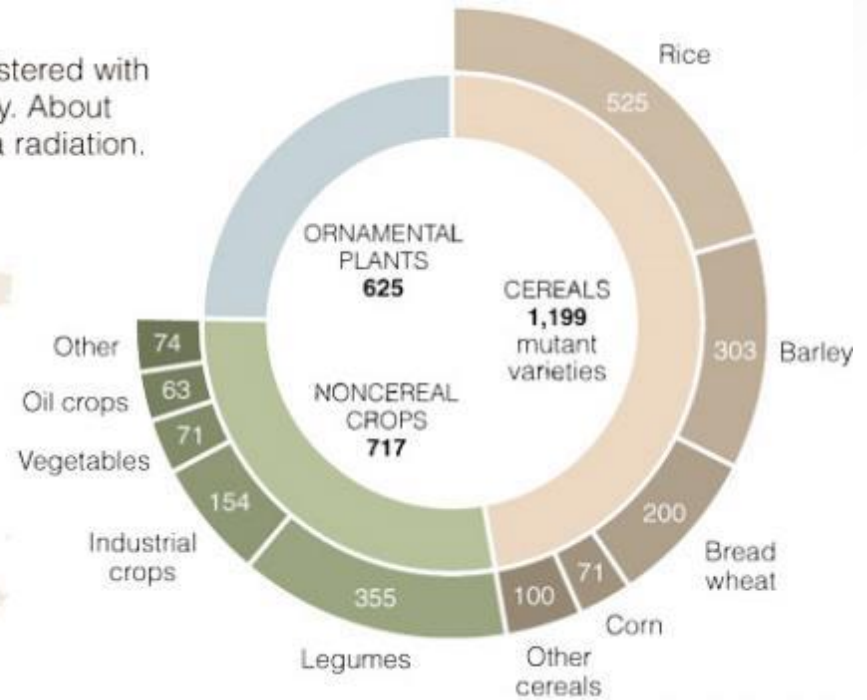
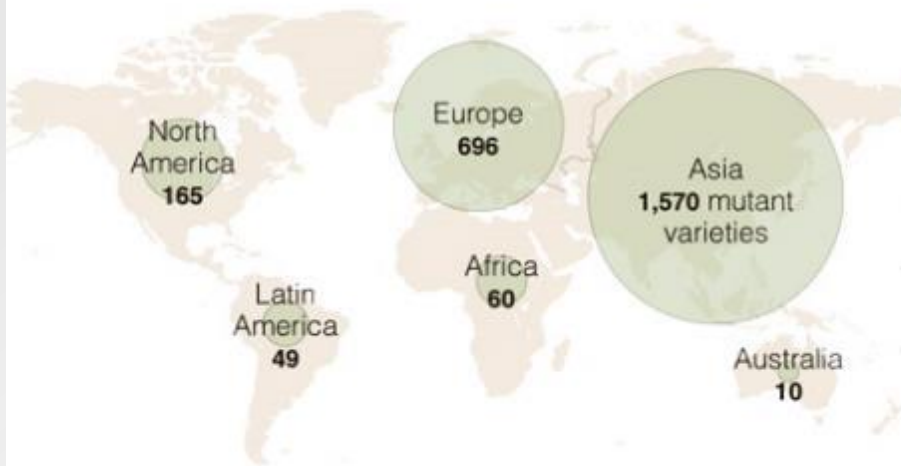
Mutation breeding using gamma radiation and chemicals has produced a significant fraction of the world's commercial food crops, including varieties of:

- Rice
- Corn
- Wheat
- Barley
- Pears
- Peas
- Cotton
- Peppermint
- Peanuts
- Grapefruit
- Sesame
- Bananas
- Cassava
- Sorghum
- Sunflowers

Mutation Breeding

Here to Stay

More than 2,500 mutant crop varieties have been officially registered with the United Nations and the International Atomic Energy Agency. About three-quarters of the varieties were directly induced by gamma radiation.



Source: FA.O./I.A.E.A. Mutant Variety Database

THE NEW YORK TIMES

Gene Editing

CRISPR:

(Clustered Regularly Interspaced **S**hort **P**alindromic **R**epeats)

- Segments of prokaryotic DNA containing short repetitions of base sequences
 - Each repetition is followed by short segments of "spacer DNA" from previous exposures to a bacterial virus or plasmid
-
- Gene Editing
 - adding, disrupting or changing the sequence of specific genes
 - Gene Regulation



Mandatory Labeling Legislation

- Unclear whether highly refined ingredients (HRI) will need to be labeled
 - Many come from GM crops, but no longer contain DNA from them
 - Oils
 - Sugar
 - Syrups



Mandatory Labeling Legislation

- Food from animals that consume GM feed *will not* be considered a bioengineered food



Mandatory Labeling Legislation

- The USDA can decide:
 - The amounts of “bioengineered substance” that may be present in order for the food to qualify as a “bioengineered food.”



Mandatory Labeling Legislation

- The USDA can decide:
 - What to call the technology
 - Genetically modified?
 - Genetically engineered?
 - Bioengineered?
 - Other?



European Labeling

- Pre-packaged products containing $>.09\%$ GMO ingredients, the list of ingredients must indicate "**genetically modified**" or "produced from **genetically modified** [name of the organism]".



Mandatory Labeling Legislation

- Disclosure can be made through:
 - A text
 - Symbol
 - Or digital link to a website
 - Such as a Quick Response (QR) code
- Companies may choose which method





11:01 PM 100%

smartlabel

Coca-Cola
Coca-Cola
#12345678
10 oz

[Nutrition](#)
[Ingredients](#)
[Allergens](#)
[Other information](#)
[Company Brand](#)

140 Calories
0 Sat Fat (g)
45 Sodium (mg)
39 Sugar (g)

Servings:
 Serving Size 1 Can
 Serving Per Can 1

Fats
 0% Total Fat 0g
 0% Saturated Fat 0g
 Trans Fat 0g





11:01 PM 100%

smartlabel

Coca-Cola
Coca-Cola
#12345678
10 oz

[Nutrition](#)
[Ingredients](#)
[Allergens](#)
[Other information](#)
[Company Brand](#)

Carbonated Water

High Fructose Corn Syrup

Caramel Color

Phosphoric Acid

Natural Flavors

Caffeine





11:01 PM 100%

smartlabel

Coca-Cola
Coca-Cola
#12345678
10 oz

[Nutrition](#)
[Ingredients](#)
[Allergens](#)
[Other information](#)
[Company Brand](#)

According to the FDA, the most common food allergens are milk, peanuts, eggs, fish, shellfish, soy, tree nuts and wheat.

This product does not contain any of these common food allergens.

Information updated on 10/15/2014 by Coca-Cola





11:01 PM 100%

smartlabel

Coca-Cola
Coca-Cola
#12345678
10 oz

[Nutrition](#)
[Ingredients](#)
[Allergens](#)
[Other information](#)
[Company Brand](#)

Coca-Cola Journey

Explore the Coca-Cola Pavilion at the 2015 Milan Expo

JUST POURED







11:01 PM 100%

smartlabel

Coca-Cola
Coca-Cola
#12345678
10 oz

[Nutrition](#)
[Ingredients](#)
[Allergens](#)
[Other information](#)
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140 Calories
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Servings:
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Fats
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11:01 PM 100%

smartlabel

Coca-Cola
Coca-Cola
#12345678
10 oz

[Nutrition](#)
[Ingredients](#)
[Allergens](#)
[Other information](#)
[Company Brand](#)

Carbonated Water

High Fructose Corn Syrup

Caramel Color

Phosphoric Acid

Natural Flavors

Caffeine





11:01 PM 100%

smartlabel

Coca-Cola
Coca-Cola
#12345678
10 oz

[Nutrition](#)
[Ingredients](#)
[Allergens](#)
[Other information](#)
[Company Brand](#)

According to the FDA, the most common food allergens are milk, peanuts, eggs, fish, shellfish, soy, tree nuts and wheat.

This product does not contain any of these common food allergens.

Information updated on 06/06/2014 10:10 by Coca-Cola





11:01 PM 100%

smartlabel

Coca-Cola
Coca-Cola
#12345678
10 oz

[Nutrition](#)
[Ingredients](#)
[Allergens](#)
[Other information](#)
[Company Brand](#)

Coca-Cola Journey

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JUST POURED





GMO Disclosure



Coca-Cola

24-12 FL. OZ Cans



049000012781

 Nutrition

 Ingredients

 Allergens

 Other Information

 Company/Brand

Claims >

GMO Disclosure

This product does include ingredients sourced from genetically engineered (GE) crops, commonly known as GMOs.

Certifications >

GMO Disclosure >

Health & Safety >

Sustainability >

Information last updated on 8/29/16 by The Coca-Cola Company

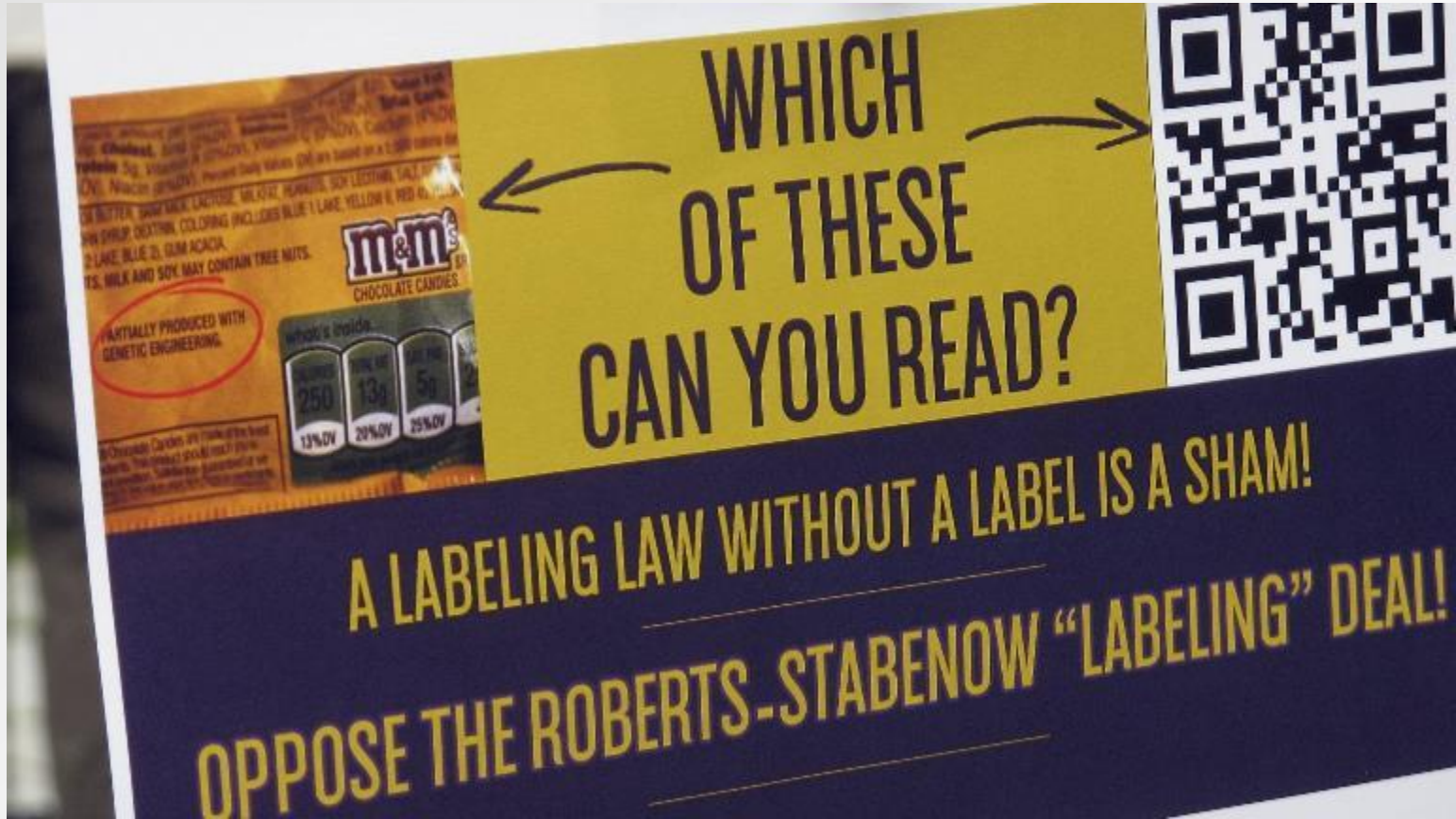
The Coca-Cola Company, P.O. Box 1754 Atlanta, GA 30302

[Privacy Policy](#) | [Feedback for SmartLabel](#)

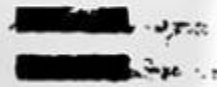
SmartLabel QR Codes



Opposition



BEWARE THE MARK OF MONSANTO



Use of QR Codes

- Annenberg Public Policy Center –
- Science Knowledge Survey
 - Phone survey with 1,011 US Adults
 - Conducted July 21-25, 2016
- In the last 12 months:
 - 29% have used mobile phones or a store scanner to scan UPC or QR codes to find the price of a product, or to check out at a store
 - 15% have used these codes to find information about a product's ingredients or nutrition information

THE ANNENBERG
PUBLIC POLICY CENTER
OF THE UNIVERSITY OF PENNSYLVANIA



Nearly Half Less Likely to Purchase GM Foods

49%

- 31% much less likely
- 18% somewhat less likely

48%

- 42% say it would make no difference
- 6% more likely to purchase



Four in Ten Would Use a QR Code to Find Out

- *How likely would you be to use a mobile phone or in-store scanner to learn whether a product contains GM ingredients?*
- 40% somewhat or very likely
 - 21% not too likely
 - 38% not likely at all



Takeaways



- Most Americans:
 - Know little, have heard little, and have talked little about GM foods.
 - Are unaware that GM foods are in supermarkets now.
 - Are confused about what products are GM.
 - Don't know the extent of GM ingredients in foods in the US.
 - Are not aware that they are eating GM foods.
- Mandatory labeling has the potential to change this. But:
 - For many Americans, it will be their first real encounter with the topic.
 - It will likely create a new wave of consumer questions and concerns.
- We must be prepared to address these issues.
 - Our answers must be based in science.
 - Our responses must help consumers make informed choices.

Acknowledgements

- Collaborators:
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 - Dr. Brianne Suldovsky (Portland State)

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Download our whitepaper here:

http://humeco.rutgers.edu/documents_PDF/news/GMlabelingperceptions.pdf