



Genetically Modified Organism (GMO) Labeling in the U.S.

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Abstract: To label Genetically Modified Organisms (GMOs) or treat them equally with non-genetically modified foods without labeling is a contentious issue, not only in the United States, but around the world, and has been ever since these engineered foods were introduced in the late 20th century (Huffman, 2004). This article seeks to objectively look at the issues from those that want to label GMOs and from those that are against it; as well as offer suggestions for moving forward to satisfy parties on both sides of the issue.

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To label Genetically Modified Organisms (GMO/GMOs) or treat them equally with non-genetically modified foods without labeling is a contentious issue, not only in the United States, but around the world, and has been ever since these engineered foods were introduced in the late 20th century (Huffman, 2004). There are vociferous voices from public consumers about separating and labeling GMOs for safety, consumer knowledge, and individual choice reasoning; with equally vocal opinions from the agricultural industry about the expensiveness and futility of labeling.

What are GMOs? Huffman (2004) defines this genetic modification as a “...complex process that involves [the] insertion of [a] gene, often from a different species, into a plant or animal.” The biotechnology process is called genetic engineering or genetic modification; and the plants that result from this process are labeled as GMOs (genetically modified organisms), GM (genetically modified) foods, GM (genetically modified) crops, or genetically engineered foods. (Huffman, 2004)

As Huffman (2004) clarifies the U.S. history of genetically modified crops, these organisms were bred first by the U.S. Department of Agriculture and state agricultural experiment stations, which are research centers that conduct scientific investigations to improve food and agricultural issues to increase crop yields. Eventually the private sector began to market high-yield hybrid corn to farmers, and with the fear of not being able to feed a growing world population the “Green Revolution” was born.

In the 1960s, rice and wheat hybrids were developed to increase crop production, lower food prices, and combat this fear of not having enough food to feed our planet. These hybrid crops were marketed as a new era of human ingenuity and human endurance, known as the

“Green Revolution.” (Huffman, 2004) This epoch is logically followed by even larger jumps in technology with the modification of genetic material in plants and animals, known as the “Gene Revolution,” which occurred in the 1990s. (Huffman, 2004) In 1996, the first herbicide-resistant genetically modified crop (*Roundup Ready* soybean) in the U.S. was patented and introduced to the market by a private company, Monsanto, to offer insect resistant cotton; and herbicide tolerant cotton, soy beans, and corn. (Monsanto, 2013)

The groups that support labeling of GMOs are consumers that doubt the safety of GM technology, demand further testing of GMOs, and are overly suspicious of “Big Ag.” Big Ag refers to the handful of powerful multinational companies that control the overwhelming majority of the agricultural industry. For example, six companies (Big 6) produce the majority of the pesticides and seeds sold in the world: Monsanto, Syngenta, Dow AgroSciences, DuPont, Bayer, and BASF. (Wallich, 2013) Additionally, many non-governmental organizations (NGOs) support labeling GMOs, such as Greenpeace and Friends of the Earth. (Huffman, 2004).

These supporters argue that labeling GMOs should be required because:

- Other foods, such as meat, processed foods, artificially flavored foods, milk, etc. require labels, so all other foods should follow the same standard. (Mother Earth News)
- Other countries in the European Union, Japan, Australia, and others have created laws labeling and tracking GM foods (Chemical Week, 2003) (Huffman, 2004) so there are models to follow.
- Labeling would create traceability to allow regulators to safeguard against future food safety issues. (Chemical Week, 2003)

- Consumers have a right to be informed about what they are eating. (Mother Earth News, 2013)
- Some consumers need to be able to identify certain ingredients and avoid them due to health problems or allergies.
- Some consumers want to identify ingredients in order to avoid eating animal products (e.g. animal DNA) for religious or ethical reasons.
- Rousu et al. (2003) have shown that consumers would be willing to pay a higher price for non-GM crops.

Many of the labeling supporters present additional arguments that are not related to labeling, per se, but focus on the negative impact of growing these types of crops, ingesting these types of foods, and having multinational oligopolistic corporations control our food supply. Supporters argue that:

- There is insufficient data proving that GMOs are safe to digest. GM foods have been linked to higher rates of cancer, liver and kidney damage, embryonic development damage (Mother Earth News, 2013), however according to Antoniou, Robinson, and Fagan (2012) “no long-term rigorous safety testing of GMOs is required and regulatory assessments are based on data provided by the company that is applying to commercialise the crop.”
- Over time, the GM crops created to be insect-resistant or herbicide-tolerant create “super bugs” that are immune to currently-used insecticides. These super bugs would cause a grave threat to our food supply and resources trying to control them.

- The gene insertion of genetic engineering is an imprecise and unpredictable process which can cause mutations in a plant's DNA. Also dangerous, is the fact that these mutations are irreversible (Antoniou, Robinson, Fagan, 2012).
- Insect resistant crops are "toxic to plant-feeding insects" (Huffman, 2004) but can also be harmful to humans and eliminate unintended insects and other wildlife that is essential to a balanced eco-system. One example is the direct or indirect effects (due to environmental factors or gene insertion process creating new toxins within the plant) that GMOs containing Bt have had on butterfly and bee populations, causing their worldwide decline.
- There is a conflict of interest in the groups that oppose labeling GMOs, and support treating these crops and food equally as non-GMO crops and food. These supporters include the Big 6, and other large corporations such as Kellogg's, Nestle, ConAgra Foods, Pepsico, Campbell's, Del Monte, Clorox, Bayer, Du Pont, and Coca-Cola. This conflict of interest creates consumer distrust.

Arguments that the anti-labeling groups present include:

- GM foods are equivalent to non-GM foods. Mother Earth News (2013) tells us that "in 1992, the U.S. Food and Drug Administration ruled...that GM foods were substantially equivalent to their non-GM counterparts."
- Labeling would be cost prohibitive, something that would either or both decrease seller profits and/or increase prices for consumers. Wilson, Janzen, and Dahl (2003) quantify the costs of segregating GM crops from non-GM crops, as well as preserving the identity of the crop through seed selection, separate storage, handling, and documentation in

Table 1, however there are also increased costs for testing, regulation monitoring, enforcement, and risk premiums.

Table 1. Study on Segregation and Identity Preservation of GM Grains (Wilson, Janzen, & Dahl, 2003)

Researcher	Methodology/scope of analysis	Estimated cost of segregation/IP
Askin (1988)	Econometric model of costs for primary elevators	Increase of 2 grades handled increased costs <0.5¢/bu
Jirik (1994)	Survey of elevator managers and processors	11-15¢/bu
Hurburgh, Neal, McVea, & Baumel (1994)	Cost accounting model for high-oil soybeans	3.7 ¢/bu
McPhee & Bourget (1995)	Econometric model of costs for terminal elevators	Increasing grades handled increases operating costs 2.6%
Hermann, Boland, & Heishman (1999)	Stochastic simulation model	1.9-6.5¢/bu
Maltsbarger & Kalaitzandonakes (2000)	Simulation model for high-oil corn	16-37 ¢/bu
Nelson et al. (1999)	Survey of grain handlers	6¢/bu (corn) 18¢/bu (soybeans)
Bullock, Desquilbet, & Nitsi (2000)	Cost accounting	30-40¢/bu (soybeans)
Dahl & Wilson (2002)	Survey	25-50¢/bu
Wilson & Dahl (2001)	Survey of elevator mgrs. for wheat	15¢/bu
USDA ERS (Lin, Chambers, & Harwood, 2000)	Cost accounting adjustments to survey results for specialty grain handlers	22¢/bu (corn) 54¢/bu (soybeans)
Smyth & Phillips (2001)	Analysis of GM IP system for canola in Canada, 1995-96	21-27 ¢/bu
Gosnell (2001)	Added transportation and segregation costs for dedicated GM elevators	15-42¢/bu (high throughput) 23-28 ¢/bu (wooden elevators)
Sparks Company (2000)		38-45¢/bu (non-GM canola) 63-72¢/bu (non-GM soybeans)

- Labeling would also hinder the efficiency and speed in bringing GMOs to the worldwide market to combat growing food demands. Senator Stabenow (D-Michigan), chair of the Agriculture Committee argues against GE labeling due to the interference that it would cause with the FDA’s determination of what labeling is essential for consumers, as well as the obstruction of getting new GE technologies to the public. Senator Stabenow is quoted as saying (Paul, 2013):

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. . . 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.

- Mandatory labeling may cause a proliferation of frivolous lawsuits.
- GM labeling may cause consumers and retailers to see GM foods as dangerous, less desirable, to think negatively about them in general, and to avoid them. Mandatory GMO labeled products in Japan and the European Union have resulted in retailers choosing not to stock these products. (Carter & Gruere, 2003)

As with the labeling supporters, anti-labeling supports argue more on the validity of biotechnology and genetically engineered foods, in general.

- GM crops have increased yields over non-GMO plants. GM crops are needed to feed the world's growing population, especially in times of climate change which affects food production rates.
- Less insecticides and herbicides are used in GM crops since they contain natural substances that protect against insects or herbicides.
- GM foods can be engineered for nutrient density, foods that include more nutrients for fewer calories. This is a way to combat malnutrition and poor health. The Food and Agriculture Organization of the United Nations (2012) estimates that, in the 2010-2012 time frame, 14.9 percent of developing countries' populations were undernourished. Approximately 18 million of these undernourished citizens live in the developed world!

- This ability to engineer foods for various properties can also be used to create low fat (or other) foods to combat our country’s obesity epidemic. Ogden & Carroll’s (2010) statistics on obesity in the United States in Table 2 show trends starting in the 1960s through 2008. These trends showed that 34.2 percent of U.S. adults are overweight, 33.8 percent are obese, and 5.7 percent are extremely obese; and that each year a larger portion of our population is overweight and obese.

Table 2. Prevalence of overweight and obese U.S. adults ages 20+ (Ogden & Carroll, 2010)

Sample size and weight status	NHANES 1988-1994	NHANES 1999-2000	NHANES 2001-2002	NHANES 2003-2004	NHANES 2005-2006	NHANES 2007-2008
Sample (n)	16,679	4,117	4,413	4,431	4,356	5,555
Overweight (25 ≤ BMI < 30)	33.1	34.0	35.1	34.1	32.7	34.2
Obese (BMI ≥ 30)	22.9	30.5	30.6	32.2	34.3	33.8
Extremely obese (BMI ≥ 40)	2.9	4.7	5.1	4.8	5.9	5.7

NOTES: NHANES is National Health and Nutrition Examination Survey; BMI is body mass index. Age-adjusted by the direct method to the year 2000 U.S. Census Bureau estimates using the age groups 20-39, 40-59, and 60 years and over. Crude estimates (not age adjusted) for 2007-2008 are 34.4% overweight, 33.9% obese, and 5.7% extremely obese. Pregnant females were excluded from the analysis.

But who makes decisions regarding labeling, marketing, and food in the U.S.? Congress, the U.S. Food and Drug Administration (FDA), the U.S. Department of Agriculture (USDA), and the Environmental Protection Agency (EPA) are all involved in setting, approving, monitoring, and enforcing food labeling standards in our country.

The U.S. Congress is the legislative authority of the United States government. Together members of Congress enact federal regulations, such as the H. R. 3147 amendment to the Federal Food, Drug, and Cosmetic Act that was proposed by in 2013 to “strengthen requirements related to nutrient information on food labels, and for other purposes.” (H.R. 3147, 2013)

The FDA is a government agency “responsible for protecting the public health by assuring the safety, efficacy and security of human and veterinary drugs, biological products, medical devices, our nation’s food supply, cosmetics, and products that emit radiation.” (U.S. Food and Drug Administration, 2013) As noted on their website, the FDA is also in charge of “advancing the public health by helping to speed innovations that make medicines more effective, safer, and more affordable and by helping the public get the accurate, science-based information they need to use medicines and foods to maintain and improve their health.” Lastly, the FDA safeguards the security of our food supply. (U.S. Food and Drug Administration, 2013)

The FDA creates standards for labeling, however food producers have relative freedom in how they go about providing customers with the required information. The FDA can request changes or removal of labels, but does not preapprove them. (U.S. Food and Drug Administration, 2013)

The FDA requires labeling of GE products if the food has a “significantly different nutritional property; if a new food includes an allergen that consumers would not expect to be present; or if a food contains a toxicant beyond acceptable limits,” according to the *Guidance for Industry Voluntary Labeling Indicating Whether Foods Have or Have Not Been Developed Using Bioengineering Draft Guidance* from the FDA (2013). In January 2001, the FDA submitted guidance for voluntary labeling of bioengineered foods with these conditions. (U.S. Food and Drug Administration, 2013)

In 1862, the U.S. Department of Agriculture (USDA) was created to collect and disseminate agricultural information from the government to the citizens, an important mission at that time when half of the population lived on farms. (USDA, 2012)

The USDA sets federal policy through various acts, such as the Food Security Act (also known as the U.S. Farm Bill), regulates and monitors food safety inspections, and ensures that our food is safe, and correctly labeled and packaged. As you will read below, the USDA's Food Safety and Inspection Service recently approved a GMO-free label for meat and eggs proposed by the Non-GMO Project. The USDA approved of the non-profit's requirements to use the voluntary label, auditing process, and standards. (Cleveland, 2013)

The EPA is an autonomous regulatory body established to protect the health and environment of our citizens. One part of their purpose that is especially relevant to the GMO labeling issue includes ensuring that individuals, businesses, and governments all have access to "accurate information sufficient to effectively participate in managing human health and environmental risks." (U.S. Environmental Protection Agency, 2013)

After Congress creates a law that involves the environment, the EPA constructs regulations to implement that law, sets national standards, helps everyone understand the requirements, and enforces the regulations. (U.S. Environmental Protection Agency, 2013)

Currently, the United States Congress, FDA, USDA, EPA, and other governing bodies work together to create standards for labeling food, while the states can enact bills to define standards, monitor, and enforce them. Since federal law does not regulate labeling of GE foods, manufacturers and producers are not required to label them, although some companies have voluntarily done so. (Center for Food Safety, 2013) Below are just a few images of GMO-free labels that companies have voluntarily added to their products.



USDA approved label



Chipotle menu labels



Other non-GMO label for products without Non-GMO Project verification

Katherine Paul (2013) of the Organic Consumers Association tells us that “Federal Law, upheld for decades by federal court legal decisions, allows states to pass laws relating to food safety or food labels when the U.S. Food & Drug Administration (FDA) has no prior regulations or prohibitions in place. There is currently no federal law or FDA regulation on GMO labeling, except for a guidance statement on voluntary labeling, nor is there any federal prohibition on state GMO or other food safety labeling laws.”

The national non-profit public interest and environmental advocacy organization, Center for Food Safety (2013) details the recent bills that have been introduced by twenty-one U.S. states requiring labeling or banning GM foods. Of these twenty-one states, six have already voted against labeling state laws, and only one has conditionally been upheld.

Three examples of state proposals supporting mandatory labeling are detailed below: California and Washington both lost close battles to require mandatory labeling, however Connecticut becomes the first state to pass similar laws, but with heavy caveats.

In 2012, California sought mandatory labeling through Proposition 37: The California Right to Know Genetically Engineered Food Act. Although 51.4 percent opposed the act and

only 48.6 percent supported it, it is interesting to see the amount of funds that pro- and anti-labeling supporters have dedicated to this ruling. \$46 million was contributed to defeat the bill by food and biotechnology companies (Top 5 contributors: Monsanto, DuPont, Pepsi, BASF, Bayer); and \$9.2 million was donated to support the bill by organic and natural food business (Top 5 contributors: Consumers Union, UFW, The Center for Food Safety, California Council of Churches, American Public Health Association). (Pollack, 2012)

In 2013, Washington sought mandatory labeling through Initiative 522. 54.8 percent opposed labeling and 45.2 percent were in favor of the bill. The top five contributors – Grocery Manufacturers Association, Monsanto, DuPont Pioneer, Dow AgroSciences and Bayer CropScience – spent \$22 million to fight this initiative, claiming that it would increase food prices and negatively impact the perception of GE foods. Of this \$22 million, *The Seattle Times* asserts that only \$550 came from state residents opposing labeling. The pro-labeling supporters, funded mainly by Dr. Bronner’s Magic Soaps, the Center for Food Safety, and state residents, contributed almost \$7 million. (Doughton, 2013)

In 2013, Connecticut became the first U.S. state to pass a law requiring labeling of foods with GMOs (except alcohol, food from farmer’s markets, and unpacked foods for immediate consumption), when HB.6519 and HB.6527 were approved to label GE foods and GM baby foods. However, David DesRoches from *Hersam Acorn Newspapers* (2013) advises us that GMO labeling will not become mandatory, until “four other northeastern states...pass similar labeling laws...one of those states...border[ing] Connecticut. The combined population of these states needs to be at least 20 million.”

As evidenced above, the issue of requiring mandatory labeling of GMOs is a fairly new legislative process in the United States. Nevertheless, there is much older and widespread legislation and regulation outside of our borders. According to the Center for Food Safety (2013), there are currently 64 countries that have mandatory labeling of GE food products, and three of these have an official ban on GE food imports and cultivation.

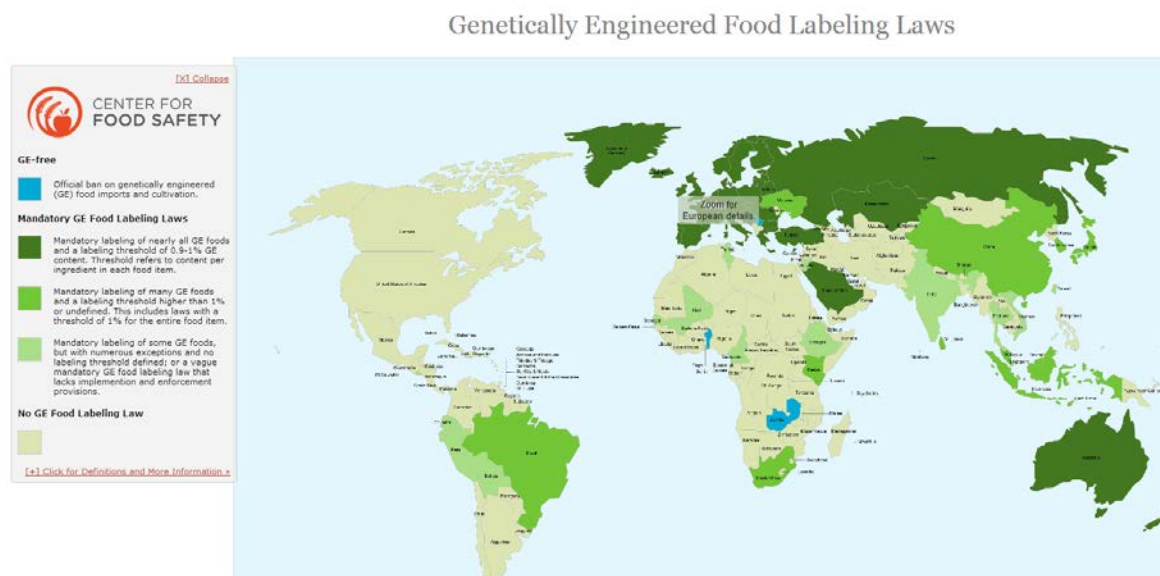
In 2006, India introduced GMO labeling legislation: *Rule 37 – E Labeling of Genetically Modified Food*, to require a label for processed foods, food ingredients, or additives from GM foods. (Gruere & Rao, 2007) Although this legislation was put into effect in 2013, there have been doubts about the lack of implementation and enforcement framework to accompany the GM label in the country. How will food be tested for GMOs? What is the threshold for minimum levels of GMO content? How will the law be enforced? (Huff, 2013)

In a Center for Strategic & International Studies (CSIS) Global Food Security Project report, authors Cooke & Downie (2010) give us Zambia's national policy on GMOs. Zambia is one of only three countries in the world that has an official ban on GE imports and cultivation, although recent government officials have shown more willingness to embrace GMOs in the future. (Center for Food Safety, 2013; Cooke & Downie, 2010) In 2002, the country's government decided to not accept GE foods, despite being amidst a food crisis, based on "scientific advice about long-term effects of the [GM products] and all related grains..." (Cooke & Downie, 2010) This stance has caused widespread mistrust of all GM foods in Zambia, as well as doubts about agricultural companies that push GMO technology and the U.S.'s continual pressuring to accept GMOs. Additionally, Zambia has built a National Biosafety Laboratory, managed by the National Institute for Science and Industrial Research that will eventually serve

to detect GMOs in seeds and grains, which will benefit citizens on a global scale if widespread GMO labeling becomes mandatory. (Cooke & Downie, 2010)

Table 3 shows us that countries in Africa, Asia, Australia, and South America all have some type of mandatory GE food labeling laws. Why is North America so different from the rest of the world?

Table 3. Worldwide GM Food Labeling Laws (Center for Food Safety, 2013).



Also found at: <http://www.centerforfoodsafety.org/ge-map/>

North and South America include the world's top four countries growing GMOs: United States, Argentina, Canada, and Brazil. Traxler (2006) tells us that these countries account for 94 percent of the GMO crop areas of maize, soybeans, canola, and cotton. Both the U.S. and Canada lead in the developing, testing, and acquiring regulatory approval of GMOs. The U.S. has received 68 approvals of 14 different crops; and Canada has received 48 approvals in 13 different crops. (Traxler, 2006) The presence and high stakes/investments of these private GE

production companies in these large developed countries of North America is most likely one significant reason for the absence of GMO labeling regulation here.

In my opinion, some form of mandatory labeling of GMOs will likely be required in the United States within ten years due to consumer preference and demand, the labeling legislation trajectory of countries with which we trade, and the inevitable need for regulation of new technologies. It also seems inevitable that the Big Ag companies that are spending inordinate amounts of money to fight labeling legislation cannot continue spending at this level indefinitely.

However, solely having legislation requiring GE/GM/GMO labels is not enough. As evidenced by the case of India and others' current labeling laws, education, threshold standards, monitoring, and enforcement also need to be part of the equation in order to yield a trustworthy and functioning process for GM and non-GM foods.

Looking at what has already been implemented abroad and proposed by U.S. companies wishing to voluntarily label non-GMO foods, there is a myriad array of possible solutions to accommodate consumer demand and assuage agricultural and biotechnology companies that have so much at stake in the labeling debate. Some of these include:

- Mandate a one to five year time period to review the effects of GMOs on humans, animals, other plants, and the environment paid for by GM agricultural and biotechnology companies; (If there is money for Big Ag to donate to pending laws, then there is money for them to conduct global studies on GMO effects.) and conducted by independent reviewers selected by USDA/FDA and approved by anti-GMO organizations, such as the Center for Food Safety. If there is no conclusion after such

time frame, then GMOs would be required to be labeled. This would provide an incentive to have extensive studies conducted by those opposed to them.

- In pending future legislation, limit financial donations on each side of the debate to allow for more leveled playing fields for pro- and against campaigns.
- Proliferate the idea of voluntary labels (as the USDA approved label has started the ball rolling), similar to the current organic and natural labels regulated by the USDA.
- Collaborate with government organizations in countries around the world to create global standards for GM or non-GMO labels.
- Bring both representatives from Big Ag or other companies against GMO labeling and centers and companies for GMO labeling together to create suggested national standards for mandatory GM product markers, indications, warnings, etc., as well as suggestions for monitoring and enforcement of these standards. These suggested standards could be brought to Congress, the USDA, FDA, and EPA for approval and adoption.
- Include federal government subsidies in the next U.S. Farm Bill to create infrastructure for separation of GMOs and non-GMOs.
- Introduce a bill at the federal level with standards on GMO labeling so that each state will work from overarching standards and not have to create their own. This will make interstate commerce easier, and allow for more efficiency in monitoring and enforcing laws when all states are working from the same standards.

The United States needs a strong federal stance to fashion a coherent front as we interact and trade with other nations, as well as to collaborate on further GMO research. Having each state customize their own regulations seems fragmented, inefficient, expensive, and more likely to fail.

In conclusion, through the vociferous and heavily-reported pro-GMO labeling supporters to the Big Ag oligopoly and other heavily-funded anti-GMO labeling supporters, we can see two opposing and polar opposite sides to this issue in our country. However, as with everything, there are more complex issues at play that will not allow us to make this a simple dichotomy of whether to label GMOs or not. Just because you are against additional labeling laws, does not mean you are against GM foods in general. Just because you do not think that our food decisions should be in the hands of a powerful agricultural oligopoly does not signify that you automatically back mandatory labeling of GMOs. Just because you like the idea of knowing where your foods comes from does not imply that you support labeling. Just because you agree that GMOs and non-GMO foods should not be lumped together does not necessarily suggest that you believe that the United States should generate separate facilities, transportation modes, and markets for both products. And just because you are a Republican politician does not mean that you support GMOs infiltrating the U.S. fields and market. (From the *Just Label It!* website (2012), we are told that 55 Republicans and Democrats from the U.S. House of Representatives and U.S. Senate signed a petition asking the FDA to endorse labeling of GE foods. The Center for Food Safety website (2013) tells us that one Republican Senator and one Republican Representative are co-sponsors of a federal bill: Genetically Engineered Food Right to Know Act.) Keith Kloor (2013) sums up the debate from his viewpoint when he says: “Personally, I’m ambivalent about GMO labeling. I see right through the naked cynicism of the Right to Know campaign. It is totally disingenuous. On the other hand, as any student of Aikido or Tai Chi knows, redirecting the force of your attacker is an effective tactic. There is a case to be made that a GMO label on foods would neutralize the opposition and eventually pave the way to greater acceptance of biotechnology.”

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