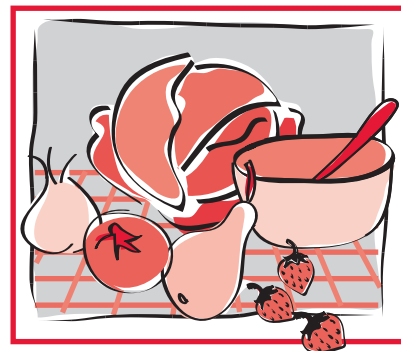


# Labeling of Genetically Engineered Foods

Fact Sheet No. 9.371

Food and Nutrition Series | Health



by P. Byrne\*

Whether or not to require labeling of genetically engineered (GE) foods is a key issue in the ongoing debate over the risks and benefits of food crops produced using biotechnology. Bills requiring mandatory labeling have been introduced in Congress and in the Colorado legislature, and there have also been attempts to place citizens' initiatives on statewide and local Colorado ballots.

The most common GE crops in the United States are soybean, corn, cotton, and canola. Because many processed food products contain soybean or corn ingredients (e.g., high fructose corn syrup or soy protein), it's estimated that 60 to 70 percent of processed foods in grocery stores include at least one GE ingredient.

## Current Labeling Policy

The U.S. Food and Drug Administration currently requires labeling of GE foods if the food has a significantly different nutritional property; if a new food includes an allergen that consumers would not expect to be present (e.g., a peanut protein in a soybean product); or if a food contains a toxicant beyond acceptable limits. Early in 2001, the FDA proposed voluntary guidelines for labeling food that does or does not contain GE ingredients, see: [www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/FoodLabelingNutrition/ucm059098.htm](http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/FoodLabelingNutrition/ucm059098.htm).

## Pros and Cons of Mandatory Labeling

There are many arguments both in favor of and against mandatory labeling of GE foods. Those arguments are summarized here.

### Pro-labeling Arguments

- Consumers have a right to know what's in their food, especially concerning products for which health and environmental concerns have been raised (Raab and Grobe, 2003).
- Mandatory labeling will allow consumers to identify and steer clear of food products that cause them problems.
- Surveys indicate that a majority of Americans support mandatory labeling. (However, such surveys often do not specify the effect on food prices.)
- At least 21 countries and the European Union have established some form of mandatory labeling (Gruere and Rao, 2007; Phillips and McNeill, 2000).
- For religious or ethical reasons, many Americans want to avoid eating animal products, including animal DNA.

### Anti-labeling Arguments

- Labels on GE food imply a warning about health effects, whereas no significant differences between GE and conventional foods have been detected. If a nutritional or allergenic difference were found in a GE food, current FDA regulations require a label to that effect.
- Labeling of GE foods to fulfill the desires of some consumers would impose a cost on all consumers. Experience with mandatory labeling in the European Union, Japan, and New Zealand has not resulted in consumer choice. Rather, retailers have eliminated GE products from their shelves due to perceived consumer aversion to GE products (Carter and Gruere, 2003).
- Consumers who want to buy non-GE food already have an option: to purchase certified organic foods, which by definition cannot be produced with GE ingredients.
- The food system infrastructure (storage, processing, and transportation facilities)

### Quick Facts

- Mandatory labeling of genetically engineered (GE) foods in the United States has been proposed, but not enacted, at the national, state, and local levels.
- Those in favor of labeling emphasize consumers' right to know what's in their food.
- Opponents of labeling point out the expense and logistical difficulties of labeling, and the fact that no significant differences have been found between GE and conventional foods.
- Implementation of mandatory labeling will require resolution of several complex technical issues.

© Colorado State University Extension. 4/02. Revised 9/10.

[www.ext.colostate.edu](http://www.ext.colostate.edu)



\*P. Byrne, Colorado State University Extension agronomy specialist and professor, soil and crop sciences. 9/2010

**Table 1. Examples of voluntary labeling under proposed FDA guidelines**

Wording on Label	FDA Comment
GMO free (does not contain genetically modified organisms). <b>OR</b> Not genetically modified.	Not recommended. "Free" implies zero content, which is nearly impossible to verify. "Genetically modified" is an inappropriate term, in that all crop varieties have been modified by plant breeders.
We do not use ingredients produced using biotechnology.	OK
This oil is made from soybeans that were not genetically engineered.	OK
This cantaloupe was not genetically engineered.	May be misleading, because it implies that other cantaloupes may be genetically engineered. Currently, there are no such varieties on the market.
Genetically engineered.	OK
This product contains cornmeal that was produced using biotechnology.	OK
This product contains high oleic acid <u>soybean oil</u> from soybeans developed using biotechnology to decrease the amount of saturated fat.	OK. The underlined part is mandatory because it indicates a nutritional change. The rest is voluntary under the proposed guidelines.

in this country could not currently accommodate the need for segregation of GE and non-GE products.

- Consumers who want to avoid animal products need not worry about GE food. No GE products currently on the market or under review contain animal genes. (However, there is no guarantee that this will not happen in the future.)

## Issues with Mandatory Labeling

Although mandatory labeling of GE ingredients may appear to be a straightforward measure, there are several complex issues that need resolving prior to implementation.

### What specific technologies for crop variety development would require a label?

The target of most labeling efforts is food products that were genetically engineered, that is, they contain genes artificially inserted from another organism. However, some legislative proposals have defined the term "genetically modified" more broadly to include an array of techniques that were used by plant breeders well before the GE era.

### What percentage of a GE ingredient must be present in a food before a label is required?

A commonly proposed threshold level is one percent. In other words, if any ingredient of a product exceeds one

percent GE content, the product needs labeling. One percent is the labeling threshold decided upon by Australia and New Zealand. The European Union has decided on a level of 0.9 percent, while Japan has specified a five percent threshold. Thresholds as low as 0.01 percent (the approximate limit of detection) have been recommended (Hansen, 2001).

### Would meat, eggs and dairy products from livestock fed transgenic crops require a label?

Some labeling proposals include these products among those that would require labels. However, the biological rationale for doing so has not been demonstrated, that is, DNA or protein from inserted genes have not been found in livestock products.

### How should regulators verify claims that a food is or is not genetically engineered?

There are two ways this can be done:

- Content-based verification requires testing foods for the physical presence of foreign DNA or protein. A current application of this type of procedure is the analysis and labeling of vitamin content of foods. Methods for detecting the presence of GE components in crops and processed foods are discussed by Auer (2003). As the number of transgenes in commercialized crops increases, the techniques for detecting an array of different transgenes have become more sophisticated (e.g., Shrestha et al., 2008).

- Process-based verification entails detailed record-keeping of seed source, field location, harvest, transport, and storage. This is similar to the procedure used to certify shade-grown coffee or organic foods. The steps and issues involved with implementing this type of 'identity preservation' system are explained by Sundstrom et al. (2002).

## What is the economic impact of labeling?

The cost of labeling involves far more than the paper and ink to print the actual label. Accurate labeling requires an extensive identity preservation system from farmer to elevator to grain processor to food manufacturer to retailer (Maltsbarger and Kalaitzandonakes, 2000). Either testing or detailed record-keeping needs to be done at various steps along the food supply chain. Estimates of the costs of mandatory labeling vary from a few dollars per person per year to 10 percent of a consumer's food bill (Gruere and Rao, 2007). Consumer willingness to pay for GE labeling information varies widely according to a number of surveys, but it is generally low in North America. Another potential economic impact for certain food manufacturers is that some consumers may avoid foods labeled as containing GE ingredients.

## Colorado Consumer Attitudes Toward GE Foods

Researchers at Colorado State University's Department of Agricultural and Resource Economics have undertaken a series of surveys and analyses to understand Colorado consumers' attitudes toward GE food, especially potatoes (Loureiro and Hine, 2004). Their survey of 437 supermarket shoppers in four Front Range communities in the Fall of 2000 found that 78 percent supported mandatory labeling of GE foods. However, the respondents were not willing to pay a premium for such labeling. Women appeared to favor mandatory labeling more than men, younger consumers were less likely to support mandatory labeling, and those who considered themselves better informed about biotechnology were less concerned that GE foods be labeled.

## References

- Auer, C.A. 2003. Tracking genes from seed to supermarket: techniques and trends. *Trends in Plant Science*, 8: 591-597.
- Carter, C.A., and G.P. Gruere. 2003. Mandatory labeling of genetically modified foods: Does it really provide consumer choice? *AgBio Forum*, vol. 6, no. 18, [www.agbioforum.org/](http://www.agbioforum.org/).
- Caswell, J.A. 2000. Labeling policy for GMOs: To each his own? *AgBio Forum*, Vol. 3, no. 4, [www.agbioforum.org/](http://www.agbioforum.org/).
- Gruere, G.P., and S.R. Rao. 2007. A review of international labeling policies of genetically modified food to evaluate India's propose rule. *AgBioForum*, vol. 10, no. 1, [www.agbioforum.org/](http://www.agbioforum.org/).
- Hansen, M. 2001. Genetically engineered food: Make sure it's safe and label it. In G.C. Nelson (ed.) *Genetically modified organisms in agriculture*. Academic Press, San Diego. pp. 239-255.
- Loureiro, M.L., and S. Hine. 2004. Preferences and willingness to pay for GM labeling policies. *Food Policy*, 29: 467-483.
- Maltsbarger, R., and N. Kalaitzandonakes. 2000. Direct and hidden costs in identity preserved supply chains. *AgBio Forum*, Vol. 3, no. 4, [www.agbioforum.org/](http://www.agbioforum.org/).
- Phillips, P.W.B., and H. McNeill. 2000. A survey of national labeling policies for GM foods. *AgBio Forum*, Vol. 3, no. 4, [www.agbioforum.org/](http://www.agbioforum.org/).
- Raab, C., and D. Grobe. 2003. Labeling genetically engineered food: The consumer's right to know?, *AgBio Forum*, vol. 6, no. 4, [www.agbioforum.org/](http://www.agbioforum.org/).
- Shrestha, H.K., K.K. Hwu, S.J. Wang, L.F. Liu, and M.C. Chang. 2008. Simultaneous detection of eight genetically modified maize lines using a combination of event- and construct-specific multiplex-PCR technique. *Journal of Agricultural and Food Chemistry* 56: 8962-8968.
- Smyth, S. and P.W.B. Phillips. 2003. Labeling to manage marketing of GE foods. *Trends in Biotechnology*, 21: 389-393.
- Sundstrom, F.J., J. Williams, A. VanDeynze, and K.J. Bradford. 2002. Identity preservation of agricultural commodities. *Agricultural Biotechnology in California Series*, Pub. 8077. Available at <http://anrcatalog.ucdavis.edu/pdf/8077.pdf>. Accessed September 1, 2010.

## Additional Information

*AgBio Forum*, [www.agbioforum.org/](http://www.agbioforum.org/), regularly carries articles on labeling of food produced through biotechnology. Accessed April 27, 2007.

The Center for Food Safety, [www.centerforfoodsafety.org](http://www.centerforfoodsafety.org/), leads a campaign in favor of mandatory labeling. September 1, 2010.

Consumer Union, [www.consumerunion.org/](http://www.consumerunion.org/), advocates for a number of food safety issue including improved regulation and labeling of GE foods.

Transgenic Crops: An Introduction and Resource Guide, <http://cls.casa.colostate.edu/transgeniccrops/>, provides information on the methods, products, benefits, and risks of GE crops. September 1, 2010.