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LABELING POLICIES OF GENETICALLY MODIFIED FOOD

LESSONS FROM AN INTERNATIONAL REVIEW OF EXISTING APPROACHES

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This brief summarizes a comprehensive review of international labeling policies for genetically modified (GM) food and uses it to draw lessons for policymakers in developing countries that are considering the possibility of adopting a labeling policy for GM food.

A multiplicity of national approaches

During the last seven years, more than forty countries have adopted labeling regulations for GM food, but the characteristics of the regulations and their degree of implementation vary greatly. Among the countries with labeling laws, the only common feature is the requirement to label products derived from GM crops that are *not substantially equivalent* to their conventional counterparts, such as nutritionally enhanced GM crops. In contrast, for products that are considered *substantially equivalent* to conventional products (e.g., from 1st generation GM crops), there is a large international heterogeneity in labeling policies.

A first major dichotomy separates countries with **voluntary labeling** (e.g., Canada or Hong Kong) to those with **mandatory labeling** requirements (e.g., Australia, the European Union, Japan or China). Voluntary labeling guidelines dictate rules that define which foods are called GM or non-GM. They allow food companies to decide if they want to use such labels on their products. In contrast, mandatory labeling requires that food handlers (processors, retailers and sometimes food producers or restaurants) display whether the targeted product/ingredient contains or is derived from GM materials.

Secondly, among countries with mandatory labeling, regulations differ widely according to the following characteristics:

a) Coverage: countries may require labeling for a list of particular food ingredients *or* all ingredients that include detectable transgenic material; highly processed products *derived* from GM ingredients, even without quantifiable presence of transgenic material; animal feed; additives and flavorings; meat and animal products fed with GM feed; food sold at caterers and restaurants; and unpackaged food.

b) Threshold level for labeling of GM ingredients: can be applied to each ingredient or only to three or five major ingredients; and its level ranges from 0.9% to 5% (with the exception of China).

c) Labeling content: "genetically modified" item on the list of ingredients, or in the front of food packages.

One of the major differences in regulations among countries with mandatory labeling depends on whether the regulation targets the presence of GM in the *finished product* or on GM technology as a *production process*. In the former case, only products with detectable and quantifiable traces of GM materials or ingredients are required to carry a label. In contrast, in the latter case, any product derived from GM crop will have to be labeled, whether or not it contains any traces of GM material. This difference is crucial for enforcement: a product-based system can be enforced with testing equipment to filter a cheater, whereas a process-based system requires viable and trustworthy documentation systems, which will lead to identity preservation or traceability requirements for the producers and importers, but do not guarantee the absence of fraud.

Lastly, national regulations differ by their **degree of implementation**. Most developing countries with mandatory labeling laws of GM food have not implemented the laws, or have only partially enforced the laws. So far, China can be considered the only developing country with a mandatory labeling policy in place.

What are the benefits? Observed effects of labeling policies

On the one hand, voluntary labeling has resulted so far in an increasing number of non-GM labeled products available as alternatives to GM products, giving consumers a choice between products that may contain approved GM products and those that have no GM ingredients. On the other hand, the case for mandatory labeling is largely debatable. The overall stated objective of mandatory labeling requirements is to provide consumer information and consumer choice. Labeling policies are designed to follow safety approval clearance.

A review of the effects of mandatory labeling policies shows that, in *developed countries*, thus far, this approach failed to provide consumer information and consumer choice. In these countries, only non-GM, non-labeled products are available. So, consumers have no choice but to take non-GM products. Mandatory labeling has resulted in all food processors and retailers removing any potential GM ingredients targeted by the labeling regulations, because of the expected effect of labels as a hazard warning and easy target for anti-GM activists. This hazard warning effect may be partially due to the fact that the labeling content of these regulations is not informative; in particular, it does not state that the relevant GM ingredients have been approved by the food safety authorities. In contrast, China is the only large *developing country* with a regulation in place, and it is also the only country where virtually all the products targeted by the regulation are labeled GM. China's policy targets certain products, but it does not have an explicit threshold level. Once again, there is not much consumer choice, but it does not seem to impact the decision-making of Chinese consumers.

What are the costs of labeling?

A few studies have been published on the cost of mandatory labeling in Canada, Australia, the United Kingdom, the Philippines, and in the U.S. state of Oregon and the Canadian province of Quebec. The main costs estimates range from \$0.2 up to \$10 or even \$20 per capita per year. The only study in a developing economy (the Philippines) evaluates that mandatory labeling would result in a 11-12% production cost increase, which could translate into 10% consumer price increases.

These estimates depend on several critical characteristics, such as the threshold level (the lower the threshold, the more costly the system), the capacity of the industry to comply with requirements (the lower, the costlier), and the public authority's capacity to enforce the labeling rules. More generally, the economic effects of labeling are intrinsically linked to the presence or absence of domestically produced GM crops, and imports or exports of GM food products. The more a country produces and uses products that may contain GM food, the more costly a mandatory labeling regulation will be.

GM food labeling in the international context

There is no international agreement, standard, or guideline on GM food labeling. The Codex Alimentarius Commission has discussed this issue for over a decade without reaching consensus on a labeling guideline. In this context, strict mandatory labeling systems adopted by importers could be found in violation of rules under the World Trade Organization (WTO).

Conclusions: lessons learned

A number of countries have adopted labeling approaches for genetically modified (GM) food or the products derived thereof. Our review of national regulations shows that the effects of labeling approaches can vary greatly depending on the specifics of the regulation. In particular, all approaches are not successful in providing consumer choice or consumer information; some regulations are bound to be very costly; and many countries have failed to implement their own regulations. Moreover, we find that mandatory labeling policies are not recognized internationally. In this context, countries that are considering introducing a GM food labeling regulation should first ask themselves eight critical questions (see box).

- 1) Is GM labeling necessary and if so for what reason?
- 2) Is it genuinely demanded by a majority of consumers and considered a labeling priority?
- 3) If labeling is requested, what type of GM labeling approach will best fulfill its objective?
- 4) What will be the reaction of the food industry to labeling, and will it result in consumer choice?
- 5) What should be the labeling content, what are the coverage and the threshold of labeling?
- 6) How will implementation be done and at what costs?
- 7) Would the chosen labeling have any effect on the potential use of GM crop technology?
- 8) Would it be compatible with the country's general economic goals and its international obligations?

A response to each of these questions is necessary to ensure the introduction of a labeling policy serves a country's economic and social goals.

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The ballot measure was widely debated. Voters needed to decide whether Oregon should be the first state to require labeling of GE food, whether the time was right, and whether the ballot measure was the best way to go about doing this (Jaeger, 2002). With a 68% turnout, the measure was defeated, with 30% of voters in favor of labeling and 70% against.

Consumer Acceptance of Biotechnology

Despite widespread acceptance of biotechnology at the farm level, consumer acceptance has remained uncertain (Lusk & Sullivan, 2002). Although studies have shown that many Americans are either supportive of or neutral toward genetically modified foods, this may be more a function of ignorance than acceptance (Marks, Kalaitzandonakes, & Zakharova, 2002).

Many consumers have limited knowledge about genetic engineering or its use in agriculture (Brown & Ping, 2003). Surveys have shown that at least one quarter of Americans have not heard or read about use of biotechnology in food production (International Food Information Council, 2003; Pew, 2001b). Only 36% of International Food Information Council survey respondents (2003) knew that food produced through biotechnology was currently in the supermarket. Likewise, only 19% of Pew Initiative on Food and Biotechnology survey respondents (2001b) knew that they had eaten genetically modified food. Of the Pew respondents, 31% indicated that they would be "not at all likely" to eat genetically modified foods, and 46% felt that it was "very important" to know whether a food contains genetically modified agricultural products.

Forty-seven percent of the general population felt it is "extremely" or "very important" to have products that do not include genetically modified organisms (Sloan, 2002). Women, older shoppers, and those with children were less likely to be accepting and more likely to be concerned, according to a Food Marketing Institute/Prevention 2001 survey (Sloan, 2002). Those who placed a high level of importance on the environment were less likely to accept genetically modified foods (Lusk & Sullivan, 2002).

Lack of acceptance may stem from lack of trust. Some surveys suggest that consumers are skeptical about government's ability to regulate biotechnology (McCullum, 2000; Nestle, 1998). Labeling genetically modified foods could function as an important tool for building trust between consumers and producers.

Organic Alternatives

It has been argued that genetically modified labeling is not needed, because consumers can now buy organic food with the assurance that it is not genetically modified. Although purchase of organic foods has been growing, there has been no uniform standard. The Organic Foods Protection Act of 1990 mandated an organic certification program for farmers and handlers of agricultural products (US Department of Agriculture, 2003). Certification gives uniformity of standards, consistency among certifiers, and reduced fraudulent practices (Montecalvo, 2001). Rules require that organic food be produced without using most conventional pesticides, petroleum- or sewage-sludge-based fertilizers, bioengineering, or ionizing radiation. The standards were finalized in 2000; compliance was required by October 2002.

Organic foods have had a recent growth rate of 20% per year and now represent 2% of the retail market (Hollingsworth, 2003). Surveys indicate that more than half of all Americans buy organic food at least one time a month (Hollingsworth, 2003) and one quarter actively seek out organic food. Organic fruits and vegetables are the main purchase category (Sloan, 2002).

The majority of consumers perceive organic foods to be safe for the environment and safer to eat. Overall, organic food users are more concerned about pollution and the environment than the general population. Two thirds of environmentally concerned Generation X supermarket shoppers consider organic foods very or somewhat important compared to 58% of Baby Boomers and 56% of Matures (i.e., those aged 65 and older; Sloan, 2002).

Consumers have a more positive attitude about organic foods than genetically modified or irradiated foods. In 2001, 64% of consumers had a very or somewhat favorable impression of organic foods compared to 21% with favorable impressions for genetically modified foods and 17% for irradiated foods (Pew, 2001b).

Survey Of Oregon Voters

To assess Oregonians' awareness of and attitudes toward organic and GE food labeling, we participated in an annual omnibus survey conducted by the Oregon Survey Research Laboratory. The statewide random phone survey of Oregonians age 18 and older was conducted in December 2002/January 2003 to assess opinions and experience on several issues. The 801 respondents included 321 males (40%) and 479 females (60%). Their ages ranged from 18 to 96 with a mean of

48.8 years. The majority (89%) was white/Caucasian (compared to 84% white, not of Hispanic/Latino origin statewide; US Census, 2000). Ninety-two percent had graduated from high school (compared to 85% statewide) and 32% had a bachelor's degree or higher (compared to 25% statewide). Respondents lived in urban (34%), suburban (34%), and rural (23%) areas of the state and on farms or ranches (8%). Fifty-eight percent were employed, 5% were not employed, and 23% were retired. Forty-two percent had children under 18 in their homes. Their incomes ranged from over \$100,000 (9%) to under \$18,000 (13%). Seventy-two percent were the main grocery shoppers in their households; 8% had equal responsibility. In 14% of the households, someone belonged to an environmental club, group, or organization.

Seventy-six percent of respondents reported that they or someone in their households had purchased

organic food in the last six months with 22% reporting "often," 30% "sometimes," and 24% "rarely." A wide range of organic food purchases were reported, including fruits, vegetables, and dairy products.

Forty percent of respondents were aware that US Department of Agriculture National Organic Standards went into effect in October 2002. Of these, 9% reported having "a lot" of knowledge about the new requirements for labeling organic food; 40% had some. Sixty-eight percent who knew "a lot" or "some" about the new standards were aware that genetically engineered foods cannot be labeled "organic;" 53% knew that organic foods cannot be irradiated. Eighteen percent of those aware of the national standards indicated that they trusted the new organic labeling to be accurate "a lot;" 48% reported "some."

Table 1. A sample of major reasons for voting in favor of or against Ballot Measure 27 to label genetically engineered foods in Oregon.

Proponents of labeling	Opponents of labeling
"I like to know what I'm eating."	"Not cost effective."
"We should be in control of what goes in our bodies."	"Big burden to the taxpayer."
"People deserve to make an educated choice."	"Benefits don't outweigh costs."
"The public has the right to know and producers have an obligation to let them know."	"Costs too much for what it is worth."
"Other countries are doing it."	"Already enough regulations."
"They haven't done enough studies of the effects."	"There's no way you can create a bureaucracy to enforce all this."
	"We didn't need something like that."
	"Waste of money."
	"I don't think we need to spend that kind of money when the state is laying off teachers and police officers."
	"It would increase cost that would be passed on to consumers."
	"Too expensive at this time without proof that there is a problem."
	"Too much red tape for farmers."
	"Gives Oregon agriculture a negative position."
	"Oregon farmers are already in trouble financially."
	"It would have cost farmers too much money."
	"The people it was going to affect were farmers and ranchers and they were against it (the measure). I figured they needed help."
	"Unfair burden to producers."
	"I get so tired of labels. It increases the cost and doesn't serve a big purpose."
	"We have to read enough labels."
	"I don't think we have to label everything."
	"I don't really care because I don't read labels closely."
	"To get all that information in, it takes so much labeling space and I can't read those small words."
	"Not sure we can trust labeling after going through all the expense."
	"Not clearly written."
	"Too broad."
	"Too restrictive."
	"Cumbersome."
	"Issue not well defined."
	"It's a good idea but poorly written."
	"Not quite sure what the ballot measure really meant."
	"Not yet defined terms and parameters that are effective and workable."

Voter Response to GE-Labeling Ballot Measure

Eighty-seven percent of respondents were registered to vote in Oregon; 81% of these had voted in the November 2002 election that included Ballot Measure 27 (entitled "Requires labeling of genetically engineered foods (as defined) sold or distributed in or from Oregon"). Thirty-four percent reported voting in favor of labeling genetically engineered foods; 55% voted against the labeling. Others reported skipping this measure on the ballot, did not know how they voted, or refused to answer the question.

In an open-ended question, voters were asked to give the major reason why they voted the way they did on the ballot measure. Although reasons varied widely, some themes emerged (Table 1). For those who voted in favor of labeling, the consumer's right to know was voiced by many. For some, labeling was a good idea or the right thing to do. Some expressed concern about the safety of genetically modified foods. Environmental concerns were uppermost in a few respondents' minds.

Of those who voted against the labeling of GE foods, cost was a major concern, particularly during a time of budget crisis in Oregon. The potential financial impact of the labeling measure on farmers was mentioned by many antilabeling voters. Many voters, in general, did not think that labeling was necessary. Wording of the ballot measure was a concern to others. A few voters reported being swayed by the media campaign against the ballot measure.

Some voters felt that GE labeling should be federal rather than state-mandated: "Genetic food labeling should be in all states, so people producing food in Oregon would not be penalized in other states." Others questioned the merits of labeling: "If people want organic foods, there are already labels there for them. If people don't want organic food, they shouldn't have to pay for those labels." "It's too late. If we had tried to enact this when most foods were not genetically altered, it would make sense to label them. But now that most are, it makes sense to label them 'not' genetically altered."

How respondents voted was significantly associated with someone in the household belonging to an environmental organization (Table 2). A higher percentage of voters with household membership in an environmental organization favored labeling than those in households without such membership. Votes were also significantly associated with frequency of organic food purchases. Labeling GE food was supported in a higher percentage

Table 2. Characteristics of Oregonians who voted for and against Ballot Measure 27 requiring labeling of genetically engineered food.

	Voted for Measure 27 (n=189)	Voted against Measure 27 (n=310)
Belonging to an environmental organization**		
Yes	24.9%	13.1%
No	75.1%	86.9%
Purchase frequency of organic foods**		
Never	11.6%	25.0%
Rarely	11.6%	32.6%
Sometimes	39.5%	28.9%
Often	37.4%	13.5%
Gender*		
Male	33.2%	43.9%
Female	66.8%	56.1%
Income**		
Less than \$18,000	11.8%	8.7%
\$18,000–25,000	12.4%	6.3%
\$25,000–40,000	27.2%	19.9%
\$40,000–70,000	28.4%	30.1%
\$70,000–100,000	13.6%	21.0%
Over \$100,000	6.5%	14.0%
Residence*		
Urban	42.6%	28.5%
Suburban	27.9%	37.4%
Rural	21.6%	23.6%
Farm, ranch	7.9%	10.5%
Likelihood of buying food labeled "modified by genetic engineering"***		
Not at all likely	36.1%	19.7%
Not too likely	36.6%	27.2%
Somewhat likely	21.9%	37.6%
Very likely	5.5%	15.5%

* $p < .01$; ** $p < .001$

of households that purchased organically food "often" or "sometimes" in the past six months.

Gender was also significantly associated with how respondents voted on the ballot measure (Table 2). A higher percentage of women favored labeling. This supports previous findings that women are more likely to be concerned about genetic modification (Sloan, 2002). Income was associated with votes as well. GE food labeling was supported by a higher percentage of voters with incomes ranging from \$25,000 to \$70,000. Area of residence was significantly associated with the labeling

Table 3. Characteristics of Oregon voters likely to buy genetically labeled food.

	Likelihood of buying genetically labeled food			
	Not at all likely	Not too likely	Somewhat likely	Very likely
Purchase frequency of organic foods**				
Never	25.1%	18.9%	22.5%	22.9%
Rarely	15.2%	27.0%	28.7%	27.1%
Sometimes	25.5%	30.5%	34.0%	32.9%
Often	34.2%	23.6%	14.8%	17.1%
Income*				
Less than \$18,000	14.0%	10.2%	12.9%	14.3%
\$18,000–25,000	15.4%	12.5%	8.3%	9.5%
\$25,000–40,000	27.0%	25.5%	21.7%	22.2%
\$40,000–70,000	26.5%	23.2%	30.4%	27%
\$70,000–100,000	11.2%	22.2%	12.4%	12.7%
Over \$100,000	6.1%	6.5%	14.4%	14.3%
Gender**				
Male	33.2%	35.5%	47.4%	55.7%
Female	66.8%	64.5%	52.6%	44.3%

* $p < .01$; ** $p < .001$

vote, with a higher percentage of urban voters favoring labeling.

Likelihood of Buying GE-Labeled Food

When asked how likely they would be to buy food that is labeled "modified by genetic engineering," 9% responded "very likely," 27% "somewhat likely," 30% "not too likely," and 29% "not at all likely." Likelihood of buying was significantly associated with voting on Ballot Measure 27. A higher percentage of those who favored labeling indicated being "not at all" or "not too likely" to buy GE-labeled food (Table 2). This suggests that labeling would influence whether consumers purchase GE food. Consumer willingness-to-pay has been shown to decrease when labeling reveals that the food has been produced with modern biotechnology (Tegene, Huffman, Rousu, & Shogren, 2003).

Likelihood of buying GE-labeled food was significantly associated with frequency of organic food purchases (Table 3). A higher percentage of those buying organic food "sometimes" were "very likely" to buy GE-labeled food. Income was also significantly associated with likelihood to buy GE-labeled food, with a higher percentage of those with \$40,000–70,000 incomes being "very likely" to buy. Gender also showed a significant association: A higher percentage of males were "very likely" to buy than females.

The Future of GE Labeling

Consumers determine the success or failure of products of biotechnology through their market behavior (Zimmerman, Kendall, Stone, & Hoban, 1994). Labeling GE food would give them an additional choice when selecting food for their families. It could function as an important tool for building trust between consumers and producers (McCullum, 2000). Benefits of such labeling could depend on information provided and consumers' ability to interpret it (Jaeger, 2002).

Mandatory labeling requirements are not necessarily the most effective means of keeping the public informed (Shoemaker, Demcey Johnson, & Golan, 2003). It has been suggested that labeling can lead to greater confusion while reducing economic efficiency. An alternative is voluntary labeling of products that contain (or do not contain) GE ingredients.

During 2001–2002, 25 pieces of legislation in 14 states were introduced to call for either voluntary or mandatory labeling of all food products generated through biotechnology (Pew, 2001a). Legislation requiring mandatory labeling of genetically modified food did not pass. A bill authorizing voluntary labeling of foods believed not to contain genetically modified ingredients passed in Maine, however.

In 2003, Oregon legislation was introduced to prevent another ballot measure like the one that appeared on the 2002 general election ballot. Local jurisdictions and the state would have been prevented from imposing

food-labeling restrictions more stringent than those adopted by the federal government. Although this bill was not passed in the legislative session, it was another pioneering step that would have put Oregon in the position of relying on national legislation to provide uniform labeling standards for GE foods. Such national legislation may be more equitable for GE food products that are marketed across state lines.

Conclusions

Our findings confirm that many voters support labeling GE foods based on their perceived right to know what they are eating. Due to ambiguities and wide-ranging impact, Ballot Measure 27 may not have been favored by some consumers who otherwise might have supported labeling GE foods. The antilabeling campaign focused on the costs and consequences that Oregon could have incurred as the first state to require such labeling. In a time of budget crisis, cost concerns could have swayed votes against the measure.

The Oregon vote on Ballot Measure 27 suggests that the time was not right and that this particular ballot measure may not have been the best way to go about labeling genetically engineered food. Increased consumer awareness resulting from the ballot measure campaign could influence future support for labeling, however. Women, households that buy organic food, and urban consumers may be in the forefront of support.

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