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# New technologies and food labelling: the controversy over labelling of foods derived from genetically modified crops

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**Abstract:** Consumers' views of genetically modified foods (GM foods) can influence food producers' decisions as to whether to market GM foods or whether to use conventional varieties. Through labelling, supported by certification, consumers could differentiate a GM food from a conventional food. A working group of the Codex Committee on Food Labelling identified seven approaches to labelling of GM foods. GM labelling is mandatory when there are differences in the final product that could have a material effect on the consumer. Several countries require labelling when the final product is different than the conventional product, regardless of whether the difference has no consequences for health. There is little consensus on labelling products which do not contain any GM material but were derived from a GM crop or labelling because of the process of production.

**Key words:** Codex Committee on Food Labelling, genetically modified foods, mandatory labelling, consumer acceptance of GM foods.

## 10.1 Agricultural biotechnology and consumers

Since genetically modified (GM) seeds were introduced commercially in 1996, their use has spread to 25 countries in North America, South America, Europe, Asia and Africa (James, 2008). The most common GM food crops are soybean and maize, which are grown primarily in the United States of America (USA), Argentina and Brazil (James, 2008). Conventional soybean and maize, as well as their

GM counterparts, are commonly processed into a range of food ingredients, which are widely used by food manufacturers to produce numerous packaged food products.

With strong competition in the global food market, consumers' views of genetically modified foods (GM foods) can strongly influence the decisions by farmers, commodity dealers, food manufacturers and food retailers regarding whether to produce and market GM foods or whether to use conventional varieties. Yet, a shopper cannot distinguish between foods that are conventional or GM without explicit information since the GM status of a product cannot be determined by sensory perceptions or experience. With the current generation of GM foods, the quality of being derived from GM crops is not revealed even after the product has been consumed. This is known as a 'credence' quality (Jahn *et al.*, 2005). Thus, it is only through labelling, supported by certification, that consumers would be able to differentiate a GM food from a conventional food. Through their purchases of labelled foods in the market, they could indicate whether the quality of being GM is important to them. This could have an impact on the use of GM technology in food production.

## 10.2 Policy options

With the potentially powerful impact that food labels could have on the future of a new technology, the decisions regarding the labelling of GM food products have been the subject of extensive debate within countries and internationally. As a result of various types of consultations with the biotechnology industry, food producers, scientific societies, consumer associations and environmental organizations, as well as the general public, and consideration of national legislation and existing Codex standards, a number of policy approaches have emerged in different countries. Since these food products are traded worldwide, harmonization of these various labelling options has been a concern of many countries. Internationally, the Codex Committee on Food Labelling (CCFL) began discussions on labelling of GM foods in 1991 and the deliberations are continuing.

### 10.2.1 Seven approaches to labelling of GM foods

At the 34th Session of CCFL, held in May 2006, a working group was charged with several tasks aimed at resolving the impasse in the deliberations. One task was to consider 'the rationale for Members' approach to the labelling of food and food ingredients obtained through certain techniques of genetic modification/genetic engineering' and to 'identify the current standards, regulations, acts/decrees, etc. among current Members with respect to the mandatory and voluntary labelling of foods and food ingredients obtained through certain techniques of genetic modification/genetic engineering' (CAC, 2007). Another was to identify Members' practical experiences in applying/implementing mandatory and voluntary labelling of food and food ingredients obtained through certain techniques of genetic

**Table 10.1** Main approaches to labelling of GM foods

1. Mandatory GM labelling as such of all foods derived from or containing ingredients derived from organisms produced using gene technology (food consisting of, containing or produced from GMOs).
2. Mandatory GM labelling as such of GM foods and food ingredients where novel DNA and/or protein are present in the final food.
3. Mandatory GM labelling as such of GM food where it is significantly different from its conventional counterpart and where GM labelling is required in addition to the significant change.
4. Mandatory labelling of GM foods where it is significantly different from its conventional counterpart and where only the significant difference is labelled, but not the method of production.
5. Voluntary labelling (voluntary labelling guidelines for foods that are or are not products of genetic engineering).
6. No special labelling requirement for bioengineered foods as a class of foods.
7. Labelling requirements under development.

Source: CAC, 2007, p. 2.

modification/genetic engineering (*ibid*). The CCFL working group, comprising of 25 members and the European Union, met in Oslo, Norway in 2007 and in Accra, Ghana in 2008. They reported back to the full CCFL, which reports to the Codex Alimentarius Commission. Based on the comments of governments, the working group identified seven main approaches to labelling of GM foods (Table 10.1).

The approaches in the table are not exclusive; a country's labelling requirements might include several of the listed categories and some products may be exempt or excluded from these regulations. To illustrate the complexity, Table 10.2 provides more detailed descriptions of the policies as explained by Codex delegates.

Within the seven approaches, there are agreements on some key points. All of the approaches require positive labelling when there are differences in the characteristics of the final product that could have a material effect on the consumer, for example, changes in the composition of the food or introduction of allergens. Several countries require labelling when the final product is different than the conventional food product, regardless of whether the difference has no consequences for health or the quality of the product. There is less agreement on whether final products which do not contain any GM material should be labelled if they were derived from a GM crop and whether a food should be labelled because of the process of production. A few countries explicitly address the use of negative food labels, that is, labels that claim that a food does not contain GM ingredients.

Of particular significance is the fact that a number of countries have set thresholds for the unintentional presence of GM material. Unintentional or adventitious presence can occur when pollen flows from GM crops to conventional or organic crops and when GM DNA comes into contact with other foods in farm equipment, storage silos, transport containers and food processing plants. Very minute quantities of GM DNA can lead to a positive test result for GM contents even though the food was produced through conventional or organic methods.

**Table 10.2** Labelling requirements for genetically modified foods from different countries

| Country | Main legislation | Main features of the policy | | |
|---|---|---|---|---|
| | | Positive label | Unintentional GM presence | Negative label |
| Argentina | Argentina Food Code<br>Law 24.240 on Consumer's Defence<br>Commercial Loyalty Law | '…specific regulations at a national level are based on the characteristics and properties of the product when these are technically verifiable…' (p. 2)<br>No law at national level for labelling food produced from raw material or ingredients derived from genetically modified organism. | | |
| Australia | Australia New Zealand Food Standards Code Standard 1.5.2–Food Produced Using Gene Technology<br>Trade Practices Act, 1974 | 'GM foods and food ingredients [including food additives and processing aids] must be labelled if there is novel DNA and/or novel protein in the final food, or if the food has "altered characteristics"… [that is] significantly different from its non-GM counterpart with respect to allergenicity, toxicity, nutritional impact or end use.' (p. 7)<br>'…does not require mandatory labelling on the basis of method of production where there is no novel DNA or novel protein.' (p. 7) | '… no more than 10 g/kg per ingredient … [is permitted to] remain unlabelled'. | '… might be called on to substantiate the claim…' |
| Brazil | Decree 4.680 of April 24, 2003<br>Portaria (Regulation) 2.658 December 22, 2003<br>Law 8.078 of September 11, 1990 Code of Defense of the Consumer<br>Law 11.105 of March 24, 2005 | '…labelling of foods and food ingredients containing or consisting of organisms obtained by certain techniques of genetic modification/genetic engineering is mandatory…'<br>'…the main reason for the labelling … is to guarantee the legitimate consumer right to information, in order to favour his/her conscious choice of foods.' (p. 10) | Must inform about presence of GMO when above the limit of 1%. | |

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| Canada | Food and Drug Regulations<br>Food and Drugs Act<br>Consumer Packaging and Labelling Act<br>Competition Act<br>National Standard for Voluntary Labelling and Advertising (Draft) | '… mandatory labelling requirements when there is a health and safety change or a significant change in nutrition or composition in the novel food (including products of genetic engineering), and voluntary labelling requirements for method of production labelling.' (p. 12)<br>'… permit voluntary … positive labelling on the condition that the claim is not misleading or deceptive and the claim itself is factual' (p.12) | | '…Permit voluntary … negative labelling on the condition that claim is not misleading or deceptive and and the claim is factual' |
| European Community | Article 2 of Directive 2000/13/EC of the European Parliament and of the Council of 20 March 2000<br>Regulation (EC) No. 1830/2003 and Regulation (EC) No. 1829/2003 of the European Parliament and of the Council of 22 September 2003 | '…labelling … should include objective information … that a food consists of, contains or is produced from GMOs. Clear labelling, irrespective of the detectability of DNA or protein resulting from the genetic modification to the final product … facilitates informed choice and precludes potential misleading of consumers as regards methods of manufacture or production.' (p. 23)<br>'labelling should give information about any characteristic or property which renders a food different from its conventional counterpart with respect to composition, nutritional value or nutritional effects, intended use of the food and health implications for certain sections of the population, as well as … ethical or religious concerns' (p. 23) | '…a proportion no higher than 0.9% of the food ingredients considered individually or food consisting of a single ingredient…' | |

**Table 10.2** *continued*

| Country | Main legislation | Main features of the policy | | |
|---|---|---|---|---|
| | | Positive label | Unintentional GM presence | Negative label |
| Ghana | National Biosafety Bill (draft) | No Ghana Standards or regulations (as of February 2007) (p. 33) | | |
| India | Prevention of Food Adulteration Rules, 1955 37 E Labelling of Genetically Modified Food (draft) | 'a GM Food, derived there from, whether it is primary or processed or any ingredient of food, food additives or any food product that may contain GM material shall be compulsorily labelled, without any exception.' (pp. 36–37)<br>'…provisions will be applicable to all such products both imported or domestically produced' (pp. 36–37)<br>'the label of imported GM Food or derived there from … shall also indicate that the product has been cleared for marketing and use in the country of origin so that the verification, if needed can be taken up with that country without having to resort to testing.' (pp. 36–37) | | |
| Japan | Article 21 of the Enforcement Regulation of the the Food Sanitation Law The Labeling Standard for Genetically Modified Foods (Notification No. 517 of the Ministry of Agriculture, | '…labelling is required for the products in which genetically modified DNA or protein is present and detectable.' (p. 39)<br>'Processed foods in which DNA or protein is undetectable are not subject to mandatory labelling…'<br>Labelling is mandatory for 'GM foods whose composition or nutritional values are significantly different from their conventional counterparts.' | Adventitious presence accepted up to 5%. | 'Non-GM products may be voluntarily labelled as "non-GM" if certification is provided to show that the non-GM ingredients were under the identity preserved handling…' |

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| | Forestry and Fisheries of March 31, 2000 Law Concerning Standardization and Proper Labeling of Agriculture and Forestry Products | |
| Malaysia | Drafting regulations for mandatory labelling (p. 43) | |
| Mexico | Genetically Modified Organisms Biosafety Law Article 101 General Health Law Article 282 Bis 2 Statute for the Sanitary(safety) Control of Products and Services Article 166 Mexican Official Standards (Technical Regulations) | Labelling of GMOs and of products containing them is required: 'in the events where their traits are significantly different than those of conventional products … explicit reference must be made to "genetically modified organisms" and the label must state their food composition or such nutritional properties that are different from their conventional counterparts.' (p. 44) There is no obligation to label where the GMO is not different from its conventional counterpart. Labelling is not required solely because of the process or method of production. |

**Table 10.2** *cotinued*

| Country | Main legislation | Main features of the policy | | |
|---|---|---|---|---|
| | | Positive label | Unintentional GM presence | Negative label |
| New Zealand | Australia New Zealand Food Standards Code Food Standard 1.5.2 'Food Produced using Gene Technology' Standard 1.2.9 'Legibility Requirements' Fair Trading Act of 1986 | '…the Code requires all foods, food ingredients or additives sold … to be labelled at point of sale, where novel DNA or protein is present in the final food, or the food has altered characteristics as a result of genetic modification processes.' (p. 47) Flavourings making up less than 1% are exempt from labelling. 'The GM labelling requirements apply to all packaged and bulk foods, but do not apply to food prepared in restaurants, cafes and takeaways.' '…does not require mandatory labelling for method of production, where a food has been derived from gene technology, but does not contain novel DNA and/or novel protein.' | …trace amounts of GM material (less than 1%)…' | |
| Norway | Regulations relating to the labelling, transport, import and export of genetically modified organisms (GMOs) General Regulation of 8th July 1983 no 1252 Section 16a Regulation of 21st December | 'the regulations contain rules for the authorisation, labelling and traceabilty of both GM food and feed. The regulations are based upon EU Regulations (EC) Nos 1829/2003 … and 1830/2003…' (p. 52) 'The labelling regulations apply to all GM foods including GMOs and food derived from GMOs, whether their properties or characteristics be different from those of comparable conventional food or not.' | Label required if GM component constitutes more than 0.9% of the ingredient. | |

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| | 1993 no. 1385<br>Section 4a no. 4<br>Section 7 and<br>Section 10 | |
| United States of America | Federal Food, Drug and Cosmetic Act (FFDCA)<br>Section 403(a)(1) of the FFDCA (21 U.S.C. 343(a)(1) and<br>Section 201(n) of FFDCA (21 U.S.C. 321(n)<br>Food and Drug Administration Guidance for Industry: Voluntary Labeling Indicating Whether Foods Have or Have Not Been Developed Using Bioengineering: Draft Guidance 2001 | 'No special labelling requirement for bioengineered foods as a class of foods.'<br>'If a bioengineered food is significantly different from its traditional counterpart … the name must be changed to describe the difference.'<br>'If an issue exists … regarding how the food is used or consequences of its use, a statement must be made in the labelling to describe the issue.'<br>'If a bioengineered food has a significantly different nutritional property, its labelling must reflect the difference.'<br>'If a new food includes an allergen that consumers would not expect to be present … that allergen must be disclosed…'<br>'All statements … must be truthful and not misleading.' (p. 57) |

Source: extracted from the Report of the CCFL Working Group on Labelling of Foods and Food Ingredients Obtained Through Certain Techniques of Genetic Modification/Genetic Engineering held in Oslo, 6–7 February 2007 (CAC, 2007).

Unintentional presence can undermine consumer confidence in the integrity of the food label.

### 10.2.2 Case study: voluntary labelling in the United States of America

In the USA, the Food and Drug Administration (FDA) has responsibility for regulating all processed and packaged foods, animal feed, food additives, veterinary drugs and human drugs that are derived from agricultural biotechnology (Executive Office of the President, Office Science and Technology Policy,1986). The authority to regulate labels for GM foods labels is derived from the Food, Drug and Cosmetic Act of 1938 which states that the labelling of a product must 'reveal facts material in the light of such representations or material with respect to consequences which may result from the use of the article' (United States Congress, 1938). In addition, it is illegal to misbrand a food through labelling which is 'false or misleading in any particular …' (*ibid*).

The agency's approach to regulation of GM foods was explained in 1992, when the FDA issued the 'Statement of Policy: Foods Derived from New Plant Varieties; Notice". The 1992 policy stated:

> The regulatory status of a food, irrespective of the method by which it is developed, is dependent upon objective characteristics of the food and the intended use of the food (or its components). Consumers must be informed, by appropriate labeling, if a food derived from a new plant variety differs from its traditional counterpart such that the common or usual name no longer applies to the new food, or if a safety or usage issue exists to which consumers must be alerted. (Food and Drug Administration, 1992, 22991)

In 2001, after reviewing its approach in light of public, industry and trade concerns, the FDA announced a draft policy: 'Guidance for Industry, Voluntary Labeling Indicating Whether Foods Have or Have Not Been Developed Using Bioengineering' (FDA guidance) (Food and Drug Administration, 2001). The main features of the guidance are shown in Table 10.3.

It is notable that the FDA approach provides guidance for producers who wish to inform consumers that their product does not contain GM ingredients, i.e. negative labelling. In addition, it specifically draws attention to the United States Department of Agriculture rules for organic foods (National Organic Program final rule; 65 FR 80548) involving requirements for certification that a product is organic. 'The national organic standards would provide for adequate segregation of the food throughout distribution to assure that non-organic foods do not become mixed with organic foods. The agency believes that the practices and record keeping that substantiate the "certified organic" statement would be sufficient to substantiate a claim that a food was not produced using bioengineering.' (Food and Drug Administration, 2001).

**Table 10.3** Key features of the FDA, 2001 guidance for voluntary labelling of bioengineered foods

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| *Bioengineered* |
| Optional to say 'contains (product) developed/produced through biotechnology' |
| Allowed to claim 'developed through biotechnology because (positive reason)' but **must substantiate claim**. (emphasis added) |
| Cannot claim benefits for whole product if amount of positive ingredient insignificant |
| Must disclose allergens not found in conventional counterpart |
| Must change name if significantly different |
| Optional to say 'contains (product) developed/produced through biotechnology' |
| Allowed to claim 'developed through biotechnology because (positive reason)' but **must substantiate claim**. (emphasis added) |
| Cannot claim benefits for whole product if amount of positive ingredient insignificant |
| Must disclose allergens not found in conventional counterpart |
| Must change name if significantly different |
| Label may apply to human foods and animal feeds |
| *Non-bioengineered* |
| All ingredients must be non-bioengineered |
| Cannot imply that specific product is non-bioengineered if no products of this type are bioengineered. |
| Can say all foods of a type are non-bioengineered |
| Must be able to substantiate 'non-bioengineered' through testing, documentation, segregation |
| USDA certified organic foods are non-bioengineered by definition |
| Permitted to say biotechnology not used if there is **no suggestion that product is superior**. (emphasis added) |
| Label may apply to human food and animal feeds |

Source: Adapted from FDA, 2001.

### 10.2.3 Case study: mandatory labelling in the European Union

In the European Union, the European Commission, the European Parliament and the European Food Safety Authority (EFSA) have responsibilities for developing laws to regulate GM products. Regulations in each EU country must be harmonized with the regulations of the other members of the EU so that foods can flow freely throughout the European market.

Since the late 1980s, the governments that now comprise the EU have considered genetically modified organisms as a distinct class of biological entities requiring special regulatory attention (Lezaun, 2006). This process-oriented approach has been influenced by the 'Precautionary Principle' which states 'where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation' (Rafferty, 2004, 282). The precautionary principle stems from Principle 15 of the Rio Declaration on Environment and Development that has the following aims: … '[T]o contribute to ensuring an adequate level of protection in the field of safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on

**Table 10.4** Key features of the European Union's mandatory labelling law for genetically modified foods

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| Where the food consists of more than one ingredient, the words 'genetically modified' or 'produced from genetically modified (name of the ingredient)' shall appear in parentheses immediately following the ingredient or a footnote. |
| Where the ingredient is designated by the name of a category, the words 'contains genetically modified (name of organism)' or 'contains (name of ingredient) produced from genetically modified (name of organism)' shall appear in the list of ingredients or a footnote. |
| Where there is no list of ingredients, the words 'genetically modified' or 'produced from genetically modified (name of organism)' shall appear clearly on the labelling. |
| Where there is no list of ingredients, they shall appear clearly on the labelling. |
| Where the food is offered for sale to the final consumer as non-pre-packaged food, or as pre-packaged food in small containers, the information must be permanently and visibly displayed either on the food display or immediately next to it, or on the packaging material, in a font sufficiently large for it to be easily identified and read. |
| The law does not apply to foods containing GM material of less than 0.9 percent if the presence of the GM ingredient is adventitious or technically unavoidable. Lower thresholds may be established for particular foods or to take into account scientific and technical advances. |

Source: Adapted from European Parliament, 2003a.

the conservation and sustainable use of biological diversity, taking also into account risks to human health …' (Convention on Biological Diversity, 2000).

In 2003, the European Parliament enacted two complementary laws regarding GM food: Regulation (EC) 1829/2003 requires labelling for human food and animal feed containing genetically modified organisms, 'to enable consumers to make an informed choice,' while Regulation (EC) 1830/2003 'guarantees the traceability and labeling of genetically modified organisms and products produced from GMOs throughout the food chain … to facilitate monitoring'(European Parliament, 2003a,b). The law requires that operators throughout the food chain keep records of their use of GM products and that this be declared on a food package if the content of GM material exceeds 0.9 percent. The main features of the regulations are shown in Table 10.4.

A consumer in Europe would assume that an unlabelled product does not contain GM ingredients because there is a mandatory positive label, i.e. those products that do contain such ingredients must be labelled.

The EU decided not to include provisions for negative labelling in their legislation because 'experiences in some Member States revealed that voluntary "GMO-free" (or similarly phrased) schemes were beset by a number of technical, commercial and other difficulties.' (CAC, 2008, 46).

## 10.3 Commercial experiences with labelling

Although some early GM products were labelled (Martineau, 2001), there has been very little published evidence regarding companies' implementation of labelling

policies in recent years. Indeed, when CCFL members were asked about experiences, a number of countries reported that products had been tested yet almost none had been found to have GM material in sufficient quantity as to require labelling. Therefore, there was no recent practical experience with positive labels that is known to governments.

There may be several explanations for this lack of information, such as a lapse between the times that a policy is enacted and when the labelled products reach market shelves and the time and resources that are required for monitoring and documenting industry and consumer reactions to labelled products. However, given the keen interest in this topic, it seems that there would have been efforts made to monitor labelling experiences. A more likely reason for the lack of experience in implementing the labelling policies is the lack of interest among food producers and retailers in selling foods that are labelled as containing GM ingredients. In the case of labelling foods as 'non-GM' there is also reluctance since the regulations are perceived to be burdensome.

If a farmer or manufacturer wished to sell GM foods, food retailers in some markets such as Europe act as 'gatekeepers' and prevent these foods from being available because of their scepticism about consumer acceptance of GM foods (Knight *et al.*, 2005). This experience was expressed by the European Community delegation to CCFL; they reported that

> few food products labelled as genetically modified are at the present time on the Community market. The situation is however not uniform throughout the EU since in some Member States the number of GM products is negligible while in others their number is more significant … The sale of this type of products is mainly governed by factors that are not related to the legislative framework, such as consumer demand and the policies of food producers and retailers. (CAC, 2007, 28).

### 10.3.1 Disincentives to label food products

It is generally acknowledged that the generation of GM crops that are currently cultivated have agronomic traits that appeal to many farmers; they do not have qualities that might attract consumers. On the contrary, in research in the large and affluent markets of North America and Europe study participants express their preferences for foods that are not produced with GM ingredients (Evenson and Santaniello, 2004; The Mellman Group, Inc., 2006). Given the present milieu, there is little incentive for the food industry to use positive labels, i.e. statements that claim that a food does contain GM ingredients, while there may be some incentive to use negative labelling, i.e. the claim that a food does not contain GM ingredients.

## 10.4 Conclusions

If food producers, manufacturers and retailers are wary of consumer reactions to

foods that are labelled as GM, they will not implement a labelling policy, whether it is mandatory or voluntary. Food sellers volunteer to label a product when they believe it will encourage sales. When it is mandatory to disclose information about a food that may deter consumers from buying the product, food sellers avoid the risk of labelling. In the case of GM foods, they may reformulate their products and sell conventional and organic products. In the case of negative labels, producers may be deterred from labelling because the costs of substantiating this claim may not be justified by the premiums consumers are willing to pay and the risks that a label may be considered to be misleading and in violation of regulations.

Regardless of how well-intentioned and well-designed a policy may be, it appears that there is little implementation of labelling policies when it comes to GM foods. Without substantial experience and evidence to demonstrate the feasibility and usefulness (or lack thereof) of a specific approach, it will be difficult for governments to move forward to reach consensus on a harmonized standard or guideline for labelling of GM foods. The CCFL delegates will continue to discuss recommendations for the labelling of foods and food ingredients obtained through genetic modification (CAC, 2009). For the foreseeable future, each country will develop its own policies, in keeping with its own priorities, as well as interpretation of the existing Codex standards and international agreements.

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