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Is it Time for Canada to Institute Mandatory Labelling for Genetically Engineered foods? Assessing the Evidence

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More than 60 countries, including Japan, China and recently the United States, which are Canada's major trading partners, require mandatory labelling of genetically engineered (GE) food products. While Canada is a major producer and exporter of GE foods, Canada has only voluntary labelling requirements for them. This paper investigates the justification and possible effects of replacing Canada's voluntary labelling scheme with one that is mandatory. The paper sheds light on the important but neglected socio-economic policy issue of genetically engineered food labelling policy in Canada. It is shown that Canadian producers have been minimally affected by labelling regulations in export markets. In addition, it is shown that the cost of changing to a mandatory labelling requirement could be very substantial. Canada does experience some domestic pressure surrounding the labelling of these products, as a large proportion of Canadian consumers express a desire for more information. This 'right to know' demand is created largely by consumer advocacy groups, not the scientific or agricultural communities' influence on the public. With a clearer understanding of economic, social, political and regulatory factors that surround the labelling issue, several recommendations are made including increased public and private sector education about these genetically engineered food products, and no immediate need to change Canada's current voluntary labelling scheme. Conclusively, Canadian policy makers and market participants can feel confident in their current system but must remain vigilant to changes both domestically and abroad.

Keywords: *genetically engineered foods, voluntary labelling, mandatory labelling, public policy*

Introduction

Genetically modified or engineered foods (referred to hereafter as GE foods)[1] have been controversial in Canada from the time of their first appearance. All food products in Canada, including those that have been genetically engineered, are regulated jointly by Agriculture and Agri-food Canada, the Canadian Food Inspection Agency, Health Canada and the Public Health Agency of Canada (Government of Canada 2021). There is no requirement for labelling of GE food products in Canada unless a nutritional or compositional change has been made that poses a health or safety issue to consumers of the product (Canadian Food Inspection Agency 2015,

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[1]Genetic engineering (GE) and genetic modification (GM) are both used to describe recombinant DNA (rDNA) technology. GM is the term used in international agreements and in European regulation whereas GE is the term used in U.S. legislation (CBAN 2024).

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Canadian Biotechnology Action Network 2023, Government of Canada 2024b, Government of Canada 2024d). Several consumer and environmental lobby groups (referred to hereafter as non-government organizations or NGOs) believe the Canadian government is falling short of its responsibilities and have challenged not only the safety of GE foods but also the amount and veracity of information that sellers of GE foods are required to divulge on the labels. These two opposing bodies have effectively defined the situation around GE foods as one of citizens' maximum welfare vs the consumers' 'right to know' (Smyth 2014).

The term *Frankenfood* was coined in 1992 by Paul Lewis, an English professor at Boston College (Mirchandani 2015). It was quickly picked up and used by some NGOs and highlighted in British tabloids in the early 1990s to describe GE food products. It was meant to create fear among consumers, to whip up hysteria, and to assert that these "unnatural" food products might be unsafe, unhealthy, and possibly environmentally destructive. Since the introduction of GE food products, debate has raged about the health risks and ethical implications of this new technology in plant and animal breeding. Many influential NGOs have continued to protest the introduction and availability of GE foods and want them to be banned from sale or, if not banned, labelled to contain the scary term of "contains GEs or GMOs" to dissuade consumers from purchasing the products.

Since all food products offered for sale in Canada have been subjected to a strict testing and regulatory regime prior to being offered for sale, most scientists and scientific associations generally have supported the existing voluntary labelling scheme (Government of Canada 2021, 2024b). Further imposed information requirements in the form of mandatory labelling, they contend, would impose additional costs that inevitably would be passed onto consumers, agricultural growers, and secondary producers without enhancing the safety or quality of the food products (Bovay and Alston 2018). Additionally, Canadian taxpayers might also incur increased tax requirements or opportunity costs of alternative uses of government resources to support the regulative and legislative efforts required to establish, maintain, and enforce a new system (Roe et al. 2014).

However, recent mandatory labelling requirements for GE foods in the United States, a major market for Canadian-grown GE canola and soybeans, might pose significant challenges for future agricultural trade. This policy makes the U.S. the 65th country with a mandatory GE labeling policy. Labelling regulations that differ across borders can create significant trade barriers and additional costs for producers.

In this paper, we consider the case for mandatory labelling of GE foods in Canada. The goal is to gain sufficient insight into the issues surrounding GE labelling so that useful policy recommendations can be made in the current environment of conflicting views and disparate public and private agendas. The economic consequences of the new U.S. and other countries' mandatory GE labelling laws for Canada, as well as the economic consequences, i.e., the potential benefits and costs associated with mandatory labelling of GE foods in Canada, have not been adequately examined in the academic literature. To date, no scientifically credible study of potential costs that would be incurred by a change to a mandatory labelling scheme has been conducted in Canada (though they're likely to be substantial), and there is evidence that suggests many Canadian consumers would prefer mandatory labelling of GE food products (The

Strategic Counsel 2016). Therefore, understanding the United States labelling system, recently changed to mandatory for all GE products and in a market culture not dissimilar to Canada's, provides an opportunity with which to gain understanding into the possible effects if Canadian authorities were to impose a mandatory labelling scheme for GE foods in Canada.

What are Genetically Engineered Foods?

Traditionally, domestication and improvement of plants and animals involved repeated crossbreeding and selection of offspring throughout several generations for specific desired traits that improved yields, resistance to pests, quality or other desired characteristics. If successful, the improved plant or animal would exhibit the improved trait(s) in successive generations. This was a time-consuming and not always successful process. In the case of Canadian wheat, the process could take 12-15 years with successive generations grown in Canada during the months May – September, followed by planting seeds from the Canadian harvest in the southern hemisphere (often in Chile) to grow another generation during the months of October to March (Klein et al. 1996).

In recent years, with improved scientific knowledge and computer technology, scientists have been able to isolate specific genes of interest, insert those genes in a plasmid to multiply the genetic material, move the plasmid into a plant or animal cell, and insert that DNA into the plant or animal chromosome – all within a laboratory (e.g., Gray and Malla 2001, Malla and Gray 2003, 2005, Brewin and Malla 2012, 2013, Malla and Brewin 2015, 2019). The process greatly hastens the development of improved plants and animals compared to the traditional approach of growing multiple successive generations after crossbreeding and selection.

The first GE animals (mice) were produced in 1982; the first GE plants were produced in 1985 (e.g., Gray and Malla 2001, Brewin and Malla 2013, 2014). Regulations in the United States for the deliberate release of GE plants were released in 1993. The first GE tomato (trade-named Flavr Savr) was approved for sale in the United States in 1994. It was developed to remain firm after harvest and therefore could remain on the vine longer prior to shipment. This allowed producers increased flexibility in the timing of harvest and movement of product.

Canadian authorities approved the first GE crop (canola) in 1995 (Brewin and Malla 2012, Malla and Brewin, 2015, 2019). Since GE corn, flax, sugar beets and soybeans have been approved for production in Canada (CBAN 2024). In 2003, international agencies developed international guidelines and standards by which national bodies could determine the safety of GE food products. The Organization for Economic Co-operation and Development (OECD), World Health Organization (WHO), and Food and Agriculture Organization of the United Nations (FAO), under the Codex Alimentarius Commission (Codex Alimentarius 2023), agreed that if any GE crop or food composition was the same, or similar, to that of non-engineered crops that had a history of safe use for feed and food, except for the expressly modified differences, the GE crop would be considered 'as safe as' the non-modified crops (Delaney et. al. 2018). Therefore, food products that are "as safe as" the non-GE

equivalent should need no special identification on the label, which, by itself, might frighten consumers needlessly.

In 2003, the Cartagena Protocol on Biosafety extended this convention and ensured that people dealing with GEs conducted health and safety tests on their products. In 2018, the Nagoya-Kuala Lumpur protocol developed a framework for handling liability in case GE products caused harm. Adoption by farm producers of GE plants was rapid. The worldwide area planted to GE crops increased from 1.7 million hectares in 1996 to 206 million hectares in 2023 (Agroinvestor 2024). In Canada, 100% of sugar beets and over 92% of canola, corn and soybeans plantings were GE cultivars in 2023 (Statista 2024).

What are Some Benefits of Genetically Engineered Foods?

In addition to greatly decreasing the time required for breeding improved cultivars, first generation GE crops have enhanced input traits such as herbicide tolerance (that result in greater yields with less herbicide applied), greater insect resistance, and better tolerance to environmental stresses (Malla and Brewin 2015, 2019, Malla and Klein 2025). The GE crops are not significantly different from traditionally grown crops in appearance, taste or nutrition. Where approved, farmers rapidly adopted these GE crops due to increased profitability from higher yields and generally reduced input costs. Also, the planting of first-generation GE crops had a positive environmental result due to the need for a lower amount of less toxic herbicides to achieve adequate weed control (Phillips 2003).

A second generation of GE crops has offered many benefits to consumers, including healthier fats, increased levels of proteins and/or specific amino acids, modified carbohydrates, increased micronutrients, increased flavours, and more (Malla and Brewin 2015 2019, Malla and Klein 2025).

In Canada, where GE food products have been approved for sale for more than two decades, commercial grocery stores are full of products that include GE content. Food products marketed by major brands, including Kellogg's, Kraft, General Mills, Nestle, Coca Cola, Quaker, Uncle Ben's, Orville Redenbacher, Johnson & Johnson, P & G, Campbell's, and dozens of others are prominent in grocery stores in Canada. Indeed, a Canadian shopper walking the aisles in a major grocery store in Canada would have a hard time avoiding the purchase of any product that was not genetically engineered.

The Issue

Mandatory labelling requirements for GE foods, recently imposed in the United States and in effect in 64 other countries, might pose significant challenges for future exports of Canadian grown bioengineered crops. Canada has become a major producer and exporter of GE crops and different labelling regulations among trading partners potentially can create trade barriers and/or diminished market opportunities.

Prior to July 2016, voluntary labelling of GE (as well as non-GE foods) was acceptable in the U.S., as is the case in Canada. Following a phase-in period, since 2022, food products marketed in the U.S. that contain GE ingredients are required by federal law to indicate that fact on the labels (Canadian Biotechnology Action Network 2023).

In Canada, the labelling of GE ingredients in food products continues to be voluntary. However, all food products offered for sale (including those with GE content) undergo a rigorous assessment to ensure that toxic or allergenic compounds are not present and there is no evidence of negative human health effects in the GE product (Government of Canada 2024c, Government of Canada 2024d).

To promote greater adoption of voluntary labelling of GE content in food products, the federal government participated in developing national standards to provide guidance and increase the application of labels. In 2021, the Standards Council of Canada (SCC) officially adopted a recommendation of the Canadian General Standards Board (CGSB) regarding the advertising and voluntary labelling of foods that are, and are not, products of genetic engineering (Government of Canada 2024c). However, as noted by Bain and Dandachi (2014), there are obvious shortcomings of voluntary labelling, including inconsistent application of labels, non-enforceability of labelling and, of course, the direct costs associated with a program that has few guarantees of informing the Canadian public of their specific concerns about the safety and healthfulness of purchasing and consuming GE foods.

The process by which GE crops are tested in Canada is robust. A combination of growing and environmental conditions that ensure a significantly varied outcome, broad samples of non-bio-engineered varieties against which to test extant traits, and statistical modelling that result in intervals derived from cumulative historical composition data are factors used to measure GE crop safety (Ridley et al. 2002, Hong et al. 2014). As GE crops are not always intended for direct human consumption but as feed for livestock, extensive tests are also conducted to verify their safety to livestock directly and by extension for human consumption.

While voluntary labels have the potential to partially defuse the GE labelling debate, they are unlikely to fundamentally address the social concerns of the anti-GE movement.

The Anti-GE Movement and Consumers' Right to Know

Consumer and environmental lobby groups (usually NGOs) have campaigned strongly against GE ingredients in food products since their first appearance. They have railed against perceptions of food safety issues despite assertions by the scientific community of no evidence of adverse health or environmental impacts from the consumption of tested and approved GE food products (FAO 2002). Demands for mandatory labelling of GE foods because consumers have the right to know what they purchase and eat have been a persistent request of the anti-GE movement (Hobbs and Kerr 2006).

Numerous examples of food scares that were unrelated to GE ingredients in food products have been exploited by groups that are strongly opposed to GE ingredients in food products. Among many examples, Xiao and Kerr (2022) recount how the

eating of (what turned out to be) non-GE corn led to reduced sperm counts in Chinese college students, and suggestions that eating GE soybeans could cause tumours and infertility.

Maeseele (2014) stated that some NGOs can be classified as 'alternative science communicators' in the manufactured social conflict regarding agricultural biotechnology. This conflict arises from a social movement that uses counter-scientifically supported facts to critique the currently accepted science and technology. The critique itself is a result of the commercialisation of science, uniting economic interests in the condemnation of biotechnology and the irregular standards surrounding scientific communication. Much public relations and corporate interest-based communication seek to provide 'alternative facts.' Once institutional science communication is indistinguishable from corporate communication, NGOs can challenge scientific knowledge by instigating suspicions of recognized scientific practices and the social values supporting those scientific endeavours.

As Pham and Mandel (2019) note, anti-GE food NGOs often pursue private politics, circumventing traditional governmental institutions, to gain direct influence over entrepreneurial companies that produce GE food products. These NGOs then endeavor to obfuscate any evidence establishing the safety and long-term beneficial impact of this new technology. This allows the NGO, a non-scientific organization, using technical language, to contest existing scientific literature with the presumed validity of regulated scientific communities. The NGOs' 'advantage' is the lack of necessity for peer review, and the non-conformity allowed through their communication approaches. As noted by Hameleers and Van der Meer (2021), the net effect is a uniform distrust of scientific communication and the redirection of scrutiny towards the scientific organizations and their methods as opposed to examination of the facts that those institutions present. Although all major countries have extensive regulations concerning the safety and healthfulness of GE food products, a formidable "right to know" movement, based on possible human health and environmental risks, has been the focus of numerous NGOs that have an anti-GE agenda (Peterson et al. 2000, Breckling et al. 2011).

What do Canadian Consumers Want?

There have been attempts, both governmental and academic, to understand the relationship Canadian consumers have with GE foods. In a report submitted to and adopted by Health Canada, the Strategic Counsel found that "(Canadian) consumers' understanding and impressions of GE foods could be described as not that well-formed, as demonstrated by the lack of detailed knowledge…" (The Strategic Counsel 2016, 4)[2]. In the same report, the Strategic Counsel indicates that negatively biased media coverage in conjunction with anti-GE activities by NGOs have largely shaped public opinion. Their report was based on a cross-country survey in 2018 of consumers who were 19 years of age and older in Toronto, Vancouver, Saskatoon, Halifax, and Quebec City.

[2]"Not that well-formed…" in the quote from the Strategic Counsel refers to the opinions held by the surveyed public and seem to be based on a low understanding of food science and technology. The low level of scientific literacy extends to agricultural practices, market implications of technology, and quantitative consequences of consumer preferences. Negative or conflicting views can be attributed to messaging from anti-GMO advocates and environmental groups (The Strategic Counsel 2016).

The Strategic Council report indicates that up to 78% of consumers did not believe the voluntary labelling scheme employed in Canada was sufficient or credible and they would be in favour of a mandatory labelling requirement. This is understood to be primarily an emotional response and indicates a significant gap between scientific communication and acceptance of scientific facts. Further, if mandatory labelling of GE food products were instituted, the increased "transparency" and enhanced ability to make "informed decisions" likely would result in 62% of surveyed consumers actively avoiding GE-labeled food (The Strategic Counsel 2016, 39).

Academic findings of the Canadian consumer response to GE foods and labelling have been mixed. A study conducted by Baynham (2018) in which 22 types of a standardized food product - all having the same price – had its labels modified into 5 distinct categories: (1) control (no label or might contain GE ingredients label); (2) GE label: might contain GE ingredients; (3) GE label: might contain genetically modified ingredients; (4) non-GE or GMO label; and (5) organic label: Canada Organic. All items were randomly assigned labelling so as not to incur existing preference bias to the 165 individuals in the survey. Impacts of the labels were measured by eye-tracking technology of a group primarily consisting of participants between the ages of 20 and 37 years old. The study found that the average consumer might not know what information labels precisely communicate but those with a 'non-GE' label received the most attention.

An alternate cross-country Canadian survey of consumers conducted by Charlebois et al. (2018) found further evidence that indicated a mixed response to mandatory GE food labelling. The study had a sample size of 1046 participants and was held over a 3-day period in May 2018 in Quebec, British Columbia, Atlantic Canada, Ontario, and the Prairies. The aim of the study was to measure Canadian attitudes towards GE foods and assess the confidence in Canada's voluntary labelling scheme. This study informed the respondents, in uncomplicated terms, about genetic engineering and testing standards in Canada before the survey was undertaken. After a base knowledge was achieved, the study asked the participants to complete a survey that took an average of 2 minutes to complete. The study found that Canadian participants believed GEs to be safe, unsafe, and unknowingly safe in almost equal proportions. Further, the result that 44% of the participants believed that the health effects of GEs were not clearly understood directly conflicted with 56.3% who believed that the current level of GE testing was sufficient. The study also found that approximately 88% of all surveyed Canadians would passively support mandatory GE content labelling. Simultaneously, these same participants indicated that the price of the product was almost 3 times more important than knowledge of the item to be purchased, having GE ingredients.

The consumers' "right to know" is established and upheld in Canada by the federal government and is facilitated directly by the Office of Consumer Affairs (OCA). In conjunction with the federal government's commitment to transparency, a policy of "open data, open information and open dialogue" is employed, and the OCA oversees the legislation administered by the Canadian Food Inspection Agency (CFIA) (Government of Canada 2024a). This agency is tasked with providing standards, in conjunction with the Canadian *Food and Drugs Act*, that establish food labelling policies with respect to health and safety. Regarding GE products, CFIA can mandate specific label requirements where the health and safety of consumers might be affected (Government of Canada 2024b).

While it is obvious that people want to know if the food they consume is safe, nutritious and healthy, despite overwhelming evidence to the contrary, there exists a persistent belief that GE foods pose a substantial threat to human health and the safety of the environment (Charlebois et al. 2018).

In a more recent study by Statista (2024), Canadians 18 years and older were asked to state their opinions on the safety of GE foods. Out of 1046 respondents, 37.7% agreed that GE foods are safe to eat, 34.7% disagreed, and 27.6% were unsure.

In another survey, Shahbandeh (2024) found a higher percentage of respondents in the main Canadian food producing provinces of Saskatchewan (60%), Alberta (54%), Manitoba (48%) and Ontario (43%) considered GE foods to be safe. However, almost half of the respondents in Atlantic Canada were unsure about the safety of GE foods. Many consumers reported they are wary of potential risks like the introduction of toxic compounds and/or allergenic compounds in their food products

The mixed response by Canadian consumers, even when uniformly informed about the testing and safety of GE foods, presents a distinct problem for regulatory authorities in the Canadian government. While most participants seem willing to passively support a switch from voluntary to mandatory labelling, there is distinctly insufficient knowledge held by participants about health and environmental effects that should be the foundation of such a change. Further, the importance of such GE information is undermined due to the relative position it has when compared to the convenience and price of foods that might, or might not, contain GE ingredients. Even if the current voluntary labelling system has been deemed sufficient by Health Canada, Office of Consumer Affairs (OCA), and the Canadian Food Inspection Agency (CFIA), there is obvious confusion and mistrust of GE foods among Canadian consumers. New legislation, including adjusted labelling schemes and education initiatives, would have to overcome any misinformed or under-informed bias held by the consumers to whom they are accountable.

Mandatory Labelling of GE Food Products – 65 Countries Require it

Sixty-five countries, many of which engage in trade of food products with Canada, now require some form of mandatory labelling of GE food products, arguing that consumers have the 'right to know' (Wohlers 2013). The European Union (EU) is known for its stringent regulations on GEs, following the precautionary principle. All food products that contain more than 0.9% of authorized GEs must be labelled as such in EU countries.

According to Kalaitzandonakes and Bijman (2003), the EU's labelling policy, established in 1997, set the precedent for the first broad rejection of GE products by legislators and retailers. The EU's rejection of GE products was founded on an extreme version of the precautionary principle[3]. The GE labelling requirement caused EU retailers to assume that these products would be unwelcome by most of their

[3]The precautionary principle is a decision-making paradigm with four central components: engaging in preventive action in the face of 'uncertainty'; allocating the 'burden of proof' to the proponents of a possibly harmful activity; creating alternatives to possibly harmful actions; and increasing public participation in decision making (Kriebel et al. 2001).

consumers. As retailers in the perishable foods industry typically do not want to carry inventory that experiences little or no turnover, the default position was to *not* acquire products manufactured or labelled with GE content. Hence, the rejection was not by consumer choice but by an absence of choice.

Mexico, China, Japan, the United States and other important markets for Canadian agricultural and food products require that GE foods be labelled as such. The recently imposed U.S. federal law on mandatory labelling of GE foods was justified as providing greater transparency and supplying consumers with increased access to information about their food (USFDA 2016, 1). Certain provisions within the recent U.S. law illustrate the level of complexity that is involved in mandating the labelling of GE foods:

- Food from an animal cannot be declared bioengineered on the basis that animal has been fed bioengineered food.
- The minimum amount of bioengineered food present in food needs to be defined by the USDA to carry the bioengineered label.
- The disclosure of bioengineered food can be a text, a symbol, or a digital or electronic link according to the discretion of the food manufacturer.
- USDA is asked to conduct a study to see whether challenges exist in regard to access to electronic information.
- In certain cases, a telephone number or internet site are allowed as a means of disclosure.
- Restaurant food and "very small" food manufacturers are excluded from disclosure requirements.
- States (and its subunits) are prohibited from establishing or continuing to require other GMO labeling practices.
- Food cannot be claimed to have no bioengineered food when there is no disclosure label.
- Certification by USDA's National Organic Program "is sufficient" for a claim that bioengineered food is absent.

Should Canada Require Mandatory Labelling of GE Food Products?

In conjunction with the strong preference of agri-food producers, the Canadian government has maintained a voluntary labelling scheme of GE food products sold in Canada (Government of Canada 2024b). A collection of governmental agencies has shown that the current voluntary labelling scheme is cost effective, scientifically rigorous, and reliable (Government of Canada 2021, 2024b).

In contrast to Canada's voluntary labelling scheme, mandatory labelling requirements are currently in place in 65 countries, several of which Canada conducts significant trade with. However, despite Canadian producers having very limited or no access to markets in the EU, there have been few negative long-term trade consequences to the Canadian agricultural industry from the mandated labelling requirements of GE food products in major importing countries of Canada's GE commodities. Indeed, as Canada's production and yield of GE canola has increased, so have Canadian canola exports to the U.S., China and Japan (CCC 2024a, b). While there is some protectionism

surrounding Chinese domestically developed and grown GE crops, shortages in their own raw and refined products are still imported from Canada (Liang et al. 2022).

Since the full implementation of the National Bioengineered Food Disclosure Standard (NBFDS) in the United States on January 1, 2022, there has been very little impact to Canada's trade in GE canola with that country. Canola oil is basically stripped of its DNA when refined for food use. Despite Canadian canola being genetically engineered, the product derived from GE canola does not necessarily qualify for mandatory disclosure (USDA, 2024). The USDA *does* require bioengineered ingredients to be disclosed, but not if the genetic material is undetectable. Further the NBFDS states that "Food from an animal cannot be declared bioengineered on the basis of that animal having been fed bioengineered food." (U.S. Congress 2016a).

Most of the corn, canola, soybeans and sugar beets harvested in the U.S. are genetically engineered and approved for human and animal food consumption. For example, high fructose corn syrup made from GE corn is a major sweetener that replaces sugar in a wide variety of approved food and drink products. Corn oil, canola oil and sugar from sugar beets are stripped of the DNA in them. The USDA requires bioengineered ingredients to be disclosed, but not if the modified genetic material is undetectable (Adalja et al. 2022)

According to the Canola Council of Canada (2024b), secondary markets in China, Mexico, Japan, and the United Arab Emirates were among the largest importers of Canadian GE canola in 2023. These countries all have their own safety and regulatory guidelines surrounding GE products. However, there is no evidence that labelling requirements in these countries contributed to the decline in imports of Canadian-produced GE commodities.

Japan, which has some of the strictest regulations involving imports of GE food products, continues to allow the importation of Canadian canola and its refined products. Early in 2023, the Japanese Consumer Affairs Agency (CAA) updated their agricultural product list that requires mandatory GE labelling. Canola is one of the 9 major crops that has been exempted from the mandatory labelling requirement and Canadian GE canola continues to be imported and sold in Japan as that country currently does not grow any of its own (Neo 2023).

Gruère (2007) noted that countries that use voluntary labelling of GE foods provide consumers with a choice of food products with and without GE content. On the other hand, while mandatory labelling of food products is meant to provide consumer information and consumer choice, in most countries with mandatory labelling requirements (notably those in the EU), only non-GE, non-labelled foods are available. Mandatory labelling has resulted in food processors and retailers removing any GE ingredients (many of which would enhance nutrition and/or flavour) to avoid protests by anti-GE activists.

What is Known about Costs for Canada to Mandate Labels on GE Foods?

The call for more transparency surrounding labelling of GE foods in Canada can be regarded as social and political pressure and not really a way to accurately represent scientific facts on healthfulness and safety of approved GE food products. Food processors might respond to imposed mandatory labelling by replacing those GE

ingredients with non-GE ingredients produced using conventional technology or with organic ingredients. Non-GE replacements that yield less and have lower nutritional content would impose extra costs, ultimately an extra burden on the consumer.

The legislative processes required to coordinate, institute, mandate and monitor a new labelling system are substantively difficult and costly. They require concerted effort for an extended length of time.

Lesser and Lynch (2014) noted that private costs of implementing a mandated labelling scheme include the costs of segregating GE foods from non-GE foods, keeping each separate during the entire production chain to the placement of finished products on store shelves. The segregation requires additional warehousing, retail, manpower, and operating space. Additional labour would be needed for documentation, identity preservation of both GE and non-GE products. Private (or possibly public) costs would be required for enforcement agencies that check and maintain segregation standards, and agencies that design, regulate, and verify the final labelling standard. Then, there would be costs for the labels themselves (with descriptions in two official languages).

While no definitive studies have been conducted on what a mandatory labelling requirement for GE foods in Canada would cost, a detailed cost analysis for the United States labelling scheme conducted by Bovay and Alston (2018) provides some guidance on the possible magnitude of costs that would be incurred if Canada were to follow the United States path. Bovay and Alston (2018) based their study on previous investigations by noted economists Alston and Sumner (2012), Shepherd-Bailey (2012), Lesser and Lynch (2014), and Dunham (2016).

They estimated the cost for labelling alone would be in the neighbourhood of USD 6.1 billion, with additional costs for warehouse and retail space, segregation, certification, and monitoring of at least USD 7.1 billion per year. By scaling Bovay's and Alston's (2018) estimates to Canada's population relative to that in the United States and their cost estimates to 2024 Canadian dollars (including inflation experienced since the Bovay and Alston study), the costs of imposing a mandatory labelling scheme for GE food products in Canada would likely be close to CAD 1 billion for labelling alone and at least another CAD 1 billion for all other costs associated with a change in labelling scheme annually (Authors Scaled Calculation based on Bovay and Alston 2018, Trading Economics 2024a, Trading Economics 2024b, Bank of Canada 2024).[4]

Overall Assessment and Policy Recommendations

While 65 countries (including Canada's major trading partners) have mandatory labelling laws for GE foods and food products, Canada's agricultural and food producers have not (so far) experienced major disruptions when exporting GE commodities to

[4]The formula used was: ([k x Pv]/ratio) where: k equals scaled calculated costs in USD in 2012-2016; Pv is the proportional value derived from A x Var. (where: A is the compounded rate of inflation, calculated annually for 10 years at an average annual rate of inflation for Canada of 2.2% (similar to US average annual rate of inflation of 2.1%) and Var. is the variance in exchange rate between USD and CAD between January 2014 and December 2023 of +5.7% CAD); and ratio is the average historical U.S. population on January 2014 compared to the current Canadian population in December 2023.

these countries. While many Canadian consumers claim (in surveys) to prefer that GE foods be required to be labelled as such, there have been no widespread protests or campaigns in Canada to "encourage" the federal government to make labelling of GE food products mandatory. Indeed, the widespread availability of GE food products on grocery store shelves throughout Canada (as readily observed in shopping baskets) suggests a lack of urgency to change the current voluntary labelling system.

Costs of changing to a mandatory labelling requirement, though unknown in detail, would likely be excessive relative to the benefits obtained. The present voluntary labelling scheme continues to serve Canada's food industry well and allows consumers to have a wide choice of GE and non-GE food products available that have been subjected to Canada's highly regarded food inspection and approval process.

The voluntary labelling scheme, as it exists in its present form, has proven itself sufficient with regard to the safety of food products in general. And there is no scientific evidence to suggest that Canadian approved GE food products warrant any further special attention. However, it is incumbent for agencies within the government that create and monitor such policies to remain vigilant with regards to new information and concerns about GE foods and food labelling.

Finally, Gruère (2007) presented eight critical questions that should be asked before Canada (or any other country) thinks about introducing a mandatory regulatory system for GE Food products. They are listed below.

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?

Conclusion

The regulation of all food products in Canada, including GEs, is undertaken jointly by Agriculture and Agri-food Canada, the Canadian Food Inspection Agency, Health Canada and the Public Health Agency of Canada (Government of Canada, 2024c). Economists and other members of regulatory bodies within the Government of Canada continue to express their support for the existing voluntary labelling scheme for GEs (Government of Canada 2024b). While a large proportion of Canadian citizens claim in consumer surveys to not trust either GE products or the Canadian Government (The Strategic Counsel 2016), there's little evidence of Canadian consumers shunning the

wide availability of GE food products on Canadian grocery shelves. Indeed, food products that contain GE corn, canola, and soy ingredients in processed foods are pervasive in Canada's existing food supply. Charlebois et al (2018) estimated that more than 75 per cent of all food products sold in Canada contain at least one GM ingredient.

However, mandatory labelling policies are currently in place in 65 other countries, including China, Japan, and recently the United States - countries with which Canada conducts significant trade. In examining the evidence for and against changing the voluntary GE labelling in Canada to a mandatory requirement, it was noted that NGOs and consumer advocacy groups have an outsized influence on the perceptions commonly held by Canadian citizens (Peterson et al. 2000). While many Canadian consumers report a lack of trust in GE food products under Canada's voluntary GE labelling scheme, the recent change in the United States from a voluntary to a mandatory labelling scheme resulted in little to no economic benefit but, likely, a significant on-going cost, according to Bovay and Alston (2018). Also, it was noted that Canadian producers have been only minimally affected by mandatory labelling regulations in export markets. As the Canadian government is arguably maintaining a high standard of safety and accountability for consumers, periodic reassessment of labelling practices for GE foods and ingredients can plausibly increase social welfare and individual well-being. The Canadian government seems to understand that there is presently no additional benefit in creating, implementing and administering a new mandatory labelling system. While a change to mandatory labelling might be beneficial to Canada in the future, the most reasonable course of action (and our recommendation) is to 'wait and see'.

Despite the relative lack of understanding and belief in governmental testing, approval and regulatory procedures, consumer confidence is a key element in a smoothly working market economy. A reasonable way to combat erroneous beliefs is education. Backing up the voluntary labeling scheme with increased and sustained public education around the safety of approved and regulated GE food products will expand consumer awareness and, possibly, reduce social and environmental concerns. Improving consumer confidence in the voluntary Canadian labelling scheme can be accomplished by making the process more transparent at the provincial and federal levels. Lastly, educating Canadian citizens and consumers on the structure, role and influence of NGOs might help to mitigate the amount of influence these organizations have over government regulations and public opinion.

A final recommendation entails the implementation of recurring governmental assessments regarding the voluntary GE labelling regime. Engaging representative consumer organizations in these reviews could strengthen public trust in both the regulatory oversight and the overall safety of GE products. Routine evaluations would allow the government to identify and address emerging domestic or international concerns. This proactive approach ensures the system remains relevant without incurring the unnecessary costs associated with premature or illogical changes.

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