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Marketing GM Foods: The Way Forward

Peter W.B. Phillips
University of Saskatchewan, Canada

David Corkindale
University of South Australia, Adelaide

Genetically modified (GM) foods represent a significant technical and commercial breakthrough, but they have also revealed a major weakness in product development and commercialization in the global agri-food system. Although the biotechnology industry has developed a number of new technologies and products and marketed them effectively to producers, the biotechnology industry has almost completely ignored the need to market these products to consumers. One facet of the marketing literature suggests that innovative products need to be proactively positioned in the market either as a replacement for what exists or as an addition. The literature suggests that innovations like GM foods must be placed in the market in such a way as to allow consumers to test and compare the new products against existing products. We suggest that although the biotechnology industry did this effectively with producers and for a few output-trait whole foods, it has relied on the concept of substantial equivalence embedded in regulatory regimes to justify ignoring the concerns of consumers for most of the GM foods currently in the market. The industry has been almost universally unwilling to proactively market input-trait GM foods to consumers. This has created a variety of consumer responses, ranging from indifference in much of North America to citizen demands for tighter government regulation and mandatory labeling, to consumer boycotts in the EU and other countries. This paper reviews the relevant marketing literature, examines the few cases where new GM foods have been proactively marketed, and draws the conclusion that it may be necessary to more clearly and fully market GM foods to consumers. This has implications for future introductions of other innovative food products.

Key words: genetically modified foods; marketing; innovation goods; labeling.

Introduction

Genetically modified (GM) foodstuffs entered the global food system in the early to mid-1990s and are now in a wide selection of raw and processed foods. The Canadian Food Inspection Agency (CFIA) has indicated that up to 70% of processed foods could contain GM ingredients if highly processed ingredients are considered. This rapid introduction of GM foods has been marked by two divergent marketing stories. In the first instance, the technology owners and developers (i.e., the biotechnology companies) have been effective in marketing their new products to farmers and producers. The adoption rates for GM varieties have been faster than any other recently introduced technology in the agri-food system (Kalaitzandonakes, 1999). Meanwhile, as input-trait GM foods were regulated as being substantially equivalent to traditional foods, this stance by definition precluded any explicit marketing effort. Most of the new products have been blended with conventional foods in global supply chains, such that consumers in many markets have not had any choice about whether to consume these products.

Although most new input-trait GM foodstuffs were not proactively marketed to consumers, the few GM foods that were proactively marketed showed the potential value of effective marketing and successful product placement. The alternative is already starkly apparent. Citizens and consumers in a number of countries have demanded and got their governments or the markets to provide either legislation or proactive labeling systems for these products. This is counterproductive for both producers and consumers, as these regulatory and labeling systems tend to be blunt instruments for managing or signalling product attributes. More effective marketing is not simply nice to do—it may be a precondition for further investment and innovation in the agri-food system.

Background

The era of modern biotechnology began in the 1980s, when scientists discovered how to move genes between normally incompatible species. Since then, scientists working in 45 countries have transformed about 60 crops for 10 broad categories of traits (Organisation for Economic Co-operation and Development [OECD], 2002). Successful transformations have involved the introduction of a range of new traits into existing crop varieties. New input traits include tolerance to broad-spectrum herbicides, heat, and drought and resistance to insects or viruses. New output traits range from delayed ripening or changed nutritional or functional characteristics of foods, to selected genes that can produce pharmaceutical proteins and enzymes. Efforts have been focused on food crops (corn, soybeans, and canola), animal feeds (corn and soybeans), industrial crops (cotton), vaccines and hormones for animals (rBST), fish (salmon), microbes, and active food ingredients (chymosin).

The first of these new products entered the global agri-food system in 1994, when Calgene received approval to commercialise the genetically modified FlavrSavr^{TM} tomato. Although there are now 16 crops modified for one or more of 47 phenotypic traits, four main crops—soybeans, maize, cotton, and canola—made up 99% of the 240 million acres planted during the first eight years of cultivation. In all, 16 countries have produced one or more GM crops, but the United States (US), Argentina, Canada, and China account for 99% of the total acreage to date. For the main crops, adoption has been extremely rapid. In 2001, 46% of the global soybean acreage used GM seeds, as did 20% of global cotton, 11% of global canola, and 7% of global maize production. More than 90% of Argentina's soybean crop in 2001 used GM seed, while more than 80% of Canada's canola acreage used herbicide tolerant seed, and more than 70% of US cotton acreage was transgenic (James, 1997, 1998, 1999, 2000, 2001). Given the high concentration of production in a few locations, much of this product is exported to consumers in as many as 175 countries around the world (Phillips, 2001). More than 80% of world trade in corn and soybeans comes from countries that have heavily adopted GM varieties, as does more than half of world trade in canola. Overall, the total market value of GM seeds rose from US$1 million in 1995 to US$3 billion in 2000, and some forecast the value of GM seed sales could double by 2005 and reach $25 billion by 2010 (James, 2001).

Although the science and the seed markets have expanded rapidly in recent years, consumers have expressed a range of concerns about the safety or value of these new products. Although consumers in most countries and markets have become increasingly aware of the presence of GM foods over the past few years, many indicate that there is something about these products that unsettles them. Even though all of these products have been evaluated through relatively stringent safety assessments (OECD, 2000), many consumers express concern about unanticipated long-term health and safety implications of the products. Public opinion surveys in recent years have shown that between 30% and 80% of citizens in different countries express negative views about GM foods, and that the largest single concern is related to food safety (e.g., Ipsos Reid, 2001).

Two features have compounded this sense of unease. First, consumers eat few of the GM crops in their raw form. The three top GM food crops—soybeans, corn, and canola—are mostly processed into oil and meal components, which are then incorporated into an estimated 70% of the processed foods on grocery store shelves. In many cases, the GM elements in the unprocessed crop are extracted or changed during processing and are thus undetectable in the resulting food. Hence, processors and marketers are neither interested in nor readily able to identify where the technology is and how it compares to traditional foods, given their view that these ingredients derived from GM crops are substantially equivalent. Second, at least partly because of the scientific and commercial difficulties of identifying these traits in processed foods, most firms have the view that the cost of proactively segregating and labeling GM products exceeds consumers' willingness to pay.

One result has been a consumer and citizen backlash in some markets. Phillips and McNeill (2001) found in July 2001 that 18 countries plus the EU had either adopted or planned to adopt mandatory labels for GM foods. A major difficulty highlighted by the survey was that these systems were not converging towards any common standards. Rather, product coverage, tolerance levels, conformity measures, and implementation dates varied widely among markets.

The dispersion of labeling rules has contributed to a de facto segmentation of the international and various national markets, with some parts of world markets accepting the new products and some rejecting them. Significant trade diversion has resulted. For example, EU imports of US corn dropped 70% after 1996, as Spain and Portugal virtually ceased importing feed grains with GM elements. EU imports of US soybeans

dropped more than 50% after 1997, and EU imports of Canadian canola virtually ceased after 1995. This trade was redirected, as exporters with GM-free markets (e.g., Brazil for soybeans and Australia for canola) gained market shares in the EU, while North American produce was channeled to other markets. One result of this complicated market is that many firms appear to have reduced their investments in GM food products that require international trade to recoup their investments.

The Theory of Marketing Innovative Products

The underlying model in many campaigns aimed at encouraging consumer acceptance and adoption of new products is based upon the major assumption that appropriate information forms favorable attitudes, which lead to desired behavior. Many marketing and social policy practitioners have accepted almost without question this "model" of human behavior. The biotechnology industry, for example, fundamentally relies on this model, investing heavily in public advocacy advertising about the benefits of GM foods in North America and Europe.

An early manifestation of this belief about behavior was the AIDA model that suggested that people move through a hierarchical set of stages: Awareness, Interest, Desire and Action (Strong, 1925). There have been many elaborations since; these are generally expressed via the sequence Cognitive-Affective-Conative (Knowing-Feeling-Doing). Knowing and feeling are often effectively summarized as an *attitude*—an abstract concept conjectured to explain and predict behavior. Models of consumer decision-making usually portray behavior as a function of attitudinal formation or change, which is, in turn, a function of persuasive marketing communication, such as advertising (Foxall, 1996).

The trouble is that attitudes are often only weakly related to behavior, particularly in what are called *repertoire markets* (i.e., frequently purchased consumer goods such as foods). In particular, attitudes fail to take existing allegiances and habits (e.g., to brands or producer groups) into account and do not clearly and concretely identify the economic calculus that consumers will undertake to determine the benefits and costs of new products. Empirical research on the attitude-behavior link generally produces low correlation between attitude and future behavior. It appears that the only time high correlations are obtained is when consumers are interviewed in "maximally conducive" conditions (Fishbein & Ajzen, 1975), such as just before the behavior of interest. In short, years of research have failed to provide strong support for the predictive capacity of attitudes (Kraus, 1995; Sutton, 1998).

However, much research seeking to examine the factors that influence the adoption of new behavior still assumes AIDA and the Theories of Planned Action (TPA) or Behavior (TPB), developed by Ajzen (1988), which still mistakenly underpin many marketing efforts and broader public policy. The problem with this approach is that the dependent variable is attitudinal—that is, "intention," not actual behavior—and the correlations between intentions and subsequent behavior are not high. For example, everybody intends to "get fit," but most do not even try.

A basic question is whether behavior leads rather than follows attitudes. A better explanation of the relationship is that behavior may lead to an attitudinal response, which in turn implies that attitudes are transient, changing as behavior changes, and are not firmly held or influential. In food brand purchasing, few consumers are solely brand loyal—perhaps 10% being a norm—but rather buy from a repertoire (Cunningham, 1956; Ehrenberg, 1988). Thus, attitudes—defined as awareness, interest and desires, or knowing and feeling—may not be directly observable, except as an adjunct to actual actions. Therefore, we should be wary of accepting such concepts and their supposed influences, particularly as the sole basis for marketing new policy initiatives or product innovations.

The prevailing view of many is that if people are ignorant about the benefits of something, or have misconceptions about it, then the route to changing their behavior is to give them more information. Government efforts to change private behaviors have illustrated that this is often the long, hard, and expensive way. It is well known that excessive speed and alcohol use on the roads kills, but trying to get drivers to keep to speed limits or not drink and drive purely by advertising campaigns is largely ineffective. Some authors concede that public education is a weak force at best (McGuire, 1986; Schneider, Salovey, Apanovitch, Pizarro, & Rothman, 2001). What is effective is the police with radar traps and spot checks with breathalyzers. If you are caught and fined, or you know someone who has, you are much more likely to modify your behavior. You then think, or rationalize, that changing your behavior is wise; in other words, an experience influences attitudes. If anything, the advertising associated with such safety campaigns reminds or reinforces those attitudes, which the experience has created. In contrast, advertising by itself can sometimes raise awareness without changing behavior.

For example, the consensus is that health education campaigns have considerably raised awareness of the risks of skin cancer but have left behavior largely unchanged (Peattie, Peattie, & Clark, 2001). In contrast, schemes that require schoolchildren to wear hats and that provide shaded areas in playgrounds do achieve the objective.

These insights from public policy suggest some lessons for producers of innovative products. Research on the diffusion of innovation shows that it is (among other things) a social process—although some people are early buyers (i.e., adapters and adopters), most are followers. This process of adaptation, adoption, and diffusion takes time. The difficulty is that innovations fundamentally challenge our certainties—they offer new untested opportunities and present potential new risks. This fundamental nature of innovations causes many people to have fear, uncertainty, and doubt (often shortened to FUD). The simplest and most basic reason for concern is that largely most people do not like change. Hence, new innovative products will almost certainly trigger some level of fear, uncertainty, or doubt. As with public health policy, overcoming that response cannot be achieved simply through advocacy marketing.

A strategic choice has to be made by those seeking to introduce an innovation to the market place: do they position it as (a) just really a "new, improved" version of what people already know and are familiar with, or (b) something that stresses the clever new technology and really is "new to the world." Friar and Balachandra (1999) have documented evidence from case histories to show that if you try to gain sales for an innovation by seeking to replace that which is currently bought by following strategy (b), you will usually fail. If you want to replace existing products, you need to follow strategy (a). Following strategy (b) leads to a much smaller set of customers, often called *visionaries*, who adopt the innovation to solve long-standing problems or to apply it to new uses. In time, and with the demonstration through the visionaries that the innovation is safe, sound, and useful, the rest of the potential customers do adopt it as a replacement for the mainstream product. The risk with strategy (a) is that (particularly with personal consumption items like food or drugs) if it becomes known that a new product does contain new-to-the-world technology, then fears, uncertainties, or doubts could cause people to accuse the company of deception and ultimately kill the product.

One lesson from this is that if people in a market are presented with real choice, which includes the option of maintaining their existing behavior, then many people can avoid dealing with their fears, uncertainties, and doubts, while others can adopt those innovations they see enhancing their welfare and thereby lead the way to greater market acceptance.

The difficulty is determining what is the likely eventual total response to any innovative product and where the early buyers and leaders will be. If people are asked in market research why they have not adopted some innovation or desirable behavior (such as getting fit or eating a more nutritious food), they will usually give an answer because they feel obliged to do so (often called the Hawthorne effect; Mayo, 1933). The problem is that they often will not reveal the true reason for their behaviors or attitudes. In many cases, the main reason they have not changed is that they cannot be bothered to change (because they perceive that the costs of change exceed any benefits). However, they can hardly say that. There are countless examples of earnest marketers who take to heart what consumers tell them is the "problem" with a new product and, when the marketers put this right, they cannot understand why there is still little uptake of their innovation.

A study of the adoption in Australia of compact fluorescent lights (CFLs) by domestic users produced some telling results (McDonald, Corkindale, & Sharp, in press). The conventional wisdom on who is likely to be an earlier buyer, mostly attributed to Rogers (1995), is that early buyers are young, high income, well educated, have higher occupational status, rely on mass media, and are more innovative, compared to the mass of the eventual adopting population. The early marketing campaigns for CFLs targeted this audience, but a large survey (McDonald, Corkindale, & Sharp, in press) showed that the adopters were not from this group. In fact, elderly retired people had disproportionately purchased them early. This was for two key reasons. First, CFLs last eight times longer than conventional lights, so elderly people do not have to climb up stepladders as frequently to replace bulbs. Second, because these new bulbs consume much less electricity, they give a sense of being insulated from energy price rises in future. Neither of these messages was targeted in the marketing campaign. Another set of early purchasers of CFLs already had other energy-saving devices; hence, they did not view the new bulbs as truly innovative, whereas virtually no one who lived in rented property had bought one (why invest in an expensive device when you might move?). Further, those who had recently built a new home or were renovating one were more likely to have purchased CFLs. These very pragmatic reasons for early purchase suggests one approach to successfully intro-

Table 1. GM foods that have been positively labeled.

Product	Dates	Markets	Label claim	Leader	Price	Market share for labeled GM product
rBST milk (Prosilac™)	1994-?	USA	Milk produced using recombinant BGH	Monsanto & milk processors	5 cent discount	Initially 50% in some states; now lapsed
FlavrSavr™ Tomato (MacGregor™)	1994-99	USA	Food is genetically modified to provide a longer shelf-life	Calgene	54% price premium	Small; sold all stocks in 1995-6
Tomato paste	1997-99	UK	Product made with genetically modified tomatoes	Zeneca; Sainsbury	15% price discount	60% of sales where competing products available; sold 1.6 million cans
NewLeaf ™ Potato (Naturemark™)	1999-00	Canada	Food is genetically modified to reduce pesticide use	Monsanto & Cavendish Foods	Premium	Peaked at 5% in Prince Edward Island; now zero
Sweet Corn	2000-02	Canada	Full disclosure of technologies used for both GM and non-GM varieties	U. of Guelph and Birkbank Farms	Parity	60% of sales during trial period on one farm
Soy tofu	2001-date	Canada	Ingredients: Genetically modified soybeans	Sunrise Soy Foods Ltd.	Parity	Unknown

Note. From Fetrow, 1999; Martineau, 2001; Harvey, 1999; CBI, 2000; McClintic, 2001; Powell et al., 2001.

ducing something new to a market—adapt to and follow consumers' interests and behavior by targeting marketing on those groups where the largest relative benefit could be realized, rather than try to alter it by general information and education.

The marketing principles illustrated above offer three lessons for industry seeking to expand acceptance of GM foods where there is fear, uncertainty, and doubt. First, general information and education is likely to be the long, hard route to market growth, if that is all that is done to increase acceptance. Second, GM food is likely to be adopted more willingly and aggressively by those for which it provides a solution to an admitted problem or inadequacy. These people will try to use it and, if it performs, will endorse it or at least not contribute to general unease. This clearly has worked, as the GM industry has successfully marketed their products to farmers, but so far they have not found the problem that consumers are seeking solutions for. Third, gaining trial and consumption of GM foods may need to be directly prompted by targeted marketing to those with problems in search of a solution. "Calls to action" are often necessary for this—including such things as free samples, price incentives, proactive comparisons, and other extra rewards of some sort. In short, people will buy what they see they need or benefits them, and not what someone else tells them they should need or want.

Proactive Marketing of GM Foods

Although most GM foods have entered the market without any choice being offered to consumers, there have been a number of examples that show the potential opportunity of finding a way to proactively market GM technologies and foods.

The biotechnology industry actually offers an excellent example of how to market new technologies. The agricultural biotechnology companies that developed the new GM seed varieties fully appreciated the need to demonstrate to farmers the value of their innovations. In each product line, they very carefully (and for the most part successfully) positioned the new technology in field trials and with early adopter (or visionary) farmers. They usually also undertook extension and direct marketing efforts to explain the technology and its benefits and costs. As a result, where producers have been allowed to choose, they have almost uniformly adopted the technology as rapidly as the market could support.

Difficulties have emerged in downstream food markets, however, because there have been only a handful of cases where the owners of the new GM products have labeled and proactively marketed their products to consumers (Table 1). Most of the cases of proactive marketing have involved whole foods (i.e., foods that involve little processing and no mixing with other ingredients). In each case, proactive labeling and marketing helped change behaviors, which helped to form positive consumer attitudes about specific GM foods.

The earliest example of a proactively labeled and marketed GM food was milk produced in the US using recombinant bovine somatotropin (rBST). When Monsanto proposed to introduce this new technology under the trade name Prosilac™, much of the milk-processing sector and many consumer groups objected. The compromise was that Monsanto agreed to work with the milk industry to label proactively milk produced with rBST and without rBST (Fetrow, 1999). In both cases, the labels indicated that although they used different technologies, "no significant difference has been shown between milk derived from rBST-treated and non-rBST-treated cows." Initially, the market was sharply divided, with up to half of the milk on the shelves in some states indicating that at least some of the milk could be produced using rBST, and the rest indicating that it was rBST free. The milk produced with rBST was initially priced about five cents per quart lower than the conventional milk. None of the producers of food using rBST milk proactively labeled its presence, while a few processors indicated they used rBST-free milk (e.g., Ben and Jerry's ice cream). Consumer actions did not follow their attitudes—in spite of strongly expressed initial reservations about the technology, consumers tested the products and compared prices. Ultimately, the majority of consumers decided to chose the new technology at the lower price, illustrating how behaviors can change attitudes. As a result, the "made with rBST" label disappeared in many states, even though 30% of the milk is produced with rBST. By 1999 only about 2% of the fluid milk sold—mostly by dairies in Wisconsin and Vermont—was labeled as rBST free (Fetrow, 1999). Butler (2003) reports that milk labeled rBST-free has made a comeback in California, while Dhar and Foltz (2003) estimate that rBST-free milk had an average 0.5% market share in 12 urban centres, with local shares ranging from 0% to 2.7%. Even though undifferentiated milk (i.e., commingled with rBST milk) is priced at a significant discount (>40%), we would question the wisdom of removing the "made with rBST" notice on labels, because new customers who may be unaware are always entering the market.

There have been two examples of proactively marketed GM tomato products. Calgene introduced a tomato modified for longer shelf life in California in 1994 and marketed it proactively to consumers as the FlavrSavr™ MacGregor™ tomato. The product was heavily marketed as a longer-lasting, tastier tomato that brought real benefits to consumers. In its first year of production it sold out the entire supply at a premium of 54% over conventional varieties but in subsequent years consumers judged that the benefits did not justify the premium, and sales slumped (Martineau, 2001). When Monsanto bought Calgene in 1996, it withdrew the FlavrSavr™ tomato and reengineered it in new germplasm, but poor market prospects caused a delay in full reintroduction. Meanwhile, in 1997 Zeneca introduced a GM tomato variety that produced more pulp than conventional tomatoes. It was produced in an identity-preserved production chain, with the tomatoes coming from Spain and being marketed proactively as a more cost-competitive product through the Sainsbury food chain in England. The product was proactively labeled as "made with genetically modified tomatoes" and was sold at 15% below competitive prices. During the first three years of introduction, the new GM tomato paste was the highest selling product in that food category. In 1998, when public distrust of GM foods exploded in England, this product was targeted by anti-GM campaigners and was ultimately withdrawn by Sainsbury in 1999, as it shifted to produce GM-free own-label products (Harvey, 1999).

In 1999, Monsanto introduced genetically modified table potatoes into Prince Edward Island (PEI), Canada's largest potato-growing region. The potatoes were both insect resistant (by expressing Bacillus thuringiensis toxins) and viral resistant. They were proactively marketed to PEI residents as New Leaf™ and Nature-mark™ varieties, offering a premium genetically modified table potato with reduced environmental risks. This addressed a significant local concern, as there are frequent fish kills during the growing season caused by insecticides washing into rivers and coastal waters. Monsanto worked with Cavendish Foods to bring the product to market, developing targeted point-of-sale information, product placement ads, and toll-free help lines. The entire crop sold out in short order at a significant price premium, outselling non-GM varieties three to one (Council for Biotechnology Information, 2000). In the second year, GM potato varieties captured about 5% of the seed potato market, but near the end of that growing season McCain Foods, the world's largest potato chip maker, announced it would not buy any more GM potatoes for its product lines due to perceived consumer resistance (McClintic, 2001). During the winter, Monsanto worked with the potato growers to remove their seed potatoes from the supply chain for the 2001 season and, as the market for the technology dried up, Monsanto eventually decided to remove the technology from the market.

Finally, in 2000, the University of Guelph and Birkbank Farms in Orton, Ontario, Canada, undertook a test

of consumer response to GM sweet corn (Powell, Blaine, Leudtke, Morris, & Wilson, 2001). They planted three eight-acre plots with equal amounts of genetically engineered Bt sweet corn and conventional sweet corn in such a way as to simulate commercial production conditions. The sweet corn, available for purchase in the market at Birkbank Farms, was fully labeled along with information on the number of sprays used and relative costs to produce. The two types of corn were presented in separate wooden bins labeled with either "genetically engineered Bt sweet corn" or "regular sweet corn." There was approximately 30cm of space between the bins that was filled with corn bags and pamphlets to prevent the corn from mixing inadvertently. Employees in the market kept both corn bins filled to the same level throughout the day. The genetically engineered Bt corn and the conventional corn were both sold for the same price (C$3.99/dozen). Pamphlets with background information were also available in the market for customers to take home. On weekends, free samples of both conventional and Bt sweet corn were distributed in front of the market and a short questionnaire was conducted as an intercept interview. Sales of both types of corn were recorded from August 30, 2000, when the corn was first harvested, to October 6, 2000, at which time the conventional sweet corn could no longer be sold due to a shorter shelf life. Small amounts of the Bt sweet corn sold over the next two weeks were not included in the sales comparisons because, although they were labeled, there was no conventional corn available for comparison. In total, over the five-week period, 136 bags (8,160 cobs) of Bt corn were sold (equal to 60% of total sales), while 90.5 bags (5,430 cobs) of conventional corn were sold.

A number of processors or food manufacturers have attempted to introduce their own form of labeling for GM or GM-free products. Although some of these processors proactively label the presence of GM ingredients, for the most part they have not made any claims on behalf of the technology. One example of this category is Sunrise Soy Foods Ltd., of Vancouver, Canada. It has three differently labeled tofu products: one proactively identifies the presence of GM soy; the second claims the tofu is produced with GM-free soy; and the third claims the soy is organic. Although the tofu maker does not make any claims for the respective technologies, it does differentially price the three products, charging the least for GM soy and the most for organic tofu.

Marks, Kalaitzandonakes, and Vickner (in press) also provide evidence of various types of processed foods (soups, fish, meatballs, pizza) that were proactively labeled by food manufacturers as containing GM ingredients. These products were sold in the Netherlands. They found that, in aggregate, Netherlands consumers did not significantly alter their purchasing behavior in the presence of such foods, nor did these consumers alter their purchasing behavior towards such foods after the labels were removed nearly three years later.

There have been only a few half-hearted attempts to market proactively input-trait GM crops that are heavily processed and incorporated into many processed foods. The main potential benefit for most of these crops is that they either reduce pesticide applications (as with Bt corn) or replace older herbicides with newer, “cleaner” herbicides (as with Roundup Ready™ or Liberty Link™ corn, soybeans, or canola). In the 1980s, and even today, one of the top two consumer concerns with modern foods is that they often have chemical residues (United Kingdom Food Standards Authority, 2000; Environics International, 2001). Probably the most serious marketing effort came in 1996, when Monsanto and Greenpeace agreed to develop an affinity card made with cornstarch from Roundup Ready™ corn. Shortly before the introduction, Greenpeace reevaluated the agreement and decided to adopt an anti-GM campaign. Since then no serious efforts have been made to position these products proactively in the consumer marketplace. Instead, the biotechnology industry has relied upon advocacy advertising to change attitudes, in the (mostly) vain hope that behaviors will follow.

Both theory and evidence suggest this timid marketing stance by the industry is counterproductive. Proactive labeling efforts, which offer consumers real and transparent choices, have been successful in the past. If the biotechnology industry truly believes their technologies and products are better than conventional options (i.e., use less toxic chemicals, support sound farming practices, or impart nutritional or food safety attributes), then they will need to offer consumers real opportunities to test the products for themselves.

Conclusions

The global agricultural biotechnology industry faces a conundrum. Although it has had significant success in marketing its new technologies and GM products to producers, it has failed to make much headway with consumers. The crops that account for almost all of the global GM food production in the past eight years—soybeans, corn, and canola—are almost ubiquitous in

much of the processed foods available in global markets but are almost entirely hidden from consumers.

The current industry strategy of public education and advocacy advertising for the general technology does not appear to be making any headway with consumers and is unlikely to be any more successful in future years, if marketing theory and evidence are correct. The bottom line is that adoption of innovative products requires transparent self-assessment. This step is for the most part not possible in any major market. Government regulations in the EU and Australia have impeded market access for many GM crops, while mandatory labeling rules have encouraged food processors and retailers to remove most of the rest of GM foods from the market. Meanwhile, consumers in North America and much of the rest of the world do not see many proactively labeled and marketed GM products. Except in a few discrete cases, GM products and ingredients have been commingled with conventionally grown produce. Admittedly, offering choice will not be easy, as securing pure supplies of GM and GM-free produce is a real challenge for the current global agri-food marketing system (Phillips & Smyth, 2000.) Kalaitzandonakes and Bijman (2003) suggest a second problem might be that processors and retailers will act in strategic ways (e.g., via standards for own-label products) that, although furthering their corporate objectives, make it difficult if not impossible for the biotechnology industry to proactively label GM foods. Clearly, there is more work that needs to be done to translate the imperative for labels into practice.

Nevertheless, we are puzzled by this problem for two reasons. First, the biotechnology industry's success in marketing their technology to producers and some of their products (albeit mostly whole foods) to consumers should have shown the industry the value of proactive marketing. Second, given the dominant role of Monsanto in the industry, we would have thought that being based in Missouri—the "show me" state—would have given them some clear vision out of their difficulties.

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Authors' Note

Peter W.B. Phillips is professor and NSERC/SSHRC Chair in Managing Knowledge-based Agri-food Development at the University of Saskatchewan, Saskatoon, Canada. David Corkindale is professor of marketing at the University of South Australia, Adelaide, Australia.