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Biosafety Decisions and Perceived Commercial Risks

The Role of GM-Free Private Standards

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ABSTRACT

We herein investigate the observed discrepancy between real and perceived commercial risks associated with the use of genetically modified (GM) products in developing countries. We focus particularly on the effects of GM-free private standards set up by food companies in Europe and other countries on biotechnology and biosafety policy decisions in food-exporting developing countries.

Based on field visits made to South Africa, Namibia, and Kenya in June 2007, and secondary information from the press and various publications, we find 31 cases of interactions between private GM-free standards and biosafety policy decisions in 21 countries. Although we cannot infer the *direct* involvement of supermarkets and food companies in biosafety policy processes in developing countries, we find that by setting up GM-free standards, these actors are *indirectly* influential via their local traders, who face the possibility of exclusion if they do not comply with the standards. Organic producers' and anti-GM organizations also play a role in spreading perceptions of commercial risks that are not always justified.

By comparing cases, we differentiate three types of relevant commercial risks: real risks, potential risks, and unproven risks. We then identify two critical, yet misleading, presumptions perpetuated by the various interest groups to spread the fear of potential or unproven risks: the infeasibility of non-GM product segregation and the lack of alternative buyers. We also find that information asymmetries and risk-averse behaviors related to perceived market power can help insert unfounded export concerns into biosafety or biotechnology policy decisions. The results of our analysis are used to suggest a simple framework to separate real commercial risks from others, based on five critical questions designed to aid decision makers when they face pressures to reject GM crop testing, application, consumption or use for fear of alleged export losses.

Keywords: genetically modified food, private standards, international trade, biosafety

ABBREVIATIONS AND ACRONYMS

GM	Genetically Modified
GMO	Genetically Modified Organism
ABARe	Australian Bureau of Agricultural and Resource economics
BRC	British Retail Consortium
CWB	Canadian Wheat Board
AGERI	Agricultural Genetic Engineering Research Center
ARC	Agricultural Research Center
USDA	United States Department of Agriculture
KARI	Kenyan Agricultural Research Institute
KOAN	Kenya Organic Agriculture Network
CIN	Consumer Info Network
KEPHIS	Kenyan Phytosanitary Agency
OIV	International Organization of Wine and Vine
CDO	Cotton Development Organization

1. INTRODUCTION

Over a decade after their introduction, genetically modified (GM) crops are still largely produced in only a few countries. In particular, many developing countries have avoided entering the debate on GM crops, observing conflicting views among developed countries between exporters promoting the use of the technology and importers strictly regulating it. Generally lacking functional biosafety systems, they have adopted a *de facto* wait-and-see position, in part due to perceived potential risks associated with the use of transgenic crops and their derived products.

Policy specialists have identified several factors playing a role in the reluctance of these countries to develop or adopt their biosafety policies and regulations. Notably, perceived commercial risks resulting from the potential loss of market access to targeted developed countries with strict import and marketing regulations for GM food is considered a significant factor in a number of countries (Paarlberg 2002, Gruère 2006a). In particular, the fear of losing agricultural exports to Europe has been used to support the observed political standstill on adopting GM technology in a number of African and Asian countries.

At the same time, applied research conducted in the area of GM products and international trade has consistently shown that the alleged commercial risks for currently approved GM crops are largely exaggerated, and that the potential export losses these countries could incur with them would be limited if not negligible compared with the potential productivity gains from adopting targeted GM crops. For instance, Paarlberg (2006) showed that Eastern and Southern African countries have very low export volumes going towards the GM- adverse markets of Europe. Smyth et al. (2006) showed that the United States (US) and Canada, despite being large adopters of GM crops and facing a moratorium on GM maize in the European Union (EU), have not decreased exports of GM crops. Several studies using international trade simulations have also demonstrated that developing countries would gain a great deal and not lose much if they adopted productivity-enhancing GM crops (e.g., Anderson and Jackson 2005, Gruère et al. 2007), despite the existence of import barriers. Other studies have shown that non-adoption of productivity-enhancing technologies could become costly if competitors adopt such technologies (e.g. Elbehri and MacDonald 2004, Berwald et al. 2006).

This observed discrepancy between the perceived and actual commercial risks, while puzzling and of considerable importance, has largely been left out of the GM food and trade debate. Assuming that policy makers are at least partially rational when assessing commercial interests, this suggests that there is a distortion between the perceived and real commercial risks, supporting a bias towards a precautionary stand that puts any possible (even unproven) export consideration before production interests. Investigating this issue requires that we dive into the political economy of national biotech and biosafety decision making on one hand, and into the distribution and transmission of information along the supply chain, from the exporter to the importer, on the other.

A closer look at the evolving global market for agricultural products suggests that private standards play a determining role. In recent years, modern value chains for exported commodities have been dominated by the demand and specific requirements of retailers in developed countries. In particular, many food companies in Europe, Japan, and a few other developed countries have responded to consumer demand by requesting that their suppliers, mainly based in developing countries, avoid GM ingredients. While these "GM-free" standards are not specifically different from other standards, their enforcement in exporting countries that are in the process of implementing policies on GM crops has created conflicts of interest between regulators,/developers, and traders.

In this paper we study the interactions between importing food companies and their GM-free private standards and biotechnology decision making in developing countries. Our objectives are first to assess the existence of observed relationships between private trade-related interests and public policies on biotechnology and biosafety, second to identify the critical factors explaining the observed disconnection between perceived and real commercial risk in decision making, and third to propose a guiding framework that will help avoid irrational decision making. To do so, we conduct a global review

of case studies linking private export-related interests and policy decisions, and analyze these cases according to the validity of their associated commercial risks.

This paper is arranged in six sections. Section 2 provides some background information on the development of GM-free private standards. Section 3 proposes a set of hypothetical links between private interests and decision making for evaluation. Section 4 reviews the available global evidence. Section 5 provides a characterization and critical analysis of these cases and their underlying factors, and suggests a decision-making framework. We close the paper with some conclusions.

2. THE DEVELOPMENT OF GM-FREE PRIVATE STANDARDS

Private standards started in the area of food safety, with supermarkets and importers setting up high standards and traceability systems in response to the food safety scares of the 1990s in the meat and vegetable sectors (Graffham 2006). With consumer confidence in public regulations on the decline, private companies decided to self-regulate with private standards (Henson 2006; Cordon et al. 2005). However, these standards were gradually extended into other application areas, including non-safety considerations such as environmental, ethical, and labor standards. Horticulture exports from African countries have been particularly affected by the private standards of European retailers in this sector. The exports from these countries are not very important for Europe (Brown 2005), but they represent a significant share of their total export value (Labaste 2005; Jaffe and Masakure 2005). Therefore, compliance with specific import requirements on production is seen as a necessity for exporters.

Applied research studies have shown that private standards have had mixed effects on developing countries. They have proven beneficial in allowing access to high-value developed- country markets. Several cases of costly safety-related bans with large export effects have shown that increasing food safety standards could be beneficial (e.g., see Henson et al. 2000; Unnevehr 2000; Swinnen and Maertens 2006). Some standards have also generated positive effects on production practices in developing countries, by improving market conditions for horticultural exports, and ensuring the safety of products from countries with lax food safety (Henson and Reardon 2005; Maertens and Swinnen 2006). At the same time, not all private standards have yielded positive outcomes. In particular, the imposition of costly production practices and sanitary standards that go beyond international standards have burdened suppliers in developing countries. Furthermore, the high level of sophistication required by these standards has encouraged concentration (Dolan and Humphrey 2000; Swinnen and Martens 2007) and left some small-scale farmers out of the picture. There is not enough evidence to suggest the long-term impacts of such private standards, but the short term has seen declining numbers of small-scale producers in the supply chain (e.g. in Kenya, see Dolan et al. 1999 and Henson et al. 2005).

Consumers' demand for similar quality attributes and the increasing number of suppliers in different countries has led to some consolidation of the standards, and a number of regional or multi-company standard-setting bodies have emerged. A few generic standards have become common across companies, crowding the market and making these essentially voluntary standards *de facto* mandatory for exporters. Although a number of standards can be traced back to actual consumer demand, others have gone beyond consumer demand in adding new requirements on sellers each year. As a consequence of the growing dominance of private standards in Europe, third-party certification has gradually become a requirement (Hatanaka et al. 2005), and certification costs have been transferred from the retailers to the suppliers, adding pressure on the suppliers' margins.

GM-free policies were first introduced in 1996 in Europe, in response to media and activist campaigns against the first import of GM soybeans and their use in food products (Livermore 2007). At that time, GM tomato paste had been successfully marketed by Sainsbury for two years in the United Kingdom (UK) without any problem. However, the introduction of GM soybeans, an ingredient present in 60% or more of all processed food, triggered a very intense campaign against GM foods, forcing supermarkets and companies to abandon the use of all GM ingredients (Livermore 2007). The Iceland supermarket company in the UK was one of the first to make this decision, but many other chains followed, including Sainsbury. Soon, this phenomenon caught on and became the norm for most food products in European supermarkets, including foods sourced from developing countries.

While strongly supported by nongovernmental organizations (NGOs) opposed to the use of genetically modified organisms (GMOs), these standards were also driven by genuine consumer demand. European consumers, on average, have maintained a negative perception about GM food since 1996. Several empirical studies have shown that consumers in Europe do not share the same views held by others (including their US counterparts) on GM food. For instance, consumers from France, Germany and the UK have a higher willingness than US consumers to pay for beef from cattle fed with GM-free corn

(Lusk et al. 2003). Consumer knowledge does not seem to be the main reason for these differences. For example, Hoban (1997) found that 65% of consumers in the US were aware of biotechnology, while 73% of the surveyed US consumers were willing to buy GM foods (Lusk et al., 2003). Comparatively, biotechnology awareness amongst consumers was 55% in France, 57% in the UK, and 91% in Germany. Negative sentiment about GM foods was the highest in Germany, where 57% viewed it as a health risk, while 60% and 63% of consumers in France and the UK, respectively, were willing to buy GM foods, with only 38 and 39% of people in France and the UK, respectively, viewing it as a health hazard (Hoban 1997).

Consumers in developed countries of Asia have a similar reticence towards GM food. Japan's consumers traditionally have concerns related to food safety, lowering their willingness to pay for GM food even though these consumers have a relatively good knowledge of biotechnology (e.g., McCluskey et al. 2003). Korea has also maintained a low consumer acceptance of GM crops (Kim and Kim 2004).

In this context, the marketing decision of avoiding GM ingredients in food items rapidly became a quality attribute employed in the competition among the retails chains of Europe, Japan and South Korea. A report by the international NGO, Greenpeace, which has encouraged companies to adopt GM-free policies, provides evidence of the widespread adoption of such practices in Europe (Greenpeace 2006), as follows:

- Twenty-seven of the top 30 retailers have a non-GM policy in Europe.
- Fourteen of these retailers have a policy of not selling GM-branded products under their company name for all European countries. These include Carrefour, Auchan, Sainsbury's, Safeway, Marks & Spencer, Coop Switzerland, Coop Italia, Migros, Big Food Group, Somerfield, Morrison's, Kesko, Boots, and Co-op UK.
- Seven of these retailers have a non-GM policy for their own branded products for their main markets (mainly in their home countries). These include Tesco, Rewe, Metro Group, Casino, Edeka, Schwarz group, Tengelmann).
- Out of the top 30 European food and drink producers, 22 have a non-GM commitment in Europe, including Nestle, Unilever, Coca Cola, Diageo, Kraft Foods (Altria), Masterfoods (Mars), Heineken, Barilla, Carlsberg, Dr. Oetker, Arla Foods, InBev (Interbrew), Heinz, Chiquita, Cirio del Monte, Orkla, Ferrero, Northern Foods, Eckes Granini, Bonduelle, Kellogg and McCain.
- Thirteen of these 22 multinationals have a company-wide non-GM policy beyond Europe. These include Diageo, Heineken, Barilla, Carlsberg, Arla Foods, Dr. Oetker, Chiquita, Cirio del Monte, Orkla, Ferrero, Northern Foods, Eckes Granini, and Bonduelle.

Some companies even go beyond banning processed products derived from GM ingredients to include requirements on GM-free animal feed in animal products. Table 1 shows the GM-free standards in place in the main retailers of the UK. Virtually all supermarkets sell only poultry fed with non-GM feeds, whereas the policies for dairy products, beef and pork vary.

For supermarkets, taking the position of not having any GM products (fresh or processed) on their shelves may appease consumers, counter negative campaigns by NGOs, and help gain greater brand equity. However, for their suppliers in developing countries, complying with non-GM requirements has meant instituting potentially costly procedures in their production lines (if the suppliers were using GM products) in addition to the social and labor standard certifications already required. Furthermore, such requirements may have pushed some suppliers to proactively encourage politicians to avoid considering the use of any type of GM product in the country.

Table 1. Presence of a GM-free policy on branded animal products in British supermarkets

Food Retailer	Milk	Other Dairy	Fresh Pork	Fresh Beef	Fresh Lamb	Eggs	Chicken	Turkey	Farmed Fish
Marks & Spencer	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Co-op	No	No	Yes	Partially	Partially	Yes	Yes	Yes	Yes
Waitrose	Partially	No	No	Partially	Partially	Yes	Yes	Yes	Yes
Sainsbury's	Partially	No	Partially	Partially	No	Partially	Yes	Yes	Yes
Morrison's	No	No	No	No	Partially	Yes	Yes	Yes	Yes
Asda	No	No	No	No	No	Yes	Yes	Yes	Yes
Somerfield	No	No	No	No	No	Yes	Yes	Yes	Yes
Iceland	No	No	No	No	No	Yes	Yes	Yes	Yes
Tesco	No	No	No	No	No	Yes	Yes	Yes	Yes
Budgens	No	No	Yes	No	No	Yes	Yes	Partially	No

Source: Friends of Earth (2006).

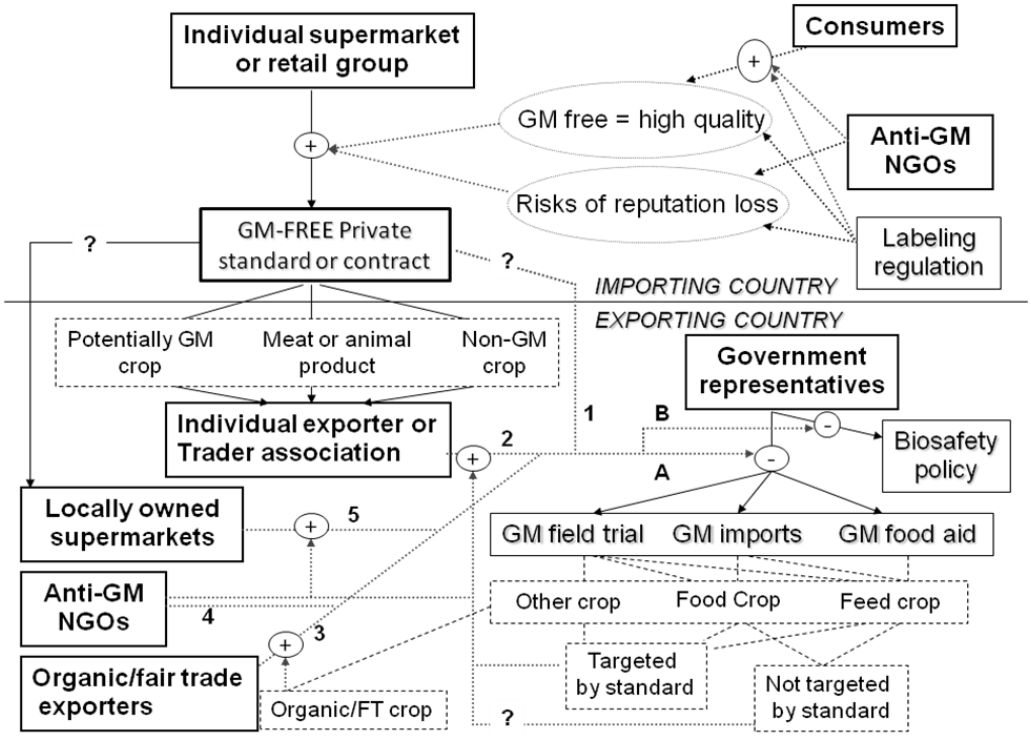
In the context of developing countries, these consumer-driven standards are largely export-related; in-country consumers, while largely unaware of biotech, do not appear to share the same negative perceptions of GM food (Curtis et al. 2004). Several consumer studies show that most consumers in India or China would be willing to buy GM food at no price difference or even at a positive premium (e.g., Li et al. 2002, Anand et al. 2007, Deodhar et al. 2007, Qaim and Krishna 2008). Fewer studies have been conducted in Africa, but the existing reports indicate similar results. In particular, Kimenju and De Groote (2008) show that a large majority of Kenyan consumers would be willing to buy GM maize at the same price as non-GM maize, while an additional third would be willing to buy it if the prices were lower than those for traditional maize.

Although the existing studies on private standards analyze a wide range of standards and their effects on the industry, consumers, suppliers and farmers, we are unaware of any article specifically examining their effects on domestic public policies. Vandenbergh (2007) demonstrates the growing role of private standards as a substitute or alternative to public policies on global environmental governance. A few articles report the observed strategy of avoiding GM products in supermarkets, especially in Europe (e.g., Bernauer 2003, Kalaitzandonakes and Bijman 2003), and others analyze the effects of an importing company's ingredient choices on their suppliers (Knight et al. 2005, Gruère 2006b). However, to our knowledge no published study specifically focuses on the political implications that GM-free standards may have on exporting countries in Africa or Asia, and how they could help explain the discrepancy between real and perceived commercial risks with regard to the use of GM products.

3. FROM PRIVATE STANDARDS TO BIOSAFETY DECISION MAKING: A CONCEPTUAL FRAMEWORK

Figure 1 presents a conceptual framework of the possible links between private and trade-related interests and biosafety policy making. The framework is based on a two-country example. The importing country (top) is a developed country with specific import and marketing regulations on GM food, and large food companies (such as a country of the EU). The second country (bottom) is a developing country that exports certain foods or feed products to one or more companies in the importing country, and therefore faces policy decisions on biosafety and/or the use of GM crops.

Figure 1. A framework of hypothetical links among actors



Source: Authors.

In the importing country, a large share of consumers tends to be averse to the use of GM food, due to the anti-GM campaigns of NGOs. Perceiving a potential risk and linking the use of GM crops to a number of concerns, these consumers see the lack of GM ingredients as a positive quality attribute in a food product. Confronted with this situation and facing requirements to label their product as GM if it contains any targeted ingredient, the food companies (here represented by a retail or supermarket chain) must decide on the use or nonuse of GM ingredients. Not only may they consider using a GM-free claim or standard as signal of high quality but they also have to confront the risk of reputation loss due to anti-GM campaigns against any labeled GM product. As a consequence of these two constraints, they decide to avoid using any GM ingredient in their product formulation. Although they may not use a specific GM-free private standard, they may include a quality requirement in their general standards, rejecting the use of GM ingredients and potentially using a non-GM labeling claim (which has the same effect as an up-front standard).

In the exporting country, this GM-free private standard or clause is transmitted to the local traders, and from there down to the producer. Depending on the products purchased by the importer, the GM-free requirement can specifically focus on a potentially GM crop (e.g., corn), or on meat or animal products fed with GM feed, or it may more broadly cover any products derived from crops for which there is no available GM variety anywhere in the world. The supermarket chain may also have a retail partner or subchain in the country subject to the same standard; this actor could further interact with policy makers. Two other groups are bound to actively participate in the debate on commercial risks (if they are present): the anti-GM NGOs, who tend to be subsets of international NGOs based in Western countries, and groups or association of organic or fair trade exporting, whose regulating principles forbid the use of GM crops, seeds or elements thereof.

Simultaneous to or after introduction of the private standards, we assume that the government of the exporting country is considering a biosafety decision. It may be discussing the adoption of a biotechnology policy or biosafety law (as is the case in many African countries), or it could be preparing to make a discrete regulatory decision on the approval or rejection of an application for one of the following: a) a confined GM field trial; b) importation of GM seeds or a shipment that may contain GM food or feed; or c) the use of food aid that may contain GM grains. Any of these decisions may be related to a food, feed or other crop that is targeted/not targeted by the private standard.

As shown in Figure 1, our framework identifies five possible influential links (numbered 1 to 5) between the different players and the two types of policy decisions (a policy adoption noted A or discrete regulatory decision noted B). The first possible link would come from the direct involvement of the importing company in policy decision making aimed at slowing the advancement of a biosafety policy or rejecting an application for the use of a GM product (for a field trial, import, or food aid). This sort of direct involvement could be risky and might not be very effective, but it is possible. The second influential link would come from in-country traders who could potentially be encouraged to lobby against an upcoming decision- for example if the GM product in question is the same product they sell to the export target under a GM-free standard. The third possible link originates from producer groups that have adopted organic or fair trade standards. These standards are issued by certification agencies rather than companies, but they share a number of similarities with private standards: they have specific requirements for market access; they require use of specific practices under certification, with the purpose of fulfilling a consumer-demanded attribute; and they may be used by importing companies as a marketing tool. The fourth link comes from anti-GM organizations, which tend to use the risk of export losses due to the use of GM products as an argument for their cause. The last possible interaction could come from local supermarkets, potentially acting under GM-free private standards, or under threat from targeting campaigns by the anti-GM NGOs.

While this framework provides a first basis for analysis, it is based on stylized facts and needs to be validated. The following review of the evidence aims to clarify which actors actually play roles in influencing policies based on proven or unproven commercial risks. Each of the supposed links will be evaluated based on our review of global evidence.

From Concepts to Facts: Reviewing the Evidence

A. Research Methods

Due to the qualitative nature of the evidence and the politically-sensitive nature of this issue in most countries, it is difficult to gather primary data and facts. Thus, we base our research on a synthesis of several sources of primary and secondary data.

First, we documented published and reported cases of interactions of importers with policy making in exporting countries, obtained via internet research. Second, we conducted phone interviews with people within targeted countries to determine whether there was any evidence of private standards in the reported cases. We also talked to a number of international biotech policy specialists based in

Washington DC and in Europe. Third, we visited three selected countries, South Africa, Namibia and Kenya, and sought to substantiate the evidence and provide case-study support.

To select our in-country respondents, we used a semi-structured snowball sampling technique, whereby local partners helped us identify a few key stakeholders and provided references for contacting more specialized individuals. In terms of instrumentation, we conducted mostly face-to-face interviews with the selected stakeholders. This format was preferred because distance and time constraints made it difficult to conduct focus group interviews, and also because some stakeholders were concerned about the privacy of their statements. All interviewees were asked the same questions, as part of a short, open-ended questionnaire. The responses were then substantiated with further questions according to the discussion pattern (i.e., the nature of the conversation and the stakeholder's response to the initial set of questions). Several items, such as the reports on possible cases of private standards, were used as aids during the interviews.

In a first best world, a more formal validation of each case, perhaps using the *Ego-Alter-Research* (EAR) methodology (Arts and Verschuren 1999), would have been appropriate. This method validates the presence of influence based on a pressure group's own perception of influence (*Ego*), the policy recipient's perception (*Alter*) and the perception of an outside researcher (*Research*), as done by Arts and Mack (2007) in the case of NGOs influencing international biosafety. However, in our case, lobbying is not an open goal for most of the involved players (instead, it is a means to an end), and the politicians have no incentive to reveal the real reasons behind their decisions. Policy makers will not admit to having been influenced and companies will not reveal whether they have tried to influence policy decisions. Therefore, most cases of potential influence were reported by third parties. Furthermore, it was often difficult to trace a reported story to its actual source. Many cases seemed to be based on rumors, with nobody willing to take clear responsibility for passing on the news. In other cases, the involved individuals were reluctant to divulge details for fear of being quoted.[1]

As a second best option, therefore, we report all relevant cases and provide the type of sources they are based on. While we think that most of these cases are relatively well substantiated, the reader can decide whether the assembled evidence makes each case credible. In the next subsection, we provide an overview of the reported international cases identified in our general search.

B. Review of Reported Cases

Table 2 presents a summary of the identified cases, indicating the location, year, product, alleged commercial risk and policy decision. We found at least 31 cases of reported direct or indirect interaction between private commercial interests and biosafety policy decisions in 21 countries. However, the actors involved, the scope of the interaction, its policy implication, and/or the possible causality largely vary from case to case. In addition, the type and strength of the evidence supporting each case also varies: from word of mouth (hearsay) to direct personal conversations with one or more individuals directly or indirectly involved in the case, to newspaper articles, technical reports and other publications. Because of this intrinsic data variability, we will now briefly present each of the cases following their order in Table 2.[2]

[1] We consciously avoid using the names of the stakeholders who met with us, but the list of organizations can be obtained from the authors.

[2] While the enumeration of global cases may appear a lengthy exercise, the nature and variability of the data requires a sufficiently thorough explanation of each case.

Table 2. List of reported cases

Country	Product(s)	Year	Alleged commercial risk	Policy decision under influence	Source *
Australia	GM canola	2007	Exports of canola and lamb to Japan/EU countries	State release of GM canola	C,D
Australia	GM wheat	2008	Exports to Japan	Pre-emptive dissuasion to reject GM wheat	C
Brazil	GM soybean	2007	Exports to Great Britain	Approval of new GM soybean?	B
Canada/USA	GM potato	n.a.	Domestic market concerns by food companies	None, but influences other countries	A,B,C,D
Canada/USA	GM wheat	2004	Exports of wheat to Europe/Japan	Canadian Wheat Board rejects GM wheat	A,D
Egypt	GM potato	2001/2	Exports to Greece and EU	Commercialization rejected	A,B,D
Egypt	GM crops	2005	Exports to Europe	Slowing application and/or future approval	C
India	GM crops	2005	Exports to the EU	Mandatory labeling of GM food	C
India	Organic	2005	Exports to Europe	Regulation of new GM crops	C
India	GM rice	2006/8	Exports to Europe and the Middle East.	Possible slowing/deterring of field trials	A,B,C,D
Indonesia	GM cocoa	2007	Exports to the United States	Push non-GM certification/deter research	B
Kenya	GM tea	2007	Exports to the EU have to be non-GM	Pre-emptive action to dissuade any research	B
Kenya	GM maize/cotton	2007	Exports of vegetables to the EU	Slow biosafety bill approval/field trials	B,C
Malawi	GM food aid	2005	Imports of non-GM food aid from the EU	No visible decision	A,B
Malawi	GM maize/cotton	2005	Exports of groundnuts to the EU	Possible slowing of GM field trials	A,B
Namibia	GM maize	2006	Meat exports to British / Norwegian supermarkets	Ban on GM maize imports	A,B,C,D
New Zealand	GM yeast	2007	Wine exports	Ban on experiments	A,C,D
Qatar/UAE	GM rice	2007	Imports from India	Encourage GM food labeling policy	C
Russia	GM food	n.a.	Agricultural exports to the EU	Moscow GM-free	C
South Africa	GM maize	2004/5	Meat export to the EU, maize exports in the region	No visible decision	B,C
South Africa	GM yeast/vine	2007	Exports of wine	Rejected application	B,C,D
South Africa	GM potato	2006/8	Export to Southern Africa	Commercialization decision stalled	B,C
Tanzania	GM tobacco	2005	Exports to developed countries	Reported ban on GM tobacco trials	B
Thailand	GM papaya	2005	Papaya and other fruit exports to EU and Japan	Moratorium on all GM field trials	C,D
Thailand	GM rice	2006/8	Exports to Europe and others	Ban on experimentation and use of GM rice	C
Uganda	GM cotton	n.a.	Exports of organic cotton	Request further analysis before trials	A
US	GM sugarbeet	1998	Domestic market	None, but possible influence elsewhere	C
US	GM rice	2004	Exports to Japan	Deter rice commercialization	D
Vietnam	GM rice	2006/7	Exports to Europe and Japan	Ban on experimentation	B,C
Zambia	GM maize	2002/7	Export of (organic) vegetables to Great Britain	Ban on food aid/imports with GM maize	A,B,C,D
Zimbabwe	GM maize	2002	Export of meat/horticultural products to Europe	Ban on food aid/ imports with GM maize	C,D

Source: Authors based on cited sources (see below).
Types of sources: A, word of mouth; B, personal conversation(s); C, newspaper article(s); D, report(s) or other publication(s).
Note: n.a. means not available or uncertain, UAE stands for United Arabic Emirates.

GM Canola and Wheat in Australia

As the commercialization of GM canola was being discussed in Australia, there was a great deal of discussion regarding the potential commercial risk of such a decision. Goodman Fielder, Australia's largest food company, and Tatiara Meats, the largest lamb exporter, called for the government to extend their bans on GM canola (ABC 2007) for another five years based on the fear of losing exports and the need to maintain the no-hormone, no-GM standard (ABC 2007).

The Biological Farmers' Association stated that allowing GM canola would result in Australia losing its export markets and lucrative GM-free status (North Queensland Register 2007). This statement was in contrast to several research reports published by the Australian Bureau of Agricultural and Resource economics (ABARe) showing the high opportunity cost of a ban on GM canola (Lewis 2007, Reuters 2008).

Consumer and farmer groups representing 155 Japanese organizations presented a petition to the state government officials of South Australia, Victoria and New South Wales, asking them to maintain a moratorium on GM crops (Farm Weekly 2007). Their stand was based on the desire of Japanese companies to continue sourcing GM-free canola and canola oil from Australia. Because canola oil from GM canola is not required to be labeled as GM in Japan (or Australia), GM-free private standards govern the demand for GM canola in Japan. Despite these active lobbying campaigns, some Australian states passed an ordinance lifting the moratorium on GM crops, allowing farmers to grow GM canola. This reportedly encouraged Japan to cancel their export order for GM-free canola from Australia (North Queensland Register 2007).

In 2008, the first reported results of Australian research on drought-tolerant GM wheat prompted some trade-related reactions by importers. The Flour Millers Association of Japan was quick to announce that they would not purchase wheat from Australia if GM wheat were planted in the country (Takada 2008).

GM Soybeans in Brazil

In a report published in 2005, the British Retail Consortium (BRC) called on Brazilian soy producers to plant less GM soybean to maintain greater share of non-GM soy in the fields (GM-freeze 2005). The BRC statement came just before crops were to be planted for the next season, causing a dilemma for numerous farmers about whether to plant their fields with GM or non-GM soy.

GM Potatoes and Wheat in Canada and the United States

In 1997, a GM potato developed by Monsanto was commercialized and planted at a relatively small scale in Canada and the US (McCoy 2008). In 1999, following requests from consumer organizations, some of the largest potato-purchasing food companies (e.g., McDonalds and McCain) decided to avoid the use of GM potatoes, with the result that the technology was shelved. Although this avoidance did not directly affect policy decisions in Canada and US, it reportedly impacted Egypt and perhaps other countries that subsequently rejected applications for GM potatoes.

In 2004, Round-up-resistant wheat was developed by Monsanto and approved by US regulation agencies, but the company then voluntarily withheld the strain from commercialization, due in part to wheat growers' fears of losing export demand from Europe. Although this might appear to have been the company's own decision, it was largely underpinned by a decision of the Canadian Wheat Board (CWB), which rejected the GM variety, thereby preventing Monsanto from achieving its goal of marketing the new wheat variety in both the US and Canada (Berwald et al. 2006). Thus, while the ultimate decision was made by the company based on traders' interests, it was largely prompted by the CWB's decision, which may have been influenced by traders.

GM Potatoes and Other Crops in Egypt

In Egypt since 1990, the Agricultural Genetic Engineering Research Center (AGERI), under the aegis of the Agricultural Research Center (ARC), has sought to develop GM crops capable of overcoming problems such as insect infestation, drought, and raised soil salinity (Krauss 2005). One such crop, developed with international partners in 1999, was a GM potato variety that proved resistant to the potato tuber moth. This GM potato underwent field trials but was not commercially released, for fear of losing Egypt's exports to Greece and other countries of the EU (USDA 2006). Interestingly, the GM potato variety in question was very different from the variety exported from Egypt to the EU. Despite this important distinction and some debate, decision makers decided not to go ahead with commercialization of the GM potato, reportedly for fear of losing market access to the EU. According to a source, this decision had no clear scientific basis, but instead seemed mainly political. The press-reported public decision of McDonald's to reject the use of GM potatoes for French fries in the US likely played a role. Egyptian traders may also have influenced this decision. In any case, the GM potato project was discontinued in 2001-02 (Serageldin and Juma, 2007).

In addition to potatoes, other GM crops under development in Egypt (e.g., cotton and corn) have also been subject to official rejection based on fear of losing exports to Europe (Krauss 2005).

GM Rice and Other Crops in India

Rice exporters in India supported a ban on GM rice for fear of losing their GM-free export markets (Bangkok Post 2006a, The Hindu 2006, Sharma 2006). They were the first to denounce field trials of GM rice in India, arguing that these trials would create economic losses (Parsai 2006, The Hindu 2008). The traders and associated organizations claimed that segregation is infeasible, and that if GM rice were approved, India would lose all its market access to Europe (Economic Times 2005). Following the escape of unapproved LL601 rice from the US in 2006, which resulted in intense testing of rice in Europe (Fletcher 2006), rice exporters reiterated their claim that the introduction of GM rice would result in the loss of all rice exports. Although GM rice has not yet been approved in India, these issues likely contributed to slowing and potentially even deterring new field trials of GM rice in this country.

Organic exporters have also been warned by several observers that if India were to release GM crops, their access to Europe would be compromised (Kumar 2005, The Hindu 2006). A number of pro-organic groups oppose GM crops on many grounds, but their main points seem to revolve around trade interests and their perception that it is completely impossible for GM and non-GM crops to coexist (Sharma 2005). Anti-GM NGOs in India have also argued that the government should adopt a mandatory labeling policy for GM food, in order to preserve their exports to the EU (Financial Times 2005), which is one of the few regions that has introduced and effectively enforced a mandatory labeling policy (Gruère and Rao 2007).

GM Cocoa in Indonesia

After publication of the first lab experiments on GM cocoa, an association of US importers asked for clarification regarding the GM status of cocoa exported from Indonesia.[3] Subsequently, the Indonesian Directorate General of Agricultural Processing and Marketing requested the research institution working on GM cocoa to build capacity for non-GM certification of cocoa. This request was very surprising given that no transgenic cocoa had reached the field, and the lab experiments were being conducted on calli, a material that is not easily regenerated into a plantlet. This case shows how quickly companies respond to the possible presence of GM trials, through their connections with government entities.

[3] Email with a member of ICABIOGRAD, Bogor, Indonesia.

GM Products in Kenya

Several different GM crops have been debated in Kenya. During discussions surrounding field trials of GM maize, several groups mentioned the fear of losing agricultural exports to the EU. The organization African Nature Stream warned the Kenyan Agricultural Research Institute (KARI), which is in charge of conducting confined field trials for GM maize, that GM trials would eliminate Kenya's export markets (Masava 2005). The Kenya Small Scale Farmer Forum also said that farmers stand to lose the EU market should Kenya commercialize any GM crops. Furthermore, the Kenya Organic Agriculture Network (KOAN) and Consumer Info Network (CIN) have pushed for a ban of GM production. They have been vocal in their opposition to a biosafety bill that would pave the way for a biosafety regulatory system in Kenya, arguing that it would negatively impact trade (Mbaria 2008) and encourage the "dumping" of GM food rejected in other countries into Kenya (Amungo 2007).

The export loss arguments used by the KOAN and its associates do not seem to be easily justifiable. Biologically speaking, it is quite difficult to find a rational explanation to support the argument that planting Bt cotton (insect resistant cotton), affects organic green beans, or that growing Bt maize could decrease the export of organic orchids. Part of this argument may be due to a general lack of understanding about market issues. In view of the absence of commercialization of any single GM vegetable in all countries, it is unlikely that a developing company would target Kenya (an exporting country to Europe and a small domestic market) as their major target for investment and commercialization of GM vegetables.

Lastly, Kenyan tea exporters have been requested by EU buyers to provide official certificates from the Kenyan Phytosanitary Agency (KEPHIS) stating that the exported tea is not GM, although there has never been any research on GM tea in Kenya. Even if this requirement does not have any policy implications, it demonstrates the spread of standards above and beyond regulations. In a rational sense, this request may have been introduced to prevent the future use of GM tea. However, even this justification is not very convincing. No market-aware company or research institute would ever invest in research and development in Kenya the GM variety of a major crop exported to countries opposed to GM crops.

GM Food Aid and Groundnut Exports in Malawi

The EU, in their agreement to provide funding for food aid to Malawi, requested that the food aid not contain GM grains. Although this decision did not involve the private sector *per se*, it may have contributed to the reluctance of Malawi to import or use GM maize in the aftermath of the food-aid crisis of 2002. In addition, outside observers suggested that in 2002, high-level officials feared that Malawi could lose their groundnut exports to Europe if GM maize or other transgenic crops were introduced. Although most groundnut exports are directed to South Africa, some may be re-exported to Europe, potentially explaining (at least partially) why Malawi rejected trials of GM maize in 2002.

GM Maize Imports in Namibia

Namibia exports high-value beef both within the Southern Africa region and to Europe.[4] Every possible effort has been made to ensure that Namibian beef exports qualify with the highest standards of safety and quality, to satisfy high-income consumers in Europe. In particular, a full traceability system is in place, beef producers use natural feeds and maintain no-hormone policies, and the country has been literally cut in two by a veterinary fence, to avoid animal disease contamination.

Against this background, there is a strict ban of GM maize imports (Africa News 2005), reportedly set up to keep GM maize out of cattle feed. This decision, explicitly supported by the Namibian Meat Board, may have been driven by Tesco, a UK-based retail chain that is a large buyer of

[4] On average between 1990-2005, 92% of all cattle-based products in Namibia were exported and 19% of cattle were used for European exports (Mendelsohn 2006).

Namibian beef, or by other companies in the UK and/or Norway.[5] According to Paarlberg (2008, p 135), in 2000, one or more European companies stopped importing beef from Namibia upon learning that the animals had been fed yellow GM maize. This event may have been the trigger for the import ban. However, our meetings with stakeholders and the lack of a clear Tesco policy on beef (see Table 1), failed to confirm that buyer requirements were the sole reason for banning imports of GM maize. Since GM-free private standards are likely to be driven by supply and demand considerations, the ban was probably intended to satisfy the preference of European retail chains, and helped maintain market access in 2000, but also to help Namibian beef keep its high-quality reputation in the eyes of GM-averse European buyers.

As a result, Namibia has enforced a strict moratorium on GM maize (Graig 2001). Yet, the relevance of this public policy decision does not seem to be supported by the evidence. While part of the decision was because the GM food regulations are still not yet in place, the central role of Namibian Meat Board in supporting this position seems to suggest the use of policy to satisfy purely commercial interests. If the entirety of the industry and all sectors of the population support the ban, such a decision would appear publicly legitimate.[6] However, several elements provide arguments showing that this is not the case. First, a large part of the chicken and ostrich feed industry has reported that it would welcome imports of cheaper mixed (GM and non-GM) maize, particularly given that the price of maize doubled between 2006 and 2008. Second, although maize is used to feed cattle in Namibia, the actual share of yellow maize in the total animal feed is extremely low. The Namibian cattle intended for high-value export, are by definition grass-fed. In comparison, other animal subsectors use much more maize feed. Third, banning GM maize import to avoid the risk of it being fed to export-bound cattle presumes that segregation of imports is infeasible, and that all (or at least a large share of) exports would actually be lost upon the importation of GM maize. However, a government-ordered cost-benefit analysis conducted in 2002 on the use of GMOs in Namibian agricultural products found that there was a maximum threat of losing 1% of sale revenues due to export value loss, should Namibian cattle feed upon GM maize (Namibia Resource Consultants 2002). The study also concluded that segregating GM and non-GM maize could be feasible. Fourth, a very large share of all meat sold in the EU has been fed with GM soybeans and/or GM maize. Therefore, even if Namibia were to feed their cattle with a very small potential share of GM maize, the meat should still be able to enter the EU market.[7]

GM Yeast and Vines in New Zealand

New Zealand wine is valued for its image of purity, and the wine industry in New Zealand has excluded the use of any GM ingredients. In 2003, the International Organization of Wine and Vine (OIV) formally adopted a position dissuading the use of biotechnology in commercial production of wine, until consumers demand it. Consequently, winemakers from Australia and New Zealand have decided that no GM vines or other GM ingredients will be used to produce wines until it is acceptable for consumers in their export markets. The international brands have all dissociated themselves from GM wines, so the potential pioneering of GM wines would irreversibly change the pioneering country's image, and could compromise the future of the wine industry.

GM Imports in Qatar and the United Arabic Emirates (UAE)

Several news articles in Qatar reported the campaign by an anti-GM organization calling for the labeling of GM food based on the fear that rice imported from India could be GM (e.g., Landais 2007). As noted above, India conducted confined field trials of GM rice, but has not approved the commercialization of

[5] According to Mendelsohn (2006), 73% of meat exports to Europe go to the UK, while the remaining 17% is purchased by buyers in Norway.

[6] Even if potentially inconsistent with its obligations under the World Trade Organization.

[7] In fact, Argentina's larger traders have even said that they never had any trouble exporting GM-fed cattle to the EU (ABC 2006).

any GM rice variety to date. A similar fear-mongering campaign against rice imports from India was reported in the United Arabic Emirates (AME Info 2007).

General GM Policies in Russia

Russia has made clear statements about its willingness to avoid GM introduction, in an effort to reduce the risk of trade loss with the EU. The city of Moscow even implemented a "voluntary" GM-free policy, possibly mimicking those seen in selected cities, regions and countries of the EU. These moves do not seem to be based on genuine consumer demand (Kilner 2007).

Various GM Products in South Africa

South Africa is the only country with commercialized GM crops. In the last few years, GM cotton, maize, and soybeans have all been grown in South Africa (Gruère and Sengupta 2008). Reports have noted that South African traders have had difficulty exporting GM maize because the importers fear retaliation from EU buyers (e.g., like in the case of beef exports from Namibia or food aid to Zambia). Meat and dairy exporters have also expressed concerns that their products would not reach the EU if the animals are fed GM maize, despite the fact that most cattle in the EU are fed GM soybeans.

Other products have also been the subject of market- and trade-related concerns. A GM potato developed in a public-private partnership faced several concerns from the industry, despite being designed for small-scale non-commercial use (Kahn 2008). Opposing NGOs say that introduction of GM potatoes will result in trade losses (Africa News Network 2008).The Pick-N'Pay supermarket chain was reported to have stated that it would not sell any GM potato. Verification with a representative, however, indicated that the media reports appear to have been exaggerated; the company only said that it would not sell the potato until it was approved by the relevant regulatory authorities (Gruère and Sengupta 2008). Nonetheless, this case made noise, and others in the food and restaurant industries reported concerns regarding this GM potato. In a recent decision, the wine industry of South Africa also decided to reject the use of GM yeast and pushed the GMO executive council to reject such an application, in an effort to remain GM-free and keep all markets open (Benton 2008).

GM Tobacco in Tanzania

A Tanzanian scientist reported in 2005 that efforts to develop a GM tobacco were stopped due to the fear of tobacco export losses. When investigating this, we found that Vector Tobacco, a US company, had conducted field trials for a low-nicotine GM tobacco. In 2002-2003, GM tobacco was grown on 60-100 acres. However, the company actually went bankrupt, and backers realized that the demand for low-nicotine tobacco was not sufficient to guarantee a return on additional investment. Therefore, even if the rumored threat reached the ears of decision makers, it does not appear to have been a primary cause of the project's cessation.

GM Papaya and Rice in Thailand

Papaya is one of Thailand's primary agricultural exports, comprising of 25% of the country's exports and earning US $78.69 million in 2005. The major importers of Thai papaya are the US, Japan and Canada (Greenpeace 2006). Research on papaya has been carried out since the mid-1990s, in an effort to develop a variety tolerant to the papaya ringspot virus. In 2004, there were reports of possible gene escape out of GM papaya field trials to conventional papaya growers (Bangkok Post 2006b). This had an immediate effect on papaya exports from Thailand. A number of supermarkets rejected papaya shipments, including Tesco, Carrefour and a prominent German food distributor (Sukin and Sirisunthorn 2004). Some traders even called for the destruction of potentially GM papaya trees. At least ten fruit exporters complained that their processed papaya exports to various European countries were delayed or rejected due to fears of "contamination" (Samabuddhi 2004). An executive of Sun Sweet Co. was quoted as saying that exporters

of sweet corn, baby corn, tomatoes, and other food products would be eventually affected, adding that it would be better if the Thai Department of Agriculture called off the ongoing field trial of GM papaya and moved to clarify the government policy on GMOs. These pressures encouraged the government to institute a temporary ban on field testing GM crops. Since then, organic exporter groups have supported prolongation of the ban. In 2007, the Thai organic agricultural association, which groups exporters of various organic products, publicly opposed the removal of the ban on GM crop field trials, arguing that, "*Allowing field testing of GM crops is wrong and would ruin the export of Thai farm products to major European and Japanese markets*" (Eyre 2007).

The case of rice differs, as the restriction of GM rice in Thailand was motivated by preemptive rather than reactive considerations. In 2006, at a time when US rice was banned from many countries for the risk of having GM traces, Thai rice exporters announced their decision to ban the use of any GM rice in order to gain competitive shares and access to the EU market. This decision encouraged the government to stay out of research and development on GM rice, as witnessed by the adoption of a GM-free clause in the Thailand 2007-2011 rice strategic plan (Thai News Agency 2008). The exporters have also been keen to ensure that no GM rice is used in Thailand. In March 2008, the Foreign Trade Department Director-General declared that, contrary to a published report, no exported Thai jasmine rice was GM. In June 2008, the Thai Rice Farmers Association asked the Thai government to test suspect second-season rice allegedly produced by a large investment group potentially representing foreign interests, for fear that it could be GM and therefore affect Thai rice exports (Pungpao 2008).

Organic Cotton in Uganda

In Uganda, Bt cotton trials were initially not approved, reportedly at least in part because of trade-related issues and concerns regarding access to the EU market. The Cotton Development Organization (CDO), which grows organic cotton, vocally opposed Bt cotton trials and use, arguing that it may adversely affect cotton premiums abroad. However, Uganda recently moved toward approving Bt cotton, conditional on an *ex-ante* assessment of the economic effects it could have on the industry.

GM Rice and Sugarbeets in the United States

US rice exporters opposed the approval of herbicide-tolerant varieties due to fear of losing exports (Pollak, 2007). Despite its expected benefits (Bond, Carter and Farzin 2005), GM rice was particularly opposed by California-based exporters, who believed it could compromise access to the highly requiring Japanese market.

Herbicide-resistant GM sugarbeets were not released initially due to opposition from major buying companies (e.g., Mars and Hershey's) that feared consumer resistance and preferred to remain GM-free (Pollack 2007).[8] However, the situation changed in 2008 with many multi-national companies operating in the US becoming more positive about the use of GM ingredients in their food products. American Crystal Sugar, the largest processor of sugarbeets, feels that consumers have now come to accept GM sugar. Similar sentiments were voiced by a spokeswoman Kellogg's, who mentioned that they have not had any issues from GM sugar. Neither case had any direct implication on policies, but they do demonstrate the ability of private standards by major food companies to affect the commercial release of GM technologies, even in a country that does not require the labeling of GM products.

GM Rice in Vietnam

In 2006, the Vietnam Food Association and Thai rice exporters announced their decision to ban the use of any GM rice, in order to maintain access to the EU and Japanese markets (Wipatayotin 2006). While the decision of these semi-public entities was not a public policy, it prompted the two countries to avoid

[8] The same type of GM sugarbeet has long been debated in Europe, with support among economists, a number of agronomists, and beet growers, but opposition by sugar companies that fear consumer backlash.

research and approval of future GM rice trials. In 2007, the Vietnamese government reportedly received a warning letter from a major rice importer in France that commercialization of GM rice would have negative impacts on rice exports to the EU.

Food Aid and Exports in Zambia

During the Zambian famine of 2001-02, Zambian officials told US officials that they were concerned that accepting food aid potentially containing GM maize could jeopardize their exports of green beans to the EU. Several outside observers confirmed that Zambia's rejection of potentially GM-containing food aid during the crisis (and GM maize imports thereafter) was partly due to fears of losing exports to the EU (Cauvin 2002, Bergstrøm 2007). According to Paarlberg (2008, p 135), during the crisis in 2002, executives of Agriflora, a Zambian trading company that exported certified organic vegetables to the UK, received a phone call from a British supermarket warning that their exports of baby corn would be in jeopardy if GM food aid was accepted. In response to that, Agriflora asked Zambian President Levy Mwanasa to reject the food aid. The Zambian government rejected the GM food aid and later noted that exports of organic baby corn and honey in particular, and organic food in general, were potentially at risk (Government of Zambia 2002). Bergstrøm (2007) also notes that the potential introduction of GM maize in Zambia would have triggered the risk of restricting exports of beef to the EU, Japan and other GM-regulating nations. The Zambian National Farmers Union, a group dominated by export-oriented commercial farmers who sell baby corn, honey and tobacco to the EU, has supported the Zambian GMO ban of 2002 (Robinson 2003, cited in Paarlberg 2008, p 136).

GM Maize Imports in Zimbabwe

Zimbabwe reportedly rejected GM food aid in 2002 in part because it feared that accepting GM shipments might cause the country to lose its meat markets in the EU. We also found a possible- although unconfirmed- link between Zimbabwe's opposition to GM maize import/use and fears regarding agricultural and horticultural exports (including green beans) to the EU at a time when Zimbabwe was a significant agricultural exporter.

4. DISENTANGLING IRRATIONAL FEARS FROM REAL COMMERCIAL RISKS

Characterization of Cases: From Linkages to Risk Categories

Our global review of cases helps us evaluate the conceptual framework proposed in section 3 and shown in Figure 1. In particular, we find that each of the five identified actors (supermarkets in importing countries, traders, organic producers, NGOs and local supermarkets) may have had partial influences on decision making in at least one of the cases identified herein. However, it is clear that the role, importance, and scope of influence of each actor largely vary across cases. We do not find conclusive evidence that importing companies interact directly with policy makers, although they may take positions that indirectly affect policy making. Instead, most cases show the prominent role of local trader groups. Organic groups and NGOs appear to play similar roles, sharing views and sometimes campaigns in opposition of GM products (often based on commercial arguments). Lastly, local supermarkets or food companies do not seem to play a significant role in developing countries, but they can be influential in developed countries with labeling policies.

While only some cases reveal a causal relationship between the identified stakeholders and visible policy decisions, most provide evidence that decisions are potentially influenced by claimed commercial risks related to private GM-free policies. A few cases involve lobbying actions by trade interest groups against a legislative or parliamentary decision (e.g., the biosafety bill in Kenya, labeling regulations in the Middle-East and India), where several other situations appear to have influenced discrete regulatory decisions, such as restrictions on confined field trials, banning of GM imports, or the acceptance/rejection of food aid potentially containing GM products.

The type of standards and the targeted products also vary. In some cases, GM-free private standards appear to encourage decisions on products targeted by those standards. However, we also find cases where the product under consideration by policy makers is not fully related to the products being exported to GM-free markets. We find one case where the private standard exceeds the regular quality standard of the importing market (GM-free fed meat from Namibia), and another case where an official standard is set for a product that is completely GM-free (Kenyan tea).

Next, we separate the cases based on the validity or nature of the alleged commercial risks. More specifically, we identify three types of commercial risks: unproven risks, potential risks, and real risks.[9] Cases associated with unproven risks include real but manageable risks (e.g., GM potatoes in Egypt) and irrational or nonexistent risks (e.g., GM tea, maize, and cotton in Kenya). Cases facing potential risks have the potential for export loss (present or future), and are more generally associated with uncertainty regarding the presence or scope of the risk and/or its manageability. This second category includes cases with risks that require more information for their classification as real or unproven. Lastly, cases with real risk are those wherein a particular industry has a GM-sensitive market and would actually stand to lose part or all of this market upon adoption of GM crops or products. This group includes large exporters that are likely to face important losses if they do not consider commercial risks. Table 3 divides the cases according to these categories.

Interestingly, Table 3 shows that most African cases are included in the first category, while most Asian or developed-country cases fall in the two other categories. This discrepancy across regions underlines the differences in situations; many African decision makers on biotechnology are not knowledgeable with regard to market-related issues. Furthermore, they tend to be more dependent on (but also more influenced by) export considerations, especially as related to their market access to Western Europe.

[9] In this categorization, the term "risk" refers both to the presence of a possible economic loss (defined as exposure*hazard) in a classical sense, but also the degree to which the risk is manageable. For instance, facing a real risk implies that there is no easy way to manage the risk; conversely, an unproven risk may represent real but completely manageable risk.

Table 3. Categorization of selected cases by type of risk

Risk category	Cases
Unproven risks	Australia (GM canola), Egypt (GM potatoes), Malawi (GM maize/cotton), Indonesia (GM cocoa), Kenya (GM maize/cotton), Kenya (GM tea), Namibia (GM maize), Qatar & UAE (GM rice), Russia (GM food), Tanzania (GM tobacco), Zambia (GM maize), Zimbabwe (GM maize),
Potential risks	Australia (GM wheat), Brazil (GM soybeans), Canada & US (GM wheat), India (GM rice), Uganda (GM cotton), South Africa (GM potato), Thailand (GM papaya), US (GM sugarbeet).
Real risks	New Zealand (GM yeast), Thailand and Vietnam (GM rice), US (GM rice).

Source: Authors.

More generally, the usefulness of this categorization is found in its application, whereby the type of risk determines the relevance of the issue and its policy response. As such, this division can be interpreted as a "traffic light": cases based on unproven risks require no particular attention (green light), potential risk cases require additional information (yellow light), and real risk cases require responses (red light). We will now focus on identifying factors that can explain why some policy decisions are made based on unproven risks, and use these factors to help separate out real risk cases from the rest.

From Unproven Risks to Political Influence: Two Critical Presumptions

We find that virtually all reported cases in the unproven risk category, as well as many cases in the potential risk category, are based on two basic underlying assumptions. The first assumption is that *segregation of GM crops from non-GM crops is infeasible*. The conflict among animal feed sub-sectors, the insistence of organic producers to avoid any GM approval, and even the fear of losing export markets if any GM is approved, fails to hold if non-GM products can be segregated for export. Assuming that segregation is absolutely infeasible prompts the fear that the conventional products will cease to be produced if a GM variety is approved (or even tested). In fact, segregation is not always feasible or easy. However, it may be possible to segregate non-GM products when the exports are already subject to multiple quality and safety checks. Then, the issue becomes a question of who bears the cost. Several exporting countries use segregation systems and sell both GM and non-GM products. For example, the US, Brazil, South Africa, and Spain all produce, consume, and/or export both GM and non-GM products, while China segregates imported GM soybeans.

As part of an email conversation, a representative from Marks & Spencer, a major supermarket chain in the UK, noted that the company is willing to continue trading with a partner who develops or uses a GM product different from the one they purchase. Even if the technology is adopted for the same exported crop, the company would still consider maintaining a purchasing channel, on a case-by-case basis, after close inspection of the efficacy of the segregation process. This underlines the relatively open-mindedness of certain companies in facing the real-world marketing constraints of having both GM and non-GM markets, and may also suggest that in some cases, the traders (not the supermarkets) may actually be the ones most actively avoiding the introduction of GM products, in an effort to avoid having to implement segregation systems.

The second assumption which underlies the cases of private standards reported in this paper is the idea amongst traders in developing countries that *current markets in Europe (and Japan in some cases) are the only markets for exports*. It is true that these markets are largely opposed to GM products, meaning that (under this rationale) there is a very limited scope for trade if a country engages in GM products. However, a number of countries in Asia as well as some emerging markets in the Middle-East either do not discriminate between GM and non-GM products, or do not have the very high marketing standards of Europe for GM versus non-GM products. If African countries can successfully explore these

markets, they would not only expand their export base, but they would be able to strengthen their bargaining power with European buyers.

Although neither of these two assumptions is generally valid, they form the basis of the perceived (but in fact speculative or future) risks in most of the countries examined herein. There are only a few examples of countries finding alternatives to these traditional mindsets. South Africa successfully segregates between GM and non-GM maize for their exports to Zimbabwe and Namibia, with a certain portion of the cost being transmitted to the buyer. Also, South Africa, Kenya and some other countries have recently begun discussing the exploration of other, less GM-stringent markets in Asia and the Middle-East.

In addition to these two critical assumptions, we find that two other factors related to market imperfections are key in the diffusion of unproven commercial risks in developing countries: the presence of multiple information asymmetries and risk aversion among key actors having skewed perceptions of market power. We will explore these two issues in the next subsections.

The Role of Information Asymmetries

We find two types of information asymmetries that potentially affect our cases: those between the importer and local actors, and those between the policy makers and local or outside actors. Although both can result in confusion, misunderstandings, and bad decisions, we argue here that the second type of asymmetry can prove more damaging to the country involved.

Policy makers in developing countries looking to establish an export market in the EU often have access to only scattered information about the GM production statuses and national regulations governing the trade of GM products in these countries. This incomplete information feeds into the overwhelming belief that Europe is totally free of GM crops. This idea may be perpetuated by the failure of importers to acknowledge that several countries within Europe currently grow GM crops for animal feed. Information asymmetry is also propagated through the fact that while the importing-country supermarkets have comprehensive information about the various laws in the developing countries they source from, the exporting countries largely rely on information provided to them by their importers. These information asymmetries often work in favor of the European importers, who may seek to coerce the developing-country exporter to oppose legislation that might bring GM products into the country.

In support of this, we note that during our meetings, a number of exporters and many NGO representatives (who were vehemently in favor of remaining GM-free) were not aware that the EU was using GM crops and importing GM products, or that it had a threshold level of 0.9% for accidental co-mingling of GM content in non-GM or even organic products. Many of them also ignored the fact that most of the meat sold in the EU is fed with GM-containing feeds. For example, a representative of the Kenya Biodiversity Coalition said in the press that Kenya should not promote GMO, knowing that the "*EU does not even allow cattle to eat [GM products]*" (The Nation 2007). This is completely untrue in view of the millions of tons of GM soybeans that are imported by the EU from Latin American countries for use in animal feed.

We also met with traders who were aware of the EU regulatory system and knew that Europe was not entirely GM-free; however, these traders often said that they would still maintain the GM-free status of their exports in order to satisfy the buyers. Therefore, even if information asymmetries play a significant role in tilting trade terms in favor of the European buyers, this effect should not be generalized. In fact, it is not clear that the actors would behave differently if these asymmetries were removed. Surely, better information would provide additional bargaining power for suppliers in developing countries, allowing them to plead for equitable treatment during the imposition of private standards for exports. It could also encourage them to refine their arguments. However, increased information would not necessarily result in a change of action if exporters are still subject to GM-free standards.

The informational advantage of special interest groups over policy makers may be more consequential. In many countries, governmental agents and members of commissions in charge of

biosafety and biotechnology policies tend to have at least a basic knowledge of (if not an expertise in) the scientific issues related to the use of transgenic crops and/or their possible consequences for health and ecosystems. In some biosafety systems, agriculture specialists are included in decision making; however, most systems rely on specialists in the Ministry of Environment or the Ministry of Science and Technology (or their equivalents). In any case, most key decision makers on agricultural biotechnology are scientists rather than specialists in agricultural markets or trade. As a consequence, these commissions tend to have limited knowledge about markets and trade-related issues. For instance, it is striking that country representatives at meetings of the Biosafety Protocol (essentially a trade agreement on the movements of GM organisms) are largely uninterested in and unaware of the trade-related consequences of their regulatory decisions. With this patent lack of knowledge, a rumor on trade risk can be perceived as a fact, and decisions may be influenced by information campaigns led by advocacy groups focusing on trade-related issues -that are often based on "cherry-picked" bibliographies- can be very influential on decisions (Macan-Markar 2008). In addition, recognition of their own relative ignorance can make these decision makers more open to any expertise, even that coming from groups with clear political goals. Although they might be skeptical about a statement on commercial risks, decision makers may prefer to take a precautionary stance, thinking that no risk is better than some risk. This leads to the second important factor- risk aversion.

Market Power and Risk Aversion

Risk aversion can be defined in several ways. In our context, we define it as the behavior of specific economic agents who, when considering options on an action with uncertain outcomes, prefer to minimize risk even if such action goes against rational expectations and will likely result in welfare (or opportunity) losses.

In reviewing our cases, we find evidence that certain traders, particularly in developing countries, may be risk-averse in their relationship with buyers, blindly complying with buyers' requirements, often despite the costs these standards may imply. The perceived or actual market power of buyers accentuates this phenomenon. In our interactions with the various exporters in Kenya, Namibia and South Africa, we clearly find that exporters see themselves as small players in a big market dominated by the large buyers (e.g., the supermarket chains of Europe). Because they perceive themselves as facing a monopsony, traders prefer to obey any type of requirement (even absurd ones). Our discussions in Kenya showed that many traders actually acknowledge the possibility of contacting other buyers if standards go too far. This could be a sensible strategy, especially if these traders represent a significant share of the global supply, as in the case of Kenyan tea. However, the traders also think they could lose everything to a hypothetical competitor if they reject a demand of the importer, and prefer to avoid this risk. As a consequence, their risk-averse behavior results in the adoption of any requested production standards, even those that exceed any production standard in the targeted developed country.

Risk aversion can also be found among policy makers. Although we do not have specific factual evidence for this, a number of elements lead us to believe that some decision makers have demonstrated risk-averse behavior in avoiding or delaying a decision based on limited or sometimes even nonexistent commercial risks, in an effort to avoid any potential consequence. Several studies have sought to quantify how much export of non-GM crops would be lost by selected African countries if they were to adopt GM crops and lose their agricultural exports to the EU (Paarlberg 2006; Nielson et al. 2003). Even though these studies show that the projected loss would comprise only a small fraction of their total export trade, in-country sentiment seems to suggest otherwise. Within the export communities in these countries, losing a niche market is considered to have serious consequences, irrespective of the actual value of lost trade (even if it is completely negligible in value). This may be due to the perception, at least in certain African countries, that exports to Europe are extremely important. In some cases this goes against reason, with policy makers believing that it is better to keep a small volume of high-value exports to the stagnant EU food sector than to explore a larger export volume with more diverse export destinations in the dynamic food markets of Asia and the Middle-East. Coupling this risk-aversion tendency with an

ignorance of market conditions among policy makers means that any non-representative export or anti-GM group could successfully lobby and alter a biosafety or biotechnology decision.

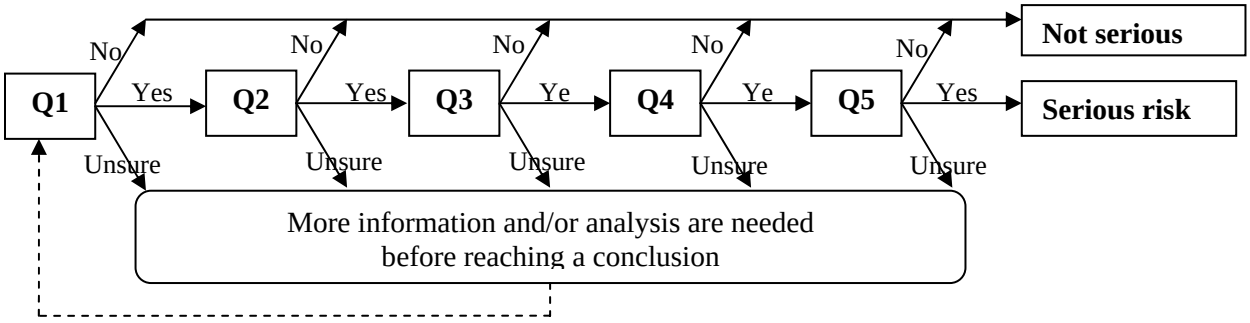
The Egyptian government's decision to discontinue the GM potato project may be an example of this type of behavior. Special interest groups, possibly traders, likely spread fears about the possible consequences that commercialization of GM potatoes could have on potato exports, even if the GM potato varieties would not be used by exporters and therefore would be very unlikely to pose a serious problem.

From Critical Factors to Practical Decision Making: A Suggested Framework

Even if natural risk aversion is difficult to reverse, we think that more and better information on real commercial risks could help policy makers arrive at better decisions for the benefit of their countries. For a benevolent and rational policy maker faced with a decision that has uncertain trade related outcomes, it would be very helpful to understand the nature, likelihood and amplitude of the risks. In this section, we propose a set of necessary questions to help decision makers determine whether they should make a direct yes/no decision, or require a more comprehensive assessment of the actual commercial risks and possible management strategies.

Let us suppose that a decision has to be made on a GM product application (for confined use, field trial, planting, or import) and stakeholders are arguing that this decision would result in a significant risk of export loss. Table 4 lists five critical questions (italicized and numbered from Q1 to Q5) that should be answered to help clarify the nature, likelihood (exposure) and amplitude (hazard rate) of the claimed risk, if it can be avoided, and if avoiding this risk is a good or bad decision. These five questions, all answerable with a YES or NO, are designed to provide guidance to policymakers; they correspond to five necessary but not sufficient conditions for the presence of a real or serious commercial risk. Figure 2 shows the suggested procedure that policy makers should follow to reach a decision. The process starts with question Q1 (on the left hand side of Figure 2) and then follows through to a clear determination of whether the risk is serious or not (right hand side of Figure 2).

Figure 2. From the five critical questions to risk level determination



As shown in this figure, if the unambiguous response to all questions is YES, then the commercial risk is serious and could justify a rejection of the application. If, however, the answer to one of the five questions is a clear NO, the risk is not serious enough to require a negative decision in itself and, everything else being equal, the debate should be pursued. If one or more answers to these questions are ambiguous or undetermined, policy makers should ask for more information from the claimant or even command a more complete analysis of the situation.

Table 4 also provides more detailed sub-questions and identifies the information needed to provide clear answers to the five questions. Under Q1, we list basic questions that can be used to help separate cases based on hearsay or rumors from actual arguable cases of potential risks. If no information can be obtained under these bullets, the case is not worth considering. Under Q2, a few clarifying

questions are designed to help reject possible ad-hoc cases, such as the risk of Bt cotton field trials affecting the export of vegetables. The sub-questions under Q3 aim to gather quantitative evidence of potential risks; without such evidence, any party could exaggerate the actual exports in question. The fourth category of questions (under Q4) directly addresses the two misleading presumptions present in virtually all unproven cases: the infeasibility of segregation and the lack of other market opportunities. The last set of questions (under Q5) is intended to help reduce the likelihood of risk-averse behavior by reminding decision makers to compare the risks and expected benefits of their decision.

Table 4. Critical questions and detailed elements required for decision making

Q1. Gathering basic information: Is the alleged risk substantiated?
Identify the claimant, the claim, the product(s) under alleged commercial risk, and the targeted foreign country.
Obtain basic information about the GM import regulations and production practices in the targeted country.
Q2. Determining the degree of exposure: Are export losses likely with the decision?
Is the product targeted by the decision biologically or economically related to the product under presumed risk of export loss?
Is the GM-free requirement voluntary or based on a country regulation? • If voluntary, is there substantial evidence of this requirement? • If mandatory, is there evidence that the target export country actually bans GM?
Is the product under decision currently exported to the target country?
Are there other examples of cases where such decision has resulted in export losses?
Does the decision directly compromise exports? Or is it only a hypothetical possibility?
Q3. Determining the hazard rate: Are presumed export losses non-negligible for the country?
What is the volume and value of exports of the targeted product?
What is the share of these exports going to the sensitive country?
Is all the industry at risk or just a portion of it? What share of the industry is concerned?
Q4. Considering plausible management solutions: *Is the risk unavoidable?*
Are there other buyers for this product on the same market?
If so, would these alternative buyers buy the product even with a decision?
Are there other markets where the product could be sold?
Is non-GM segregation feasible with the decision, at least for export?
Q5. Consequence of renouncing to the decision: *Is the risk greater than the benefits?*
What are the benefits of going ahead with the decision?
What are the potential costs of rejecting the decision?
Would other actors in the industry benefit from the decision? If so how?

Source: Authors

Although this simplified and rational procedure may not include all possible questions about potential commercial risks, it can be used to effectively reject irrational or unsubstantiated cases, and should therefore bar unjustifiable decisions based on trade-related considerations.

5. CONCLUSION

Despite the rapid expansion of genetically modified (GM) crops over the past twelve years, these crops have been rejected by a number of countries. Apart from developed countries that have restricted the import, marketing, and use of GM products, many developing countries have stayed out of the debate, preferring to avoid the use of GM products for a number of reasons, including the risk of losing exports to countries with marketing restrictions and consumer opposition against GM products. At the same time, studies on the trade and economic implications of adopting GM crops in developing countries show that in many cases, these presumed commercial risks are absent or limited, and any export loss would be much smaller than the gains of adopting potentially productivity-enhancing GM crop technologies.

In this paper, we investigate the discrepancy between real and perceived commercial risks for the use of GM products by diving into the political economy of GM food and international trade. We focus particularly on the effects of GM-free private standards set up by food companies in Europe and other food-importing countries on biotechnology and biosafety policy decisions in exporting developing countries. To do so, we review cases reported in news articles, publications and technical reports, or identified through interviews with international biotech specialists. We complement this review by analyzing several case studies based on visits to Kenya, Namibia and South Africa, undertaken in June 2007.

Overall, we found 31 cases where GM-free private standards may have interacted directly or indirectly with biosafety or biotechnology policy decisions in 21 countries. Because many of the cases rely on unpublicized lobbying activities, and because there is a general lack of comprehensive evidence, many cases do not provide straightforward evidence of causality links between importers/traders and policy decisions. However, by assembling the various pieces of evidence, we are able to obtain a relatively consistent framework of observed influential links among major actors at the confluence of policy makers and the supply chain.

We find that although GM-free private standards and policies are set up by importing food companies (especially supermarkets in Europe), there is insufficient evidence to support the *direct* involvement of the companies in policy processes in African or Asian countries. However, these actors *indirectly* influence policy making via their local traders, who face the possibility of exclusion if they do not comply with the companies' standards. Apart from the traders and associated producer groups in the exporting countries, organic producers and anti-GM nongovernmental organizations use the fear of export losses to support their case. Local supermarkets, which are the fifth group of actors we discuss herein, tend to have a very limited role in the debates in developing countries, even if they may be influential in exporting developed countries.

We differentiate three types of risks among cases: real (or legitimate) commercial risks, potential (or uncertain) risks, and unproven (or irrational) risks. The separation of real risks from the two other categories is necessary to avoid misguided decisions. By comparing cases, we identify two critical yet misleading presumptions perpetuated by interest groups seeking to support the latter two categories of risk: the infeasibility of non-GM (or organic) product segregation, and the lack of buyers or market opportunities other than the one requiring GM-free products. We also find that information asymmetries and risk-averse behaviors related to market perceptions play a role in inserting the mostly-unfounded export concerns into biosafety or biotechnology policy decisions. The results of our analysis are used to suggest a simple framework, based on five critical questions, to aid decision makers who are facing pressure to reject applications for GM crop testing, application, consumption or use, for fear of alleged export losses.

The prominence of private standards in food trade and their capacity to dictate what products can access developed countries is neither new nor specific to products derived from modern agricultural biotechnology. Similarly, the observed political power of exporting producers to influence domestic policy decisions to satisfy their economic self-interest is also not new or GM-specific. However, the combination of these two phenomena in the complex, often poorly-informed, and highly-politicized

debate around the use of GM products makes this situation particularly unique and the source of unexpected and often seemingly irrational decisions. Rejecting a specific trial of an agricultural technology can be quite detrimental to a country in the medium- to long-run, especially if this technology addresses critical agronomic constraints and proves successful in other countries. Rejecting food aid that may contain GM elements for fear of export losses in a completely different and unrelated crop is a more worrisome decision that can directly affect the lives of at-risk individuals. In both cases, we feel that the use of basic information and the questions proposed herein can provide guidance to policymakers, with the hope of avoiding regrettable and costly decisions.

While commercial risks are a legitimate concern for countries that largely depend on agriculture, they still differ considerably from the health and environmental risks potentially associated with the use of GM products, and should therefore be managed differently. Among other things, commercial risks do not face the same direct consequences, they are not as uncertain, and they are not irreversible. With this in mind, a "precautionary approach" to managing commercial risk is largely irrelevant. Commercial risks can be managed carefully, through gathering information and accounting for market uncertainties rather than prescribing a simple blanket ban on any decision that could *hypothetically* have long-term effects on *possible* future trade. Large uncertainties regarding the commercial consequences of a specific decision can most often be addressed by gathering more and better market information.

Our global review of evidence has also shown the prominence of the European Union and its companies as leaders in the international governance of GM food, as manifested by their preference for GM-free products. However, several recent developments suggest that European opposition of GM products and their regulatory approach to risk may be bound to change. Although European consumers remain largely opposed to GM foods, politicians and food companies are starting to become more aware of the effects of the European opposition to GM products. European politicians have begun questioning the justification of European consumer preferences in view of their likely implications on African technology choices. For instance, the European Commission has become keen on adopting a positive tolerance level on unapproved GM products (European Commission 2007), and in 2007, the Danish Environment Minister voiced her concern that Europe may have had a negative effect on developing countries by imposing their standards on regulating GMOs (Friends of Europe 2007). In June 2008, the government of the United Kingdom openly questioned the national opposition to the use of GM crops, particularly with regard to the food price crisis (Crowley 2008; Grice and Mock 2008). In June 2008, Nestlé's chairman, Peter Brabeck, took a public position in favor of GM noting that strict EU regulations were hurting African farmers (Devez 2008; Forbes 2008; Minder et al. 2008).

The food price crisis has also altered the will of certain companies to avoid GM ingredients. In 2008, for the first time, a number of importing food companies in South Korea and Japan, faced with the high prices of non-GM corn (e.g., $450/ton for non-GM corn in Korea, when regular corn could be purchased at $350/ton), decided to import GM corn for highly-processed products (Farms.com 2008, Moon 2008, Pollack 2008). These countries may also be considering importing GM soybeans for food products (Nakashini 2008, Maeda 2008). Products based on these GM imports do not really contain detectable traces of GM, and are therefore exempt from labeling policies; however, the abandonment of GM-free private standards by these companies signals an economically-driven change of purchasing policies. This change could be reversed if more producers in exporting nations decide to return to non-GM standards. However, the current market outlook suggests that exporting farmers may prefer to use potentially more productive GM crops to produce and sell more outputs at such a high price. It is yet unclear whether these private policy changes lead to a broader disappearance of GM-free private standards, and possibly to a change of mindset. Many consumers in these countries have sufficient income and willingness to pay to avoid GM products, meaning that such change may only be seen in the long run.

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