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34. Market Segmentation for Genetically Modified Corn and Soybean Exports

Carrie J. Cunningham and Laurian J. Unnevehr

Food Marketing Policy Center
Department of Agricultural and Resource Economics
University of Connecticut
and
Department of Resource Economics
University of Massachusetts, Amherst

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Carrie J. Cunningham

Laurian J. Unnevehr

Department of Agricultural and Consumer Economics
University of Illinois

Chapter 34

Market Segmentation for Genetically Modified Corn and Soybean Exports

Carrie J. Cunningham and Laurian J. Unnevehr[1]

The European Union and the United States have established one of the world's largest and strongest international trade relationships. Trade in agriculture has been a very important, yet difficult, part of this trade relationship. The U.S. and the EU have had many trade disputes in the past over the high level of protection for EU agriculture and the use of export subsidies. Following the 1994 GATT agreement, which limits supports and subsidies, these traditional disputes have diminished in importance. The focus of more recent disputes has been the safety of agricultural inputs, and differing approaches to regulating risks from these inputs. The most recent dispute concerns the use and trade of Genetically Modified Organisms (GMOs)[2].

Genetically modified crops were introduced to the international marketplace in the late 1980's and early 1990's. The genetically engineered seeds of interest to this paper, namely Bt Corn and Roundup Ready Soybeans, are designed to provide resistance to the European Corn Borer and Roundup Ready™ brand herbicide, respectively. This resistance carries with it a reduction in input costs, possible yield improvements, reduced need for tillage, and increased flexibility in crop rotations (Simone 1998). These products have been widely adopted in the Midwestern United States. In 1998, ERS reported that there were 37.5 million acres of genetically modified corn and 44.2 million acres of genetically modified soybeans planted in the United States (ERS/USDA, 1999).

The growing use of these crops has brought about changes in regulation to address their special characteristics and risks. Australia, Canada, USA, Mexico, Japan, and the European Union all regulate GMOs in specific ways that differ from regulation of traditional crops and inputs. Debates over consumer food safety, environmental concerns, and ethical obligations are the motivation for these policies. Specific concerns include: (Buckwell, 1999)

1. ethical objection to the transfer of genetic material between species that could not occur naturally;
2. perception amongst some citizens that the deliberate, irreversible, (sic) release of artificially created genotypes of food crops into the environment should only be made after sufficient consideration of the long-run effects on human health and the environment;
3. specific concerns that adverse impacts on the environment may arise through possible out-breeding of GM crops, weeds and organisms. There are also concerns that GM technology may bring about further reduction in bio-

diversity through losses of beneficial plants, insects, and the creatures that depend on them.

4. concern about the long term safety of diets containing GMOs, which may differ chemically from traditional food crops.

As of August 1999, the European Union is the only regulatory body which requires food product labels that specify the presence of GMOs, and some European countries are not allowing the import or use of particular GMOs. Other countries such as Australia and Japan have instituted steps toward regulation of GMOs. As we discuss below, the European public expresses the most trust in consumer and environmental groups. Trust in government and industry is much lower than in the U.S. (Hoban, 1998.) Almost immediately after the introduction of genetically modified crops, several European consumers expressed discontent with the new products. By October of 1991, the member states of the European Community were required to comply with Directive 90/220/EC which required notification of a genetically modified organism (GMO) being placed into the market. Initially environmental concerns about GMOs motivated this policy, but the issues of safety and ethics later emerged as important. Because of these latter concerns, the original Directive was amended to require labeling of all products which may contain GMOs, so that consumers could make an informed choice in the marketplace.

Both the policies and the consumer concerns in the EU lead to a demand for certified non-GMO products. The export market in the U.S. is in the process of responding to this emerging segmentation in export demand between markets that accept GMOs and markets that do not accept them. The purpose of this paper is to examine this market segmentation and its economic consequences. We begin by reviewing EU policy and how it leads to segmentation. Next, we discuss the response of the Midwestern grain market. Last, we will discuss our conclusions and the future of GMOs in European Union - US trade.

European Union Policy for Genetically Modified Corn and Soybeans

Before examining further the two specific pieces of legislation that deal directly with genetically modified crops, it is useful to look at past EU policy related to biosafety issues. The bovine spongiform ecephalopathy (BSE) scare was a major issue in the late 1980's and 1990's, and it influences policies that are being instituted to regulate GMOs. The British Ministry of Agriculture, Fisheries and Food is widely thought to have underestimated the transmissability of BSE in its efforts to help the beef industry and prevent public panic (Jasanoff, 1998). The effect of this ban can still be seen in consumer behavior in the European Union today(Hoban, 1998). Consumers were ill-informed and outraged when the full extent of disease hazard became known. Another very recent issue that will have an effect on the trust of European consumers in food safety is the Dioxin scare that was unveiled in Belgium in June 1999. The carcinogen Dioxin was found in several food and animal products, and not caught until several months after it had entered the food chain. Once again, consumers were misinformed and continue to

put less and less trust in government monitoring institutions. Therefore, they see GMOs as another potentially dangerous threat to their health and to the information available to them as consumers. In other words, the presence of GMO crops in food products constitutes an unknown and unfamiliar hazard, which carries a high outrage factor.

The German policy of the "precautionary principle" is also worthwhile to understand, as it is now the backbone of most European environmental and agricultural policy (Jasanoff, 1998). The main idea of this policy is that damage should be avoided in advance, which forces a duty of care on policymakers, and emphasizes the need for prevention, rather than allowing a risk and incurring the costs of mitigating any failures. The explicit German hostility towards GMOs and biotechnology can be linked to the Nazi era, whose memory leads consumers to a fear of uncontrolled genetic experimentation and state-sponsored science (Jasanoff, 1998). European consumers have much less faith in their governments and scientific establishments because of past events that were detrimental to consumer health, environmental stability and moral well-being.

The two major laws that the European Union has established to address issues relating to GMOs are Council Directive 90/220/EEC and Regulation No. 259/97. The first law, Directive 90/220/EEC, concerns market placement of GMO products described as raw materials. The second, Regulation No. 259/97, makes labeling of any product containing GMOs, or that may otherwise be considered a 'novel' food, mandatory throughout the European Union. Both of these laws have become non-tariff trade barriers for the United States by limiting market access and/or imposing added costs to grain exports to the European Union.

The main objective of Council Directive 90/220/EEC was to approximate the laws of the various member states of the European Union regarding the placing of GMOs in the market that will subsequently be released into the environment (Stewart and Johanson 1998)[3]. Its main components were:

1. the requirement of notification to the authorities of the member states when an importer or manufacturer wished to put a GMO product on the market,
2. approved for use Bt-Maize manufactured by Ciba-Geigy, and
3. imposed provisional restrictions on GMOs if justifiable reasons could be presented for harm to human health or environment.

Although the Commission approved the use of one Bt-Maize seed, Austria and Luxembourg prohibited the use and sale of the product. The Commission is in the process of taking action against the two countries for refusing to abide by the Commission's decision for several months (Stewart and Johanson, 1998)[4]. France also expressed discontent with the decision, but later decided to conform with permitting placement on the market, but with stern labeling restrictions. The French delay to implement a decision to authorize the import of some varieties of Bt-Maize was the subject of a major trade dispute between the French and the US. The US claimed that the delay cost corn exporters some $300m in lost exports to the EU (Roberts 1998). Other disputes arose with Canadian and US canola and cotton exporters, who also grow GMOs.

It is useful to examine the importance of EU demand for US exports in order to put current changes in demand into perspective. The US exported a total of 41.7 million tons of corn in 1997, with only 1.6 million tons going to the EU. In 1998, only 0.3 million tons were shipped to the EU out of a total 41 million tons exported (FATUS online 1999). The decline in US exports can be attributed to countries such as France, Austria and Luxembourg prohibiting the import of genetically modified crops. In response, importers from these countries looked elsewhere for corn, and market share was transferred to places such as Argentina, Brazil and China.

Shortly after allowing Bt-maize onto European Union markets, the Commission amended Directive 90/220/EEC with Commission Directive 97/25/EC to require the labeling of products that contain or may contain GMOs (Stewart and Johanson, 1998)[5]. This amendment was generally more accepted throughout the member states and was agreeable to members of the Parliament, who are wary of biotechnology (Stewart and Johanson, 1998). The only major opposition to the directive and amendment came from the environmental group Greenpeace, who showed disappointment in the failure of the amendment to require segregation of GMO from non-GMO products (Stewart and Johanson)[6].

The Novel Food Regulation (Regulation (EC) No 258/97) was adopted in January 1997. The law further requires not only GMO's in the form of raw materials to be labeled, but all foods, processed and non-processed, which may contain GMO's to be labeled as such. At the time when EU officials began to develop this regulation, several member states such as France had already instituted such regulations. The law was written mostly as a response to the need for a common uniform law on novel foods throughout the European Union that would facilitate the functioning of the internal market (Stewart and Johanson, 1998). Much like the original Directive 90/220/EC, there must be prior notification to the individual member state when a GMO seed is marketed, including specific details on the method of labeling for resulting products. Two requirements in particular are, 1) labels must indicate whether characteristics of a food make it no longer equivalent to an existing food; and 2) the decision whether a food is not equivalent with an existing food, and thus novel shall be determined by a "scientific assessment" (Stewart and Johanson, 1998)[7]. The regulation amendment took effect immediately when passed by the European Commission, but a Directive is not in effect by each member country until it is adopted into law in that country. Each country may have their own set of guidelines concerning genetically modified organisms as long as they are not in conflict with the EC guidelines. Once a policy is established in one country, as in allowing a certain crop to be used, it must be accepted, or harmonised throughout the European Union. The country that approves the crop is then the national authority to which notification must be submitted.

Table 1 gives some of the policies individually instituted by each member state. The method by which each genetically modified material is placed onto the market is quite complicated. The first thing that must happen in order for a certain GMO to be either imported, planted or consumed is for a proposal to be submitted by the state to the European Commission that wishes to either import or plant it. The Commission then con-

siders the evidence for environmental, human and moral safety of the product. After it is found to be safe on all levels and all other proper precautions have been taken for labeling, etc., the member state is given authorization to plant or import the product. The member state is then responsible for authorizing all other member states to use this particular product. All conflicts concerning the product are also taken up with the individual member state which originally proposed its acceptance.

Table 2 outlines which products have and have not been accepted by the European Commission for import in the European Union, as well as by the decisions which have been made by the monitoring institutions in the United States, Japan, and Canada (Pioneer Hi-Bred International, Inc., 1999)[8]. The information in these two tables demonstrates the patchwork quilt of regulation in effect for different GMO varieties of the same crop across different European markets. Not all GMOs are excluded from all European markets for all uses. Instead, some varieties are acceptable in some markets for some uses. Presumably this means that European importers need information about varietal type when matching supplies to end use markets. Alternatively, the costs of such matching may mean that importers simply demand non-GMO crops as a way of ensuring that any imported grain can potentially meet any demand. The latter is more likely if European consumers are demanding non-GMO products in the marketplace, regardless of whether or not their country approves some GMO varieties for use. Nearly all of the major grocery suppliers in the United Kingdom, as well as many throughout Europe have made the decision to supply their stores with only non-GMO products. Sainsbury's and Tesco for example have joined forces with several other grocers in the UK to build a guaranteed GMO-free supply chain. This alliance as well as others that are similar throughout Europe have broadened the need for US response to non-GMO demand.

Market Segmentation Between GMOs and Conventional Crops

One way to examine the effects of EU policy on corn and soybean trade is to look at the United States' share of the EU market over the time period in which changes in policy are taking place. Obviously, agricultural markets are quite volatile and variation from year to year in production can be quite high due to weather, price and other factors. This can influence any observed changes in traded volumes or market shares. Nevertheless, U.S. corn exports to the EU have dropped sharply during the last few years, so that the EU market is now insignificant in total U.S. corn export demand. The U.S. exported a total of 41.7 million tons of corn in 1997, with only 1.6 million tons going to the EU. In 1998, only 0.3 million tons were shipped to the EU out of a total of 41 million tons exported (FATUS, 1999). The decline in U.S. exports can be attributed to countries such as France, Austria and Luxembourg prohibiting the import of genetically modified crops. In response, importers from these countries looked elsewhere for corn, and market share was transferred to places such as Argentina, Brazil and China. During the 1980's, the US held a fairly constant share of the market, supplying around 75 percent of EU corn import on average, but market share declined sharply in 1994, when GMOs were first introduced (FAO Agricultural Statistics, 1999).

TABLE 1 Summary of Marketing Notifications for Corn and Soybeans under Directive 90/220/EC

Date Submitted	National Authority	Description of GMO	Scope of Application	Date of Consent
6 Dec 1994	UK	Herbicide tolerant soybeans	Importation, storage and use for animal feeds and food. Not for cultivation.	7 May 1996
31 Mar 1995	France	Insect resistant and herbicide tolerant maize	Planting in EC and importation of grain	5 Feb 1997
12 Mar 1996	France	Insect resistant and herbicide tolerant maize	Planting, import, storage and processing of grain and maize for use in food, feed and industrial products	Vote not yet taken in regulatory committee.
12 May 1996	France	Insect resistant maize	EU planting, import storage, processing for use in feed, food and industrial products	Commission decision 22 April 1998. Consent not yet issued.
31 May 1996	France	Herbicide tolerant maize	Agricultural use, human and animal consumption	Decision in favor 18 March 1998. Consent not yet issued
3 June 1996	UK	Insect resistant and herbicide tolerant maize	Importation of grain only	Consent was expected in 1998
15 Dec 1997	UK	Herbicide tolerant maize	Importation for processing for use as animal feed and food ingredients. Not for cultivation.	Application not yet forwarded to the commission.

Source: Roberts, Michael. "Genetically Modified Foods: Opportunities and Challenges of the Biotechnology Revolution." Financial Times, London, 1998. Taken from the Department of the Environment, Transport and the Regions, Written Evidence to the Select Commitee on the European Communities Sub-committee D, 4 June 1998.

TABLE 2 Summary of Corn and Soybean Traits and Events which have been Approved in U.S., Japan, EU, and Canada

Corn		**Approved**			
Trait Owner Trait Name Trait Designation	**Corn Brands**	**U.S.**	**Japan**	**Europe (EU)**	**Canada**
Monsanto (Bt) "YieldGard" (Mon 810)	Pioneer DeKalb Cargill Golden Harvest Others	Yes	Yes	Yes	Yes
Pioneer (Bt, LL) (Mon 810/T25) 33Y11, 38B22, 34T14	Pioneer	Yes	Yes	No	Yes
"LibertyLink"(T25)	PioneerOthers	Yes	Yes	Yes	Yes
DeKalb/Monsanto RR Corn (GA21)	DeKalb	Yes	No	No	Yes
DeKalb "Bt-Xtra" (DBT 418)	DeKalb	Yes	No	No	Yes
DeKalb Glufosinate Tolerant (DLL25 (B16))	DeKalb	Yes	No	No	Yes
AgrEvo "StarLink" (Bt, LL) (Cry9c)	Garst Others	Yes	No	No	No
"LibertyLink" (T14)	Used by Holdens; growers must ask suppliers (no Pioneer)	Yes	Yes	No	Yes
Novartis/Ciba "Maximizer with Knockout" NatureGard (E176)	Novartis Ciba Mycogen	Yes	Yes	Yes	Yes
Novartis "YieldGard" (Bt, LL) (Bt 11)	Novartis	Yes	Yes	Yes	Yes

Soybeans		**Approved**			
Trait Owner Trait Name Trait Designation	**Soybean Brands**	**U.S.**	**Japan**	**Europe (EU)**	**Canada**
Monsanto (RR) "Roundup Ready" (40-3-2)	Pioneer® RR brand varieties with the "Roundup Ready" gene. Others.	Yes	Yes	Yes	Yes

Source: Pioneer Hi-Bred International, Inc. 1999. www.pioneer.com.

The near disappearance of the EU market for U.S. corn exports should be put into historical perspective. There has been a distinct downward trend in total EU corn imports. This can be attributed to the Common Agricultural Policy goal of achieving self-sufficiency through high support prices for grains, such as corn. Over time, as domestic supply in the EU has expanded in response to these high support prices, imports have fallen from around 20 million tons in 1980 to around 4 million tons in the mid-1990s. U.S. export volumes to the EU have also declined over time, although market share did not decline until 1994. Thus, while recent resistance to GMOs appears to have contributed to the observed decline in export volumes, but this decline is also part of a long run trend.

The soybean market differs from the corn market in three important ways. First, EU policies do not protect domestic oilseed producers as much as grain producers, so there has always been a stronger import demand for soybeans in the EU. Second, there are fewer major producers in the world market, so there are fewer alternative sources of soybeans. Third, there are fewer substitutes for soybeans, which provide high quality protein in feeds, than there are for corn, which is one of many potential feed grains.

The U.S. exported 26 million tons of soybeans in 1997, and nearly 9 million tons went to the EU. In 1998, the EU imported 6.4 million tons out of the total 20 million tons exported by the U.S. For soybean meal, the U.S. exported 6.4 million tons in 1997, with 1.3 million tons to the EU; in 1998 the total was 7.6 million tons with 1.2 million to the EU. Thus the EU remains a significant market for U.S. soybeans and soybean meal, in spite of resistance to soybean GMOs.

It appears that the European demand for non-transgenic corn is being met from non-U.S. sources, and the demand for non-transgenic soybeans are not. This should lead to greater pressure for the development of a non-GMO market for soybeans in the U.S., and less demand for non-GMO corn. There is evidence that this is occurring.

In April 1999, the Archer Daniels Midland Company and A.E. Staley, both based out of Decatur, Illinois, announced that they would only accept STS, a non-GMO soybean product, as well as rejecting any genetically modified corn that is not accepted in EU markets during the 1999 growing year (Grainnet, 1999). STS (Synchrony Treated Soybeans) are produced by DuPont Co. and are bred to resist Synchrony herbicide, which is also produced by DuPont. The STS program that ADM is offering will provide an 18-cent per bushel premium over the Decatur, IL market price for soybeans. The officials for ADM hope that this program will give farmers the incentive to grow a product that is comparable to Roundup Ready Soybeans, but without the market acceptance problems surrounding the GMO issue (Reuters, 1999). Later in the summer, both ADM and Staley retracted the statement that they would not accept GMO crops. On September 1, 1999 Archer Daniels Midland issued another statement urging its grain suppliers to segregate non-GMO crops (Kilman, 1999). This statement was issued in response to processor-customers basing buying decisions on the "genetic origin" of US grain and threats of turning elsewhere if the US is not able to provide the identity preserved product. Furthermore, a September 6, 1999 article in FarmWeek stated that producers who

knowingly or inadvertently commingle GMO and non-GMO grain thus could share liability for shipment rejection(Ross, 1999). If true, this is further indication of how U.S. corn and soybean markets are having to adapt to European and Japanese consumer demands. Adequate supplies to the EU and Japan may also be an issue, as Illinois Agri-News reports that at least half of the corn and soybean crop in Illinois is genetically modified. Another important development is that starting in April 2001, foods processed from genetically modified crops must be labeled under new Japanese guidelines (Reuters, 1999).

We now turn to the issue of marketing costs from segmentation. These would include any premium paid to a producer to supply a particular variety, the costs of segregation in storage and handling, and the costs of verifying that the crop is truly non-GMO. U.S. grain handlers and processors have some extra expense in supplying the non-GMO product that is being demanded, and a possible opportunity for extra profits through premiums for assuring a non-GMO product. The product that was originally considered generic is now considered a specialty product and moves through a differentiated market channel.

Previous studies by Bender et al have examined the marketing costs associated with specialty grains in Illinois. Such specialty grains have particular characteristics, such as oil or protein content, that bring high value in particular end use markets. They report an average additional handling cost of $0.17 per bushel for corn and $0.48 per bushel for soybeans in 1998. These costs were over and above the farm price purchase premiums of $0.19 per bushel for corn and $0.74 per bushel for soybeans (Bender, et al., 1999). As these premiums are for high valued end uses, only the handling costs may be relevant to the segmentation of non-GMOs. They give a high estimate of the costs of segmentation, since it is possible that the larger volumes in GMO and non-GMO segments will reduce the costs of handling in comparison with these smaller specialty markets.

Another reason why marketing costs may be lower for market segmentation in the future is the improved communication and decreased producer- supplier-demander barriers available through the world wide web. This is demonstrated in a new system of farmer to elevator contracting on E-markets[9], an internet based marketing intermediary. On E-markets, producers are able to go to the webpage and learn which elevators in their area are contracting for several types of specialty crops and how many contractual acres are available. Phone numbers for each firm are provided, which also gives the farmer an opportunity to seek out higher premiums for the product that they wish to supply.

A short survey of several Midwestern grain handlers was given to preliminarily understand the market for non-GMO crops in the US. The questions asked in the phone survey are as follows:

1. How many bushels/ how many acres of guaranteed non-GMO product do you handle? Which crops specifically do you handle? Corn and/or soybeans?

2. Do you sell non-GMO crops to processors or exporters? Other outlets? If you sell to exporters, do you know the crops' final use in the European market?
3. How is the market for non-GMO crops changing? Do you see it expanding or declining?
4. How do you verify that your contracted growers actually deliver non-GMO product?
5. How much extra do you pay farmers for guaranteed non-GMO products, over and above the market price for generic corn or soybeans?

The questions were administered to several firms who were advertised on E-markets. The expected answers to the questions were often quite different than those that were actually obtained. For the first question, it was expected that the number of acres/ bushels of grain handled would be similar to that which was advertised on the internet. However the actual answers ranged from none (which meant that the elevator had not found farmers willing to accept a premium in exchange for growing non-GMO corn and soybeans), to up to the maximum amount that they were allowed to handle. Some firms who have multiple locations have designated entire handling capacities at one or more of their locations to handling non-GMO crops. This helped them to ensure the supply of non-GMO to those who asked for it was completely segregated.

The second question concerned who was next in the marketing channel. Most of the firms sell their grain to multinationals such as ADM, Cargill, A.E. Staley or Continental. From there, the grain is moved in larger quantities to river terminals for shipment to the Gulf of Mexico for export, or is used at the plant for processing. Some firms interviewed were located near river terminals and therefore delivered directly to the terminal. There was only one firm who sold a large amount of grain to a small merchandiser who specializes in handling grain for European export. The merchandiser never actually takes possession of the grain but contracts special transportation from the originating country elevator to the Gulf of Mexico where it is exported to Europe.

The third question asked a general opinion question of the elevator manager. Most of the respondents said that they thought the market for non-GMO grain was expanding. At the present time premiums are high enough that an increasing amount of grain is being pulled through the marketing channels. Two managers said that it is likely that by the end of fall harvest there may be an oversupply of non-GMO product and there won't be a large premium for non-GMO product that was not contracted at spring planting. Another response was that this year will be a major deciding factor in whether or not there will even be a premium for non-GMO products next year. If there continues to be a more than adequate supply, price premiums will continue to decline.

The fourth question was about verification of non-GMO products. It is of great concern to the European importer to make sure that the product being bought is guaranteed non-GMO. It was expected that the elevators contracting or accepting non-GMO corn and soybeans would also be extremely concerned with the verification of the product being guaranteed non-GMO. About half of the elevators interviewed did

continuous spot testing throughout the growing season. These test samples are kept for one year so that they are available to be reproduced if the product is in question at a later point in time. Many of these elevators also used verification techniques such as segregated on-farm storage, segregated on-site storage at the elevator, and segregated transportation measures. Many of the firms also required a signed certificate that retracted the premium agreed upon in the event that the product was found to contain genetically modified material. On the other hand, the other half of the managers that were interviewed said that they did not do any testing, that they relied on the word of the farmer for non-GMO product. Some said that it was too expensive to test for GMOs– testing can cost up to $200 or more per sample and took too long (often up to two weeks) to receive the results. Others said it was too difficult to guarantee non-GMO product because of cross pollenation and on-farm separation problems. In the news article regarding the Staley decision to accept only EU approved varieties, it stated that Staley will take deliveries on the word of the farmer, and it will not be necessary to test corn received. The responses demonstrate the difficulties associated with verification of non-GMOs.

The last question asked what each firm will pay as a premium for guaranteed delivered non-GMO product. The premiums reported that will be paid this year ranged from no premium to twenty cents per bushel above the market price. There was also a difference in premium reported for corn and soybeans. One elevator reported that the premium paid for non-GMO corn is only four cents, but with the ADM STS (a Synchrony herbicide resistant soybean) program, the premium offered above the market price is twenty cents. The managers were also asked about the premium last year if they handled non-GMO crops. In general, the premium paid to the farmer last year was thirty cents per bushel to the farmer above the market price, and the country elevator usually received that amount plus ten cents more from whomever they delivered to. The declining premium from last year to this year shows that there is an increasing supply in the market, making it unnecessary for there to be as large of a premium for non-GMO products.

Conclusions and Implications

This paper examined the evidence regarding the segmentation of export markets for corn and soybeans into GMO and non-GMO varieties and products. First, we examined EU policy which is evolving in a piecemeal fashion across countries, GMO varieties, and end-use markets. Thus EU importers face a difficult challenge in matching supplies with end use markets, and may choose to demand non-GMO product whenever possible, to avoid any problems with market acceptance. Next, we examined trade flows, which differ between the corn and soybean markets. U.S. corn exports to the EU have virtually disappeared following the introduction of GMOs, as the EU is able to supply their diminishing import demand from many other sources. U.S. soybean and soybean meal exports to the EU remain a signficant share of U.S. exports and of the EU market. There are fewer substitutes and fewer alternative sources for soybeans.

These changes in demand are reflected at the local level in Midwestern grain markets, which we examined through the trade press and informal interviews with grain handlers. Two major processors have developed a specific program to handle and process non-GMO soybeans. They will also accept only EU approved varieties of corn in this coming marketing year. Many elevators are advertising on the internet for non-GMO corn and soybean contracts with growers. These contracts vary in the price premiums offered and in the need for verification that a crop is truly non-GMO. Premiums and markets for non-GMO soybeans appear more robust than those for corn, following the pattern of EU demand. The costs of segmented markets for specialty grains provide a high estimate of the marketing costs of segmentation. Actual costs may be lower due to the higher volume in non-GMO segments and the declining costs of market coordination with use of the internet. On the other hand, if verification of non-GMO status becomes more important to end-users, that could substantially increase marketing costs.

A priori analysis of market segmentation cannot predict whether we will eventually see premiums for non-GMO product or not. Further shifts in supply and demand curves are expected in both GMO and non-GMO markets. Adoption of GMOs and the evolution of policy in other countries that are major actors in world corn and soybean markets will also influence the outcome. It will be interesting to watch markets respond to the challenges presented by new technologies and changing demands over the next few years.

Endnotes

[1]C.J. Cunningham is graduate research assistant and L.J. Unnevehr is Professor, Department of Agricultural and Consumer Economics, University of Illinois.

[2]The authors would like to acknowledge the constantly changing atmosphere surrounding biotechnology issues and apologize for any information that is not completely up to date at the time of publishing.

[3]Cited by the authors as taken directly from the European Council Directive Article 1.

[4]Taken directly from the European Council Directive Article 1.

[5]Taken directly from the European Commission press release entitled, "The European Commission press release entitled, "The European Commission has decided to propose further labeling of genetically modified organisms."

[6]Taken from European Report, "Genetic Engineering: Labeling Proposals for GMOs Will Still 'Leave Consumers in the Dark.'"

[7]Taken directly from the articles of Regulation 258/97.

[8]Taken from most recent information at authors' disposal at time of writing.

[9]www.e-markets.com

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