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EVOLUTION OF THE DEMAND FOR NON-GMO CORN AND SOYBEANS

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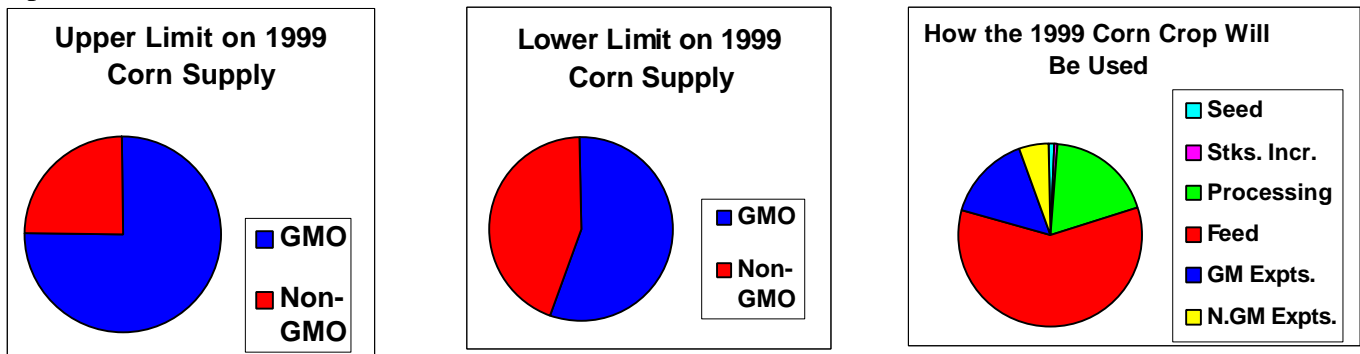
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When ISU had a GMO conference on the ICN in late April this year, the key issue was a regulatory-related one: what to do with the few GMO corn events that had not been approved by the European Union (EU). As the 1999 harvest season approaches, the issue has shifted from one centered on a foreign government regulatory process to one of consumer acceptance. Currently, the portion of demand that is emerging as actual or potential non-GMO is the direct human-food and beverage market abroad, and the domestic corn processing market. Market conditions for non-GMO and GMO grain are highly fluid. Demand-related developments have progressed rapidly in the past two and one-half months, as indicated by the sequence of events below:

- ◆ **April 1999:** Major processors indicate they will not purchase corn events not approved by EU
- ◆ **May:** Cornell University publishes a report in the science journal, *Nature*, showing potential negative impacts of Bt corn on Monarch butterflies. Some but not all findings are confirmed in a similar ISU study.
- ◆ **June:** several major food chains in the EU indicate they will cease selling GMO foods in several EU countries
- ◆ **July:** World Watch Institute, Washington, D.C., publishes a major article on global implications and concerns related to GMOs
- ◆ **July:** Gerber and Heinz indicate they will stop using GMOs in baby food
- ◆ **August:** Japan develops a labeling system for food by genetic origin of ingredients, to be implemented in March 2001
- ◆ Australia and New Zealand take steps to establish a GMO labeling program
- ◆ **September:** A major Mexican corn flour miller indicates it will stop buying GMO corn.
- ◆ **September:** Time magazine has a feature story on GMO foods
- ◆ **September:** Japanese brewers announce they will cease using GMO corn in their beer, effective this fall
- ◆ **September:** Consumers' Report has an article on GMO foods, including the regulatory processes in the U.S. The report notes that tests find GMO ingredients in veggie burgers of a major fast-food chain.
- ◆ **September:** Fuji Oil, Japan's largest manufacturer of soy protein food, announces it will cease using GMO soybeans in its soy protein foods, effective this fall
- ◆ **September:** a Japanese grain merchandising firm announces it will shift to non-GMO corn and soybeans for customers which process these products into direct human food
- ◆ **September:** A South Korean survey shows 95% of Korean consumers believe some GMO labeling is needed
- ◆ **September:** at least three major grain buying companies request that farmers and elevators segregate non-GMO grain from approved and un-approved GMO grain. Some reports indicate premiums are being paid for non-GMO grain in certain markets.
- ◆ **September:** Spain and Portugal reportedly shift to corn from non-U.S. sources to avoid having to buy GMO corn. This market is approximately 100 million bushels per year. Some reports indicate a premium for non-GMO corn of approximately \$0.16 per bushel is available for a portion of this market.
- ◆ **September:** EU labeling requirements are to be implemented for restaurants, pubs, and other establishments that sell meals. Many of these businesses in mid-September were just becoming aware of the new rules and indicate they will stop using GMO ingredients. UK labeling regulations also apply to school lunches, and some schools indicate they will cease using GMO foods. Several major fast-food chains indicate they will not use GMO foods in their products in U.K., including Wimpies, Burger King, and Pizza Hut. Fifteen super market chains operating in 10 EU nations indicate they are selling GMO-free food. Another 7 indicate they plan to sell GMO-free food within the next several months. Industry rankings of the chains range from No. 1 to No. 12 in sales.

In short, the demand picture is changing rapidly, and adds uncertainty to the future.

The figures below show the expected utilization of U.S. corn by type of use. **By far the largest use is domestic livestock and poultry feeding, and this market currently is a market for either GMO or non-GMO corn.** The third largest is domestic processing, and most of this appears to exclude GMOs unapproved by the EU. **Whether other GMO corn will continue to be acceptable to this market is uncertain.** Of special concern for processors is the EU corn gluten market, which reportedly accounts for at least one-third of the U.S. output and enters EU without the levies applied to unprocessed corn. **The second-largest market for U.S. corn is the export market, and the largest share of this is for livestock and poultry feeding.** Major export markets for U.S. corn are Japan (31% of the total), South Korea (13%), Taiwan (9%), Mexico (11%, mostly for human consumption), and a number of other markets in Asia and Latin America. Japan's direct human food use of corn is approximately 190 million bushels per year (Source: Japan's Ministry of Finance). Much of Mexico's 210 million bushels per year of U.S. corn imports are used for direct human food.



For corn, these known potential demands for non-GMO corn total a maximum of approximately 2.2 billion bushels, along with another 100 million bushels in Spain and Portugal. **That represents about 25 percent of 1999 U.S. corn production, depending on the final size of the crop.** Part of the U.S. domestic processing demand could possibly be served by GMO corn.

Reports from the seed corn industry indicate that about 35% of the 1999 U.S. corn crop was planted to GMO varieties. However, the usable percent of the crop that is non-GMO is uncertain. Some observers say that many fields were planted with alternating strips of Bt and non-Bt corn in the same field to provide a refuge for corn borers so that Bt resistance would not develop. This process is acceptable, according to personal communication with Dr. Marlin Rice, ISU Entomologist. One thousand acres of Bt corn planted this way would, for marketing purposes, produce 2,000 acres of Bt corn, since the alternating strips would have cross-pollinated and would be co-mingled during harvest. Others in the industry indicate that a significant part of the refuge corn was planted in adjoining fields (maximum of 1/4 mile away, and equal to a minimum of 20% of the Bt acreage), which would result in less comingling. Either way, the effective supply of GMO corn (including old-crop comingled grain) is likely to be considerably above 35% of the total. A worst-case scenario might put it as high as 70 to 80%, assuming that most of the non-commingled non-GMO corn can be segregated and identity preserved this fall. Regional variations in the concentration of GMO crops may exist.

Corn Premiums

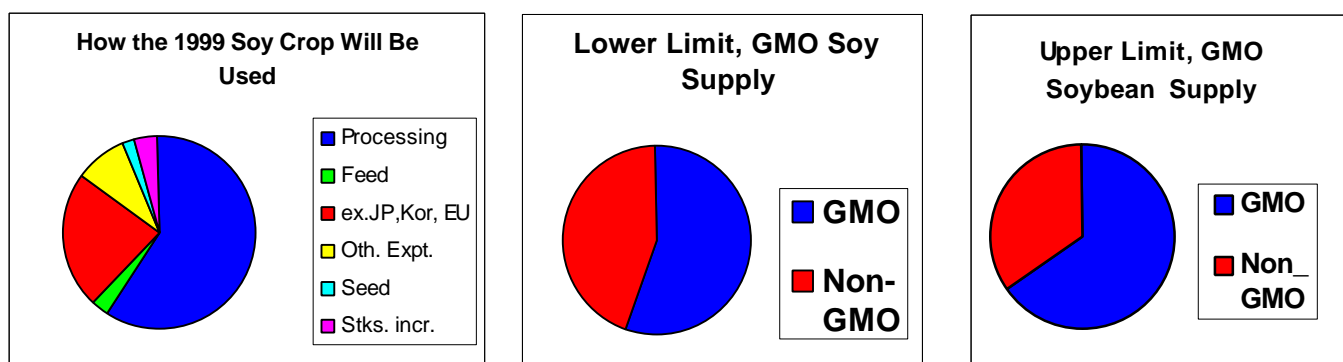
The size of premiums paid for non-GMO corn will be market determined, depending on the supply of such corn, and willingness of consumers to pay for it, as well as costs of identity preservation. As the figures above indicate, resulting premiums will depend heavily on the final percent of the supply that is useable

non-GMO corn. In the lower-limit case with non-GMO supplies, the potential demand for non-GMO corn could exceed the available supply, resulting in substantial premiums. The size of the premiums is unknown, since at some price substitutions will occur. In the other case, modest premiums might be expected for non-GMO corn. With the non-GMO demand that currently exists, discounts for GMO corn are not anticipated, but the demand picture is fluid. Premiums being reported for non-GMO corn in some markets reportedly have been in a 10 to 15 cent range.

Soybeans

For soybeans, the situation is slightly less complex because all varieties of GMO soybeans have been approved for import by EU. Also, cross-pollination is not a concern for soybeans, and refuge strips are not a problem. Reports from the seed industry indicate that 55% of this year's soybean acreage was planted to GMO varieties. Allowing for commingling of the old-crop carryover (which is about 12% of the total supply), perhaps 30 to 35 % of the total U.S. soybean supply is non-GMO (except for possible low-level contamination of non-GMO seed with GMO seed).

The figures below show the expected use of 1999-crop soybeans by type of use. Unprocessed exports are expected to account for about one-third of total production, with major markets being EU, Japan, South Korea, Taiwan, Mexico, and a number of other Latin American countries. EU alone in 1998-99 accounted for 27% of U.S. unprocessed soybean exports (down from 35% the previous year), and that market is somewhat uncertain. In Japan, direct human food use of soybeans uses about 175 million bushels (Japan Ministry of Finance). Of U.S. processed product exports, soybean meal appears to be more vulnerable than soybean oil, since it goes largely to developed nations with enough income to have discretion about the types of foods consumed. Most meal exports go for livestock and poultry feeding, which currently is not at risk. So far, U.S. soybean oil has not run into significant resistance because of the GMO issue. At this time, Japanese food use of soybeans appears to be the largest potential non-GMO demand for U.S. soybeans. That market is equivalent to 6 percent of the forecast 1999 U.S. soybean crop. However, the EU demand situation is uncertain, and a growing EU demand for non-GMO soybeans is quite possible.



Soybean Meal: EU a key market that has declined sharply

For the 1997-98 marketing year, the EU accounted for 27% of all U.S. soybean meal exports. That was not an unusual share, since the EU has been a major importer of U.S. soybean meal for decades. *So far in the current soybean meal marketing year which ends September 30, U.S. exports to the EU account for only 7% of the total according to USDA's weekly export sales report from September 16, 1999. EU, normally the largest soybean meal export market for the U.S., dropped to the third largest market,*

behind the Philippines and Canada this year. While the GMO issue is not the only one involved, it may be an important factor behind this severe drop in EU purchases of U.S. soybean meal. EU imports of U.S. soybean meal in 1997-98 were equivalent to the meal from 81 million bushels of soybeans, or about 3% of the U.S. soybean crop. So far this season, they are equivalent to the meal from only 19 million bushels of soybeans.

Potential premium for non-GMO soybeans?

Like corn, the premiums will be market determined, and will depend considerably on the useable percentage of supply that is non-GMO. Recent trade reports indicate premiums have been in a 5 to 35 cent range for non-GMO soybeans at some markets. At this writing, the main part of the soybean export demand that is transitioning toward non-GMO is the food use in Japan, which is about 174 million bushels or 6% of the currently forecast 1999 production. South Korea, the EU, and Mexico are other markets to watch closely for GMO/non-GMO developments. Together, these three areas accounted for 64 percent of the 1998-99 U.S. soybean exports. The EU market was nearly twice as large as either Japan or Mexico.

Concluding Comments

The GMO/non-GMO market situation has changed rapidly since last spring, and is still evolving. Changes are being led by foreign consumer concerns. Labeling requirements in Europe and Japan, possible labeling requirements in South Korea, some demand for non-GMO corn in Mexico, articles in *Time* and *Consumer Report* this month, and the latter's finding of GMO ingredients in a fast-food veggie burger may have some impact on U.S. consumers. *As farmers and the grain industry make decisions about grain storage, segregation, and marketing, it should be recognized that the market situation has the potential for further changes before the 1999-00 marketing year is over. Additional demand for non-GMO corn and soybeans cannot be ruled out.*