Order Code RS21620
Updated November 4, 2004

Status of Genetically Engineered Wheat in North America

Gwenell L. Waters Bass
Analyst in Industrial Organization and Corporate Finance
Resources, Science, and Industry Division

Summary

Genetically engineered (GE) wheat varieties developed by the biotech industry and university researchers hold considerable promise for producers. GE wheat developed by chemical company Monsanto is engineered to resist damage from the widely used Roundup Ready (RR) herbicide, making it easier for farmers to control weeds. The development of GE wheat raises issues of market acceptance and agronomic management. Market acceptance of GE wheat focuses on its direct acceptance by consumers, either segregated or when co-mingled with non-GE or conventional wheat. Most research suggests GE foods are safe to eat; however, uncertainty about health and environmental effects has led to public opposition particularly in Europe and Japan. This is of great concern to U.S. wheat producers because the United States exports more than half of its wheat production. Producers are concerned as to whether or not a segregation system can be designed which ensures that no co-mingling between GE and non-GE wheat will occur. Agronomic management issues include the effect of GE wheat on crop management practices and profitability, issues of contamination and spread, the development of pesticide resistance, and the cost and management of volunteer plants. While developers of the technologies are seeking regulatory approval, they indicate that they will postpone their commercialization until market acceptance is assured and systems for separating GE and non-GE wheat are in place. In May 2004, Monsanto announced that it was deferring efforts to introduce GE wheat until such time that other wheat biotechnology traits are introduced. This report will be updated as events warrant.

Background

GE wheat was first produced at the University of Florida in 1992. The strain of wheat that was developed was herbicide-tolerant. The University holds a patent on the GE wheat technology, but has granted an exclusive license to the chemical and seed company

Monsanto.[1] Herbicide-tolerant crops were developed to survive certain herbicides that destroy a crop along with the targeted weeds. With herbicide-tolerant crops, farmers can use potent postemergent herbicides, providing a more effective weed control than otherwise. Monsanto's GE wheat is a Roundup Ready (RR) crop that is resistant to glyphosate, a herbicide effective on many species of grasses, broadleaf and other weeds.

Since the first GE crops (mainly corn, soybeans, and cotton) became commercially available in the mid-1990s, U.S. farmers have been rapidly adopting them.[2] Proponents of agricultural biotechnology say it offers the potential to increase crop production, lower farming costs, improve food quality and safety, and enhance environmental quality. Cited advantages of RR products are that they cut herbicide costs and make spraying and cleaning up of fields more convenient. For example, a key aspect of RR soybean is that it provides enormous gains in crop and time management flexibility, freeing up labor time for other activities. Thus, even if output remained the same, cost would be lower for weed control chemical applications and mechanical tillage. Since producers pay more to seed companies for the herbicide-tolerant seeds, the profitability of the herbicide-tolerant varieties depends on weed control cost savings compared with seed cost premiums. Presently, the United States has approved 12 different plants with GE traits for commercial use. Two of these plants which are widely used are corn and soybeans. A study by the United States Department of Agriculture (USDA) found the adoption of herbicide-tolerant corn improved net farm returns of specialized corn farms. Herbicide-tolerant soybeans, however, did not have a significant impact on net farm returns in either 1997 or 1998.[3]

Leonard Gianessi, a senior research associate with the National Center for Food and Agriculture Policy in Washington, said the GE wheat could solve a key problem for producers experiencing relatively low wheat prices. In some areas, according to Gianessi, current weed-control measures cost about $30 an acre. The use of GE wheat could reduce costs to $16 an acre. Monsanto's GE wheat could make it affordable to plant more according to Gianessi. These estimates do not include the potential cost of separating GE from non-GE wheat or the market price implications of increased wheat production.[4]

The Canadian National Farmers Union (CNFU), is opposed to the introduction of GE wheat. CNFU has cited several reasons for its opposition of GE wheat. The list includes food safety, price impact , market loss, health concerns, environmental damage and agronomic costs. One agronomist estimates that costs to control the potential cross contamination between GE RR wheat and GE RR canola would require additional chemical applications (non-RR) totaling up to $ 400 million annually in Canadian dollars.[5]

---

[1] Monsanto is the third largest agri-chemical company worldwide. It is the only company besides Sygenta (second largest) that has developed a potential GE wheat product.

[2] For background see CRS Report RS21381, *Adoption of Genetically Modified Agricultural Products.*

[3] United States Department of Agriculture. Economic Research Service. *Adoption of Bioengineered Crops*. AER-810. 68 pp. May 2002.

[4] Melcer, Rachel. "Coalition Asks For In-Depth Study of Genetically Modified Wheat." *St. Louis - Dispatch.* Mar 12, 2003.

[5] [http://www.nfu.org]

Implications for U.S. Wheat -- Importance of Wheat Trade

The commercial acceptance of GE wheat is an issue of major importance for U.S. wheat farmers because it depends on the attitudes of consumers, domestic and foreign, and on the potential impact on food safety, health, and the environment. The United States is the fourth largest wheat producing country, with its output exceeded only by the EU, China, and India. In 2003, wheat ranked fourth among U.S. field crops in planted acreage, behind soybeans, corn, and hay. During that same period, wheat represented 6% of gross cash farm receipts, third highest among U.S. field crops.

The United States is the world's largest wheat exporter, with wheat accounting for approximately 7.5 % of the nation's agricultural export value in 2003. U.S. wheat exports equal almost one-fourth of total world wheat exports. Although nearly half of U.S. wheat is sold to foreign customers, U.S. wheat exports have shown little to no increases since 1996/97. Global competition has intensified in recent years as several non-traditional wheat exporters have emerged (Russia, Ukraine, India in particular) and the United States has seen its market share decline. The degree of foreign acceptance can significantly affect international trade and may create the need to identify and segregate GE wheat.

Market loss is a major concern of U.S. wheat producers because some of the United States' biggest trading partners have raised issues about accepting GE wheat if it is commercially traded. Approximately 70% of the Upper Midwest's hard red spring wheat, for example, is sold to the EU and Japan, where consumers shun biotech crops like GE corn and soybeans. Resistance to GE wheat may be even greater than for corn and soybeans, which are principally animal feeds, since wheat products are eaten by humans directly. U.S. corn exports to the EU have dropped from approximately $300 million in the mid-1990s to less than $10 million in recent years. This decline is due primarily to the fact that new biotech corn varieties have not been approved for marketing in the EU.[6]

Regulatory Status of GE Wheat

United States. In December 2002, Monsanto submitted a petition to the USDA and Canadian authorities for regulatory approval of its GE spring wheat.[7] USDA's Animal and Plant Health Inspection Service (APHIS) conducts programs to protect American agriculture against pests and diseases. Generally, before a genetically engineered crop can be produced on a wider scale and sold commercially, its creators must petition APHIS for a "determination of non-regulated status." APHIS must be provided scientific details about the genetics of the plant, the nature and origin of the genetic material used, information about indirect effects on other plants, field test reports, and information unfavorable to the petition. All petitions are published in the *Federal Register* for public comment. APHIS grants the petition only if it determines that the plant poses no significant risk to other plants in the environment.

---

[6] For background see CRS Report RS21556 *Agricultural Biotechnology: The U.S.-EU Dispute.*

[7] Three agencies using a coordinated framework are primarily responsible for regulating biotechnology in the United States – the USDA, the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA). For background see CRS Report RL21556 *Food Biotechnology in the United States: Science, Regulation, and Issues.*

The EPA, which would have to set a tolerance for glysophate for the wheat variety, is waiting for the USDA to complete its work. Monsanto then may approach the FDA for a premarket consultation, in which the company supplies its information indicating that the variety is safe to eat, but this consultation is not required by law. While Monsanto expects that its wheat will pass the long regulatory process, company officials have pledged not to sell the GE wheat seeds to farmers until the company can guarantee domestic and export markets. They also promised to help develop grain-handling and testing procedures that can be used to separate its modified wheat from non-modified wheat.[8]

On March 9, 2003, a coalition of environmental and farming groups filed a petition asking the USDA to conduct in-depth environmental and socioeconomic impact studies before considering approval for GE wheat products. The groups consist of the Center for Food Safety based in Washington DC, Dakota Resource Council based in North Dakota, Northern Plains Resource Council based in Montana, and other farm groups. The Environmental Working Group and Greenpeace have also questioned commercialization of GE crops.[9]

Their coalition petition to the USDA sought three actions: (1) institute a moratorium on GE wheat until all possible environmental, human health and socioeconomic impacts are analyzed; (2) institute a moratorium until possible impacts under the Migratory Bird Treaty Act are assessed; and (3) classify GE wheat as a noxious weed and thereby prohibit its production.

On April 25, 2003, the National Association of Wheat Growers, U.S. Wheat Associates, and the Wheat Export Trade Education Committee sent a letter to Agriculture Secretary Ann Veneman in response to petitions. The three national farm groups represent most U.S. wheat farmers. The organizations, while acknowledging that there are market acceptance concerns to be addressed, contend that a science-based regulatory system is not the appropriate place to address non-scientific concerns. They suggest that a mechanism other than the regulatory process must be found to address the timing of commercialization, so that the scientific safety determinations may proceed free of non-scientific encumbrances.

A statement issued jointly by the three national wheat organizations said that wheat producers would work with all segments of the industry to develop and assure that a viable identity preservation system and testing program would be instituted prior to commercialization of GE wheat varieties. They urged technology providers to obtain international regulatory approval and to ensure customer acceptance prior to commercialization. The wheat organizations declared that they support voluntary labeling of food products, but oppose government-mandated labeling of wheat products in both U.S. and international markets, based upon the presence or absence of biotechnologically derived traits that do not differ significantly from their conventional counterparts.

---

[8] Monsanto. *Bringing New Technologies to Wheat: Information on the Development of Roundup Ready Wheat.* Pamphlet.

[9] National Association of Wheat Growers, U.S. Wheat Associates, and Wheat Export Trade Education Committee letter to Agriculture Secretary Ann Veneman. April 25, 2003.

In their letter responding to the March 9th petition, the three national wheat organizations argue that the use of Roundup Ready wheat treated with glyphosate as an alternative to other types of herbicide treatment will have virtually no impact on migratory birds. They also note that herbicide resistant weeds are nothing new in agriculture and have been a problem long before the advent of biotechnology.

In May 2004, Monsanto announced that after eight years of research, it was deferring efforts to introduce GE wheat. Monsanto stated that as a part of its realignment of research and development investments, the company was suspending the introduction of Roundup Ready wheat, until other wheat biotechnology traits were introduced. The company made the announcement even as its application for commercialization remains pending. Organizations who are opposed to the development of GE wheat view Monsanto's decision as a victory. Monsanto indicated that the sales potential for GE wheat was less attractive relative to the company's other commercial priorities.

Canada. Producers in Canada are also concerned about the acceptance of GE wheat in export markets. Canada exports more than 80% of its wheat to Europe and Japan. In Canada, the Canadian Wheat Board (CWB), which enjoys a monopoly on sales of wheat to export markets, has developed a set of conditions it says must be met before a GE wheat variety could be released.

According to the CWB, there must be identified markets for the entire production of GE or co-mingled wheat for multiple years. The CWB maintains that in order to protect access to non-GE wheat markets, an effective segregation system must be developed. Farm management questions concern the effect of introduction of GE wheat varieties on management practices and profitability with respect to different kinds of farming operations (e.g., conventional tillage, conservation tillage, organic, pesticide-free, etc.) across a multi-year rotation. The CWB called for research on other agronomic risks such as contamination and spread of genetic material, the development of weed-resistance, and the cost and management of volunteer plants. Finally, the CWB called for a comprehensive analysis to account for the balancing of risks and costs associated with GE-wheat. Such an analysis would incorporate possible market benefits and costs, including segregation costs, as well as agronomic benefits and costs.[10]

On May 27, 2003, the CWB asked Monsanto Canada to withdraw its application for its environmental safety assessment of its GE RR wheat product to protect wheat exports to key foreign markets. The CWB asked Monsanto to confirm its compliance with the request to withdraw its application by June 27, 2003. The CWB was concerned that the unconfined release of GE wheat in Canada would result in significant and predictable economic harm to western Canadian farmers. Monsanto did not withdraw its application.

A recent study prepared for the CWB by three agricultural scientists concluded that the unconfined release of GE wheat into western Canada would threaten the environment and be environmentally unsafe.[11] The report points to earlier experiences in Canada with

---

[10] Grain Industry Working Group on Genetically Modified Wheat. *Conditions for the Introduction of Genetically Modified Wheat.* Draft February 5, 2003.

[11] R.C. Van Acker, A.L. Brule-Babel, and L.F. Friesen. *An Environmental Safety Assessment of*
(continued...)

GE canola and claims that if glyphosate-resistant wheat were granted unconfined release in western Canada, "the trait would move between wheat cultivars and fields in a fashion similar to that seen in canola."

Other Countries. Internationally, regulations being developed with respect to genetically modified crops could lead to potential loss of markets for producers and the additional marketing costs of segregating and/or identity-preserving. These phenomena, in turn might reduce incentives for the development of new agricultural biotechnology products. Both Canada and the United States have approved more than thirty-five GE products and allow voluntary labeling of them. The EU's moratorium on genetically modified products which was in effect for six years ended in May 2004. However, the EU's strict traceability and labeling laws for GE products took effect April 2004. Prior to the moratorium the EU approved ten products. Japan has approved at least twenty products, but it also requires mandatory labeling.

On May 13, 2003 the United States, Canada, and Argentina initiated a case with the World Trade Organization (WTO) against the EU over its five-year moratorium on approving new agricultural GE products. The WTO case will go forward in spite of the EU labeling agreement. On July 2, 2003 the EU reached a compromise agreement that settles differences over pending GE products traceability and labeling regulations. The new traceability and labeling laws will effectively require U.S. farmers to separate GE crops from non-GE crops if they want to export to the EU. Approval of the traceability and labeling legislation has been one of the conditions imposed by some EU member states for allowing a renewal of GE authorizations. The threshold level for labeling a GE product is 0.9 %. In the absence of a system to segregate biotech from non-biotech products all U.S. and Canadian wheat would have to be labeled as containing or possibly containing GE products.

Conclusion

The potential benefits of GE wheat are great, according to proponents, but some producers foresee many risks as well. Market acceptance is the biggest concern especially in export markets. Strict segregation of GE and other wheat for export may be required in the field and during storage, transportation and processing. Segregation could raise production costs for all growers, not just those who produce GE varieties. Full-scale commercialization of GE wheat appears to be many years away and will depend as much on consumers' acceptance as on government regulation.

---

[11] (...continued)
Roundup Ready Wheat: Risks for Direct Seeding Systems in Western Canada. University of Manitoba: June, 2003.