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Hard Red Spring Wheat at a Genetic Crossroad

Rural Prosperity or Corporate Hegemony?

R. Dennis Olson

> No man qualifies as a statesman who is entirely ignorant on the problems of wheat.
>
> Socrates

Overview

Shortly after Monsanto submitted its 2002 applications to deregulate its Roundup Ready hard red spring wheat in both the United States and Canada, the company publicly pledged that it would not commercially release the world's first strain of genetically engineered wheat until several conditions were met. First, Monsanto pledged to gain market acceptance for genetically engineered wheat by convincing major international wheat buyers to agree to purchase it. Second, regulatory agencies in the United States and Canada would have to approve Monsanto's genetically engineered wheat simultaneously, so as not to give one country a market advantage over the other. Third, Monsanto pledged to work with the wheat industry and the regulatory agencies to establish "appropriate" contami-

nation thresholds.[1] And finally, Monsanto committed to work with the wheat industry and the regulatory agencies to resolve unanswered questions about the costs of segregation and to address outstanding agronomic stewardship concerns (Monsanto Canada 2003). By March of 2004 Monsanto had failed to meet virtually all these self-imposed conditions, but nevertheless considered moving ahead with seeking approval of its genetically engineered wheat only in the United States, in direct contradiction to its public commitments (Reuters 2004a). After strong resistance to this move from the U.S. wheat industry, Monsanto first announced, on May 10, 2004, that it would discontinue funding for all research on genetically engineered wheat (Monsanto 2004). Then, on June 18, 2004, Monsanto announced that it was withdrawing its pending applications for regulatory approval of the genetically engineered wheat from all agencies from around the world except for the U.S. Food and Drug Administration (Reuters 2004b). This stunning retreat by a major biotechnology company from the marketing of a major biotech crop, even if it proves only temporary, represents an historical bell weather in the ongoing controversy over the safety of biotech crops for humans, biodiversity and rural economies.

The commercial release of genetically engineered wheat would have had a profound effect on farmers in North America, who played a pivotal role in pressuring Monsanto to abandon commercialization of genetically engineered wheat. Recent economic projections indicate that the commercial release of genetically engineered wheat would have caused a devastating collapse in prices that farmers get for their wheat. This was the primary reason why leaders within the North American Wheat Industry stubbornly questioned and effectively resisted Monsanto's bid to commercialize its genetically engineered wheat variety. This loss of farm income would have occurred because most major wheat importers have vowed not to buy genetically engineered wheat—because contamination of native wheat by genetically engineered wheat is inevitable—and the resulting loss of these export markets would have relegated North American wheat farmers to the role of supplier of last resort. Unlike genetically engineered corn and soybeans—which are used mostly for animal feed—genetically engineered wheat would have gone directly into the human food system. This would have likely meant even stronger consumer resistance to foods contaminated with genetically engineered wheat. The lesson of Monsanto's historic retreat is that policy makers the world over must carefully weigh the socioeconomic and agronomic ramifications of

this new food crop before commercially and irretrievably releasing genetically engineered crops into farm fields and food distribution systems.

"Aristocrat" of Wheat at the Center of Genetic Engineering Controversy

Hard red spring wheat "stands out as the aristocrat of wheat for baking bread." It has the highest protein content of all U.S. wheat varieties and therefore has greater gluten content. Many flour mills—both in the United States and abroad—desire this characteristic so they can blend hard red spring wheat with lower-protein wheat varieties to increase the gluten content in the flour that they mill. In the United States, hard red spring (HRS) wheat is grown primarily in four states: North Dakota, South Dakota, Montana, and Minnesota (North Dakota Wheat Commission 2002a). It also grows on the Great Plains provinces of Canada.

In the winter of 2001, the North Dakota House of Representatives, citing the potential loss of wheat exports resulting from consumer rejection of genetically engineered foods, passed a temporary ban on the commercial introduction of genetically engineered wheat—a shot across the bow of the multinational Monsanto, which had announced plans to introduce its genetically engineered Roundup Ready strain of HRS wheat by the planting season of 2003. The shot got Monsanto's attention.

The company and its allies launched an intensive lobbying effort to kill the genetically engineered wheat moratorium in the North Dakota Senate. With the help of the powerful chair of the state Senate Agriculture Committee, Monsanto succeeded in getting the moratorium bill watered down to a nonbinding interim study resolution. However, the interim study helped keep the issue in the limelight for the next two years by mandating research and public hearings. Significantly, a wheat farmer who ran against the agriculture committee chair won in 2002 by making the state senator's opposition to the ban on genetically engineered wheat a key campaign issue (Gillis 2003).

In 2001, farmers promoted similar bills for a moratorium and an interim study of genetically engineered wheat in Montana, another major HRS wheat state. Monsanto and its allies killed both bills there as well. The debate about Monsanto's proposed introduction of genetically engineered wheat continued to escalate, with new legislation introduced again in 2003

in both North Dakota and Montana. The new legislation would have (1) required state certification of any genetically engineered wheat variety before its commercial release (North Dakota State Legislative Branch 2003a; Montana State Legislative Branch 2003a); and (2) changed state liability laws to apply the tenets of strict liability to genetically engineered seed producers in the case of contamination from genetically engineered wheat crops, thereby providing more protection to farmers not growing genetically engineered wheat from unfair liability issues stemming from alleged patent violations (North Dakota State Legislative Branch 2003b; Montana State Legislative Branch 2003b). However, all these bills were defeated as well. Similar genetically engineered wheat certification bills were introduced, but not passed, in South Dakota (South Dakota Legislature 2003) and Kansas (Kansas State Legislature 2003/2004) in 2003.

North of the border, opposition to genetically engineered wheat also began to grow in Canada. The Canadian Wheat Board, with strong support from wheat-producer organizations, conducted surveys of its foreign buyers of wheat (Canadian Wheat Board 2001); commissioned agronomic studies of the potential ramifications of genetically engineered wheat (Van Acker, Brule-Babel, and Friesen 2003); established minimum conditions before genetically engineered wheat could be introduced (Canadian Wheat Board 2003a); and proposed regulatory reform that would allow consideration of the potential loss of export markets in making a final decision to deregulate genetically engineered wheat (Canadian Wheat Board 2003b). Finally, the wheat board publicly called on Monsanto to withdraw its application for genetically engineered wheat deregulation (Canadian Wheat Board 2003c).

These challenges likely contributed to one of the first significant recent setbacks for Monsanto's effort to gain approval for its Roundup Ready Wheat. In the spring of 2003 the U.S. Department of Agriculture (USDA) rejected Monsanto's pending application to deregulate its genetically engineered wheat because of deficiencies. The rejection meant that Monsanto would have to address deficiencies and resubmit a revised application. This development in turn meant that the regulatory review clock would be reset, and the agency would have another six months to review the application again, which is about the average time that USDA has taken to act on applications to deregulate other genetically engineered crop varieties (Center for Food Safety 2003b).

Roundup Ready Wheat: Contamination Is Inevitable

Objections to genetically engineered wheat are based on the belief that it will inevitably contaminate native wheat—restricting the ability of farmers, grain elevators, and processors to meet the requirements of customers who demand wheat free of genetic engineering. Proponents of genetically engineered wheat argue that it and natural crops can coexist with a dual marketing system that would solve the problem of consumer rejection by segregating the two crops. Such a system would provide genetically engineered U.S. wheat to buyers who accept it, and conventional and organic wheat to others who don't want it. The effectiveness of this approach is highly controversial, and the potential cost of a dual marketing system is open to debate (Wisner 2003, 22–25). Two recent cases indicate that segregating genetically engineered and non-genetically engineered crops is not sufficient to avoid serious contamination.

Mexican Corn Contamination

In October 2003, nongovernmental organizations (NGOs) released testing results that had detected genetically engineered contamination in nine Mexican states, despite Mexico's ban on the importation or cultivation of genetically engineered corn. Analyses of these tests revealed the presence of transgenes in native varieties of corn, including StarLink contamination, and the presence of genes in some plants from as many as four different genetically engineered varieties, all patented by transnational biotechnology corporations (Action Group 2003; see also Snow, Gepts, and Worhty, et. al, this volume).

"This is just a small sample," stated Ana de Ita of the Center for Studies on Rural Change in Mexico (CECCAM), "but it indicates the seriousness of the problem. If we're finding contamination in random samples from indigenous and farming communities far from urban centers and in communities that have traditionally used their own seed, then the problem is much more widespread. . . . The plants in several communities that contain two, three and even four different transgenes together indicates that the contamination has been around for years, and that contaminated maize on small farms has been cross-pollinating for generations" (Action Group 2003).

Silvia Ribeiro of the Action Group on Erosion, Technology and Concentration, an NGO that supports socially responsible developments of

technologies useful to the poor and marginalized and addresses international governance issues and corporate power, warned that "recent U.S. production of corn genetically modified to produce substances ranging from plastics and adhesives, to spermicides and abortifacients poses an even greater risk of contamination. There have already been cases in Iowa and Nebraska of accidental escape of corn modified to produce nonedible substances. If we're already finding contamination in remote areas of Mexico, where cultivation of GM corn is prohibited by law, how can we guarantee that these other types won't spread as well?" (Action Group 2003).

Canadian Contamination of Canola Seed Stock and Related Concerns about Roundup Ready Wheat

The contamination of seed stocks caused by transgene flow from Roundup Ready genetically engineered canola has devastated the organic canola industry in Canada, prompting the filing of a class action lawsuit by organic growers against Monsanto and Aventis, a European biotech company that introduced its own variety of genetically engineered canola. The lawsuit argues that genetically engineered canola has contaminated seed stocks, farm fields, and the canola distribution systems to such an extent that it has virtually wiped out the organic canola market for Saskatchewan farmers. "You can't grow organic canola in Canada anymore, simply because the GM variety exists," said Jim Robbins, a Canadian canola farmer (Reuters 2003). The suit seeks damages against the two companies, arguing that they were negligent for failing to implement effective measures to prevent farm-to-farm contamination (Organic Consumers 2002).

Because many organic canola growers depend heavily on wheat in their crop rotation, their lawsuit seeks an injunction to stop the commercial release of genetically engineered wheat as well. "We have lost canola as a crop in our rotations because of genetic contamination, but we obviously cannot afford to lose wheat which is our largest crop and largest market," said Arnold Taylor, president of the Saskatchewan Organic Directorate. According to a CNEWS article, Canadian wheat exports are estimated at $2.9 billion annually, and losing any fraction of that amount to market rejection of genetically engineered wheat by importing countries would be devastating, both to individual farmers and to the rural communities that depend on the wheat economy (CNEWS 2002).

The Canadian Wheat Board commissioned a study that assessed the

factors contributing to contamination of the Canadian canola crop by genetically engineered canola and speculated about whether similar contamination would occur with the introduction of genetically engineered wheat (Van Acker, Brule-Babel, and Friesen 2003). Because many of the factors are the same, (Van Acker, Brule-Babel, and Friesen 2003, 15–16), the study concluded that the potential level of contamination of the wheat crop caused by the unconfined release of Roundup Ready wheat would be similar to the substantial contamination that occurred with canola (Van Acker, Brule-Babel, and Friesen 2003, 1).

However, the Van Acker study points out that the place to address the question of creating a viable dual segregation system must be the farm, not the grain elevator. "The segregation issue is inextricably linked to Roundup Ready wheat management issues because both are about limiting transgene movement from Roundup Ready wheat to non-Roundup Ready wheat," write Van Acker, Brule-Babel, and Friesen (2003, 23). The report concludes that any efforts by industry and government to segregate genetically engineered wheat are likely to fail, just like they failed in regard to canola:

> Any effort made to keep the Roundup Ready trait discrete within Roundup Ready canola have proven insufficient, even in the pedigreed seed production systems which can be considered an intensive segregation system. Given the similarities between wheat and canola with respect to a Roundup Ready transgene bridge it is likely that current commercial and seed production management systems in wheat would be insufficient to keep the Roundup Ready trait discrete within Roundup Ready wheat. *Management systems sufficient to achieve and maintain discrete segregation of the Roundup Ready trait in either wheat or canola have not yet been devised, modeled or tested.* (17; emphasis added)

Loss of Export Markets

The most compelling threat fueling wheat farmers' resistance to Monsanto's introduction of its genetically engineered wheat is the loss of export markets. Across the northern Great Plains, wheat farmers have begun to ask tough questions about Monsanto's Roundup Ready HRS wheat, which would be the first genetically engineered wheat variety ever released commercially. Of major concern are the substantial, unanticipated adverse economic effects from lost export markets. This happened when consumers rejected genetically engineered varieties of other major

commodities, such as corn, soybeans, and canola. U.S. government officials have estimated that the European Union's regulations for genetically engineered crops could cost the United States as much as $4 billion in agricultural exports to Europe alone (Pew Initiative on Biotechnology 2002, 9).

Rejection of Genetically Engineered Wheat by Asian and European Buyers

Asia and Europe are major customers for both U.S. and Canadian HRS wheat. In the 2000–2001 marketing year, six of the top ten importers of HRS wheat were Asian countries, and two were European (North Dakota Wheat Commission 2002b). Substantial consumer resistance to genetically engineered foods in these countries ranges from labeling requirements to calls for outright bans on the importation of genetically engineered crops (International Forum 2003).

Private wheat-processing companies are taking even stronger stands against genetically engineered crops than their governments. For example, the Japanese Millers Association, which mills 90 percent of Japanese wheat, has stated that it will not purchase wheat that has any level of contamination by genetically engineered wheat (Northern Plains Resource Council 2002). Mandatory labeling of genetically engineered food means that many consumers are still likely to reject these products even with government approval of "acceptable" tolerance levels. A September 2002 survey found that 100 percent of Japanese, Chinese, and Korean wheat buyers responding to the poll said that they would not buy genetically engineered wheat under any circumstances, even if their governments gave regulatory approval for it (Western Organization 2003a).

Similarly strong resistance to genetically engineered crops exists in Europe. Peter Jones, an official with Rank Hovis, which controls more than 30 percent of the milling and baking in the United Kingdom, said: "I am going to ask you not to grow genetically modified wheat until we are able to sell in our market the bread made from the flour made from that [GE] wheat. I cannot tell you how to run your business—but if you do grow genetically modified . . . wheat, we will not be able to buy any of your wheat—neither GM nor the conventional" (Western Organization 2003a). Nicolaas Konijneenkijk, president of the Dutch company called AGRO Consulting and Trading, summed up the general attitude among

European wheat buyers when he said, "Wheat and bread are sacred in Europe and many other parts of the world. If farmers and government officials in the U.S. fail to recognize that, they can kiss their markets goodbye" (Western Organization 2003a).

Worsening Erosion of U.S. Wheat Export Market Share

In assessing the threat of potential export losses from genetically engineered wheat, it is important to consider the intensified competition for international markets that has undermined U.S. dominance in wheat exports since the early 1980s. The U.S. market share of world wheat exports has fallen from a peak of nearly 50 percent in the 1970s to a low approaching 20 percent in 2001 (Wisner 2003, 26). The USDA predicts that various factors will continue to erode the U.S. share of the wheat market for the foreseeable future (U.S. Department of Agriculture 2002, 6).

The introduction of genetically engineered wheat is likely to exacerbate this bleak outlook for U.S. wheat exports: If the United States attempts to supply world markets with both genetically modified and unmodified wheat from the same producing regions, foreign consumers will be faced with the following question: *"Should I buy non-GMO U.S. wheat at a premium price that includes the costs of segregation and certification, or can I get similar wheat from other suppliers without paying segregation costs?"* (Wisner 2003, 26). Major wheat-importing countries such as Japan that wish to secure alternative sources of unmodified wheat outside the United States would have incentive to make substantial investments in regions—including several former Soviet republics—that have the capacity to increase their wheat production to meet this new demand.

Economic Costs of Genetically Engineered Wheat to Farmers and the Rural Economy

In an October 2003 study, Dr. Robert Wisner—a leading grain market economist at Iowa State University—looked specifically at the potential ramifications that Monsanto's pending commercial introduction of genetically engineered HRS wheat would have on U.S. export markets and the wheat economy. Key findings of the study include:

- Thirty to 50 percent of the foreign market for U.S. hard red spring wheat, and an even greater percentage of U.S. durum wheat exports,

could be lost if genetically engineered HRS wheat is introduced in the United States before 2010.

- Average U.S. prices for HRS wheat would be forced down to feed-wheat price levels, approximately one-third lower than the average of recent years.
- Durum and white wheat exports and prices also would likely face substantial risk; other classes of wheat would face slightly lower risk.
- Loss of wheat export markets would lead to loss of wheat acreage; loss of revenue to industries supplying support services to wheat producers; losses for other rural farm-related and nonfarm businesses, local and state government tax revenues, and institutions supported by tax revenues; and diminished economic health of rural communities and state governments in the spring wheat belt. (Wisner 2003, executive summary)

"A large majority of foreign consumers and wheat buyers do not want genetically modified wheat," Wisner concluded. "Right or wrong, consumers are the driving force in countries where food labeling allows choice" (Western Organization 2003b).

"While there are many unknowns about genetically modified wheat, one thing's for certain," said Helen Waller, a Montana wheat farmer. "Commercial introduction into Montana, North Dakota, and other wheat-producing states could result in our wheat commanding only feed grain prices, consequently reducing our market price by a third. And that will put farmers like myself out of business" (Western Organization 2003b).

In June of 2003, Monsanto publicly pledged that it would not introduce genetically engineered wheat until it is accepted in major markets. Nevertheless for nearly a year the company refused demands by the Canadian Wheat Board and others to withdraw its applications for approval of its Roundup Ready wheat (Monsanto Canada 2003). According to analysts, Monsanto is in a precarious financial situation (Innovest Strategic Value Advisors 2003). Additionally, the company now faces lawsuits from farmers, and allegations from former executives, that it engaged in price fixing and violated antitrust laws (Barboza 2004). Given the potential revenues from Roundup Ready wheat, Monsanto's unwillingness to delay its application was not surprising. In the end, however, the threat of international market rejection, and tough grassroots resistance both from farmers and consumers, finally compelled Monsanto to agree reluctantly to withdraw virtually all its regulatory applications for genetically

engineered wheat pending at the U.S. Food and Drug Administration (Monsanto 2004).

Potential Effects of Genetically Engineered Wheat on the U.S. Domestic Market

U.S. Consumers Skeptical Too

Although much of the debate has focused on loss of overseas markets, there also are substantial concerns about how Monsanto's genetically engineered wheat introduction would affect the U.S. domestic wheat market. Polling has consistently shown that a large majority of U.S. consumers want genetically engineered foods to be labeled and that a substantial portion of the population would avoid genetically engineered foods if they were labeled. For example, an ABC News Poll in June 2001 found that 93 percent of Americans say that they want genetically engineered foods labeled. "Such near-unanimity in public opinion is rare," commented the poll's authors. Additionally, this poll found that "[b]arely more than a third of the public believes that genetically modified foods are safe to eat. Instead, 52 percent believe such foods are unsafe, and an additional 13 percent are unsure about them. That's broad doubt on the very basic issue of food safety" (Langer 2001)

Such a high level of skepticism toward genetically engineered food causes U.S. wheat processors to question the wisdom of blindly forging ahead with the approval of Monsanto's genetically engineered wheat deregulation. "In every study [of U.S. consumers] . . . there's still 7 to 10 percent of people who say 'I will not buy a product if it contains a genetically modified ingredient,'" stated Ron Olson, vice president of General Mills. "When you come to a company like ours, which is a wheat-based organization, and we run the risk that we will lose 7 to 10 percent of our business if you change a product and it becomes an issue . . . I don't think that's a risk our corporation would take" (Western Organization 2003a). However, it seems that Monsanto is counting on making profit on genetically engineered wheat once government regulatory agencies approve "appropriate" contamination levels. Once genetically engineered wheat is released commercially, it will be impossible to segregate it from nongenetically engineered wheat, according to the study by Van Acker, Brule-Babel, and Friesen (2003). Eventually, it will be next to impossible to guarantee that any wheat is GE-free. Over time, that level of contamination will increase, and natural wheat will eventually disappear, making the whole de-

bate a moot issue. Then buyers and consumers will have no choice but to buy products containing contaminated wheat and concerns about Monsanto's product will be a moot point.

It is not a lack of concern among consumers that has stifled debate in the United States about the safety of genetically engineered crops; it is rather the U.S. government's failure to allow a debate. It was in this vacuum that wheat farmers and legislators from the northern Great Plains in early 2003 joined with U.S. consumer groups to demand that the USDA conduct a complete environmental impact statement (EIS) on the effects of deregulating Monsanto's Roundup Ready wheat. The petition from farmers, legislators, and consumers contended, among other things, that the government must identify the potential socioeconomic, agronomic, and environmental impacts that would result if the agency were to approve Monsanto's application for genetically engineered wheat deregulation and develop means of mitigating the adverse effects of genetically engineered wheat (Center for Food Safety 2003a). The USDA may never respond to the petition because Monsanto has withdrawn its application, but the issues it raised may have contributed to the agency's decision to reject Monsanto's application as deficient.

Foreign Importers Could Win Increased Share of U.S. Domestic Wheat Market

Many U.S. wheat processors export finished wheat products to Asia and Europe, and there is concern that they could lose domestic market shares to foreign imports of wheat if genetically engineered wheat were introduced in the United States. Dan McGuire of the American Corn Growers Association explained this threat at a town hall meeting in Montana in January 2003 (before Monsanto withdrew its applications): "If U.S. farmers were to grow GMO wheat, U.S. millers might import conventional wheat from Europe and elsewhere so as not to jeopardize not only their market with U.S. consumers but also their market for flour and wheat products that they export from the U.S. to buyers around the world that won't accept products made from GMO wheat" (McGuire 2003).

Resistance Grows: Survey Reveals Grain Elevator Opposition to Genetically Engineered Wheat

In the spring of 2003, the Institute for Agriculture and Trade Policy, which promotes family farms, rural communities, and ecosystems around the world through research, education, science and technology, and

advocacy, surveyed grain elevator operators in North Dakota about their views on Monsanto's pending application. Ninety-eight percent of the operators responding to the survey said that they were either very concerned (82 percent) or somewhat concerned (16 percent) about the proposed introduction of genetically engineered wheat. Additionally, 78 percent of the respondents supported an expanded public review of genetically engineered wheat, one that would go well beyond what the USDA has required for approval of genetically engineered crops in the past (Institute 2003).

"The world wide consumer must have confidence with the credibility of the U.S. farmer and government dealers, which will have no control should Monsanto be in control of wheat releases," said one elevator operator. "Where is the demand for Roundup Ready wheat? Not one consumer group wants it!" (Institute 2003).

"Release [of genetically engineered wheat] before customer acceptance could be death to the U.S. spring wheat market," said another operator. "It's impossible to have a segregation system with zero tolerance" (Institute 2003).

In other survey results, the North Dakota elevator operators ranked loss of export markets as their greatest concern related to genetically engineered wheat deregulation. All said that their customers were concerned about genetically engineered wheat deregulation, with 77 percent characterizing their customers' concern about genetically engineered wheat as either very high (54 percent) or high (23 percent) (Institute 2003).

Confirming the skepticism among North Dakota elevator operators, the National Grain and Feed Dealers Association recently estimated that fewer than 5 percent of U.S. grain elevators have the capacity to operate a dual grain-marketing system (Wisner 2003, executive summary).

Whose "Right to Choose" for Whom?

> The Government now has all of the necessary information to make a sensible and definitive statement about the future of GM crops within the UK. It is time to move forward in a sensible, responsible manner that will give back UK growers and consumers the right to choose, whilst allowing the economy and the environment the opportunity to benefit from this exciting technology.
>
> Dr. Paul Rylott, chair,
> British Agricultural Biotechnology Council (2003)

Proponents of genetic engineering often accuse critics of genetically engineered crops of infringing on farmers' and consumers' "right to choose." However, evidence continues to mount that genetically engineered crops limit, and in some cases may even eliminate, the right of farmers to choose to raise unmodified crops—either conventional or organic—and sabotage the consumers' right to choose *not* to eat genetically engineered food. The cases of Mexican corn contamination and Canadian organic canola contamination are clear examples of this.

Proponents of genetically engineered crops also argue that society should protect the "right" to plant these crops, because genetic engineering is a management tool that may increase farmers' profits. There have been some documented cost savings for certain genetically engineered crops—especially for initial users. However, over time, because of the increase in herbicide-resistant weeds and other factors, studies show that the farmer's costs for growing genetically engineered crops rise substantially, calling into question the alleged economic benefits of such crops for individual farmers (Benbrook 2003).

Additionally, the Canadian Van Acker report breaks down the farm costs for both adopters of the genetically engineered technology and nonadopters. Just for managing Roundup Ready "volunteers"—seeds that germinate a year or more after the initial planting—the additional estimated on-farm costs for adopters range from $6.95 to $15.37 (U.S.) per acre for low-disturbance direct seeding to $1.46 to $3.66 (U.S.) per acre for high-disturbance direct seeding or conventional tillage. For nonadopters, the costs range from $5.49 to $11.47 (U.S.) per acre for low-disturbance direct seeding,[2] with no increased costs for high disturbance (conventional plowing) (Van Acker, Brule-Babel, and Friesen. 2003, 19).[3] It is one thing for proponents to argue that whether to adopt genetically engineered technology is the choice of the individual farmer, who also therefore then decides to incur the extra management burdens reflected in this report. However, since when does our society sanction the "right" of individual farmers to impose such clear and irreversible additional operating costs on her or his neighbors who choose *not* to use it?

Finally, proponents of genetically engineered wheat often tout the environmental benefits of these crops. However, the Van Acker report concludes that the unconfined release of genetically engineered wheat would cause the loss of reduced tillage cropping systems, which would in turn result in increased soil erosion, increased herbicide loads on ecosystems,

and increased greenhouse gases. Low disturbance tillage cropping systems do not rely on conventional plowing for weed control. These systems leave crop residues as ground cover and rely as heavily on more intensive chemical applications—like Roundup—to control weeds. This reduces soil erosion—and is especially effective in the arid Great Plains. The Van Acker study found that the introduction of genetically engineered wheat would result in an increase in the application of Roundup herbicide to control an expected increase in volunteer Roundup wheat prior to seeding in low disturbance cropping systems. The study also projected that farmers would have to increase in the application of other chemicals to control the emergence of other types of Roundup resistance weeds. These increased chemical applications required by the introduction of genetically engineered wheat would cause increased costs to all farmers—both adopters and non-adopters. Not only would these increased chemical loads threaten the environment, but when added to the chemical loads already being applied in crop rotations for Roundup Ready canola they would ultimately threaten the long-term sustainability of reduced tillage cropping. (Van Acker, Brule-Babel and Friesen 2003, 1–2; 25–26).

The current U.S. policy of deregulating genetically engineered crops—including Roundup Ready and other crops—poses a clear and present danger to the integrity of seed stocks and biodiversity worldwide. It threatens the very existence of conventional and organic crops, and it threatens to eliminate the right of farmers to choose organic or conventional crops over genetically engineered crops—not to mention the right of consumers to choose *not* to eat genetically engineered food. Because of unwavering market rejection of genetically engineered wheat among most international buyers, and because of dogged grassroots opposition from farmers, rural communities and consumers, Monsanto has temporarily corked the genetically engineered wheat genie in the bottle. The evidence now available overwhelmingly argues against the deregulation and unconfined release of genetically engineered wheat, and even Monsanto has acknowledged that fact—if only indirectly through the withdrawal of its regulatory applications for genetically engineered wheat around the world. Wheat farmers and the rural economies that depend upon wheat cannot afford the economic catastrophe that would inevitably result if this genie is unleashed before the myriad problems already documented with other crops are resolved. Our valuable wheat must be protected from irreversible genetic contamination.

Notes

1. The Webster's New World Dictionary defines the word "contaminate" as meaning: "to make impure, corrupt, etc. by contact; pollute; taint." Current and proposed threshold standards for permitting trace levels of genetically engineered materials in both conventional and organic crops, and for creating viable systems for segregating genetically engineered and non-genetically engineered materials, do not distinguish between contamination caused through gene flow, such as occurs with pollen drift, and contamination caused by simple physical mixing of genetically engineered seeds, harvested crops or processed flour with conventional or organic seeds, crops or processed flour. Therefore, throughout this paper I use the term "contaminate," and "contamination," to mean, interchangeably, either contamination by gene flow, or physical mixing of genetically engineered and non-genetically engineered seeds, harvested crops or processed products.

2. "Direct seeding, like no-till, is a cropping system which aims to improve soil and soil moisture conservation. Direct seeding is more flexible than no-till; it allows some tillage to solve immediate weed problems and to deal with high moisture and heavy clay soil conditions." Direct Seeding System: Terms, Definitions and Explanation. Agriculture and Rural Development website of the Alberta Government: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex3483?opendocument (accessed on August 16, 2004).

3. The amounts cited here have been converted to U.S. dollars from Canadian dollars, the latter of which were used in the Van Acker study. I used the Money Converter program on the website titled, "Babel Monery Conversion Around the World," at: http://oanda.com/converter/classic?user=Babel, which I set for June 1, 2003 (accessed August 16, 2004). This date coincides with the date of publication of the Van Acker study of June 2003. The actual figures in the Van Acker study in Canadian dollars are: $9.50 to $21 per acre for high-disturbance direct seeding or conventional tillage, to $2-$5 per acre for high-disturbance or conventional tillage for adopters; and, the costs range from $7.50-&16 per acre for low=disturbance direct seeding for non-adopters.

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