

# Who is planting GM crops and why? The Thoughts and Experiences of Minnesota Farmers

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The commercial release of GM crops like Bt corn and herbicide tolerant (HT) soybean is one of the most important developments in U.S. agriculture over the past decade. It is important because few new technologies have been so rapidly adopted by U.S. farmers and few have sparked so much controversy. In just eight years, Bt corn acreage has grown to represent almost one-third of U.S. corn acreage, while HT soybean has grown to represent about three-quarters of U.S. soybean acreage. Even more remarkable is the fact that this rapid adoption has occurred even though the European Union and other important U.S. trading partners have restricted GM imports citing human health and environmental concerns.

Researchers from the Department of Applied Economics at the University of Minnesota conducted the Minnesota Farm Poll between March and July of 2002 to learn more about why Minnesota farmers have rapidly adopted GM crops and how these crops have performed for them. The purpose of this report is to provide a brief overview of the findings derived from the survey.

Surveys were sent to a random and confidential sample of 2,000 corn and soybean farmers from a database maintained by the Minnesota Agricultural Statistics Service. About 50 percent of the surveys were returned, with 33 percent complete enough for analysis. A variety of interesting results emerged from the survey data.

## *Farmer and Farm Characteristics*

The average survey respondent had 33 years of farming experience. Of an average 584 crop acres sown in 2001, 174 acres were corn and 199 acres were soybean. Almost all respondents had completed high school (93 percent). One in four had at least a two-year college, technical, or vocational degree. Fifteen percent had a four-year college degree. One in three farms generated revenues of less than \$50,000, while one in five generated revenues in excess of \$250,000. Two in five respondents worked off-farm to supplement their income.

## *Technology Adoption*

Major technological advances in agriculture over the last quarter of the century include personal computers, precision farming (e.g. yield monitors, global positioning systems, and variable rate applicators), and GM crops. A majority of respondents use personal computers (65 percent), while only about one in five use precision farming or plan to use it sometime in the next five years. In 2001, about 40 percent used Bt corn, while 60 percent used HT soybean. Just less than one in three planted neither GM crop.

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**Table 1: Agricultural Biotechnology Attitudes**

Description	Agree	Dis- agree
	<i>% Respondents</i>	
Increases Farmer Dependence on Large Corporations	58.5	13.2
Improves Living Of MN Farmers	23.0	30.3
Mostly Benefits Large Farms	52.8	22.3
Benefits Consumers	48.1	14.1
Makes Farmers Less Dependent on Chemicals	50.4	23.3
Research Should Target Small/Medium Farms	44.2	23.7
Consumers Will Not Accept	56.1	14.6
Products Should Be Labeled	49.6	22.0
Segregation Not Practical	55.9	18.0
Consumer Concerns Are Overreaction	53.6	14.6

Note: Percentages may not sum to 100 due to neutral responses.

### *Biotechnology Attitudes*

Even though almost 70 percent of respondents used GM crops, their attitudes toward this type of agricultural biotechnology were mixed (Table 1). A majority thought biotechnology would make them more dependent on large corporations and would mostly benefit large farms. A majority also thought consumers would be reluctant to accept GM produce. In contrast, about half thought biotechnology would benefit consumers and consumer concerns were an overreaction. Half also thought biotechnology would make them less dependent on chemicals.

### *Factors Related to GM Adoption*

A variety of factors have been found to consistently relate to the adoption of new technologies. Similar results were found for Bt corn and HT soybean in the Minnesota survey. Though, there were a few surprises.

Farmers with more education tend to adopt new technology more rapidly provided it proves useful. The survey results support this trend with a caveat. Farmers with a four-year college degree were more likely to adopt both Bt corn and HT soybean or neither. The survey did not anticipate this dichotomy, so the result is difficult to explain with the available information. However, we suspect this dichotomy is driven by a lack of consensus regarding the usefulness of GM crops.

The adoption of Bt corn is influenced more by farm characteristics than the adoption of HT soybean. Farms with more crop acreage were more likely to use both Bt corn and HT soybean. Farms with a higher proportion of corn acreage were more likely to adopt Bt corn and HT soybean, while farms with a higher proportion of soybean acreage were more likely to adopt HT soybean, but not Bt corn. More diversified farms (i.e. farms that plant a greater proportion of their land to crops other than corn and soybean) were less likely to adopt Bt corn. Farms that planned to adopt precision agriculture technologies in the next five years were more likely to use both Bt corn and HT soybean. Farms with revenues under \$20,000 were more likely to plant neither Bt corn nor HT soybean.

### *Reasons For Not Planting GM Crops*

A lack of production benefits leads the list of reasons why farmers chose not to use Bt corn or HT soybean (Table 2). Farmer concerns about planting Bt corn were stronger than their concerns about planting HT soybean. A lack of corn borer problems was the primary factor motivating farmers to not use Bt corn. Trouble selling Bt corn, having to segregate Bt corn, and environmental and safety issues were the

**Table 2: Why Farmers Didn't Plant GM Crop Most**

Concern	Important	Most Important
% Respondents		
<i>Bt Corn</i>		
No Corn Borer	37.9	13.5
Selling Crop	20.0	4.5
Segregation	18.7	4.2
Environment/Safety	17.7	8.5
Lower Net Return	15.2	6.0
Lower Price	10.7	1.5
Insect Resistant Management	8.5	0.7
Lower Yield	5.2	1.2
<i>HT Soybean</i>		
Lower Net Return	23.1	6.4
Lower Yield	21.6	6.1
Segregation	14.4	2.3
Selling Crop	13.3	4.9
Lower Price	13.3	1.9
Environment/Safety	8.3	3.8

Note: Farmers were asked to check boxes for all of the important reasons and to circle only the most important reason.

next most noted reasons. Yield was the least noted reason closely followed by the EPA's insect resistance management requirements. Alternatively, net return and yield were the most noted reasons for not planting HT soybean. Environmental and safety issues were the least noted reason.

#### *Reasons For Planting GM Crops*

Farmers who did plant Bt corn or HT soybean also focused their decision on the potential production benefits (Table 3). Three out of four indicated higher yields and better insect control were important reasons for adopting Bt corn. No other reason was agreed upon by a majority. More than nine in ten respondents cited better weed control as an important reason for using HT soybean. A majority also indicated that the use of fewer herbicides, lower costs, and less labor were important factors in their decision.

**Table 3: Why Farmers Planted GM Crop Most**

Reason	Important	Most Important
% Respondents		
<i>Bt Corn</i>		
Higher Yield	78.8	43.2
Better Insect Control	75.6	19.6
Use Less Insecticide	42.8	8.0
Seed Dealer/Consultant	34.4	3.6
Fits With Production	28.8	3.2
Lower Cost	22.4	4.0
Less Labor	14.4	0.0
Neighbor	4.4	0.0
University/Extension	2.8	0.0
<i>HT Soybean</i>		
Better Weed Control	94.6	59.2
Use Less Herbicide	71.3	7.0
Lower Cost	61.0	8.5
Less Labor	53.0	3.6
Use Post Emergent Herbicide	40.1	0.5
Higher Yield	38.0	2.3
Fits With Production	36.7	0.5
Seed Dealer/Consultant	25.3	0.8
Drill Soybean	22.2	1.6
Use No-Till	13.2	0.5
Neighbor	10.6	0.0
University/Extension	2.1	0.3

Note: Farmers were asked to check boxes for all of the important reasons and to circle only the most important reason.

#### *Performance of GM crops*

A majority of Bt corn farmers reported less insect damage and higher yields, but also reported higher costs (Table 4). The net result is that slightly more than half reported higher profits per acre, while only about one in ten reported lower profits. Almost half also report a reduction in their insecticide use, while one in four reported using less labor.

For HT soybean, a majority of farmers reported using fewer herbicides and less labor. A majority also reported no change in

**Table 4: Performance of GM Crop**

Per Acre	% of Respondents	
	Higher	Lower
<i>Bt Corn</i>		
Costs	70.8	7.2
Yield	69.2	4.4
Profit	50.4	11.6
Insect Damage	7.2	65.6
Insecticide Use	2.8	48.8
Labor	1.2	25.6
<i>HT Soybean</i>		
Profit	46.0	14.7
Yield	29.5	14.2
Costs	19.4	48.8
Herbicide Use	7.0	70.3
Labor	5.2	64.1
Weed Damage	4.7	28.9

Note: Percentages may not sum to 100 due to respondents who reported no change.

yields and weed damage. Not quite half reported lower costs and higher profit.

### Conclusions

GM crops like Bt corn and HT soybean have rapidly become an important part of U.S. agriculture despite all the controversy. While both crops offer many farmers a better pest control option, each benefits farmers distinctly.

Most farmers planting Bt corn highlighted the benefits of less pest damage and higher yields, while a small number reported reductions in pesticide use and labor.

Alternatively, most farmers planting HT soybean highlighted the benefits of reduced pesticide use and labor, while a majority reported little change in yields and weed damage.

The adoption of HT soybean has outpaced the adoption of Bt corn even though a higher percentage of Bt corn farmers report increased profit per acre. There are three complementary explanations for this result:

- Corn borer populations are variable both spatially and temporally. For farmers

who do not believe they experience frequent or severe corn borer infestations, the value of yield saved due to reduced corn borer damage is not enough to cover the added cost of Bt seed corn.

- HT soybean offers a consistent advantage in labor savings by reducing herbicide applications. These labor savings increase adoption because farmers have the opportunity to expand their operations. Even if the profit per soybean acre falls, whole farm income can increase with an increase in farming activity.
- Farmers continue to harbor concerns about using GM crops. Some worry about being able to sell their crop, while others worry about segregation and the potential environmental and safety issues. Furthermore, many think GM crops will make them more dependent on corporations and that consumers may not accept their produce. These concerns have been magnified for Bt corn due to a steady stream of controversial studies. These studies have questioned the environmental and human health consequences of Bt corn, while garnering the attention of the popular press.

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