

The Pros and Cons of Genetically Modified Soybeans

From the Field to the Table

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INTRO

As consumers we want to be able to go to our local supermarket and be presented with a vast array of tasty, nutritious, inexpensive, health-approved food. For the most part, we in the United States are fortunate enough to have that luxury. Producers have the constant task of keeping up with the ever-changing demands of consumers in the U.S., as well as with world-wide agricultural needs. Many new innovations and discoveries have been made over the years, but the issue of Genetically Modified Organisms (GMO's) has been arguable one of the most controversial and widespread concepts.

Genetically modified soybeans have been one of the most accepted and implemented crops for producers around the world. Companies like Monsanto have taken on a completely new focus with their biotechnology discoveries, particularly in soybeans. The GM (Genetically Modified) seeds are most commonly referred to as "Roundup Ready" soybeans. The main purpose of Roundup Ready beans is to increase the tolerance of the seed to Roundup or other herbicides, while still maintaining the healthy life of the plant.

The biotechnological science behind the genetic modification of soybeans begins with the organism's DNA (deoxyribonucleic acid). Most organisms' DNA is basically very similar, containing a set of direct cells to make the proteins that are the basis of life. Modification involves the transfer of a specific piece of DNA from one organism to another. A gene segment for the desired trait is cut from a chain of DNA and inserted into an opening made in the plasmid. Often times enzymes are used to ensure the security of the new gene. (Monsanto.com) Using this basic, yet very precise science, researchers have been able to develop new varieties of soybeans, containing specific beneficial traits, while at the same time, eliminating the undesirable traits. Some of the

benefits that GM soybeans offer are herbicide resistance, increased productivity, healthier oils, profit potential, and greater efficiency and flexibility for the producer.

However, the idea of genetic modification remains a much divided issue. Many people believe that there are far too many complications and negative effects associated with the concept of taking an organic material and altering it for performance. Some of the drawbacks associated with GM soybeans are the problems of gene flow, environmental factors, allergens, and increased costs and legal battles.

We will evaluate both alternatives, comparing the pros and cons of the use of genetically modified soybeans followed by an overall summary and recommendation.

PROS

Roundup Ready soybeans have found significant success in recent years. Millions of farmers throughout the world have witnessed the benefits that these herbicide-resistant seeds provide. One of the main benefits, which is basically the reason for the biotech research to begin with, is the tolerance or herbicide resistance that the GM seeds have. What this means is that growers can spray Roundup (a chemical herbicide used for weed control) over the soybeans at any stage of development without harming the soybean plant itself. Roundup Ready soybeans have proven to provide complete crop safety from herbicides, while still producing the maximum yields. (Monsanto.com) This feature greatly reduces the number of applications and varieties of pesticides that are many times used on non-GM soybeans in order to obtain the same results.

With this new-found herbicide tolerance comes cleaner fields, and therefore increased productivity and profit potential. Because producers are able to spend less

money per acre on pesticides, the Roundup Ready soybean seeds increase yield potential by an average of \$9.00 per acre more than non-GM seed. Research has also shown that after three years of testing, Roundup Ready soybeans yielded 2.6 bushels more per acre than conventional seed programs. (Monsanto.com) The charts below illustrate these statistics.

Roundup Ready Soybean System	2-Pass
Yield bu/A ¹	50
Gross Income/A ²	\$ 282.50
Seed Cost/A ³	\$ 26.23
Herbicide Cost/A	\$ 20.42
<i>2-Pass Roundup UltraMAX 1l[®] @ 22 oz/A</i>	
Less: Total Herbicide & Seed Cost/A ⁴	\$ 46.65
VS	
Conventional Soybean Herbicide Program	
Yield bu/A ¹	\$ 47.40
Gross Income/A ²	\$ 267.81
Seed Cost/A ³	\$ 16.04
Herbicide Cost/A	
<i>Prowl[®] 3.3EC @ 3 pts/A</i>	\$ 7.71
<i>Raptor[®] @ 4 oz/A</i>	\$ 17.05
<i>AMS @ 2.5 lbs/A</i>	\$.52
<i>Crop Oil @ 1 pt/A</i>	\$.54
Less: Total Herbicide & Seed Cost/A ⁴	\$ 41.86
Net Return Per Acre	\$ 225.95

¹ Based on 832 Monsanto Field Trials comparing Roundup agricultural herbicide to conventional herbicides on Roundup Ready Soybeans, 1996-1998.

² Based on \$5.65 per bushel average.

³ Source: 2002 Doane Market Research.

⁴ Herbicide and seed costs are based on in-season estimated 2003 prices. Prices may vary in your area.

The Roundup Ready Soybean System can yield 2.6 bu/A more.

	Conventional Soybean Herbicide Program	Roundup Ready Soybean System
Yield bu/A ¹	47.4	50
Gross Revenue/A (\$5.65 per bushel)	\$ 267.81	\$ 282.50

Farmers like Tim Seifert, of central Illinois, have converted “every inch” of their soybean acreage to Roundup Ready beans. Seifert states, “It’s a system: Plant the seed and spray the proprietary chemical for which it’s genetically engineered. Farmers will tell you they do it for profit, for ease of farming. They do it for vanity too. You keep a “clean” field year-round, naked of anything except what you saw, and your land looks good and rents for more.” (Lambrecht, p.100) Tim and many other farmers like him seem to be saying that Roundup Ready soybeans lead to a cycle of profit, from decreasing chemical costs, all the way down to increasing the value of farmland.

To satisfy the health craze in the past decade or so, companies like Monsanto have developed an even better soybean that is designed to contain a lower amount of linolenic acid, a link to trans-fats. These beans, which will also contain the Roundup Ready trait, will produce less than 3% linolenic acid, compared to 8% for non-GM soybeans. This processes into more stable soybean oil, with better flavor and hydrogenation. Hydrogenation is used to make products like margarine and shortening and to increase their shelf-lives. Because these GM soybeans contain less linolenic acid the need for partial hydrogenation is reduced or even eliminated, along with the trans-fats. This is a major health benefit because trans-fats have been proven to lower our HDL or good cholesterol, while at the same time raising our LDL or bad cholesterol.(Monsanto.com) John Becherer, CEO of QUALOSOY stated that this new variety of soybeans “not only improves the competitiveness of growers, it also meets the needs of the food industry.”(Monsanto.com)

Finally GM soybeans create greater efficiency and flexibility for today’s farmer. As discussed above, Roundup Ready soybeans provide the benefit of reducing the

number of chemical applications quite significantly. This frees up more time for producers and also presents the option of farming more acres in a season. GM soybeans have also made the idea of conservation tillage possible. This method involves less plowing of the soil with more “crop mulch,” or a layer of leaves, stems stalks, etc. from the previous crop. Conservation tillage means less fuel costs, less wear on machinery, as well as increased yield, environmental, and agronomic benefits. Roundup Ready soybeans make this possible because they produce fields containing fewer weeds, making reduced tillage feasible. Most of all, this method leads to measurable time and labor savings. According to Monsanto .com, conservation tilling saves you 36 minutes per acre more than conventional tilling methods. For a 1,000 acre farm, that amounts to 60 extra hours per for the farmer to redistribute as he/she wishes.

CONS

The drawbacks with this issue are also growing concerns. One of the main problems with the GM soybeans is gene flow. This refers to when one gene transfers from one species to another, and if the herbicide-resistant gene, found in Roundup Ready soybeans, transfers to weed varieties, then it would be necessary for stronger chemicals to control the new herbicide-resistant weeds. (agresearch.com) this could lead to substantial problems with weeds becoming immune to known herbicides. These weeds would be much stronger and would require more toxic chemicals to eliminate what are referred to as “super weeds.” Gene flow also leads to the problem of genetic pollution. Wind, rain, birds, insects, etc. carry genetically modified pollen into adjoining fields, contaminating the DNA of those non-GM crops. (organicconsumers.org) The newly gene-altered crops

are very unpredictable and can reproduce, migrate, or mutate. Once the organisms are released, it is nearly impossible to bring them back to the lab or field.

(organicconsumers.org) This problem of genetic flow and pollution enrages organic farmers and demonstrates problematic environmental factors.

Another problem that puts fear into consumers is allergens. When soybeans are taken from their original state for genetic modification, strands of DNA are taken from numerous different organisms in order to obtain specific traits. This cross-breeding can produce foods that may induce an allergic reaction in certain people. (psswa.com)

According to York Nutritional Labs in England, soy allergies have increased by 50% since Roundup Ready soybeans have been implemented into the food supply.

(psswa.com) The main concern with this is that genetically modified soybeans contain proteins that may have never before been consumed by large masses of people at the same time, and it is not known which proteins will cause allergies to what people. There are many people that have severe allergies to certain foods, that if exposed, they could become very sick or even die. For example, researchers in Nebraska cross-bred a soybean with a Brazil nut in order to increase the protein content of the seed. People who were allergic to Brazil nuts reacted when they ate the cross-bred products. (psswa.com) The issue remains, how do we know which GM crops will cause allergies? It seems nearly impossible to tell.

Aside from the problems of allergens and gene pollution, studies have been done to show misrepresentations about the economical benefits of GM soybeans. Some studies have actually released results stating that Roundup Ready soybeans increase production costs, rather than decrease. Two of these studies, one by the USDA and the

other by Dr. Charles Benbrook, showed that Roundup Ready soybeans produced lower yields than that of conventional soybeans. They also claimed that farmers are using more herbicide on their Roundup Ready soybeans, up to 2-5 times more per acre. This survey was taken with over 8,000 field trials by the University of Wisconsin. (mofga.com) GM seed does cost more to purchase, and if the overall per acre profit does not exceed that of traditional soybean seed, the benefit does not exist.

An additional economics concern is the idea of “biosefdom.” This is a term that has been used to refer to the point in time when farmers will lease their crops from large biotech companies, such as Monsanto, and pay royalties on the seeds.

(organicconsumers.org) This concept would destroy the idea of the family farm, which would leave millions of farmers around the world jobless. Small rural communities would also break apart, and the patenting of GM foods would force families to save and share their seeds in order to buy costly GM seeds, along with the chemicals they require from a few biotech monopolies. This idea scares farmers because it could literally change the way their operations have been run for generations.

Adding to the increased costs that Roundup Ready soybeans can cause are the many legal battles and issues that have arisen from these GM seeds. The issue of labeling has been a huge controversy. Should GM products be required to be labeled as such, or is it not fair or necessary? Europe has not accepted genetic modification nearly as well as the U.S. has. The Church of England refused to allow its British government to use its 23,000 acres of farm land for trials of GM crops because they are not convinced of its morality and safety. (mofga.com) Certain American companies have also stopped using GM soybeans. Some of these companies include, Gerber, Heinz, and Iams. These

companies are refusing the use of GM products because they do not feel they are safe, and they don't want to incur any legal costs due to customer dissatisfactions or other product malfunctions. In 1999, a New York law firm Cohen, Milstein, Hausfeld, and Toll combined with the National Family Farm Coalition, the Foundation for Economic Trends, as well as others, to file a lawsuit against the large biotech companies. They claimed that GM seeds were forced onto the market at fixed prices, and the testing for health and environment safety was not sufficient. There were also allegations of anti-trust law violations, public nuisance, deceptive trade practices, breach of implied warranty contracts, and violation of customary international law. (mofga.com) All of these issues cost money for everyone involved, and sometimes the truth can be blurred by dollar signs and personal or corporate benefits, making it difficult to come to the correct conclusion.

Evaluative Summary of Both Alternatives

The genetic modification of soybeans has a long list of benefits and drawbacks, and it seems a difficult issue to take a definite stand on one way or the other, but genetic modification is not going to go away. Producers and consumers need to look at the positive and negative alternatives to GM soybeans and make a decision that reflects their needs. McLaughlin states it well: "I absolutely believe that biotechnology is not the panacea to all the world's ills. We need to optimize all tools so that we can optimize the interaction of various things that work best in a particular environment. However, we need to make this science-based. We cannot throw out the science." (Lambrecht, p.308)

Recommendations

As the years pass and biotechnology becomes more and more understood I feel that the concern with the safety issues will decline, and GM seeds will become a very accepted part of the agricultural process. Right now we are dealing with the “wrinkles.” GM soybeans have already produced unsurpassed results, and if we can iron out the “wrinkles”, I believe the concept will be solidified. My recommendation for questioning producers and consumers is to educate yourself on GM soybeans in your situation and have patience. Time will eventually give solid results.

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