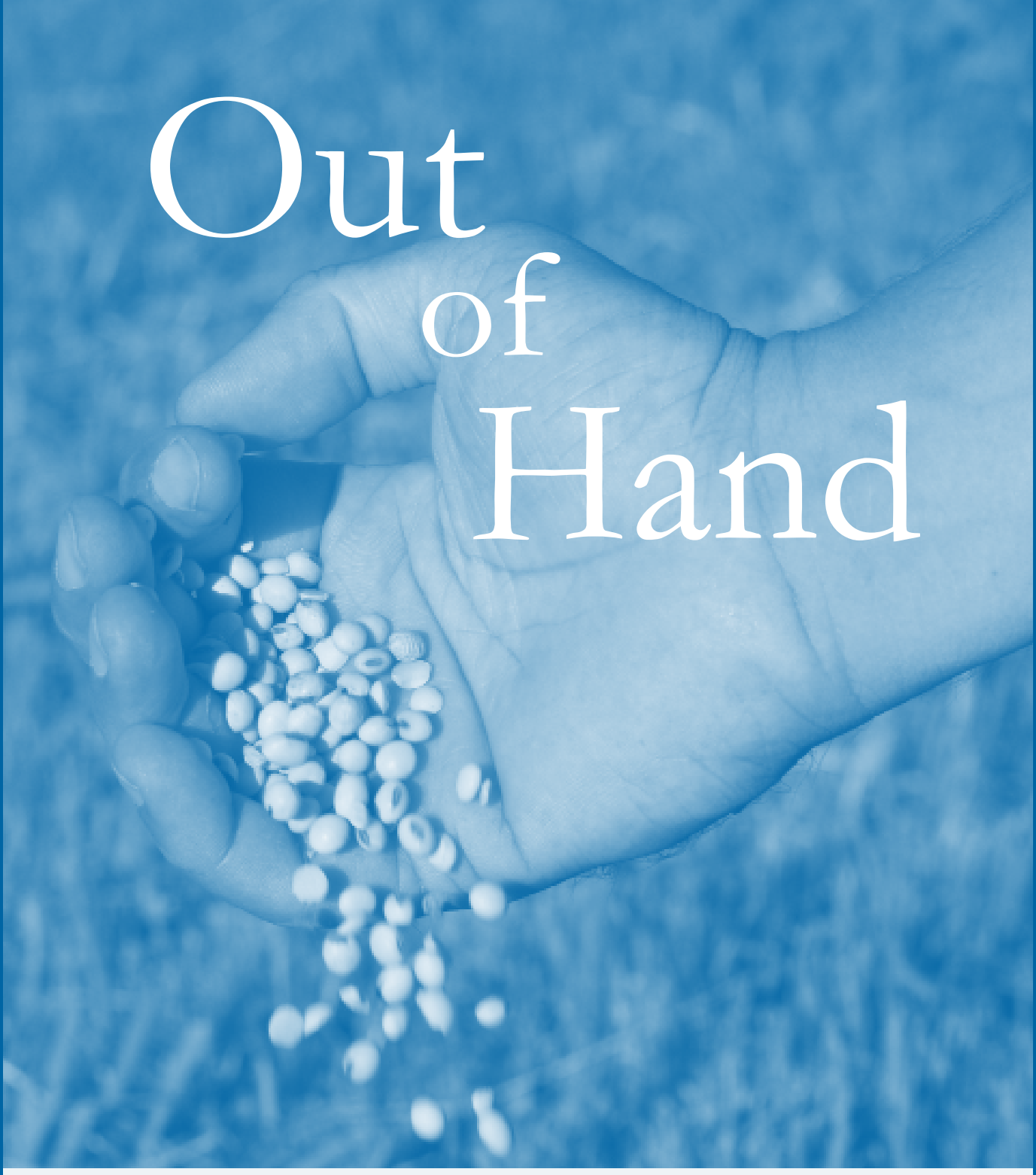

Out of Hand

Farmers Face the Consequences of a Consolidated Seed Industry

A report by the FARMER to FARMER Campaign on Genetic Engineering

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Farmers Face the Consequences of a Consolidated Seed Industry

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The full text of this report is available online (in PDF format) at www.farmertofarmercampaign.org or by emailing farmertofarmercampaign@gmail.com.

Design: Studio Country

About the Farmer to Farmer Campaign on Genetic Engineering

The Farmer to Farmer Campaign on Genetic Engineering is a network of 34 farm organizations from throughout the United States that endorsed the Farmer Declaration on Genetic Engineering released in December 1999. The Farmer to Farmer Campaign on Genetic Engineering seeks to build a farmer driven campaign focused on concerns around agricultural biotechnology and to provide a national forum for farmer action on these issues.

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Executive Summary

The seed industry has quickly consolidated. The U.S. Department of Justice (DOJ) announced in August 2009 that it would investigate alleged anticompetitive conduct in the seed industry largely because a few dominant firms now control much of the seed supply.

Ten companies account for about two-thirds (65 percent) of the world's proprietary seed – that is, branded varieties subject to intellectual property protections – for major crops. Economists say that an industry has lost its competitive character when the concentration ratio of the top four firms (CR4) is 40 percent or higher. In seed, the top four firms account for 50 percent of the proprietary market alone, and 43 percent of the commercial market, which includes both proprietary and public varieties. This level of concentration has proven problematic, reducing choice and increasing prices for the average American farmer.

Several factors have contributed to concentration in the seed industry. Extensive concentration is a consequence of weak antitrust law enforcement and Supreme Court decisions that allowed agricultural biotechnology and other plant products to be patented. Together, these factors have created unprecedented ownership and control over plant genetic resources in major field crops.

Federal policy has also contributed to concentration. The 1980 Bayh-Dole Act allowed universities – for the first time – to patent inventions that result from publicly funded research projects on the theory that the law would increase innovation. With passage, industry funding of public research surged and public funding dropped dramatically. The result has been the privatization of public research, leading to restrictions on the free exchange of basic research, less public analysis of new varieties, and diminished innovation. Though industry funding of universities may not be something to criticize on its own, these trends are troubling.

Dozens of mergers and acquisitions followed the expansion of agricultural biotechnology. Many smaller companies could not compete with large firms that owned much of the genetic resource base in seed, and licensing genetics from these firms was costly. At least 200 independent seed companies have been lost in the last thirteen years alone. Furthermore, biotechnology research demands financial resources that most smaller, family-owned companies do not have. Large firms investing in these technologies and earning royalties from licensing agreements quickly achieved a market advantage that led to numerous buy-outs.

As smaller, independent companies vanish from the landscape, farmers see fewer options and higher prices in the marketplace. This report documents these trends in corn and soybeans using industry sources, government data, and personal interviews with farmers and seed industry representatives.

Discussions on seed industry concentration typically center on the dominant firm, the Monsanto Company, which achieved the No. 1 position in less than a decade by capturing the markets for corn, soybean, cotton, and vegetable seed. Its position is most evident when looking at acreage. Today, its genetically engineered (GE) traits are planted on more than 80 percent of U.S. corn acres and more than 90 percent of soybean acres.

Three major trends have emerged in the Monsanto-dominated seed marketplace that prove challenging to farmers.

1) Historic price increases in seed driven by royalty fees for GE traits

USDA figures show that the most substantial price increases occurred parallel to the rise in GE crop plantings, with the most significant price increases occurring within the last few years. Corn seed prices in 2009 were more than 30 percent higher, and soybean seed nearly 25 percent higher, than 2008 prices. These mark the steepest year-to-year increases to date.

Monsanto's dramatic price increases are unmatched. The company's traits and the technology (royalty) fees tied to them stand out as the driving force behind increased seed costs. These fees vary by crop type, but all have increased substantially over the years. The Roundup Ready trait in soybeans added $6.50 per bag in 2000 and has nearly tripled since then, now costing $17.50 per bag for the same trait – sometimes attributing to nearly half the price of a bag of Roundup Ready soybean seed.

2) The biotechnology industry's push for greater market penetration of stacked traits in corn

Higher seed prices have also resulted from Monsanto leveraging its market share to stack various traits into single varieties. In 2008, Monsanto executed an "expanded trait penetration" plan to increase sales of seed comprised of, or "stacked," with three different traits. The strategy is aggressive and effective: First capture ample market share through attractive pricing structures and then increase prices once "penetration goals" are met. Because each trait fetches a separate royalty for Monsanto, as seed traits are stacked, prices grow.

3) Lack of conventional corn and soybean seed options

Monsanto also boosts triple-stack seed sales by effectively eliminating other options in the marketplace. As the industry consolidates, seed options narrow, and farmers lose access to important varieties they once relied on. Conventional (non-GE) options have diminished, and single and double trait corn varieties are also more difficult to locate. Farmers report that it is increasingly hard to find Bt corn without the Roundup Ready trait. Monsanto's data confirms this trend.

To drive farmers toward triple stack varieties, Monsanto implemented more dramatic price increases for single trait and double stack varieties while reducing single trait and conventional options in its own brands and subsidiary companies. Little attention has been given to this emerging trend, where demand does not factor in as much as a lack of choice.

To be sure, there is great demand among farmers for GE corn and soybeans. Yet demand for conventional varieties is growing at the same time that farmers are seeing these varieties slip away as the industry consolidates. Higher Roundup Ready soybean seed prices have sparked renewed interest in conventional soybeans. In 2009, numerous university extension agents reported that conventional soybean sales had doubled and demand could not be met. In fact, this year marked the first reduction of GE soybean acres since their introduction in 1996.

This report explores how the renewed demand for conventional soybeans is a result of various factors: high seed and glyphosate costs, glyphosate-resistant weeds, high premiums for conventional soybeans, and the ability to save non-patented varieties of conventional seed. Taken together, buying conventional soybean seed leads to cheaper production costs, access to more profitable markets, and the ability to save and improve seed.

All of these impacts to farmers are best understood by examining the role patent law has played in encouraging concentration. Over the course of decades, Congress has visited intellectual property protection for breeders of living organisms and consistently argued that sexually reproducing plants should not be awarded patents for fear of curtailing innovation, threatening the free exchange of genetic resources, and increasing market concentration. When Congress passed the 1970 Plant Variety Protection Act (PVPA) the law represented a compromise. It provides plant developers a temporary, legal protection of plants while exempting farmers and plant researchers.

But in 1980, the Patent and Trademark Office (PTO) awarded the first "utility" patent – patents for inventions – to a living organism. The Supreme Court upheld the PTO decision, holding that patent law is not specifically excluded in the PVPA but leaving the door open for Congress to make PVPA the exclusive protection for sexually reproducing plants.

Because patents remove a farmer's right to save seed – an important form of competition – they have led to investigations of farmers for patent infringement (illegally saving patented seed) that at times infringe upon privacy and property rights.

Some of the concerns identified in this report are not new. They have been the focus of several antitrust cases targeting large firms. These cases provide valuable context and affirm this report's findings. For example, *Texas Grain Inc. v. Monsanto Company* alleges that Monsanto's licensing agreements with hundreds of seed companies restrain competition and future innovation by turning smaller seed companies into exclusive licensees of Monsanto products. Seed companies enter into these licensing agreements to access limited use of Monsanto's technology, such as the Roundup Ready trait. The lawsuit points to financial disincentives for selling competitors' products, which, if proven in court, means these businesses are essentially forced to maintain Monsanto's market share or risk being financially penalized.

As the industry consolidates, seed options narrow, and farmers lose access to important varieties. Little attention has been given to this emerging trend, where demand does not factor in as much as a lack of choice.

We hope this report spurs the federal government, seed industry, and farmers to acknowledge and confront the issues resulting from a highly concentrated seed industry. The DOJ's August 2009 announcement that it is inviting input on competition issues affecting U.S. agriculture – including industry concentration and issues relating to patents and intellectual property – is a necessary examination long overdue.

Our recommendations go beyond the examination of anticompetitive conduct in the seed industry, but they do start there. Our specific recommendations include:

1) The Department of Justice should closely examine anticompetitive conduct in the industry. Biotechnology firms have merged with or acquired a significant number of competitors, and though some have drawn antitrust scrutiny, no meaningful action has been taken to deal with anticompetitive players.

2) Change patent law and establish Plant Variety Protection Act as sole protection. By establishing the PVPA as the sole means of intellectual property protection over plants, farmers could regain the right to save seed and the right to choice, as plant breeders would have better access to plant genetics that are currently off limits to innovation because of patents.

3) Change the Bayh-Dole Act (Patent and Trademark Law Amendments Act). The Bayh-Dole Act as applied to seed patenting and agricultural innovations should be re-evaluated and reformed to prohibit mandates for seed patenting and exclusive licenses relating to technologies and innovations developed through publicly funded research.

4) Rebuild public plant breeding and public cultivar development programs. Now is the time for the USDA to make this major recommitment to reinvigorating our public breeding and public cultivar development programs so we can ensure that the needs of farmers and the general public are met and that research is conducted in an open and honest way.

5) Remove the restriction on research from licensing agreements. Independent research relies on access to protected products for purposes of innovation and information sharing. Patent owners should not have the power to prevent performance and safety testing of their products.

6) Enact farmer contract reforms and establish a federal "Farmer Protection Act." Restoring fully the federal rights of farmers to negotiate fair contracts, and including explicitly the right of farmers to negotiate collectively, would greatly contribute to restoring a fair and open playing field and better ensure future competitive and transparent market behaviors.

Introduction

The concentration of economic power in agriculture has led to grave consequences for American farmers and rural communities. Today, reduced competition in agricultural markets means farmers face increasingly high input prices and diminished choice and innovation.

Farmers are familiar with a concentrated agricultural system because the number of firms from which they can buy their inputs and to which they can sell their products has dropped precipitously. Economists say an industry has lost its competitive character when the concentration ratio of the top four firms (CR4) is 40 percent or higher.[1] Many agricultural sectors have exceeded – in some cases have doubled – this benchmark. For example, four firms control more than 80 percent of beef packing; three firms control about 70 percent of soybean crushing; and three firms handle 55 percent of flour milling.[2] Farms themselves have quickly consolidated since the 1930s. The number of farms has decreased over the years, while the size of farms and the average age of farmers have steadily increased.

Input industries are included in the trend and in fact demonstrate even higher levels of concentration in some sectors. Six companies account for 75 percent of the agricultural chemical market worldwide.[3] The fertilizer market is similarly ruled by a handful of firms, all of which easily maintain market power in an industry difficult to penetrate.

The seed industry is one of the most concentrated in agriculture. The top four firms account for 43 percent of the global commercial seed market, which includes both public and proprietary varieties sold. They also account for 50 percent of the global proprietary seed market. (The term proprietary refers to branded seed subject to intellectual property protections.) These same firms also hold dominant positions in the agricultural chemical market.[4]

The prevailing leader, the Monsanto Company, accounts for about 60 percent of both the U.S. corn and soybean seed market through subsidiaries and technology (i.e., genetically engineered traits, such as Roundup Ready and Bt) licensing agreements with smaller companies. When looking specifically at genetically engineered traits in the U.S., more than 90 percent of the soybean and cotton acreage, and more than 80 percent of corn acreage, is planted with one or more of Monsanto's traits.

Economists say an industry has lost its competitive character when the concentration ratio of the top four firms is 40 percent or higher. Many agricultural sectors have exceeded – in some cases doubled – this benchmark.

Section 1 of this report identifies the seed industry leaders and explores events that allowed a handful of firms to acquire enormous market power. In general, extensive concentration is a consequence of weak antitrust law enforcement and Supreme Court decisions that allowed agricultural biotechnology and other plant products to be patented. Together, these factors have created unprecedented ownership and control over plant genetic resources in major field crops.

Section 2 examines the impacts to farmers in the context of choice and pricing. As the market power of the largest

seed firms grow, so do the prices farmers pay for seed. One clear cause is that firms increasingly "stack," or combine, genetically engineered traits – each tied to a royalty payment – into single varieties. Accompanying this trend are less expensive and quality options in the seed marketplace, especially conventional varieties, which fetch a premium price because they do not include genetically engineered traits. These alternatives are harder to find in an industry led by a few players focused on biotechnology. And in the case of soybeans, where the Roundup Ready trait is proving to be a short-lived technology, demand for these alternatives outstrips supply.

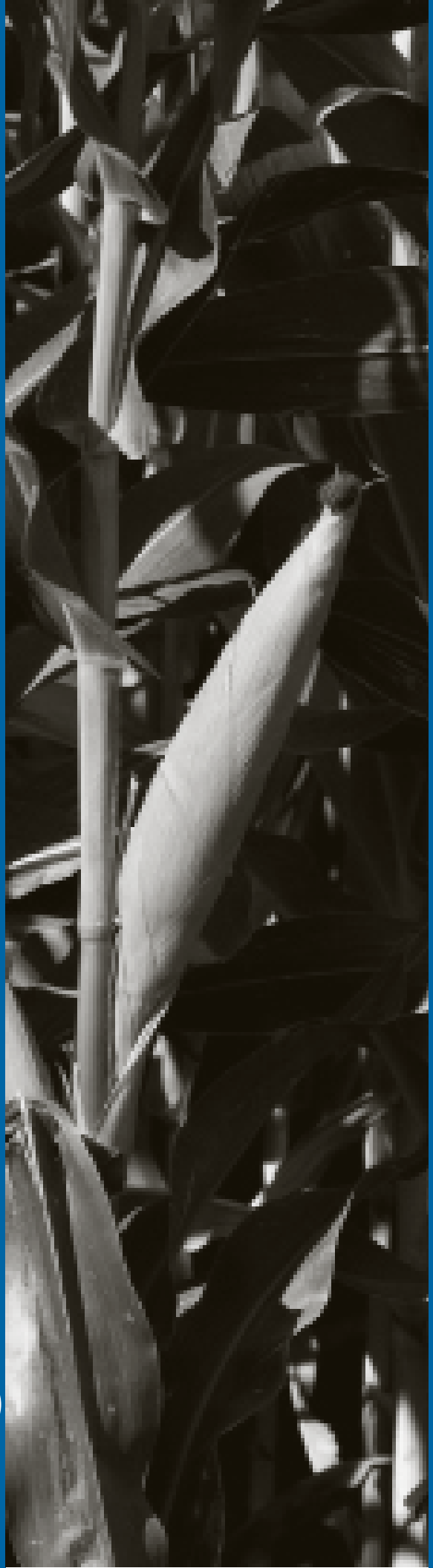
Section 3 discusses the consequences of patents on crops, including the impacts to public breeding programs and small seed companies. Patents have allowed for a culture of secrecy to develop around patented research that threatens the transparency of public programs; reduces access to genetic resources that ensures future innovation; and restricts independent testing that would provide farmers useful information about products they are purchasing. Furthermore, the enforcement of patents on seed shows a troubling pattern of investigations and litigation that can infringe on farmers' privacy and property rights.

One important finding is a general fear in agricultural communities that simply talking about the seed industry's shortcomings will result in repercussions against them personally. This report gives voice to their stories.

Other legal cases involving patents and seed traits point not to farmers but Monsanto and other powerful firms. The report also documents various antitrust allegations against industry leaders. The Department of Justice's (DOJ) August 2009 announcement that it is exploring competition issues affecting agricultural industries and weighing the appropriate role of antitrust and regulatory enforcement provides some hope that the government will address unfair conduct, and not turn a blind eye to anticompetitive mergers and acquisitions in the seed industry.

The implications of a concentrated seed industry are no longer discussed in future tense. As this report explores, industry sources, government data, and personal interviews with farmers and seed industry representatives all attest to historic price increases and reduced options in the corn and soybean marketplaces. The purpose of this report is to document these trends. Some sources were uncomfortable sharing their identity publicly because they feared backlash from industry partners, namely Monsanto. One important finding is a general fear in agricultural communities that simply talking about the seed industry's shortcomings will result in repercussions against them personally. This report gives voice to their stories.

Regardless of one's opinion on agricultural biotechnology, concentration in the seed industry means farmers are beholden to a few major firms. As concentration worsens, farmers lose more power in a once vibrant and independent production process. Finding our way back demands a serious examination of current seed industry structure and conduct, as well as an open and honest review of patent law as it pertains to the most fundamental piece of agriculture: seed.



Section 1

Concentration in the Seed Industry

Several factors facilitated seed industry concentration. Though once a public resource, seed has become increasingly privatized to the point where a handful of large firms now control much of the supply. In the face of weak competition law enforcement, biotechnology and agrichemical firms acquired and merged with dozens of smaller competitors. The rapid expansion of agricultural biotechnology, and the Supreme Court decisions that allowed these plant products to be patented, led to unprecedented ownership and control over plant genetic resources.

The defunding of public plant breeding programs also eliminated many public seed varieties from the marketplace, and shifted research efforts to meet the needs of private firms investing in their work. Coupled with the 1980 Bayh-Dole Act, which allows universities to patent publicly funded research and products, university-industry relationships accelerated the privatization of important plant genetics that would otherwise be publicly available to farmers and other breeders, and therefore compete with private products. This section explores how a handful of firms came to control much of our seed supply. One company in particular, Monsanto, has successfully captured the markets for most major crops in less than a decade.

A Short History of Plant Breeding

Farmers were the first true plant breeders. Throughout the 19th century farmers conducted extensive crop

breeding with new seeds provided free of charge from the U.S. government, many of which came from overseas.[5] Most farmers depended on seed saved from their own harvest or a neighbor's harvest, and did not buy large quantities from commercial suppliers. At the time these were small-scale, family-owned operations that grew varieties produced in the public domain.

The public sector eventually took on more breeding efforts and provided new seed varieties to farmers and small independent seed companies at affordable prices. Public breeding programs advanced American agriculture tremendously. They effectively increased yield in major crops, and were the strongest base of scientific knowledge with the best research facilities.[6] Private firms at the time were small in number and offered few products.

During the first half of the 20th century, plant breeding developed simultaneously in both the public and private sector. The public sector was well funded and continued to set the benchmark for quality, especially as evidence surfaced that some new private seed companies were falsely advertising the performance of their seed.[7] Farmers still played an important role in selectively harvesting seed for their own use and to share with other farmers as well as researchers.

Congress long argued that sexually reproducing plants should not be awarded utility patents for fear of curtailing innovation, threatening the free exchange of genetic resources, and increasing market concentration.

The 1930s ushered in a game-changing seed development: hybrid corn. Before the 20th century, seed corn consisted almost entirely of open-pollinated varieties that farmers saved. Despite the inability to save and re-propagate the new hybrid varieties, farmers quickly adopted the high-yielding seed. Private seed companies capitalized on the feat and expanded in the commercial marketplace, largely because farmers who planted hybrids bought all new seed each year.

New seed companies entered the scene solely to produce hybrid corn. While most produced and sold hybrid seed corn developed by larger firms or the public sector, some established their own research and breeding programs. By 1965, more than 95 percent of U.S. corn acreage was planted to hybrids.[8]

The public sector started to reduce production of cultivars for crops where the private sector had increased output, such as hybrid corn. But both basic research to build new germplasm pools and cultivar development continued in the public sector, especially in regions that were not served or underserved by the private sector.[9]

Accompanying successes in plant breeding and other areas of agriculture was the consolidation of farms themselves. The number of farms and farmers in the U.S. declined dramatically in the latter half of the 20th century. Interest in financial support for public plant breeding also started to decline, a trend that continues today.[10]

The private sector expanded rapidly in the 1960s and 1970s, especially after plant variety protection legislation stimulated commercial breeding of major crops, such as soybeans. The 1970 Plant Variety Protection Act (PVPA) provided the private sector an incentive to expand in the seed marketplace. Many seed companies did not have proprietary rights on the seed they sold but the PVPA provided a temporary, legal protection of plant products – with a few exceptions – to plant developers.

The PVPA represented a compromise by Congress, which had long argued that sexually reproducing plants should not be awarded utility patents – "patents for invention" – for fear of curtailing innovation, threatening the free exchange of genetic resources, and increasing market concentration. But in 1980, the Patent and Trademark Office (PTO) awarded the first utility patent on life in the landmark case of *Diamond v. Chakrabarty*. The Supreme Court upheld this decision in 2001, the implications of which are explained in Section 3.

This decision provided the budding agricultural biotechnology industry with enforceable intellectual property protections. These firms rushed to patent genetic resources and plant breeding technologies – including those developed in the public domain – making it difficult for other companies to compete and ultimately slowing innovation. New restrictions on seed saving were also enforced. For example, soybean farmers only recently stopped saving most of their seed. In 1982, purchased seed made up about half of soybean acreage.[11] Today nearly all the soybeans planted are patented varieties with seed saving restrictions.[12]

These firms also rushed to purchase independent seed companies to leverage existing breeding programs and established regional markets in pursuit of commercializing biotechnology seed traits.[13] Many of these larger firms that acquired or merged with dozens of smaller companies were established multinational pharmaceutical, petrochemical, and food corporations that had only recently entered the seed business. By the 1980s, some of these firms were the largest seed companies in the world.[14]

The mergers and acquisitions that followed the expansion of agricultural biotechnology allowed firms to quickly increase market share in a number of ways. For one, buy-outs come with intellectual property rights, so companies can avoid expensive licensing agreements tied to traits and other genetics as well as profit from others' innovations.

These firms have also capitalized on proprietary biotechnology products by leveraging economies of scope.[15] That is, a particular genetically engineered (GE) trait can be bred into several crop types, as we have seen with the Roundup Ready trait now commercialized in canola, corn, cotton, and soybeans. Because these firms are multinational, they can expand into international markets easier than smaller firms, increasing sales and profits that support further research and development.

The University-Industry Complex

Legislative changes transformed how industry and universities do business. In 1980, Congress passed the Bayh-Dole Act, which, for the first time, allowed universities to patent technologies and other products that result from publicly funded research projects. Universities had previously regarded patents as at odds with their non-profit educational mission, but following Bayh-Dole, they began to earn royalties in exchange for licensing their inventions to private companies.[16] Industry funding for academic research surged after Bayh-Dole as public support diminished, increasing from $850 million in 1985 to $4.25 billion in less than a decade.[17]

The biotechnology sector has benefited the most from Bayh-Dole arrangements.[18] Investments in plant biotechnology research largely focus on crops and traits with the greatest profit potential for large firms as opposed to non-proprietary solutions that benefit the wider public.[19]

Coupled with changes in patent law, Bayh-Dole has allowed private firms to gain monopolies through patents on research results discovered through their donations to public breeding programs.[20] As a result, farmers and researchers have less access to seed developed in the public domain. Patents also eliminate a farmer's right to save seed, and as more germplasm is held in private hands, small breeding companies and public researchers have a harder time accessing breeding material to further innovation and increase competition.

Industry's funding of public universities may not be something to criticize on its own, especially in light of dwindling public funds. But with the industry's expanded role in funding some troubling trends have emerged. Industry funding often comes with strings attached that dictate terms of research, including confidentiality agreements and restrictions on the

As the seed industry became more concentrated, private research 'dropped or slowed,' and those companies that survived consolidation are 'sponsoring less research relative to the size of their individual markets than when more companies were involved.'

interchange of basic research and information due to patents on university research.[21] Worse than secrecy is evidence that companies manipulate results before publication to serve the interests of private investors. It is also not uncommon for university professors and universities to own stock in the very companies financing their research.[22]

Ironically, the biotechnology industry would not exist if not for the free exchange of basic research done independently from market constraints.[23] Now with proprietary restrictions in place, innovation is inhibited because university researchers cannot access important plant genetic resources. Furthermore, some universities have spent more money on legal fees to defend intellectual property than what they earn from patenting and licensing these products.[24]

Clearly, both sectors of plant breeding – private and public – depend on the other for resources, be it financial or agronomic. In the face of consolidation, the need for public plant breeding programs to produce cultivars for the public domain is more important than ever. While larger firms typically only produce seed for which there is a large market, public plant breeding programs have historically focused on local or regional markets – markets that have been abandoned as companies consolidate, public breeders vanish, and local seed production and distribution infrastructures are lost.[25]

Where Are We Now?

Seed industry concentration is becoming worse. Seed companies have rapidly consolidated to the point where ten companies account for about two-thirds (65 percent) of the world's seed for major crops, including corn, soybeans, canola and cotton (see Figure 1).

As previously mentioned, economists say that an industry has lost its competitive character when the concentration ratio of the top four firms (CR4) is 40 percent or higher.[26] In the case of seed, the top four firms account for 43 percent of the global commercial seed market, which includes both public and proprietary varieties sold. When looking at the proprietary

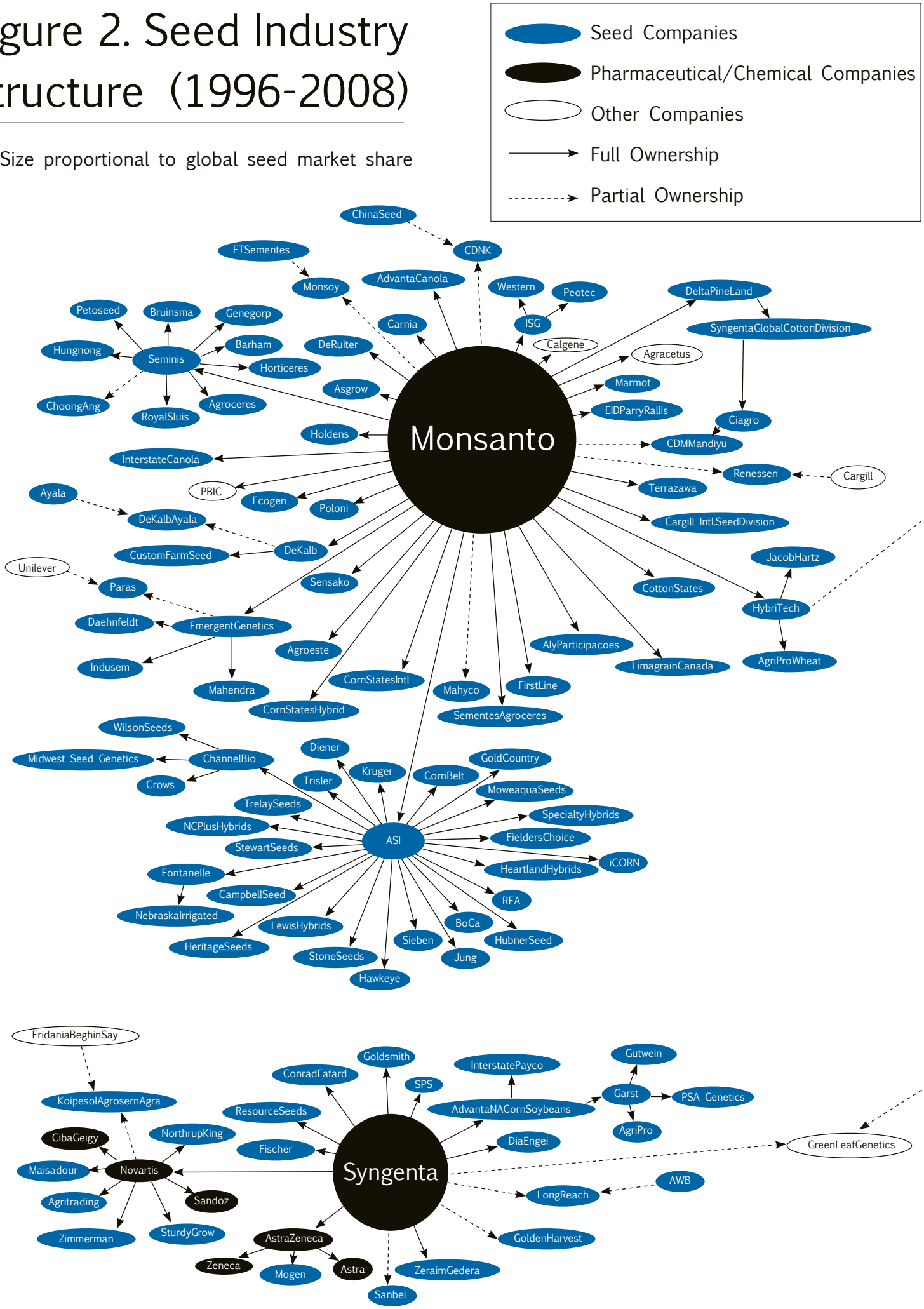
Figure 1. Top Ten Company Share of Global Proprietary Seed Market (2008)*

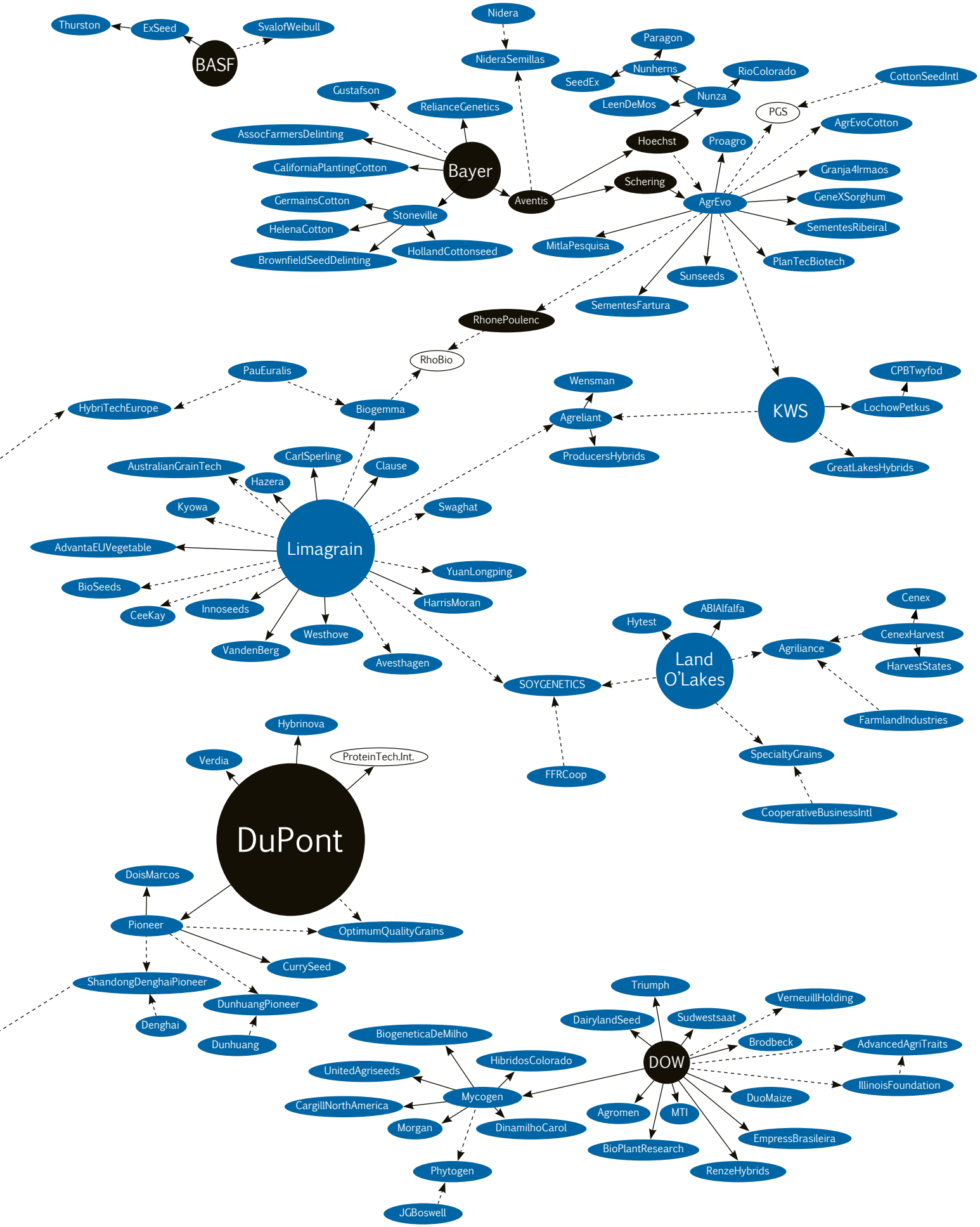
Company	2008 Seed Sales Million	Percent of Global Proprietary Seed Market
Monsanto (US)	$6,364	22.4
Dupont/Pioneer Hi-Bred (US)	$3,976	14.0
Syngenta (Switzerland)	$2,400	8.4
Bayer CropScience (Germany)	$1,462	5.1
Limagrain (France)	$1,254	4.4
Land O'Lakes (US)	$1,185	4.2
KWS (Germany)	$839	2.9
Sakata (Japan)	$396**	1.4
DLF-Trifolium (Denmark)	$391**	1.4
Takii (Japan)	$347**	1.2
TOTAL GLOBAL PROPRIETARY SEED MARKET:	$28.4 BILLION	

Source: Seed sales figures compiled from annual reports and the ETC Group (http://www.etcgroup.org/en/). Seed market estimates provided by the Context Network (http://www.contextnet.com/).
*Dow does not publicly share market share figures as they pertain to seed sales specifically. However, one recent article notes that Dow AgroSciences is the fifth largest seed producer in the world (Source: "Suitors' interest grow in Dow unit," May 15, 2009, at http://www.indy.com/posts/suitors-interest-grows-in-dow-unit.)
**Sales figures for Sakata, DLF-Trifolium, and Takii are from 2007.

Figure 2. Seed Industry Structure (1996-2008)

Size proportional to global seed market share





Source: Phil Howard, Assistant Professor, Michigan State University, http://www.msu.edu/~howardp

Seed vs. Trait

There is a crucial difference between seed and seed traits when examining concentration in the seed industry. Monsanto is largely a trait (or technology) provider, whereas smaller – often family-owned and independent – seed companies focus their breeding programs on improving germplasm through traditional breeding methods. These companies typically do not have the resources to develop traits through biotechnology.

The biotechnology industry tends to overvalue genetically engineered traits and undervalue the germplasm – i.e., the conventional varieties – the traits are inserted into. High-quality germplasm is responsible for a host of characteristics expressed by a crop, including intrinsic yield, disease resistance, maturity time, size of grain, and climatic conditions. On the other hand, almost all GE acres are planted to one of two traits (often both): the insect-resistant Bt trait and herbicide-tolerant Roundup Ready trait. These traits do not provide intrinsic yield increases or other agronomic benefits besides killing a particular insect and surviving applications of one specific chemical, respectively.

Biotechnology firms largely depend on smaller companies' brands of regionally specific seed tailored to different environments and growing conditions – in addition to cultivars coming out of public breeding programs – as vehicles for distributing their biotechnology traits. By licensing their GE traits to companies with an established production and distribution infrastructure, larger firms can access important distribution channels that farmers rely on and trust.

Conventional seed options will diminish further as biotechnology firms buy out even more smaller seed companies with valuable germplasm and breeding programs. There is a financial incentive for these firms to only introduce high-yielding cultivars that have expensive GE traits inserted into them. Indeed, the trend is already occurring, as explained in this report.

seed market, which is made up of branded seed subject to intellectual property protections, these four firms account for 50 percent of the global proprietary seed market. These same firms hold dominant positions in the agricultural chemical market.[27]

According to the American Antitrust Institute, weak enforcement of antitrust laws has facilitated consolidation in the seed industry and harmed farmers who buy large quantities of agricultural inputs – especially seed – by turning them into "price takers" who must pay what the input companies demand.[28] The role of the DOJ is to investigate and prosecute violations of antitrust laws, which prohibit unfair business practices, such as anticompetitive mergers, and are designed to support competition in the marketplace. Figure 2 illustrates rapid consolidation in the seed industry through acquisitions and mergers between 1996 and 2008.

Monsanto's Dominance in Seed

Discussions on seed industry concentration typically center on the dominant firm, the Monsanto Company, which, as documented in Figure 2, achieved the No. 1 position through a series of acquisitions, mergers, and partnerships with competitors in its industry. It took less than a decade for the company to capture the corn, soybean, cotton, and vegetable seed markets. Today, its GE traits are planted to more than 80 percent of U.S. corn acres and more than 90 percent of soybean acres.[29] In the company's 2009 third-quarter report, $1.4 billion of its $1.8 billion pre-tax profit came from seeds and genetics.

Monsanto stands out as the most aggressive player in expanding market power and enforcing intellectual property rights. It owns the most widely adopted seed technologies, maintains substantial market power, and leverages this success by increasing prices at historic rates and implementing strategies to steer farmers toward expensive seed options, as explained in the next section.

Only a few major seed companies have maintained their independence in the last decade. Many of

these companies have, however, entered into several agreements (and disagreements) with Monsanto regarding shared rights to patented traits.[30]

Monsanto's spate of seed company acquisitions includes its 1997 purchase of Holden Foundation Seeds, the largest foundation corn seed provider in the U.S. Holden's parent lines are in approximately one-third of independent hybrid corn sold in the U.S.[31] By comparison, Greenleaf Genetics, another foundation corn seed company created by DuPont and Syngenta in 2006, has only a 2 percent market share.[32]

When the DOJ approved Monsanto's acquisition of DeKalb Genetics in 1998 it ordered Monsanto to license Holden subsidiary's corn germplasm to more than 150 seed companies.[33] This, the agency said, would "ensure that the merger does not reduce competition in biotechnology developments in corn."[34] Competition in corn has only lessened since then.

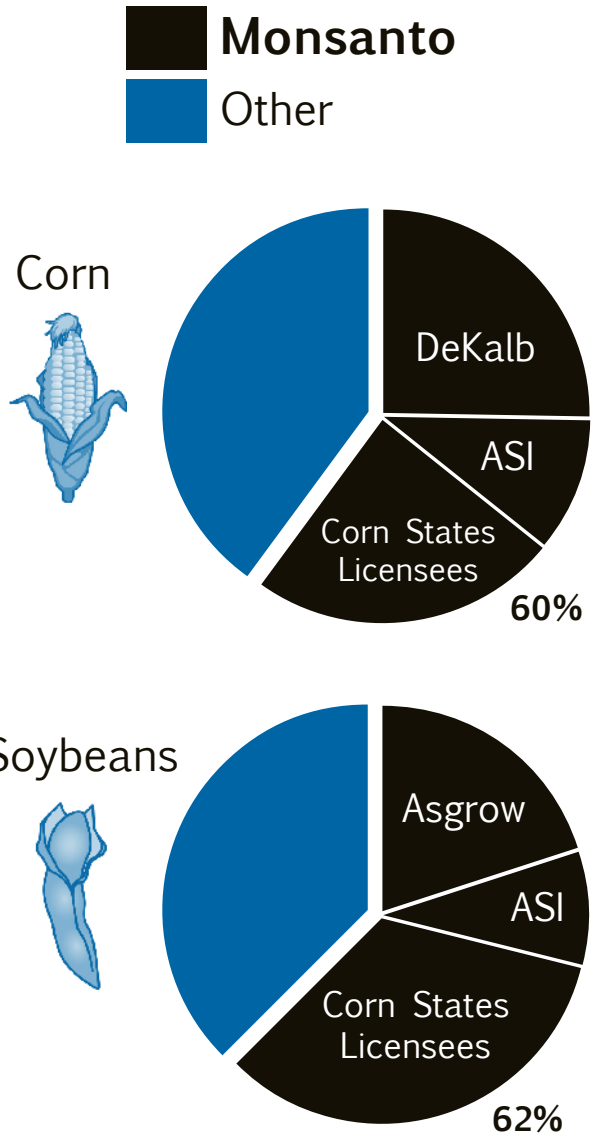
Findings from the U.S. Department of Agriculture's Economic Research Service (ERS) show that fewer players means less innovation. As the seed industry became more concentrated, private research "dropped or slowed," and those companies that survived consolidation are "sponsoring less research relative to the size of their individual markets than when more companies were involved."[35] Fewer companies engaged in researching and marketing seed means less choice for farmers, contrary to the argument that consolidation leads to more options in the marketplace.

Corn

Three firms currently dominate the seed corn market, with Monsanto obtaining the number one position only recently. Monsanto's corn seed trait revenues now constitute the bulk of Monsanto's trait revenues. The company's leading corn brand, DeKalb, increased its market share from 16 percent in 2005 to 25.5 percent in 2008. Monsanto's holding company, American Seed Inc. (ASI), tripled its market share in this time, now carrying 11 percent of the corn market with its 25 franchises. [36,37] Counting Monsanto's licensing arm, Corn States Hybrids, which includes licenses with approximately 200 seed companies, Monsanto controls roughly 60 percent of the U.S. corn seed market through direct sales and seed trait licensing agreements (see Figure 3).[38] Monsanto's level of control is best conveyed in trait acreage, since more than 80 percent of U.S. corn acreage is planted to its patented traits.

The longtime market leader, Dupont/Pioneer Hi-Bred, now ranks second with about 30 percent market share of corn seed, down from 40 percent in 2001. Syngenta ranks third at roughly 10 percent.[39] Dow is catching up through several recent acquisitions of corn

Figure 3. Monsanto's Seed Market Share in Corn and Soybeans (2008)



Source: Monsanto's Supplemental Toolkit for Investors (April 2009) at http://www.monsanto.com/investors/presentations.asp

companies, including six in 2008 alone.[a]

Monsanto's international presence grew last year with its acquisition of Cristiani Burkard (SCB), the largest Central American hybrid seed company. Monsanto will expand market power where SBC already does business: twelve countries throughout North, Central and South America and the Caribbean, including more than 900 dealers in Central America alone.[40]

Soybeans

Monsanto maintains a dominant position in soybeans through its Asgrow brand (acquired in 1997) and ASI holding company, and by licensing its Roundup Ready trait to other seed companies. Monsanto controls nearly 30 percent of the market directly through seed sales and more than 60 percent when taking into account proprietary ownership of traits licensed to approximately 200 other seed companies through its Corn States Hybrids program (see Figure 3).[41] Because Monsanto's patented genetics are in nearly all U.S. soybean acreage – 91 percent in 2009 – the company owns these traits (even in other companies' brands) and thus enjoys unprecedented market power in soybean seeds and traits.[42]

Monsanto clearly dominates two major U.S. field crops. But the company's market power extends much further, reaching into the cotton, vegetable and sugar industries – an empire of patents, profits, and plant genetic resources that have launched Monsanto into the position of seed industry leader.

[a] In 2008, Dow acquired four domestic companies (Triumph Seed, Dairyland Seed, Renze Hybrids, and Brodbeck Seed) and two international companies (Coodetec Paracatu Hybrid Corn Seed and Sudwestsaat GbR)

Cotton

Monsanto set its sights on the fiber market in 1998 through a $1.5 billion proposal to purchase the nation's largest cotton seed company, Delta and Pine Land. Though it dropped the deal under antitrust scrutiny, regulatory hurdles did not stop Monsanto when it tried again and succeeded in 2007. Delta and Pine Land came with more than a dozen of its own domestic and international subsidiaries and provided Monsanto instant control of 95 percent of the biotech cotton seed market.[43]

Vegetables

More recently, Monsanto worked to capture the vegetable seed market. Not only did acquiring Seminis in 2005 make Monsanto the largest vegetable seed company, it gave Monsanto the market boost it needed to become the dominant leader in the entire seed industry. As the world's largest fruit and vegetable seed firm, Seminis supplied more than 3,500 seed varieties to growers in more than 150 countries.[44] Monsanto now controls the genetics that supply 21 percent of the global vegetable seed industry, largely for tomatoes, peppers, squash, and cucumbers.[45] Farmers and backyard gardeners have long relied on Seminis seed and its associated brands. Some farmers fear that Monsanto's ownership impacts the availability of their favorite vegetable cultivars.[46]

Monsanto increased its market share in vegetable seed by acquiring Netherlands-based De Ruiter Seeds in 2008. De Ruiter supplies vegetable seed to the

Licensing Seed Traits

Biotechnology firms grow market power by licensing their GE traits to other seed companies. For example, more than half of Monsanto's market share in corn seed is attributed to licenses with about 200 other companies. Many of these companies[47] enter into these agreements because they do not have the financial means to develop their own GE traits. Companies license the trait to breed into their independently developed cultivars of soybeans and hybrid corn. Some independent seed companies say the licenses are cleverly designed to gain market power, restrict competition, and prevent future innovation and market access by competitors, as explained on page 23.

greenhouse, or "protected culture," industry – the fastest growing sector of the vegetable seed market, according to Monsanto.[48] Combined, Seminis and De Ruiter give Monsanto more than a quarter share of the global vegetable industry.[49] Ninety percent of De Ruiter's seed sales in 2008 were for protected cultures, while approximately 90 percent of Seminis's seed sales were for open field production.[50] Monsanto has therefore effectively captured much of the protected culture and open field vegetable seed markets.

Sugar

Monsanto is also moving quickly to command biotechnology in the sugar industry. In 2009, an estimated 95 percent of U.S. sugar beets planted had the Roundup Ready trait (only the second year of GE beet production).[51] Even growers who quickly adopted Roundup Ready sugar beets expressed concern that traditional varieties would not be an option in a few years.[52] But given a recent court ruling that overturned USDA's approval of Roundup Ready sugar beets, citing the agency's failure to conduct an Environmental Impact Statement, Roundup Ready sugar beets might be removed from the marketplace.[53]

As for sugar cane, last year Monsanto purchased the largest sugar cane breeding company in the world, Brazil-based Aly Participações Ltda., which operates CanaVialis S.A. and Alellyx S.A.[54] In addition to raw sugar production, Monsanto says it will expand sugar ethanol research and development.[55]

Wheat

In July 2009, Monsanto purchased WestBred, LLC, Montana's prominent wheat breeding company. The companies report that WestBred's genetics will be used to develop genetically engineered traits in wheat.

Monsanto attempted to commercialize genetically engineered wheat but abandoned these efforts due to market rejection abroad in 2004.[56] Farmers – both those who support and reject crops derived from biotechnology – recognize the economic risk in introducing a crop that customers do not want, particularly those in Asia where much of the U.S.'s wheat is shipped.

Seeing this risk, the 2003 Montana State Legislature overwhelmingly passed then-State Senator Jon Tester's Joint Resolution that stated, "the introduction of genetically engineered wheat and barley for commercial production must be carefully timed so that it occurs only when there is acceptance of these crops by Montana's major customers."[57] The Canadian Wheat Board, a major world wheat marketer, also maintains that it will not support genetically engineered wheat until world markets, like Europe and Japan, accept it.[58]

Dr. Robert Wisner, a leading grain market economist at Iowa State University, warned that commercializing genetically engineered wheat could result in the U.S. losing up to half of its wheat exports.[59] Where will that unwanted wheat go? It will likely end up in U.S. livestock feed or industrial channels, such as ethanol plants. This should concern corn producers, says Dan McGuire with the American Corn Growers Farmer Choice – Customer First program. Farmers who raise corn would face reduced demand and prices should wheat displace corn in these markets.[60]

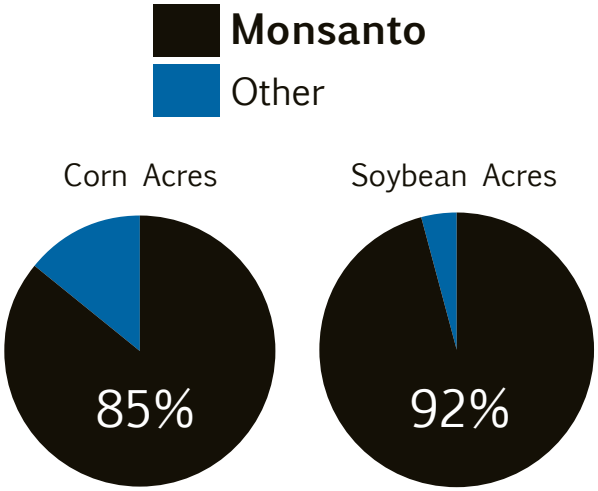
Even if export markets decide one day to accept genetically engineered wheat, the fear that Monsanto will reduce seed options that farmers currently rely on is very real.

Section 2

Price, Choice, and Availability in Corn and Soybeans

U.S. farmers adopted crops with GE traits faster than any other technology in agricultural history. Introduced in 1996, soybeans genetically engineered to tolerate Monsanto's Roundup herbicide covered more than half of U.S. soybean acreage by 2000 and 91 percent in 2009. Farmers in the South adopted herbicide-tolerant and insect-resistant (Bt) cotton as quickly, growing from 61 percent of U.S. acreage in 2000 to nearly 90 percent in 2009. While GE corn had a slower start, genetically engineered varieties now cover 85 percent of U.S. corn acreage.[61] As seen in Figure 4, Monsanto's dominance in the trait industry is unrivaled.

Figure 4. Total U.S. Acreage Planted to Monsanto's Traits (2008)



Sources: USDA/ERS. 2009. "Adoption of Genetically Engineered Crops in the U.S.," http://www.ers.usda.gov/data/biotechcrops/; Monsanto's Supplemental Toolkit for Investors (April 2009) at http://www.monsanto.com/investors/presentations.asp.

Seed companies and dealers responded accordingly, growing and stocking more Roundup Ready and Bt varieties of major crops. Though conventional varieties matched and sometimes out-yielded crops with GE traits, the new technology was "like a drug," says one farmer, and each year farmers came back for the higher priced seed that allowed for unprecedented conveniences in farming.

The rapid adoption of GE traits in U.S. agriculture has led to three major trends in the seed marketplace that impact farmers:

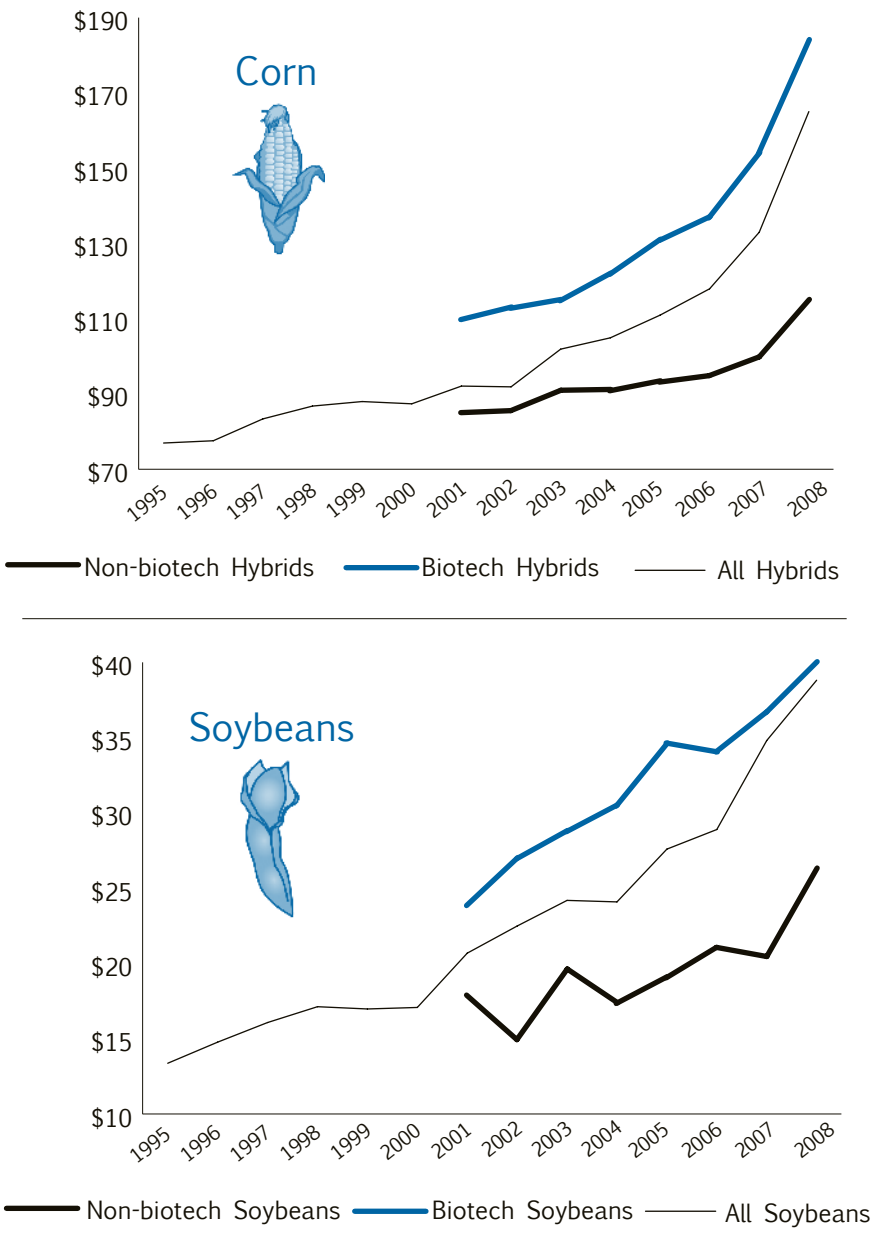
1) Historic price increases in seed driven by royalty fees for biotech traits;

2) Biotechnology firms' push for greater market penetration of stacked traits in corn; and

3) Lack of conventional corn and soybean seed options.

An examination of these trends shows they are a function of a single underlying force: increased market power of the largest biotechnology firm.

Figure 5. Prices Paid for Corn and Soybean Seed



Source: USDA/NASS Agricultural Prices (April figures) at http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1002.

GE Traits Break New Ground in Seed Pricing

GE traits have spurred a rapid increase in seed prices, largely because firms have implemented a novel pricing structure through "technology fees" charged on top of basic seed costs.

USDA figures document this trend. The most substantial price increases have occurred since 1999, parallel to the increases in genetically engineered crop plantings. Prices farmers pay for seed have increased 146 percent since 1999, and 64 percent of that increase occurred in just the last three years.[62] Prices of hybrid corn seed were more than 30 percent higher, and soybean seed about 25 percent higher, over 2008 prices.[63]

According to USDA's Agricultural Price Index, farmers paid $49.60 per bushel of biotech soybeans, roughly $41.00 per unit. They paid $28.00 per unit for non-GE seed.[64] (A unit of soybeans is approximately 83 percent of a bushel: 50 lb. units versus 60 lb. bushels.) As explained later, farmers can expect even greater price increases in 2010.

Biotechnology traits and technology fees are the driving force behind increased seed costs. These fees vary by crop type, but all have increased substantially over the years. For example, the Roundup Ready trait in soybeans added $6.50 per bag in 2000. It has nearly tripled since then, now costing $17.50 per bag for the same trait – sometimes attributing to nearly half the price of a bag of Roundup Ready soybean seed.[65] This means a farmer who plants one bag of Roundup Ready soybeans per acre on 1,000 acres has seen his production costs increase by $11,000 in five years due to the trait price increase alone. It also means that smaller seed companies that license the trait for varieties they have developed independently recoup only a fraction of their research costs, since much of the price goes back to Monsanto in the form of a royalty.

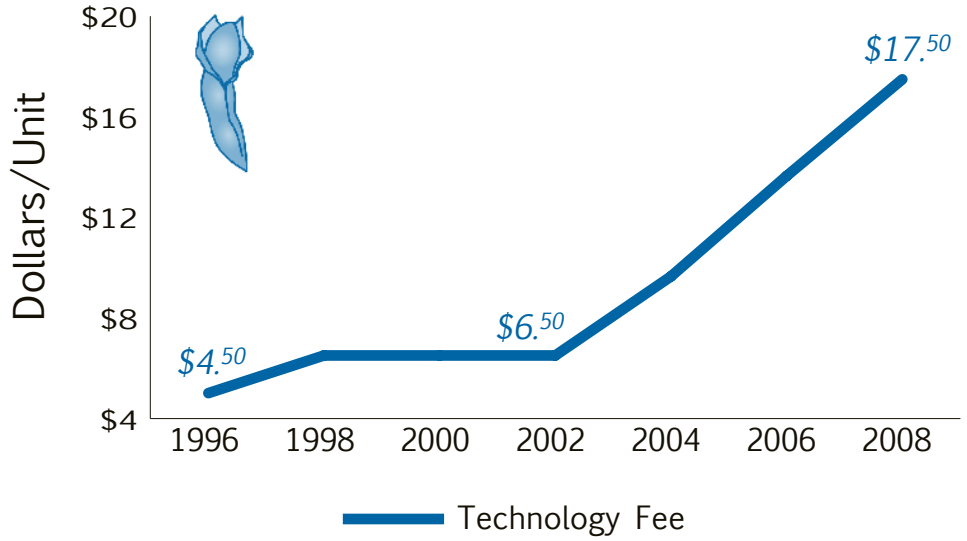
Farmers have long criticized Monsanto for its technology fees. The company responded to mounting disapproval by changing its trait pricing structure. In 2002, the company stopped requiring farmers to pay a separate technology fee and implemented a seamless pricing requirement, shifting the royalty payment obligation from the farmer to seed manufacturer. Seed companies are now required to set a streamlined price reflecting the cost of the traits and basic genetics (developed independently from Monsanto) and send royalty payments for the traits to Monsanto accordingly.

One effect of the modified pricing structure is less transparency because farmers do not always know what a GE trait is costing them. In fact, seed companies that license these traits are ordered not to share this information. Increases in technology fees are therefore hard to identify because they are now part of confidential licensing agreements. Figure 6 shows the general trend in the cost of the Roundup Ready soybean trait by piecing together various reports over the years.

Furthermore, seed companies say the licensing contracts they must sign to access Monsanto's traits have become increasingly onerous. "I feel like a puppet on a string," explained one seed company owner.[66] Another seed company representative noted that Monsanto audits its licensees every year and "knows what you got in the bank and what's in your fields – everything we know, they know." He adds that the salary of one of their secretaries goes almost entirely "to keeping Monsanto happy" by managing the licensing and reporting paperwork.[67] These licensing contracts are protected by confidentiality clauses and therefore escape public scrutiny. Nevertheless, they have been the focus of antitrust investigations and lawsuits, as explained in on page 23.

As acreage planted to patented traits increases, so do the prices farmers pay for the technology. And as we will see, few farmers are immune to the far-reaching effects.

Figure 6. Roundup Ready Soybean Technology Fee



Sources: University of Missouri. 1998. "Roundup Ready Seed Economics," Integrated Pest & Crop Management Newsletter, Vol. 8, No. 3, April 24 (cites 1998 fee); Monsanto Co. v. McFarling, 488 F.3d 973 (Fed. Cir. 2007) (cites 1999 and 2000 fee); Monsanto Co. v. David, 448 F. Supp. 2d 1088 (E.D. Mo. 2006) (cites 2003 fee), Julie Newman. 2005. Network of Concerned Farmers, Electronic Forum on Biotechnology in Food and Agriculture of the Food and Agriculture Organization of the United Nations, January 27 (cites 2004 and 2005 technology fee); additional figures acquired from anonymous sources.

Litigation in the Seed Industry

Litigation involving antitrust allegations in the seed industry typically focus on industry practices that harm competition through anticompetitive licensing agreements and/or monopoly power in the seed and seed trait markets. Some of these cases describe conduct that creates adverse incentives for seed companies to promote products other than Monsanto's or lock farmers into Monsanto's products. The question these allegations raise is simple: Has Monsanto used its market power to foreclose rivals from market access, consequently leading to diminished innovation and choice, and higher prices for farmers?

The American Antitrust Institute documents that between 2002 and 2009, about 60 patent infringement and antitrust cases were filed in federal district and appeals courts.[68] The Institute notes that Monsanto is the plaintiff in about 55 percent of these cases (many of these include patent infringement cases against farmers for saving seed, as explained in Section 3) and in about 20 percent is the defendant. In all, Monsanto has been involved in 75 percent of biotechnology litigation over the last seven years.

As discussed, seed companies enter into licensing agreements to access and sell other companies' genetics in their own branded seed. Although these agreements are protected by confidentiality clauses that shield them from public debate, they have been the focus of recent antitrust investigations and lawsuits. One lawsuit in particular, *Texas Grain Inc. v. Monsanto Company*, alleges that several terms in these agreements restrain competition and future innovation by turning smaller seed companies into exclusive licensees of Monsanto products.[70] Seed companies enter into these licensing agreements in order to access limited use of another company's trait, such as Monsanto's Roundup Ready trait used in soybeans, corn, and cotton.

In *Texas Grain v. Monsanto*, plaintiffs argue that Monsanto's licensing agreements restrict a company's ability to stack Monsanto seed traits with competitors' seed traits. This, they say, creates an "artificial barrier" to rival products entering the market since Monsanto's traits are in a majority of corn and soybeans sold.

Independent seed companies serve as critical distribution channels for other companies' genetics, since they are often regional in size and bear a brand name that farmers recognize and trust. The lawsuit alleges that Monsanto entered into hundreds of licensing agreements with seed companies in the late 1990s. In addition to acquiring dozens of seed companies around this time, plaintiffs assert that Monsanto figured it could control the independent seed market by virtually foreclosing the market to rivals through restrictive licensing agreements.

The lawsuit also points to stipulations requiring that of all the biotech seed a company sells, 70 to 85 percent must contain at least one of Monsanto's seed traits – exclusively Monsanto's traits – in order for the licensee to receive a rebate and/or have their royalty fees waived. Some licensing agreements last for as long as ten years. This means if these agreements are truly reducing market access, that is a decade where competitors are at a disadvantage in the marketplace because of the disincentive for licensees to sell competing seed and seed traits.

While the licensing agreements do not directly affect conventional seed sales, they are affected indirectly, as dealers will offer what they need to sell in order to receive rebates as part of their licensing agreements.

This lawsuit points to a potentially troubling scenario in which seed companies and dealers are made to pay if they sell "too much" of a competitor's product or choose to incorporate a rival trait into their seed. If proven true in court, it means these businesses are essentially forced to maintain Monsanto's market share or risk being financially penalized.

There is evidence that these trait licensing agreements vary among independent seed companies. In a 2009 *Des Moines Register* article, John Latham of Latham Seeds in Alexander, Iowa, said, "you hear talk that not all licensing deals are equal."[71] Myron Stine of Stine Seeds in Adel, Iowa, concurred, explaining that, "Licensing hasn't been presented to brands on a level playing field. A federal investigation is probably needed."[72]

In August 2009, the DOJ announced it was investigating possible violations of antitrust rules in the seed industry. Monsanto said it was complying with the DOJ's request for documents, and the department reported interviews with two leading competitors, Dupont and Syngenta.[73] Texas and Iowa's attorneys general have acknowledged their own state investigations of Monsanto's conduct in the seed industry.[74]

Though Monsanto is the focus of many ongoing antitrust investigations, other seed firms are also accused of anticompetitive conduct. In *Schoenbaum v. Dupont and Monsanto*, plaintiffs allege that Monsanto and Dupont entered into unlawful agreements to restrain trade and fix prices of GE corn and soybean seeds.[75] They argue the agreements aided the company's dominance in the seed industry and allowed for: 1) Monsanto's control of almost all production, marketing and sale of GE soybean and corn seeds and/or seed traits; 2) suppressed competition in the GE soybean and corn seed and/or seed trait markets; 3) increased or fixed prices of GE seeds through restrictive and anticompetitive licensing arrangements and technology fees; and 4) increased barriers to entry for new GE seed traits.

The Story of Seed Corn: Stacked Traits Lead to Historic Prices, Less Choice

Grumblings of seed corn price hikes traveled across the Midwest in 2008, and agricultural media confirmed the buzz. Monsanto's "elite hybrids" would be listed for about $350 per bag – roughly a $100 increase – in some parts of the U.S.[76] Three hundred dollar seed corn was unheard of just one year before.

Indeed, seed corn prices have increased rapidly, with GE prices rising faster than conventional. Conventional seed has consistently sold for $50 to $100 less than varieties with GE traits and yet, even in light of more demand, farmers find that high-quality, non-GE varieties are increasingly difficult to locate.

Though costly seed corn is partially attributed to companies cashing in on higher commodity returns – farmers received a record $6.00 per bushel in 2008 driven largely by the ethanol boom – seed prices have continued to increase even as prices farmers received decreased.[77] Monsanto's strategy to combine, or "stack," as many traits as possible into seed sold appears to be the major contributor to increased prices in corn seed.

Monsanto's dominance in the seed corn industry was built through careful strategy, including dozens of acquisitions, as explained in Section 1. Last year the company executed an "expanded trait penetration" plan to increase sales of seed stacked with as many traits as possible. Its triple stack varieties include three traits in a single variety: two Bt traits coupled with the Roundup Ready trait. The tactic is aggressive and effective: first capture ample market share through attractive pricing structures when technologies are young and then ramp up prices once "penetration goals" are met.[78]

In August 2008, the company announced it would increase acreage of its triple stack corn from 28 million acres in 2008 to 35 million in 2009, more than 40 percent of total U.S. corn acreage.[b] Triple stack corn varieties would also sell for 30 percent more in 2009.[79]

By March 2009, Monsanto had met its goal. Even with commodity prices sliding, the company reported that more than 70 percent of its seed corn sales were triple stack varieties – the most expensive seed corn options on the market.[80]

Monsanto's radical price increases are unmatched.[81] If increasing seed corn prices by 30 percent in one year is not evidence enough of exercising market power, then Monsanto's pricing structure should be. The company recently implemented a "value-based pricing model" to "convert as many farmers as possible to triple stacks."[82,83]

Mirroring Microsoft

Monsanto's dominance in the seed industry is often compared to Microsoft's dominance in the operating-system software market. In 2000, Microsoft used the "value-based" pricing argument to defend itself in antitrust hearings. Justice Thomas Jackson referred to Microsoft's maximizing of profits through the value-based model in his verdict, finding the company guilty of breaking U.S. antitrust law. Monsanto's strategy to upgrade farmers to triple stack corn varieties mirrors Microsoft's forcing of customers to buy upgrades of operating systems.[84]

"First it was just the East and West," says one seed company representative, "now there are seven zones Monsanto uses to price its seed."[85] He explains that the Roundup Ready trait in corn carried a technology fee of $33 per bag where it has been widely adopted and $23 per bag where the trait has not been well accepted, such as North Dakota.

The differences in zones depends, then, on where Monsanto seeks to expand market share and make triple stack corn more attractive – charge more where demand is higher (where pest pressure is worse) and less where farmers do not necessarily need the trait package. That is, the pricing model helps "convert" farmers who would not otherwise choose Monsanto's triple stack varieties.

Monsanto also boosts triple stack seed sales by effectively eliminating other options in the marketplace. Some farmers have bought triple stack seed sim-

[b] This figure was based on 2009 estimates that Monsanto's triple stack varieties will be planted on 35 million acres and U.S. corn acreage will total 85 million acres. (Monsanto Company. 2008. "Monsanto Is Extending Its Industry Leadership Through 2012, Executives Tell Investors at Annual Field Event," August 12; USDA/NASS. 2009. "National statistics: Field corn," Retrieved on May 13, 2009.)

David Shupe

Farmer, Researcher
Toledo, Illinois

In his 40 years of business, David Shupe, a Toledo, Illinois, farmer and researcher, has realized an important truth: "There isn't enough competition for the market to work and set prices that are in line with the fluctuating agricultural economy."

Shupe says traited corn is selling for about $200 per unit in 2009 with normal early pay and quantity discounts applied – that's about $75 per acre just for seed. Soybeans are running between $40 to $50 per unit with normal discounts, or about $67.50 per acre.

"These prices represent a cost increase over 2008 of about 35 to 55 percent, often for the same variety," he explains. "As a seed producer it should also be noted that my premiums for producing seed have only raised about 1 to 2 percent, so growers are not getting the increase. Usually it is the trait provider that demands over 90 percent of that increase."

The rise in cost has forced producers like Shupe to handle their seed needs differently.

"One example," Shupe explains, "is double cropping soybeans after wheat. There is always increased risk with this practice due to the late planting date and when you look at seed cost going from $12 to $15 an acre several years ago to about $100 per acre today it can be very hard to decide if it will pay." (Seed costs for a double crop are higher because you have to use much higher seeding rates.)

Shupe notes that even if soybeans do not produce well after wheat, they make a great cover crop that benefits the soil. "But because of the cost you are priced out of this practice," he says.

When it comes to choice in the marketplace, Shupe says farmers who plant mainstream traited seed and are willing to pay the price do not have a problem.

"If you want to raise, say, a non-GMO soybean or some non-traited corn," however,

"you better get your seed needs locked in far in advance or you may not be able to secure your needs," he says.

Shupe says in 2008 his seed needs were not met. "Because of the large amount of replant due to weather, you were often told what you would plant rather than choosing," he says. "With soybeans we were forced to use some low quality seed from companies with short supply while we had very high quality seed sitting in our bins. We were not allowed to condition and plant this seed because the patent holders would not allow it even though we offered to pay the tech fees they would normally charge a seed company."

Shupe says choice in the soybean market is probably worse than corn, explaining: "I do not know of any new soybean crosses that do not have a trait bred into them."

Still, Shupe says he sees major changes in the seed corn market as well.

"You cannot separate traits and genetics," Shupe says. "I do not know how many times I have tried to purchase new genetics and been told, 'We only produce those with our set of traits.' You are always told how much yield the traits are making over non-traited refuge hybrids, but if you cannot get that genetic package non-traited then how do you know?

"One thing for certain now is that companies do not keep varieties around long enough that you learn to rely on them," he says. "The average life of a hybrid or variety is only about two to three years. About the time you get comfortable with where one works and when to use it, that number is gone. I think it is also sad that even if a company quits producing a variety that you want and need, it is patent infringement for you to save seed out of it for your own use."

While the decrease in seed dealers began before the "current seed and trait situation," Shupe says, notable changes can be seen in the way large seed companies have moved seed sales from farmer dealers to fertilizer and chemical dealers.

"It is my feeling that they wanted everything under one roof to make it much easier to check customer records and be sure people were not pirating seed," he says.

"There has also been a huge reduction in the number of smaller regional seed companies," he adds. "At one time there were probably a dozen companies trying to sell me seed. Now there is less than half that number and all but two are owned by the major trait company through a subsidiary."

There isn't enough competition in the market to work and set prices that are in line with the fluctuating agricultural economy.

- David Shupe

ply because varieties they once relied on are no longer available. Instead of producing an "inordinate number of products to serve all these regional markets," reads an investment report, "Monsanto would like to move as many customers to triple stacks as possible."[86]

In many cases trait penetration has meant forcing traits on farmers. Farmers suspect that some companies increasingly only offer the best varieties of seed with traits.

Independent Seed Companies Dying Out

Independent seed companies are a critical component of U.S. agriculture. These family-owned businesses have served the regional needs of farmers for decades by breeding varieties with agronomic traits adapted to very specific regions. They have also become essential distribution channels for GE traits developed by larger firms, as evidenced by licensing agreements. As the industry consolidates, however, and product options narrow, farmers lose access to important varieties tailored to their area.

The Independent Professional Seed Association (IPSA) estimates that approximately 100 independent seed companies remain, down from 300 (which includes independent and consolidated companies) just 13 years ago. IPSA launched a marketing campaign to raise visibility of independent seed companies. But since the campaign was launched just one year ago, about 25 seed companies have been acquired or gone out of business.[87]

As John Latham, owner of Latham Hi-Tech Seeds, explains, once a company is purchased by a larger firm, "that particular dealer will only push the parent company's products – genetics, weed and insect control, etc. – even though they might not be as good for a producer's operation."[88] Latham believes that independent companies work for the best interest of farmers.

Many farmers agree. "When we had many regional breeding programs sharing genetic material someone would find these niche varietal crosses and produce them for quite specific areas," says Illinois farmer David Shupe. "This is gone today because the only varieties that large companies are interested in are ones that can be sold over a very large geographic area."[89]

Selling fewer products over a larger market share affords Monsanto efficiency and control in the marketplace, and lays the groundwork for crops in the pipeline. In particular, investment reports note that the company's market share creates a "captive customer base" for octo-stack "SmartStax" corn seed – which includes six Bt insect-resistant traits and two herbicide-tolerant traits – to be released in 2010.[90] Because of its foothold in the market, Monsanto expects adoption to reach 65 million acres, or nearly 75 percent of corn acreage in the U.S., by 2012.[c]

It is easy to understand why farmers have mixed feelings about this precedent-setting hybrid. With such an extraordinary trait package, farmers wonder what Monsanto will charge for so many traits and question whether the company will continue to market single, double – or even triple – trait varieties, especially when many farmers neither want nor need all those traits.

Farmers may not have much of a choice, says Bob Nielsen, extension corn specialist at Purdue University. He explains that if seed prices increase even more in the future, "producers don't really have any options." He adds, "If everyone raises seed prices, the

> *If everyone raises seed prices, the only option is to not plant corn. So you pay and plant, or stop producing corn.*
>
> - Bob Nielson, extension corn specialist

[c] Based on corn acreage in 2008 at http://www.nass.usda.gov/QuickStats/index2.jsp and Monsanto's Supplemental Toolkit for Investors, April 2009

only option is to not plant corn. So you pay and plant, or stop producing corn."[91]

Dan Davidson, an economist at DTN in Omaha, Nebraska, asks about SmartStax technology, "Will Monsanto price [SmartStax] relative to market, or will they double the price for all those extra traits? The question is, will there be enough value to justify the cost?"[92]

It seems Monsanto has enough market power to evade market economics. "While Monsanto would like its products to more closely reflect current market prices," reads an investment report, "the company does not want to establish such a direct linkage, for once cyclical grain markets reverse it does not want the pressure of providing price concessions."[93]

With high commodity prices, it might only take a few bushels to make up for expensive seed costs, like the $6 corn farmers enjoyed in 2008. But with 2009 prices hovering around $3.50, farmers are flirting with the break-even point and questioning the value of expensive triple stack seed. "I've had two guys cancel their DeKalb seed orders, triple stack, because they wanted to find cheaper corn," reported one seed company salesman in early 2009. "I think [Monsanto's] pricing themselves out of the market."[94]

But Monsanto controls the market, and in a highly concentrated industry, competition does not regulate price. In fact, when asked about its precedent-setting $300 seed corn, Monsanto said it could "get the pricing right to show farmers the benefits," adding, "We can pass the red-faced test from the Panhandle of Texas to McLean County, Ill."[95] If embarrassment has replaced market competition as the restraint to price gouging, then Department of Justice take note: an article in *Farm Industry News* notes that $500 seed corn and varieties stacked with 20 traits may not be far off.[96,97]

Indeed, according to one source, the retail price for SmartStax corn is running more than $400 per bag, about $23 more per acre than triple stack varieties.[98]

Clearly, dominant biotechnology firms like Monsanto have leveraged their success in gaining huge market share for GE seed by stacking different traits into single varieties. Because each trait fetches a separate royalty for the patent holder, as seed traits were stacked, prices grew. And so have company returns. The only shrinking part of the equation is competition and choice. The question is whether the company has acquired this market power ethically and legally, as discussed in on pages 23 and 24.

Demand or Lack of Choice?

Reduced competition does not only take away from a farmer's bottom line through higher seed prices. It takes away choice.

Iowa State University agricultural economist Mike Duffy said a producer called him in May 2009 explaining that he could not find corn seed in Iowa that was not genetically engineered. He said corn seed that cost $50 to $100 a bag 10 years ago now tops $350 for hybrids stacked with traits.[99] Duffy believes consolidation has hurt farmers because they are paying more than they should for seed due to less competition and choices. Simply put: "When you have a few firms, the ability to set prices is greater," Duffy explains.[100]

Illinois farmer David Shupe agrees. "You cannot even purchase the latest corn hybrids today without them being loaded with traits," he says. "You either sign a seed and trait suppliers contract which forces you into conditions that take away many of your rights or you cannot competitively produce a crop."[101]

Stacked trait varieties now dominate the seed corn marketplace. These traits are often owned by the same company, though different firms also enter into agreements to share and stack traits. For example, SmartStax corn is the result of a partnership between Monsanto and Dow AgroSciences. Dow AgroSciences also has an agreement with Syngenta to cross license their respective corn traits – Herculex and Agrisure – under their branded seed businesses.[102]

Trait licensing agreements between large firms have not gone without controversy. Monsanto filed a lawsuit in May 2009 against Dupont/Pioneer Hi-Bred

accusing Dupont of "unauthorized use" of its Roundup Ready trait.[103] Monsanto contends that Pioneer is illegally stacking its new Optimum GAT trait (which also confers glyphosate-tolerance) with Monsanto's Roundup Ready trait. A month later, Dupont countersued Monsanto alleging patent abuse and seeking to invalidate underlying patents.[104] The same month, DuPont and Germany-based BASF sued each other on claims of patent infringement also regarding DuPont's Optimum GAT.[105]

Not only has choice in conventional varieties diminished, single and double trait corn varieties are also more difficult to locate. This means farmers who prefer these varieties can only access the newest genetics by paying for unnecessary traits. Farmers report, for example, that it is increasingly hard to find Bt corn without the Roundup Ready trait.

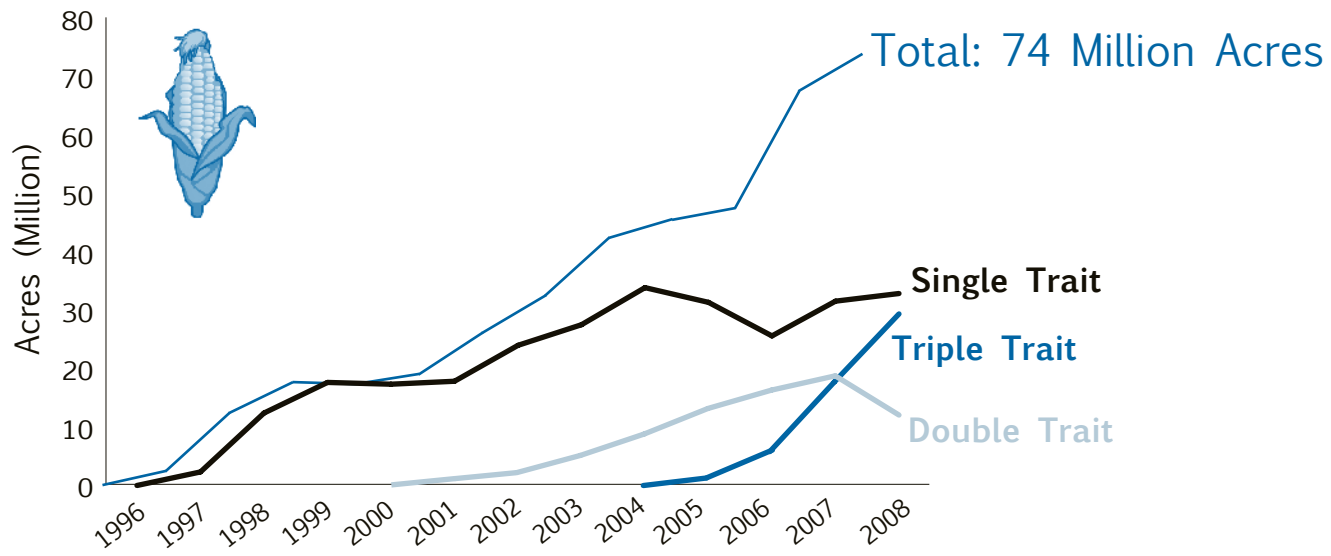
Monsanto's data confirms this trend. Single trait acreage – especially Bt corn varieties – is rapidly decreasing. Acreage of single trait Bt corn borer varieties decreased by two-thirds between 2006 and 2008 and Monsanto reported zero acreage for single trait Bt rootworm varieties in 2008.[106] Monsanto's single trait acreage for Roundup Ready corn peaked in 2007 before falling slightly in 2008.

Triple stack varieties, however, show tremendous growth. Within three years, acreage of triple stack corn went from zero to 35 percent of U.S. corn acreage.[107] Double trait acreage is now falling, covering 16 percent in 2008, after hitting its peak last year of nearly 30 percent (see Figure 7).

To drive farmers toward triple stack varieties, Monsanto implemented more dramatic price increases for single and double stack varieties while reducing single and conventional options in its own brands and subsidiary companies.[108] Little attention has been given to this emerging trend, where demand may not be at play nearly as much as a lack of choice.

The lack of conventional corn seed options has led many farmers to believe that high yields can only be achieved by purchasing GE varieties. Some companies have eliminated non-GE versions of particular hybrids, so when a new high-yielding variety is introduced, it is only available with stacked GE traits. Therefore some farmers believe that to increase yields and take advantage of the newest genetics, they need to purchase stacked trait hybrids. Yet a 2008 Ohio Corn Performance Test revealed that average plot yields of non-GE and GE corn were comparable with non-GE corn out-yielding some GE varieties. One of the

Figure 7. Trends in Monsanto's Corn Trait Acreage (1996-2008)



Source: Monsanto's Supplemental Toolkit for Investors (April 2009) at http://www.monsanto.com/investors/presentations.asp

Paul Rozwadowski

Dairy Farmer
Stanley, Wisconsin

Paul Rozwadowski has operated a dairy farm for 30 years in Stanley, Wisconsin, and can attest to changes in the corn seed industry that have led to farmers paying exorbitant prices with less choice in the marketplace.

"This year there are no seed corn varieties available that are three-way and four-way crosses," Rozwadowski says.

All GE varieties are single-cross hybrids, he explains, and while some conventional corn are single cross varieties, all three-way and four-way crosses are conventional. Single-cross hybrids are more genetically uniform, lending to predictability but also vulnerability. Three-way and four-way hybrids have more genetic variety and cost less.

"Three-way crosses did the best on my farm because it's a diversified plant – much more diversified than the single cross trait. A lot of farmers I know bought four-way crosses, too," he explains.

Another thing that plays into the elimination of three-way and four-way crosses, he says, is the fact that farmers who sell their seed to Monsanto are getting more for the single cross GE seed than conventional.

"It costs essentially the same to grow both but Monsanto is paying growers more for GE seed than conventional...Because of these trends, the availability of conventional corn keeps going down," Rozwadowski says.

Rozwadowski anticipated these trends ten years ago and co-founded Project Seed, a project of the Diocese of La Crosse Rural Life Committee that helps farmers hit hard by low milk and grain prices.

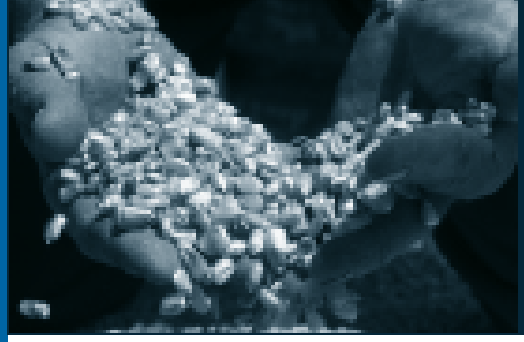
"Farmers' income was really low," he explains. "There were lots of farmers struggling and some didn't have enough money to buy their seed."

Around the same time, the GE debate heated up and a lot of farmers came out against the new technology. "They didn't think it could help farmers," he says.

As seed companies and dealers started to push GE varieties, Rozwadowski and others wanted farmers to have an outlet to buy conventional corn at a reasonable price. He and his friends searched for a cheaper supply and self-distributed the seed, working directly with companies to cut out the middleman.

They continue to bring seed by the semi-load to church parking lots where volunteers load the seed for farmers. The project solicits donations through advertisements in papers and on a website. The pot of money is divided among farmers who are experiencing extreme hardship, while others purchase the seed at a very reasonable price.

"The project has kept some farmers in business who otherwise would've gone under," Rozwadowski says.



As fewer independent seed companies are left on the agricultural landscape, conventional seed options are increasingly in danger of disappearing.

agronomists who looked at the data reported, "I'm unaware of any research indicating stacking traits per se increases yield."[109]

Though couched as expanding choice, new varieties therefore often replace less expensive varieties with expensive counterparts stacked with traits that some farmers do not need. Not every farmer needs three (or, next year, eight) GE traits. Some do not need these traits at all. But all should have choice.

Meeting Farmers' Needs

To be sure, there is great demand for GE corn. Yet demand for conventional corn is growing at a time when these varieties are slipping away in the face of a consolidated industry determined to expand market share and increase shareholder profit by pushing expensive traits.

Farmers seek out conventional corn for a variety of reasons, including the appeal of earning a premium and reducing seed costs associated with GE varieties. Many farmers successfully manage pests and weeds that GE corn targets and therefore question the need for expensive traits. But they fear that locating non-GE hybrids will become increasingly difficult to locate.

"I don't know if there are that many premium opportunities with corn," says Bruce Vester of Beck's Hybrids, "but there's definitely growers looking to plant more acreage to conventional corn."[110]

Even though conventional corn premiums may not be as attractive as those for conventional soybeans, other independent seed companies also report that demand for non-GE varieties of corn are growing.

Monsanto reports that half of its research and development investments in seed goes to breeding, the other half biotechnology. "At any point, once we identify the germplasm, we can choose to put that trait in it or to keep it out," says Jeremy Frie, a Monsanto representative.[111] But since the money is in the traits, companies like Monsanto have little economic incentive to sell good, high-yielding seed without including expensive, GE traits. As fewer independent seed companies are left on the agricultural landscape, conventional seed options are increasingly in danger of disappearing.

Independent seed companies stand out as the most reliable source for high yielding varieties of conventional seed. They maintain these options in the marketplace to meet demand for non-GE seed but also because royalty fees for licensing GE traits are increasing and taking a larger share of seed prices.

"We make more money selling conventional than we do traited corn," says one independent seed company representative, who is also licensed to sell Monsanto's traits, because a significant percentage of seed costs go to Monsanto as a trait royalty. That means they recoup less of their investment in developing their branded seed.

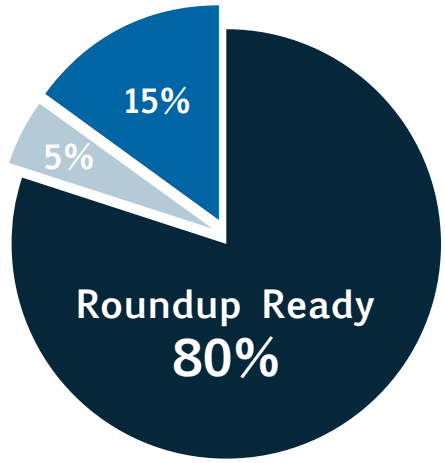
Not only are royalties high and increasing, trait licensing agreements may also be putting independent seed companies at a disadvantage by limiting their ability to sell non-Monsanto seed due to onerous requirements that limit competition of other products (see page 23).

The trend toward fewer single trait and conventional plantings seems to be influenced as much by a narrowing of availability driven by industry interests to sell stacked varieties as it is demand. Seed catalogs confirm that triple stack varieties rule the marketplace and that fewer conventional, single trait and double trait options exist. This is especially true for Monsanto's sub-

sidiary companies.

For example, Trisler Seeds, Inc. based in Fairmont, Illinois, is a well-established seed company with a 70-year history in seed corn. In 2006, Trisler was bought by Monsanto's holding company, American Seed Incorporated (ASI), after which the diversity in seed options decreased dramatically. In 2004, Trisler offered 33 conventional corn varieties, about 40 percent of its seed corn platform. This number remained relatively steady until the years following its acquisition by Monsanto. Trisler offered three conventional varieties this year, a 91 percent reduction from five years prior, even in light of renewed interest in conventional corn varieties and increasing trait prices. Furthermore, the company only offers three non-Roundup Ready traited varieties, and more than half of the seed offered is a triple stack variety.[112]

Figure 8. Total U.S. Corn Acreage Containing Roundup Ready (RR) Trait



Percent Acreage Containing Monsanto's RR Trait
Percent Acreage Containing Monsanto's Bt Trait (without RR trait)
Other

Source: Monsanto's Supplemental Toolkit for Investors (April 2009) at http://www.monsanto.com/investors/presentations.asp

Heritage Seeds based in Reynolds, Indiana, was also part of Monsanto's 2006 seed company purchasing spree. Heritage's selection is in line with other subsidiaries, and reflects Monsanto's triple stack penetration plan. Triple stack varieties comprise 68 percent of its corn platform and the company is not offering conventional and non-Roundup Ready varieties this year.[113]

The reason Monsanto continues to stack the Roundup Ready trait in virtually every variety it offers is simple. The trait is used in conjunction with Roundup herbicide, which ensures Monsanto benefits from these seed sales twice. Figure 8 shows that 80 percent of U.S. corn acreage is planted to the Roundup Ready trait. As explained below, the combination is even more lucrative now that glyphosate prices have also increased. Monsanto also provides a disincentive for using generic (non-Roundup) brands of glyhposate by disqualifying farmers from warranties on seed products who do not purchase the company's higher priced expensive trademark brand. Only, some farmers buy seed with the Roundup Ready trait not because they plan to apply Roundup, but because it is difficult to find non-Roundup Ready varieties.

This reality has led to a general fear among farmers that the best and newest genetics will only be accessible by purchasing expensive trait varieties that may not fit their farming system. One farmer recounts his experience at a field day in 2007 where an agronomist pointed to a new corn variety and told him to "get your order in early," explaining that this corn performed best in last year's trials as a conventional. When this farmer said he wanted to buy the variety as a conventional, the agronomist said this was not possible – it would only be available as a triple stack.[114]

Greg Hamner

Clemmons & Hamner Seed, Inc.
Killen, Alabama

Greg Hamner has operated Clemmons & Hamner Seed, Inc. in Killen, Alabama, since the early 1980s. He reports a rapid "swing back" to conventional soybeans in his area because they are less expensive to grow and glysophate-resistant weeds are increasingly a problem.

By February 2009, Hamner was sold out of his two most popular conventional soybean varieties. In 2008, conventional soybeans made up half of his soybean sales. "This year it will be closer to 80 to 90 percent conventional," he says.

Hamner says his company continued to sell conventional soybeans over the years because many farmers in his region grow less expensive varieties of soybeans in food plots for deer and other wildlife. But demand for these conventional varieties has surged recently for agronomic and financial reasons.

"In the South, resistance is just such a huge problem," Hamner explains. "Palmer amaranth, or Pigweed, is so resistant to Roundup. So if growers are going to have to mix conventional herbicides, why would they want to pay a tech fee on top of that?"

Another reason more farmers are looking at conventional varieties is because ADM offered a premium for identity-preserved soybeans in 2008 that exceeded $1.00 per bushel.

Conventional varieties are also offering competitive yields, he says, as evidenced by field trials conducted in Lawrence County, Tennessee. Lawrence Farmers Cooperative compared conventional and Roundup Ready varieties after customers started demanding more conventional soybeans and asking, "Can I grow them cheaper?"

The top three yielding varieties were conventional, Hamner reports, and after comparing the retail prices of herbicides in conventional and Roundup Ready systems, conventional varieties turned out to be cheaper to grow.

The conventional varieties in the study were 20 to 30 years old, and may lack resistance to more recent agronomic problems. But they yielded as well or better than modern Roundup Ready varieties, particularly in rotated fields.

"Roundup Ready technology was so simple when the only thing in your tank was Roundup," he says.

Soybean Sticker Shock: More Farmers Searching for Conventional Seed

Corn is not the only field crop giving farmers pause. In one year, some farmers saw Roundup Ready soybean seed prices double, jumping from $25 per unit to $50 in 2009. While the technology royalties explained earlier have increased over the years, higher commodity prices have also led to a justification among seed companies to "take any extra margin," according to one farmer.[115] As commodity prices make a dip, however, higher Roundup Ready seed prices have farmers looking for alternatives. Their hunt uncovers startling truths about the state of the U.S. non-GE soybean supply.

Historic Roundup Ready seed prices, coupled with other factors explained below, have sparked renewed interest in conventional soybeans. Seed companies and university extension agents started to receive more inquiries about the supply and benefits of conventional soybeans in 2007. The interest has only grown since then, and agricultural media reported an official "comeback" of conventional soybeans in the face of skyrocketing Roundup prices and seed costs the following year.[116] By 2009, some university extension agents reported that conventional soybean sales had doubled and could not meet demand.[117, 118, 119]

In fact, 2009 marked the first reduction in GE soybean acres since their introduction in 1996.[120] Experts agree that the percent of conventional soybean acreage would be higher if the conventional seed supply could meet demand.[121, 122]

In 2009, conventional soybean shortages were reported in Arkansas, Mississippi, Missouri, and Ohio.[123, 124, 125, 126] University extension estimated that if Mississippi soybean growers planted all the public and private conventional seed available, the amount would add up to no more than 3 percent of the state's soybean acreage (and just 0.5 percent if only the public varieties available were planted).[127]

"Out of 10 to 15 excellent varieties of Roundup Ready soybeans there's only one excellent conventional," reports one Iowa farmer. "Then there's the problem of availability and quantities, and it becomes more difficult to get what you need."[128]

There is less breeding of non-GE soybean varieties in general, and much of the work is conducted at state universities. However, fewer private companies that focus on breeding and selling conventional varieties remain independent businesses, meaning distribution channels for these varieties have also decreased.[129]

"We used to have more public varieties," says J.B. Ladd, an Indiana farmer. "They'll say they're available but fewer are supplied by local dealers."[130]

The renewed demand for conventional soybeans is spurred by the following factors. Taken together they lead to cheaper production costs, access to more profitable markets, and the ability to save seed.

High Seed Costs

As explained, Roundup Ready soybean seed has dramatically increased in price over the years and now cost about twice as much as conventional varieties. Farmers say the price hikes in Roundup Ready seed are unjustified because they are paying for the same trait each year without yield advantages to substantiate the higher cost. With other input costs at an all-time high, farmers see conventional soybeans as a clear-cut way to keep more money on their farm because of lower seed costs and comparable yields.

In fact, Roundup Ready soybeans do not always yield as well as conventional varieties, and demonstrated a yield drag when they were first introduced.[131] Though RR is not a "yield trait," advertisements purport the trait to provide direct yield benefits. A recent

Out of 10 to 15 excellent varieties of Roundup Ready soybeans there's only one excellent conventional.

- Iowa farmer

study, however, explains that biotechnology traits are not responsible for improvements in intrinsic yield but rather traits are often bred into varieties that yield well as a result of traditional breeding.[132] Good genetics and agricultural practices remain the most important factor for yield, yet biotechnology firms continue to tout the yield advantage provided by single herbicide-tolerant and insect-resistant traits.

Still, Monsanto introduced second generation "Roundup Ready 2 Yield" (RR2Y) soybeans in 2009 touting improved yields of 7 to 11 percent over first generation varieties. Critics say RR2Y is Monsanto's implicit admission that its first generation Roundup Ready soybeans did not yield as well as farmers expected.[133] Regardless, RR2Y varieties are creating even more sticker shock for farmers and seed companies licensing the new trait.

Will the yield advantage the product's name implies be realized and justify a much higher price? Maybe not. One independent seed company representative, who spoke on condition of anonymity, turned down RR2Y varieties in 2009 because "the yield data showed that farmers wouldn't make money."[134]

"When they asked us to market that product," he says, "we looked at the yield data and what they wanted us to charge our customers. We didn't think they were better agronomically for our market." A representative of a different company, also wishing to remain anonymous, adds, "The yield is not there…It just hasn't been proven."[135]

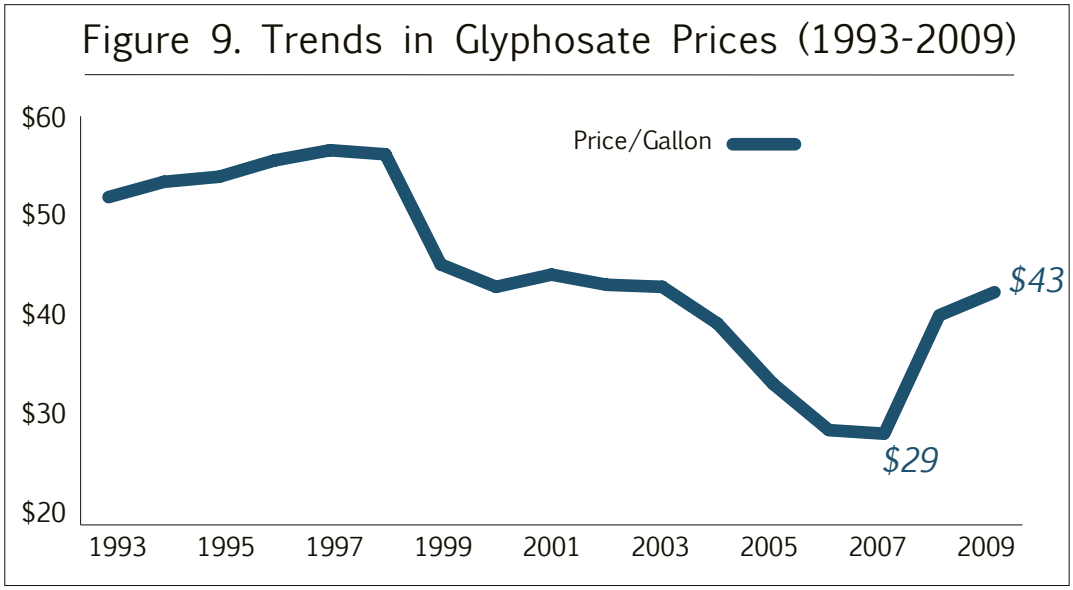
Reports following the 2009 harvest confirm preliminary data. Approximately 20 farm managers and seed distributors in five states reported in an October 2009 survey that "yields from the new soybean seeds didn't meet their expectations."[136] Beck's Hybrids, a prominent Midwestern seed company, said 188 of its farmers conducted side by side test plots and found that RR2Y yielded about two bushels per acre less than first generation RR soybean varieties.[137]

The royalty on a bag of RR2Y soybeans is approximately $22.[138] By comparison, this royalty alone is more than the total cost (trait plus genetics) of a bag of Roundup Ready soybeans when the technology was first introduced. And compare this, too, to the original technology fee for the Roundup Ready trait at $4.50 per bag.

Seed companies report that higher prices and less choice are on the horizon. In August 2009, Monsanto announced a 42 percent increase on second-generation RR2Y soybeans in 2010, or $74 per acre. First generation Roundup Ready soybeans would increase to $52 per acre.[139]

The second-generation trait alone is expected to cost more than $30 per bag, and companies have been told that less expensive first generation Roundup Ready soybean options will be phased out by 2012.[140] This means farmers who want the Roundup Ready trait in soybeans will have no choice but to purchase the more expensive second-generation varieties. Farmers will be paying six times what they paid for the first generation trait when it debuted in 1996.

With conventional soybean seed in short supply, farmers paid a $17.50 royalty in 2009 for GE varieties they would otherwise not choose and may not



Source: USDA/NASS. Agricultural Prices (April figures) at http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1002.

be benefiting from. If the conventional seed supply does not improve as first generation Roundup Ready varieties are phased out, choice will be reduced further as seed costs increase. Frustration among farmers will only grow if the higher yields promised by new Roundup Ready varieties are not realized to soften the blow to their bottom line.

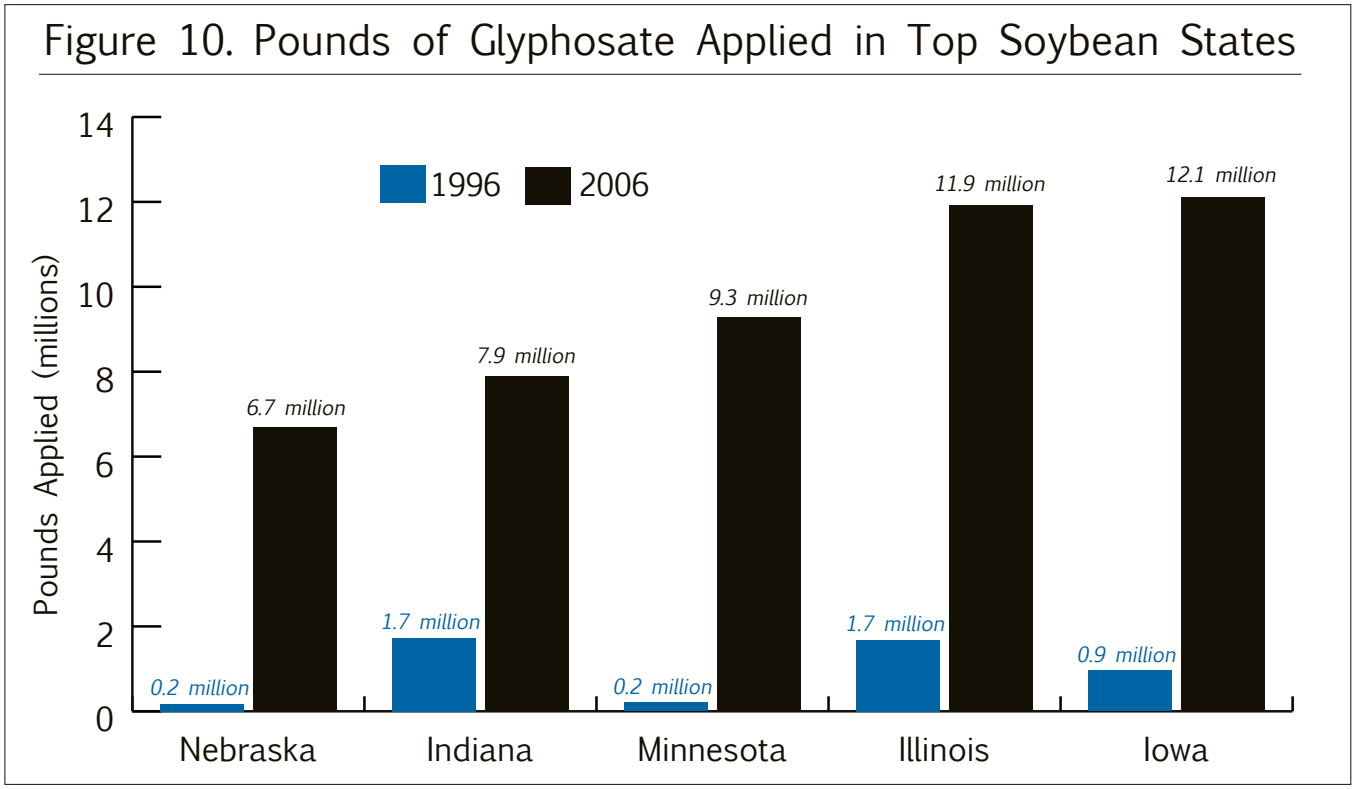
Glyphosate Costs Shoot Up

In addition to higher seed prices, farmers are facing a host of other inflated inputs costs, including the most widely used herbicide, glyphosate. Figure 9 shows that for years, glyphosate prices dropped after Monsanto's patent on the chemical formulation ran out in 2000. But in recent years generic forms of the popular weed control have doubled and even tripled in price. For example, in some parts of the country, glyphosate prices increased from $24 per gallon in 2007 to about $60 in 2008.[141] Seed and chemical dealers told farmers the price hikes were a result of several factors, including increased global demand (more Roundup Ready acreage); waning production in China (which supplies much of the generic glyphosate supply); and shortages of phosphorous (a key glyphosate ingredient).

For the first time, the price of generic glyphosate was on par with Monsanto's trademark brand, Roundup. Monsanto responded with a 30 percent increase in Roundup prices in order to "ration supply."[142] According to Jim Zimmer, a Monsanto representative, "Monsanto was forced to raise prices to slow down offtake because it didn't want to be in a position where it couldn't supply Roundup to a farmer with a Roundup Ready crop."[143]

But the justification for a price increase is often unrelated to the reasons given for public relations purposes, says Neil Harl, emeritus professor of economics at Iowa State University. "In this instance, it is likely more related to exercise of market share power to increase profits," Harl explains. "This area of the economy is a long way from perfect competition. That has been my main concern for several years about Monsanto."[144]

In 2008, Monsanto explained its rationale for increasing Roundup prices in a "Dear Valued Customer" letter sent to chemical dealers and producers, and warned of further price increases in 2009. The letter said, "At this time we are unsure to what degree glyphosate prices will increase, however we do anticipate a price increase on all Roundup brands for the 2009 season."



Sources: USDA/NASS, Agricultural Chemical Usage 2006 Field Crops Summary, May 2007 at http://usda.mannlib.cornell.edu/usda/nass/AgriChemUsFc//2000s/2007/AgriChemUsFc-05-16-2007_revision.txt; Agricultural Chemical Usage 1996 Field Crops Summary, September 1997 at http://usda.mannlib.cornell.edu/usda/nass/AgriChemUsFc//1990s/1997/AgriChemUsFc-09-03-1997.txt.

Indeed, Roundup was $71 per gallon in 2009, according to Missouri dealer Bob Niemeyer. "And that's wholesale," Niemeyer says. Generic glyphosate, on the other hand, went down $10, he adds, explaining he brought the cost down to $21.50 per gallon for his customers this year.[145]

As mentioned earlier, Monsanto's patent on glyphosate expired in 2000, yet the company's trademark brand continues to demand a large market share (estimated at 60 to 80 percent) even as generic glyphosate sales expanded.[146] This dominance in the glyphosate industry is curious, and has been the focus of antitrust lawsuits.[d]

As the most widely used herbicide, glyphosate is certainly a money maker. Its use has expanded significantly due to Roundup Ready crops. In Iowa, the U.S.'s leading soybean state, 952,000 pounds of glyphosate was applied on 15 percent of the state's soybean acreage the first year Roundup Ready soybeans were offered. Ten years later, glyphosate use had grown eightfold (see Figure 10). More than 90 percent of Iowa's soybean acreage was applied with 12 million pounds of glyphosate.[147]

[d] See *Texas Grain Storage v. Monsanto Co.*, 2008 WL 2570530 (W.D. Tex. 2008)

Agronomists warn against lowering recommended application rates in response to higher glyphosate prices, which speeds up weed selection pressure (i.e., susceptible plants die and resistant plants survive and reproduce without competition) and facilitates the development of glyphosate-resistant weeds. As will be explained next, glyphosate-resistant weeds are now the bane of many farming operations and another reason farmers are returning to conventional systems.

Glyphosate-Resistant Weeds

If you are a corn, cotton, or soybean producer in the Southeast or Mid-South, effects of glyphosate's prolific use is seen in fields and felt in pocketbooks. Glyphosate-resistant weeds are now established in 19 states and deemed a serious economic problem, at times adding more than $20 per acre.[148, 149] Weed specialists refer to resistant weeds as a "train wreck" making their way across the country.[150]

The International Survey of Herbicide Resistant Weeds lists nine weeds resistant to glyphosate in

the U.S., including: common ragweed, common waterhemp, giant ragweed, hairy fleabane, horseweed, Italian ryegrass, johnsongrass, palmer amaranth, and rigid ryegrass.

Some of the worst resistance is found in pigweed (Palmer amaranth). Resistant pigweed now infests hundreds of thousands of acres in the Southeast. For example, 70 to 80 percent of Macon County, Georgia, dubbed the "epicenter" of glyphosate-resistant Pigweed, is infested with the weed, and farmers were forced to abandon 10,000 acres in 2007.[151]

Purdue University weed scientist Bill Johnson explains that, "Farmers do not think resistance is a problem until they actually have it." Johnson points out that new innovation and choice in herbicides has diminished over the years, so farmers have fewer chemical options. He says farmers "think the chemical companies can turn on the spigots and produce a new herbicide whenever they want."[152] But with Roundup's success, money has not been invested in new herbicide research.

Weed resistance clearly diminishes the value of glyphosate and Roundup Ready systems, evidenced by the fact that farmers with resistance problems routinely mix glyphosate with other conventional herbicides.

"Spreading weed resistance is rapidly relegating the Roundup Ready system to the list of yesterday's herbicide systems," says North Dakota farmer, Todd Leake. "When a farmer looks down the weed guide list and sees 'poor control' for glyphosate on so many problem weeds, he has to wonder if the Roundup Ready system is worth his time and money."[153]

Therefore, resistant weeds have effectively wiped out the one advantage Roundup Ready seed once offered and farmers can no longer justify paying for the expensive trait. Indeed, for farmers with Roundup-resistant weeds, conventional soybeans are now cheaper to produce and easier to manage.

Although not yet a big problem in northern states, farmers are taking precautions against weed resistance, according to Judge Barth, executive director of Dakota Pride Cooperative. "I think [farmers] are more willing to put conventional soybeans in a farming rotation because some are worried about resistance to Roundup," Barth explains. "Conventional became an alternative for them when they could say, 'my fields are clean already, and maybe I can get a premium on top of rotating herbicides.'"

With premium programs for non-GE soybeans expanding, farmers are finding it more appealing to walk away from the Roundup Ready system.

Premiums for Conventional Soybeans

There are a number of national and international mar-

Figure 11. GE and Non-GE Soybean Price Comparison

Soybean Price Comparisons (per bu)	Saved Seed	New Non-GE	New GE
Opportunity Cost*	$8.82		
Cleaning Cost	$1.00		
Bagging Cost	$1.50		
Total Cost	**$11.32** ($9.40/unit)	**$40.60** ($33.70/unit)	**$59.76** ($49.60/unit)

Source: New seed costs derived from USDA/NASS April 2009 Agricultural Prices Index; Cleaning and bagging costs provided by independent seed cleaners.
*Soybean bid as of May 7, 2009 for new crop.

kets sourcing non-GE soybeans, and the premiums are catching farmers' attention. Mark Albertson of the Illinois Soybean Association reports that some of the major purchasers had booked all of their non-GE acres for the year by March 2009. "I never would have heard that a year ago," he says.[154]

Still, as of May 2009, SoybeanPremiums.org listed more than 40 non-GE premium programs spanning 32 states. Premiums typically range between $1 and $2 per bushel, though some farmers report receiving even more. One Iowa farmer says he will receive $3.40 per bushel this year as a premium for his non-GE soybeans.[155]

"There is no doubt that non-GE premiums have increased from last year," Albertson says. "In addition, the flat price of soybeans has decreased, making the premium a larger piece of the pie. With the cost of growing GE beans being higher than usual, the perceived risk and reward ratio of non-GE is looking more favorable to many farmers."[156]

And while demand for non-GE soybeans continues to increase, especially abroad, U.S. production is not keeping up. The biggest reason, says Corey Nikkel of Schillinger Seed, Inc., which recently introduced a new platform of exclusively non-GE crops, is the limited supply of conventional soybean seed. "The U.S. was short last year," he explains, "but I hope we'll only grow in terms of supply for non-GE from here."[157]

While non-GE premiums provide a nice incentive to farmers, it is a drop in the bucket compared to another advantage of growing conventional varieties: the ability to save seed.

Farmers Reclaiming Control

Agricultural biotechnology dramatically changed agriculture beyond conveniences in weed and pest control. Because patents protect GE traits, patent holders exercise unprecedented ownership and control over their intellectual property even after the seed is bought and sown. Patent law allows seed and seed trait developers to enforce licensing contracts for their technologies that, among other restrictions, terminate a farmer's time-honored right to save seed.

Prior to the advent of patented seed traits, most farmers traditionally saved a portion of their soybean harvest to plant the following year or sell to neighbors. Eliminating a farmer's right to save seed effectively removes an important form of competition in the seed industry, as farmers who plant GE varieties – at times with few other options – must buy new seeds each year. Sometimes farmers are forced to destroy seed they cannot sell, but would otherwise plant, if not for seed saving restrictions imposed by patent holders.

More than a decade has passed since patented seed entered the marketplace and yet many farmers still lament seed saving restrictions. With all the challenges explained above, farmers see an opportunity to reclaim control over their seed by returning to non-patented conventional varieties. The savings are huge. Farmers can pay seed cleaning fees – costing them approximately $1 per bushel – instead of buying new and ever more expensive seed every year.

Farmers' reasons for wanting to save seed, however, are not limited to economic justifications. Many farmers still prefer to selectively harvest seed for traits and performance. "The reason for producing our own seed was and always has been quality," says David Shupe. "I will pick out only the very best beans from my field for seed. I can then carefully store and condition that seed and am assured that it is treated correctly. I cannot be sure of this kind of quality care anywhere else."[158]

Shupe bemoans the loss of regionally adapted varieties made available through more numerous and diverse breeding programs of the past. He worries, like many farmers, that the lack of genetic diversity spanning the majority of our soybean and corn fields today leaves us vulnerable to future problems. "If for some reason we had to abandon that system of production we would lose most of our ag production capacity overnight and we do not have anything to replace it with on a timely basis," he says.[159]

Leland "Judge" Barth

Dakota Pride Cooperative
Jamestown, North Dakota

Judge Barth is the Executive Director of Dakota Pride Cooperative in Jamestown, North Dakota. While many of the Cooperative's members grow non-GE soybeans, including food grade, he is concerned that research in conventional soybeans is lacking at a time when interest in non-GE soybeans oversees is growing.

Roundup Ready soybeans have been well received by producers who find the technology cuts labor costs, he says, but last fall there was "a lot of talk of planting conventional varieties." While there has not been a "mad rush" to buy non-GE varieties, there is more interest than in the past.

"Farmers are really upset with the pricing of biotech soybeans. There's a lot of talk among producers looking to go with conventional varieties because they don't want to pay tech fees," he says. "It gets them upset."

Barth explains that seed prices have gone up partly because of commodity price increases a year ago. It was an opportunity for agriculture input suppliers to raise prices since there were more dollars per acre.

Producers are also thinking about the premium for conventional soybeans, and the benefit of rotating herbicides. Farmers consider conventional varieties as a way to avoid weed resistance in the Northern Plains.

"Many farmers 35 and younger don't know any other way to control weeds than with Roundup," Barth says. "I think they're more willing to put conventional soybeans in a farming rotation because some are worried about resistance to Roundup."

With demand for conventional soybeans growing, Barth says expanding these options in the marketplace must be a priority.

"What's scary from a research standpoint," Barth explains, "is the amount of money Monsanto, Syngenta, and other companies put into plant breeding. Nearly all of it is going into the biotech field. This leaves public universities competing against these companies and these breeding programs with a base of public funding. They can't compete against that kind of research money.

"So you see demand for [non-GMO] oversees, but all the research is going into the biotech area. From a producer's standpoint, conventional gets labeled as a poor variety, and farmers become skeptical of planting those," he explains. "Whether it's North Dakota State University, South Dakota State University or Minnesota, their public breeding programs can't keep up with dollars going into basic research. This is a big, big concern. New traits and genetics will all be placed in stacked varieties, and farmers will be forced to buy them when they might not need them."

Section 3

The Role of Patents in Seed Industry Concentration

Patents have impacted U.S. agriculture in significant ways by allowing unprecedented ownership and control over our nation's plant genetic heritage. Utility patents on plants have reduced breeders' access to essential genetics and therefore slowed crop improvements needed to meet farmers' needs. And, as is the focus of this report, patents have facilitated concentration in the seed industry by placing farmers and smaller seed firms at a disadvantage in the marketplace. Furthermore, the enforcement of seed intellectual property rights has led to a culture of fear in rural communities as enforcing patent rights often comes at the expense of farmers' privacy and property rights.

The changes in the seed industry described in this report are largely a result of the U.S. Patent and Trademark Office's (PTO) 1980 decision to award the first utility patent on life, a bacterium capable of breaking down crude oil, which was upheld in the Supreme Court case of *Diamond v. Chakrabarty*. The PTO's decision was later upheld again in the landmark 2001 Supreme Court ruling in *J.E.M Ag Supply, Inc. v. Pioneer Hi-Bred International, Inc.*, where Pioneer Hi-Bred had sued J.E.M. Ag Supply for illegally saving patented seed.[160]

Before the ruling, Congress had long argued that sexually reproducing plants should not be awarded utility patents – the same patents awarded to toasters, for example – for fear of curtailing innovation, threatening the free exchange of genetic resources, and in-

creasing market concentration. As this report shows, Congress was right. These consequences are now being realized.

Congress passed the Plant Patent Act in 1930, which explicitly rejected making sexually reproducing plants patentable subject matter. Patents, the law said, could only be applied to asexual reproduction, such as grafting, budding, cuttings, layering, and division.

More than 35 years later, in 1967, Congress returned to the idea of patents on sexually reproducing plants when it defeated an amendment to include these plants in the Patent Reform Act. Significantly, USDA also opposed the amendment because of the threats it posed to future research and development.

At the same time, Congress saw that some form of protection for sexually reproducing plants was reasonable. It created the 1970 Plant Variety Protection Act (PVPA) to provide plant developers similar rights as patent holders, including exclusive rights to propagate and market a protected variety for 20 years. USDA administers the PVPA and is responsible for awarding a Certificate of Protection to plant developers who prove their new variety is novel from existing varieties, genetically uniform, and stable through successive generations.

The enforcement of seed intellectual property rights has led to a culture of fear in rural communities, as enforcing patent rights often comes at the expense of a farmer's privacy and property rights.

Congress implemented important exemptions consistent with public policy and USDA's unease around utility patents on sexually reproducing plants. First, the PVPA provides a research exemption so other plant breeders can use protected varieties for research and development purposes. Second, farmers can save seed from protected varieties to replant on their own land. Neither the Plant Patent Act described above nor utility patents offer these exemptions.

Ten years later, a landmark case started to unravel the progress Congress had made in plant protections. The first patent on life was awarded in 1980 in the landmark case of *Diamond v. Chakrabarty*. In this case, the Supreme Court ruled 5 – 4 that a living bacterium was patentable subject matter. The U.S. PTO decided five years later in the case *Ex parte Hibberd* that sexually reproducing plants should be awarded patents (largely pointing to the Chakrabarty case) and began accepting patent applications for these plants.

The Supreme Court decision in the 2001 *J.E.M. Ag Supply, Inc., v. Pioneer Hi-Bred International, Inc.*, where plaintiffs argued that Congress had never intended for PTO to grant utility patents for sexually reproducing plants, concluded that Congress did not explicitly exclude plants in section 101 of the Utility Patent Act. Justice Clarence Thomas, a former attorney of Monsanto, wrote the majority opinion.

Opponents of utility patents on sexually reproducing plants continue to argue that Congress should amend the PVPA to be the exclusive means of protection for such crops. Removing these patents would help plant breeders and farmers return to traditional practices and rights that are beneficial to farmers and society as a whole.

Patents Hurt Public and Private Breeding

Owners of utility patents on plants have far-reaching control over access and use of their protected products. They can claim an entire plant – as is the case with patents for asexually reproducing plants and PVPA certificates – in addition to plant parts, such as a DNA sequence, gene, seed, or tissue culture. They can also claim the methods used to produce the variety and any hybrid varieties that result from patented plant parts.

As a result, these patents have effectively removed valuable genetic material from the pool of resources that breeders rely on for improving agricultural

crops. Access to patented material hinges on restrictive licensing agreements that create a mess of legal arrangements where important genetics essentially get stuck and underutilized.

Furthermore, patent owners can deny licensing agreements for strategic purposes, in particular, to prevent competition. Some researchers might need several licenses for one variety, and their ability to use genetic resources for improving plant varieties is slowed or stopped if they are denied a license for even one patent. This in turn denies breeders from improving and expanding the genetic base on which agriculture depends.

Denying licensing agreements also restricts public analysis of new varieties already in or entering the marketplace. Many public plant breeders rely on industry funding for their work, which means large private firms sometimes dictate research and create barriers to answering important questions about their products.

According to 26 university scientists who submitted a joint complaint to EPA on this point, "No truly independent research can be legally conducted on many critical questions."[161] These scientists, most of whom remain anonymous, point to situations where biotechnology companies are keeping universities from fully researching the effectiveness and environmental impact of the industry's genetically engineered crops.[162]

In 1999, *Nature Biotechnology* reported that "Nearly 50 percent of public plant breeders have had difficulties obtaining genetic stocks from companies."[163] Not only do firms deny access to varieties, they often insist on reviewing scientific findings before they are published. The editors of *Scientific American* recently asked, "Do Seed Companies Control GM Crop Research?" The article noted the scientists' letter to EPA mentioned above, and said that claims touted by biotechnology companies have little independent research backing them up. "Unfortunately, it is impossible to verify that genetically modified crops perform as advertised," the article reads. "That is because agritech companies have given themselves veto power over the work of independent researchers."[164] The article goes on to say:

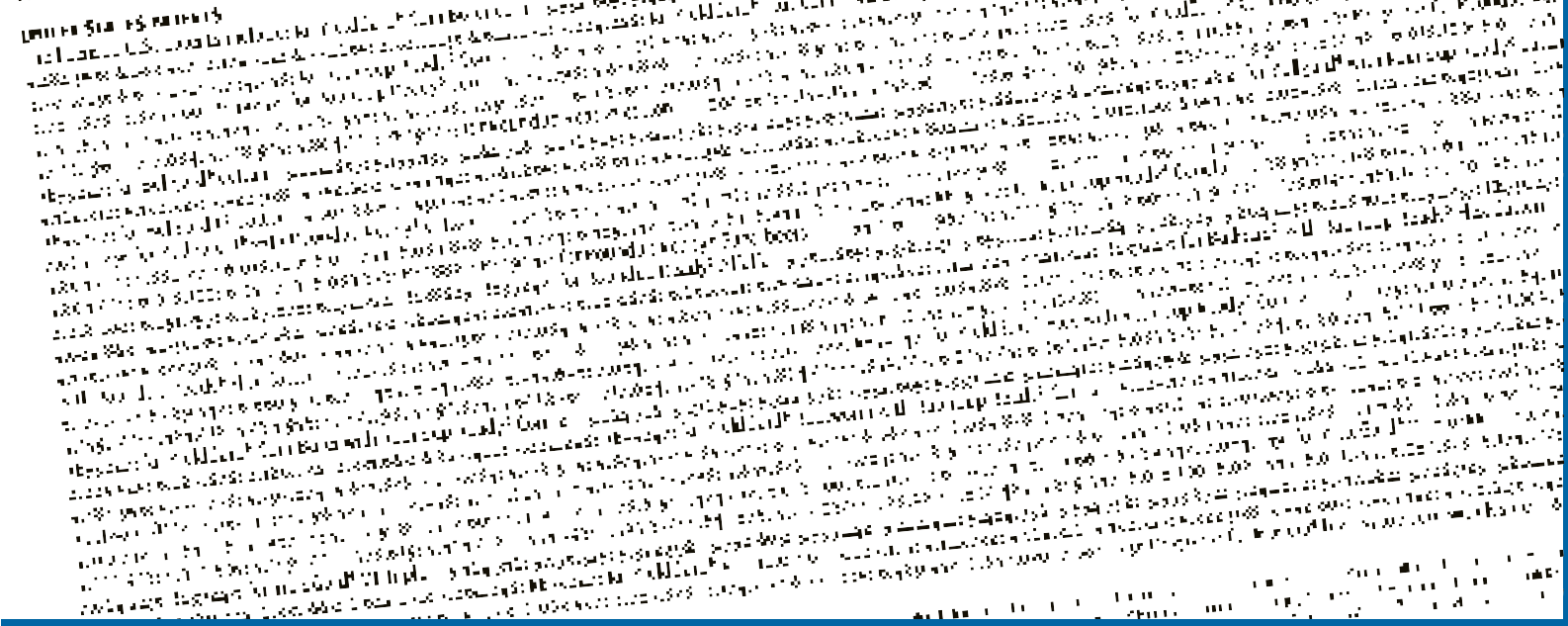
> *Under the threat of litigation, scientists cannot test a seed to explore the different conditions under which it thrives or fails. They cannot compare seeds from one company against those from another company. And perhaps most important, they cannot examine whether the genetically modified crops lead to unintended environmental side effects… It would be chilling enough if any other type of company were able to prevent independent researchers from testing its wares and reporting what they find—imagine car companies trying to quash head-to-head model comparisons done by Consumer Reports, for example.*[165]

Private research has also been affected. There is a financial disincentive to seek access to patented material to expand research because of costly royalties and onerous licensing agreements with patent owners, some of which have led to lawsuits. This reality serves as a major barrier to new companies entering the plant breeding industry.

Crop research in general has narrowed, prioritizing commodities where the most profit can be made over breeding programs focused on the range of needs of farmers. Uniform seed options have replaced cultivars tailored to specific regions, and smaller independent seed companies with a history of meeting these regional needs are disappearing.

Patents Hurt Independent Seed Companies and Reduce Competition

Utility patents have not spurred innovation in plants. In fact, the opposite seems true, as evidenced by USDA reports that document a downward trend: "Calculations for corn, soybeans, and cotton indicate that as the seed industry became more concentrated during the late 1990s, private research intensity dropped or slowed."[166] As opposed to driving innovation, utility patents on plants have provided an incentive to expand control over genetic resources, limit access to them, and make access expensive.



A snapshot of Monsanto's seed trait patents as listed in their 2008 technology agreement

The number of independent seed companies, especially small, family-operated businesses and research firms, has dramatically declined over the last few decades. As mentioned earlier, the Independent Professional Seed Association says there are only about 100 independent seed companies left, compared to more than 300 total (independent and consolidated) thirteen years ago.[167]

Utility patents on plants have facilitated this trend because of increased concentration of financial and genetic resources, which have led to numerous buyouts and an increased barrier to entry. Larger firms buy out smaller companies to increase their market share and lock up greater amounts of genetic resources obtained through the acquisitions. They also apply for the most patents on plants to control what is researched and sold.[168]

It is important to remember that patent owners do not start from scratch. Farmers and other plant breeders have played crucial roles in building our nation's germplasm base for modern agriculture to thrive, expand, and meet new agricultural challenges. Saving seed and the free exchange of germplasm is central to this history of innovation and genetic diversity.

Companies take advantage of the plant breeder exemption under the PVPA by making once public germplasm inaccessible to other plant breeders in addition to charging expensive fees for using these resources. Often times, the licensing agreements are for a limited use and disallow further research and development.

Utility patents on plants remove an important form of competition in the seed industry: a farmer's right to save seed. This has added to the problem of seed prices, where in most major crops a handful of firms have the largest market share. In turn, prices are not regulated by the market but by the largest players. In a concentrated seed industry where patents provide a legal monopoly on plants and plant parts, price is not driven down by competition from varieties derived from already patented material or by seed saving, since patents allow enforcement of technology agreements that restrict this traditional practice. Seed saving provides a check on seed price increases. Farmers would likely save more seed on the farm in response to escalating seed costs, for example.

Congress understood the importance of farmers' right to save seed when it created this exemption in the PVPA, and certainly did not intend for firms to take advantage of the plant breeder exemption by making once public germplasm inaccessible to other plant breeders.

Plant Patent Enforcement Threatens Privacy and Property Rights

Farmers who use seeds containing genetically engineered traits are required to enter into onerous agreements that, among other things, remove their traditional right to save seed on their farm (a right, remember, provided under the PVPA).[169]

The pursuit of farmers for patent infringement (i.e., illegally saving patented seed) has affected rural communities beyond the drain of expensive attorney fees and judgments. These investigations, lawsuits, and most often, out of court settlements, have created a culture of fear in communities where farmers are targeted, as Monsanto's private investigators are known to harass and intimidate families and businesses under investigation.

No other company is enforcing its plant patents as aggressively as Monsanto. The company hosts an anonymous toll-free hotline that farmers can call to snitch on neighbors suspected of saving patented seed. This has bred distrust, suspicion, and less information sharing among farmers. Not to mention false leads.

In the 2008 *Vanity Fair* article, "Monsanto's Harvest of Fear," Donald L. Bartlett and James B. Steele write, "Some compare Monsanto's hard-line approach to Microsoft's zealous efforts to protect its software from pirates. At least with Microsoft the buyer of a program can use it over and over again. But farmers who buy Monsanto's seeds can't even do that."

In one lawsuit, a U.S. District Court for the Southern District of Illinois referred to Monsanto's investigative practices as "scorched-earth policies," citing the company's "hardball tactics." In this particular case, the farmer was sued in the wrong court venue based on a forged technology use agreement (his name was even misspelled), and Monsanto obtained an injunction to lock the farmer's grain bins. When the case finally reached the correct court venue, the crop had gone bad, costing the farmer lost revenue on top of attorney fees.

More than 100 lawsuits have been filed in 27 states against farmers for patent infringement.[170] While many of these farmers admit they illegally saved seed, others say they followed the rules but were told of accusations long after the opportunity to collect independent samples had passed. Most farmers do not have the resources to fight a multi-billion dollar corporation in court. And Monsanto's investigators are known to threaten farmers with lawsuits and bankruptcy if they contest allegations and resist settling out of court. As such, the majority of farmers sign settlements. Because these farmers receive gag orders, many of their stories remain untold, and it is unknown how many farmers believe they were wrongly targeted.

Hundreds of farmers are investigated each year. As of 2006, Monsanto had initiated up to 4,000 "seed piracy matters" against farmers in 19 states.[171] Farmers have paid an estimated $85,653,601 to $160,594,230 in settlements and the number of settlements is 20 to 40 times the number of lawsuits in public court records.[172]

In response, several states have passed Farmer Protection Acts to level the playing field in patent investigations, including North Dakota (2001), South Dakota (2002), Indiana (2003), Maine (2008), and California (2008). These laws typically establish mandatory crop sampling procedures for patent holders to follow when collecting samples from a farmer's field. This provides transparency and ensures that farmers and a third party have an opportunity to collect duplicate samples. Some of these laws also recommend that the venue for disputes be the state court where the alleged infringement occurred. Still, even with some protections in place, innocent farmers have endured undue financial and emotional stress in their effort to avoid costly lawsuits.

More than 100 lawsuits have been filed in 27 states against farmers for patent infringements.

David Runyon

Soybean Farmer
Adams County, Indiana

David Runyon's family lives and farms in eastern Indiana. Five years ago, Monsanto alleged Runyon had infringed its patents based on an anonymous tip, which led to years of unrest for Runyon's family.

In July of 2004, two men appeared at the Runyons' door and presented the business card of McDowell & Associates, LTD. "Providing actionable information and real life solutions," it read.

"They arrived unannounced and said they wanted to ask me questions about our farming operation," Runyon says. "They did not tell me they were investigators from Monsanto."

Four months later, Runyon received a letter from a Monsanto attorney demanding his production records within seven days. "I kept wondering, 'Why are they after me?'" Runyon recalls. "I do not plant or use any of their products." Runyon only plants public, non-patented seed that comes from two universities.

Monsanto's seed licensing contracts require all patent infringement cases be tried on its home turf in St. Louis, Missouri. This means farmers shoulder expensive transportation and lodging costs on top of attorney fees if they choose to defend themselves in court. Thanks to a seed contract law passed in Indiana the year before, Runyon was spared a trip to St. Louis to argue his case. This law protected Runyon's family from potentially devastating travel and legal expenditures.

Runyon hired a local attorney who requested from Monsanto an explanation for why the case was being pursued in the first place. "At one point, Monsanto's attorney said he had an agreement with the Indiana Department of Agriculture to search my land," Runyon says. "I asked for a copy of the agreement, since Indiana didn't even have a Department of Agriculture at this time." Indiana's law also requires patent holders to receive permission from farmers before taking crop samples. "To this day, I have not received an answer of any kind from Monsanto," Runyon adds.

"I don't believe any company has the right to come into someone's home and threaten their livelihood," his wife, Dawn Runyon, said in a *CBS News* interview in 2008, "to bring them into such physical turmoil as this company did to us."

Runyon says farmers deserve to be notified of investigations through an honest process, and farmers who have not planted patented seed deserve to be protected from unreasonable allegations.

"Most farmers have never seen the inside of a courtroom let alone a Federal Court House," Runyon says. "These investigations are expensive and emotionally stressful."

Conclusion

Policy Recommendations for Restoring Choice and Fair Prices in the Seed Industry

The consequences of seed industry consolidation cannot be ignored. As this report explores, farmers are experiencing less choice in the seed marketplace as prices increase at historic rates. Reversing these trends will take a serious examination of current conduct by dominant firms and the role patents have played in seed industry consolidation. Furthermore, rebuilding public plant breeding programs is central to expanding choice and meeting the diverse needs of farmers.

Revamping patent law on seed would restore some of farmers' basic rights. The level of control biotech firms wield over farmers is a function of an intellectual property system that puts industry profits before the interests of farmers. A system that works for seed developers and farmers alike will return choice, fair prices, and transparency to the U.S. seed industry.

In particular, removing plant utility patents would level the playing field for farmers by re-establishing the time-honored right to save seed and eliminating patent infringement investigations that lead to out of court settlements, lawsuits, and intrusions of property and privacy rights. Federal legislation is needed in the short term that provides farmers who face patent infringement allegations a fair advantage in these investigations.

Challenging plant utility patents is a direct confrontation to concentration. As this report has shown, patents have facilitated consolidation in the seed industry and an unfair marketplace (higher prices and less choice).

Because the existing landscape involves biotechnology failures (e.g., the Roundup Ready system is breaking down) and farmers looking for alternatives, it's crucial to rebuild the infrastructure for these alternatives, specifically public breeding programs. What's needed is a strategy to support public breeding programs and engage public breeders in organizing and education efforts. This will allow for better exchange of plant genetic resources. We must work toward open and honest public breeding that supports the public interest and restores choice in the seed (especially non-GE seed) marketplace.

Lastly, antitrust law must be enforced when there is evidence of anticompetitve conduct in the seed industry. We must ensure that farmers have an open and fair marketplace that encourages innovation and provides a variety of seed options at competitive prices.

Our policy recommendations include:

The Department of Justice should closely examine anticompetitive conduct in the industry

Biotechnology firms have merged with or acquired a significant number of competitors, and though some have drawn antitrust scrutiny, no meaningful action has been taken to deal with anticompetitive players. Farm commodity prices are falling and will not sustain escalating seed prices, which continue to put these firms' primary customers – American farmers – at a disadvantage. Independent seed companies say that the licensing agreements they sign to access GE traits unreasonably restrain competition. Because independent seed companies are important distribution channels for new seed varieties, this market needs to be protected from predatory practices.
For all proposed and pending mergers that could result in further concentration of the seed industry, the DOJ and U.S. Department of Agriculture (USDA) should establish a public, consultative process that assesses how the merger will impact the structure of agriculture. This assessment should be made public with ample opportunity for public comment prior to any governmental action on the merger.

Furthermore, antitrust law must be enforced when there is evidence of anticompetitive conduct. If the DOJ determines that anticompetitive conduct exists as a result of concentration in the seed industry, it should use all remedies at its disposal through the Sherman Antitrust Act of 1890 and Clayton Antitrust Act of 1914 to eliminate those anticompetitive practices. U.S. farmers deserve an open and fair marketplace that encourages innovation and provides a variety of seed options at competitive prices.

Change patent law and establish Plant Variety Protection Act as sole protection

By establishing the PVPA as the sole means of intellectual property protection over plants, farmers could regain the right to save seed and the right to choice, as plant breeders would have better access to plant genetics that are currently off limits to innovation because of patents. This is consistent with the original congressional intent in enacting PVPA. Patent rights were only afforded through the Supreme Court decision in *J.E.M Ag Supply, Inc., et al. v. Pioneer Hi-Bred International, Inc.* where the majority opinion, in a split court decision, determined that Congress had not adequately expressed sole authority in the PVPA. This Supreme Court decision did, however, very importantly leave the door open to future congressional action to clarify the original intent.

Change the Bayh-Dole Act (Patent and Trademark Law Amendments Act)

The Bayh-Dole Act as applied to seed patenting and agricultural innovations should be re-evaluated and reformed to prohibit mandates for seed patenting and exclusive licenses relating to technologies and innovations developed through publicly funded research, because such patents and exclusive licenses are reducing farmer choice, reducing researcher access and directly contributing to this increasing trend of monopoly power, higher prices and/or other anti-competitive practices.

Rebuild public plant breeding and public cultivar development programs

Public universities and farmers have historically produced much of the conventional seed supply for major field crops, yet many public programs have become increasingly dependent on the biotechnology industry for major financial support as the publicly funded options dwindle. This has been compounded through pressures from the Bayh-Dole Act and Supreme Court decisions on plant patents. In recent 2007 Farm Bill legislation, Congress prioritized public cultivar development as a major capacity restoration focus for the USDA. Now is the time for the USDA to make this major recommitment to reinvigorating our public breeding and public cultivar development programs so we can ensure that the needs of farmers and the general public are met and that research is conducted in an open and honest way. This is the most effective way to increase farmer and consumer choices and options.

Remove the restriction on research from licensing agreements

Independent research relies on access to protected products for purposes of innovation and information sharing. Farmers deserve to know which varieties perform best under specific conditions. Patent owners should not have the power to prevent performance and safety testing of their products. Removing this restriction from licensing agreements would reduce fear within the public breeding community that companies will prohibit research – or file lawsuits – if protected plants are included in lab and field research.

Enact farmer contract reforms and establish a federal "Farmer Protection Act"

The 2007 Farm Bill took some of the first steps toward restoring fair contract rights for farmers, however GE crop seed licensing agreements for farmers remain some of the most predatory contracts in the industry. Restoring fully the federal rights of farmers to negotiate fair contracts, and including explicitly the right of farmers to negotiate collectively, would greatly contribute to restoring a fair and open playing field and better ensure future competitive and transparent market behaviors. Several states have also introduced bills that aim to level the playing field in patent infringement investigations and protect farmers' privacy and property rights. These state initiatives have had mixed success, yet together the efforts signal a real need and important momentum for federal legislation.

A federal Farmer Protection Act would protect farmers targeted with patent infringement allegations in four ways, ensuring that (1) the venue and choice of law is the state where the farmer resides; (2) an independent third party participates in patent infringement investigations; (3) farmers are not held liable for patent infringement when small amounts of GE content is discovered on their property and the presence provides no economic benefit; and (4) the manufacturer of GE crops is held strictly liable for economic damage caused by contamination.

Grover Shannon

University of Missouri Soybean Breeder
Delta Research Center

Grover Shannon, a soybean breeder at the University of Missouri's Delta Research Center, sees more interest in conventional soybeans among farmers than ever before.

"They're asking questions now," he says. "They're pretty angry due to sticker shock. So we've gotten a lot of calls."Shannon refers to a series of price hikes over the last few years steering farmers toward non-traited soybean seed.

In 2007, Roundup was $15 a gallon. The following year it skyrocketed to $50 a gallon in some areas. Roundup Ready soybean seed jumped from $30 to $50 per bag.

"Farmers got to looking at the economics," Shannon explains. "There are a lot of resistant weeds, too."

Farmers started realizing it might be cheaper to switch back to conventional soybeans since they were spending more by mixing Roundup with other herbicides. Purchasing less expensive seed could alleviate pressure to their bottom line.

"They decided they have a little more control if they grow conventional varieties again," Shannon says. "A lot of conventional varieties are not patented so farmers can save seed." On top of not purchasing new seed each year, farmers also enjoy a premium for non-GE soybeans, typically around $1.00 or more per bushel.

Supply has not kept up with demand, however, which has more than doubled in two years. Shannon thinks they might catch up in 2010.

"If it weren't for public programs we wouldn't have conventionals," he says. "Two-thirds of my program is still Roundup Ready but one-third is conventional. Most of the conventional breeding is coming from public programs."

The *Delta Farm Press* reported this year that the majority of public varieties Mid-South growers have access to come out of Shannon's breeding program. Shannon says his conventional varieties yield as well as Roundup Ready varieties.

"The conventional thing has thrown a little bit of a curve to the big [companies]," he says. "I think competition in a lot of ways is good."

Shannon believes competition in the seed industry is waning and decreasing the options for farmers.

"This is what they're selling it for and I can take it or leave it," he explains. "I think conventionals help provide some competition."

He adds: "The money's where the traits are and where they can patent. With conventional, it's another option. It is important to the grower that he has other options. As the companies get more control of a certain trait, farmers lose control of what they can get at a certain price."

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Glossary

Antitrust law Modern competition law is comprised of the Sherman Antitrust Act of 1890 and Clayton Antitrust Act of 1914. These laws seek to maintain competition in the marketplace by prohibiting agreements or practices that restrict competition between businesses; banning abusive behavior by a dominant firm or anticompetitive practices that lead to a firm's dominant position; and supervising mergers and acquisitions of large companies that threaten competition.

Bayh-Dole Act U.S. legislation adopted in 1980 that allows universities to patent inventions and other intellectual property resulting from public funding.

Biotechnology Technology related to the engineering of living organisms. The term is often used interchangeably with genetic engineering and genetic modification. See genetically engineered crops.

Bt crop Insect-resistant crop genetically engineered to contain a gene from the soil bacterium Bacillus thuringiensis, a toxin to several insects, including the European corn borer and corn rootworm.

Commercial seed market Seed market comprised of both proprietary and public varieties.

Conventional variety Crop variety that does not contain genetically engineered seed traits.

Cultivar A cultivated plant that has been bred and selected for desired characteristics. Also referred to as a crop variety.

Genetically engineered crops Crops engineered through molecular techniques that involve combining and transferring genes, sometimes between unrelated organisms. Most GE crops are engineered for insect resistance (e.g., Bt corn and cotton) and/or herbicide tolerance (e.g., Roundup Ready canola, corn, cotton, and soybeans). These crops are also referred to as genetically modified organisms (GMO).

Glyphosate An herbicide effective against many species of weeds that was initially patented and sold by Monsanto in the 1970s under the trademark, Roundup (the U.S. patent expired in 2000). Glyphosate is the most widely used herbicide in the U.S. More than 90 percent of all U.S. soybeans and cotton planted, and more than 80 percent U.S. corn planted, are genetically engineered to tolerate glyphosate applications.

GMO See genetically engineered crop.

Hybrid corn Corn developed by crossing inbred lines. Hybrids only retain their desirable genetic traits for one generation, so they do not breed true to type. The vast majority of corn varieties planted in the U.S. are hybrids.

Licensing agreement

Seed companies enter into licensing agreements with other companies to access limited use of proprietary plant genetics, including genetically engineered traits.

Plant Variety Protection Act (PVPA) Gives plant breeders exclusive control over new sexually reproducing or tuber propagated plant varieties. The PVPA grants similar protections available through utility patents but provides crucial exemptions for farmers and researchers. Farmers can save protected varieties for on-farm use or to sell to neighbors, and researchers can use protected plants to develop new varieties. This form of plant protection should not be confused with plant patents under the Plant Patent Act, which apply to asexually reproducing plants, such as fruit trees.

Proprietary Marketed and protected under a registered trade name. In the case of crops, these are branded varieties subject to intellectual property protections, including those awarded utility patents and certificates under the Plant Variety Protection Act.

Public variety Crop developed in the public domain. The absence of patents and other plant protections on seed developed in the public domain allows farmers and researchers to freely reproduce the seed.

Stacked traits Two or more genetically engineered traits expressed in a single seed variety, such as a corn plant that expresses both the Roundup Ready and Bt trait.

Utility patent Also referred to as "patents for invention," utility patents are a type of property right that gives the patent holder exclusive rights (for a limited time) to making, using, and selling the subject matter. The U.S. Patent and Trademark Office determines when a patent should be granted.

Variety Also called cultivars, a variety is a subgroup within a species that differs in genetics and characteristics from other varieties.

Scott Morgan

Soybean/Corn Farmer
Stoddard County, Missouri

Scott Morgan farms in Stoddard County, Missouri, and chooses to grow conventional soybeans because of the production cost advantage and premiums.

"The main thing at first was the initial cost of Roundup Ready seed beans," Morgan explains. "And over the last couple years, I've been receiving a pretty good premium for non-GMO soybeans....The simple fact is you bring in more money and it doesn't cost quite as much for input costs."

Morgan thinks the non-GE soybean market was "overloaded" last year and in 2009, and says if a farmer did not have a market early this spring for non-GE soybeans, he might not have found one this year.

He reports that Roundup Ready soybeans were selling for $40 to $50 per bag in 2009 in his area and that conventional varieties cost him $17 to $19 per bag.

"You can save your seed and not have any money in seed the next year except for cleaning them," he explains, "which costs roughly about $1 per bushel for cleaning...I don't think there's any kind of yield advantage with Roundup Ready beans. In my experience, they're even."

Morgan says he's worried about the lack of research going into non-GE seed beans, because "they put so much time into Roundup Ready that the non-GMO beans got left behind."

For example, some of the big seed companies have 15 to 20 Roundup Ready options, he explains, but they might only have two to three non-GE varieties available.

Morgan also grows corn, about half of which is conventional. He says seed corn with traits costs "quite a bit more." His conventional seed corn costs can be steep, too – about $140 per bag – but he receives a $0.50 premium per bushel for some of his non-GE corn.

"The way I farm I don't need the Roundup Ready trait in seed corn but a lot of times you have to buy that [trait] because it's in almost everything now," he explains. "I think the Roundup Ready trait is $17 of the cost of seed corn," he explains.

When Roundup Ready traits are stacked with Bt traits, it "jacks the price of seed corn up," costing around $200 per bag. This is a problem, Morgan says, since they put in traits you might not need.

"I run into that a lot," he says. "It's frustrating."