

Farmers' Guide to GMOs

Second Edition
February 2009



A Publication of Farmers' Legal Action Group

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Farmers' Legal Action Group, Inc.

FLAG



FARMERS' LEGAL
ACTION GROUP,
INCORPORATED

Farmers' Legal Action Group, Inc.
360 North Robert Street, Suite 500
Saint Paul, Minnesota 55101-1589

Phone: 651-223-5400

Fax: 651-223-5335

Toll-Free in Minnesota: 877-860-4349

Email: lawyers@flaginc.org

Website: www.flaginc.org

PUBLISHED BY

Farmers' Legal Action Group, Inc.
360 North Robert Street, Suite 500
Saint Paul, Minnesota 55101-1589
lawyers@flaginc.org
www.flaginc.org

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We hope this guide provides farmers with the information they need as they maneuver the complex and ever-changing landscape of GMOs, while at the same time growing healthy food that nourishes our country and the world.

Susan E. Stokes
Executive Director
February 2, 2009

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FARMERS' GUIDE TO GMOs

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**FARMERS' CHECKLIST: WHAT FARMERS NEED TO
UNDERSTAND BEFORE PLANTING GMOs
(based on the 2009 Monsanto Technology/Stewardship Agreement)**

	<i>Pages</i>
<input type="checkbox"/> Farmers accept all the terms and responsibilities of the Technology Agreement (TA) by signing the contract <i>OR BY OPENING THE BAG!</i>	9-11
<input type="checkbox"/> Farmers cannot negotiate the terms of the TA which they are required to sign.	9
<input type="checkbox"/> Farmers cannot save any seed from GM crops or provide any seeds to others.	11-12
<input type="checkbox"/> Farmers accept <u>responsibility</u> for keeping GM crops out of markets, elevators, or other farmers' fields that do not want or allow GM crops.	13-14
<input type="checkbox"/> Farmers who plant GMOs must allow Monsanto access to their fields to inspect crops and determine the farmer's compliance with the contract.	16-18
<input type="checkbox"/> Farmers who plant GMOs must allow Monsanto access to their Farm Service Agency (FSA) and Risk Management Agency (RMA) agency records, and to invoices for all seed and chemical transactions, and they must allow Monsanto to copy any relevant documents.	15
<input type="checkbox"/> There is no specified end to the contract. Monsanto can review a farmer's documents, and inspect a farmer's fields, and crops even after the farmer has stopped growing Monsanto seeds.	16
<input type="checkbox"/> Monsanto will seek money damages, attorneys' fees, and costs if a farmer is caught violating the TA.	18-21
<input type="checkbox"/> Monsanto will not honor any warranties if the farmer does not also use Monsanto-approved chemicals on the GM crops.	22-23
<input type="checkbox"/> A farmer's only remedy for poor performance of the GM seed is reimbursement of the price paid for the seed or, at Monsanto's choice, replacement of the seed.	24
<input type="checkbox"/> Farmers' disputes with Monsanto must be brought in courts in Missouri; Missouri state laws, not the laws of the farmer's state, will apply.	25-26
<input type="checkbox"/> Cotton farmers must settle disputes with Monsanto through expensive binding arbitration, NOT in court.	26-27

FARMERS' GUIDE TO GMOs

I. Introduction and Background

A. Purpose of this Guide

This guide is a tool to assist farmers in understanding the complex framework of laws surrounding the planting of genetically modified organisms (GMOs). The guide explains farmers' legal obligations under GMO contracts and the very real possibility that farmers may be held legally liable to pay tens of thousands of dollars to biotech companies for violations of those contracts or to neighboring farmers whose fields become contaminated with GMOs. It also highlights the devastating impact GMO contamination has had on some agricultural markets and the lawsuits surrounding those events. Due to the significant risks posed by planting GMOs, the guide provides some suggestions on how farmers may protect themselves from GMO contamination risks.

B. What Are GMOs?

GMOs in agricultural crops are products resulting from the use of recombinant DNA technology to alter the genetic sequence of a plant to force the plant to express a desired trait. The two most common GMO traits on the market are herbicide tolerance and insect resistance. Herbicide-tolerant GMOs are engineered to survive application of potent herbicides, such as glyphosate. Roundup Ready® seeds are the most prevalent herbicide-tolerant GMOs. Insect-resistant, or Bt, crops contain a gene from a soil bacterium, *Bacillus thuringiensis*, that produces a protein toxic to specified insects. Some genetically modified (GM) seeds contain both herbicide-tolerance and insect-resistance traits and are often referred to as containing "stacked" traits.

C. The GMO Industry

The vast majority of GMOs are developed, manufactured, and marketed by a small number of agribusiness companies. These companies—including Monsanto, DuPont Pioneer, Syngenta, Aventis,

and Bayer—control the bulk of GMO technology and the resulting seed and chemical markets.¹ Monsanto's GM traits are found in an estimated 86 percent of the world's biotech crops, appearing either in Monsanto-produced seeds or through licensing agreements with other companies such as DuPont-Pioneer and Bayer.² For these companies, the GMO market is more than selling seed to farmers each year; it includes a whole package of chemical inputs that the GM seeds are designed to tolerate.³

GM varieties of soybeans, corn, and cotton became commercially available in 1996. By 2007, herbicide-tolerant GMOs were planted on 91 percent of soybean acreage and 70 percent of cotton acreage in the U.S. In 2007, Bt varieties were planted on 59 percent of U.S. cotton acreage and 49 percent of U.S. corn acreage.⁴ As these figures demonstrate, farmers are increasingly planting stacked-trait varieties of GM seed, i.e., those that have two or more GM traits in one plant. The planting of corn varieties with both herbicide tolerance and Bt traits increased from 1 percent of acreage in 2000 to 28 percent in 2007, while use of stacked-trait cotton varieties more than doubled, increasing from 20 percent to 42 percent of acreage over that period.⁵

There are many new GM products in the pipeline. These include a single corn variety that may incorporate eight herbicide-tolerance and insect-resistance traits.⁶ And, after initial concern about consumer rejection, a variety of Roundup Ready® sugar beets made a commercial debut in 2008.⁷ These and other GM products are being developed and tested at public land grant institutions and private companies across the United States. Also, biotechnology companies are beginning to contract with farmers to grow GM industrial and pharmaceutical crops that express traits that can be used for industrial chemicals, drugs, and vaccines.⁸

D. Patents on GMOs

Agribusiness or biotech companies maintain control of—and secure the greatest financial return on—their GM seeds by patenting either the seeds or the genetic traits used to modify the seeds. Once a GM seed contains a patented genetic trait, no one may lawfully plant, sell, or use it in any manner without first obtaining the permission of the company holding the patent. This permission is often referred to as a “license.” Licenses to use GM seed containing patented material

severely restrict the manner in which the seeds may be used, including prohibiting farmers from saving seed from GM crops for planting another crop. Farmers are granted licenses to use GM seed for limited purposes through a contract usually called a Technology Agreement. Patent infringement may occur when a person uses seeds or sells crops containing patented GM technologies in a manner not covered by a valid license from the patent holder. The financial penalties for patent infringement can be quite severe.

II. Federal Regulation of GMOs

Federal regulation of GMOs involves primarily three federal agencies: the U.S. Department of Agriculture (USDA), the U.S. Environmental Protection Agency (EPA), and the U.S. Food and Drug Administration (FDA).⁹ Each agency has regulatory authority over different aspects of GMO development, production, and marketing.¹⁰ Sometimes these agencies' authorities overlap, and sometimes there are gaps in federal regulatory authority, including authority to regulate what happens after GMOs are marketed commercially.¹¹

A. USDA – U.S. Department of Agriculture

USDA regulates field testing of GMOs before they are released for commercial production. The Animal and Plant Health Inspection Service (APHIS) is the agency within USDA responsible for evaluating impacts of these GMO field trials on the environment.

1. APHIS Regulates Plant Pests

APHIS's authority to regulate GMOs comes from the Plant Protection Act (PPA).¹² This statute and the regulations implementing it govern the release of plant pests into the environment. Since GMOs are considered potential plant pests, APHIS approval is required before a GMO may be offered for commercial sale.¹³ APHIS's review of genetically engineered plants is narrowly focused on whether the GMO would directly or indirectly injure, or cause disease in or damage to, any plant.¹⁴ APHIS allows GMOs to be deregulated and offered for commercial sale if it believes the field tests show that the GMO will not pose a plant pest risk.

Prior to conducting field trials, biotech companies must obtain a permit from APHIS or, if a permit is not required, provide notice to APHIS according to a specific notification procedure.¹⁵ The permitting process requires the company to provide more detailed information about the crop and trial and allows APHIS more time to decide whether the field trial meets regulatory requirements. Under the streamlined notification process, APHIS simply acknowledges the notification for conducting field trials; it does not consider the possible environmental impacts a field trial may have. APHIS has allowed the vast majority of GM crop field trials to proceed under the simple notification procedure and has only required permits in a few cases. However, in two cases, one involving genetically engineered bentgrass and the other involving drug-producing genetically engineered crops, federal courts held that APHIS violated the National Environmental Policy Act (NEPA) by failing to conduct the required environmental review before allowing field trials of the genetically engineered crops to be conducted.¹⁶

After a field trial is completed, a company that wants to market the GMO product to farmers must petition APHIS, asking that the GMO no longer be regulated.¹⁷ The petition must include data supporting the company's request that the GMO should not be considered a plant pest, and information regarding any potential impacts the GMO may have on the environment.¹⁸ Once the petition is approved, the GMO is no longer subject to APHIS regulation as a plant pest, and the company is free to market and sell the GMO to farmers.¹⁹

Once APHIS allows a GMO to be deregulated and therefore commercialized, the extent of the agency's regulatory authority significantly diminishes. According to a report by the Pew Initiative on Food and Biotechnology,

Under the PPA, [a crop] can be brought back within the regulatory control of APHIS if the agency determines that the crop is a plant pest or noxious weed, presumably on the basis of new information brought to the agency's attention by the developer, a petitioner, or new analysis. APHIS, however, has no systematic

program in place for monitoring plants after they are deregulated.²⁰

2. 2005 Audit Concluded APHIS Regulation Is Inadequate

In December 2005, USDA's Office of Inspector General (OIG) issued a report condemning APHIS's practices in regulating genetically engineered crops.²¹ With regard to field tests of GM crops, the audit concluded that APHIS "lacks basic information about the field test sites it approves and is responsible for monitoring, including where and how the crops are being grown, and what becomes of them at the end of the field test."²² Pointing to many serious weaknesses in APHIS's practices, OIG concluded that APHIS is "relinquishing its regulatory responsibility in favor of self-certification" by companies manufacturing GMOs that they will comply with performance standards.²³

3. 2008 Farm Bill Directs APHIS to Improve Regulation of GMOs

In the 2008 Farm Bill, Congress directed APHIS to take action to improve the way it manages and oversees GMOs.²⁴ In October 2007, APHIS published a list of factors it was considering to improve its oversight of GMOs.²⁵ The 2008 Farm Bill requires that, by late 2009, APHIS take action on each of the factors under consideration and, where appropriate, issue regulations.²⁶ The factors include, among other things, addressing procedures for: (1) biotech companies to maintain and make available to APHIS complete records on their GMO products; (2) taking, testing, and making available to APHIS representative seed samples during investigations of GMO contamination events; (3) regaining the identity and control of GMO material in the event of an unauthorized release; (4) corrective actions when there has been an unauthorized release of a GMO; (5) managing isolation distances between GMO and non-GMO crops and dealing with outcrossing problems; and (6) improving clarity in contracts with those conducting research on GMOs.²⁷ In addressing these factors, the law requires APHIS to consider both establishing standards for such things as isolation and containment distances for GMO crops, and requiring permit holders to take certain actions that are designed to improve the permit holders' control of the GM

material, recordkeeping, auditing, training, and contingency or corrective action planning.²⁸

4. Court Reverses APHIS Deregulation of Roundup Ready® Alfalfa

In 2007, a federal court ruled for the first time that APHIS's deregulation of a genetically engineered crop was illegal and ordered an immediate halt to the commercial sale of the GM seeds.²⁹ In *Geertson Farms v. Johanns*, the U.S. District Court for the Northern District of California found that APHIS had violated the National Environmental Policy Act by failing to adequately evaluate the potential economic and environmental impacts of Monsanto's Roundup Ready® alfalfa before authorizing its commercialization.³⁰ The court threw out the agency's decision to grant nonregulated status to the GM alfalfa and ordered APHIS to complete a full Environmental Impact Statement (EIS) before making a new decision regarding commercial release of Monsanto's Roundup Ready® alfalfa.³¹ The court's decision gives some guidance on the types of issues APHIS will be expected to address in the EIS. These issues include the concern that Roundup Ready® alfalfa will contaminate natural and organic alfalfa, the economic risks to conventional and organic alfalfa growers from contamination, and the impacts of Roundup®-resistant superweeds that could follow commercial planting of the GM alfalfa.³²

The court also prohibited the future planting of Roundup Ready® alfalfa until the EIS is completed and APHIS makes a new decision regarding its commercial release.³³ At the time this guide was written, APHIS was in the process of developing the EIS required by the court.³⁴

In January 2008, a lawsuit was filed challenging APHIS's decision to allow commercial release of Monsanto's Roundup Ready® sugar beets. Similar to the alfalfa case, this lawsuit seeks a court order throwing out APHIS's decision to deregulate Roundup Ready® sugar beets and ordering the agency to perform a complete EIS prior to any new decision to allow commercial release.³⁵ At the time this guide was written, commercial planting of Roundup Ready® sugar beets was taking place and was

expected to continue until such time as the court may issue an order prohibiting it.

Also at the time this guide was written, APHIS had not completed an EIS on any of the GM food or feed crops currently on the market.

B. EPA – U.S. Environmental Protection Agency

EPA has authority to regulate pesticides under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).³⁶ Under this authority, EPA regulates pesticides contained within GMOs, which EPA calls “plant-incorporated protectants” (PIPs).³⁷ For example, EPA regulates GMOs that contain Bt because Bt is a pesticide.³⁸ Under FIFRA, EPA regulates GMOs containing pesticides to ensure that they do not harm the environment.³⁹ It does this by requiring that, prior to commercial release of GM seeds engineered to produce pesticides, GMO developers must obtain a registration of the GM seeds from EPA.⁴⁰ EPA is supposed to determine that a pesticide is not “unreasonably” harmful to the environment before approving a registration.⁴¹ Even though the GMOs that EPA regulates contain pesticides, EPA does not require use-restriction labels on the commercial seed, unlike the requirement for other pesticides.

EPA also sets tolerance levels for pesticides that will end up as residues in foods.⁴² If a chemical residue exceeds these tolerance levels, the food is considered not safe for consumption under the Federal Food, Drug, and Cosmetic Act.⁴³ Since some GMO food crops, such as Bt corn, have been modified to produce a pesticide, EPA must either set a tolerance level for such pesticide-producing GMO crops or exempt them from the tolerance requirement. The pesticide level of any food containing pesticide-producing GMOs must be within the residue limits set by EPA. In practice, EPA has granted exemptions from pesticide tolerance requirements for many of these pesticide-producing GMOs.⁴⁴

EPA’s duty to set residue tolerance levels for pesticides also applies to pesticides applied to crops, such as Roundup®, whose use may increase as a result of commercialization of herbicide-tolerant GM crops. Thus, the agency may address pesticide tolerance issues as new Roundup Ready® GM crops are introduced.

C. FDA – U.S. Food and Drug Administration

FDA has regulatory authority over food produced from GMOs.⁴⁵ Generally, FDA treats GM food crops as the “substantial equivalent” of conventional foods—treating GM food crops as mere variants of well-accepted foods with no different or greater safety concerns.⁴⁶ Relying on this substantial equivalence principle, EPA presumes that most GM food crops are “generally recognized as safe” (GRAS). Food additives that are found to be GRAS are exempt from independent safety testing of the food and from pre-market approval and labeling requirements.⁴⁷

In 2006, FDA issued a new guidance encouraging manufacturers to contact the agency early in the development of new plant varieties, emphasizing the need to avoid “inadvertent introductions into the food supply of proteins from biotech crops under development.”⁴⁸ The guidance does not establish any legally binding requirements for the biotech companies, but rather sets out completely voluntary procedures. It simply encourages companies to voluntarily submit a food safety evaluation to FDA during the development of new GM plant varieties. In response to a voluntary submission, FDA sends a letter to the company stating whether or not its review of the company’s evaluation raised concerns about food safety and encourages the company to address any such concerns.⁴⁹ Even this completely voluntary food safety evaluation procedure does not apply to GM plants engineered to produce pesticides—those are left to regulation by EPA.⁵⁰

III. GMO Contracts/Technology Agreements

To maintain control over the patented technologies used in GMOs, biotechnology seed companies require farmers to sign a special contract—often called a technology agreement—when purchasing and planting GM seed. **This contract generally gives the farmer limited permission, called a “license,” to use the company’s patented seed for planting a single crop.** If a farmer uses seed or crops containing a company’s patented technologies in any way that is not permitted under a license from the company, the company may sue the farmer for patent infringement. If the company’s patent infringement lawsuit is successful, the farmer may be

required to pay the company a substantial amount of money in damages, attorneys' fees, and court costs.

In exchange for receiving a limited license to use the GM seed, a farmer who enters into a GM seed contract generally agrees to: (1) pay the technology fees included with the seed purchase; and (2) comply with all of the company's production, management, and marketing requirements and restrictions.⁵¹ Biotech companies also generally use these contracts to get the farmer's agreement to a number of protections for the companies' interests.

Under a GM seed contract, farmers typically agree to the following practices.

- Follow specific farming practices required by the company.
- Save no seed from the crop produced from the purchased GM seed.
- Take specified measures to protect the company's intellectual property rights in the GM seed.
- Sell the crop produced from the GM seed in specifically approved markets.
- Allow company representatives access to fields to inspect crops.
- Resolve any disputes under the contract either through binding arbitration or in a court convenient to the company.⁵²

Monsanto uses a single contract, called a Technology/Stewardship Agreement (hereinafter referred to as "Technology Agreement" or "Agreement"), to grant farmers the limited license to use many of its GM corn, cotton, soybean, sugar beet, and alfalfa seeds.⁵³ Because Monsanto's Technology Agreement covers such a large percentage of the GM crops planted in the United States, a recent (2008) version of that Agreement will be referred to in this Guide as an example of typical contract terms.⁵⁴

GMO contracts are almost always standard form contracts written by the biotech company. **Farmers will not have an opportunity to negotiate the terms of the contract.** The biotech companies offer these contracts on a take-it-or-leave-it basis as part of the seed purchase.

A. How Farmers Become Bound by GMO Contracts

In general, a person becomes bound by the requirements of a given contract by knowingly agreeing to be bound, usually by giving a signature. However, in some cases, it is possible to become bound by the terms of a contract because of one's actions, even if no formal agreement or signature is ever given. These two general means for forming a binding contract also apply in the specific case of GM seed sales and use.

In general, farmers become bound by a GMO contract when they sign it and return it to the company. For example, Monsanto's Technology Agreement clearly states that a farmer will only have a license to use Monsanto's GM seeds once the company issues a license number to the farmer from its main office in Saint Louis, Missouri.⁵⁵ Even Monsanto's authorized seed dealers and retailers do not have the authority to issue a license for use of Monsanto's GM seed. Monsanto could deny a farmer a license number even after the farmer has purchased the seed and completed and signed the Technology Agreement. **Because the farmer does not have a license to use Monsanto's GM seed until given a license number from the Saint Louis office, it is extremely risky for a farmer to even plant the seed before receiving a license number.** Simply planting the seed without first having a license number may be an infringement of Monsanto's patents and could lead to the farmer being sued for substantial money damages.

Monsanto's Technology Agreement requires that for a farmer to be eligible to sign the Agreement and, thus, obtain a license to use the GM seed, the farmer must be the operator or grower for all fields where the purchased GM seed will be grown.⁵⁶ That is, the farmer cannot be purchasing seed for any other farmer to use. By signing Monsanto's Agreement, the farmer represents that he or she has the full authority to contractually bind himself or herself and all business entities for which the farmer obtains seed, as well as all other persons who have an ownership interest in those business entities.⁵⁷ Because of this provision, farmers signing Monsanto's Technology Agreement should make sure that everyone with an ownership interest in the business entity that will use the GM seed is notified of and understands the obligations and responsibilities under the GMO contract.

Although a farmer is generally not entitled to any *rights* under a GMO contract until the agreement is formally signed and approved (such as the right to plant the seed and harvest a crop), farmers may become bound by the *duties* of a GMO contract as soon as they take possession of the GM seed. For example, **farmers may become bound by the terms of Monsanto's Technology Agreement simply by opening and using a bag of seed containing Monsanto technology.** Monsanto's Technology Agreement states

Grower accepts the terms of the following NOTICE REQUIREMENT, LIMITED WARRANTY AND DISCLAIMER OF WARRANTY AND EXCLUSIVE LIMITED REMEDY by signing this Agreement and/or opening a bag of Seed containing Monsanto Technology. If Grower does not agree to be bound by the conditions of purchase or use, Grower agrees to return the unopened bags to Grower's seed dealer.⁵⁸

One court found that a farmer was bound by a GMO contract's prohibition against saving soybean seed for planting, even though the farmer did not sign a Technology Agreement for the two growing seasons in dispute, because he did open and plant some bags of seed.⁵⁹ The bottom line is that farmers who *use* GM seeds, even if they do not sign a contract, may be bound by the terms of the biotech companies' contracts.

B. Strict Limitations on GM Seed and Crop Use

Monsanto's Technology Agreement contains very strict requirements for how farmers will use GM seed. **Farmers who enter into the contract agree to follow many restrictions on the use of the purchased Monsanto seed and the crop grown from that seed,** including the following rules.⁶⁰

- Use the purchased GM seed for the planting of only one commercial crop.
- Plant the GM seed only where all required regulatory approvals have been obtained. (Some Monsanto seed technologies have not been approved for planting in some states or in some counties within a state.)⁶¹
- Do not save for planting any crop produced from the GM seed.

- Do not clean for planting any crop produced from GM seed.
- Do not supply seed produced from the GM seed to anyone for planting except a Monsanto licensed seed company.
- Do not transfer any GM seed to any other person or entity for planting.
- Do not plant or transfer to others to plant any seed that the grower has produced containing the GM seed for crop breeding, research, or generation of herbicide registration data.
- Do not plant in another country GM seed that has been purchased in the United States, and do not plant in the United States any GM seed that has been purchased in another country.⁶²

The only time a farmer is permitted to save or clean for the purpose of planting any seed containing Monsanto's patented technologies is when the farmer has entered into a valid written seed production agreement with a seed company licensed by Monsanto. In such an instance, the farmer must deliver all of the seed containing Monsanto technologies produced under that agreement to that licensed seed company or sell it for non-seed purposes or use.⁶³

By limiting farmers who use seed containing Monsanto technologies to planting only one crop and prohibiting the saving of seed for planting the next season's crop, Monsanto ensures that farmers must purchase new seeds each year. The restrictions on using any crop produced from GM seeds for breeding or research purposes means that any new developments in these crop lines will come only from Monsanto and not through public breeding programs or farmer innovation.

As explained in Section IV of this guide, Monsanto has been very successful in enforcing the Technology Agreement provisions that prohibit farmers from saving their seed, despite farmers' legal challenges to these provisions.

C. Complicated Requirements for Farming Practices

As GM crops have become more prevalent, there have been increasing concerns about: (1) contamination of non-GM crops through cross-pollination or other means; and (2) the development of weed

resistance to glyphosate herbicide used on many GM crops, and insect resistance to Bt engineered into some GMOs. As a result of these concerns and the possible threats to the performance and profitability of GM crops, **biotech companies have begun requiring farmers to comply with strict farming practices mandated by the companies.** For example, under Monsanto's Technology Agreement, farmers agree to and are bound by the detailed farming practice requirements contained in the Technology Use Guide (TUG) and the crop-specific Insect Resistance Management (IRM) guides.⁶⁴

While many farmers growing Monsanto's GM seed may not have actually received a copy of the TUG at the time they signed the Technology Agreement, by signing the Agreement farmers state that they *have* received a copy and agree to comply with the detailed farming practices included in it.⁶⁵ A farmer also agrees to comply with any changes in those farming practice requirements whenever the company decides to change the TUG or IRM guides.⁶⁶

Depending on the specific GM seed being planted, Monsanto's TUG and IRM guides require farmers to implement Monsanto-specified practices such as:

- Plant certain acreage with non-GM seed as a refuge for insects according to detailed calculations for the size, shape, location, timing of planting, and limitations on pesticide use.⁶⁷
- Follow multi-phased integrated pest management practices.
- Follow a detailed set of minimum pesticide application guidelines for weed management to minimize the risk of developing glyphosate-resistant weed populations and for managing those weeds already identified as being glyphosate-resistant.⁶⁸
- Follow guidelines for preserving the identity of the specific GM crop, including guidelines to manage pollen flow and prevent mechanical mixing.⁶⁹
- For Roundup Ready® alfalfa, follow a list of specific court-ordered stewardship practices.⁷⁰

Farmers who do not comply with Monsanto's detailed Insect Resistance Management requirements may lose their limited permission to purchase and plant Monsanto's GM seeds.⁷¹

D. Restrictions on Marketing and Channeling Grain

Some GM crops have not received approval for export to certain countries' markets. In addition, some GM crops have been approved only for certain uses.⁷² It is essential that these GM crops *not* find their way into markets where they are not allowed. One farmer's mistake, in allowing a GM crop that is not approved for a certain market to be commingled with other crops heading to that market, could cause contamination of millions of bushels of grain, leading to rejection of entire shipments and even dramatic declines in crop exports.⁷³

Biotech companies put the burden on the farmer to keep GM crops out of markets where they are not authorized. For example, Monsanto's 2009 Technology Agreement has several provisions setting out the farmer's obligations to make sure that the GM crops end up in appropriate markets. These provisions include the following.⁷⁴

- For certain Monsanto GM corn and canola crops that have been approved for U.S. food and feed use, but have not yet been approved in certain export markets, the farmer is required to direct all production of the crop to elevators that agree to accept the crop, feeding on-farm, use in domestic feed lots, or other approved uses in domestic markets only. Farmers growing these GM crops must complete and send to Monsanto a Market Choices® Grain Marketing Communication Plan that verifies that the farmer understands other countries' import restrictions and identifies the grain handlers (elevator, feed lot, feed mill, or ethanol plant) where the farmer is considering marketing the crop.
- For other Monsanto GM corn and for GM soybean crops, the farmer is required to sell only to entities in those countries where full regulatory approval of those GM crops has been granted.
- For Monsanto GM alfalfa, the farmer is required to direct any crop produced from the Monsanto seed, including hay and hay products, only to countries where regulatory approval for GM alfalfa has been granted.

Monsanto's Technology Agreement refers farmers to the website www.866sellcorn.com or the American Seed Trade Association's

website, www.amseed.org, for a list of grain handlers' positions on accepting GM crops.

E. Company Investigation of Farmers' Compliance

Monsanto and other biotechnology companies use various methods to monitor and investigate farmers' compliance with GMO contracts and to enforce contract obligations when necessary.

1. Access to Farmers' Records

One method that Monsanto uses to ensure that it can monitor and enforce farmers' compliance with GMO contracts is **requiring farmers to agree that seed and input suppliers and U.S. Department of Agriculture (USDA) may give the companies access to records and documents related to the farmers' operations**. For example, under Monsanto's 2009 Technology Agreement, a farmer agrees that Monsanto can, upon written request, have access to the following information.⁷⁵

- Farm Service Agency (FSA) crop reporting information on any land farmed by the farmer.
- Risk Management Agency (RMA) claim documents submitted by the farmer.
- Dealer or retailer invoices for the farmer's seed and chemical transactions.

In addition to permitting access to these specific documents, by entering into Monsanto's Technology Agreement, a **farmer also agrees to "allow Monsanto to examine and copy any records that could be relevant" to the farmer's performance** under the Agreement.⁷⁶

The federal Privacy Act protects farmers from having certain of their government records released to others without written permission from the farmer.⁷⁷ However, by entering into a GMO contract such as Monsanto's Technology Agreement, a farmer grants permission to USDA to release the farmer's government records to the biotech company and may waive any protections under the Privacy Act.

The biotech company may use documents and records obtained from these government agencies and licensed GM seed sellers to try to determine whether the farmer is violating the GMO contract. For example, such records could provide evidence that Monsanto would believe demonstrates that a farmer saved seed in violation of the Technology Agreement. Based on USDA records showing the number of acres of each crop a farmer is planting and the farmer's historic yields for those acres, together with input from suppliers' receipts showing the amount of seed and chemicals the farmer purchased, Monsanto may calculate that a farmer only purchased enough Roundup Ready® soybean seed to plant 125 acres, while the farmer's FSA records show 265 acres were planted. If additional evidence demonstrates that the farmer purchased enough Roundup® or other glyphosate to spray on these additional 140 acres, Monsanto may suspect that the farmer has saved soybean seed containing Monsanto technologies from previous crops. Alternatively, after harvest of the GM crop, Monsanto may look at USDA records showing the farmer's acreage, historic yields, and reported yield for the crop, together with any crop loss claim filed by the farmer and receipts from a grain warehouse or other purchaser, and suspect that the farmer did not sell all of the GM crop yield. Using this information, Monsanto may either seek to inspect a farmer's fields and on-farm storage or bring a federal lawsuit against the farmer for violating his or her GM seed license and infringing on Monsanto's patent by saving seed.⁷⁸

It is important for farmers to understand that the obligations and legal liability under a GMO contract will likely stay in effect even after the farmer stops growing the GM seeds. For example, Monsanto's 2009 Technology Agreement provides that it will remain in effect "until either the Grower or Monsanto choose [sic] to terminate the Agreement."⁷⁹ However, the Agreement does not say how a farmer may choose to terminate the agreement. This means that Monsanto may continue to have access to USDA and supplier records, and other documents related to the farmer's operation, long after the farmer has stopped growing Monsanto's GM seeds.

2. Field Inspections

Another monitoring and enforcement tool biotech companies will use is field inspections. **Biotech companies will perform field inspections to make sure farmers are complying with required practices.**

a. Field Inspections for Compliance with Insect Refuge Management Requirements

Bt technology works to kill rootworm and corn borer. It is assumed that these insects will survive and thrive in the insect refuge areas where the Bt technology is absent. The requirement in many GMO contracts for the farmer to plant non-GMO insect refuges is an attempt to minimize the development of insect resistance to the pesticides contained in the GMOs. If all of a farmer's crop acres were planted with GMOs containing pesticides, it would be more likely that only insects that could tolerate the pesticides would survive, and future generations of insects would be increasingly resistant to the incorporated pesticides, making the GMOs (and other forms of the pesticides) ineffective.

Recent studies have found insect resistance to Bt crops.⁸⁰ The U.S. Environmental Protection Agency (EPA) requires that insect refuge management practices be implemented by all farmers who grow crops containing pesticides, such as Bt.⁸¹ By signing Monsanto's Technology Agreement, farmers agree to comply with any insect refuge management requirements, including planting and maintaining insect refuges according to the company's detailed specifications for size, shape, location, and maintenance of the refuge. For example, in corn-growing areas, each farmer must plant at least 20 acres of non-Bt corn for every 80 acres of Monsanto YieldGard® corn; in cotton-growing areas, each farmer must plant 50 acres of non-Bt corn for every 50 acres of some Monsanto YieldGard® corn products.⁸²

Through an agreement with EPA, Monsanto or an approved agent of Monsanto will monitor farmers' insect refuge management practices.⁸³ The TUG requires that, upon the company's request, **farmers must identify the location of all**

fields planted to Bt crops and all associated refuge areas and must cooperate fully with any field inspections.⁸⁴ In turn, Monsanto promises to arrange any insect refuge management field inspection with the farmer in advance and to do the inspection at a reasonable time.⁸⁵ Farmers should insist on this and be present for the inspection.

Thriving pest populations in refuge areas naturally cause havoc on a farmer's crop yields. According to some reports, this insect damage to crop yields is why some farmers do not always follow insect refuge requirements.⁸⁶ However, Monsanto makes it clear that a farmer's failure to follow the insect refuge management practices included in the TUG and IRM may result in the farmer losing the license to grow Monsanto's GM seeds.⁸⁷ In addition, the farmer may be found to have breached the contract with Monsanto if the company brings a lawsuit.

b. Field Inspections for Other Purposes

Biotech companies may want to perform field inspections for purposes other than monitoring compliance with insect refuge management practice requirements. However, farmers may not have agreed in the GMO contracts to allow field inspections for such other purposes. Farmers should determine whether their contracts require them to allow field inspections for the purposes for which the companies want to conduct them. Because evidence from field inspections could be used against a farmer in a lawsuit for patent infringement, farmers should be cautious when giving permission to conduct field inspections. See Section VI below for suggestions for what to do if the company asks to conduct field inspections or take crop samples.

3. Anonymous Reporting of Farmers' Noncompliance

Another method Monsanto uses to monitor farmers' compliance with GMO contracts is to **encourage neighbors, acquaintances, and other farmers to report suspected noncompliance to the biotech company.** Monsanto's TUG and its website provide toll-free telephone numbers and addresses for persons to report individuals who are suspected of not complying with

requirements of a GMO contract. Monsanto will treat the reported information as “confidential” — meaning Monsanto will attempt to protect the source’s identity unless ordered to reveal it by a court—or “anonymous” — meaning the information may be reported in a way that the person reporting cannot be identified.⁸⁸

F. Companies’ Remedies in Legal Actions Against Farmers

Biotech companies have extensive legal remedies to punish farmers for violating GMO contracts. **Lawsuits by biotech companies pursuing these remedies have already cost farmers millions of dollars.** Monsanto’s Technology Agreement spells out these extensive remedies. **If a farmer violates the Agreement,** Monsanto can pursue the following legal remedies.⁸⁹

- **The farmer’s limited-use license for any seed or crop containing Monsanto’s GM technologies will be immediately terminated.** The full implication of terminating the license is not clear. According to the Agreement, even if the license is terminated, farmers may still use the GM seed for planting only one commercial crop. However, when a license is terminated, there is some question whether the farmer’s ability to market the crop will be affected. The Agreement does provide that if a court finds that the farmer infringed on the company’s patent, then the company will be entitled to a court order prohibiting the farmer from making, using, selling, or offering seed containing Monsanto’s patented technology.
- **The farmer will be barred from using Monsanto’s licensed seed products, probably forever.** The farmer will not be able to use Monsanto’s GM seed again, unless Monsanto gives the farmer a written notice stating that the farmer had violated the Agreement and the limited-use license was previously terminated, but that Monsanto will re-issue that terminated license. Even if Monsanto were to issue a new license number to the farmer for a future seed purchase, this would not be a legally effective license for the farmer to use that seed unless the written notice described in the previous sentence had been given by Monsanto. The likelihood that the company will issue new licenses to violators is not great. Given that Monsanto controls through ownership or licensing a

very large share of the GM seed market, this could make it difficult for farmers to obtain GM seed in the future.

- **The farmer may be sued for a very large amount of money for breach of the contract and/or infringing on Monsanto's patents, and for Monsanto's attorneys' fees and costs and investigation costs.** If a farmer saves GM seed for replanting, or uses purchased GM seed or crops grown from the GM seed in any way that violates the Technology Agreement, the farmer may be sued for patent infringement and/or breach of contract. By entering into the Technology Agreement with Monsanto, the farmer agrees that if a court finds that the farmer has violated Monsanto's patent, then Monsanto will be entitled to recover from the farmer the full amount of money damages available under patent law.

Money damages for infringing a GM seed patent are likely to include, among other things, a "reasonable royalty" for each bag (or equivalent) of seed found to have been saved and replanted. Courts have ordered farmers to pay royalties of as much as \$55 per bag (or equivalent) of GM soybean seed, \$556 per bag of GM cottonseed, and even \$1,113 per bag of cottonseed when it was saved and transferred to another person.⁹⁰ If the court finds that the farmer willfully infringed the patent, then the court may also order that a farmer is required to pay "enhanced damages"; this means that the amount owed for such things as "reasonable royalties" may be multiplied up to three times.⁹¹

Under the Technology Agreement, the farmer also agrees to pay all of Monsanto's attorneys' fees, court costs, and other expenses incurred in enforcing its rights under the Agreement. Courts have ordered farmers to pay tens and even hundreds of thousands of dollars for Monsanto's attorneys' fees and costs.⁹² According to the Technology Agreement, Monsanto may also recover from the farmer the costs of investigating the farmer's breach of contract and infringement of the patent on GM technologies.

A court order requiring a farmer to pay Monsanto such a huge amount in damages, attorneys' fees, and costs could force the farmer into bankruptcy. However, even in bankruptcy, a farmer may not find relief from the obligation to pay a huge damage

award for patent infringement if the bankruptcy court finds that the infringement was willful.⁹³

Monsanto has been very aggressive in pursuing patent infringement lawsuits against farmers for misuse of GM seed and crops containing Monsanto patented technologies. As of October 2007, courts had awarded Monsanto a total of more than \$21,500,000 in 57 recorded judgments against U.S. farmers.⁹⁴ Press reports and Monsanto's own statements suggest that the company investigates roughly 500 farmers each year.⁹⁵ Many of these investigations lead to out-of-court settlements. Based on Monsanto's documents, it has been estimated that U.S. farmers may be paying well over \$85 million to Monsanto through out-of-court settlements for what the company calls "seed piracy" (patent infringement).⁹⁶

- **The farmer may be prohibited by a court from making, using, selling, or offering seed for sale if the farmer is found to have infringed the company's patent.** Under Monsanto's Technology Agreement, the farmer agrees that if a court finds that the farmer infringed the company's patent by using the GM seed or crop in any way not authorized in the Agreement, then Monsanto may pursue a court order prohibiting any future use of Monsanto's GM seed.⁹⁷

G. Farmers' Warranties and Legal Remedies Are Limited

As discussed above, GMO contracts generally secure very broad and generous remedies for the company if the farmer violates the contract. At the same time, GMO contracts severely limit the legal remedies a farmer may pursue if the company's seed does not perform well or the company itself violates the contract.

1. Limitations on Warranties of GM Seed

A commercial product typically carries a warranty that the product will perform well for its intended use. This type of warranty is generally created by statute, with an allowance for a product's maker to put conditions on the warranty and limit its availability if the limitations are set out expressly in the product documentation.⁹⁸

a. Farmers Must Strictly Follow All Directions for Planting, Management, and Herbicide Application

Monsanto has chosen to make an express limitation on its warranty that its GM seeds are fit for their intended use. Under the Technology Agreement, Monsanto warrants only that the GM seed will perform as set forth in the TUG when used in accordance with directions.⁹⁹ The 50-page TUG in effect in 2009 includes detailed and complex directions on how to plant and manage each specific GM seed product, including extensive requirements for pesticide and herbicide applications and management. In addition, each pesticide and herbicide product will come with its own detailed instructions for application. As a result of these combined conditions for “use” of the GM seed, if a farmer plants Monsanto’s GM seed and it does not perform well, it could be very difficult for the farmer to make a successful claim under the seed warranty; the farmer would most likely have to be able to prove compliance with each and every one of the detailed directions and requirements.

b. General Disclaimer for Certain GM Corn Hybrids

In addition to the general limitation on a warranty for its GM seeds, Monsanto appears to have attempted to further limit its warranty on some specific GM corn hybrids by stating in the Agreement that “a small number of these hybrids may infrequently demonstrate variable levels of performance in fields and not meet grower expectations.”¹⁰⁰ Monsanto would likely attempt to use this statement to defend against any farmer’s attempt to collect money damages due to poor performance by the named corn hybrids.

c. Farmer Must Notify Monsanto Within 15 Days of Observing Poor Performance

Monsanto’s Technology Agreement also requires that a **farmer must send a written notice to Monsanto within 15 days of the date on which the farmer first observed an issue regarding poor performance.**¹⁰¹ This is to allow Monsanto sufficient time to do a field inspection of the crops. The written notice must describe what the claim is about and

must name the Monsanto technology and the seed hybrid or variety. If this notice is not sent on time, and the farmer attempts to pursue legal action against Monsanto or a seller of Monsanto's GM seed because of the seed's poor performance, the court may conclude that the farmer's failure to provide the notice as required bars any legal claim relating to poor performance of the crop.

d. No Warranty If Farmer Uses Off-Brand Glyphosate Herbicide on Roundup Ready® Crops

When Monsanto first introduced Roundup Ready® GM seed, it required farmers to use Monsanto's Roundup® herbicide. But in 2000, the patent for Roundup® expired and other companies began manufacturing and marketing generic glyphosate equivalents of Roundup®.¹⁰² Monsanto's TUG now acknowledges that other glyphosate products may be used on Roundup Ready® crops.¹⁰³ However, **Monsanto disclaims all responsibility for and makes no warranties regarding the use of glyphosate herbicides made by other manufacturers on Monsanto's GM crops.**¹⁰⁴ If a farmer used glyphosate herbicides made by other manufacturers on Monsanto's GM crops, Monsanto would be likely to attempt to use that fact as a defense against any claim by the farmer for poor performance of the GM seeds.

e. No Warranty If Farmer Fails to Control Glyphosate-Resistant Weeds

Glyphosate-resistant weeds are becoming an increasing problem for farmers. Widespread planting of Roundup Ready® crops in combination with the emergence of glyphosate-resistant weeds brought a fifteen-fold increase in the use of glyphosate on major field crops between 1994 and 2005.¹⁰⁵ Thirty new glyphosate-resistant weeds appeared in the U.S. between 2001 and 2007 alone.¹⁰⁶ Monsanto acknowledges many of these glyphosate-resistant weeds and includes requirements for their management in its 2009 TUG.¹⁰⁷ The TUG makes it clear that Monsanto does not warrant the performance of its GM seed if glyphosate-resistant weeds are not properly managed.¹⁰⁸

Monsanto encourages farmers to use its herbicide and pesticide products on crops grown from its GM seed by offering its Roundup Rewards® program.¹⁰⁹ This program gives farmers incentives to use Monsanto pesticide products by providing some support for reapplication if certain conditions are met and providing some seed replacement cost-share if the seed or crop is lost or must be replanted due to a catastrophe. But to take advantage of these incentives, farmers must rely on Monsanto for all of their pesticide and herbicide needs, without the benefit of price or quality comparison.¹¹⁰

2. Severe Restrictions on Farmers' Legal Remedies

Though GMO contracts secure very broad legal remedies for the companies against farmers for violations of the contract terms, **GMO contracts also attempt to severely restrict a farmer's legal remedies if the GM seeds do not perform well or the company violates the contract or is negligent.**

For example, according to Monsanto's Technology Agreement, no matter what type of legal claim the farmer raises or the severity of the financial losses, injury, or damages the farmer suffers, **Monsanto would never have to do more than refund the price the farmer paid for the seed or replace the seed itself.**¹¹¹ The Agreement allows Monsanto to choose whether to replace the GM seed rather than refund even the price of the seed purchased by the farmer.¹¹² The Agreement explicitly states that the refund of the seed cost or replacement of the seed is the only remedy for

ANY AND ALL LOSSES, INJURY OR DAMAGES RESULTING FROM THE USE OR HANDLING OF SEED CONTAINING MONSANTO TECHNOLOGIES (INCLUDING CLAIMS BASED IN CONTRACT, NEGLIGENCE, PRODUCT LIABILITY, STRICT LIABILITY, TORT, OR OTHERWISE). . . . IN NO EVENT WILL MONSANTO OR ANY SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, OR PUNITIVE DAMAGES.¹¹³

Because of this language in the Technology Agreement, Monsanto would likely argue that a court cannot require it to pay a farmer

any more than the amount the farmer paid for Monsanto GM seed, even if the GM crop produced a very poor yield resulting in a huge loss in crop income for the farmer. Monsanto would also likely argue that this provision means that a farmer who is bound by the Agreement cannot recover money from Monsanto if the farmer is ordered to pay money damages to a neighboring farmer or consumer for GMO contamination of non-GM crops or food products.

Whether a court would enforce these limits is an open question,¹¹⁴ but Monsanto would likely argue that, by signing the Technology Agreement, a farmer has agreed to these limitations.

H. Governing Law and Selecting Forum to Resolve Disputes

GMO contracts typically establish which state's laws will apply to any disputes that arise between the farmer and the biotech company, and identify which court or other forum any legal claim must be filed in. These are often not the laws or courts of the state where the farmer is located.

1. Governing Law

Courts consider a variety of principles when they need to decide which laws to apply in a particular case because the action or parties involved are based in more than one state. These principles would not necessarily require a court in a GMO case to apply the laws of the state in which the biotech company is located, but might instead result in applying the laws of the state in which the crop is planted or the farmer resides. But these legal principles typically only come into question when the parties have not agreed between themselves how the "choice of law" issue will be resolved.

Monsanto's Technology Agreement states that the parties agree that Missouri and federal law will apply to any disputes between the farmer and the company.¹¹⁵ Because this is part of the GMO contract, it is likely that a court would consider that both Monsanto and the farmer are bound by this Agreement. This means that **the laws of Missouri will be applied when resolving a legal claim, and not the laws of any other state in which the farmer may reside.**

2. Forum for Resolving Disputes

A forum selection clause is the part of a contract where the parties agree to use a specific court or process for resolving all legal disputes.

a. Courts in Saint Louis, Missouri, for Legal Claims Involving Most of Monsanto's GM Crops

Monsanto's main offices are in Saint Louis, Missouri. Monsanto's Technology Agreement states that the parties agree that the legal claims for all GM corn, soybean, canola, alfalfa, and sugar beet products covered by the Technology Agreement can only be filed in the U.S. District Court or county Circuit Court in Saint Louis.¹¹⁶ This means that farmers from anywhere in the country who want to sue Monsanto based on a GM seed contract must file their lawsuit in a court located in Saint Louis, Missouri, not in the state where the farmer resides. It also means that if Monsanto sues a farmer, it can file the lawsuit in Saint Louis. Courts across the nation have consistently enforced this clause in Monsanto's GMO contract.¹¹⁷ Suing or having to defend a lawsuit in a state in which the farmer does not reside will likely increase costs of any lawsuit for the farmer.

b. Binding Arbitration for Legal Claims Related to Monsanto's GM Cotton

The one exception to the general requirement that legal claims regarding Monsanto's GM seeds must be filed in a federal or state court in Saint Louis, Missouri, is GM cotton. Monsanto's Technology Agreement states that **any legal claims against Monsanto or any seller of Monsanto's GM cotton, except those arising from patent laws, must be resolved in binding arbitration.**¹¹⁸

Farmers who enter into a contract with Monsanto for GM cotton agree that any disputes will be resolved in an arbitration proceeding conducted according to the American Arbitration Association's Commercial Dispute Resolution Procedures.¹¹⁹ They also agree that the arbitration hearing will be held in the capital city of the state where the farmer lives or

any other location all parties agree to. If the parties do not resolve the farmer's claim or dispute within 30 days of Monsanto's receipt of the written notice described above at Section III. G. 1. c., any party, including Monsanto, may begin the arbitration proceedings. When an arbitration proceeding is initiated, the farmer and Monsanto must each immediately pay one-half of the filing fee. As the arbitration proceeds, Monsanto and the farmer will also be required to each pay one-half of the administration and arbitrator's fees. However, the arbitrator has the right to apportion these fees in a different fashion—meaning that the farmer might be required to pay all fees if he or she loses the case. The farmer also agrees that the arbitration proceedings, results, and decision will be kept confidential unless: (1) there is a written agreement by the parties allowing disclosure; (2) disclosure is necessary to put the decision into effect; or (3) disclosure is required by law.¹²⁰

Generally, binding arbitration clauses have been bad for farmers. Binding arbitration limits the remedies available and usually prevents farmers from raising legal claims in court. Moreover, arbitration can involve such large, mandatory filing, administration, and arbitrator fees that farmers cannot afford to pursue their legal claims. Finally, arbitrators' decisions are kept confidential and thus are not available for use in other similar cases, and it is impossible to determine how many other farmers are facing the same issues and whether they are getting the same results.¹²¹

IV. Can Farmers Save GM Seed for Planting Next Season's Crop?

A. Short Answer: "No"

The general consensus of the court decisions in the United States is that farmers who save and plant seed from a GM crop containing validly patented technology without the company's express permission to do so will be liable for potentially huge money damages for infringing the biotech company's patent.¹²² Because the GMO contracts farmers enter into almost always expressly prohibit the

saving of seed for planting the next season's crop, farmers should assume that they may not legally save seed from their GM crop.

B. Growing and Saving Seed—Legal Analysis

For countless generations, farmers have taken a portion of their harvest and saved the seed for the next year's crop.¹²³ Farmers selected the best possible seed either to plant themselves or to exchange with other farmers or breeders who developed improved varieties.¹²⁴

In 1970, Congress passed the Plant Variety Protection Act of 1970 (PVPA) which granted companies the authority to obtain plant certificates for unique varieties of sexually reproducible plants.¹²⁵ The PVPA plant certificates gave legal protection to developers of these plant varieties, but provided that farmers who grew these varieties were still allowed to save their seed for planting a later crop.¹²⁶ In 1995, the U.S. Supreme Court limited PVPA seed saving exemptions to allow farmers to save seed only for replanting on their own acreage.¹²⁷

In 1980, the U.S. Supreme Court held that companies could obtain general utility patents for genetically engineered living organisms (in that case, a bacterium).¹²⁸ This court ruling eventually led to the U.S. Patent and Trademark Office granting general utility patents for genetically engineered seeds.¹²⁹

The intersection of PVPA plant certificates and general utility patents for GM seeds eventually led to the question whether farmers could save seeds from crops grown from seed covered by a general utility patent. In 2001, the U.S. Supreme Court's ruling in *J.E.M. Ag. Supply v. Pioneer Hi-Bred International* answered that question with a resounding "No." The Court held that the company (Pioneer) had a valid general utility patent on the conventional hybrid corn seed at issue in the case. The Court also found that the protections in the PVPA allowing farmers to save seed did not apply under general utility patents.¹³⁰

This ruling was later applied to GM seed in *Monsanto v. McFarling*.¹³¹ In that case, a farmer saved and planted seeds produced from a Roundup Ready® soybean crop. Citing the U.S. Supreme Court's decision in *J.E.M. Ag. Supply*, the Federal Circuit Court held that the PVPA does not protect a farmer's right to save GM seed for planting a later crop, because the GM seeds are covered by general utility patents

under the Patent Act rather than plant certificates under the PVPA, and the Patent Act does not contain seed saving protections.¹³² This holding has been followed in numerous other cases involving farmers saving and planting GM seed on which there was a valid general utility patent.¹³³

C. Farmers Pay Huge Damages Awards in Seed Saving Cases

When farmers are found to have infringed a biotech company's patent on GM seed by saving seed and planting another crop, they are often ordered to pay tens and even hundreds of thousands of dollars in damages to the company. As discussed earlier, such money damages are likely to include a "reasonable royalty" for each bag of seed found to have been saved and replanted, attorneys' fees, and court costs, and may include "enhanced damages" if the court finds that the infringement was willful.¹³⁴ The "reasonable royalty" farmers have been required to pay has ranged from \$40 to \$55 per bag for GM soybean seed to \$556 per bag for GM cottonseed, to \$1,113 per bag for GM cottonseed that was saved and transferred to another person.¹³⁵ Monsanto is very aggressive in pursuing patent infringement lawsuits against farmers for saving and misuse of GM seed and crops containing Monsanto's patented technologies, investigating roughly 500 U.S. farmers each year.¹³⁶ Reports indicate that Monsanto is collecting more than \$85 million annually from U.S. farmers in out-of-court settlements,¹³⁷ while courts have awarded Monsanto more than \$21,500,000 in 57 recorded judgments against U.S. farmers.¹³⁸ Many, though not all, of these damage awards were based on the farmer having saved the seed.

In addition to farmers being held liable for patent infringement by saving and planting patented GM seed, seed cleaning businesses have also been held liable for *inducing* patent infringement by encouraging farmers to clean GM seed.¹³⁹

D. Dangers of Saving Seed from Fields Contaminated with GMOs

There is concern that farmers who do not intentionally plant GM seed, but whose fields contain GMOs due to genetic contamination, may be held liable for patent infringement if they save seed from those fields for future plantings. Much of this concern has resulted from the

Canadian court case discussed below. It is not yet known whether courts in the United States would order farmers who save and plant seed from fields contaminated with GMOs to pay large money damages for infringement of the biotech company's patents.¹⁴⁰ U.S. farmers need to be aware of the risk of possible liability and should seek legal advice before saving and planting seed from fields they know are contaminated with GMOs. As mentioned above, much of the concern about saving and replanting seeds from fields contaminated with GM material stems from a Canadian court case in which a Canadian canola farmer, Percy Schmeiser, was found to have infringed on Monsanto's Roundup Ready® canola patent, although the farmer never purchased Roundup Ready® canola and only planted seed that he had saved from his own fields.¹⁴¹ In the summer of 1997, while spraying Roundup® in ditches along the edge of one of his fields, the farmer noticed that some of the canola on the edge of the field had survived the spraying. He then sprayed about three acres of the field with Roundup® as a test and discovered that many of the plants survived, especially those closest to the ditch. That fall, the farmer harvested the field and stored the seed, which he planted the following year. Monsanto sued him, alleging that he had infringed on its patent by planting for harvest and selling a 1998 canola crop containing the patented Roundup Ready® gene. The farmer argued that he could not be liable for patent infringement because the Roundup Ready® genes got into his canola crop against his will, either through spilled, water-borne, or wind-blown seed or pollen drift. The trial court ruled for Monsanto and ordered the farmer to pay \$20,000 in damages—the amount of his profit from the 1998 canola crop.

The Canadian Federal Court of Appeal affirmed.¹⁴² The court found that after his 1997 field test, the farmer knew or should have known that some of the canola plants in that field contained Monsanto's patented Roundup®-resistant gene. When he saved the canola seed from that field and planted it in 1998 for harvest and sale, he infringed on Monsanto's patent. The court held that it did not matter how the genes initially got into the farmer's crop. Nor did it matter that the farmer did not take advantage of the Roundup®-resistance of his 1998 canola crop by spraying with Roundup® to control weeds.

The appeals court emphasized that its holding was tied to the unique circumstances of the case. Because of his 1997 discovery and spraying test, the farmer had reason to know that the canola he planted, harvested, and sold in 1998 was resistant to Roundup®. The court suggested that a GMO patent claim might not be successful in other cases, such as against a farmer who unknowingly harvests and saves seed containing patented genes, or a farmer who is aware of and “tolerates” plants showing GM characteristics but does not intentionally propagate the GM genes by saving and replanting the seed.

On a 5 to 4 vote, the Supreme Court of Canada affirmed the lower courts’ rulings that the farmer infringed on Monsanto’s patent, but reversed the award of damages and costs to Monsanto.¹⁴³ The Supreme Court rejected the farmer’s argument that it should recognize a general exemption from infringement liability for “innocent bystanders” who are not aware of GMO contamination of their crops, stating that the “complexities and nuances of innocent bystander protection in the context of agricultural biotechnology” should be addressed by lawmakers.¹⁴⁴ Regarding the specific case before it, the court concluded that the farmer was not a mere “innocent bystander,” because he “actively cultivated Roundup Ready[®] Canola.”¹⁴⁵ Finally, the Supreme Court rejected the argument that, under ancient common law property rights, farmers can keep that which comes onto their land, in this case the progeny of the Roundup Ready® canola that came onto the farmer’s field. The Supreme Court concluded that “the issue is not property rights, but patent protection. Ownership is no defence [sic] to a breach of the Patent Act.”¹⁴⁶ Therefore, the Supreme Court of Canada held that “the trial judge and Court of Appeal were correct in concluding that the [farmer] ‘used’ Monsanto’s patented gene and cell and hence infringed the Patent Act.”¹⁴⁷

However, the Supreme Court of Canada reversed the lower courts’ ruling that the farmer must pay damages to Monsanto for the infringement. The court noted that the Canadian Patent Act permits damages based on either the patent holder’s lost profits due to the infringement or the amount of profits gained by the infringement.¹⁴⁸ Monsanto had chosen to seek damages based on the farmer’s profits resulting from the infringement and was therefore only entitled to

recover the portion of the farmer's canola crop profits that could be attributed to Monsanto's patented technology.¹⁴⁹ Because the farmer did not receive a price premium for the crop, nor did he take advantage of the crop's Roundup®-resistance to spray weeds and gain an "agricultural advantage," the court concluded that the "profits were precisely what they would have been had [the farmer] planted and harvested ordinary canola."¹⁵⁰ Because the farmer "earned no profit from [Monsanto's] invention," Monsanto was entitled to "nothing" for its damages claim.¹⁵¹ Also, due to the "mixed result" of the case, the court ordered that each party pay its own costs, overruling the trial court's order that the farmer pay Monsanto's substantial legal costs.¹⁵²

E. State Legislation to Protect Farmers with GMO-Contaminated Crops from Patent Infringement Claims

The **Maine** Legislature recently passed a law that is intended to protect farmers whose crops or seeds have been inadvertently contaminated with GMOs from biotech companies' claims of patent infringement.¹⁵³ The law provides that if a genetically engineered product is possessed by or found on property owned by a farmer, and the amount of the product present is very small or the farmer did not intend to have it, then the farmer cannot be held liable for any damages claimed by the manufacturer of the GMO.¹⁵⁴ The law requires that any lawsuit brought by a GM seed manufacturer against a farmer who has not entered a current contract to plant the GM seed must be brought in a court in the area where the farmer resides or where the disputed crop was grown.¹⁵⁵ The Maine law also directs the state Commissioner of Agriculture, Food and Rural Resources to adopt rules to "establish best management practices to maintain the integrity of crops and minimize the potential conflict between farmers."¹⁵⁶

V. Who Will Be Held Liable for GMO Contamination — Farmers, Biotech Companies, or Both?

Farmers must be aware that one of the most significant problems with the production of GMOs is the vast potential for contamination of non-GM crops, seeds, and food products. Contamination affects farmers in two significant ways. First, crop prices may drop dramatically and entire

markets may be lost when agricultural commodities destined for export or food production markets are found to contain GMOs that have not been approved for use or which are simply not desired in those markets. Second, farmers who plant GMOs might be held liable to pay substantial money damages in cases of GMO contamination, either to neighboring farmers whose non-GM crops are contaminated by pollen drift from fields planted with GMOs, or to farmers harmed by the intermingling of the GM crops with non-GM crops during harvesting, storage, transportation, or marketing.

Biotech companies routinely disclaim any responsibility for what happens to the GMO technology once seed has been sold and is out of their control. Given past events of wide-scale GMO contamination of commodity supplies, it is conceivable that, in the future, a biotech company that is sued for damages as a result of its genetically modified product contaminating conventional commodity supplies would seek to bring into the case any farmers who planted the GM seed in order to shift some of the responsibility and cost onto those farmers.

A. Methods of Contamination

GMO contamination of a farmer's conventional crops may occur due to cross-pollination in the field; accidental mixing of GM crops or seed through planting, harvesting, hauling, or storage equipment that is not thoroughly cleaned between use on genetically modified and conventional crops; and volunteer plants growing from GM seeds that have remained dormant in a field after a previous planting.¹⁵⁷ Farmers may also experience GMO contamination by planting conventional varieties of seeds not knowing that they contain some GM material from a prior contamination. Seed companies are finding it difficult to ensure that conventional seed varieties do not contain GM material. In some cases, biotech companies have also produced and distributed seed not realizing it contained GM material.¹⁵⁸ When farmers sell, through conventional channels, commodities that they do not know have been contaminated with GMOs, the contamination can rapidly spread throughout the domestic and international storage, transportation, marketing, and food production systems.

The StarLink™ corn event, discussed below, reveals how GMO contamination of non-GM crops can occur and just how serious the results can be. Aventis attempted to create a “genetic fence” for

StarLink™ by having farmers plant a 660-foot buffer strip of non-StarLink™ corn around StarLink™ cornfields.¹⁵⁹ Corn grown in the buffer strip was also approved only for animal feed or non-food industrial purposes. The use of buffer strips was intended to limit cross-pollination to non-GM corn and also create a refuge where European corn borers and other targeted pests would not as quickly develop resistance to the Bt found in StarLink™ corn. Most farmers were reportedly unaware of the buffer strip requirement, resulting in many cases of StarLink™ corn being planted directly adjacent to a neighbor's non-StarLink™ corn, making cross-pollination of StarLink™ and non-StarLink™ corn likely.¹⁶⁰ As a result of a settlement agreement in litigation over StarLink™ contamination, any non-StarLink™ corn grown within 660 feet of a StarLink™ field was eligible for compensation from Aventis.¹⁶¹ However, StarLink™ contamination of conventional crops, presumably due to cross-pollination, occurred even outside the 660-foot buffer zone. After pressure from the Attorneys General from 17 states, Aventis agreed to provide compensation to farmers who had planted non-StarLink™ seed more than 660 feet from a StarLink™ field and still found the StarLink™ insecticidal protein Cry9C in their corn crop.¹⁶²

B. GMO Contamination of Non-GM Crops and Food Products Is on the Rise

GMO contamination of non-GM crops and food products is on the rise. The year 2006 has been reported as the worst year ever for significant GMO contamination events around the world.¹⁶³ A report based on the GM Contamination Register—an initiative of two non-governmental organizations to record the incidents of contamination by intentional or accidental release of GM crops—reported a record 24 significant contamination events in 2006.¹⁶⁴ In early 2007, the Register listed 142 cases of GMO contamination incidents and illegal releases of GM organisms that had occurred in 26 countries around the world since the first commercial production of GM crops in 1996.¹⁶⁵ Cross-pollination is indicated as a cause of contamination in many of these reported events.¹⁶⁶

C. GMO Contamination Results in Huge Losses to Farmers

Some GMO contamination events have resulted in massive economic losses for farmers due to declines in market prices when U.S. agricultural commodities are rejected by importing countries.

1. StarLink™ Corn

One of the most widely publicized GMO contamination events occurred in 2000 when Aventis CropScience's StarLink™ corn, which had been approved only for livestock consumption, was found in human food products such as taco shells. StarLink™ corn had not been approved for human consumption because of concerns about potential human allergic reactions.¹⁶⁷ As a result of the contamination, many of the U.S.'s largest food-producing companies had to halt production of food products containing corn, and there was a sharp reduction in U.S. corn exports.¹⁶⁸ Farmers, seed companies, processors, and food makers spent over one billion dollars attempting to eliminate StarLink™, yet it remained in the U.S. corn supply more than three years later.¹⁶⁹ Hundreds of lawsuits were filed, and eventually Aventis CropScience paid more than \$500 million to farmers, food processors, and handlers, including \$110 million to corn growers who did not plant StarLink™ but lost money due to the drop in the market for U.S. corn.¹⁷⁰

2. Liberty Link® Rice

In 2006, a GM variety of rice, known as "Liberty Link®" or LL601—that had only been approved for experimental field trials and not for commercial sale for human consumption—was found in much of the U.S. long-grain rice supply.¹⁷¹ The discovery was particularly shocking because the biotech company which developed Liberty Link® rice had abandoned research on the product five years earlier.¹⁷² The unapproved GM rice was found in five southern U.S. states and in 29 countries that imported long-grain rice from the United States.

Countries importing U.S. rice reacted swiftly: Japan banned the importation of U.S. rice, and the European Union imposed strict testing requirements on all rice shipments.¹⁷³ As a result, the price paid to U.S. farmers for rice plummeted.¹⁷⁴ Nearly half of the U.S.

long-grain rice supply is exported, and some experts estimate that the U.S. rice industry may have lost as much as two billion dollars in 2006 as a result of the Liberty Link® contamination and resulting restrictions imposed by export customers.¹⁷⁵

Nearly 200 lawsuits were filed as a result of this contamination event.¹⁷⁶ In May 2007, a Master Consolidated Complaint was filed in the U.S. District Court for the Eastern District of Missouri, combining many of these cases into one lawsuit.¹⁷⁷ This master case is now proceeding as a consolidated series of individual cases for rice producers in Arkansas, Louisiana, Mississippi, Missouri, and Texas, against Bayer CropScience and its related entities, seeking compensation for the property damage, market losses, and other economic and related damages caused by the contamination. Because the master case is not now proceeding as a class action lawsuit, any rice producers who suffered damages due to the LibertyLink® contamination should discuss their case with an attorney to determine whether to file an individual case. The rice producers' legal claims in the master consolidated case include many of the types of claims discussed below at Section V. E.¹⁷⁸

3. Compensation May Be Limited to Farmers Who Experience Physical Contamination of Crops

Despite the devastating impact of these industry-wide contamination events, farmers who suffer financial harm from GMO contamination because they are unable to sell their non-GM crops may face some difficulty seeking compensation for their losses. Under the “economic loss doctrine” in law, damages that result solely from lost markets or income may not be recoverable for certain types of claims.¹⁷⁹ Whether a farmer whose own crop was not directly contaminated may seek compensation for lost markets or revenues after wide-scale GMO contamination will generally depend on whether the economic loss doctrine is recognized in the law of the farmer's particular state.

For example, in 2003, a federal district court dismissed a lawsuit against Monsanto filed by non-GMO-growing farmers from Iowa and Illinois who sought damages after Monsanto's introduction of Roundup Ready® corn and soybeans led to a European Union

boycott of all U.S. corn and soybeans.¹⁸⁰ The court noted that both Illinois and Iowa law incorporate the economic loss doctrine and prohibit compensation for purely economic losses based on claims of public nuisance or negligence; therefore, without evidence of physical contamination of the farmers' crops, the farmers' claims had to be dismissed.¹⁸¹

In the StarLink™ litigation, a federal district court—applying the economic loss doctrines found in Illinois and Wisconsin law—made a clear distinction between farmers who claimed direct GMO contamination of their crops and farmers who claimed only economic harm: “To the extent [farmers] allege that their crops were themselves contaminated, either by cross-pollination in the fields or by commingling later in the distribution chain, they have adequately stated a claim for harm to property [and] may be entitled to compensation for certain economic losses.”¹⁸² On the other hand, “[a]bsent a physical injury [farmers] cannot recover for drops in market prices. Nor can they recover for any additional costs, such as testing procedures, imposed by the marketplace.”¹⁸³ Despite this ruling, non-GM corn farmers continued pursuing claims against Aventis CropScience for their market losses; and, in early 2003, they reached a settlement for \$110 million to be shared among all growers of non-Starlink™ corn for the 2000 crop year.¹⁸⁴

In recent litigation related to the Liberty Link® rice contamination event, a federal district court noted that Arkansas law does not impose the economic loss doctrine even in cases of strict liability, and concluded that the doctrine would arguably not apply in the Arkansas rice farmers' lawsuit against Bayer CropScience and their rice cooperative.¹⁸⁵

D. Farmers Who Plant GMOs May Be Liable for Contamination of Neighbors' Crops

Litigation in recent years resulting from GMO contamination of non-GM crops and food products has been against the biotech companies that produce the GM seeds. However, farmers who plant GMOs also risk liability for contamination of their neighbors' non-GM crops.

Biotech companies advise farmers planting GM seeds of the potential for GMOs to contaminate a neighbor's non-GM crops, but then place

the burden on the farmer to prevent this contamination. For example, Monsanto's Technology Use Guide (TUG) includes "General Instructions for Management of Pollen Flow and Mechanical Mixing."¹⁸⁶ These instructions recognize that certain crops—such as corn, alfalfa, and canola—cross-pollinate, allowing genetic material to migrate beyond where the GM crops are planted, and provide general guidelines that farmers are expected to follow to minimize this risk. But following these instructions does not guarantee that contamination of neighbors' fields would not occur. Monsanto's TUG acknowledges that some level of pollen movement will occur in production of its GM corn, and that it is not possible to achieve 100 percent purity of seed or grain in any corn production system.¹⁸⁷

Until "genetic fences" are developed that can prevent cross-pollination or stop the transfer of GM material during cross-pollination, disputes may arise between farmers who plant GMOs and their neighbors who do not.¹⁸⁸ Neighbors may suffer damages, for example, by being unable to market their non-GM crops as they wish if the non-GM crops test positive for GMOs that came from a neighboring farmer's field.¹⁸⁹

A farmer's general farm liability insurance may not cover claims of GMO contamination, depending on the terms and exclusions in the particular policy.¹⁹⁰

E. Legal Bases for Liability

Someone who files a lawsuit to seek damages for GMO contamination—whether against a GMO-growing farmer, seed supplier, or biotech company—will most likely base his or her claims on one or more tort theories, such as trespass to land, nuisance, negligence, or strict liability.¹⁹¹ Tort liability involves claims of harm between or among parties who do not have any pre-existing contractual relationship, or who do not have a contractual relationship that is related to the harm that occurred.

Because there are no agreed-upon contract terms to govern the resolution of a tort claim, the outcome will generally be determined by whatever state law applies to the case. Tort liability is most commonly thought of in the context of personal injuries and damage to property, but it can also involve harm to economic interests.

Not all claims of injury and harm will result in a damages award. Tort law establishes standards of care that all people are expected to meet in going about their lives. These standards vary depending on the situation, but are usually referred to as what a “reasonable person” would do. If the applicable standard of care was satisfied, a person will generally not be liable for tort damages, even if harm occurs.

1. Trespass to Land

A “trespass to land” occurs when someone intentionally enters another person’s land and causes damage.¹⁹² Entering a person’s land can take many forms, from walking across someone’s land to causing an invasion of pollen or dust particles.¹⁹³ Trespass could arise in a GMO-related context if a farmer or seed company knows that genetic traits from a GM crop could enter a neighbor’s property, and genetic drift in fact occurs, causing harm to the neighbor’s crop. The farmer and/or seed company could then be liable for any harm caused by the GM crop.¹⁹⁴

While there are no reported trespass cases involving GMOs, there are several comparable cases involving the aerial application of pesticides.¹⁹⁵ As one commentator has noted in describing cases dealing with airborne particulates that are similar to pollen, “the courts stressed that they had to look at the character and instrumentality that was used in making an intrusion on another’s land—rather than its size.”¹⁹⁶ Therefore, if damage could be proven as a result of the intentional invasion of a GMO onto another person’s land through pollen or other means, a trespass to land claim could exist.¹⁹⁷

2. Nuisance

Private nuisance occurs when someone interferes with another person’s use and enjoyment of his or her property.¹⁹⁸ The interference is generally an act that results in obnoxious noise, sights, or smells coming from the defendant’s property and sensed from the other person’s land. For example, in *Jost v. Dairyland Power Cooperative*, the Wisconsin Supreme Court held that a nuisance existed when a coal power plant emitted sulfur-dioxide gases that caused damages to farmland, because the “value of crops raised had diminished in value and . . . certain types of vegetation were dying out or had died out completely.”¹⁹⁹

However, the interfering act does not need to cause property damage; it just has to affect a person's ability to use and enjoy his or her property.

GMO contamination could affect what crops a farmer can grow, thereby interfering with the farmer's ability to use his or her property.²⁰⁰ The district court in one of the StarLink™ cases refused to dismiss a private nuisance claim, holding that drifting pollen from GM crops could constitute an invasion of land, and that having one's crops contaminated was an interference with the enjoyment of land.²⁰¹ This type of claim could also include an actual loss of value in farmland.²⁰² If a loss of market or farmland damages could be linked to GMO contamination, a claim for the tort of private nuisance could exist.²⁰³

Public nuisance claims may also arise in GMO contamination cases.²⁰⁴ A public nuisance is an unreasonable interference with a right the public holds in common.²⁰⁵ However, to win a public nuisance claim, a farmer who is harmed by GM contamination would have to show that his or her harm was different from the type of harm the general public experienced. In a StarLink™ case, the district court refused to dismiss corn farmers' claim of public nuisance against Aventis CropScience, holding that the farmers might be able to show harm different from the general public's harm because the farmers "depend on the integrity of the corn supply for their livelihood."²⁰⁶ A public nuisance claim due to GMO contamination would more likely be brought against a biotech company than an individual farmer, because the claim is likely to be based on contamination of the food supply rather than just one farmer's crops.

3. Negligence

Negligence means that a person has failed to act reasonably for the given circumstances, and this failure resulted in harm to another.²⁰⁷ To make a successful negligence claim, a person who suffers harm must usually prove: (1) the existence of a duty on the part of the defendant to exercise care or protect the plaintiff from injury; (2) failure of defendant to perform that duty; and (3) injury to the plaintiff resulting from such failure.²⁰⁸

To prove that GMO contamination was the result of negligence, an injured person would need to prove that the biotech company, seed supplier, or GMO-growing farmer had a duty to prevent GMO contamination and that there was a reasonably foreseeable likelihood of injury. Commentators have provided the following example of how negligence may be determined: “[W]hether a grower was negligent may depend on the position of the crop as compared to the position of adjoining fields, and the specific hazards of planting genetically modified crops next to certain other crops.”²⁰⁹

Given the potential for certain GM crops to contaminate neighboring fields, a court could find that farmers have a duty to prevent this injury to their neighbors.²¹⁰ If a duty were established, a neighbor would then have to show that this duty was breached by the farmer growing GM crops, and that the breach of duty caused damages to the neighbor.²¹¹ Failure to select seed properly, adhere to specified buffer zones, or follow growing and harvesting procedures could constitute a breach of a farmer’s duty to prevent contamination of a neighbor’s crops.²¹² If one of these failures is linked to a neighbor’s losses, the farmer or seed company that caused the GMO contamination could be liable for negligence.

4. Strict Liability

Another potential tort claim related to GMO contamination is strict liability.²¹³ Strict liability arises when someone engages in an abnormally dangerous activity; in such cases, a person harmed by the abnormally dangerous activity can recover damages from the person who engaged in the activity, without having to prove that the person who did the activity was reckless or negligent.²¹⁴ Courts have found abnormally dangerous activities to include housing wild animals,²¹⁵ storing and using explosives,²¹⁶ or spraying pesticides.²¹⁷ Some legal scholars argue that if a farmer or seed company knows that a GM crop is difficult to control, and that it will likely cross-pollinate with crops in adjacent fields, the farmer and/or seed company should be held strictly liable for any resulting damages.²¹⁸

Courts faced with GMO contamination claims based on strict liability may compare them to past pesticide drift cases. In an often-cited 1977 Washington State Supreme Court case, *Langan v. Valicopters*, the court held that an aerial spray company, which allowed pesticides to drift onto an organic farm, was strictly liable for damages because the organic farm faced losing its ability to market organic crops, and the farmer would be unable to sell crops on the regular commercial market due to failure to enter into a contract before the growing season began.²¹⁹ The holding in *Langan* could be used to argue that seed companies who develop and farmers who raise GM crops that genetically “pollute” a crop are strictly liable for damages to neighboring crops.²²⁰ Such damages could include costs related to: violating identity-preserved crop contracts because the crops no longer meet the required specifications; loss of organic certification with resulting loss of ability to meet contract obligations or to market crops at higher premiums; or even litigation expenses when neighboring farmers are sued by biotech companies for “stealing” GMO technology that was in actuality blown onto their fields. If a court determines that GMOs are “abnormally dangerous,” a neighbor affected by GMO contamination could have a claim of strict liability.

This section described several possible legal theories under which claims for money damages due to GMO contamination may be brought against biotech companies, seed suppliers, and farmers planting GMOs. However, few court decisions have addressed these legal theories as they apply to GMO contamination. As a result, there is yet no case law clearly defining who will be held liable for damages caused by GMO contamination. Some organizations and policymakers continue to seek passage of laws that would clarify issues of liability for GMO contamination.

VI. What to Do When a Biotech Company Wants to Take Field Samples

If you are a farmer who is unfortunate enough to have a biotech company or its agent ask to enter your property to conduct field tests or take crop samples, there are several things that you should do to reduce your

exposure to legal claims that might follow from such testing and sampling.

A. Evidence from Field Testing May Result in Legal Action

There are two main reasons why a biotech company may want to conduct field tests and take crop samples on your farm. Both of these reasons present potentially significant legal risks.

First, if you have planted GM crops containing Bt, the company may be monitoring your fields to determine if you have complied with your obligation to plant and maintain insect refuges intended to help prevent the development of insect resistance to Bt. The U.S. Environmental Protection Agency (EPA) requires the companies to monitor farmers' compliance with insect refuge requirements.²²¹ If the field testing produces evidence that you have not properly maintained insect refuges, the company may use this evidence to claim that you have violated your contract and to seek money damages or other relief for that violation.

Second, the company may be investigating whether you have infringed on its GM seed patent by saving and planting seed from a previous GM crop or otherwise having patented GM plants in your field without the company's permission. If field testing and crop sampling produce evidence that supports a claim of patent infringement, the company will likely try to get you to pay it a lot of money either through an out-of-court settlement or through a court order. Courts have ordered farmers to pay Monsanto hundreds of thousands of dollars in damages and attorneys' fees and costs in patent infringement lawsuits even when it was not proven that the farmer signed a Technology Agreement for that year.²²²

B. Steps to Take When Asked to Allow Field Tests

There are several things you should do to reduce your exposure to potential legal claims that may result from a biotech company's field testing or crop sampling.

1. Consider Whether to Grant Permission to Conduct Field Tests

Whether or not you signed a GMO contract or Technology Agreement with a biotech company, you may not need to

immediately grant permission to allow field testing or crop sampling.

a. If You Did Not Sign a GMO Contract

If you did not sign a contract with the company regarding GM seed and there is no order from a court permitting the company to enter your property, you most likely are not required to grant the company permission to enter your fields to do testing or take samples. You should not immediately grant permission to enter your fields. Tell the person seeking entry that you do not give permission. In addition, send a follow-up letter to that person and to the biotech company: (1) telling them that you do not give permission to enter your land to conduct field tests or to take crop samples; and (2) asking that any future requests to do so be sent to you in writing and include the reason the company thinks you are required to allow them onto your land. Entry onto your land to conduct field tests, after a person has been notified that they do not have permission to do so, may be considered an unlawful trespass in many states.²²³

b. If You Did Sign a GMO Contract

If you signed a GMO contract or Technology Agreement with the biotech company that wants to conduct field tests or take crop samples, you may have agreed to allow the company access to your land for certain purposes.

However, if you do not know whether you signed a contract, you should not simply accept the representative's word that you did. Request a copy of the contract that the company claims you signed and ask them to identify the specific contract provision the company thinks justifies their request for field testing.

Monsanto's Technology Use Guide (TUG), which is made part of the Technology Agreement farmers sign, makes clear that Monsanto or its agents will monitor insect refuge practices on farms as required by EPA.²²⁴ The TUG requires that, upon the company's request, the farmer must identify the location of all fields planted to Bt crops and all associated refuge areas and

must cooperate fully with any field inspections.²²⁵ If you signed such an agreement, it will be hard to argue that Monsanto does not have the right to enter your land to do field inspections and monitoring. However, because this agreement is for monitoring of insect refuge requirements, it may be possible to argue that the company only has the right to conduct field inspections for that purpose.

Through the TUG, Monsanto promises that it will arrange with the farmer in advance to do any insect refuge management field inspection and to conduct it at a reasonable time.²²⁶ You should insist that all field test arrangements be made with you in advance so that you can be present and participate in those tests. If the company's agent arrives at your farm and attempts to do an immediate field test, you should tell the agent that you are denying access to your land until a reasonable time for field testing can be arranged in advance. You should also send letters to the agent and the company confirming this denial of access to your land and requesting that any future requests: (1) be sent to you in writing, and (2) identify the provision of the contract that justifies the company's request to do testing. You should also try to get the company to agree to a protocol for conducting those tests and making the crop samples and data gained from them available to you. See below for some recommendations for field test protocols.

2. Consult with an Attorney

Because evidence found through testing and sampling may result in serious and costly legal claims, you should consult with an attorney before allowing a company's representative to conduct field tests or take crop samples. You also should not do any of the following without first consulting with an attorney: (1) give the company any records, receipts, or other documents; (2) admit to anything to the company's representatives, investigators, or lawyers; (3) sign any agreements or release-of-records forms; or (4) pay any fines or settlements to the company.

An attorney can provide advice on whether you have any contractual obligation to release records or allow field inspections.

For example, Monsanto's 2009 Technology Agreement states that the farmer agrees to allow the company to inspect records and receipts relevant to the farmer's performance under the agreement, and, upon request, to authorize the company to obtain certain of the farmer's records from U.S. Department of Agriculture (USDA) and seed and chemical suppliers.²²⁷

An attorney can also help you assess the potential legal risks of allowing field testing and crop sampling and decide whether or not to give permission for the company to conduct such tests. Though in many cases there may be serious legal risks from allowing field testing, in some cases it may be helpful to provide the company with some limited information.

You should also be aware that, in certain circumstances, the biotech company may be able to get a court order allowing it to come onto your land to conduct field tests even if you have refused permission. Some courts may grant a biotech company such an order if the court is convinced your fields may contain evidence that the company's patented GM material is present without the company having given you permission to plant GM seed that year. For example, **North Dakota** and **South Dakota** laws allow those who hold patents on GMOs to seek a protection order in state court if they believe the crop they want to sample may be subject to intentional damage or destruction.²²⁸ Presumably, such protection orders may include a court's directive that field tests and crop samples be taken in order to prevent the potential destruction of evidence. Under the laws in North Dakota and South Dakota, these protection orders may not interrupt or interfere with normal farming practices, including harvest and tillage.²²⁹ An attorney can help you assess how these factors may affect your situation.

If you ultimately decide to allow the biotech company's agent to conduct field tests or take crop samples, you or your attorney should get an agreement from the biotech company that the field tests and crop sampling will be conducted in a manner acceptable to you. It will be important for you to witness the field tests, obtain your own samples, and have access to the results of any tests and analyses. See below for suggestions for a field testing and crop sampling protocol.

C. Document All Dealings with Company Representatives

As soon as you receive a request for field testing or crop sampling, you should begin documenting all conversations, meetings, and any other dealings with the biotech company and its representatives. Keep a notebook in which you record the date, time, location, person involved, and what was said in each conversation with a company representative. Keep copies of any letters or documents you receive from the company representative, or items that are in any way related to the field testing or crop sampling issue. Also keep copies of any letters you write to the company or other individuals involved and any documents you share with them.

D. Protocol for Field Testing and Crop Sampling

Farmers should always attempt to ensure that field inspections and tests by any biotech company are conducted in a manner that will protect the farmer's interests. Some states have attempted to provide protections for farmers in this regard.

1. Suggested Steps for Field Testing and Crop Sampling

Whenever a biotech company or its agent will be conducting field tests or taking crop samples from your fields, you should insist that: (1) you receive prior written notice of the date, time, and purpose of the field tests and crop sampling; (2) you and/or your representative will be present for any tests or sampling; (3) separate matching or split samples from the same fields will be taken by someone independent of the biotech company; and (4) a copy of all test results and/or analyses will be sent to you.

If the biotech company believes that you may have saved seed from a GM crop and used it to plant a later crop, the method used to inspect the field and take crop samples will become very important, as well as any calculations used to determine the amount of seed needed to plant the total acreage on which the crop is grown. To ensure the methods used are appropriate, you may want to find a person with experience in field testing and crop sampling to accompany you when the biotech company representative conducts the tests. This person may also be able to help assess whether any calculations by the company to justify a claim of patent infringement are accurate. County Extension

agents, the state Department of Agriculture, or university or college agriculture departments may be helpful in identifying someone with the necessary experience who can assist you.

If a biotech company claims that the results of a field test have revealed that you violated its patent rights or breached its contract with you, those results should be compared to your own independent testing results and, if possible, retested. If you have not already obtained legal counsel, you should do so as soon as a biotech company suggests that it believes you have either infringed on its GMO patent or breached your contract to grow GMOs. An attorney who is experienced in agriculture, litigation, and patent law would be preferable, though often the choice comes down to what attorney is available and affordable.

You should also preserve all records and seed bags that show what seed and chemicals you purchased, that document your plantings, and that detail your crop yields. These records may show that you purchased sufficient seed to plant all of your crop acres, and may be the evidence you need in court to prove that you did not infringe on the company's patent.

2. State Laws on Field Testing and Sampling

Indiana, North Dakota, and South Dakota all have laws that address field testing and sampling by seed companies.

The **Indiana** law applies to farmers who have signed technology agreements to plant GM crops. Under the law, seed companies, including those producing or supplying GM seed, either must provide a farmer with at least five days' advance notice of the date, time, and purpose for entering the farmer's land to conduct field tests, or must obtain a court order to enter the farmer's land to prevent destruction of the crop intended to be sampled.²³⁰ The notice must also be sent to the state seed commissioner.²³¹ The company must allow the farmer, the state seed commissioner, or their agents to take matching samples or receive split samples of any field samples taken by the company.²³² If these requirements are not satisfied, the farmer may sue the company for damages caused by the violation.²³³ A seed company must also notify the Indiana Agriculture Director of any lawsuit filed against a farmer related to a technology agreement.²³⁴

North Dakota and **South Dakota** have laws that require a biotech company to provide written notice of its intent to take crop samples from a farmer's land to determine whether patent infringement has taken place. The company must obtain either written permission from the farmer or a court order to enter the land for that purpose.²³⁵ These laws also allow the farmer and, upon request, a representative of the state agriculture department to be present and take crop samples.²³⁶ **North Dakota's** law also sets out specific requirements for how the state seed commissioner is to retain crop samples and requires independent laboratory testing and distribution of results.²³⁷

VII. How Farmers Can Minimize Their Risk of GMO Contamination

The widespread use of GMOs has caused many farmers to reassess their production practices.²³⁸ Increasingly, farmers who save or purchase seeds for conventional crops for which there is also a GMO variety need to take extra precautions. Whether farmers grow GMOs, conventional non-GMOs, or organic crops, they need to implement management practices that will maximize their protection from GMO contamination.²³⁹ While there is no guaranteed method to ensure that no GMO contamination will occur, farmers can minimize their risk by following the types of practices required in contracts for identity preserved crops, and by exercising great care when purchasing seed and in the field.²⁴⁰

A. Identity Preserved Crop Contracts

One way for farmers to protect themselves from GMO contamination and earn a premium for their crops is to enter into and follow the guidelines of an identity preserved crop contract. The increased use of GMOs and market demand, especially outside of the U.S., for verifiable non-GM commodities has led some companies to contract with farmers to produce crops that are identity preserved as non-GMO (though not necessarily certified organic under the National Organic Program.).

Farmers who want to market their crops as identity preserved non-GMOs will need to meet detailed requirements for the particular market or purchaser they intend to sell to. The types of requirements farmers will be expected to meet may include the following.²⁴¹

- **Seed selection and handling practices.** Purchase verified non-GM seed; retain non-GM seed bag labels or tags; plant and transport seed in equipment cleaned to ensure no GMO contamination; and clean all seed loading and storage equipment and facilities to prevent contamination by other seed.
- **Planting practices.** Clean according to specifications all equipment to be used for planting, including drills, planters, bulk seed handling trucks, augers, and seed treating equipment; practice crop rotation that ensures a specified period between planting non-GM seeds and GM seeds in the same field; and maintain required buffer strips or isolation distances between a non-GM crop field and a field planted with GM seeds.
- **Field inspections.** Permit field inspections to ensure that the crop meets specified non-GMO requirements and limitations on appearance of other varieties.
- **Harvesting and storage practices.** Clean according to specifications all equipment to be used in harvesting, handling, and storage of the crop, including combines, trucks, tarps, augers, conveyors, and storage bins, to prevent contamination; and submit a clean truck affidavit for the transported crop.
- **Recordkeeping.** Maintain records as specified for the identity preservation program.
- **Testing and sampling.** Subject the crop to specified testing to verify non-GMO purity; and maintain crop samples from shipments.

Identity preserved non-GMO contracts are one method of allocating risk and, if followed correctly, minimizing the risk of GMO contamination.²⁴² Farmers should be aware that there is some economic risk in growing identity preserved crops. If a farmer is, in the end, unable to fulfill the non-GMO requirements in an identity preservation contract, the farmer will lose the price premium associated with selling an identity preserved non-GM crop, but will still bear the added production costs associated with identity

preserved production.²⁴³ It would not matter whether the failure to meet the identity preservation standards was due to factors under the farmer's control; the only consideration would be whether the contract standards are met.

Farmers who are considering producing and marketing non-GM crops may want to consult the *Non-GMO Sourcebook*, which is updated annually to list companies that supply non-GM seed, purchase non-GM crops, conduct seed and crop tests for GMOs, and produce GMO-free food and feed products.²⁴⁴ In addition, a list of companies offering non-GMO and organic grain production contracts is published each year in the *Organic and Non-GMO Report* monthly newsletter.²⁴⁵

B. Production Methods to Reduce Risk of GMO Contamination

Farmers do not need to enter into identity preserved contracts to limit their risk of GMO contamination. The primary means of limiting contamination, especially for organic farmers, is to ensure all possible measures are implemented to keep one's crops GMO-free.²⁴⁶

1. Seed Selection

Protecting against GMO contamination starts with careful seed selection. Farmers are advised not to assume that there has been no GMO contamination of conventional seeds that they purchase. A 2004 report published by the Union of Concerned Scientists concluded that "[s]eeds of traditional varieties of corn, soybeans, and canola are pervasively contaminated with low levels of DNA sequences derived from transgenic varieties."²⁴⁷

Farmers should seek reassurances from their seed supplier and/or seed producers that GMO contamination has not occurred. One approach is to purchase seeds with a certification that: (1) they come from GMO-free areas that have ample isolation distances between non-GM and GM crops, and (2) they were segregated during processing.²⁴⁸

In part to ensure availability of GMO-free seed, **Vermont** recently enacted a law that requires labeling of seed that contains GMOs.²⁴⁹ This law requires that manufacturers and processors of seeds that contain genetically engineered materials must label them,

specifying the identity and relevant traits and characteristics of the seed; describing requirements for safe handling, storage, transport and use; and describing how to obtain more information about the seed.²⁵⁰

2. Planting Location

The next step is to ensure that GMO-free crops are not planted near GM crops.²⁵¹ If neighboring crops contain GMOs, then wind or insects may bring GMO pollen into the non-GMO field and contaminate the crop intended to be GMO-free. What distance is sufficient between non-GM and GM crops varies by crop, and there is debate among scientists how much distance is enough to avoid pollen drift. For some crops, such as soybeans, the distance needed is not great because soybeans largely self-pollinate (though bees may carry and cross-pollinate GMO traits to non-GM soybeans); for other crops, such as corn, canola, and alfalfa, the necessary distances are greater, especially in windy areas where pollen could travel great distances.

Farmers who are planting in newly purchased or rented land should also attempt to determine whether seed from a GM crop planted in a previous crop year may still be in the field.

3. Equipment Cleaning

After seed and field conditions are taken into account, the next risk area for GMO contamination is equipment. Sharing of planters, combines, trucks, and other equipment among farms that grow GMOs and GMO-free farms risks contamination because the equipment may not always be completely cleaned between uses.²⁵² To avoid GMO contamination, if possible, farmers should not use their GMO-growing neighbors' equipment.

Besides the risk of contamination at planting or harvest through inadequate cleaning, the mixing of GM and non-GM crops in storage and transport may cause contamination. One important lesson from the StarLink™ incident was that, even if farmers maintain proper buffer zones and other barriers between GM and non-GM crops, contamination might still occur throughout the grain handling system, including transportation systems.²⁵³

4. Testing

Through each of the steps in crop production, farmers can attempt to protect themselves by testing for the presence of GMOs. Testing does not eliminate risk, but does put farmers on notice that their crops may contain GMOs and can help them contain any contamination that does occur. GMO tests may be costly, though testing companies will offer a variety of services and prices from strip tests that can be done on loads of grain to full laboratory analysis.²⁵⁴ Farmers may have to pay for these testing services in order to assure customers that their crops are GMO-free. Without testing farmers risk losing access to the market for GMO-free crops and any price premiums that may be offered in that specialty market.

The Iowa Grain Quality Initiative at the Iowa State University Extension Service has compiled a directory of companies from across the U.S. that conduct GMO testing of grain crops.²⁵⁵ *The Non-GMO Sourcebook*, discussed earlier, also includes contact information for companies that conduct testing for GMOs.²⁵⁶

C. Provide Assurances Only for Factors in the Farmer's Control

All farmers should be careful when making crop sales to only make representations about actions that were actually in the farmer's control.²⁵⁷ This might include the fact that the seed planted was represented by the seed company and supplier as being non-GM seed and that care was taken to avoid contamination from GM crops. As discussed above, these precautions may include careful cleaning of equipment and storage bins, and testing of seed and crops for GMOs.

Farmers should avoid promising that a crop contains only non-GM material or promising that a crop was not genetically contaminated from a neighbor's crop or during harvest and storage.²⁵⁸ Before making any decisions regarding non-GMO warranties, farmers should consult with an attorney.

VIII. Organic Farmers Must Address GMO Issues

Organic farmers face particular problems related to GMOs. They risk losing organic certification if they plant GMOs. In addition, they risk

losing the anticipated premium prices for their products if GM material is found in their crops or livestock feed.²⁵⁹ The significance of this threat is highlighted by a 2004 report of the Organic Farming Research Foundation, which found that at least 17 percent of organic farmers surveyed had their seed or other inputs tested for GMOs and, of those farmers tested, 11 percent came back with positive results for GMOs.²⁶⁰

The USDA National Organic Program requires that, in general, farmers who want to obtain or maintain organic certification may not use GMOs.²⁶¹ The regulations prohibiting the use of genetic modification in organic farming and handling are relatively straightforward. But it can be challenging to apply these regulations to issues of GMO drift and other unintended applications of GMOs. For a more detailed discussion of these issues, see *If Your Farm Is Organic, Must It Be GMO-Free?: Organic Farmers, Genetically Modified Organisms, and the Law*, available from FLAG.²⁶² This section gives a brief summary of some key points from that article.

A. No “Use” of Genetic Modification

In order to be sold or labeled as “organic,” food and other agricultural products must have been produced and handled without the use of “excluded methods,” including genetic modification.²⁶³ However, according to USDA, the mere detection of GMO residue would not necessarily cause farmers to lose their organic certification, but could trigger an investigation by the organic certifier.²⁶⁴

B. Three-Year Transition Period

Any field or farm parcel from which organic crops are intended to be sold must not have had any prohibited substances, including GM seeds and other GM crop inputs, applied to it for at least three years immediately preceding harvest of the crop.²⁶⁵

C. Must Take Steps to Prevent Unintended Application of GMOs

Organic land must have boundaries and buffer zones to prevent the unintended application of a prohibited substance to the crop or contact with a prohibited substance applied to adjoining land.²⁶⁶ The farmer’s organic system plan should document the steps taken by the farmer to minimize the risk of contamination.²⁶⁷

D. Use Caution Before Agreeing to Provide “GMO Free” Crops

Some buyers may ask organic farmers to meet criteria beyond organic certification. For example, a buyer may wish to advertise that its goods are “GMO Free.” Terms such as “GMO Free” may be used in addition to the organic label, as long as the terms are truthful and are not used as a replacement for the term “organic.”²⁶⁸ Organic farmers should give careful thought to their ability to meet the additional criteria sought by the buyer before entering into any agreement to do so.

IX. The GMO Cost and Yield Benefit Myth

As GM crops have become more prevalent, there have been many new studies showing how their use affects farmers’ input costs and yields. Many of the studies provide evidence challenging the general perception that GM crops lower farmers’ costs in combating weeds and increase crop yields.

A. Weed Control Costs Are Increasing Due to GM Crops

A general perception about GM crops is that they decrease farmers’ use of pesticides.²⁶⁹ Herbicide-tolerant GM crops are often thought to reduce farmer’s use of pesticides and lower farmers’ input costs because spraying once or twice kills all the weeds while leaving the GM plant unharmed, as compared to the need to use additional tillage practices and/or multiple sprayings to control weeds and avoid impacts on a conventional crop. It is also widely assumed that GMO technology that directly incorporates a pesticide into the plant, such as Bt corn, reduces farmers’ pesticide applications because the plant itself generates the desired pesticide.

Recent research shows, however, that the perception that GM crops reduce the use of pesticides is unfounded. Instead, the evidence shows that GM crops have led to a substantial increase in pesticide use. A leading agricultural scientist conducted an exhaustive analysis of USDA data on pesticide use from 1996–2004 and concluded that “GE [genetically engineered] corn, soybeans and cotton led to a 122 million pound increase in pesticide use since 1996.”²⁷⁰ A small decrease in insecticide use over that period due to insect-resistant Bt

corn and cotton was far surpassed by the substantial increase in herbicide use on herbicide-tolerant crops, resulting in an overall rise of 4.1 percent in pesticide use on acres planted to GM crops.²⁷¹ This study also concluded that “the difference in total pounds of herbicide applied to [herbicide-tolerant crops] compared to conventional varieties increased steadily since 2000.”²⁷² The primary factor causing farmers to apply more herbicide per acre to achieve the same level of weed control is a reliance on a single herbicide, glyphosate, as the primary method of managing weeds.²⁷³

Much of the increase in pesticide use is due to the dramatic rise in application of glyphosate on Monsanto’s Roundup Ready® GM crops. This, in turn, is a primary contributor to the rapid increase in the development of glyphosate-resistant weeds.²⁷⁴ The recently published *Guide to Genetically Modified Alfalfa* summarizes some of the most recent accounts of the devastating impact and rising costs faced by farmers battling glyphosate-resistant weeds. The following examples of the financial impact of glyphosate resistance are drawn from that report.²⁷⁵

Farmers are often forced to double their chemical costs to control resistant weeds.

The rapid adoption of Roundup Ready[®] crops has been associated with a 50 to 200 percent increase in the suggested rates of glyphosate use.

In 2005, glyphosate-resistant horseweed . . . may have cost Arkansas farmers as much as \$500 million in inputs.

One Arkansas producer with a severe infestation of glyphosate-resistant horseweed saw his yields reduced by more than 50 percent, and lost more than \$35,000 in input costs.

Tennessee lost 50 percent of its no-till acreage in one year due to glyphosate-resistant horseweed infestations.

Since 2005, scientists in Georgia, Missouri, South Carolina, and North Carolina have all reported high levels of [pigweed] resistance to glyphosate (8 to 12 times the suggested rate). . . . On average, resistant

pigweed costs cotton producers an extra \$40 or more per acre.

The list of glyphosate-resistant weeds is getting longer every year, especially in the U.S. Of the 58 new glyphosate-resistant weeds that were identified around the world between 2001 and 2007, 31 were identified in the United States.²⁷⁶

As these reports indicate, to combat herbicide-resistant weeds, farmers are having to increase and diversify their herbicide use, thereby increasing their input costs. In its 2009 Technical Use Guide (TUG), Monsanto acknowledges the increased weed management needs for Roundup Ready® crops by recommending the use of tillage and application of preemergence herbicide in addition to Roundup®.²⁷⁷ Whether this trend will continue is difficult to assess, but increased herbicide resistance in weeds²⁷⁸ and the potential for new pests—such as aphids in soybeans²⁷⁹—to develop seem to suggest that farmers will face more, rather than less, overall pesticide use on GM crops.

B. Purported GM Crop Yield Increases Are Not Realized

Biotech companies also often tout increased yields from GM crops as another benefit to farmers. Recent evidence also calls this claim into question.

A recent report discussing evidence of yields for GM crops observed:

Significantly, overall soybean yields went flat in the years following the introduction of GM soy[] in the mid 1990s, while stagnation in cotton yields persisted well into the period of massive GM cotton adoption. Only [corn], shows a persistent trend of yield increase into the biotech era, but even here the rate of increase is no greater after than before biotech varieties were introduced.²⁸⁰

While this observation relates, in part, to combined yields in the U.S. for GM and non-GM varieties, the report also cites important evidence directly comparing yields of GM varieties to conventional varieties. Summarizing some of the important study findings related to GM soybeans, which seem to have experienced the most significant yield drag problems of the GM crops, the report states:²⁸¹

A carefully controlled study by University of Nebraska agronomists found that [Roundup Ready® soy] varieties yielded 6% less than their closest conventional relatives, and 11% less than high-yielding conventional lines.

USDA data show that conventional soybeans planted in Brazil outperformed Roundup Ready[®] varieties grown in the US, while a 2004 study found that conventional soy in Brazil yielded 13% more than Roundup Ready[®] soy grown in Argentina.

A 2007 study by [a] Kansas State University agronomist . . . suggests that Roundup Ready[®] soy[] continues to suffer from yield drag: “[Glyphosate-resistant] soybean yield may still lag behind that of conventional soybeans, as many farmers have noticed that yields are not as high as expected, even under optimal conditions.”

Some scientists believe that . . . nutrient-robbing effects [of glyphosate presence] may account for the 5–10% yield drag of [Roundup Ready® soy].

This report also summarizes data related to GM cotton yields and the effectiveness of Bt technology on controlling various pests, and concludes:

[C]otton yields in the U.S. stagnated precisely during those seven years when Bt cotton (the great majority stacked with HT [herbicide-tolerance]) became prevalent, suggesting no positive yield impact.²⁸²

As for GM corn, Monsanto’s 2009 Technology Agreement acknowledges some limitations on the effectiveness of some of its Bt corn varieties: “A small number of these hybrids [YieldGard Rootworm® and YieldGard® Plus corn] may infrequently demonstrate variable levels of performance in fields and not meet grower expectations.”²⁸³ This may be a recognition of what at least one study in the U.S. has demonstrated: “Bt corn yields anywhere from 12% less to the same as . . . [highly similar] conventional varieties.”²⁸⁴

Given all of these reports, farmers should seriously consider whether GM crops can realistically be expected to increase their yields.

C. Control of Seed Supply by a Few Companies May Impact Price and Choice

Control of the seed market is rapidly concentrating into the hands of a few multinational companies, with four agrichemical companies that are involved in producing genetically engineered seed—Monsanto, DuPont Pioneer, Syngenta, and Bayer—now selling 41 percent of the world’s seeds.²⁸⁵ Monsanto is the world’s number one seed firm, and its GM traits are found in an estimated 86 percent of the world’s biotech crops.²⁸⁶

With this growing concentration in the seed markets has come a dramatic rise in average seed prices since the advent of the biotech era in the mid-1990s. Farmers’ average per-acre seed costs rose 4.7-fold for corn, 4.1-fold for soy, and more than ten-fold for cotton from 1975 to 2000, with the bulk of the increase occurring since the mid-1990s and “attributable to the much higher cost of GM vs. conventional seeds.”²⁸⁷ For example, GM cotton seed reportedly costs two to four times as much as conventional seed.²⁸⁸ At least one analyst has predicted that if a proposed multi-stacked corn variety containing eight GM traits is introduced, it may cost more than twice as much as the average seed cost per acre in 2006.²⁸⁹

Biotech companies that control much of the seed supply are also phasing out more affordable seed varieties in favor of those containing GM traits. For example, between 2003 and 2006, the number of less-expensive conventional cotton seed varieties offered in the U.S. dropped by more than half.²⁹⁰ Farmers have also reported that conventional corn and soybean seeds are becoming more difficult to find.²⁹¹

Farmers considering planting GMOs should seriously consider these impacts on the rising cost of seed and reductions in seed choice.

X. GM Pharmaceutical and Industrial Crops

Most GM crops currently on the market are those used in food or feed products. Generally these crops have been modified to repel pests or withstand application of chemical pesticides. Biotech companies,

however, are currently developing another line of GM crops, often referred to as pharma/industrial crops.²⁹² That is, plants are being genetically modified to produce medicines and other pharmaceuticals for use in therapeutic drugs for humans or livestock, while other plants are being genetically modified to produce materials for research and industry, such as cell culture media.

The use of food and feed crops to produce pharmaceutical or industrial compounds is highly controversial, as is the open-air field testing and production of these GM crops.²⁹³ There is grave concern that the federal regulatory scheme is not adequate to ensure that pharmaceutical or industrial compounds in these plants will not contaminate the food and feed supplies, and concern that there may be serious human health and environmental effects from their production. Because GM pharma/industrial crops are not intended for consumption by the general public, unintended consumption through contamination of conventional food crops may cause severe health impacts. Already, there have been three reports of pharmaceutical crops contaminating conventional food and feed crops, necessitating destruction of the contaminated conventional crops.²⁹⁴

Economic studies have also called into question the biotech industry's often-asserted claims that farmers and their rural communities will reap huge economic benefits from growing GM pharma/industrial crops.²⁹⁵ Several factors that may limit any economic benefits for farmers from growing GM pharma/industrial crops have been identified. These include: (1) farmers will be unable to negotiate contracts with the companies from a position of strength; (2) contracts to grow GM pharma/industrial crops will likely require significant farmer investment in such things as land and equipment that will be dedicated exclusively to that crop's production and in specialized training for production and management; (3) foreign competition for GM pharma/industrial crop production will drive farmer compensation down; (4) because of relatively small production levels, only a few farmers may benefit, possibly the largest and wealthiest; (5) farmers would face costs to return to conventional crop production if contamination or other events cause a shutdown of the GM pharma/industrial crop production; and (6) farmers, particularly organic farmers, who do not grow GM pharma/industrial crops may incur additional costs for testing and other protective measures if it becomes

necessary to certify that their crops are free of GM materials from pharma/industrial crops.

XI. State and Local Laws Related to GMOs

In response to concerns about the safety of GM crops in food products, their potential impacts on the environment, and the aggressiveness of the biotech companies' investigations and enforcement actions against farmers for patent infringement, some states and local governments have enacted laws providing some limited protections for consumers, farmers, and the environment.

This section highlights a few of these state laws as examples of the kinds of measures that have been adopted. For full state-by-state coverage of state and local statutes and regulations regarding GMOs, an excellent resource is a report, "A New View of U.S. Agriculture," published by the Center for Food Safety and available online at www.centerforfoodsafety.org/pubs/US_Ag_Report.pdf.²⁹⁶

A. Liability Protection for Farmers Whose Crops or Seeds Are Contaminated with GMOs

In April 2008, a new law was enacted in **Maine** that is intended to protect farmers whose crops or seeds have been contaminated with GMOs.²⁹⁷ The law provides that if a genetically engineered product is possessed by or found on property owned by a farmer, but the amount present is very small or the farmer did not intend to have it, then the farmer cannot be held liable for any damages claimed by the manufacturer of the GMO.²⁹⁸ The law requires that any lawsuit brought by a GM seed manufacturer against a farmer who has not entered a current contract to plant the GM seed must be brought in a court in the area where the farmer resides or where the disputed crop was grown.²⁹⁹ The Maine law also directs the state Commissioner of Agriculture, Food and Rural Resources to adopt rules to "establish best management practices to maintain the integrity of crops and minimize the potential conflict between farmers."³⁰⁰

B. Field Sampling Procedures to Protect Farmers

Some biotech companies take very aggressive action to investigate farmers to ensure the company's patents on GMO technology are not infringed. As discussed earlier in this guide, these investigations often

involve taking crop samples from farmers' fields. Such field testing evidence might then provide the basis for a biotech company's lawsuit against a farmer.

The **Indiana**, **North Dakota**, and **South Dakota** state legislatures have passed laws that are designed to provide some protection for farmers when biotech companies or seed suppliers want to inspect fields and take crop samples.³⁰¹ These state laws generally set out certain procedures that must be followed by GMO seed suppliers and manufacturers before making field inspections and sampling crops. The procedures generally require that the company must: (1) send the farmer a prior written notice of the intended field sampling and explain its purpose (for example, to determine whether the farmer has infringed on the biotech company's GMO patent); and (2) allow the farmer and, upon request, representatives of the state agriculture agency to be present when the company enters the land to take matching or split samples.³⁰² In all three of these states, GMO seed suppliers may seek a state court order of protection if there is a reason to believe that the crops intended to be sampled might be damaged or destroyed.³⁰³

Under **North Dakota** law, before a person can go onto land owned by someone else to take crop samples to determine if there has been a patent infringement, the North Dakota Agriculture Commissioner must be notified in writing of the suspected GMO patent infringement.³⁰⁴ **North Dakota's** law also establishes detailed procedures for the maintenance and labeling of the crop samples and allows mediation of disputes between farmers and the GMO seed suppliers.³⁰⁵ In addition, **North Dakota** law authorizes the state seed commissioner to establish: (1) procedures for inspecting, analyzing and verifying genetic identity and physical traits of seed or crops; (2) criteria for field inspections; (3) procedures for identity preservation and traceability for seeds or crops inspected; and (4) laboratories and facilities to conduct seed and crop sample analyses.³⁰⁶

The **Indiana** law gives a farmer the express right to bring a lawsuit against a biotech company or other GMO seed supplier which enters the farmer's land without complying with the law's procedural requirements.³⁰⁷

C. Permitting and Registration of GMOs

Several states have enacted laws that require various types of permits or registrations for GMOs.

Minnesota has a law that establishes permitting procedures for the release of certain genetically engineered agriculturally related organisms.³⁰⁸ This law is intended to protect humans and the environment from the “potentially significant adverse effects” of releasing GMOs into the environment.³⁰⁹ It requires that, before a GMO covered by the law can be released outside a contained building or facility, a permit must be obtained from the Minnesota Commissioner of Agriculture.³¹⁰ The permit is to be granted only if the Commissioner determines that the applicant has shown that the proposed release “does not have the potential for unreasonable adverse effects on the environment”³¹¹ A permit may place conditions on release of the GMO, including conditions relating to the size of the release, monitoring activities, schedules for inspection by the Minnesota Department of Agriculture, reporting of experiment results, and experiment termination procedures.³¹²

Another **Minnesota** law prohibits use, distribution, or release experiments of a genetically engineered pesticide in the state until it has been registered with the state Commissioner of Agriculture.³¹³ The registration procedures are designed to determine whether the experimental GM pesticide product will cause unreasonable adverse effects on the environment.³¹⁴ The registrations of experimental GM pesticides are to remain in place until the Commissioner determines that the product should be subject to the normal pesticide regulatory scheme.³¹⁵

Idaho also has a law requiring that a state permit be obtained before a genetically engineered plant or plant pest may be shipped into or sold or released in the state.³¹⁶ It gives the director of the Idaho Department of Agriculture the authority to enter into cooperative agreements with U.S. Department of Agriculture (USDA) to provide oversight and regulation of GMOs that may be plant pests.³¹⁷ These agreements may include allowing the state to review USDA’s GMO-related notifications and permits and conduct inspections of GMO facilities and field release sites.³¹⁸

A law in **Wisconsin** establishes requirements for notifying state agencies before releasing into the environment any GMO whose release is regulated by a federal agency.³¹⁹ The law authorizes the appropriate state agency to make comments to the federal agency regulating the GMO release. Enforcement and penalty provisions for violations of notification law are also included.

Nebraska regulates genetically engineered pesticide products, such as Bt crops, under its Pesticide Act.³²⁰ This law is intended “to regulate, in the public interest, the labeling, distribution, storage, transportation, use, application, and disposal of pesticides for the protection of human health and the environment.”³²¹ It requires registration of pesticides engineered into GM crops as a biological control agent and subjects them to full regulation like any other pesticide.³²²

D. GM Seed Labeling and Instructions

Some states attempt to ensure that farmers planting GM seeds will be provided sufficient information about the planting, handling, and transporting practices necessary to minimize the chance of contaminating non-GM crops.

For example, a law in **Maine** requires that a manufacturer or dealer of GM plants, plant stock, or seeds must give written instructions to all growers on how to plant, grow, and harvest the crops to minimize potential cross-contamination.³²³ These instructions must be filed with the state Commissioner of Agriculture, Food and Rural Resources at least 20 days before the sale of the GM plants or seeds in the state. GM seed manufacturers and dealers are also required to maintain, for at least two years after a sale, records of the names and addresses of all growers who plant their GM products.³²⁴ While this list is not made available to the public, it is available to the Commissioner for use in investigating a claim of cross-contamination. If these requirements are not met, the Commissioner is authorized to impose civil penalties and/or revoke the manufacturer’s or dealer’s seed labeling license.³²⁵

Vermont requires that seed containing genetically engineered material be labeled identifying: (1) the relevant traits and characteristics of the seed; (2) the requirements for safe handling, storage, transport, and use of the seed; (3) a contact where further

information can be obtained; and (4) the name and address of the manufacturer, distributor, or supplier of the seed.³²⁶ The law gives the Vermont Secretary of Agriculture the authority to issue rules for labeling of seed that contains genetically engineered materials.

E. Labeling Food as “GMO Free”

To address consumer concerns and desires to know whether food contains GMOs, there is a law in **Maine** that permits the labeling of food products and ingredients offered for sale in the state as “free of or made without” genetic engineering or bioengineering.³²⁷ Food products that contain 1 percent or less of genetically engineered ingredients may be labeled as being free of genetically engineered ingredients. However, if food is falsely labeled or advertised as being “free of or made without” these materials, the food will be considered misbranded under the Maine law and subject to civil penalties.³²⁸

F. Regulation of GM Rice Due to “Commercial Impact”

Both **Arkansas** and **California** have enacted laws specifically authorizing the regulation of GM rice as rice that has “characteristics of commercial impact.”³²⁹ This term is defined to include characteristics that “may adversely affect the marketability of rice in the event of commingling with any other rice,” including characteristics that: (1) “cannot be visually identified without the aid of specialized equipment or testing”; (2) “create a significant economic impact in their removal from commingled rice”; and (3) “whose removal from commingled rice is not feasible.”³³⁰ The **Arkansas** law directs the Arkansas State Plant Board to adopt rules to implement the statute, investigate violations, and “[p]rohibit or place restrictions on the selling, planting, producing, harvesting, transporting, storing, processing, or handling” of such rice.³³¹ The **California** law directs the appointment of a committee whose duties include identifying rice with “commercial impact” characteristics and recommending to the California Secretary of Food and Agriculture “regulations establishing terms and conditions for planting, producing, harvesting, transporting, drying, storing, or otherwise handling” in order to “maintain the integrity and prevent contamination of rice which has not been identified as having characteristics of commercial impact.”³³²

G. State Regulation of GM Pharmaceutical Crops

A recently enacted **Oregon** law is designed to increase the state's input into the federal permitting system for GM pharmaceutical crops.³³³ Under this law "biopharmaceutical crops" are "plants that have been genetically modified using a recombinant DNA process to produce vaccines, drugs, enzymes or other medicinal compounds."³³⁴ This law authorizes the state Departments of Agriculture and Human Services to enter into agreements with federal agencies that regulate the growing of GM pharma crops in order to increase the state's input into the federal permitting process.³³⁵ Among the powers the state departments may seek in their agreements with federal permitting agencies are authority to: (1) review GM pharma crop permit applications and related information submitted to USDA; (2) conduct site inspections and monitor GM pharma crops grown in Oregon; (3) take enforcement action if there is evidence that GM pharma crops are endangering Oregon agriculture, horticulture, or forest production; and (4) charge the GM pharma crop permit applicant or holder up to \$10,000 in fees for the cost of state oversight or services.³³⁶

H. Local Government Prohibition or Regulation of GMOs

Some local units of government—counties, towns, cities—have also taken action to address GMO concerns. For example, a few counties in **California** have enacted ordinances or passed voter initiatives making it unlawful to propagate, cultivate, raise, or grow GMOs within their respective boundaries.³³⁷ Similarly, at least two cities in **California** have prohibited the sale, distribution, or growing of GMOs within city limits.³³⁸ In **Maine**, at least one town has, by resolution, declared itself to be a GMO-free zone.³³⁹ Additionally, several towns in **Massachusetts** and **Vermont** have passed resolutions voicing opposition to GMOs.³⁴⁰

While counties, cities, and towns in some states are taking an active role in addressing their residents' concerns about GMOs, several state legislatures have passed laws that preempt or prohibit such actions by local units of government.³⁴¹

XII. International Issues

An in-depth discussion of international GMO issues is beyond the scope of this guide. However, farmers are strongly advised not to assume that their GM crops will be accepted for sale in all foreign markets. Farmers should also be aware that if they fail to ensure that their GM crops are sold in foreign markets only where such sales are permitted, they may be contributing to the contamination and rejection of large amounts of crop stores and the loss of important export markets.

For many years, the European Union (EU) effectively had a moratorium on approval of GMOs, with the result that imports of GM agricultural and food products from the U.S. were restricted. In 2003, the United States, along with Canada and Argentina, challenged the EU's moratorium before the World Trade Organization (WTO).³⁴² When the WTO panel issued its decision on this challenge, there were no clear winners or losers. Though the panel decided that the EU's moratorium on approving GMO imports was not justified for risk assessment purposes, it did not question the right of EU member nations to introduce strict regulatory frameworks for approval of GMOs or to ban individual GMOs at the national level.³⁴³ Despite this ruling and the European Commission's repeated attempts to force EU countries to remove national bans on particular GMOs, many of these bans remain in place.³⁴⁴ In addition, many regions of the EU are declaring that they want to be GMO-free and are advocating for the right to have GMO-free farming.³⁴⁵

In other areas of the world, opposition to GMOs also continues and has resulted in legislative action to address various issues related to GMOs and declarations of GMO-free zones.³⁴⁶

Another significant international trade issue affecting GMOs is the ratification by the necessary number of countries of the Cartagena Protocol on Biosafety.³⁴⁷ As described by the member organizations:

The Protocol seeks to protect biological diversity from the potential risks posed by living modified organisms resulting from modern biotechnology. It establishes an advance informed agreement (AIA) procedure for ensuring that countries are provided with the information necessary to make informed decisions before agreeing to the import of such organisms into their territory.³⁴⁸

The United States has not signed on to the Cartagena Protocol on Biosafety, but many of the countries that are export markets for U.S. agricultural products have signed on. This could mean more rigorous crop production, segregation, and tracking procedures for farmers who grow GMOs, and for those who don't.³⁴⁹ This could create additional liability concerns for American farmers marketing their crops to the affected countries.

In the spring of 2008, the International Assessment of Agricultural Science and Technology for Development (IAASTD), issued a report assessing global agriculture and expressing significant skepticism regarding GM crops.³⁵⁰ This report was prepared by over 400 of the world's leading scientists and was signed by over 60 governments in a unique collaboration of organizations from around the world, including the United Nations; the World Health Organization; governments; and private sector, scientific, and other non-governmental organizations. Some of the concerns raised in the report include: (1) assessment of GMO biotechnology impacts is lagging behind development; (2) GMO benefits and harms remain uncertain; (3) ownership of agricultural resources tends to be concentrated; (4) the use of patents in GMOs may drive up costs, restrict experimentation by farmers and public researchers, and undermine local practices that enhance food security and economic sustainability; and (5) farmers are being exposed to new liabilities, including liability for farmers who plant GM crops if the unauthorized presence of GM materials causes loss of markets, and liability for conventional farmers if patented GMO technologies are detected in their crops.³⁵¹ With this influential report raising concerns about these GMO issues, it is likely that many governments worldwide will be taking a closer look at whether and how to address their own domestic cultivation of GMOs, as well as importation of GMOs from the United States.

APPENDIX: Additional Resources

More information about GM plants and foods and the rights of farmers and consumers can be found in the reports described here.

This appendix was excerpted, with some modification, from *A Guide to Genetically Modified Alfalfa*, a 2008 report written by the Western Organization of Resource Councils (WORC) and available at www.worc.org/issues/art_issues/alfalfa_guide/Guide%20to%20GM%20Alfafa%20v2.pdf.

A copy of this report may also be obtained by writing WORC at 220 S. 27th Street, Billings, MT 59101.

1. **Gone to Seed: Transgenic Contaminants in the Traditional Supply**

The Union of Concerned Scientists examines how GM crop varieties threaten the quality of the seed supply and concludes that traditional seed varieties of corn, soybeans, and canola are pervasively contaminated with low levels of DNA sequences derived from GM varieties.

To order write to: The Union of Concerned Scientists, 2 Brattle Square, Cambridge, MA 02238.

Download at:

www.ucsusa.org/food_and_environment/genetic_engineering/gone-to-seed.html.

2. **Genetically Engineered Crops and Pesticide Use in the United States: The First Nine Years**

Dr. Charles Benbrook debunks GM crop proponents' claim that GM crops reduce pesticide use, and uses USDA data to show that GM corn, soybeans, and cotton have led to a 122 million pound increase in pesticide use since 1996.

Download at: www.biotech-info.net/Full_version_first_nine.pdf.

3. Monsanto vs. U.S. Farmers

The Center for Food Safety documents the Monsanto Company's lawsuits against American farmers, revealing thousands of investigations and nearly 100 lawsuits by Monsanto targeting farmers.

To order write to: Center for Food Safety, 660 Pennsylvania Ave, SE, Suite 302, Washington, DC 20003. (Paper copies are \$5. Please send a check, money order, or cash.)

Download at:

www.centerforfoodsafety.org/Monsantovsusfarmersreport.cfm.

4. Seeds of Doubt: North American Farmers' Experience with GM Crops

The Soil Association presents evidence challenging commonly claimed benefits of GM technology: higher yields, lower chemical use, food security, and profitability for farmers.

Download at: www.soilassociation.org.

5. If Your Farm Is Organic, Must It Be GMO-Free? Organic Farmers, Genetically Modified Organisms, and the Law

FLAG examines requirements that farmers avoid the use of GMO technology if they are certified organic or wish to become certified organic. The article also addresses handling requirements as they apply to organic farmers and includes a brief discussion of the ways in which sales contracts may impose responsibilities upon farmers with respect to GMOs that differ from the requirements for organic certification.

To order write to: FLAG, 360 N. Robert Street, #500, Saint Paul, MN 55101.

Download at:

www.flaginc.org/topics/pubs/arts/OrganicsAndGMOs2007.pdf.

6. Harvest at Risk

Dr. Charles Benbrook describes the probable consequences of Roundup Ready® wheat adoption and projects economic impacts on growers and the industry, including the cost of adoption and the impacts on farmers who do not adopt Roundup Ready® wheat.

Download at: www.worc.org/issues/benbrook.html.

7. Contaminating the Wild?: Gene Flow from Experimental Field Trials of Genetically Engineered Crops to Related Wild Plants

The Center for Food Safety reports on gene flow from experimental field trials of genetically engineered crops to related wild species.

To order write to: Center for Food Safety, 660 Pennsylvania Ave, SE, Suite 302, Washington, DC 20003.

Download at:

www.centerforfoodsafety.org/pubs/Contaminating_the_Wild_Report.pdf.

8. Transgenic Crops

ATTRA, a sustainable agriculture information service of the National Center for Appropriate Technology, provides farmers a comprehensive overview of GM crops in the U.S., including the unintended effects, regulations, liability concerns, and impact on organic producers.

To order a paper copy call: 800-346-9140.

Download at: www.attra.ncat.org/attra-pub/geneticeng.html.

9. Market Risks of Roundup Ready Hard Red Spring Wheat

Dr. Robert Wisner, Professor of Economics at Iowa State University, examines the potential impacts on export markets and prices from commercializing GM hard red spring wheat in the U.S.

Download at: www.worc.org/issues/marketrisk-reports.html.

10. A Growing Concern: Protecting the Food Supply in an Era of Pharmaceutical and Industrial Crops

This report addresses the challenge of protecting the U.S. food supply from contamination by crops genetically engineered to produce drugs and industrial substances. Six experts commissioned by the Union of Concerned Scientists to analyze this problem concluded that corn and soybean cannot be used as pharmaceutical crops while preventing contamination of the food supply – unless substantial changes are made to the commodity production and management practices applied to these crops.

To order write to: The Union of Concerned Scientists, 2 Brattle Square, Cambridge, MA 02238.

Download at:

www.ucsusa.org/food_and_environment/genetic_engineering/pharmaceutical-and-industrial-crops-a-growing-concern.html.

11. A Grain of Caution: A Critical Assessment of Pharmaceutical Rice

The Center for Food Safety details the potential human health impacts of Ventria's pharmaceutical rice and the FDA's refusal to approve Ventria's rice-grown drugs. The report also disputes the need for Ventria's pharmaceutical rice, discussing cheap and effective solutions for prevention and treatment of diarrhea recommended by the World Health Organization and other public health experts.

To order write to: Center for Food Safety, 660 Pennsylvania Ave, SE, Suite 302, Washington, DC 20003.

Download at:

www.centerforfoodsafety.org/pubs/Pharmaceutical%20Rice-FINAL.pdf.

12. Economic Implications of Plant-made Pharmaceutical Production in North Carolina

The Rural Advancement Foundation International-USA, together with researchers from the University of North Carolina Wilmington and Arizona State University, reviewed the potential economic benefits, environmental impacts, and externalized costs of GM crops, particularly pharmaceutical crops, for North Carolina. The report concludes that use of food crops in the field to produce pharmaceutical products offers only speculative benefits while presenting too great a risk of potentially very costly harm. The report notes that use of food crop in open fields is also unnecessary, since there are alternatives for production of pharmaceuticals using non-food crops in contained environments.

Download at www.rafiusa.org/docs/pmpstudy.pdf.

NOTES

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- ² Friends of the Earth International, *Who Benefits from GM Crops? The Rise of Pesticide Use* (Jan. 2008), page 14, available at www.foei.org/en/publications/pdfs/gmcrops2008full.pdf.
- ³ Ronald Jager, *THE FATE OF FAMILY FARMING: VARIATIONS ON AN AMERICAN IDEA* (2004), pages 205-19.
- ⁴ Jorge Fernandez-Cornejo, *U.S. Farmers Increase Adoption of Genetically Engineered Crops and Favor Multiple Traits*, *AMBER WAVES*, USDA Economic Research Service (Sept. 2007), available at www.ers.usda.gov/AmberWaves/September07/Findings/USFarmers.htm.
- ⁵ Jorge Fernandez-Cornejo, *U.S. Farmers Increase Adoption of Genetically Engineered Crops and Favor Multiple Traits*, *AMBER WAVES*, USDA Economic Research Service (Sept. 2007), available at www.ers.usda.gov/AmberWaves/September07/Findings/USFarmers.htm.
- ⁶ Western Organization of Resource Councils, *A Guide to Genetically Modified Alfalfa* (2008), page 68, available at www.worc.org/issues/art_issues/alfalfa_guide/Guide%20to%20GM%20Alfalfa%20v2.pdf.
- ⁷ Western Organization of Resource Councils, *A Guide to Genetically Modified Alfalfa* (2008), page 70, available at www.worc.org/issues/art_issues/alfalfa_guide/Guide%20to%20GM%20Alfalfa%20v2.pdf.
- ⁸ For a map listing USDA-approved GM pharmaceutical crop plantings in each state, see the Union of Concerned Scientists' online Pharma Crop Database at http://go.ucsusa.org/food_and_environment/pharm/index.php?s_keyword=X. See also, Thomas P. Redick, *Biopharming, Biosafety, and Billion Dollar Debacles: Preventing Liability for Biotech Crops*, 8 *DRAKE J. AGRIC. L.* 115 (2003); Don McCabe, *Where Will We Farm Pharmacrops?*, *THE FARMER/DAKOTA*

FARMER (March 2003), page 22; Phillip Brasher, *Biotech Corn May Have Tainted Soybeans*, DES MOINES REGISTER (Nov. 13, 2002).

- ⁹ For a more detailed description of the United States' GMO regulatory framework, see Andrew C. Fish, *Guide to U.S. Regulation of Genetically Modified Food and Agricultural Biotechnology Products*, Pew Initiative on Food and Biotechnology (Sept. 7, 2001), available at <http://pewagbiotech.org/resources/issuebriefs/1-regguide.pdf>; Blake A. Biles, *Agricultural Biotechnology: The U.S. Perspective*, NATURAL RESOURCES AND ENVIRONMENT (Summer 2003); Rebecca Bratspies, *Symposium: Genetically Modified Organisms: Philosophy, Science, and Policy: Some Thoughts on the American Approach to Regulating Genetically Modified Organisms*, 16 KAN. J. L. & POLICY 393 (Spring 2007).
- ¹⁰ The three federal agencies operate under the Coordinated Framework for Regulation of Biotechnology, which sets out the policies for regulating GMO products. Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. 23,302 (June 26, 1986). See also Donald L. Uchtmann, *Regulating Foods Derived from Genetically Engineered Crops*, AGRIC. L. UPDATE (May 2000), page 4.
- ¹¹ Michael Taylor & Judy Tick, *Post-Market Oversight of Biotech Foods: Is the System Prepared?*, Pew Initiative on Food and Biotechnology (April 2003), pages 12-26, available at <http://pewagbiotech.org/research/postmarket/PostMarket.pdf>.
- ¹² 7 U.S.C. §§ 7701 to 7772.
- ¹³ See generally 7 C.F.R. pt. 340, Introduction of Organisms and Products Altered or Produced Through Genetic Engineering Which Are Plant Pests or Which There Is Reason to Believe Are Plant Pests (2008).
- ¹⁴ 7 C.F.R. § 340.1 (2008).
- ¹⁵ 7 C.F.R. §§ 340.3, 340.4 (2008).
- ¹⁶ *International Center for Technology Assessment v. Johanns*, 473 F. Supp. 2d 9 (D.D.C. 2007); *Center for Food Safety v. Johanns*, 451 F. Supp. 2d 1165 (D. Hawaii 2006).
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- ¹⁸ 7 C.F.R. § 340.6 (2008).
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page 17, available at
<http://pewagbiotech.org/research/postmarket/PostMarket.pdf>.

- 21 U.S. Department of Agriculture, *Audit Report: Animal and Plant Health Inspection Service Controls Over Issuance of Genetically Engineered Organism Release Permits*, Audit 50601-8-Te (Dec. 2005), available at www.usda.gov/oig/webdocs/50601-08-TE.pdf.
- 22 U.S. Department of Agriculture, *Audit Report: Animal and Plant Health Inspection Service Controls Over Issuance of Genetically Engineered Organism Release Permits*, Audit 50601-8-Te (Dec. 2005), page i, available at www.usda.gov/oig/webdocs/50601-08-TE.pdf.
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- ³⁵ See *Center for Food Safety, Organic Seed Alliance, et al. v. Connor*, No. 3:2008cv00484, filed in January 2008 in the United States District Court for the Northern Division of California.
- ³⁶ 7 U.S.C. §§ 136 *et seq.* See 40 C.F.R. pt. 174, Procedures and Requirements for Plant-Incorporated Protectants (2008).
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- ³⁸ Neil D. Hamilton, *Legal Issues Shaping Society’s Acceptance of Biotechnology and Genetically Modified Organisms*, 6 DRAKE J. AGRIC. L. 81, 92-96 (2001).
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- ⁴¹ 7 U.S.C. § 136a(c)(5).
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- ⁴⁹ FDA, *Guidance for Industry: Recommendations for the Early Food Safety Evaluation of New Non-Pesticidal Proteins Produced by New Plant Varieties Intended for Food Use*, Introduction (June 2006) (stating "FDA's guidance documents, including this guidance, do not establish legally enforceable responsibilities"), available at www.cfsan.fda.gov/~dms/bioprgu2.html.
- ⁵⁰ FDA, *Guidance for Industry: Recommendations for the Early Food Safety Evaluation of New Non-Pesticidal Proteins Produced by New Plant Varieties Intended for Food Use* (June 2006), note 3 (noting that EPA is responsible for evaluating the safety of pesticides), available at www.cfsan.fda.gov/~dms/bioprgu2.html.
- ⁵¹ See, for example, 2009 Monsanto Technology/Stewardship Agreement.

- 52 See generally Nicole C. Nachtigal, *A Modern David and Goliath: Farmer v. Monsanto: Advising a Grower on the Monsanto Technology Agreement 2001*, 6 GREAT PLAINS NAT. RESOURCES J. 50 (2001).
- 53 2009 Monsanto Technology/Stewardship Agreement.
- 54 2009 Monsanto Technology /Stewardship Agreement.
- 55 2009 Monsanto Technology/Stewardship Agreement, "Grower Information" page 1.
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- 57 2009 Monsanto Technology/Stewardship Agreement, "Grower Information."
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- 59 *Monsanto v. Dawson*, 2000 U.S. Dist. LEXIS 22392 (E.D. Mo. 2000) (unpublished).
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- 62 2009 Monsanto Technology/Stewardship Agreement, "Grower Receives from Monsanto Company."
- 63 2009 Monsanto Technology/Stewardship Agreement, "Grower Agrees."
- 64 2009 Monsanto Technology/Stewardship Agreement, "Grower Agrees."
- 65 2009 Monsanto Technology/Stewardship Agreement, "General Terms" and "Grower Understands."
- 66 See 2009 Monsanto Technology/Stewardship Agreement, "Grower Agrees" and "Grower Understands." According to the TUG, the federal Environmental Protection Agency requires that an Insect Resistance Management plan be implemented for all YieldGard®/YieldGard VT™ corn products and Bollgard®/Bollgard II® cotton products. Monsanto 2009 Technology Use Guide, page 3.
- 67 Monsanto 2009 Technology Use Guide, pages 10-19 and 23-28.; and Monsanto YieldGard® 2008 IRM Guide, revised 02/08.
- 68 See Monsanto 2009 Technology Use Guide, pages 19-21 and 30-40.
- 69 See Monsanto 2009 Technology Use Guide, pages 78.
- 70 See Monsanto 2009 Technology Use Guide, page 43.
- 71 See 2009 Monsanto Technology/Stewardship Agreement, "Grower Understands."

- ⁷² See, for example, Monsanto 2009 Technology Use Guide, page 5, stating which of Monsanto's GM corn products have been fully approved in the U.S. for food and feed markets, which have been approved for feed markets in Canada and Japan, and which have been approved for food, feed, or processed feed markets in the European Union.
- ⁷³ Robert Schubert, *Are Roundup Ready Soybeans Pushing Out Conventional Varieties?*, CropChoice (Mar. 28, 2001), available at <http://cropchoice.com/leadstry.asp?recid=270> (describing the market rejection of Tom and Gail Wiley's organic soybeans due to GMO contamination). See Center for Food Safety, "Contamination Episodes with Genetically Engineered Crops" (Aug. 2006), available at www.centerforfoodsafety.org/pubs/Contamination%20episodes%20fact%20sheet.pdf.
- ⁷⁴ 2009 Monsanto Technology/Stewardship Agreement, "Grower Understands."
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- ⁷⁶ 2009 Monsanto Technology/Stewardship Agreement, "Grower Agrees."
- ⁷⁷ 5 U.S.C. § 552a(b). See also *Doe v. Veneman*, 380 F.3d 807 (5th Cir. 2004).
- ⁷⁸ See, for example, *Monsanto v. Trantham*, 156 F. Supp. 2d 855 (W.D. Tenn. 2001) (holding that a Tennessee cotton and soybean farmer infringed on Monsanto's patent by saving seed).
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- ⁸⁰ See Center for Food Safety, Comments on APHIS's Draft Environmental Assessment for a determination of nonregulated status for insect-resistant corn derived from the MON 89034 transformation event (Feb. 11, 2008), available at www.centerforfoodsafety.org/pubs/MON%2089034%20comments-FINAL.pdf (citing Bruce E. Tabashnik, et al., *Insect resistance to Bt crop: evidence versus theory*, NATURE BIOTECHNOLOGY, Vol. 26, No. 2: 199-202 (2008)).
- ⁸¹ Monsanto acknowledges this requirement in the Monsanto 2009 Technology Use Guide, page 3.
- ⁸² Monsanto YieldGard® 2008 IRM Guide, page 11.
- ⁸³ Monsanto 2009 Technology Use Guide, page 3.
- ⁸⁴ Monsanto 2009 Technology Use Guide, page 3.
- ⁸⁵ Monsanto 2009 Technology Use Guide, page 3.

- ⁸⁶ Justin Gillis, *Some Farmers Not Following Rules for Biotech Corn: Crops' Usefulness Is at Risk*, WASHINGTON POST, page E4 (June 19, 2003).
- ⁸⁷ Monsanto 2009 Technology Use Guide, page 3.
- ⁸⁸ Monsanto 2009 Technology Use Guide, page 10. See also www.monsanto.com/monsanto/ag_products/stewardship/default.asp.
- ⁸⁹ 2009 Monsanto Technology/Stewardship Agreement, "Termination."
- ⁹⁰ See, for example, *Monsanto v. David*, 516 F.3d 1009, 1017-1020 (Fed. Cir. 2008), *rehearing and rehearing en banc denied* 2008 U.S. App. LEXIS 11121 (Fed. Cir. 2008) (unpublished); and *Monsanto v. McFarling*, 488 F.3d 973, 878-981 (Fed. Cir. 2007), cert. denied 128 S. Ct. 871 (2008); *Monsanto v. Ralph*, 382 F.3d 1374, 1377 and 1382-1384 (Fed. Cir. 2004), *rehearing and rehearing en banc denied* 2004 U.S. App. Lexis 27219 (Fed. Cir. 2004) (unpublished).
- ⁹¹ 35 U.S.C. § 284. One North Dakota farmer was ordered to pay Monsanto an additional \$10,000 in enhanced damages when he was found to have saved seed and planted another crop. *Monsanto v. David*, 516 F.3d 1009, 1017 (Fed. Cir. 2008), *rehearing and rehearing en banc denied* 2008 U.S. App. LEXIS 11121 (Fed. Cir. 2008) (unpublished).
- ⁹² See, for example, *Monsanto v. David*, 516 F.3d 1009, 1017 (Fed. Cir. 2008), *rehearing and rehearing en banc denied* 2008 U.S. App. LEXIS 11121 (Fed. Cir. 2008) (unpublished) (affirming an award of more than \$300,000 in attorneys' fees for Monsanto in saved seed case).
- ⁹³ See, for example, *In re Trantham v. Monsanto*, 304 B.R. 298 (B.A.P. 6th Cir. 2004), and *In re Wood v. Monsanto*, 309 B.R. 745 (Bankr. W.D. Tenn. 2004).
- ⁹⁴ See Center for Food Safety, *Monsanto vs. U.S. Farmers* (Nov. 2007 Update), page 2, available at www.centerforfoodsafety.org/Monsantovsusfarmersreport.cfm.
- ⁹⁵ See Center for Food Safety, *Monsanto vs. U.S. Farmers* (Nov. 2007 Update), page 2, citing *Monsanto vs. U.S. Farmers* (2005) pages 23-24, available at www.centerforfoodsafety.org/Monsantovsusfarmersreport.cfm.
- ⁹⁶ See Center for Food Safety, *Monsanto vs. U.S. Farmers* (Nov. 2007 Update), page 2, available at www.centerforfoodsafety.org/Monsantovsusfarmersreport.cfm.
- ⁹⁷ 2009 Monsanto Technology/Stewardship Agreement, "Termination."
- ⁹⁸ See, for example, Uniform Commercial Code §§ 2-314 to 2-316 (2004); Minn. Stat. §§ 336.2-316 to 336.2-316 (2007); N.C. Gen. Stat. §§ 25-2-314 to 25-2-316 (2007).

- ⁹⁹ 2009 Monsanto Technology/Stewardship Agreement, “Limited Warranties and Disclaimer of Warranties.”
- ¹⁰⁰ 2009 Monsanto Technology/Stewardship Agreement, “Grower Understands.”
- ¹⁰¹ 2009 Monsanto Technology/Stewardship Agreement, “Notice Requirement.”
- ¹⁰² Lonie Boens, *Glyphosate-Resistant Soybeans: An Introduction*, 6 GREAT PLAINS NAT. RESOURCES H. 36 (Fall 2001).
- ¹⁰³ Monsanto 2009 Technology Use Guide, pages 20 and 43.
- ¹⁰⁴ 2009 Monsanto Technology/Stewardship Agreement, “Grower Agrees.”
- ¹⁰⁵ Friends of the Earth, *Who Benefits From GM Crops? The Rise in Pesticide Use*, AGRICULTURE & FOOD (Jan. 2008), page 9.
- ¹⁰⁶ Friends of the Earth, *Who Benefits From GM Crops? The Rise in Pesticide Use*, AGRICULTURE & FOOD (Jan. 2008), page 10.
- ¹⁰⁷ See Monsanto 2009 Technology Use Guide, pages 21, 31, 35, 43, and 49.
- ¹⁰⁸ See Monsanto 2009 Technology Use Guide, pages 29, 32, 41, and 48.
- ¹⁰⁹ 2009 Monsanto Technology/Stewardship Agreement, “Grower Receives from Monsanto.”
- ¹¹⁰ 2009 Roundup Rewards® Summary, available at www.monsanto.com/monsanto/ag_products/pdf/rr_rewards_brochure.pdf
- ¹¹¹ 2009 Monsanto Technology/Stewardship Agreement, “Grower’s Exclusive Limited Remedy.”
- ¹¹² 2009 Monsanto Technology/Stewardship Agreement, “Grower’s Exclusive Limited Remedy.”
- ¹¹³ 2009 Monsanto Technology/Stewardship Agreement, “Grower’s Exclusive Limited Remedy.”
- ¹¹⁴ For example, the Idaho Supreme Court has held that limiting damage awards in an herbicide contract was unconscionable and therefore unenforceable. *Walker v. American Cyanamid Co.*, 948 P.2d 1123, 1130 (Idaho 1999). A Kentucky federal court upheld an herbicide contract provision that limited a farmer’s damages because “it is appropriate to shift the risk of loss to the farmer in this situation given the many uncertainties and variables that exist in the farming business.” *Gooch v. E.I. Du Pont De Nemours & Co.*, 40 F. Supp. 2d 863, 872 (W.D. Ky. 1999). See also Scott S. Partridge, *The Use of the Class Action Device in Agricultural Products Litigation*, 6 DRAKE J. AGRIC. L. 175, 188 (2001) (describing why class actions based on GMO technology are difficult to pursue because each farmer has a different set of growing conditions);

Gaby R. Jabbour, *Class Certification Order Reversed in Suit Against Monsanto and Others*, National AgLaw Center (June 2003), available at www.nationalaglawcenter.org/assets/archivecases/monsanto-davis.html (describing a Texas case where class certification was denied because defenses that were peculiar to individual farmers).

- ¹¹⁵ 2009 Monsanto Technology/Stewardship Agreement, “Governing Law.”
- ¹¹⁶ 2009 Monsanto Technology/Stewardship Agreement, “Forum Selection for Non-Cotton Related Claims Made by Growers and All Other Claims.”
- ¹¹⁷ See, for example, *Monsanto v. McFarling*, 302 F.3d 1291 (Fed. Cir. 2002), cert. denied, 537 U.S. 1232 (2003); *Ex parte Monsanto Co.*, No. 1001766, 2002 Ala. LEXIS 12 (Jan. 18, 2002) (unpublished), opinion withdrawn, 2002 Ala. LEXIS 301 (Oct. 1, 2002) (unpublished); *Monsanto v. White*, No. 4:00CV1761, 2001 U.S. Dist. LEXIS 25135 (E.D. Mo. June 22, 2001) (unpublished); *Monsanto v. Dawson*, No. 4:98CV02004, 2000 U.S. Dist. LEXIS 22391 (E.D. Mo. Aug. 18, 2000) (unpublished); *Massey v. Monsanto*, No. 2:99CV218-P-B, 2000 U.S. Dist. LEXIS 11305 (N.D. Miss. June 13, 2000) (unpublished); *Monsanto v. Godfredson*, No. 4:99CV1691, 2000 U.S. Dist. LEXIS 22383 (E.D. Mo. Apr. 13, 2000) (unpublished).
- ¹¹⁸ 2009 Monsanto Technology/Stewardship Agreement, page 2.
- ¹¹⁹ 2009 Monsanto Technology/Stewardship Agreement, page 2.
- ¹²⁰ 2009 Monsanto Technology/Stewardship Agreement, page 2.
- ¹²¹ See Randi Ilyse Roth, *Redressing Unfairness in the New Agricultural Labor Arrangements: An Overview of Litigation Seeking Remedies for Contract Poultry Growers*, 25 U. MEM. L. REV. 1207, 1230 (Spring 1995).
- ¹²² See *Monsanto v. McFarling*, 363 F.3d 1336 (Fed. Cir. 2004); *Monsanto v. Ralph*, 382 F.3d 1374 (Fed. Cir. 2004), rehearing denied 2004 U.S. App. Lexis 27219 (Fed. Cir. 2004) (unpublished); *Monsanto v. Scruggs*, 459 F.3d 1328 (Fed. Cir. 2006), cert. denied 127 S. Ct. 2062 (2007); *Monsanto v. David*, 516 F.3d 1009 (Fed. Cir. 2008), rehearing and rehearing en banc denied 2008 U.S. App. LEXIS 11121 (Fed. Cir. 2008) (unpublished); and *Monsanto v. Vanderhoof*, 2007 U.S. Dist. LEXIS 31186 (E.D. Mo. 2007) (unpublished).
- ¹²³ Keith Aoki, *Traditional Knowledge, Intellectual Property, and Indigenous Culture: Article: Weeds, Seeds, and Deeds: Recent Skirmishes in Seed Wars*, 11 CARDOZO J. INT’L & COMP. L. 247, 257-276 (Summer 2003), available at www.law.uoregon.edu/faculty/kaoki/site/articles/weedsandseeds.pdf.

- ¹²⁴ Samantha M. Ohlgart, *The Terminator Gene: Intellectual Property Rights v. the Farmer's Common Law Right to Save Seed*, 7 DRAKE J. AGRIC. L. 473 (Summer 2002).
- ¹²⁵ 7 U.S.C. §§ 2321 *et seq.*
- ¹²⁶ 7 U.S.C. § 2543.
- ¹²⁷ *Asgrow Seed Co. v. Winterboer*, 513 U.S. 179, 192 (1995). In *Asgrow Seed*, soybean farmers in northwest Iowa brown-bagged a sizable portion of their crops for resale to other farmers. Asgrow sued the farmers seeking damages and a permanent injunction against the sale of the protected seed. The farmers defended their right to resell the soybean seed based on the seed saving exemption of the PVPA. The Supreme Court disagreed and held that the statute allowed farmers to save seed only for their next crop. For more information on the *Asgrow Seed* case, see Nathan A. Busch, *Jack and the Beanstalk: Property Rights in Genetically Modified Plants*, 3 MINN. INTELL. PROP. REV. 1, 69-73 (2002), available at <http://mipr.umn.edu/archive/v3n2/busch.pdf>.
- ¹²⁸ *Diamond v. Chakrabarty*, 447 U.S. 303 (1980).
- ¹²⁹ *Ex Parte Hibberd*, 227 U.S.P.Q. 443 (Bd. Pat. App. & Int. 1985). The Patent Board's decision states that: "In our view, the Supreme Court's analysis of the legislative history of the plant-specific Acts makes it clear that the legislative intent of these acts was to extend patent protection to plant breeders who were stymied by the two noted obstacles."
- ¹³⁰ *J.E.M. Ag Supply v. Pioneer Hi-Bred Int'l*, 534 U.S. 124, 139-146 (2001). On behalf of the American Corn Growers Association and National Farmers Union, the International Center for Technology Assessment (CTA) filed a "friend of the court" brief in this case in support of J.E.M.'s position. In the brief, these organizations argued that the Patent and Trademark Office's granting of general utility patents on seeds is unlawful and has curtailed research into improved plant varieties, brought higher seed prices for farmers, and contributed to consolidation in the seed industry.
- ¹³¹ *Monsanto v. McFarling*, 302 F.3d 1291, 1299 (Fed. Cir. 2002), cert. denied 537 U.S. 1232 (2003).
- ¹³² *Monsanto v. McFarling*, 302 F.3d 1291, 1299 (Fed. Cir. 2002), cert. denied 537 U.S. 1232 (2003).
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David, 516 F.3d 1009 (Fed. Cir. 2008), rehearing and rehearing en banc denied 2008 U.S. App. LEXIS 11121 (Fed. Cir. 2008) (unpublished); and *Monsanto v. Vanderhoof*, 2007 U.S. Dist. LEXIS 31186 (E.D. Mo. 2007) (unpublished).

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- ¹³⁶ See Center for Food Safety, *Monsanto vs. U.S. Farmers* (Nov. 2007 Update), page 2 (citing *Monsanto vs. U.S. Farmers* (2005) pages 23-24), available at www.centerforfoodsafety.org/Monsantovsusfarmersreport.cfm.
- ¹³⁷ See Center for Food Safety, *Monsanto vs. U.S. Farmers* (Nov. 2007 Update), page 2, available at www.centerforfoodsafety.org/Monsantovsusfarmersreport.cfm.
- ¹³⁸ See Center for Food Safety, *Monsanto vs. U.S. Farmers* (Nov. 2007 Update), page 2, available at www.centerforfoodsafety.org/Monsantovsusfarmersreport.cfm.
- ¹³⁹ *Monsanto v. Parr*, 2008 U.S. Dist. LEXIS 33250 (N.D. Ind. Apr. 21, 2008).
- ¹⁴⁰ It appears that courts in the United States have not yet directly addressed the issue of whether a farmer who saves and plants seed from a field that has been contaminated by GMOs is liable for patent infringement. However, one federal judge used just such a scenario as an example in a concurring opinion in a patent infringement case between two companies, suggesting that farmers would not be liable for patent infringement just because GM seed blew onto their property. *SmithKline Beecham Co. v. Apotex Co.*, 365 F.3d 1306, 1330-31 (Fed. Cir. 2004) (Gajarsa, J., concurring) (“Consider, for example, what might happen if the wind blew fertile, genetically modified blue corn protected by a patent, from the field of a single farmer into neighboring cornfields. The harvest from those fields would soon contain at least some patented blue corn mixed in with the traditional public domain yellow corn—thereby infringing the patent. The wind would continue to blow, and the patented crops would spread throughout the continent, thereby turning most (if not all) North American corn farmers into unintentional, yet inevitable, infringers. The implication—that the patent owner would be

entitled to collect royalties from every farmer whose cornfields contained even a few patented blue stalks— cannot possibly be correct.”). See also Robert Schubert, *Federal Judge’s Opinion Shows Understanding of Patented Gene Spread*, CropChoice (May 17, 2004), available at www.cropchoice.com/leadstry1659.html?recid=2560.

- ¹⁴¹ *Schmeiser v. Monsanto Canada, Inc.*, No. 29437, 2004 SCC 34 (Can. 2004), available at <http://scc.lexum.umontreal.ca/en/2004/2004scc34/2004scc34.pdf>; *Schmeiser v. Monsanto Canada, Inc.*, No. A-367-01, 2002 FCA 309 (Fed. Ct. App. 2002), available at <http://decisions.fca-caf.gc.ca/en/2002/2002fca309/2002fca309.html>; *Monsanto Canada, Inc. v. Schmeiser*, No. T-1593-98, 2001 FTC 256 (Trial Div. 2001) available at <http://decisions.fct-cf.gc.ca/en/2001/2001fct256/2001fct256.html>. See also, Hilary Preston, *Drift of Patented Genetically Engineered Crops: Rethinking Liability Theories*, 81 TEX. L. REV. 1153 (March 2003); and Tim Van Pelt, *Is Changing Patent Infringement Liability the Appropriate Mechanism for Allocating the Cost of Pollen Drift?* 31 IOWA J. CORP. L. 567, 569-571 (Winter 2006).
- ¹⁴² *Schmeiser v. Monsanto Canada, Inc.*, No. A-367-01, 2002 FCA 309 (Fed. Ct. App. 2002), available at <http://decisions.fca-caf.gc.ca/en/2002/2002fca309/2002fca309.html>.
- ¹⁴³ *Schmeiser v. Monsanto Canada, Inc.*, No. 29437, 2004 SCC 34 (Can. 2004), available at <http://scc.lexum.umontreal.ca/en/2004/2004scc34/2004scc34.pdf>.
- ¹⁴⁴ *Schmeiser*, 2004 SCC 34 at 95, 159.
- ¹⁴⁵ *Schmeiser*, 2004 SCC 34 at 95.
- ¹⁴⁶ *Schmeiser*, 2004 SCC 34 at 96.
- ¹⁴⁷ *Schmeiser*, 2004 SCC 34 at 97.
- ¹⁴⁸ *Schmeiser*, 2004 SCC 34 at 100.
- ¹⁴⁹ *Schmeiser*, 2004 SCC 34 at 100-102.
- ¹⁵⁰ *Schmeiser*, 2004 SCC 34 at 104.
- ¹⁵¹ *Schmeiser*, 2004 SCC 34 at 105.
- ¹⁵² *Schmeiser*, 2004 SCC 34 at 106. See also E. Ann Clark, *So, Who Really Won the Schmeiser Decision?*, CropChoice (June 13, 2004), available at www.cropchoice.com/leadstryfac9.html?recid=2612.
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- ¹⁶⁴ GeneWatch UK and Greenpeace, *GM Contamination Register Report* (Feb. 2007), page 3, available at www.genewatch.org/uploads/f03c6d66a9b354535738483c1c3d49e4/gm_contamination_report_2006.pdf.
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- ¹⁷⁹ Roger A. McEowen, *Legal Issues Related to the Use and Ownership of Genetically Modified Organisms*, 43 WASHBURN L.J. 611, 626-27 (Spring 2004).
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- ¹⁸¹ *Sample v. Monsanto Co.*, 283 F. Supp. 2d 1088, 1093-94 (E.D. Mo. 2003).
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- ¹⁸⁴ See D.L. Uchtmann, *Corn Farmers Face May 31 Deadline to Submit "Proof of Claims" for Non-StarLink Farmer Class Action Lawsuits* (Apr. 10, 2003), available at www.farmdoc.uiuc.edu/legal/pdfs/StarLinkMay31Deadline.pdf. See also the website established specifically for the settlement at www.non-starlinkfarmerssettlement.com.
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- ¹⁹⁴ Stephen M. Scanlon, *Should Missouri Farmers of Genetically Modified Crops Be Held Liable for Genetic Drift and Cross-Pollination?*, 10 MO. ENVTL. L. & POL'Y REV. 1, 8 (2002).
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- ¹⁹⁸ RESTATEMENT (SECOND) OF TORTS § 821D (1977); Minn. Stat. § 561.01. See also Gregory N. Mandel, *The Future of Biotechnology Litigation and Adjudication*, 23 PACE ENVTL. L. REV. 83, 99 (Winter 2005-2006).
- ¹⁹⁹ *Jost v. Dairyland Power Cooperative*, 172 N.W.2d 647, 654 (Wis. 1969). See also *Miles v. A. Arena & Co.*, 73 P.2d 1260 (Cal. Ct. App. 1937) (nuisance existed when pesticide drifted during crop dusting, killing honey bees).
- ²⁰⁰ John P. Mandler & Kristin R. Eads, *Liability Exposure to Seed Companies from Adventitious GMO Pollination Due to Pollen Drift Resulting in Cross Pollination or Outcrossing*, Faegre & Benson (Jan. 26, 2000), page 9, available at www.faegre.com/downloads/gmo.doc.
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- ³⁴² Information on the challenge by the United States to the European Communities (EC) *de facto* moratorium on GMOs can be found on the World Trade Organization website at www.wto.org/english/tratop_e/dispu_e/cases_e/ds291_e.htm.
- ³⁴³ See, Friends of the Earth International, *Who Benefits from GM Crops? The Rise of Pesticide Use* (Jan. 2008), page 36, available at www.foei.org/en/publications/pdfs/gmcrops2008full.pdf. For a summary of the WTO panel decision see *EC – Approval and Marketing of Biotech Products (DS291, 292, 293)*, available at www.wto.org/english/tratop_e/dispu_e/cases_e/1pagesum_e/ds291sum_e.pdf.
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³⁵¹ IAASTD, *International Assessment of Agricultural Knowledge, Science and Technology for Development: Executive Summary of Synthesis Report*, page 14, available at www.agassessment.org/docs/SR_Exec_Sum_280508_English.pdf.

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FARMERS' LEGAL
ACTION GROUP,
INCORPORATED

Farmers' Legal Action Group, Inc.
360 North Robert Street, Suite 500
Saint Paul, Minnesota 55101-1589

Phone: 651.223.5400

Fax: 651.223.5335

Toll-free in Minnesota: 877.860.4349

Email: lawyers@flaginc.org

Website: www.flaginc.org