ORGANIC FARMERS PAY THE PRICE FOR GMO CONTAMINATION

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Until genetically engineered crops (also described as GMOs) were introduced as a production method for U.S. farmers, "coexistence" between different sectors of agriculture was a fairly simple prospect. Today, the ability of organic, non-GMO or identity-preserved production to coexist with GMO production is in question.

GMO crops became commercially available in the United States in 1996 and now constitute the vast majority of corn, cotton and soybean crops grown in the country.[1] U.S. GMO cultivation grew rapidly from only 7 percent of soybean acres and 1 percent of corn acres in 1996, to 93 percent of soybean and 90 percent of corn acres in 2013.[2] Certifiable organic crops cannot be grown from GMO seeds.

The threat and actual occurrence of contamination of non-GMO crops by GMO crops harms many participants in markets where no detectable GMO presence is required or expected, including organic and non-GMO (often described as "identity preserved").

The topic of coexistence becomes even more complicated because organic and non-GMO farmers are taking a variety of precautionary measures to try to protect themselves from contamination and maintain their ability to sell into specific markets, while GMO growers are not specifically required to mitigate the risk of contamination.

Food & Water Watch partnered with the Organic Farmers' Agency for Relationship Marketing (OFARM) to survey organic grain producers on preventative measures that they use to avoid GMO contamination and the financial losses associated with contamination.

Survey findings include:

- Nearly half of respondents were skeptical that GMO and non-GMO crop production could coexist.
- Over two-thirds did not think good stewardship alone is enough to protect organic and non-GMO farmers from contamination.

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- Five out of six responding farmers were concerned about GMO contamination impacting their farm, with 60 percent saying that they were extremely concerned.
- One out of three responding farmers have dealt with GMO contamination on their farm. Of those contaminated farmers, over half have been rejected by their buyers for that reason. They reported a median cost of a rejected semi load (approximately 1,000 bushels) of $4,500.
- Nearly half of responding farmers would not purchase crop insurance unless legally required to do so to cover losses associated with GMO contamination. And of those who would purchase insurance, three out of four reported that GMO patent holders, GMO users or both of those entities should bear the liability burden for any economic loss associated with GMO contamination.

The results of this survey reveal that the risks and the effects of GMO contamination have unfairly burdened organic and non-GMO farmers with extra work, longer hours and financial insecurity, which has led to general skepticism about coexistence within the organic community.

The U.S. Department of Agriculture's focus on coexistence is misplaced. Recommendations by a USDA panel, the Advisory Committee on Biotechnology and 21st Century Agriculture, fail to point the department in the right direction. The AC21 committee claimed that there is insufficient data to determine if contamination is occurring. And the committee's approach to responding to contamination was based on crop insurance purchased by organic and non-GMO crop producers, while its approach for preventing contamination relied on encouraging GMO crop producers to use good stewardship practices and to communicate with their neighbors. These approaches are inadequate and, as the results of this survey indicate, are unacceptable to most organic producers.

Instead of an extended discussion of coexistence, the USDA must recognize the harm that is already being done to organic and non-GMO farmers and prioritize ways to prevent contamination.

Paths of Contamination

Gene flow

Gene flow is a natural process that fosters biological diversity in a plant population by shuffling genetic information from the pollen or seeds of closely related individuals.[7] In crops of the same species, GMO crops can "outcross" or "cross-pollinate" non-GMO crops through wind dispersal or pollinators.[8] Some self-pollinating crops can still be cross-pollinated, like canola, which can outcross with nearby plants up to a frequency of 55 percent.[9]

Commingling

After a crop is harvested, there are several steps during which GMO and non-GMO seeds or grains can become mixed. This can happen during handling or transport if machinery is not properly cleaned, or due to a quality-control failure or human error during storage or processing.[10]

Food & Water Watch and OFARM recommend that:

- Biotech and seed companies holding GMO seed patents should be held accountable for all losses associated with GMO contamination and pay into a compensation fund to help farmers recover the full costs of their economic hardship caused by contamination.
- The USDA should create and enforce mandatory stewardship requirements for GMO crop production to ensure that responsibility for preventing contamination is shared, rather than resting solely on organic and non-GMO producers. These requirements should include buffer zones for GMO crop fields that adjoin organic and non-GMO crop fields to reduce GMO and chemical drift. This is especially important in light of the pending approval of crops engineered to tolerate herbicides such as 2,4-D that are prone to drift.
- The USDA should commit resources to researching, tracking and analyzing incidences of contamination and associated economic losses at all levels of the supply chain.
- The USDA should dedicate resources through its extension service to help educate GMO, non-GMO and organic farmers about this escalating problem and how to best avoid contamination problems.

Introduction

In 2011, the U.S. Department of Agriculture convened the Advisory Committee on Biotechnology and 21st Century Agriculture (AC21) to address the issue of the feasibility of coexistence in agriculture. Heavily weighted with biotech proponents, the committee gathered for a series of meetings in 2011 and 2012 with the task of establishing a protocol for coexistence and designing a compensation mechanism for farmers that are economically harmed by contamination from GMO crops.[3]

Unfortunately, the committee was unable to estimate the costs associated with GMO presence on non-GMO and organic farms due to a lack of data. Their final suggestion for a compensation mechanism was a form of crop insurance that included, in one proposal, a premium to be paid by producers of non-GMO crops.[4]

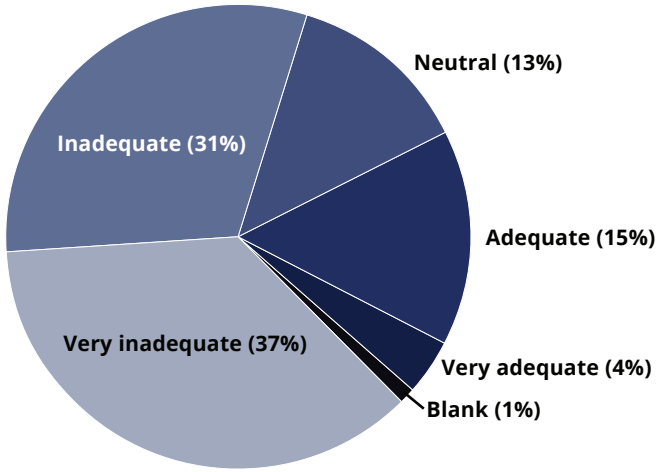
The financial burden associated with contamination and efforts to prevent contamination are significant. Some of the costs to farmers from contamination include loss of access to markets that require no GMO presence, and long-term investments associated with producing a crop intended for a non-GMO or organic market, such as organic certification.

Methodology

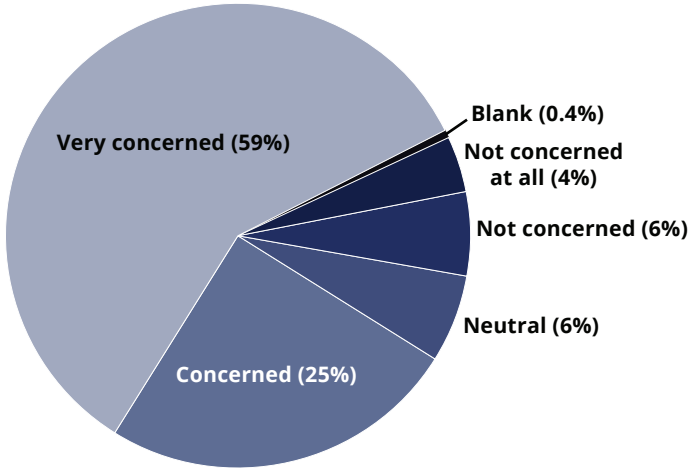
In an effort to fill the data gap that was used to justify an inadequate policy recommendation by the AC21, Food & Water Watch and OFARM gathered information from organic producers and co-op managers on coexistence and GMO contamination. We sent a survey to 1,500 farmers, identified as certified organic field crop producers. Many of these producers use the marketing assistance services of the OFARM member co-ops. The survey attempted to quantify some of the costs associated with preventive measures taken by farmers to keep GMO presence off their farm, the financial burden of farm-level GMO presence and how GMO presence affects co-op managers.

Out of the 1,500 surveys sent out, 87 were sent back for various reasons. Of the 1,413 remaining, we received a 19 percent response rate of 268 responses. Farmers who participated in the survey hail from 17 states, predominantly in the Midwest, and grow a wide variety of organic specialty crops and organic field crops.

Do you think good stewardship is enough to protect organic/non-GMO farmers from unintended GMO contamination?



How concerned are you about GMO contamination affecting your farm?



Costs of Preventative Measures to Avoid GMO Contamination	
Method	**Median Annual Cost**
Buffer Strips	$2,500
Delaying Planting	$3,312 to $5,280
Testing	$200
Other Measures	$520
Total	**$6,532 to $8,500**

GMO Crops Are a Major Obstacle to Coexistence

Because using GMO seeds is an excluded method under the USDA's organic standards, organic farmers are responsible for making certain that they do not grow genetically engineered crops.[5] With the proliferation of these crops, however, coexistence between organic, non-GMO and GMO farmers has become more and more difficult, due to the potential for gene flow and commingling of crops at both the planting and harvesting levels and in the distribution chain. Often referred to as "adventitious presence," GMO crops can contaminate non-GMO and organic crops through cross-pollination on the field or through seed or grain mixing post-harvest.[6]

Nearly half (48 percent) of respondents were skeptical that GMO growers and non-GMO growers could coexist, with 22 percent saying that there was no chance at coexistence. One farmer wrote: "I feel that the GMO contamination problem is the most severe for organic farmers. I see no solution to it."[11] Due to the risks of GMO contamination, some farmers are feeling hopeless and even choosing to abandon their organic production altogether.[12] And over two-thirds (68 percent) of respondents did not think that good stewardship alone could protect organic farmers from GMO contamination, with 37 percent saying that they thought it would be totally inadequate.

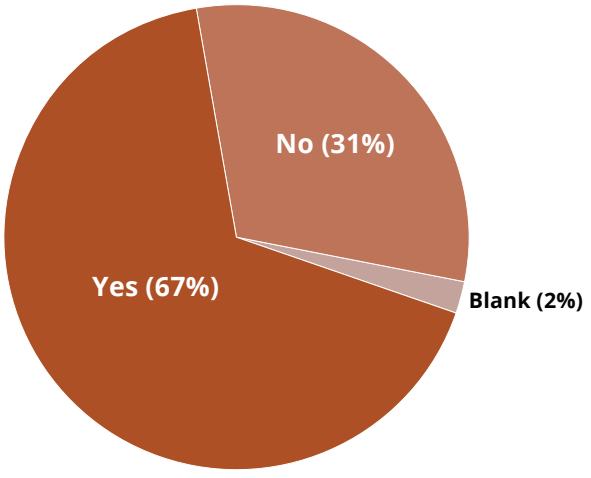
When farmers were asked about the prospect of GMO contamination occurring on their farms, 5 out of 6 (84 percent) respondents were concerned, with 59 percent saying that they were extremely concerned. This concern will only grow as more GMO crops are pushed through the USDA's pipeline, making it harder for organic and non-GMO farmers to successfully sell their crops without GMO-related rejections.

The Costs of Contamination Prevention

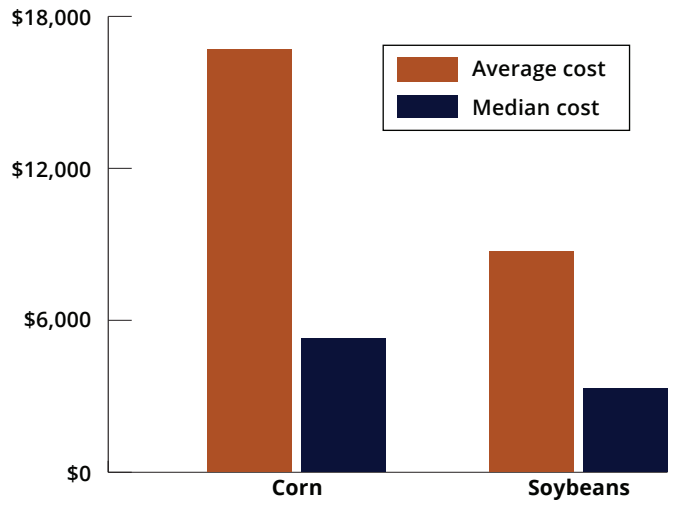
The USDA organic standards require that organic farmers use certain preventative measures that will minimize the risk of contamination. One of the main requirements is maintaining a buffer zone that is adequate to protect crops from chemical spray drift or cross-pollination.[13] Due to these requirements, organic farmers end up bearing the burden of avoiding GMO presence from crops planted by their neighbors.

The necessary acreage of a buffer zone depends on the drift risk of the field in question,[14] but the median size of buffer zones for survey respondents was about five acres. Because the buffer takes up space on land that otherwise could be cultivated and sold, such zones can represent a financial loss. Grass buffers are often not harvested, so farmers lose all of the value that could have been gained from growing an organic crop on that land. Farmers who grow conventional crops as buffers are able to sell the harvested buffer to the conventional market, but they lose the value of the organic premium for those acres. According to respondents, the median cost of buffers due to the loss of organic premium is approximately $2,500 per year, with several farmers reporting annual losses of over $20,000.

Do you delay planting to prevent contamination from neighboring farms?



Estimated annual cost/loss associated with delayed planting?



Another method that farmers often use in order to avoid contamination is delaying planting so that their crops pollinate later than their neighbors' GMO crops. About two-thirds (67 percent) of respondents delay planting in order to avoid cross-pollination. This delay can cause producers to miss the optimal time period for starting the crop, lowering their yield at harvest. Of those that delay planting, the median annual cost to farmers is $5,280 for corn and $3,312 for soybeans.

Organic farms are inspected and certified every year.[15] One marketing expert estimated that all certified organic producers and marketers devote about 25 percent of their certification process toward avoiding GMO contamination. Since each certification for a producer is about $1,350 annually, each producer can attribute about $340 of his or her certification costs to avoiding contamination.[16]

Survey results indicate that some of the preventative measures that farmers take in addition to what is required for their organic certification include:

- delayed planting,
- recording when neighbors plant or spray their fields,
- additional cleaning and hauling records for buffers,
- flushing out equipment more often,
- choosing not to plant certain crops prone to GMO contamination,
- spending more on purer seeds or the GMO-blocking Pura-Maize seed, and
- seed testing.

Survey respondents estimated that using some of these other measures took up about one hour per week, resulting in a median cost of about $520 every year.

About 20 percent of responding farmers reported that they did their own testing for GMO presence on their farm, which cost them a median of $200 every year.

Organic farmers are frustrated with the amount of work that they put in to avoid GMO presence while, even after this diligent effort, contamination still occurs. One farmer wrote: "If [GMO] was not here this would not be going on. It's their contamination that's the problem but we have to guard against something we have no control over. How do you even get a patent on something you can't control? The whole object is control and that is not our [organic farmers'] problem."[17]

Another wrote, in reference to GMOs and associated herbicide use: "I'm getting tired of maintaining these miles of buffers. How about the guy that sprays up to the fence be liable for the damage that is done?"[18]

Contamination Is Occurring

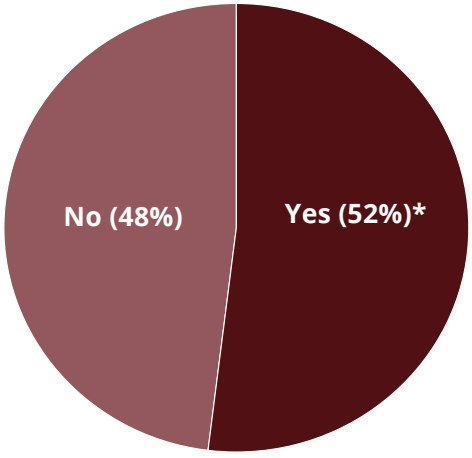
About one-third (31 percent) of respondents reported that unintended GMO presence had been found or suspected on their farm. Most did not do their own on-farm testing, so much of the testing is done by their co-op or grain buyer. Because many farmers do not test their loads of grain being shipped to their buyer, it is common that they do not find out about contamination until they deliver it. If the shipment is on the buyer's scale when it is rejected, the contamination problem becomes very real and financial losses mount rapidly.

Contamination occurred most often in corn, followed by soybeans. Out of corn and soybean growers, 63 (34 percent) and 54 (35 percent), respectively, reported that they had found or suspected GMO presence in their contracted shipments.

Of those respondents who had found contamination, over half (52 percent) had loads rejected by their buyer due to GMO content. Of all responding corn and soybean growers, 37 (59 percent) and 31 (57 percent) had been rejected by a buyer due to GMO presence. Buyers, like organic marketing co-ops or organic and non-GMO grain storage and handling facilities, often conduct GMO tests, so many farmers did not know the exact percentage of GMO content found in their loads. But of those who reported percentages of contamination, GMO content ranged from 0.1 percent to 17.5 percent, with a median of 3 percent. The median loss of a rejection due to GMO presence in one season was $4,500. One Illinois farmer reported that the vast majority of his 2013 corn harvest was rejected for the organic food market, resulting in a $3.50 loss per bushel of 105,000 contracted bushels and a $367,000 hit.[19]

Not only do contaminated farmers lose the premium value of their crops upon rejection if the crop cannot be sold as organic or non-GMO, but often they must also pay for the transportation of that load back from the buyer, described as "double freight." According to one marketing expert, double freight

Have you ever been rejected by a buyer due to GMO presence in your grain?



*** $4,500 median cost due to this load rejection, with one farmer reporting as much as $367,000 lost in one year.**

usually costs farms about $1,000 to $2,000 per rejected load.[20] And rejections are not necessarily a once-in-a-lifetime occurrence. Of those respondents who had crops rejected, over a third had been rejected more than once.

Along with the economic losses associated with rejection, there is also the difficulty and stress of finding a new market and buyer for the rejected load and resolving the situation. As more GMO crops are approved and contamination becomes more of a problem for a wider variety of farmers, it is very likely that the number of loads rejected will increase and the financial burden will be more than some organic producers can continue to bear.

Looming Threat of Contamination for GMO Alfalfa and Wheat Farmers

Some of the surveyed farmers indicated that GMO contamination would become more of an issue for them in the future depending on future adoption of new GMO crops, such as GMO wheat. "We know corn pollen can travel up to two miles. There is no doubt of GMO pollution. Now alfalfa is next, will it ever stop?" asked one farmer.[21] A North Dakota farmer wrote: "All this is subject to change if our neighbors grow GM alfalfa or GM wheat is approved or wider wheat seed contamination is detected. One can only go so far eliminating crops with GM varieties. The loss of crop options is not a direct cost, but a real one. We cannot, for example, grow organic canola as we are surrounded by hundreds of acres of GM canola — pollinated by insects — no buffer is big enough to contain cross-pollination."[22] A Montana farmer echoed this concern, writing, "We grow wheat and won't need extra protection until GM wheat is commercially available."[23]

The USDA approved Roundup Ready alfalfa in 2010, which is not only the most important feed crop for dairy cows, but also an open-pollinated crop, meaning that wind or insect pollinators can pollinate and readily contaminate non-GMO alfalfa fields for distances as great as 1.5 miles.[24] Alfalfa contamination is already occurring in the United States.

In August 2013, a Washington state farmer reported that his alfalfa was rejected for export due to the presence of a genetically engineered trait. However, the USDA decided not to take any action to investigate transgenic alfalfa gene flow or to address ways to prevent contamination.[25] In addition to alfalfa, GMO wheat — which hasn't been field-tested since 2005 — was found on an Oregon farm in May 2013, causing Japan and South Korea to suspend some U.S. wheat imports. It is unclear how the GMO wheat appeared, but although one Monsanto representative tried to claim that it was the result of potential sabotage, there is zero evidence supporting that allegation.[26] Monsanto is currently working on herbicide-tolerant GMO wheat,[27] which once commercialized could follow in the path of alfalfa as a serious risk to organic and non-GMO farmers.

Strained Relations Between Neighbors

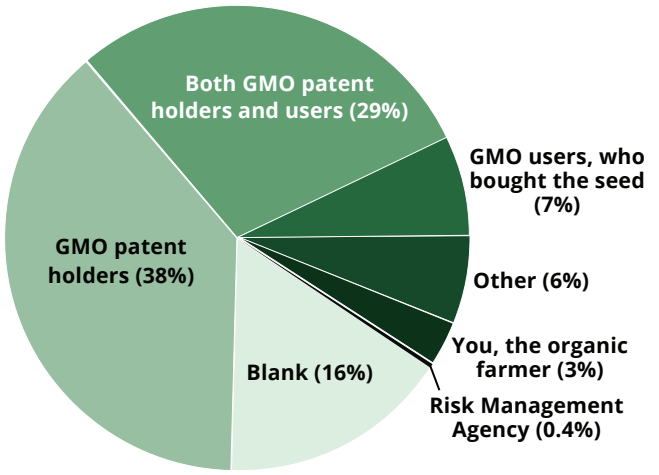
The survey asked farmers if they had any non-monetary costs from the threat of GMO contamination. Several responses described strain between GMO and non-GMO farmers. One farmer wrote that, "...every time I walk into the local co-op they grit their teeth."[28] Others wrote that "conventional farming neighbors do not respect us," that non-organic "neighbors feel that our farm is a thorn in their sides or a nuisance," and that they "are considered to be a problem to them because we are not GMO like the rest of them."[29] Some relationships have gotten so strained that "neighbors get bent out of shape" when approached about GMO issues, and "some neighbors will no longer tell us what they plant."[30]

Given the entrenched structural differences in types of farming that are creating this strain, solutions to coexistence that are based on efforts to improve communication seem unlikely to succeed. This tension between neighbors casts doubt on the emphasis being put by the AC21 Committee on communication between farmers as a primary strategy for coexistence.

Compensation for GMO-related Harm

Because of the significant economic loss associated with GMO contamination, our survey asked farmers who should have to pay the premium for a theoretical insurance package that was designed to cover those costs.

Who should pay the added crop insurance premium for coverage for contamination?



Nearly half (45 percent) of respondents said that they would not purchase crop insurance intended to cover costs associated with GMO contamination. Of the 35 percent of respondents respondents who answered that they would purchase insurance for GMO contamination-related losses, more than three-quarters of them (78 percent) believed that the added premium for coverage should be paid by GMO patent holders or GMO patent holders *and* GMO users. One farmer said: "Under no circumstances should an organic farmer have to buy insurance to protect him from financial harm due to GMO contamination. That responsibility should be with those companies selling this technology and those farmers using it."[31]

The respondents' comments made it quite clear that they believe it is unfair that those being harmed by GMO contamination most are the ones that would be responsible for also paying into an insurance program. Only 9 respondents (3 percent) said that organic farmers should be the ones to pay for the premium on contamination insurance.

One farmer noted: "Monsanto and allies are spending millions buying votes to vote against GMO labeling in the stores! They should pay for insurance for GMO contamination on organic land. All the big boys care about is their bottom line. They have to be held accountable if their [GMO seed] contaminates my crop!"[32]

During the series of AC21 meetings in 2011 and 2012, there was almost no discussion about the idea of a compensation fund paid into by the technology patent holder. But there is widespread agreement in the organic community,[33] backed up by the results of this survey, that the liable party for contamination should be the patent holder of the gene technology that profits from the technology. A time-tested foundation of liability has been that users of a new technology had to assume legal responsibility for its proper use and containment of its unintended consequences.

In addition to concerns about who would pay premiums for crop insurance to compensate for contamination, there is doubt that a crop insurance mechanism is feasible for organic growers. Crop insurance always has been intended for protection from natural disasters, and by its nature it would need to be significantly redesigned to cover this kind of loss. Although the USDA has made improvements to crop insurance coverage for organic producers in recent years, there are still some organic growers who are reimbursed for losses at conventional prices, instead of being covered for the higher value associated with their specialized production.[34] Others may not even have access to crop insurance if sufficient risk data associated with these crops are not available for developing an insurance policy.[35]

Conclusion

As the organic farmers surveyed made clear, peaceful coexistence between GMO crops and organic crops is unlikely, and contamination is already occurring. The burden of trying to protect themselves and paying for contamination is resting solely on organic farmers, rather than on the companies that profit from this technology and the users who have so far been able to escape responsibility for serious effort for containing it.

The USDA's focus on coexistence is misplaced. Instead of an extended discussion of coexistence, the department must recognize the harm that is already being done to organic and non-GMO farmers and prioritize ways to prevent contamination.

Food & Water Watch and OFARM recommend that:

- Biotech and seed companies holding GMO seed patents should be held accountable for all losses associated with GMO contamination and pay into a compensation fund to help farmers recover the full costs of their economic hardship caused by contamination.
- The USDA should create and enforce mandatory stewardship requirements for GMO crop production to ensure that responsibility for preventing contamination is shared, rather than resting solely on organic and non-GMO producers. These requirements should include buffer zones for GMO crop fields that adjoin organic and non-GMO crop fields to reduce GMO and chemical drift. This is especially important in light of the pending approval of crops engineered to tolerate herbicides such as 2,4-D that are prone to drift.
- The USDA should commit resources to researching, tracking and analyzing incidences of contamination and associated economic losses at all levels of the supply chain.
- The USDA should dedicate resources through its extension service to help educate GMO, non-GMO and organic farmers about this escalating problem and how to best avoid contamination problems.

Costs Not Limited to Farm Level

In addition to the survey, we interviewed organic grain marketing experts from several co-ops, which market grain from farmers in more than a dozen states.

These experts reaffirmed the opinions from survey respondents about contamination and the inappropriateness of crop insurance as a remedy. And several themes emerged from these interviews about trends seen in the marketing stage of the organic grain supply chain.

1. **Contamination is occurring.** Several marketers estimated that GMO contamination is either the first or second most frequent reason for loads being rejected by buyers. They also pointed out that contamination was a major problem in 2013 due to weather conditions that made it hard for growers to time their planting to avoid contamination of corn crops. One marketer estimated that 10 to 20 percent of the production his organization handled was rejected for GMO contamination in 2013, and another described rejections in 2013 as an "epidemic."
2. **Costs of contamination are imposed at the marketing level as well as at the farm level.** In addition to the costs described in the survey by growers, co-ops and grain marketing organizations are incurring costs as well. One organization went so far as to develop its own testing program, which costs them over $19,000 annually. In addition to their own testing efforts, other costs imposed at the marketing stage include:
   - Washing trucks to try to minimize potential contamination during shipping. (One marketer estimated that each truck washout costs $40 to $50.)
   - Loss of marketing fees if a load tests positive for GMO contamination and can no longer be sold for the original intended use, but will be accepted for animal feed or other lower-premium use. One marketer estimated that each shift from the food market to the animal feed market cost about $5.00 per bushel.
   - Extra labor to find new buyers if a load is rejected.
   - Shipping costs to move a load back to the farm or to a new buyer if a load is rejected. (One co-op reported freight costs that range from $500 to $900 per load. This means that a rejected load can add more than $1,000 in costs if the crop has to be shipped back to the farm and then to a second buyer.)

   Some marketers have gone so far as to limit themselves to lower-premium markets, such as animal feed, to reduce the costs and hassle of trying to complete sales to food markets with more rigorous GMO testing regimes. The cost of this limitation on the pool of potential buyers is hard to quantify, but very real.
3. **It is unrealistic to expect this issue to be resolved in the marketplace.** Many of the marketing experts we spoke to expressed their growing concern about their ability to be treated fairly in a system that relies predominantly on buyer testing programs. The variable nature of contamination, even within one load or one corn field, as well as the increasing sophistication of testing technology are major challenges to creating a testing system that protects both buyers and sellers of organic grain.

   Organic grain marketers expressed concern that they have little recourse if a buyer mistakenly finds contamination due to sloppy testing practices (such as not cleaning the sampling probe between samples). Another gave the example of a load of corn that was rejected when a buyer tested and found some level of contamination. The grower took the crop back, stored it separately from other crops and six months later shipped it to the same buyer, only to have it accepted.

   Everyone we spoke to expressed frustration that even after the growers and co-ops do their own testing before shipping the crop to the buyer, some loads are still rejected. Loads can be contaminated by dust from passing GMO soybean harvests or from trucks that had previously hauled GMO crops and had not been properly cleaned.

   Relying on the buyer-seller relationship to resolve this problem is not feasible. Growers and their marketers are worried that the considerable cost and effort of taking back a rejected load puts them in a vulnerable position. This makes some more willing to lose the premium for an organic food-grade crop, rather than pay to take the crop back and find a new buyer. These are the types of economic burdens that are not well suited to a crop insurance mechanism and indicate the urgent need for the USDA to focus on preventing contamination.

Costs of GMO Contamination Survey Results *(March 2014)*

General Information	
1. Farm Location	**17 states including:** MN: 70 respondents IA: 44 respondents WI: 33 respondents IL: 30 respondents KS: 22 respondents SD: 15 respondents NE: 15 respondents OH: 13 respondents IN: 5 respondents MT: 3 respondents ND: 2 respondents MD: 1 respondent MO: 1 respondent PA: 1 respondent TN: 1 respondent TX: 1 respondent WY: 1 respondent Blank: 2 respondents
2. Size of Farm (Acres)	0–100 acres: 29 respondents 101–500 acres: 154 respondents 501–1000 acres: 46 respondents 1001+ acres: 36 respondents Blank: 3 respondents Maximum: 12,000 acres Minimum: 5 acres Median number of acres: 334 acres Mean number of acres: 618.3 acres
3. Production method (organic, conventional, non-GMO, GMO):	Organic: 222 respondents (83%) Non-GMO: 6 respondents (2%) Organic and non-GMO: 15 respondents (6%) Conventional: 7 respondents (3%) GMO: 1 respondent (0.4%) Non-GMO and GMO: 5 respondents (2%) Blank: 3 respondents (1%) All: 9 (3%)
4. Number of crops, types grown (organic, conventional, non-GMO, GMO):	Corn: 188 respondents Soybeans: 153 respondents Pasture/Hay/Alfalfa: 163 respondents Oats: 85 respondents Wheat: 97 respondents Small grains: 72 respondents Other: 47 respondents
5. If organic, percentage organic?	Maximum: 100% Minimum: 3% Median: 100% Mean: 90% 0–25%: 14 respondents 26–50%: 9 respondents 51–75%: 13 respondents 76–100%: 219 respondents

(continued on page 10)

6. If organic, number of years organic?	Maximum: 170 years Minimum: 1 year Median: 15 years Mean: 17.5 years 0–5 yrs: 13 respondents 6–10 yrs: 41 respondents 11–20 yrs: 130 respondents 21–30 yrs: 39 respondents 31+ years: 18 respondents
Genetically Engineered Contamination	
7. How concerned are you about GMO contamination affecting your farm? *(0–1 not concerned at all, 2–4 not concerned, 5 neutral, 6–8 concerned, 9–10 very concerned)*	Not concerned at all: 11 respondents (4%) Not concerned: 15 respondents (6%) Neutral: 16 respondents (6% Concerned: 66 respondents (25%) Very concerned: 159 respondents (59%) Blank: 1 respondent (0.4%)
8. Do you think GMO growers and non-GMO growers can coexist? *(0–1 being no chance at coexistence, 2–4 little chance, 5 neutral, 6–8 chance, 9–10 high chance of coexistence)*	No chance: 58 respondents (22%) Little chance: 70 respondents (26%) Neutral: 55 respondents (21%) Chance: 54 respondents (20%) High chance: 27 respondents (10%) Blank: 4 respondents (1%)
9. Do you think good stewardship is enough to protect organic/non-GMO farmers from unintended GMO contamination? *(0–1 being very inadequate, 2–4 inadequate, 5 neutral, 6–8 adequate, 9–10 being very adequate)*	Totally inadequate: 99 respondents (37%) Inadequate: 82 respondents (31%) Neutral: 34 respondents (13%) Adequate: 40 respondents (15%) Very adequate: 11 respondents (4%) Blank: 2 respondents (1%)
Preventative Measures	
10. Do you have any buffers in place to prevent contamination from neighboring farms?	Yes: 255 respondents (95%) No: 11 respondents (4%) Blank: 2 respondents (1%)
10-a. If yes (255), is the buffer grass or conventional crop?	Grass: 160 respondents (63%) Conventional: 44 respondents (17%) Some of both: 45 respondents (18%) Blank: 6 respondents (2%)
10-b. Acreage of buffer?	Maximum: 67 acres Minimum: 0 acres Median: 5 acres Mean: 9.5 acres
10-c. Estimated annual cost/loss associated with buffer? *(include loss of premium because buffer crop is not sold as organic)*	Maximum: $45,000 Minimum: $0 Median: $2,500 Mean: $4,776
11. Do you delay planting to prevent contamination from neighboring farms?	**All (268):** Yes: 179 respondents (67%) No: 84 respondents (31%) Blank: 5 respondents (2%) **Corn Growers (188):** Yes: 141 respondents (75%) No: 45 respondents (24%) Blank: 2 respondents (1%) **Soy Growers (153):** Yes: 120 respondents (78%) No: 33 respondents (22%) Blank: 0 respondents

(continued on page 11)

11-a. If yes (179 respondents), are you missing an optimal production window?	Yes: 138 respondents (77%) No: 28 respondents (16%) Maybe: 1 respondent (1%) Blank: 12 respondents (7%) **Corn Growers who answered yes to Q11 (141):** Yes: 108 respondents (77%) No: 23 respondents (16%) Maybe: 1 respondent (0.7%) Blank: 9 respondents (6%) **Soy Growers who answered yes to Q11 (120):** Yes: 93 respondents (78%) No: 19 respondents (16%) Maybe: 1 respondents (0.8%) Blank: 7 respondents (6%)
11-b. If yes, by how many days?	Maximum: 30 days Minimum: 4 days Median: 12 days Mean: 13 days
11-c. Estimated yield drag associated with delayed planting?	**Corn:** Maximum: 500 bushels/acre Minimum: 2 bu/acre Median: 20 bu/acre Mean: 25 bu/acre **Soybeans:** Maximum: 80 bu/acre Minimum: 1 bu/acre Median: 5 bu/acre Mean: 8.2 bu/acre **Wheat/Other:** Maximum: 5 bu/acre Minimum: 45 bu/acre Median: 10 bu/acre Mean: 15.4 bu/acre
11-d. Estimated annual cost/loss associated with delayed planting?	**Corn:** Maximum: $361,200 Minimum: $100 Median: $5,280 Mean: $16,699 **Soybeans:** Maximum: $78,829 Minimum: $60 Median: $3,312 Mean: $8,713 **Wheat/Other:** Maximum: $39,837 Minimum: $150 Median: $4,000 Mean: $10,159
12. Do you test your crops for presence of GMO materials?	Yes: 56 respondents (21%) No: 208 respondents (78%) Blank: 4 respondents (2%)
12-a. If yes (56), which of the following tests do you use *(circle all that apply):*	ELISA Strip Test: 34 respondents (61%) Herbicide bioassay: 3 respondents (5%) Don't know: 2 respondents (4%) Other: 3 respondents (5%) Blank: 14 respondents (25%)

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12-b. Estimated annual cost associated with testing for GMO presence?	Maximum: $1,000 Minimum: $20 Median: $200 Mean: $321
13. Do you keep any additional records in an effort to protect yourself against GMO presence?	Yes: 97 respondents (36%) No: 151 respondents (56%) Blank: 20 respondents (7%)
13-a. If yes, what types of records do you keep?	Contamination log, cleaning out dates, planting dates, equipment logs, neighbor's activity log, neighbor's spray dates, non-GMO affidavits, non-GMO seed records, testing dates and results
13-b. Estimated time and resulting cost associated with record-keeping, if any?	**Hours/week:** Maximum: 50 hrs/wk Minimum: 0.02 hr/wk Median: 1 hr/wk Mean: 3.1 hrs/wk **Cost:** Maximum: $18,720/yr Minimum: $1/yr Median: $520/yr Mean: $1,318.55/yr
14. Do you take any other measures that either help to prevent contamination or lower the financial burden associated with GMO presence?	Yes: 94 respondents (35%) No: 116 respondents (43%) Blank: 58 respondents (22%)
14-a. If yes, what are these measures?	Cleaning out equipment, planting wider buffers than required, planting PuraMaize (GMO blocker hybrid corn), purchase non-GMO seed, careful monitoring of neighbors' activity, communication with neighbors about what they're planting, gave up growing corn, avoid conventional manure, change rotations depending on what neighbors are planting
14-b. What is the amount of time spent on these activities and associated cost, if any?	**Hours/week:** Maximum: 25 hrs/wk Minimum: 0.04 hrs/wk Median: 1 hr/wk Mean: 3.41 hrs/wk Maximum: $7,000/yr Minimum: $20/yr Median: $520/yr Mean: 1,004/yr
Contamination Incidents	
15. Have you ever found GMO presence or suspected it on your farm?	**All (268):** Yes: 84 respondents (31%) No: 170 respondents (63%) Maybe: 5 respondents (2%) Blank: 9 respondents (3%) **Corn Growers (188) only:** Yes: 63 respondents (34%) No: 115 respondents (61%) Maybe: 4 respondents (2%) Blank: 6 respondents (3%) **Soybean Growers (153) only:** Yes: 54 respondents (35%) No: 91 respondents (59%) Maybe: 4 respondents (3%) Blank: 4 respondents (3%)

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15-a. If yes (84), what crop(s) were affected? *(Some had multiple crops affected, so it does not add up to 84)*	Corn: 54 respondents Soybeans: 29 respondents Cotton: 1 respondent Wheat: 2 respondents Hay: 2 respondent Alfalfa: 2 respondents Milo: 1 respondent
15-b. What percentage of GMO presence was detected?	Maximum: 17.5% Minimum: 0.1% Median: 3.0% Mean: 4.4%
16. Have you ever been rejected by a buyer due to GMO presence in your grain?	**Those that said yes to Q15 only (84):** Yes: 44 respondents (52%) No: 40 respondents (48%) Blank: 0 respondents **Corn Growers only (63):** Yes: 37 respondents (59%) No: 26 respondents (41%) Blank: 0 respondents **Soybean Growers only (54):** Yes: 31 respondents (57%) No: 23 respondents (42%) Blank: 0 respondents
16-a. If yes (44), was the rejection for food, feed or both?	Food: 25 respondents (57%) Feed: 10 respondents (23%) Both: 8 respondents (18%) Blank: 1 respondent (2%)
16-b. When, and for how many seasons, did GMO presence occur?	**No. of years (Ranged from 1999–2013):** 1: 22 respondents (50%) 2–5: 12 respondents (27%) More than 5 years: 3 respondents (7%) Unknown: 1 respondent (2%) Blank: 6 respondents (14%)
16-c. How many bushels were rejected?	Maximum:105,000 bu Minimum: 300 bu Median: 1,000 bu Mean: 3,767 bu
16-d. What was the associated premium loss or cost due to this load rejection?	Maximum: $367,000 Minimum: $450 Median: $4,500 Mean: $14,140
17. Have you ever had any non-monetary losses due to GMO presence on your farm, i.e., relationship strain with local co-op, neighbors?	Yes: 55 respondents (21%) No: 152 respondents (57%) Blank: 61 respondents (23%)
17-a. If yes, please explain:	Over-spray and drift from neighbors, GMO farmers don't understand organic operations, GMO and conventional farmers don't respect non-GMO/organic farmers
18. If you have had GMO presence on your farm (84), were you approached by the company that held the patent on the GMO seed?	Yes: 1 respondents No: 65 respondents Blank: 18 respondents
18-a. If yes, how was the situation resolved?	The seed company said they would pay the difference if the load was rejected.
Compensation for GMO-related Financial Harm	
19. Do you have crop insurance?	Yes: 156 respondents (58%) No: 96 respondents (36%) Blank: 16 respondents (6%)

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20. If crop insurance was redesigned to cover costs associated with unintended GMO presence on your farm, would you purchase it?	Yes: 94 respondents (35%) No: 120 respondents (45%) Don't know: 22 respondents (8%) Blank: 32 respondents (12%)
20-a. If not, why?	Reasons included: cost, why should I pay if I didn't cause the problem, don't have a problem with contamination right now, don't believe in insurance
20-b. Who should pay the added premium for coverage?	**Of everyone:** Risk Management Agency (crop insurance provider): 1 respondent (0.4%) GMO patent holders: 103 respondents (38%) GMO users, who bought the seed: 19 respondents (7%) Both GMO patent holders and users: 77 respondents (29%) You, the organic farmer: 9 respondents (3%) Other: 16 respondents (6%) Blank: 43 respondents (16%) **Of those who answered yes (94) to 20:** Risk Management Agency (crop insurance provider): 1 respondent (1%) GMO patent holders: 38 respondents (40%) GMO users, who bought the seed: 5 respondents (5%) Both GMO patent holders and users: 31 respondents (33%) You, the organic farmer: 4 respondents (4%) Other: 10 respondents (11%) Blank: 5 respondents (5%) **Of those who answered no (120) to 20:** Risk Management Agency (crop insurance provider): 0 respondents GMO patent holders: 49 respondents (41%) GMO users, who bought the seed: 13 respondents (11%) Both GMO patent holders and users: 31 respondents (26%) You, the organic farmer: 4 respondents (3%) Other: 4 respondents (3%) Blank: 19 respondents (16%)

Endnotes

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3 USDA Advisory Committee on Biotechnology and 21st Century Agriculture (AC21). "Enhancing Coexistence: A Report of the AC21 to the Secretary of Agriculture." November 19, 2012 at 3 to 4.

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9 Greene (2011) at 21; Gealy (2007) at 11.

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11 Survey No. 35.

12 Survey Nos. 35, 133, 176

13 Coleman (2012) at 47.

14 *Ibid.*

15 *Ibid.* at 9.

16 Food & Water Watch estimates taken from interview with a Midwestern farmer co-op conducted on December 20, 2013.

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21 Survey No. 3.

22 Survey No. 130.

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30 Survey No. 214, 229

31 Survey No. 118.

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