Adoption and Coexistence of GE, Conventional non-GE, and Organic Crops

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July 29, 2013

Selected Poster prepared for presentation at the Agricultural & Applied Economics Association's 2013 AAEA & CAES Joint Annual Meeting, Washington, DC, August 4-6, 2013.

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Introduction

The adoption of genetically engineered (GE) crop varieties by U.S. farmers is widespread for major crops—94 percent of planted acres for soybeans, and 88 percent for corn in 2012 (USDA-NASS 2012).

The potential exists for GE crop production to impose costs on organic and conventional non-GE production via unintended presence of GE material along the supply chain through:

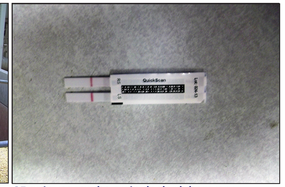
- Contamination of seed stock
- Accidental cross-pollination
- Accidental co-mingling during planting, harvesting, handling, and storing of crops (Bullock and Desquilbet 2002).

Maintaining the integrity of GE-differentiated product markets relies on segregation protocols such as:

- Hybrid selection and seed purity testing
- Physical distancing during crop production
- Equipment cleaning and product segregation during processing
- GE-testing (Greene and Smith 2010).

Under USDA regulations, GE methods and inputs are prohibited in organic production, but USDA has not set a tolerance level for accidental presence of GE material. Food manufacturers and retailers have sought additional assurance in recent years that foods labeled organic or natural do not contain GE material. Many buyers now require the use of avoidance protocols, including testing, and have set tolerance levels for accidental GE presence.

GE testing probe in a grain delivery truck
Photo courtesy of SunOpta Grains & Food Group, 2013.



GE strip test at the grain dealer laboratory
Photo courtesy of SunOpta Grains & Food Group, 2013.

Research Objectives

- Synthesize previous ERS findings on the adoption and coexistence of GE, organic and non-GE conventional crops.
- Examine the related economic issues using new data from several sources including consumers, farmers, and grain dealers.
- Identify the continuing gaps in data and research related to these differentiated markets.

Data & Methods

- Analysis of new data on the costs of coexistence from a pilot project that is part of the USDA's Agricultural Resource Management Survey (ARMS) for Organic Corn (2010) and Soybeans (2012).
- Site visits and interviews with ten major Organic and non-GE grain dealers for corn and soybeans in the U.S.
- Focus group at the 2013 Midwest Organic and Sustainable Education Service (MOSES) Organic Farming Conference to better assess the challenges of maintaining coexistence for farmers.

USDA Agricultural Resource Management Survey

USDA's major annual economic survey of producers is the Agricultural Resource Management Survey (ARMS), which collects detailed information about production practices, costs, and returns in major farm sectors. In 2005, ERS and NASS expanded the ARMS survey to include periodic oversamples of organic producers in order to enable side-by-side comparisons of organic and conventional production. A targeted oversample of certified organic corn producers was in the 2010 ARMS survey, and the questionnaire included questions on GE-testing and shipment rejection. The 2012 ARMS survey of conventional soybean producers had questions about non-GE soybean production and marketing.

USDA ARMS Survey States and Locations of Grain Dealers Interviewed

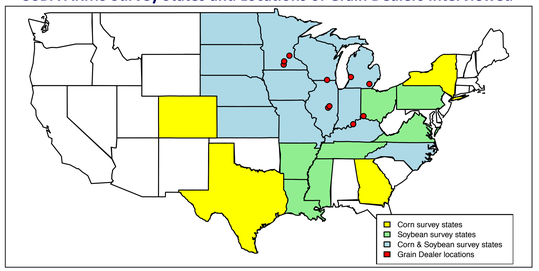


Table 1. Soybean Production

Non-GE seed as a % of all planted acres*	3.2%
% sold through in non-GE market	63.5%
% non-GE certified seed	63.0%
% Organic certified seed	N/A
% seed tested for GE	34.6%
% grown under production contract	31.5%
$ non-GE price premium per bushel	$2.50
GE seed as a % of all planted acres	96.8%

SOURCE: USDA Agricultural Resource Managment Survey, 2012.
*The ARMS sample was not stratified by production system, and non-GE production may be underestimated.

Table 2. Corn Production

Organic corn as a % of all planted acres	0.2%
% Organic certified seed	74.4%
% planting date to avoid cross pollination	25.6%
Conventional corn as a % of all planted acres	99.8%
Non-GE seed as a % of all planted acres	7.4%
GE seed as a % of all planted acres	92.6%
% of organic farmers who tested for GE in 2010	18.4%
% of organic farms with shipments ever rejected for GE presence	2.4%

SOURCE: USDA Agricultural Resource Managment Survey, 2010.

Grain Dealer Interviews

In 2011 and 2012, a team of researchers from USDA-ERS and the University of Maryland (UMD) interviewed ten corn and soybean trading companies in the Midwestern U.S. The grain dealers expressed a number of concerns about the coexistence of non-GE and organic production with GE production, including:

- Non-GE foundation seed is becoming unavailable
- Lack of non-GE and organic seed development for enhanced yield
- Increasing administrative, testing and segregation costs
- More difficulty finding replacement for specialty (non-GE and organic) grains when supply is low due to weather or aflatoxin/mycotoxin contamination
- Difficulty finding new organic and non-GE producers in the United States
- Increasing competition with GE corn and soybean producers
- Increasing foreign competition for non-GE and organic markets.

Table 3. Characteristics of GE-Differentiated Corn and Soybean Markets in the U.S.

Characteristic	USDA Certified Organic	Non-GE
U.S. Production Area[1,2]	***Corn:*** 0.2% of planted acres (2011) ***Soybeans:*** 0.2% of planted acres (2011)	***Corn:*** 7% of planted acres (2012) ***Soybeans:*** 12% of planted acres (2012)
Identity Preservation[3, 4]	Most sold through organic markets	**Corn:** Unknown **Soybeans:** 64% of the non-GE soybean crop was sold in markets for non-GE soybeans in 2012
Standards[5,6]	**Federal organic regulations:** • Prohibits GE • Requires GE avoidance practices • *Does not set GE tolerance level* • Excludes synthetic pesticides • Excludes synthetic fertilizers • Excludes sewage sludge • Maintain/improves soil condition • Fosters cycling of resources • Conserves biodiversity	**Private standards:** • Prohibit GE • Requires GE avoidance practices • *Sets GE tolerance level* • N/A • N/A • N/A • N/A • N/A • N/A
Certification[5,6]	Mandatory (for producers with over $5,000 in annual sales)	Voluntary—compliance with private sector protocols
GE testing[6]	Often—especially for food-grade corn and soybeans	Usually specified in a production contract or buyer agreement
Domestic supply[6,7]	Chronic shortages	Cyclical shortages for soybeans; Chronic shortages for corn
Price premiums[6]	Usually based on supply / demand	Usually tied to CBOT

SOURCES: (1) USDA-NASS Annual Acreage Survey; (2) USDA-ERS Certified Organic Production Database; (3) USDA 2011 Certified Organic Production Survey; (4) USDA Agricultural Resources Management Survey (2012); (5) USDA National Organic Program Final Rule (2000); (6) USDA-ERS/University of Maryland—Interviews with U.S. grain trading companies (2011-12); (7) USDA-ERS EIB-55, *Emerging Issues in the U.S. Organic Industry* (2009).

Farmer Focus Group: The Challenges of Coexistence

Researchers from USDA-ERS and UMD met with farmers attending the 2013 MOSES Organic Farming Conference in La Crosse, Wisconsin. The conference is the nation's largest educational and networking event for organic farming community. The focus group included both organic and non-GE corn and soybean producers, and the discussion focused on the markets for organic and non-GE crops and strategies to reduce GE risks.

- Because Non-GE is largely a ***product*** standard, it presents greater uncertainty than a mostly ***process***-based standard like organic. Also, the avoidance practices used by organic and non-GE producers are costly and do not guarantee compliance with non-GE tolerance levels:
  1. **Buffer strips**: the 30-foot strips required for organic production may not prevent cross-pollination of corn crops.
  2. **Scattered planting dates:** suboptimal time for non-GE farmers and crops may still pollinate simultaneously based on weather.
  3. **Use of non-GE seed stock:** seed testing is not sufficient to fully verify progeny.
- Sample testing of crops after harvest is subject to varying standards and protocols based on the buyer, and results are not always reliable. Should there be different standards for food, animal feed, seeds, and grains?
- What constitutes an equitable compensation structure? Crop insurance does not cover this type of liability, and losses due to accidental presence of GE material are paid for by the organic / non-GE farmers.

Conclusions

- Organic corn and soybean production has already stagnated in the U.S., and processors find it increasingly difficult to source non-GE corn and soybeans. The uneven distribution of the costs and risks to maintain GE-differentiated markets contributes to the challenges suppliers face in meeting the growing demand for organic and non-GE products.
- The strategies to reduce accidental presence of GE material in Non-GE and organic food products are costly for both farmers and processors. The lack of a uniform tolerance standard also increases uncertainty.

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Further Information

Please contact cgreene@ers.usda.gov for more information. ERS and the University of Maryland are both providing funding support (including in-kind funding) for this project. The views expressed are those of the authors, and should not be attributed to USDA, ERS, or UMD. Results are preliminary, do not cite without permission.