



Find the full report at [www.ers.usda.gov/publications/eib-economic-information-bulletin/eib-163](http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib-163)

# The Adoption of Genetically Engineered Alfalfa, Canola, and Sugarbeets in the United States

Jorge Fernandez-Cornejo, Seth Wechsler, and Daniel Milkove

## What Is the Issue?

Genetically engineered (GE) varieties of corn, soybeans, and cotton with herbicide-tolerant and/or insect-resistant traits were commercially introduced in the United States in 1996. Twenty years later, most corn, cotton, and soybean farmers use these varieties, and the impacts of adoption have been widely documented. By contrast, relatively little is known about the adoption of GE alfalfa, canola, and sugarbeets, crops that add substantial value to the U.S. agricultural sector. For instance, alfalfa is the fourth largest crop in the United States in terms of acreage and production value. It was also the first widely grown GE *perennial* to be commercialized. GE alfalfa and GE sugarbeets have been subjects of recent legal controversies.

## What Did the Study Find?

Most GE varieties of alfalfa, canola, and sugarbeets have herbicide-tolerant (HT) traits. The most common of these varieties are resistant to glyphosate.

### *Alfalfa*

- Approximately 18 million acres of alfalfa, with a production value of \$10.7 billion, were harvested in the United States in 2013. Alfalfa is the fourth largest crop in the United States (in terms of acreage and production value). South Dakota, Montana, North Dakota, Idaho, and Wisconsin account for 42 percent of national acreage devoted to alfalfa.
- The first GE HT alfalfa varieties were deregulated by USDA in June 2005. Deregulation facilitates commercialization by allowing the introduction (importation, interstate movement, and environmental release) of the GE organism without further authorization from USDA. Following legal action from environmental groups in March 2007, plantings were temporarily suspended while USDA's Animal and Plant Health Inspection Service (APHIS) prepared an Environmental Impact Statement (EIS). Once the applicable regulatory requirements were satisfied, GE HT alfalfa was fully deregulated in February 2011. Planting resumed that spring.
- Alfalfa is a perennial crop with an average of 6-7 years between plantings. Approximately 3.5 million acres were newly seeded in 2013 (14 percent of the acres that were harvested that year). Nearly one-third of this newly seeded alfalfa acreage was GE HT.
- Data from USDA's Agricultural Resource Management Survey (ARMS) indicate that GE HT alfalfa constituted 13 percent of the alfalfa acres harvested in 2013.

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

- GE HT alfalfa adoption rates were highest in New York, where approximately 37 percent of the acres that were harvested in 2013 were produced using GE HT. Adoption rates were also relatively high in Washington and Colorado.
- ARMS data from 2013 suggest that farmers who planted GE HT alfalfa had higher yields than farmers who planted conventional seeds. On average, adopters' yields were 0.53 ton per acre, approximately 17 percent higher than the yields of other farmers.

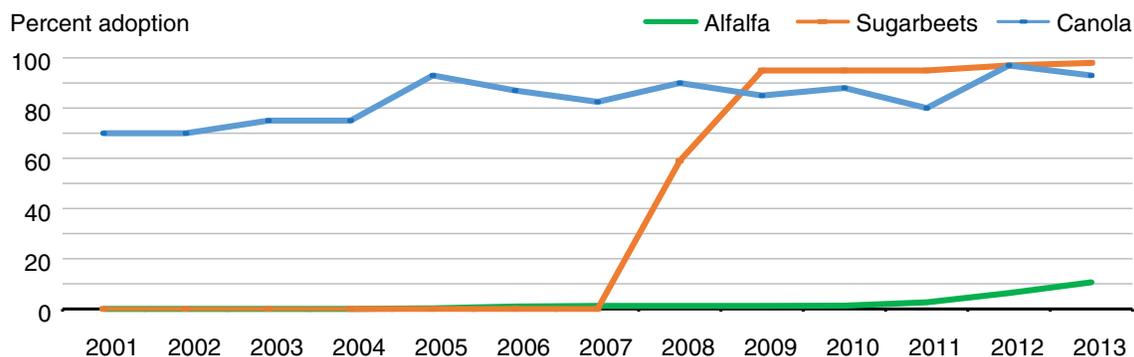
### Canola

- Approximately 1.3 million acres of canola (an edible version of rapeseed), with a production value of \$456 million, were harvested in the United States in 2013. North Dakota, Oklahoma, Montana, Idaho, and Washington accounted for 96 percent of U.S. canola production.
- GE HT canola varieties were deregulated in 1998. ARMS data indicate that GE HT canola accounted for 95 percent of U.S. canola acres that were harvested in 2013. While this result is based on a small sample, it is consistent with estimates obtained from other sources.

### Sugarbeets

- Approximately 1.2 million acres of sugarbeets, with a production value of \$1.6 billion, were harvested in 2013. Minnesota, North Dakota, Idaho, and Michigan accounted for over 80 percent of sugarbeet production in 2013.
- APHIS deregulated the first GE HT sugarbeets in 1998. Small amounts of these varieties were produced for testing and seed production in 2006 and 2007. GE HT sugarbeets were commercially introduced in 2008, and about 60 percent of total acreage was planted with GE HT seeds in that year. ARMS data indicate that over 99 percent of harvested acreage was produced using GE HT seeds in 2013.
- Previous studies suggest that using GE HT-based production systems increases sugarbeet root yields and reduces herbicide and labor costs.

#### Adoption of genetically engineered herbicide-tolerant (GE HT) sugarbeet



Note: Because alfalfa is a perennial, new alfalfa seedlings represent a small percent of the total GE alfalfa in production. Therefore, adoption rates for HT alfalfa were calculated as a percent of harvested acreage. Adoption rates for HT canola and HT sugarbeets were estimated as a percent of planted acreage.  
 Source: USDA, Economic Research Service using data from the International Service for the Acquisition of Agri-biotech Applications, Brookes and Barfoot (2014), Johnson et al. (2008), and National Agricultural Statistics Service (NASS).

## How Was the Study Conducted?

This report uses simple statistical methods and information from secondary sources to analyze the adoption of genetically engineered alfalfa, canola, and sugarbeets. The primary source is USDA's 2013 Agricultural Resource Management Survey, which is jointly managed by USDA's Economic Research Service and USDA, National Agricultural Statistics Service. Other data sources include publications by the International Service for the Acquisition of Agri-Biotech Applications (ISAAA) and the 2012 Census of Agriculture.