

Soybeans through the ages

Cultivation of soybeans was first reported in Asia in 11 B.C.E., but they weren't established as a major crop in the U.S. until the 1920s.¹ Planting and use expanded in the runup to World War II as they provided an alternative source of fat and oil.¹ Soybean production reached new highs in 2022 with news from the U.S. Department of Agriculture that 91 million acres would be planted—marking one of the few times in U.S. history that soybean acres would exceed corn acres.²

A history of soybean development and the introduction of biotechnology traits

Efforts to further develop and refine soybeans were ongoing in the U.S. by the 1870s, and by the early 1900s, there were approximately 23 varieties planted on less than 50,000 acres. Additional development, along with the influx of new soybean types collected internationally, prompted an ongoing expansion in varieties. However, the USDA did not initiate a focused and large-scale breeding and research program until 1963 when it incorporated state agriculture stations.³

The first soybeans with biotechnology traits, like herbicide tolerance or insect resistance, were introduced in the 1990s. The first herbicide-tolerant soybeans were commercialized in 1996 by Monsanto, whose Roundup Ready® soybeans were tolerant to glyphosate.

According to the USDA, by 2005, more than 85% of soybean acres in the U.S. were growing soybeans with biotechnology traits. By 2017, that number had increased to 94–95%.⁴

Expanding herbicide tolerance and weed control options

As the planting of herbicide-tolerant soybeans increased rapidly, concerns about an over-reliance on a single

herbicide for weed control were realized with the development and spread of glyphosate-resistant weeds. The first glyphosate-resistant weed in the U.S. was documented in 1998 with five more evolving in the next seven years.

As glyphosate-resistant weeds became more of a problem, several more herbicide-tolerant trait technologies were commercialized to bring different modes of action to farmers. Thirteen years after Roundup Ready soybeans were introduced, LibertyLink® soybeans were brought to market in 2009 providing new herbicide tolerance to glufosinate.

Roundup Ready 2 Xtend® soybeans followed LibertyLink soybeans in 2017, providing tolerance to glyphosate and dicamba.⁶ Use of dicamba helped farmers deal with glyphosate-tolerant weeds. However, the EPA estimates that more than one million acres of non-dicamba-tolerant soybeans may have been injured by herbicide drift. More than 3,500 dicamba-related incident reports were submitted in 2021.⁷ LibertyLink® GT27® launched in 2018, providing tolerance to glufosinate, isoxaflutole and glyphosate.

Enlist E3® soybeans were introduced in 2019. The technology provided tolerance to 2,4-D choline, glyphosate and glufosinate. Herbicides included Enlist One® herbicide (straight-goods 2,4-D choline that offers additional tank-mix flexibility with products like Durango® DMA® and Liberty®



Timeline of soybeans in the U.S.

1804 – Although growth may have started earlier, this marks the first recorded use of the word “soybean” in crop literature in the U.S.

1920–1930 – First records of any real acreage planted with soybeans in the U.S., about 1.8 million acres. However, the crop may have been used primarily for forage or hay.

1936 – The USDA officially opens its U.S. Regional Soybean Laboratory in Illinois. The facility focused on improving soybean varieties and plant breeding.

1941 – Supply chains are disrupted by WWII, creating more interest in soybeans as an alternative form of oil and fat. Financial incentives are established to support additional growth of soybeans.

1948 – The first U.S. government-sponsored germplasm collection is founded at Iowa State University.

1963 – The USDA establishes a large-scale cooperative soybean research program in conjunction with state agricultural stations across the country.

1980 – The Supreme Court rules that organisms created using genetic manipulation are to be granted copyright protection.

1996 – The first herbicide-tolerant soybean technology, Roundup Ready® soybeans, is launched.

2009 – LibertyLink® soybeans are launched.

2017 – Roundup Ready 2 Xtend® soybeans are released, prompting renewed interest in dicamba application.

2018 – LibertyLink® GT27® soybeans are commercialized.

2019 – Enlist E3® soybeans are commercialized.

2021 – XtendFlex® soybeans carrying tolerance to dicamba, glyphosate and glufosinate see a full launch, but 3,500 dicamba-related incident reports are submitted.

2021 – The Enlist® weed control system is America's fastest-growing trait herbicide system, with Enlist E3 soybean U.S. market share at ~35%.

2022 – In the U.S., more acres of soybeans are expected than acres of corn.

herbicides) and Enlist Duo® herbicide (a proprietary blend of 2,4-D choline and glyphosate). Enlist herbicides feature near-zero volatility and reduced physical drift potential. Adoption of the technology has been increasing rapidly, with Corteva Agriscience capturing about 35% of the U.S. market in 2021 and growing to more than 45% market share in 2022.*

The most recent trait technology to be released is XtendFlex® soybeans, which saw a full launch in 2021 and are tolerant to glyphosate, glufosinate and dicamba.

Conclusion

Soybeans have undergone a range of changes over the years, with the most recent iterations looking beyond plant quality and yield to elements of the production process. Biotechnology traits have been rapidly adopted across the market as more and more acres of soybeans are grown on an annual basis. However, planting herbicide-tolerant soybeans needs to be done with an understanding of herbicide management and good stewardship. Making herbicide application and the use of multiple modes of action part of a larger program approach can help protect the long-term viability of currently available and up-and-coming herbicide-tolerant soybean technologies.

*2022 Quarterly Earnings Report.

¹ Timmerman, Amy, Aaron Nygren, Brandy VanDeWalle, Loren Giesler, Ron Seymour, Keith Glewen, Charles Shapiro, Amit Jhala, and Don Treptow. “History of Soybean Management.” University of Nebraska Institute of Agriculture and Natural Resources Cropwatch. Accessed June 30, 2022. <https://cropwatch.unl.edu/soybean-management/history-soybean-management>.

² USDA. “Prospective Plantings.” National Agricultural Statistic Service, Agricultural Statistics Board, United States Department of Agriculture (Washington, DC: March 31, 2022). ISSN: 1949-159x.

³ Shurtleff, William, and Akiko Aoyagi. *History of Soybean Variety Development, Breeding and Genetic Engineering* (1902–2020). Lafayette, CA: Soyinfo Center, 2020. <https://www.soyinfocenter.com/books/229>.

⁴ “Most GE corn and cotton seeds now have both herbicide tolerance and insect resistance.” USDA Economic Research Service. Updated July 31, 2017. <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=84533>.

⁵ Boerboom, Chris, and Michael Owen. “Facts about Glyphosate-Resistant Weeds.” *Glyphosate, Weeds, and Crops Series*. Purdue Extension, 2006. <https://extension.purdue.edu/>.

⁶ Jhala, Amit. “Factors to Consider When Multiple Herbicide-Resistant Soybean Traits Coexist.” University of Nebraska Institute of Agriculture and Natural Resources Cropwatch. Updated April 6, 2021. <https://cropwatch.unl.edu/2021/factors-consider-when-multiple-herbicide-resistant-soybean-traits-coexist>.

⁷ Unglesbee, Emily. “EPA Details Dicamba Damage: EPA publishes dicamba damage report, but says label changes unlikely in 2022 season.” *Progressive Farmer*, December 21, 2021. <https://www.dtnpf.com/agriculture/web/ag/crops/article/2021/12/21/epa-publishes-dicamba-damage-report>.

* * Trademarks of Corteva Agriscience and its affiliated companies. The transgenic soybean event in Enlist E3® soybeans is jointly developed and owned by Corteva Agriscience and M.S. Technologies L.L.C. Enlist Duo® and Enlist One® herbicides are not registered for sale or use in all states or counties. Contact your state pesticide regulatory agency to determine if a product is registered for sale or use in your area. Enlist Duo and Enlist One are the only 2,4-D products authorized for use with Enlist crops. Consult Enlist herbicide labels for weed species controlled. Always read and follow label directions. Roundup Ready 2 Xtend® is a registered trademark of Monsanto Technology LLC used under license. DO NOT APPLY DICAMBA HERBICIDE IN-CROP TO SOYBEANS WITH Roundup Ready 2 Xtend® technology unless you use a dicamba herbicide product that is specifically labeled for that use in the location where you intend to make the application. IT IS A VIOLATION OF FEDERAL AND STATE LAW TO MAKE AN IN-CROP APPLICATION OF ANY DICAMBA HERBICIDE PRODUCT ON SOYBEANS WITH Roundup Ready 2 Xtend® technology, OR ANY OTHER PESTICIDE APPLICATION, UNLESS THE PRODUCT LABELING SPECIFICALLY AUTHORIZES THE USE. Contact the U.S. EPA and your state pesticide regulatory agency with any questions about the approval status of dicamba herbicide products for in-crop use with soybeans with Roundup Ready 2 Xtend® technology. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Soybeans with Roundup Ready 2 Xtend® technology contain genes that confer tolerance to glyphosate and dicamba. Glyphosate herbicides will kill crops that are not tolerant to glyphosate. Dicamba will kill crops that are not tolerant to dicamba. Corteva Agriscience is a member of Excellence Through Stewardship® (ETS). Corteva Agriscience products are commercialized in accordance with ETS Product Launch Stewardship Guidance and in compliance with the Corteva Agriscience policies regarding stewardship of those products. In line with these guidelines, our product launch process for responsible launches of new products includes a longstanding process to evaluate export market information, value chain consultations, and regulatory functionality. Growers and end-users must take all steps within their control to follow appropriate stewardship requirements and confirm their buyer's acceptance of the grain or other material being purchased. For more detailed information on the status of a trait or stack, please visit www.biotradestatus.com. Excellence Through Stewardship® is a registered trademark of Excellence Through Stewardship. Liberty®, LibertyLink® and the Water Droplet Design are registered trademarks of BASF.

© 2022 Corteva.