Soybeans: Trait Technologies Boost a Wonder Crop

With its multitude of food and industrial uses, soybeans are sometimes called a "wonder crop." Second on the list of the world's top-five food crops (corn is number one), soybeans are an inexpensive and important source of high-quality protein, fat and oil. Protein yield from soybeans, by weight, exceeds meat by two times, eggs by four times and bread by six times. Soybean oil is incredibly versatile and can be used to make everything from food to personal products to industrial oils and biofuels. It's also an excellent source of high-quality protein for poultry, swine and cattle. Soybeans are so intrinsic to the goods around us, it's hard to imagine a time they weren't ubiquitous in American farm fields. But in fact, high-volume soybean production in the U.S. is a relatively recent phenomenon — one that's grown and prospered thanks in large part to trait technology.

HISTORY OF SOYBEANS

Soybeans originated in southeast Asia, and historians estimate they were first domesticated by Chinese farmers in 1100 BCE. Their first documented use in the U.S. dates to 1765, when they were farmed in what was then the colony of Georgia. In the mid-1800s, soybeans began being planted in the Corn Belt, with cultivation expanding in the 1870s when farmers discovered the utility of soybeans as livestock feed. In 1904, George Washington Carver discovered that soybeans were valuable as a source of protein and oil and helped preserve soil quality.[1] He encouraged farmers to plant soybeans in rotation with other crops to help restore nitrogen in their fields.

Still, for decades, most of the soybeans used in the U.S. were imported from China. This changed with the onset of World War II, which cut off import supplies just as demand was rising for industrial applications of soybean oil. Domestic production increased, and following the war, a growing American economy and improved nutrition meant more demand for meat. Livestock producers increasingly turned to soybeans as an affordable source of protein to feed animals. As demand for the "wonder crop" kept growing, technology would provide a way to produce soybeans more efficiently than ever.

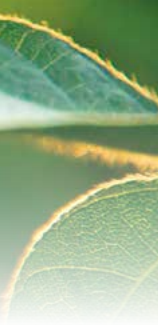
INTRODUCTION OF HERBICIDE-TOLERANT (HT) TRAITS

The soybean industry was forever changed in 1996 when Monsanto introduced the first traited soybeans. With Roundup Ready® glyphosate-tolerant soybeans, farmers could spray for weeds after soybean emergence. With better weed control, yields improved. This new technology was adopted quickly and by 2002, 81% of U.S. soybean acres were planted with traited seed.[2] The next advances came quickly. In 2008, Monsanto introduced their next-generation Roundup Ready® 2 soybeans, and the following year brought the release of LibertyLink® soybeans tolerant to glufosinate. Monsanto then released Roundup Ready 2 Xtend® soybeans in 2016, with tolerance to dicamba and glyphosate. Growers were enthusiastic adopters of these advances. By 2018, at least 93% of acreage involved in U.S. soybean production used HT-traited seed,[2] but farmers were ready for new tools in the fight against weeds.

ENLIST E3® SOYBEANS HIT THE MARKET

Traited soybeans took their next big step forward in 2019 with the release of Enlist E3® soybeans, with tolerance to three herbicides: 2,4-D choline in Enlist® herbicides, glyphosate and glufosinate. Farmers now had expanded options in the fight against resistant weeds in an easy-to-use system. Paired with Enlist® herbicides that have near-zero volatility, flexible application timing and expansive options for tank-mixing, Enlist E3 soybeans quickly gained a reputation for convenience and performance.

In 2021, the adoption rate of Enlist E3 soybeans on U.S. soybean acres reached 35%, making it America's fastest growing soybean trait herbicide system. The trend continued, and by October of 2022, grower adoption of Enlist E3 soybeans had reached 45%.[3] That same year, the



U.S. EPA granted Enlist One® and Enlist Duo® herbicides amended registrations through January 11, 2029, giving farmers increased confidence in having long-term access to these products to support growing Enlist E3 soybeans. In 2023, just four years after full commercial launch, Enlist E3 soybeans became the number-one selling soybean technology in the U.S., with 58% market penetration.

Of course, the drive for better soybean trait technologies won't stop there. Corteva Agriscience is continuing to pursue the next advances in soybean traits to serve the needs of farmers, industry and the food chain. The future may hold new herbicide tolerances, improved nutritional and oil profiles and environmental benefits that allow soybeans to yield more with fewer inputs. Corteva looks forward to introducing the next trait technologies that will give us all even more reasons to marvel at this "wonder crop."

HISTORY OF SOYBEANS

1100 BC
Soybeans are first domesticated in China

1765
First documented soybeans in the U.S.

1870s
Farmers start planting soybeans as livestock forage

1904
George Washington Carver discovers their value as a source of protein and oil

1940s
Domestic production ramps up to meet demand during WWII

1996
The first soybean trait technology, Roundup Ready®, is introduced

2019
Corteva launches Enlist E3® soybeans

2021
35% of U.S. soybean acres are planted with Enlist E3 soybeans

2022
Enlist E3 soybeans hit 45% adoption in U.S.

2023
58% of U.S. soybean acres are planted with Enlist E3 soybeans

[1] NC Soybean Producers Association. "History of Soybeans." Accessed March 25, 2024. https://ncsoy.org/media-resources/history-of-soybeans/.

[2] USDA Economic Research Service U.S. Department of Agriculture. "U.S. Soybean Production Expands Since 2002 as Farmers Adopt New Practices, Technologies." Accessed March 25, 2024. https://www.ers.usda.gov/amber-waves/2023/july/u-s-soybean-production-expands-since-2002-as-farmers-adopt-new-practices-technologies/.

[3] Farm Progress. "Rapid Adoption of Enlist E3 Soybeans Continues." Accessed March 25, 2024. https://www.farmprogress.com/crops/rapid-adoption-of-enlist-e3-soybeans-continues.

CORTEVA™ agriscience