Science Societies

Seeds of change: Ohio’s crop performance trials reveal decades of yield improvement

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Photo courtesy of Adobe Stock/Jana.



The Ohio Crop Performance Trials have provided unbiased, real-world data for more than 50 years, helping farmers compare crop hybrids and varieties across diverse Ohio growing conditions. By combining long-term yield data with farmer-managed fields and evolving genetics, the trials show how advances in seed technology, rotations, and conservation practices have doubled yields while improving efficiency. Today, the program remains a key decision-making resource as farmers navigate tight margins and increasingly complex seed choices.

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For more than 50 years, the Ohio Crop Performance Trials have served as living laboratories providing crucial data on seed hybrids and varieties for farmers, seed companies, breeding programs, agronomists, and CCAs. The on-farm Ohio crop performance trials have collected a cornucopia of data through the decades on farming practices and yields across numerous locations in the state, giving valuable insight into how crop hybrids and varieties perform across diverse growing conditions.

While similar trials have closed due to declining participation from seed companies or lack of infrastructure and resources to maintain the trials. The Ohio State University (OSU) program continues giving producers and stakeholders consistent, location-specific performance data on key crops like corn, soybean, and wheat.

The plots are located at strategic and representative locations across the state. While some are located at OSU's research farms, most are through cooperation with farmers. The corn program runs 9 to 11 locations across Ohio with six locations for soybeans and five for wheat. Small plots are used to replicate each seed hybrid or variety submitted at each location. Seed companies voluntarily submit seed entries into the program each year with the entry fees covering the operating costs for the trials.

Making the trials unique is farmer involvement in each of the plots. While university researchers plant and harvest the plots at the university farms and farmer fields, most cooperating farmers contribute general field management, such as deciding tillage practices, fertility rates, crop rotations, and herbicide programs, says Dr. Osler Ortez, assistant professor for corn and emerging crops at OSU, who supervises the Ohio Corn Performance Test.



Of the Ohio Crop Performance Trials, "farmers decide tillage practices and fertility and weed control programs," says Dr. Osler

Ortez from The Ohio State University, pictured here during a field day.

"In 2025, from our 10 sites, three of these were on university farms with the other seven in partnerships with farmers across the state," Ortez explains. "For the most part, farmers decide tillage practices and fertility and weed control programs. We come in as a guests, plant, monitor, and harvest the trials to understand the potential yields of a given corn hybrid."

The university researchers collect data from each location, which are then compiled in an annual report and compared with data from the two prior years of trials for analysis. The annual report for each crop has become a go-to source of unbiased field data for farmers, CCAs, and seed companies on the yield performance of hybrids and varieties.

Dr. Laura Lindsey, professor of soybean and small grains at OSU, leads the trials for soybeans and wheat. The long-history of the annual trials, she says, provides a valuable source of yield data and cropping systems for farmers to use in the field.

The research results in all three main crops often show wide variations in yield of 20 to 30% between the hybrids or varieties at any given year or location with important implications on farm profitability

"If there's a variety that comes out on top across years and across locations, that would be one that we would recommend the farmer plant potentially," Lindsey says. "From the farmer's standpoint of margins, they can compare that on the seed cost, the seed treatments and the herbicide cost."

Yield improvements

Undeniable in the history of data is the phenomenal increases in crop yields, Ortez points out. Looking through the decades of data reveals fascinating trends that show

how numerous factors spanning seed genetics, technology, and evolving farming practices have combined to lift crop yields. Corn yields have skyrocketed over the years, much of that owed to seed genetics, technology, and farming practices, Ortez says.

"Fast forward 50 years later, we are looking at anywhere between 240 to 270 bushels of corn per acre. ... Corn yields pretty much doubled."

"In the first three years of the corn trials, 1972–1974, we were producing somewhere between 120 to 150 bushels per acre of corn in the trial," Ortez says. "Now, fast forward 50 years later, we are looking at anywhere between 240 to 270 bushels of corn per acre in the same trial. Corn yields pretty much doubled. What kind of corn genetics did we have in 1972? There were no traits, just conventional single-cross materials. From about 1995 forward, we entered the biotech-GMO era with largely improved hybrids and traits dominating the corn production space across the U.S."

The Ohio trials started documenting the number of traits in 2005, Ortez says. In corn hybrids, the most common traits represented in the corn test program are European corn borer, glyphosate herbicide tolerance, rootworm resistance, glufosinate tolerance, and drought tolerance. Over time, the corn trials show increasing use of traits in hybrids with up to six traits included in a given hybrid between 2005 and 2021, according to Ortez.

“In 2005, we reported up to three traits per hybrid,” he says. “By 2010, we reported up to four traits per hybrid, and by 2015 we were seeing six per hybrid. There was slight drop in 2017, but were back to six traits per hybrid in 2020–2021.”

Ortez adds that corn has also benefited from less lodging over time with improved genetics.

“We went from about 5 to 20% of the corn crop lodging in the 1970s, and we are now down to about 5% or less lodging over the last decade of corn trials for the most part,” he notes. “A lot of the differences are explained by hybrid.”

With wheat being a non-transgenic crop that doesn’t benefit from traits like corn or soybeans, Lindsey notes that breeding is still important, particularly for managing Fusarium head blight. The highest-yielding crops across five locations in this year’s trials tended to be varieties that had more Fusarium head blight resistance, she notes.



One of the most common traits in corn hybrids in the Ohio corn test program is for control of European corn borer, shown here. Photo by Mariusz Sobieski, Bugwood.org.

The accelerating pace of innovation in seed genetics—particularly for corn and soybeans—creates challenges for researchers evaluating crop performance in the trials for comparison to trials of prior years, Lindsey points out.

“We have a lot of variety turnover,” Lindsay explains. “We try to test varieties for more than one year, but the reality is we can't because there's so much turnover in the industry as breeders improve their varieties, especially in the corn and soybean space. For wheat, you have less turnover, but I think you have less wheat breeders in general, and it's a fairly minor crop in Ohio compared to soybeans or corn.”

The innovation in seed varieties is keeping pace with changes across different herbicide technologies as breeders keep up with herbicide resistance, Lindsey notes. The trials adapted to compare varieties with herbicide resistance versus conventional varieties.

Crop genetics have adapted to much higher seeding rates, Ortez adds.



Seeding rates have gone up in the Ohio corn trials from 27,500 seeds/ac in 1972 to 36,000 seeds/ac. Photo by Ricardo Costa Silva (not part of the Ohio trials).

“We bumped up seeding rates in 50 years,” he says. “The seeding rate in this trial for 1972 was 27,500 seeds per acre. Today we are looking at about 36,000 seeds per acre. That’s a 30% increase. So, we are being more intensive in terms of management.”

The new hybrids can tolerate a higher plant population, Ortez says, explaining that the plant physiology has changed to accommodate higher plant populations, such as having more upright leaves. Older corn genetics do not perform as well under high plant populations.

Seed treatments have also expanded alongside increased use of traits, higher seeding rates, and herbicide technologies over the years, Lindsey says.



The rise of seed treatments creates new challenges in evaluating variety performance in the crop trials since "it's not a true genetic comparison," says Ohio State's Laura Lindsey. Photo by Kaitland Miller.

"There are a lot more seed treatments now," she says, noting that the rise of seed treatments creates new challenges in evaluating variety performance in the crop trials. Each variety arrives with specific treatments already pre-applied from the company submitting the seed. "So it's not a true genetic comparison. It's more of a seed package—the genetics plus the treatment that the company provided," Lindsey explains, adding that the seed treatments are included in the final report, so farmers can see what seed treatment was used with which variety.

Ortez agrees that seed treatments have played a growing role in the trials and have contributed to crop performance.

"We have more seed treatment strategies now with new seed treatment products on every hybrid that we are planting in the field," he says. "That practice has at least

partially contributed to an observed increase in the germination rates."

Crop rotations and tillage

The adoption of crop rotations and reduced tillage accompanied yield improvements in the past 50 years. Crop rotations have evolved with the corn-soybean rotation being the most practiced in fields used under the corn performance trials, Ortez explains, while acreage devoted to continuous corn has dwindled.

"In the earlier years of the corn trials, the predominant preceding crop was corn with little presence of soybean and wheat," Ortez notes. "That has changed over time. In the most recent decade, we have 80% of the fields in the test under a corn–soybean rotation. Ten percent of previous crops were wheat, and only 10% were corn."



The adoption of crop rotations and reduced tillage accompanied yield improvements in the past 50 years. Photo courtesy of USDA.

The shift to a primarily corn–soybean rotation instead of continuous corn is good news agronomically, Ortez argues.

"If you are growing corn-on-corn, you are building up issues that can often penalize subsequent corn yields, including pest population increases and crop residue buildup," Ortez explains. "When you bring soybeans into the system, soybeans fix nitrogen from the atmosphere. So, there is free nitrogen coming into the system with the benefit of faster residue decomposition."

Low crop prices are creating interest among farmers in bringing alternative crops into rotations, says Lindsey, as farmers look for more profitable opportunities.

“We’ve done a little variety comparison with hybrid rye and barley, but nothing to the scale of what we do with wheat and soybeans,” says Lindsey. “There aren’t a lot of these crops flooding in [to the trials].”

The emergence of new herbicides and crop genetics, especially for corn and soybeans, has had the combined effect of allowing farmers to reduce tillage, which has also accompanied the steady rise in crop yields, Ortez notes.

“In 1972–1978, 100% of the fields in the trial were all conventional till,” he says. “In 1979, the first reported no-till field came in as a practice for our performance trials, and no-till started to expand over time. By 1996, we had the first report for stale seedbed, which is a reduced tillage practice aiming at better weed control. By 2008–2010, only about 15% of the fields in the trial were still conventional till with the rest being minimum or reduced till. From 2013–2020, strip-till was introduced. By 2021, none of our fields in the trials had conventional till. We are now doing a better job with conservation practices and reducing soil disturbance.”



As crop yields continue to climb, fertility rates have fallen. Photo courtesy of Alamy/Grant Heilman Photography.

Improved environmental stewardship with fertilizer has also accompanied improved genetics, more effective crop rotations, and reduced tillage, Ortez adds. Historical trial data in Ohio shows that as crop yields continue to climb, fertility rates have fallen.

“We have a figure that summarizes how much fertilizer was being applied for nitrogen,

phosphorus, and potassium," Ortez explains. "Surprisingly, since the 1970s, we are seeing a decrease in application rates over time, and more so for nitrogen. We are cutting nitrogen and other fertilizer rates and keeping up with higher yields. We are producing more with less."

Data and profitability

Ohio's crop performance trials have served a simple but powerful purpose: reduce uncertainty in an increasingly complex farming landscape, Lindsey says. By combining real-world field conditions, scientific rigor, and transparent timely reporting, the trials help farmers make smarter, data-driven decisions.

A data-based approach to selecting seed hybrids or varieties becomes even more important when farm margins are stressed from low commodity prices and high input prices, Lindsey says, pointing out that seed is an expense affecting every farmer.

"Right now, farm margins are really, really, tight," she notes. "Because seed is an expense that farmers must have, I think variety and hybrid selection is going to be important going into 2026. What they could take away from the trials is that they may not need to spend the highest amount of money."

But price alone shouldn't drive seed selection, Lindsey cautions. Cheaper or older seed varieties may carry risks.

"Sometimes people want to save money by purchasing an older variety that may not perform as well as a newer variety," she says.

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Lindsey warns that buying something cheap or planting untreated seed could create other issues that negatively impact yield and profitability.

Since results can vary from site to site and year to year, Lindsey encourages farmers and their CCAs to take a multi-data approach to seed selection rather than focusing just on seed price.

“The more data a farmer can have, the better,” stresses Lindsey. “I always tell farmers we're one source of information. If possible, get multiple sources. We always want farmers to look at multiple locations and multiple years as much as possible. So, use our data, use the seed company data, and look at the pest resistance packages of these different seed offerings. We're one piece of the puzzle that you may want to use to make your seed selection decisions.”

Dig deeper

Ohio Crop Performance Trials: https://u.osu.edu/perf/archive/

An Overview of the Ohio Corn Performance Test: Trends Over 50 Years: https://doi.org/10.1002/agj2.21727

Historical Changes and Yield in the Ohio Corn Performance Test: A 50-year Summary: https://doi.org/10.1002/agj2.21746

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1. Which crops are primarily included in the Ohio Crop Performance Trials?

a. Corn, rice, and barley.

b. Corn, soybeans, and wheat.

c. Soybeans, cotton, and wheat.

d. Corn, oats, and alfalfa.

2. Who usually decides field management practices for most trial plots?

a. Seed companies.

b. University administrators.

c. Government agencies.

d. Cooperating farmers.

3. The Ohio Crop Performance Trials have been collecting data for more than 50 years.

a. True.

b. False.

4. How often are trial results published?

a. Monthly.

b. Annually.

c. Every two years.

d. Every five years.

5. What range of yield variation is commonly observed between varieties?

a. 5% to 10%.

b. 10% to 15%.

c. 20% to 30%.

d. 40% to 50%.

6. Approximately how much have corn yields increased since the early 1970s?

a. They have doubled.

b. They have tripled.

c. They stayed the same.

d. They decreased.

7. Wheat trials benefit from transgenic traits in the same way corn does.

a. True.

b. False.

8. What is one major benefit of improved corn genetics over time?

a. Higher lodging rates.

b. Lower seed costs.

c. Elimination of fertilizers.

d. Reduced lodging.

9. How have corn seeding rates changed since 1972?

a. They have decreased by 30%.

b. They have remained the same.

c. They have increased by about 30%.

d. They have doubled.

10. According to Laura Lindsey, what should farmers rely on most when selecting seed?

a. Lowest price available.

b. One trusted company.

c. Government recommendations.

d. Multiple sources of data.

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