The Farming Systems Trial (FST) at Rodale Institute is the longest-running side-by-side comparison of organic and conventional grain cropping systems in North America. After nearly 40 years, data from FST has established that organic management practices match or outperform conventional. FST continues to innovate to determine the potential for organic agriculture to benefit soil, human and environmental health.

Our decades-long research has shown that, in comparison with conventional methods, organic systems:

• **PRODUCE** competitive yields after a 5-year transition period
• **YIELD** up to 40% more in times of drought
• **EARN** 3-6x greater profits for farmers
• **IMPROVE** soil health and build soil organic matter over time
• **USE** 45% less energy
• **RELEASE** 40% fewer carbon emissions
• **LEACH** no atrazine, a toxic chemical, into waterways

**OUR MISSION**

Through organic leadership, we improve the health and well-being of people and the planet.

**RESULTS AT A GLANCE**

RODALE INSTITUTE is a 501(c)(3) nonprofit dedicated to pioneering organic farming through research and outreach. For more than 70 years, we’ve been researching the best practices in organic agriculture and sharing our findings with farmers and scientists throughout the world, advocating for policies that support farmers, and educating consumers about how going organic is the healthiest option for people and the planet.

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Learn more at RODALEINSTITUTE.ORG/FST
The Farming Systems Trial was started in 1981 to study the dynamics of transitioning from conventional to organic agriculture. Since inception, FST has compared three core systems: a manure-based organic system, a legume-based organic system, and a chemical input-based conventional system. In each, corn and soybean production is the focus, because 70% of U.S. acreage is devoted to growing grains. In 2008, each core system was further divided to compare traditional tillage with no-till practices. At that time, genetically modified corn and soybeans were also introduced to the conventional system to mirror common practice.

The Farming Systems Trial is leguminous cover crops and crop rotation is the primary line of defense against pests. The innovative roller crimper, developed here at Rodale Institute, enables farmers to terminate a cover crop and create a weed-suppressing mulch while planting the next crop—all in a single pass.

Corn and soybean crops in organic systems tolerate higher levels of weed competition than their conventional counterparts while producing equivalent yields. We utilize the roller crimper as our primary weed control tool in organic no-till systems, and we continue to research best practices for reducing weed pressures.

Data from 2018 shows that conventional systems leach atrazine, an herbicide known to disrupt human and animal endocrine systems, into the water table. Organic systems, which do not rely on synthetic inputs, leach zero atrazine.

In 2018, we began a new study in partnership with Stroud Water Research Center to explore and educate the public on connections between farming practices and clean water. We are conducting a trial similar in design to FST comparing organic, conventional, and conservation agriculture on 40 acres of sloped land in Choteau County, Pennsylvania, to measure:

- Residues of pesticides, fungicides, and herbicides on crops and in the water and soil
- Water infiltration rates
- Quantity and composition of runoff
- Stream water quality, or the presence of harmful microbes in the water
- Crop yields
- Physical, chemical, and biological properties of soil
- Emissions and energy use

Looking upstream at the way we farm can have a huge impact on the quality and quantity of clean, fresh water available worldwide.

**SUMMARY**

After nearly 40 years of existence, FST continues to demonstrate, through scientific research data, that organic farming outperforms conventional systems with regard to building, maintaining, and replenishing the health of the soil, which is the key to regenerative agriculture.

**WEED CONTROL**

Corn and soybean crops in organic systems tolerate higher levels of weed competition than their conventional counterparts while producing equivalent yields. We utilize the roller crimper as our primary weed control tool in organic no-till systems, and we continue to research best practices for reducing weed pressures.

**SOIL HEALTH**

Healthy soil allows plants to grow to their maximum productivity while limiting disease, pest and fertility issues, and without a need for off-farm inputs. FST data shows that soil health in organic systems continuously increases over time, while soil health in conventional systems remains essentially unchanged.

**YIELDS**

Consistent with our long-term finding that organic can outperform conventional, in 2016, our no-till organic manure systems produced 200 bushels of corn per acre. It was a record-breaking yield for our county that surpassed both conventional yields and the county average by 22%.

Due to better soil health & water-holding capacity, organic grains outperform conventional, in years of drought or extreme weather. Due to improved soil health, percolates through the soil, increasing over time, while soil health in conventional systems remains essentially unchanged.

**HUMAN HEALTH: NUTRIENT-DENSITY**

Preliminary research reveals that organic oats grown in systems utilizing legume cover crops contain higher levels of total protein and higher levels of 8 out of 13 essential minerals analyzed—including magnesium, zinc, phosphorus, and potassium—than conventional oats.

**WATER HEALTH**

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Looking upstream at the way we farm can have a huge impact on the quality and quantity of clean, fresh water available worldwide.

**ABOUT**

The Farming Systems Trial was started in 1981 to study the dynamics of transitioning from conventional to organic agriculture. Since inception, FST has compared three core systems: a manure-based organic system, a legume-based organic system, and a chemical input-based conventional system. In each, corn and soybean production is the focus, because 70% of U.S. acreage is devoted to growing grains. In 2008, each core system was further divided to compare traditional tillage with no-till practices. At that time, genetically modified corn and soybeans were also introduced to the conventional system to mirror common practice.

**THE DIFFERENT SYSTEMS**

**ORGANIC MANURE**

This system represents an organic cash grain system. It features a mid-length rotation consisting of annual grain crops and perennial forage crops. Fertility is provided by leguminous cover crops and crop rotation is the primary line of defense against pests.

**ORGANIC LEGUME**

This system represents an organic cash grain system. It features a mid-length rotation consisting of annual grain crops and perennial forage crops. Fertility is provided by leguminous cover crops and crop rotation is the primary line of defense against pests.

**CONVENTIONAL SYNTHETIC**

This system represents a typical U.S. grain farm. It relies on synthetic nitrogen for fertility, and weeds are controlled by synthetic herbicides selected by and applied at rates recommended by Penn State University Cooperative Extension.