

By Bill Spiegel, Crops Editor



**Soil health test sampling protocol is the same as for regular soil fertility tests. For this story, Heartland Soil Sampling's Mike Viethaler pulled 10 to 12 cores, creating one composite sample per 2½-acre grids. Be sure the laboratory's procedures are calibrated to the depth of the samples you pull.**

farm in Jewell County, Kansas. Technician Mike Viethaler pulled 6-inch composite samples in 2½-acre grids; each composite contained 10 to 12 cores.

Both fields consist of Harney silt loam soils, have been in diverse cash crop rotations for several decades, and had wheat harvested from them in the summer of 2016. Field 1 has been in a strict no-till system since 2001; Field 2 has had conventional tillage for at least 70 years.

For soil health testing, we mixed soils from all the grid samples to obtain one composite sample per field. For all but the Ohio State University test, we sent composite samples to the respective laboratories for testing. To ensure objectivity, I paid for all services.

## ABOUT THE TESTS

Our comparison included five commonly available soil health tests from four different laboratories.

### Phospholipid Fatty Acid (PLFA) Test, Ward Laboratories

Ray Ward, founder of Ward Laboratories, developed the PLFA test to measure the breakdown of organic material in the soil and the feeding on this material that occurs by the

soil microbial community. It helps farmers understand whether the crop production system used is sustainable.

### Haney Soil Health Analysis, Ward Laboratories

Several laboratories offer the Haney test, developed by Rick Haney, soil scientist for USDA's Ag Research Service in Temple, Texas.

The Haney test uses chemistry to measure the amount of nutrients readily available to soil microbes. It includes the Solvita CO<sub>2</sub> Burst test, in which a specific amount of water is added to dried soil to cause a burst of carbon dioxide, which indicates microbial biomass and correlates with nitrogen mineralization. The report shows values for organic carbon, nitrogen, and phosphorous, plus it indicates the amount of organic fertilizer for the next crop.

### Soil Quality Field Test Kit, Ohio State University

Developed by soil scientist Rafiq Islam, farmers can perform this test at home in about 30 minutes. It measures the amount of active organic matter, which serves as an indicator of soil quality, plus nutrient availability and crop yield potential.

This is a self-contained kit with excellent instructions on how to mix soil with provided chemistry. The vial of soil turns a color that corresponds with a laminated, color-coded card that indicates soil health.

### Regular Soil Health Test, Woods End Laboratories

Producers who use this ▶

## SOIL HEALTH TESTS

CAN YOU MEASURE WHAT CANNOT BE SEEN?

For all the momentum the adoption of soil health practices has gathered in the last half decade, there remains one glaring hurdle toward their adoption: a lack of standard that measures how healthy a farm's soils may actually be.

Without a gold standard soil health test, it is difficult for farmers to ascertain whether they are making progress in the soil health movement. However, several private industries have created soil health tests of their own.

*Successful Farming* magazine set out to evaluate some of the more popular soil health tests with one end goal: Discover which test provides the most useful information to farmers.

## TEST PROCEDURE

We hired Heartland Soil Sampling of Cunningham, Kansas, to pull soil tests on two fields from my home

test will receive a lengthy report, which indicates soil microbial biomass, determines soil nutrients that can feed future cash crops, and evaluates the quality of soil organic matter.

Results include the Solvita CO<sub>2</sub> Burst and SLAN (Slovita Labile Amino Nitrogen) tests, as well as aggregate stability and organic matter. Results also indicate the amount of organic minerals available for the next crop.

Producers receive an overall fertility score and a soil health score. Woods End also has an in-field, rapid test available.

### Soil Health Assessment, Cornell University

Cornell collects a lot of data, including soil pH, organic matter, microbial activity, Solvita CO<sub>2</sub> Burst, SLAN, and much more. Results are displayed in an easy-to-read, color-coded scorecard (where red=bad; green=good), a soil health score based on a 0 to 100 scale, and a lengthy explanation of results.

The Cornell Soil Health Assessment is considered the test of choice by several national initiatives, including the Soil Renaissance, USDA's NRCS Soil Health Division, and the Soil Health Partnership.

### WHAT WE LEARNED

**W**e used the fields in question because, aside from tillage prac-

tice, they are nearly identical. Prior to the test results, we expected that Field 1 would prove to have healthier soils than Field 2, just because it had been in no-till long term. That didn't prove to be correct.

In all four tests, the soil health scores for both Field 1 and Field 2 were close. So close, in fact, that, at first, we wondered if there had been an error in the sampling procedure. That proved not to be the case, so we were left wondering why.

Soil scientist Will Brinton was not surprised at all. "This tells us that no-till without cover crops is not necessarily a winner to boost soil health," he explains.

What he did like, however, is that each soil health test – regardless of the procedure used – agreed on the test results.

These soil health tests offer management strategies to improve soil health. These differed based on the test.

For instance, the Haney test from Ward Laboratories recommends a cover crop

mix that includes 80% legumes and 20% grasses to boost the soil health score on Field 1.

Meanwhile, the Woods End Laboratories soil fertility and health report suggests a cover crop mix of 10% legumes and 90% grasses for the same field.

The Cornell assessment has several suggestions, including adding manure, shallow-rooted cover crops, compost, and green manure.

On Field 2, Ward Laboratories' Haney test recommends a cover crop mix of 50% grasses and 50% legumes, while Woods End suggests 100% grasses and no legumes. The Woods End report suggests adding stable organic materials, high biomass covers, manure, green manure, and mulch.

### THE BOTTOM LINE

**E**ach soil health test has its merits.

The Woods End and Cornell soil health tests are easy to read, with color-coded results and clear explanations that most farmers will appreciate.

Ward Laboratories' PLFA test takes a different approach to soil health analysis and has many supporters in the field of soil science.

For quick analysis, the Ohio State University test is hard to beat. What it lacks in details and recommendations for improvement, it makes up for in speed and simplicity.

You will find useful information from each of these tests and others on the market. Take a look at the websites to determine which one is right for you. **SF**



Soil Health Test	Price	Turnaround	Features
<b>Soil Health Assessment, Cornell University</b>	<b>\$95.00</b>	<b>8 weeks</b>	<b>10-page report includes a wealth of information including pH, aggregate stability, organic matter, active carbon, soil respiration, and nutrient availability. An overall quality score is offered, plus recommendations for improving the soil health.</b>
<b>Phospholipid Fatty Acid (PLFA) Test, Ward Laboratories</b>	<b>\$59.50</b>	<b>2 to 3 weeks</b>	<b>2-page report shows the presence of phospholipid fatty acids, a unique way to measure soil microbial activity. Indicators include total bacteria, total fungi, and protozoa.</b>
<b>Haney Soil Health Analysis, Ward Laboratories</b>	<b>\$49.50</b>	<b>2 to 3 weeks</b>	<b>2-page report includes soil pH, organic matter, Solvita CO<sub>2</sub> Burst test, and several organic mineral results. The Soil Health Calculation includes cover crop recommendations and potential N savings.</b>
<b>Regular Soil Health Test, Woods End Laboratories</b>	<b>\$55.00</b>	<b>2 to 3 weeks</b>	<b>1-page report featuring Solvita CO<sub>2</sub> Burst and SLAN tests, plus aggregate stability and organic matter. Includes fertility and soil health scores, with recommendations.</b>
<b>Soil Quality Field Test Kit, Ohio State University</b>	<b>\$30.00</b>	<b>Instant</b>	<b>Easy-to-use kit includes chemistry, vials, directions, and color-coded chart indicating active organic matter and available nitrogen.</b>