

Understanding soil health

| Joey Sabljic

Getting the full scoop on soil health involves more than just a quick glance at what's being grown on the surface. Rather, it requires a better understanding of a complex relationship including cover crop use, microorganism populations and cropping systems. To this end, the OMAFRA - University of Guelph research partnership has been working toward a better understanding of how Ontario farmers can keep soils as rich and fertile as possible while aiming for sustainable high yields that will feed a growing population.

Give winter wheat a spin in crop rotations

Corn and soybean rotations have tended to dominate Ontario's farming landscape, but when it comes to long-term soil health, University of Guelph researchers found that these simple corn-soy rotations have reduced yield and lower soil organic matter, and are more susceptible to drought than more complex rotations.

Plant agriculture professor Bill Deen leads a research team that has been looking at Ontario crop production systems and crop rotations to find out which

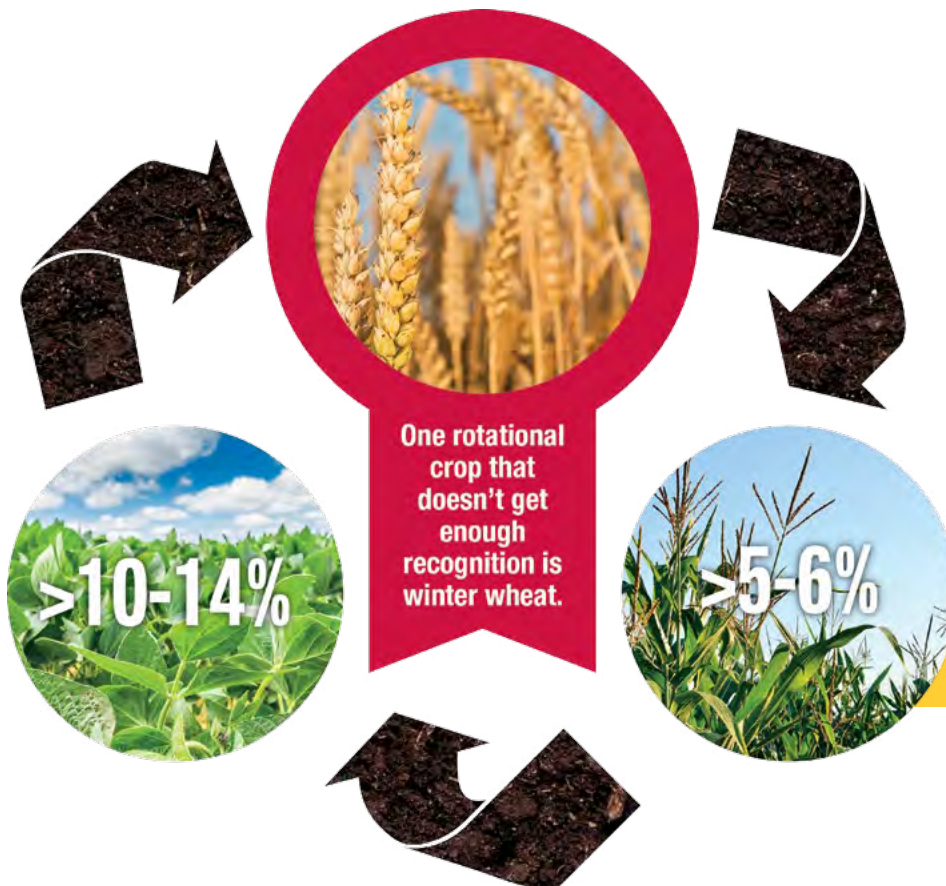
provide the most benefits to long-term soil health and productivity.

What they've found from their own studies, as well as by looking at data from more than three decades of long-term rotation trials at the University of Guelph's Elora Research Station, is that simple rotations have more pronounced negative impacts on the environment and soil health.

"Simple rotations are not preferred from an environment or soil health perspective, and may not be most profitable either," says Deen. "When you consider the economic value of complex rotations in terms of yield increases, reduced nutrient requirements and yield stability, then complex rotations just might be more profitable."

One rotational crop that doesn't get enough recognition, he argues, is winter wheat. Deen says including winter wheat in rotations can provide several major soil health benefits — including increases in soil organic matter — and resilience to environmental stresses, such as drought.

Winter wheat can also help set the stage for planting a cover crop, such as red clover, which adds nitrogen and beneficial



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organic matter to the soil. Winter wheat is generally harvested in late July or early August, giving growers a few months to plant a cover crop and produce valuable biomass. Corn and soybeans, however, are harvested late in the season, which makes it very difficult to obtain sufficient growth required to realize a benefit from a cover crop.

Ultimately, the numbers in favour of winter wheat speak for themselves. Deen says that, even by conservative estimates, adding winter wheat to a crop rotation can provide a 5 to 6 per cent yield increase in corn and a 10 to 14 per cent yield bump in soybeans. “If you’re a grower, and you are serious about soil health, you really need to consider rotation diversity, and winter wheat is a good option for this,” he says.

Finding the right cover crop combination

Are cover crops all they’re cracked up to be when it comes to improving soil health? According to a University of Guelph researcher, the simple answer is “yes.” But which cover crops should farmers plant for the biggest benefit? The answer to that question lies deeper below the soil surface.

Laura Van Eerd, a professor in the School of Environmental Sciences at the University of Guelph’s Ridgetown Campus, is leading a series of long-term trials to determine which cover crops — or cover crop combinations — contribute the most to soil health from chemical, physical and biological perspectives.

“Growers use cover crops for various reasons, including for soil health,” says Van Eerd. “While everyone says cover crops are good for the soil, there are very few long-term studies that actually measure meaningful changes in soil organic matter or compare the performance among different cover crops.”

She is leading a research team comparing several cover crops, including radish, rye, oats, forage pea and hairy vetch, with a no-cover crop control. Each cover crop is planted during the fall after the main cash crop is harvested and then studied to see its impact on the following year’s crop yield and quality.

Using their long-term trials at Ridgetown Campus, Van Eerd and PhD student Inderjot Chahal are taking a closer look at several different soil health

indicators to see whether they can detect differences based on cover crop use.

So far, they’ve found that crop yields are as good as or better with the cover crop than without. They also saw that a cover crop mixture of oilseed radish and rye offers the biggest boost in beneficial soil organic carbon. Without a cover crop, soil organic carbon levels were lowest.

Van Eerd has also been looking at comparing cover crop planting date (early August to early September) with cover crop growth, nitrogen uptake and the following year’s yields.

From their results so far, she says, there was no impact on the following year’s yields, despite large differences in cover crop growth.

“What the research indicates is that it’s more important to have a cover crop growing, than when you plant the cover crop,” says Van Eerd.

She adds that this research suggests that timing of planting may be less important, and stresses the benefits of growing cover crops.

As part of the next phase of her work to understand how cover crops affect soil health, Van Eerd is working with environmental sciences professor Kari Dunfield to look at the biodiversity of fungi and bacteria living within the soil.

“Through our long-term trials, we’re hoping to get a better understanding of what’s happening in the soil with different cover crops.”