

London – When Matt Hagny talks about the benefits of long-term no-till there is no compromising. He doesn't mean tilling only after wheat or just zone tillage or vertical tillage.

Tillage, any tillage, “causes soil productivity to decline,” the Kansas crop agronomist told members of the Innovative Farmers Association of Ontario at their annual conference here last week. Doing just a little tillage simply means you're “screwing up a smaller volume of soil,” he added.

It's a lesson that farmers in his part of North America are learning the hard way. Through well over a century of intensive cultivation and a lot of intense storms many areas have lost eight inches of topsoil, Hagny told the group. “We're now farming subsoil. Tillage causes long-term degradation of soil.”

The original soils had an organic-matter content of five to six per cent. Now they're below two.

To illustrate his point he showed a couple of yield maps showing areas of fields where yields were substantially higher than others. These used to be pastures, he said, cropped for only about a decade. “They're getting 25 per cent more yield from areas that haven't been farmed as long. In drought conditions sometimes the yields are double.”

Is that experience relevant to Ontario? “I've looked at no-till experiences around the world, across a wide diversity of soils and climates,” Hagny said. “The principles are the same.”

He reminded growers that plant growth is based on sunlight, carbon dioxide, and water. Since no-till soils store more water and carbon than tilled ground, those additional inputs can be made to translate into extra yield with proper management.

HAGNY'S MAIN message was that no-till can repair some of the damage caused by years of tillage, rebuild soil structure and organic matter, and ultimately increase yield. But to get all those benefits requires a change in management, with greater emphasis on early season nutrient availability and keeping the soil covered throughout the year.

In many cases, including a lot of research studies, that hasn't been done, he added.

Hagny cited a Pioneer Hi-Bred survey of all available tillage studies done across eastern North America. In summarizing the data from hundreds of plots Pioneer scientists concluded that no-till benefits became smaller and smaller as you move north and actually disappeared in the cooler, damper Great Lakes climate.

The picture is skewed because the methods used in the no-till plots weren't always the best, Hagny said. "We know how to do tillage." But no-till is different in terms of many things, not the least of which is fertility.

When you're building organic matter, you're sequestering carbon, Hagny said. But in the process you're also sequestering a lot of nutrients, including nitrogen, phosphorus and a slew of micronutrients.

Tillage will make all these nutrients available fairly quickly. With no-till it takes longer, he said. "We need to compensate with management."

He advises growers to pay special attention to micronutrients like sulphur, zinc and boron, even going so far as doing tissue tests to assess the plants' nutrient status. "Pay attention to them. These things don't cost a lot but they pay off big."

In response to a question about the reliability of assessing micronutrient levels in three-leaf corn or third-trifoliolate beans, Hagny said the numbers for corn are good. "On seedling soybeans we're getting close."

But corn is the critical one because it "seems to be the most sensitive to early seedling deficiencies," he said. "You don't dare let anything go very far astray" since corn is developing to a strict genetic timetable and anything holding it back will eventually affect yield.

Early growth in no-till is usually a bit slower, Hagny said, "but I get very alarmed if the plant is anything less than dark green." Any visual symptoms should be investigated immediately.

The only problem nutrient is boron, which doesn't show any outward symptoms but expresses itself in slower growth and impaired pollination.

To cover themselves, Hagny said many growers are now applying sulphur and zinc routinely. "We apply 10 to 15 lbs of sulphur as insurance and we don't plant corn without putting zinc down the row."

ADDRESSING THE issue of no-tilling corn into wheat stubble, Hagny acknowledged that residue management is the main stumbling block. Yet corn has no problem emerging in soybean stubble. The answer? "Make the wheat stubble more like bean stubble," he said.

To accomplish that, Hagny is advising growers to use cover crops. A brassica cover crop seeded after wheat harvest will help break down the wheat stubble, he said. "If you can get good decomposition in the low rainfall, low humidity environment of South Dakota, what can you do here?"

He said well-known cover crop innovator Pat Sheridan of Michigan has solved his problem of soils not warming up in the spring by drilling oil[seed] radish.

“Or you can spray on liquid nitrogen after the wheat harvest” to also help break down stubble, he added.

Hagny urged growers to be extra careful about nutrient levels in the corn if a cover crop is used. The latter will make any shortfalls even worse. “You will need sulphur and zinc,” he predicted.

Another benefit of cover crops is that they help dry out the soil in the spring. “Wheat into corn is almost always too wet. So grow something, extract the water.”

If grown ahead of soybeans, cover crops can help with disease management. Hagny cited a Wisconsin study that showed the presence of a cover crop prompted white mould to develop too early and die out before it could infect the bean crop.

Other benefits of cover crops include increasing the plant-available phosphorus in the soil. “And it does give you extra yield, sometimes significantly.”

“Keep pushing the limits,” Hagny advised. “Or someone else will.”

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