

Back to tillage after wet years

With extra rain, tillage is back in style in some areas. First, evaluate the risks of erosion and salinity. Then, consider dealing with compaction



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Crops

Soggy springs and summers have made tillage fashionable again in some parts of the Prairies. Some see tillage as a means of drying saturated soils. Others hope to relieve compacted soils through some sort of vertical tillage.

But is tillage an effective solution to these problems? And do the potential benefits outweigh the risks?

Tilling to warm soils

Farmers dealing with sopping wet soil might want to try tilling, Dr. David Lobb told delegates at the Manitoba Agronomists conference in December 2014. Lobb is with the University of Manitoba's Department of Soil Science.

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“Crop residues shade the soil and keep it moist. You have a cool, moist environment which usually delays seeding,” said Lobb. Since tillage buries crop residue and exposes soil to air, it should help warm and dry it, Lobb explained.

But research into using tillage to manage wet soils hasn't yielded conclusive benefits. Some studies have shown tilled soils tend to be slightly warmer and dryer than no-till soils, Lobb said. But differences are often insignificant and results are inconsistent, he added.

Farmers might see some small improvement by managing extra moisture through tillage, he said. “But what's going to override how wet your soil is isn't the tillage system so much as the weather. If you have wet weather, you have wet soils.”

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Tillage brings risks to the Prairie pothole region and the Red River Valley, Lobb said. For one, it accelerates soil erosion. Without residue cover, farmers will more likely see wind and water erosion. Tilled hilltops are more likely to erode. And in the Red River Valley, “tillage is actually what fills in a lot of those surface drains, particularly at the field edges where you get a bit of damming,” said Lobb.

In wet years, water draws salt to the soil surface, causing salinity. Tilling those areas can increase salinity, said Marla Riekman, land management specialist with Manitoba Agriculture, Food and Rural Development. The salinity caused by tilling around wetlands can outweigh potential benefits such as drying, she added.

Lobb said tilling to eliminate ruts is a good way to keep fields operational. But tilling when soils are still wet will make the problem worse. Instead, he suggested targeted tillage when the soil is slightly frozen. “You can actually level out those ridges and ruts a little bit.”

Compacted soils

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Some farmers are concerned about compaction in their fields, especially as equipment gets heavier. Compaction happens when soil particles are squeezed together, compressing pore space. But slightly compacted soils promote good contact between seed and soil, the University of Minnesota’s website notes. A little compaction can also cut water loss from the soil.

But in wet years, yields drop with any increase in compaction, the University of Minnesota notes, because it leads to more denitrification. In dry years, some soil compaction boosts yields. But too much soil compaction cuts yields in dry years, too, according to the university.

Tillage, raindrops and minimal crop rotation can all cause some form of compaction, the University of Minnesota notes. But wheel traffic is the major cause, as machinery grows heavier and farmers are pressured to start seeding before soil is dry enough to support the equipment.

“The challenge is not actually causing the compaction in the first place,” said Riekman.

Farmers should keep in mind that 80 per cent of compaction happens on the first pass, Riekman said. She suggested making sure tractors aren’t over-ballasted.

Running tires at the rated pressure is also important. Riekman said when tires are at the rated pressure, they don't cause any more compaction than tracks. Often tires are over-inflated for the field, she said.

As for vertical tillage, Riekman warns that many units are actually more like high-speed diskers than true vertical tillage implements. Faster soil movement has the potential for higher erosion, she added.

The University of Wisconsin's Discovery Farms looked at shallow vertical tillage on five Wisconsin farms. Researchers concluded that "aggressively designed vertical tillage implements will disturb more soil and surface residue" than other designs.

Machines with aggressive blades and rear attachments and gangs angled at more than 180 degrees disturb soil and crop residue more than other vertical tillage implements, the Wisconsin researchers noted. Conservative and shallow are key words when using those implements in fields likely to suffer soil loss, the reports states.

Making two or more passes with vertical tillage implements can boost soil disturbance and reduce residue, similar to tandem disking, Wisconsin researchers noted. Aggressively designed vertical tillage equipment will move soil laterally on the first pass, they added. One shallow pass with non-concave coulters didn't move much soil laterally.

Riekman said researchers haven't found any fracturing below the coulter. As well, one of Riekman's colleagues and a summer student used a penetrometer to see whether vertical tillage cut compaction in a field. Three weeks after the field had been tilled, they couldn't find any signs that compaction had been decreased, she said.

Subsoilers also fall into the vertical tillage category, but they're meant to dig deeper into the soil profile and fix deeper compaction issues.

"Will it help? Maybe. But the end game is we're trying to gain yield here," said Riekman.

Farm trials in Iowa found subsoilers had a 50 per cent chance of bumping yield high enough to offset costs, she said. Subsoiling is very expensive, Riekman noted, partly because it takes a lot of fuel to run the implements up and down the field. Rather than working the whole field, farmers should focus on headlands and other areas that are more compacted, she suggested.

The University of Minnesota's extension website also noted that although subsoilers can break hard pans, subsoiling doesn't boost yield consistently or for long periods of time. Irrigated loamy soil is one possible exception, the university noted.

There may be several reasons for the lack of yield gain, such as recompaction, insufficient depth of subsoiling, high soil moisture levels while subsoiling, or worsening of soil properties because of subsoiling, the university's website states.

Subsoiling can help by shattering a hard pan, Riekman told delegates. But farmers shouldn't go more than an inch below the hardpan, she added. Going too deep might create more compaction, she said.

The University of Minnesota suggests the following steps for successful subsoiling:

1. Make sure there's actually a compaction problem. Do visual crop symptoms match wheel traffic? Is there standing water in wheel traffic patterns?
2. Make sure subsoiling will loosen up the compacted layer.
3. Soil should be dry and fracture to the shank's depth during subsoiling.
4. Use controlled traffic to avoid more soil compaction.

The University of Minnesota Extension has soil compaction information [available on its website by clicking here](#).

University of Wisconsin's Discovery Farms research is [available on its website by clicking here](#).