Should You Play The Vertical Game?

Vertical tillage improves the seedbed and root zone while keeping residue on the surface, producers say.

By Martha Ostendorf, Contributing Editor

While no-till can take soil quality and the resulting yield benefits a long way, preexisting compaction layers and less-than-ideal seedbeds can put a ceiling — or in terms of root growth, a floor — on progress. That's where vertical tillage might play a helpful role, users of the practice say.

"Vertical tillage is any tillage system that does not create a horizontal density layer, but instead forms cracking patterns in the soil profile," says Napolean, Ohio, equipment dealer Paul Martin, who counts the Landoll 7130 To The Max vertical tillage tool among the offerings at his dealership.

"Examples of vertical tillage are in-line rippers without wings, coulter tillage tools, rolling harrows and spike aerators. Horizontal tillage tools are discs, field cultivators and plows."

Conventional "horizontal" tillage implements may create horizontal compaction or density change layers in the soil.

These density changes inhibit root growth, impacting crop standability and yields.

While no-till can help mellow the soil, no-till acres aren't immune to

Photos: HCC

RESIDUE MANAGEMENT. Charles Rice uses vertical tillage to more evenly distribute corn stalks for faster decomposition.

"I use vertical tillage on corn stalks in the fall to fracture the ground so that water can penetrate and the freeze-and-thaw cycle can help mellow the ground…"

compaction layers or density changes in the soil profile.

"I have one producer who has a 10-year-old no-till field that, when we tested it with a soil probe, we found it had 5 inches of soil that was like a rock and then the best ground you'd ever find below that," says Tom Evans of Great Plains Manufacturing, which produces the Turbo-Till. "There was great soil underneath, but his crop wasn't getting through to it.

"Vertical tillage can help no-till producers overcome that stumbling block."

The main goal with vertical tillage is to create uniform density throughout the soil profile and to create a good seedbed for ideal seed placement. There are many other benefits of vertical tillage though, too.

Vertical Tillage Vs. Vertical Finish

When going vertical, there are many different tools and approaches. However, implements mostly fall into one of two categories — vertical finish or vertical tillage.

Vertical Finish. Shallow-working implements — such as the To The Max harrow from Landoll, the McFarlane Reel Disk, Turbo-Till from Great Plains, the Case IH True-Tandem 330 Turbo and the Supercoulter Plus from Summers — use cutting reels, rolling harrows, blades, coulters and other methods to work just the top inch or two of the soil profile.

These top-only tools are considered shallow vertical tillage or vertical "finishers."

Vertical finish tools can be used to manage residue in the fall or can be run in the spring to create a uniform, desirable seedbed for no-till planters or drills. Finishers promote residue breakdown by putting residue in contact with the soil.

Vertical finish tools work to manage corn root balls — which can wreak havoc on next year's planting operations and stand establishment.

They also break through crusted soil, enhance seedbed warming, aerate the soil, size residue and level out wheel tracks for a more uniform seedbed.

By working no deeper than the seedbed, vertical finish tools ensure that seeds germinate into the type of soil

their roots will grow into. A little loose soil below the seedbed, and then even a slightly denser layer, results in restricted root growth.

Ohio dealer Ron Burkhart of Burkhart Farm Center in Bucyrus, Ohio, uses and sells the Case IH True-Tandem 330 Turbo. He says vertical finishers are a great tool for no-tillers.

"They can be used in the fall for residue management. It will help speed deterioration of strong-stalked *Bt* hybrids and uniformly distribute residue," he says. "A lot of no-tillers are using the tool in the spring to work about three-quarter-inch deep to create loose, warm soil over a firm seedbed.

"This can work to dry the ground in wet conditions and break the crust in dry conditions, creating an insulation layer that lets the seed germinate in a good fashion.

"One thing that I like about the True-Tandem 330 Turbo is that it also takes out inconsistencies from row to row, such as wheel tracks from spray rigs, and it helps knock back some weeds."

He says the tool helps planters or no-till drills work better, keeping them from sinking too deep in mellow ground and from working hard on crusted ground.

Vertical Tillage. AerWay Air-N-Till Technology, Smart-Till from HCC, the Gen-Till II from Genesis Tillage and other tined implements work deeper into the soil profile to aerate and fracture the soil and are considered vertical tillage tools.

"Vertical tillage fractures the top 5 to 8 inches of soil, helping to get oxygen and water into the soil profile," says Mapleton, Ill., producer Charles Rice, who uses a Smart-Till System from HCC. "You can help speed up the breakdown of residue by getting a little soil on it, but the Smart-Till still leaves residue mostly on the soil surface to stop wind and water erosion."

Most of the tools in this category utilize tines that enter the soil profile vertically, punching a hole, and then torque to the side to fracture the soil from side to side without turning the earth.

"You pull the machine at a high rate of speed, 8 to 9 miles per hour. The speed and the angle that the tines enter the soil work to fracture the soil structure," says Bill Meeker, a North Henderson, Ill., no-till corn and soybean producer who uses the AerWay Air-N-Till Technology for vertical tillage in the fall.

Having more water in the ground through the winter maximizes the freeze-and-thaw effect, helping to mellow the soil. Plus, vertical tillage tools can loosen surface compaction — a type of compaction likely found in no-till operations — without turning over a lot of dirt. Tines are often

Photos: AerWay, Genesis Tillage and McFarlane Mfg.

ADJUSTABLE AGGRESSION: Most vertical-tillage implements can be adjusted, allowing producers to determine aggressiveness of soil disturbance and residue management to fit their specific farm needs.

adjustable, allowing producers to regulate how aggressively they want to work the soil.

"We run a Gen-Till System straight to aerate hay ground and then adjust it to a 5.5-degree angle when we're on corn ground," says Syracuse, N.Y., producer Larry Stinson. "The implement can be adjusted all the way up to 10 degrees, but at that point it looks like a conventionally tilled field and you're moving away from the whole purpose of vertical tillage."

Subsoilers. Also falling into the vertical tillage category are subsoilers. As the name implies, subsoilers work deep in the soil profile and are used to address deeper compaction issues.

When run at the correct depth — usually half as deep as the shank spacing — subsoilers break up compaction with very little surface disturbance. Deep points lift and fracture the soil, allowing for water movement and root growth. Subsoilers typically work between 10 and 16 inches deep.

Vertical Benefits

The reasons producers are using vertical soil management systems vary almost as much as the implements they use to do the job. Crop rotations, soil conditions, compaction concerns, tillage programs and many other factors determine the timing of tillage, equipment used and goals.

Of producers interviewed, one common benefit noted was that the vertical system of soil management helped them get the benefits of no-till or minimum-till practices in unforgiving, heavy soil conditions where utilizing reduced-tillage practices are a challenge.

But vertical systems offer plenty of benefits for all types of producers.

Water Infiltration. Vertical tillage tools, working deeper than the crust of the soil, can help improve water infiltration, which in turn gives producers a variety of benefits.

"I use vertical tillage on my corn stalks in the fall to fracture the

ground so that water can penetrate and the freeze-and-thaw cycle can help mellow the ground," says Rice, who practices minimum- and strip-tillage.

He uses vertical tillage to fracture the soil profile down to an 8-inch depth, while leaving crop residue in place and creating minimal surface disturbance.

"We don't want erosion. We do want rain to percolate into the ground," Rice adds. "By breaking the soil profile vertically, we get water into the ground and prevent erosion."

Meeker has raised no-till corn and soybeans for 15 years, 10 of which he has used the AerWay Air-N-Till Technology for vertical tillage.

He covers all of his crop acres in the fall and is no-tilling into fields that are third and fourth year corn-on-corn.

"The AerWay leaves millions of pockets for water to get down into the soil profile," Meeker says. "We have a lot of soil types and no-tilling has helped us with the tighter soils.

"But with the vertical tillage and no-tilling combined, our fields absorb even heavy rains without runoff or erosion."

Moisture Management. "Fields can and will dry out to the depth you dig, which can get pretty deep with cultivators or chisel plows. We can't afford that," explains Portland, N.D., farmer and custom seeder Merle Strand. "With a vertical finish, you can go into heavy residue, even during a wet spring, and dry out just the top couple inches of soil for planting.

"It creates a good firm, warm seedbed and conserves moisture."

Strand has been experimenting with vertical finishing on his own and his clients' fields for the last 3 years and uses the Supercoulter Plus from Summers for residue management in the fall and seedbed preparation in the spring.

"Our biggest challenge with no-till is that we have heavy soils that need to be disturbed a bit and dried out on top so we can get seed placed properly. Vertical tillage allows us to do

"We can get over a lot of acres quicker and it makes for a perfect seedbed..."

that," Strand says. "Running a vertical finisher in the spring prior to planting can loosen, warm and dry soil for better, earlier planting."

Room To Grow. Conventional tillage can create multiple compaction layers that limit root growth. And limiting the roots limits crop performance, especially yields.

Lakefield, Minn., producer Brad Murphy combined vertical tillage, with a deep in-line ripper, with a vertical finish in the spring with a Landoll To The Max harrow for 5 years. But he decided to go back to conventional tillage as he transitioned to corn-on-corn. The results proved the old maxim, "If it isn't broke, don't fix it."

"We were getting terrible roots. Corn was tipping over, we saw drops in yields and the shallow-rooted crops weren't very weather resistant when our crops had always stayed greener, longer, before than anyone's," Murphy says. "We didn't realize how much damage we could do by running horizontal tillage.

"We decided we needed to go back to vertical tillage and make a bigger flower pot for our plants to grow in."

And Murphy isn't alone in his experience. In one manufacturer study, fields were vertically tilled for 5 years. Then, in the sixth year, they ran a field cultivator over half the acres just once. Depending on soil type, yield losses compared to the acres with only vertical tillage ranged from 6.5 to 26.5 bushels of corn per acre.

Earlier Planting. "You can get a jump on the planting season by a day or two by running a vertical finish in the spring vs. no-till, and in a wet spring you can get in the field much sooner than when running a disc or cultivator," says Schilling Brothers equipment dealer Troy Latch of Mattoon, Ill. He sells McFarlane Reel Disks among other vertical tillage equipment. "We see a lot of guys who are using a vertical finisher before planting no-till or minimum-till soybeans into corn stalks.

"It gives them good seed-to-soil contact and improves the seedbed."

Time, Energy Savings. An uncertain economy has everyone looking for ways to cut out unnecessary expense. As with no-till, vertical tillage saves time and money when compared to conventional tillage.

"Fuel is a big savings for me," says Stinson, who uses a 40-foot Gen-Till II rig. "My yields are comparable with my neighbors, but input costs are less.

"You can cover a lot of ground at 7 miles per hour and not strain the tractor like you would making two or more trips across the field with conventional tillage. It's very fuel-efficient."

Stinson, who has used vertical tillage for the last few years, makes

How Does Vertical Tillage Fit In A No-Till System?

Compaction layers exist in most fields, including those managed with no-till practices.

"Vertical tillage can unleash your yield potential because of what it can do for your crops' root systems," says Great Plains vice president Tom Evans, who has seen surface compaction in some no-till operations limit yield potential.

Evans says that even in the absence of a hard compaction layer, varying soil densities can greatly impact root growth and therefore crop health.

"When seeds sprout, the density of the soil around it determines the root diameter," Evans explains. "If a kernel sprouts in a 50-psi soil, it will produce a large diameter root. When that root starts going down for moisture and nutrients, and then hits a 100-psi or 150-psi layer, the roots are too large and can't get through, so they grow sideways."

The key, Evans says, is to create uniform density throughout the soil profile, which is what vertical tillage achieves. And with a variety of vertical tillage implements available that cause minimum surface disturbance, there are viable options for no-tillers.

Besides creating uniformity in the soil profile, Evans says no-tillers with corn-on-corn acres should consider vertical tillage for residue management.

"Old root systems are toxic to a new plant and diseases carry over in residue. We've seen studies where yields take a 40- to 50-bushel hit from residue," Evans says. "Using a vertical-tillage finisher in the fall yields great results for managing residue and reducing runoff."

A vertical finish also has benefits in the spring. One of Evans' no-till customers started to do a vertical finish on wheat stubble prior to planting. But when his crop consultant saw what he was doing, he told him to stop when the field was only partly done because he was wasting moisture.

Throughout the year, the corn was taller where the producer had run the vertical-tillage finisher and, at harvest, the finished acres averaged 12.2 bushels more per acre than the rest of the field.

"If we can un-restrict the roots so they can go down for moisture and nutrients, we're going to build a bigger factory for that ear of corn, produce a bigger ear and, ultimately, a higher yield," Evans says. "Vertical tillage really works with no-till, not against it."

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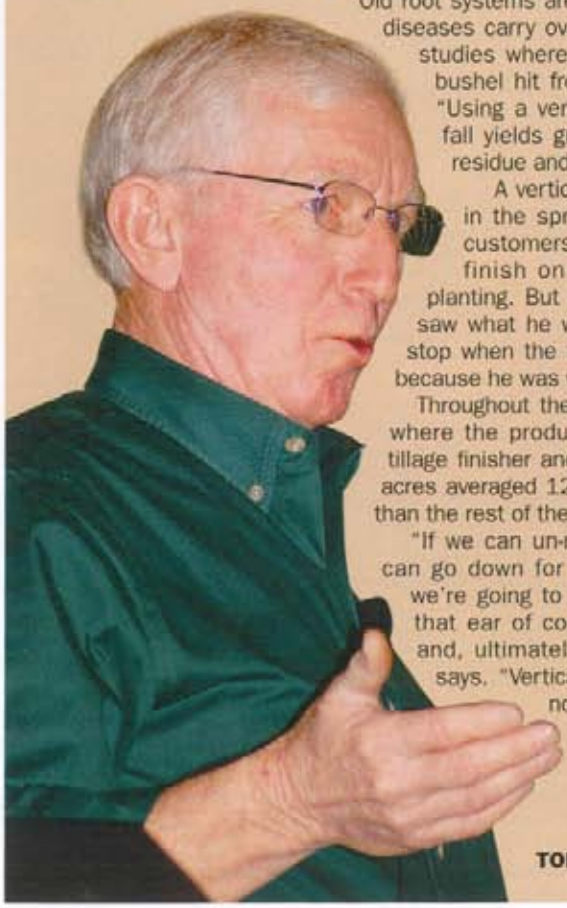

TOM EVANS

two trips across his fields with his vertical tillage implement each year — once in the fall, or in early spring if unable to get in the field in the fall, and then attaches the planter behind the Gen-Till for one-pass aeration and planting.

Most vertical tillage tools — other than subsoilers — are designed to be pulled at a high rate of speed, which means less time in the field and less overall fuel consumed.

Seedbed Preparation. "I use a vertical finisher as a final-pass tool before planting. I can get out with it in early spring to warm up and dry out the seedbed," says Altamont, Ill., grower Wendel Alwardt, who uses a McFarlane Reel Disk. "It doesn't move a lot of dirt, but it does a great job.

"We haven't done deep tillage for 5 years and we still get great yields. We can get over a lot of acres quicker and it makes for a perfect seedbed."

Photo: Great Plains

SEEDBED PREPARATION. Vertical finishers, like this Turbo-Till, work only as deep as the seedbed to manage residue, loosen soils and create a warm, firm seedbed for accurate seed placement with a planter.

Photo: Case IH and AerWay

VERTICAL AND LATERAL TILLAGE. Low-concavity blade design on the True-Tandem 330 Turbo (left), offset AerWay ShatterTines (right) and other designs allow vertical tillage implements to move soil vertically and laterally for a uniform seedbed and maximum soil fracture.

Burkhart, who sells and uses a True-Tandem 330 Turbo at his dealership's demonstration fields, noted excellent emergence following a vertical finish.

"When our independent agronomist saw nearly 100% emergence on wheat following traditionally no-tilled soybeans, he said we couldn't plant anything anymore without vertical tillage first," says the dealer, who now advises customers planting winter wheat into bean stubble to follow the combine with vertical tillage.

"It's a good application on any crop: wheat, soybeans, corn and in no-till situations. Wheat likes a firm seedbed and vertical finishing gives it what it needs."

Deeper-working tools also benefit the seedbed.

"Compaction forms at the level you work, so with no-till, the compaction level moves to the surface. Vertical tillage in the fall helps prevent compaction in the spring," says Kingdom City, Mo., dealer Don Hanson, who offers the Smart-Till from HCC in his vertical-tillage lineup. "By getting out in the fall, managing residue and loosening up the top 3 to 8 inches of soil, it allows the soil to dry much faster in the spring.

"And it doesn't leave a ribbon like a coulter might, which can lead to erosion."

Residue Management. A no-tiller since 1988 and a strip-tiller for the last 10 years, Kewanee, Ill., producer Norlyn McCormich looked to a vertical finisher in the fall of 2007 as a way to deal with residue on his corn-on-corn acres.

"Microbial activity from no-tilling helps get rid of residue. But when we switched to a guidance system for our strip-till rig last year, we ended up running across a lot of rows, which created more of a residue issue than usual," says McCormich, who uses a Great Plains Turbo-Till. "Running the Turbo-Till in the fall after a safened urea application helped slice up the residue and speed up the deterioration process."

Though McCormich says other influences may have helped, he noted that after using the vertical finish tool, his yields hit 250 bushels per acre on fields that had never done more than 210.

Users of both vertical finishers and deeper-working tools cited vertical tillage as an excellent way to manage corn residue, especially in corn-on-corn situations. Vertical tillage also can be used to incorporate manure applications.

> "You can go into heavy residue even during a wet spring and dry out just the top couple inches of soil for planting..."

Vertical Tillage Challenges

As with anything worth doing right, there are some challenges with vertical tillage, though they are arguably outweighed by the benefits. One is expense.

"If you're going from a straight no-tilling situation to vertical tillage, this will be an extra expense because it's a step you would not normally take," says one dealer. "But when moving

"We decided we needed to go back to vertical tillage and make a bigger flower pot for our plants to grow in...."

away from conventional tillage, it removes the need for a cultivator or disc and actually reduces cost."

Due to the speed needed for maximum benefit and the weight, some vertical tillage tools also require a lot of horsepower to operate. Most implements are available in a variety of sizes though, so dealers recommend that producers take stock of how much horsepower they have available and buy the tool that will work in their operation.

Despite a couple of challenges, users of vertical tillage are quick to point out the benefits — just not too close to home.

"I'd recommend vertical tillage... but not to my competition," jokes Murphy, who saw his corn yields swing from 125 bushels per acre in 2001 to 219 bushels per acre in 2005 after implementing a vertical tillage system that pairs deep vertical tillage with a vertical finisher.

A variety of individual equipment features and optional add-ons can help no-till producers customize vertical tillage equipment for their operation needs. There are hydraulically controlled options to adjust weight as needed for residue management and soil crusting, rotary harrows for better field finish, rolling baskets, fertilizer application attachments and more.

Vertical-tillers recommend that producers considering vertical tillage either look to a neighbor who is using vertical tillage or rent various types of equipment before buying to determine what works best for their specific situation.

7 Reasons To Go Vertical

- Compaction management
- Seedbed preparation
- Residue and manure management
- Time and energy savings
- Get in the field sooner
- Soil aeration and improved water infiltration
- Field leveling/seedbed uniformity