An uncharacteristically cold and wet spring across the northern United States greatly affected farmers’ ability to get into the field for planting this year. According to the USDA 2019 Crop Progress and Conditions Report, corn and soybean growth and quality lag far behind five-year averages. Scientists predict that such rollercoaster weather will develop into the new normal, which begs the question: what practices can be adopted to combat unpredictable weather’s effects on crops?

In recent decades, farmers have been adopting new methods of plowing the soil, also known as tillage. From no-till and strip-till to vertical tillage and conservation tillage, it can be difficult to keep different tillage types and definitions straight. Jargon juggling aside, it is important to understand the benefits that can be expected from adopting a different tillage regimen and how it will affect crop production in an ever-shifting and erratic climate? Beginning to address these questions will help to determine what form of tillage is a good fit for you, your farmer and your land. But, before we jump into the what and the how, let’s root ourselves in the why.

UPCOMING EVENTS:

Ohio

Women for the Land Conservation Learning Circle: Pollinator Habitats

Wednesday, October 2, 2019
8:30am–3pm

Mulberry Creek Herb Farm,
3312 Bogart Road,
Huron, Ohio

Join women natural resource professionals as well as women farmland owners like yourself for a conversation about the impact agriculture and conservation has on pollinators and their habitat. Explore which pollinators help produce commonly found products at grocery stores. Discover the benefits of pollinators and learn how you can rebuild pollinator habitats. After an included lunch, we will be exploring conservation practices in the field.

Please RSVP online or by phone by September 27th at:
Erie Conservation District, Breann: 419-626-5211.
Cost: $10 per person for just 1 class, $7 if you sign up for the entire series. Includes lunch.

Learn More


Ohio residents can also contact Ashley Brucker, abrucker@farmland.org for more information.

Residents in New York can contact Aaron Ristow, aristow@farmland.org.
UNDERSTANDING CONSERVATION TILLAGE

WHY PLOW?
There are many benefits to plowing the soil. The act of plowing breaks apart clumps of soil that have become compacted and dense over time. Tillage allows for easier planting, root growth and drainage and helps to incorporate organic matter from manure or crop residues into the soil, speeding up decomposition into plant available nutrients. Plowing destroys weeds and buries their seeds at depth, reducing germination and growth. However, tillage also pulverizes soil structure, ‘burns off’ organic matter and exposes bare soil to wind and water, reducing infiltration and increasing erosion. Think of the Dust Bowl and the massive clouds of topsoil lifted from fields in the Great Plains. This was a direct result of conventionally tilled fields, dry weather and wind. In the cold, wet northern states, water can similarly erode uncovered fields. Rather than being transported in a large cloud of dust, soil from Ohio or New York may run off into local waterways and end up in one of our Great Lakes.

Soil loss on any given field is dependent upon the climate, especially rainfall; how easily the specific soil type can be eroded; the topography of the field; crop management; and any conservation practices used. Losing topsoil can affect your crop yield and quality as it contains much of the organic matter which stores nutrients and makes them more available to crops. Deeper layers of the soil profile are often denser, which restricts root growth and contains fewer nutrients. In cases of significant topsoil loss, these deeper layers are exposed. Without the benefits from topsoil, crops can struggle to produce.

RESOURCES FOR FURTHER INFORMATION

» A short video on basics of soil health:
  » https://www.youtube.com/watch?v=LSRmFSKBypI

» Conservation tillage and soil management:
  » http://extension.cropsciences.illinois.edu/handbook/pdfs/chapter10.pdf

» Reduced tillage in organic systems handbook:

» Weed management in conservation tillage:
  » https://extension.psu.edu/an-introduction-to-weed-management-for-conservation-tillage-systems

» Importance of role of soil organic matter:

» Economics of tillage:
  » https://extension.umn.edu/soil-management-and-health/economics-tillage

» Tillage studies:
Conservation tillage is one of several practices that reduce soil erosion and is characterized by leaving at least 30% of crop residues on the soil surface post-harvest. Although crop residues can be problematic, they can improve soil organic matter and provide other benefits, when managed correctly. The residues slow evaporation while improving water infiltration rates and protecting soil from erosion caused by water and wind. Well-utilized crop residues improve soil quality and nutrient cycling, which leads to improved crop productivity and better environmental outcomes.

Before making any decisions, make sure to discuss with your farmer and either a local NRCS technical service provider or extension agent, what type of conservation tillage is most appropriate for your land. To help you in this conversation, the table below highlights benefits, disadvantages and ideal climates of different forms of conservation tillage to minimize yield risks:

### Effect of Conservation Tillage on Crop Yield

The type of tillage your farmer uses has a considerable effect on a crop’s ability to thrive under tough conditions like those this past spring. Tillage options that speed up soil warming and drying such as vertical, ridge and strip tillage are most advantageous when dealing with cold, wet springs, and studies show promising results in crop growth and yield for each during these challenging weather patterns (DeJong-Hughes and Vetsch 2007; Lauer 2016; Sundermeier and Reeder 2016, Thelen 2011). As we move into unpredictable climate territory, a willingness to adapt and adopt new practices may help your operation increase its overall resiliency.

### What is Conservation Tillage, Can it Help, and Which Form Should I Use?

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<table>
<thead>
<tr>
<th>% Residue Coverage</th>
<th>Actions Taken on Soil</th>
<th>Seeding Requirements</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Climate for Best Yield</th>
<th>Preferred Soil Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conventional Tillage</strong></td>
<td>~70</td>
<td>Invert and loosen by breaking up clumps of soil; incorporate crop residues</td>
<td>Seed planter/seed drill to open soil and press seeds into soil</td>
<td>Weeds buried, easier seeding, residue incorporation</td>
<td>Highest risk of soil erosion and moisture loss; most labor intensive and increased use of tractor and equipment; highest soil compaction; reduction in soil organic matter</td>
<td>Any</td>
</tr>
<tr>
<td><strong>No-Till</strong></td>
<td>&gt;70</td>
<td>Minimal surface clearing; just for seeding</td>
<td>Specialized equipment to move residues; seed drill to open soil and press seeds into soil</td>
<td>Better water infiltration; least soil erosion, least labor intensive and minimal use of tractor and equipment; combats soil compaction over years</td>
<td>Slowest heating of soil in spring; specialized equipment</td>
<td>Warm and dry; can be adapted to cold, wet climates</td>
</tr>
<tr>
<td><strong>Strip-Till</strong></td>
<td>~70</td>
<td>Shatters soil crust; lifts soil above crop residue; creation of strips of tilled seed bed soil</td>
<td>Specialized equipment to move residues; seed drill to open soil and press seeds into strips</td>
<td>Faster seed bed heating in spring; better water infiltration; decreased soil erosion</td>
<td>Highly specialized equipment</td>
<td>Can establish in colder, wetter regions more easily than no-till</td>
</tr>
<tr>
<td><strong>Ridge-Till</strong></td>
<td>~70</td>
<td>Moves residue to row middle, tilling rows and builds permanent ridges of raised soil for planting</td>
<td>Ridge-clearing mechanisms and planter stabilizers for seeding into ridges; seed drill to open soil and press seeds into soil</td>
<td>Faster seed bed heating in spring; better water infiltration; decreased soil erosion</td>
<td>Highly specialized equipment; ridge maintenance; not well-suited for narrow row soybeans or small cereals</td>
<td>Can establish in colder, wetter regions more easily than no-till</td>
</tr>
<tr>
<td><strong>Mulch-Till</strong></td>
<td>30–70</td>
<td>Tilling soil without inversion or breaking up of soil clumps</td>
<td>Specialized equipment to move residues; seed drill to open soil and press seeds into soil</td>
<td>Decreased soil erosion; better water infiltration</td>
<td>Modified planter equipment; slower to warm up in spring</td>
<td>Can establish in colder, wetter regions more easily than no-till</td>
</tr>
<tr>
<td><strong>Vertical Tillage</strong></td>
<td>30–70</td>
<td>Shallow, vertical soil cutting to avoid creation of dense horizontal layer in subsoil, speeds up spring warming/drying</td>
<td>Specialized equipment to move residues; seed drill to open soil and press seeds into soil</td>
<td>Avoids horizontal layer created by tillage that restricts root growth; speeds up soil warming and drying in spring; cuts up residues while maintaining cover</td>
<td>Highly specialized equipment; not effective against deep-rooted weeds; not ideal for heavy residue fields</td>
<td>Can establish in colder, wetter regions more easily than no-till</td>
</tr>
</tbody>
</table>
CONSERVATION TILLAGE IN PRACTICE

MADMAX FARMS, OHIO
Eric Niemeyer’s MadMax Farms lies in the middle of the Upper Scioto Watershed in Ohio. Eric is a first-generation farmer in his 15th farming season producing corn and soybeans. He has learned many lessons the hard way by trying different ideas and learning what practices work best on his 1,250-acre operation.

Eric knew his fields were impacted by erosion. When gullies formed in low areas, soil would wash away in areas of concentrated water flow. He recognized that using conventional tillage practices made it difficult to consistently grow a profitable crop. In response, Eric converted his cropland to no-till, adopted variable rate fertilizer application technology, and started planting cover crops on his entire farm.

On the 1,250 acres in this study he improved his bottom line by $38 per acre, or $47,569 total.

Additionally, USDA’s COMET-Farm Tool estimated that on one of Eric’s 110-acre fields his soil health practices resulted in a 494% reduction in total greenhouse gas emissions which corresponds to taking 17 cars off the road.

GARY SWEDE FARM, NEW YORK
Jay Swede and his father Gary and brother Ryan farm 4500 acres in northwestern New York. The farm is split between three rotations: grains, vegetables and feed grown for a dairy cow partnership. In 2005, Jay began experimenting with strip-till on 100 acres of the sweet and grain corn for dairy cow feed. His initial step to address compaction, erosion and reduce costs developed over the years into a comprehensive soil health management system composed of strip-tilling, cover cropping and nutrient management for 600 acres of sweet corn and corn silage. With reduced tillage introduced into his three years of alfalfa, Jay practices some form of conservation tillage on all 1500 acres of his dairy cow feed rotation.

The combination of increased yield due to soil health, reduced machinery operating costs, nutrient savings, decreased erosion and increased costs associated with cover crops, and setting up the planter to handle residue and learning activities, has given the Swedes an annual net income gain of $55 per acre, or $82,257 total. Beyond the economic gains, Jay’s soil health practices have the added environmental benefit of reducing greenhouse gas emissions. Using the USDA COMET-Farm Tool, Jay found a 560% reduction in greenhouse gas emissions from one of his 25-acre fields, the equivalent of taking three cars off the road.
Great Lakes Conservation connect is a partnership formed to engage both women non-operator landowners and tenants to work together to increase conservation practices on rented lands while improving water quality in the Great Lakes.

Contact Jennifer Filipiak (jfilipiak@farmlandl.org) to get involved.

HEAR WHAT OUR LEARNING CIRCLE PARTICIPANTS HAVE TO SAY!

A recent Learning Circle on structuring farm ownership was positively received by landowner Mary Traxler of Leroy, NY:

There were conversations about the LLC structure for organizing farm ownership and then the second session on the trust, and after evaluating both, I went for the trust structure for my farmland just to create a legacy for my children.”

Tom Corcoran, farmer tenant of Caledonia, NY, describes a system that his landlord, Gina, transitioned to after learning about cover crops at our Learning Circle event:

Gina set up a program that she will charge me X amount of rent if I don’t put a cover crop on, but she will reduce it by 25% if I put a cover crop on her land every fall. So, she is willing to share in the expense if we’re going to do a good job taking care of her land like we treat our own land.”

The Great Lakes Conservation Connect Team has created a series of checklists to help landowners assess their on-farm resources and think through their goals for the land. If you would like to receive these three checklists, please return the enclosed card.