A Few Tips On Strip-Till

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Strip-till is relatively new in the Midwest, so many are still wondering what it is and how it differs from other tillage systems. I will provide some definitions, offer guidance on timing and nutrient applications, and compare strip-till to no-till and conventional tillage.

I have probably heard as many definitions of tillage as people talking about it. I think this is the result of great diversity in equipment and methods of use. All these differences make it difficult to try to define tillage by what it does to the soil, so instead I would like to define it by what it does to crop residue.

Three main tillage categories are described by the Conservation Technology Information Center: conventional (or intensive) tillage, reduced tillage, and conservation tillage. Conventional tillage is a full-width system that disturbs the entire soil surface before and/or during planting and results in less than 15 percent residue cover after planting. Reduced tillage, also a full-width system, involves one or more tillage trips that disturb the entire soil surface, is performed before and/or during planting, and results in 15 percent to 30 percent residue cover after planting. Conservation tillage is any tillage and planting system that results in at least 30 percent residue cover after planting.

Both strip-till and no-till fall in the category of conservation tillage. Strip-till can be considered a form of no-till, which is defined as a system where the soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width. Strip tillage is typically done for crops planted in 30-inch rows. The strip, or berm, that is plowed is normally less than 10 inches wide and 3 to 4 inches tall; the space between the strips is left undisturbed.

When to do strip-till. Strip tillage is typically done soon after harvest. The middle of October is considered the best time to begin operations; starting too early can risk excessive flattening of the strips after the large rain events that are more typical in September and early October. When that occurs there is often a reduction in the warming and drying potential of the strips the following spring.

Strip-tilling in the spring can create challenges whether conditions are wet or dry. Strip tillage done in a wet spring can result in smearing of soil, hard soil clods in the seedbed, and soil compaction between rows. In a dry spring it can result in excessively dry seedbed conditions and an uneven surface for planting.

Nitrogen applications with strip-till. You can apply nitrogen with strip-till, but typically it is not the best idea, for at least two reasons. First, when soil conditions are adequate for strip-till operations, soil temperatures are typically too warm to apply nitrogen. While combining these activities can save time, it is important to wait until soil temperatures 4 inches below the surface are 50°F and falling. Doing the application earlier poses too high a risk of nitrogen loss.

Using strip-till does not justify changing the current recommendations for fall nitrogen application. A potential drawback of trying to combine anhydrous ammonia application with strip-till is that by the time fall conditions are adequate to apply nitrogen, the soil might be getting a little too wet for strip-till operations.

The second reason I don't recommend combining anhydrous ammonia applications with strip-till is the potential for seedlings to be injured by free ammonia. Of course, this concern is greatest when anhydrous ammonia is spring-applied in the strips. While injury might not result every year, I consider the practice riskier than applying nitrogen in the row middles or in some other way that increases the distance between the seedlings and the concentrated nitrogen band.

Phosphorus and potassium applications with strip-till. Under no-till systems, slowly mobile nutrients such as P and K are typically broadcast on the surface. This technique creates a vertical stratification of the nutrients, with higher concentrations in the surface compared with the subsurface. The stratification can have negative effects if the high-nutrient surface becomes too dry or if crop roots are not actively growing in that fraction of the soil volume. Strip-till offers more flexibility than no-till because it is easy to combine deep placement of nutrients with the tillage operation to make the soil berms. Combining these activities helps spread the workload and can result in fewer trips across the field.

It is important to realize, however, that deep placement of nutrients is not required. In fact, studies under way in Illinois and other locations have shown that the more expensive and time-consuming deep placement of P and K typically does not improve grain yield, and if it does the gain is not sufficient to pay for the added costs. Further, band application of fertilizers can make it more difficult than with broadcast placement to obtain a representative soil sample to determine fertilization needs. On the other hand, shallower placement of dry P and K fertilizers in the strip can have a starter fertilizer effect that can be more cost-efficient than applying liquid starter fertilizers. In a wet spring, better growing conditions in the strip can also reduce the need for starter fertilizers.

Strip tillage pros and cons. Strip-till can be considered a compromise of sorts between no-till and conventional tillage, combining certain benefits of each system. You need to consider strip-till's various benefits and drawbacks before deciding whether it is right for your farming operation.

Advantages of strip-till compared with no-till

Strip-tillage for continuous corn has been shown to improve yields compared with no-till and to produce similar yields compared with other tillage systems. The response of corn to tillage following soybean is inconsistent. Similarly, soybean response to strip-till compared with no-till has been inconsistent.

One of the major drawbacks of no-till is the wetter and cooler soil conditions that tend to persist in spring compared with conventional tillage systems, especially where crop residue is high. These conditions can delay planting; restrict hybrid selection; reduce stand uniformity, germination, and development of seedlings; and cause temporary nutrient unavailability due to a reduced ability of the root system to take up nutrients. These conditions can reduce yield or reduce corn dry-down in the field and have deterred many corn farmers from adopting continuous no-till; most prefer to do tillage before corn and plant no-till soybean.

One of the strongest advantages of strip-till compared with no-till is that it helps overcome the obstacles just described while retaining similar soil and water conservation benefits. The strip that is tilled in the fall dries out and warms up faster than the rest of the soil in early spring, creating more favorable conditions for planting and early plant development. Studies have reported temperatures between 2 and 4°F higher in the seedbed for strip-till compared with no-till.

Another benefit of strip-till is that the creation of the strip can break up the surface compaction that is sometimes present with no-till.

Since the strip is created in the fall, precipitation helps mellow the strip and provides a uniform seedbed, which provides ease of planting compared with no-till's high surface residue. The residue-free strip also allows for the use of older planting equipment that was not designed to handle high surface residue, making for an easier transition from conventional tillage to conservation tillage.

Disadvantages of strip-till compared with no-till

While strip-till can help solve many of the drawbacks of no-till, certain challenges could make strip-till less attractive. For one, strip tillage is more costly. There is need for specialized equipment, and more tractor horsepower, fuel consumption is higher, and extra time and labor are required.

Doing strip tillage correctly is another challenge, given time constraints in the fall when harvest takes priority. Potential problems include the possibility of wet soil conditions, snow, or freezing of the soil; the need for an additional trip across the field; and difficulty creating the strip due to high surface residue.

Strip tillage can cause problems with soil erosion, especially if done under wet soil conditions or in the direction of the slope on a sloping field. When strip-till is done with wet soil, smearing of soil surfaces can create a channel for water to move and erode soils and transport nutrients into waterways.

Other concerns with strip-till include crusting of the soil surface, destruction of natural soil structure and greater weed exposure in the strip, faster loss of fragile residue, dry conditions in the seedbed in dry springs, and performance of unnecessary tillage when spring conditions are suitable for no-till.

Some field operations can be more difficult in strip-till than in no-till. Planting in a strip-till system the following spring can be more difficult if an RTK guidance system is not used. Strip tillage can make it more difficult to spread manure or to perform other field operations without interfering with the strip zone, and it creates a constraint in the case of narrow planting rows.

Advantages of strip-till compared with conventional tillage

Strip tillage maintains high surface-residue coverage compared with conventional tillage (and it maintains as much residue as no-till in the undisturbed areas between strips). The higher residue reduces soil erosion, improves soil health (by increasing organic matter content and populations of earthworms and other soil organisms and improving soil structure, penetrability, and soil stability), and helps preserve natural resources.

Water availability is typically a major limiting factor for agriculture in Illinois. Strip tillage offers an advantage over conventional tillage because it reduces soil-water evaporation by covering approximately 2/3 of the soil surface with residue. Further, in contrast with conventional tillage, where the entire surface is disrupted, the undisturbed soil in strip-till typically contains more macropores, earthworm channels, and other forms of preferential flow paths that can increase rainwater penetration into the soil and reduce the potential for runoff of surface water, nutrients, and chemicals.

Disadvantages of strip-till compared with conventional tillage

Conventional tillage is easier to perform than strip-till and makes it easier to manage fields with high residue content. Farmers typically already have the equipment they need for conventional tillage, which can be performed when soils might be getting too wet for strip-till. Δ

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