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Spring tillage preparation

Abstract
Every spring presents new challenges for producers in assessing and working with field and soil conditions. As of today, the only thing about the 2004 growing season we know for sure is that, at some point in time, producers will have to decide whether or not to go to the field for spring tillage. The key issue is knowing when tillage is warranted versus when it would be best to resist the tillage impulse.

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Agronomy, Agricultural and Biosystems Engineering

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INTEGRATED CROP MANAGEMENT

Spring tillage preparation

The spring tillage decision

Every spring presents new challenges for producers in assessing and working with field and soil conditions. As of today, the only thing about the 2004 growing season we know for sure is that, at some point in time, producers will have to decide whether or not to go to the field for spring tillage. The key issue is knowing when tillage is warranted versus when it would be best to resist the tillage impulse.

Currently, the moisture status is very encouraging -- early spring soil moisture conditions across the state are generally more than adequate. Therefore, if wet soil conditions persist during early spring producers need to think about a tillage system that is least likely to cause crop failure.

Tillage objectives -- why to go to the field

Conservation tillage includes a wide range of reduced-tillage operations. There are many valid reasons for using minimum tillage within a conservation tillage management system. Reasons can vary from soils classified as poorly-drained, to using tillage implements for weed control to either kill the first flush of weeds, or to incorporate herbicide application, or to use tillage to incorporate certain fertilizers, such as urea, and to warm and dry wetter soils. However, caution is necessary when using tillage to dry the soil's surface because tillage can result in compacted subsurface soil layers. Also, soil may need to be leveled for planter operation.

Inspection and calibration of tillage equipment

Producers can inspect and adjust now, before heading to the field. First, check the soil engaging points, that is, checking the condition of the sweeps, chisel points, disc blades. The frequency of inspection will depend on where the equipment has been operated. Was it used on poorly-drained, high organic matter soils, well-drained, medium texture, medium organic matter soils, sandy loam and fine, sandy loam soils that cause abrasion, or soils with coarse fragments and rocks. The latter conditions will require more frequent checks on the condition of soil engaging points. Make a note to make daily checks if local soils are especially hard on tillage equipment.

Check for worn or broken tillage components such as sweeps, chisel points, and disc blades. Damaged or worn cutting edges can result in an uneven job. Also, check the down-pressure springs. Are the springs adjusted evenly? Are there any broken ones? Also, note that the down-pressure springs behind tractor wheels may need to be set for more penetration.

This is a good time to check for sales on replacement parts and a slow time for manufacturers, too. Furthermore, for parts that have to be specially ordered, waiting now is better than waiting when the job needs to be done.

Next, inspect the equipment's frame for sprung or broken welds and twisting or bending. Since most equipment covers a very wide swath, even a slight twist can result in a big difference in tillage from one end of the implement to the other, making it difficult to do an even job.

Finally, check the wheels and tires and wheel bearings, hoses and hydraulics for good condition, cracking, and proper operation.

Make a note for later -- after hooking up this spring, test the equipment. Make sure the hitch is level. While traveling through the field, observe the function of components that engage the soil, such as sweeps, chisel points, disc blades. Are they working as intended? Are they leaving an even distribution? Are they penetrating at an even depth? Do the down-pressure springs need adjustment for even penetration?

Additional resources for this topic

For more information, check out the Iowa State University publication Conservation Tillage: Adjustment and Operation of Tillage Equipment in Systems with High Levels of Surface Residue [1] (PM 1492k). Also, refer to the Iowa State University Soil Management website [2].

Conclusion

As decisions about spring tillage are weighed, leaving less than 30 percent crop residue on the soil's surface after planting puts most Iowa soils at risk for soil erosion. There are several key questions that need to be answered before choosing tillage. What will tillage accomplish? What effect will spring tillage have on the 30% residue goal? What are the risks in turning over or disturbing crop residue?

If the answers to those questions lead to a decision in favor of spring tillage, then the proper set-up and maintenance of tillage equipment can eliminate extra tillage trips through the field, preserve crop residue and limit the potential for erosion.

Below: Corn (left) and soybean (right) residue cover percentages (25, 50, 75, 90). The percentage of residue coverage increases from top to bottom for each crop in a column. Photos are courtesy of Nebraska Extension publication G95-1134-A, *Estimating Percent Residue Cover Using the Photo Comparison Method [3]* (D.P. Shelton and P.J. Jasa).

Examples of residue cover percentages. [100k]

To estimate the impact of each tillage operation (including planting) on residue cover, multiply the impact of the tillage operation by the remaining percentage of residue (Table 1). Continue until all tillage operations are included. (see example below):

Table 1. Crop residue cover percentage as affected by field operations.

Field Operation	Corn	Soybeans
After harvest	0.90-0.95	0.80-0.90
Over winter decomposition	0.80-0.90	0.70-0.80
Plow	0.02-0.07	0.00-0.02
Chisel (twisted shank)	0.40-0.50	0.10-0.20
Disk (off-set, deep)	0.25-0.40	0.10-0.20
Paraplow	0.65-0.75	0.35-0.45
Chisel (straight shank)	0.50-0.60	0.30-0.40

Disk (tandem, shallow)	0.65-0.75	0.25-0.35
Anhydrous applicator	0.75-0.85	0.45-0.55
Field cultivator	0.80-0.90	0.55-0.65
Plant	0.80-0.90	0.80-0.90
Till-Plant	0.55-0.65	0.55-0.65

Example of an Erosion Scenario

Producer A:

Harvests corn and has 95% residue existing. 95%

Over winter, he will lose some residue to decomposition, multiply by 0.90 (95% x .90 = 85%)

In the spring, he runs over the stalks with the disk (deep), multiply by 0.40 (85% x .40 = 34%)

Then he field cultivates, multiply by 0.90 (34% x .90 = 31%)

Finally, he gets the 2004 crop planted, multiply by 0.90 (31% x .90 = 28%)

Therefore, in a best-case scenario, Producer A would have less than 28% residue remaining after planting -- which is below the recommended minimum residue percentage of 30%. To determine soil erosion based on residue cover, please visit: http://extension.agron.iastate.edu/soilmgmt/Default.htm

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Links:
[1] http://www.abe.iastate.edu/machinery
[2] http://extension.agron.iastate.edu/soilmgmt/
[3] http://www.ianr.unl.edu/pubs/fieldcrops/g1134.htm

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