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Use crop residues for soil conservation

Michael J. Tidman
Iowa State University

Gerald A. Miller
Iowa State University, soil@iastate.edu

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Abstract
Managing residue matters! As you make tillage plans for this spring and throughout the year, keep in mind the important role that crop residues play in your overall conservation plan. You have already made many choices for this year, starting with the amount of residue left on the ground during combining and after fall tillage last fall. But reducing tillage and leaving as much crop residue as possible in the field each season is good residue management and part of an effective conservation plan.

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In 1992, the statewide annual average soil erosion loss was estimated in excess of 6 tons per acre on cropland. In some areas, Iowa's losses to soil erosion may be as high as 25 tons per acre. Because the amount of soil lost to erosion each year is directly proportional to the amount of crop residue remaining on the surface, good residue managers intentionally leave as much of the past year's crop residue on the soil surface as possible. You may already have made substantial changes in your farming operation to reduce erosion, but at the heart of your conservation plan should be some provision for conservation tillage. Conservation tillage is defined as tillage that leaves at least 30 percent of the field surface covered with crop residue after planting. Conservation tillage practices are compatible with any cropland and crop practice, and they are also a solution to a serious problem that reduces labor, fuel, and time costs.

How residues work

When rain falls, every individual drop forcefully strikes the ground. Drops can be up to 6 millimeters in diameter and can hit the soil at 20 miles per hour. The pounding of raindrops can dislodge soil particles and splash them up to 3 feet away. And the accumulation of that force on bare soils can turn a simple rainfall into a pounding that erodes soil that has been left with no cover to cushion the impact. If there is no residue, not only is rain left on top of the soil and not absorbed but also the process seals off the soil's surface, further reducing rainfall infiltration, allowing it to collect and travel downhill, carrying soil particles with it. Depending on the amount of the flow, slope of the land, and energy level of the flow, runoff rainfall can lead to gullies and severe rill erosion. Crop residues and the cover they provide play an important role in hindering erosion. Cushioning the force of falling raindrops with crop residues can help reduce the number of soil particles dislodged, giving the soil time to absorb the rain. Crop residues also prevent soil compaction, allowing greater water infiltration into the soil.

Winning against soil erosion

Soil erosion leaves others dealing with the problems of unwanted sediments, negatively

effects aquatic habitat, and contributes to water pollution and excess nutrient runoff. It is also carelessly washing away your most important and irreplaceable resources. Using crop residue is a simple, powerful strategy for saving that resource.

Three Basic Crop Residue Management Systems

Conservation tillage is defined as tillage that leaves at least 30 percent of the field surface covered with crop residue after planting. Consider the following tillage choices when thinking about how much crop residue to leave on the surface. Generally, the amount of residue left on the field surface depends on many factors, including the number and speed of operations, the depth of tillage, soil conditions, and the condition and type of residues.

Ridge-till: a system of planting crops on ridges. No tillage is performed prior to planting. During planting, the ridge top is cleared and the seed planted. The ridges are built and then maintained with cultivation as the crop grows.

Mulch-till: a system often referred to as full-width tillage. It uses a chisel plow or disk to till the entire land area of the crop field.

No-till: this system leaves the soil and crop residues undisturbed with the exception of the crop row area where the seed is placed into the ground.

From Crop Residue Systems for Conservation and Profit. USDA Soil Conservation Service, Des Moines, Iowa, October 1992.

Top 10 Ways to Leave More Residue

1. Follow a crop rotation sequence with high-residue-producing crops (e.g., soybeans do not provide the same protection as corn)
2. Wait until spring for tillage operations
3. Reduce the number of tillage passes
4. Plant rye or wheat as a winter cover crop, especially when growing low-residue crops, such as soybeans
5. Set chisels and disks to work shallower
6. Stop using the moldboard plow
7. Drive slower on tillage operations;driving faster throws more soil and covers residue
8. Use straight shanks and sweeps on chisel plows; twisted shanks may bury 20 percent more residue
9. No-till drill soybeans instead of planting them conventionally; no-till drilling keeps more residue on the soil surface and generally produces a quicker canopy
10. Convert to a no-till system

From Conservation Catalog. USDA Soil Conservation Service, Des Moines, Iowa, October 1991.

Estimate your residue!

Multiply each operation by the existing percentage of residue left to find how much ground cover will be left after each tillage operation.

Operation	Corn	Soybeans
After harvest	0.90-	0.80-0.90

	0.95	
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

An example of how to calculate percentage of residue remaining after planting into corn residue for mulch tillage systems.

After harvest	<	(0.95)
After winter	<	(0.90)
Spring chisel (straight shank)	<	(0.60)
Spring disk (shallow)	<	(0.75)
Planting	<	(0.90)
Percentage of ground cover after planting	=	(0.35)

(0.95 < 0.90 < 0.60 < 0.75 < 0.90)

From Conservation Catalog. USDA Soil Conservation Service, Des Moines, Iowa, October 1991.

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