Residue Management

Understanding the benefits of managing crop residue to reduce soil erosion.

Key Points

- **What are the agronomic benefits of residue?**
- **Proper crop residue coverage starts with the combine.**
- **Managing crop residue.**
- **Measuring crop residue.**

What are the agronomic benefits of residue?

Raindrops can strike the ground with a surprising amount of force. In a normal rainfall, drops 6 millimeters in diameter can hit the soil's surface at 20 miles per hour. Large, pounding raindrops dislodge soil particles, splashing them up to 3 feet. The process of soil "splash" also works to "seal" or crust the soil's surface, reducing water infiltration and allowing rainwater to collect and move down slopes, carrying dislodged soil particles and causing soil erosion.

A blanket of residue left on the soil surface is extremely effective in controlling erosion, and should be part of every producer's conservation plan. Complete residue cover can reduce soil erosion 95 to 98 percent, as compared to unprotected soil. Any residue—straw, chaff, manure, even the finest plant material—can reduce erosion by stopping rain splash erosion, slowing and trapping runoff and allowing for better water infiltration.

For most Iowa soils, high residue levels translate directly into soil conservation benefits. The consensus among experts is that effective conservation tillage practices should leave at least 30 percent crop residue after planting on sloping soils subject to soil erosion.

Proper crop residue coverage starts with the combine.

Getting an even crop residue distribution while harvesting is critical in stopping soil erosion. Combine operators need to set up straw and chaff spreaders or choppers properly, so that the combine distributes residue evenly. Larger headers on combines can make it tougher, because they tend to concentrate material behind the machine.

Managing crop residue.

Concentrated crop residues insulate the soil's surface from the sun, reduce seed to soil contact, make it tougher to plant in the spring, and can slow seed germination and crop development. If you think that you need more tillage, consider whether or not crop residues were spread out evenly, and take steps to spread it better during harvest. Alternatively,

consider removing a narrow band of residue from the row at planting with row cleaner attachments on the planter and plant on a contour.

Tillage operations reduce residue cover in the field. In Table 1, multiply the existing percentage of residue left by the residue remaining factor, to find how much ground cover will be left after each tillage operation.

Running tillage implements shallower and slower tends to increase the residue remaining factor, and thereby increase the percent residue cover.

Table 2 gives an example of how to calculate residue losses from fall harvest (corn) to after planting. Determine the percentage of existing residue after harvest, then multiply that percentage by the remaining residue indicated for each of the field operations.

Table 1. Calculating crop residue following tillage operations.

	Residue Remaining Factor	
Operation	**Corn**	**Soybeans**
After harvest	0.90–0.95	0.80–0.90
Over winter decomposition	0.80–0.95	0.70–0.80
Anhydrous ammonia applicator	0.60–0.75	0.30–0.50
Plow	0.00–0.10	0.00–0.05
Paraplow	0.80–0.90	0.75–0.85
Chisel Plow (twisted shank)	0.50–0.70	0.30–0.40
Chisel Plow (straight shank)	0.60–0.80	0.40–0.60
Disk (off-set, deep)	0.25–0.50	0.10–0.25
Disk (tandem, shallow)	0.40–0.70	0.25–0.40
Field cultivator	0.70–0.80	0.50–0.60
Planting	0.85–0.95	0.75–0.85
Till-Plant	0.40–0.60	0.20–0.40

Table 2. Calculating residue losses from fall harvest (corn) to after planting.

Tillage Operation	Impact of Operation	% Residue Remaining
Percent residue remaining at harvest:	——	95%
Reduction from winter decomposition: *(multiply 0.95 residue remaining by0.90)*	0.90	86%
Reduction from spring chiseling (straight shank): *(multiply 0.86 residue remaining by 0.70)*	0.70	60%
Reduction from spring disking (shallow): *(multiply 0.60 residue remaining by 0.60)*	0.60	36%
Reduction from planting: *(multiply 0.36 residue remaining by 0.90)*	0.90	32%

Approximate percentage of crop residue remaining in this example after planting: 32%

Measuring crop residue.

There are several acceptable methods for measuring and estimating crop residue. For every method, repeat measurements at several sites within each field, and average them to ensure an estimate for the entire field. The “line-transect” method, the “meter stick” method, the “photo-comparison” method, or the “calculation” method can calculate

residue remaining after a tillage operation. Check with your Iowa State University county Extension office or Soil and Water Conservation district office for more information on how to measure crop residue.

Best Management Practices, or BMPs, utilize the most effective and practical means available to reduce or prevent water pollution from farm operations. BMPs are selected based on assessment, analysis of the impact of alternative practices and their economic considerations. They are implemented using current available technologies, management skills and available resources. BMP information sheets available from ISU Extension include:

NMEP 1, *Soil Testing*
NMEP 2, *Phosphorus Application*
NMEP 3, *Manure Resources*
NMEP 4, *Residue Management*
NMEP 5, *Crop Rotation*
NMEP 6, *Crop Yields*
NMEP 7, *Nitrogen Application*
NMEP 8, *Nutrient Management Plan*
NMEP 9, *Equipment Calibration*
NMEP 10, *Conservation Reserve Program*
NMEP 11, *Conservation Practices*

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