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Spring - soil's most vulnerable season

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Abstract
Spring rains can come hard and fast, causing substantial soil erosion when soils are most vulnerable because of degraded crop residue cover, soil preparation tillage, and no crop canopy. The combination can not only lead to serious soil erosion but also, consequently, water quality problems.

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How does it happen? In a normal rainfall, raindrops 6 millimeters in diameter hit the ground at 20 miles per hour. The cumulative impact of millions of raindrops hitting the ground in a hard-hitting spring storm rainfall can be incredible, dislodging soil particles and "splashing" them up to 3-5 feet away.

The splashed particles clog soil pores, effectively sealing off the soil's surface, resulting in poor infiltration. Instead of soaking into the soil, rainwater collects and moves down-slope, in rill erosion or forming gullies, carrying soil particles.

Soil crusting is another significant problem resulting from lack of crop residue, particularly in soils with a minimum amount of residue cover. High intensity rain breaks down soil aggregates into small particles, causing the bare soil surface to seal. When rapid drying occurs, a hard crust layer can form in the top 2 inches. Soil crusts that form above seed can be a significant challenge for plants as they emerge. In addition crusted soils create surface conditions that induce further surface runoff.

A good soil conservation plan limits exposed soil and rainsplash erosion. Effective conservation plans also depend on planning, observation, and maintenance. Spring is as good a time as any to turn over a new leaf in conservation planning.

The first line of defense: crop residue

The first step in preventing spring soil erosion is to have a substantial blanket of crop residue remaining from last season's harvest. Growers are encouraged to assess the changes in residue cover since last fall's harvest. For example, did the winter weather induce much decomposition? Has surface water runoff modified the crop residue cover? If so, reconsider fall crop residue management after future fall harvests. If there was a fall tillage pass, or if manure or anhydrous ammonia was injected, what impact on crop residue did that action have?

As part of the residue cover assessment use an acceptable crop residue measurement technique to determine what's left and to project if there will be at least 30 percent remaining after planting this year's crop.

Choices and consequences

With the most sensitive weather and field conditions for erosion fast approaching, what options remain before planting?

First, before going to the field this spring, growers should consider the effect any tillage will have on remaining crop residue. From the measurements taken with an acceptable crop residue measurement technique, use the table to calculate what residue will remain after any planned field operations. If the result falls below 30 percent, reconsider what is planned.

Conservation structures can be a secondary line of defense. If they exist, spend some time checking terraces, standpipes, and waterways. Winter can be hard on conservation structures. Check terrace ridges, standpipes and terrace channels. Ensure that waterways have retained optimum shape, i.e., they are wide, shallow, and sod-lined to prevent erosion and gullies.

Soil, surface runoff, and nutrient loss relationship

Different pollutants such as nutrients and pesticides have different transport mechanisms. For example, phosphorus can be transported attached to the soil particles that are suspended in runoff water. Nitrate nitrogen can be transported in surface runoff or infiltrate with water into the soil profile and be intercepted by tile lines and returned to surface water by tile outflow.

The issue of water quality is not going away any time soon. The relationship between water quality and soil erosion cannot be overemphasized. Soil erosion and residue management, especially surface water runoff, influence water quality. The need for adoption of conservation practices can be significant in controlling soil erosion.

Table 1. Residue cover after different operations.

Operation	Corn	Soybean
After harvest	0.90-0.95	0.80-0.90
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

Here's an example of how a producer might estimate residue remaining after planting. (This example is for corn residue: note the lower beginning values of soybean residue).

Impact of Operation	Remaining Residue (%)
Residue (%) remaining at harvest	<95
Reduction from winter decomposition (multiply 95% residue remaining by 0.80-0.90)	0.90-85.5
Reduction from spring chiseling (straight shank) (multiply 85.5% residue remaining by 0.50-0.60)	0.60-51.3
Reduction from spring disking (shallow) (multiply 51.3% residue remaining by 0.65-0.75)	0.75-38.5
Reduction from planting (multiply 38.5% residue remaining by 0.80-0.90)	0.90-34.6
Estimated residue (%) remaining after planting	35

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