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Methods for measuring crop residue

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Methods for measuring crop residue

Abstract

It is a good time to measure crop residue, or the stems and stalks remaining from last year's crop. Crop residue provides a very important cover for the soil during this time of year, shielding soil particles from heavy rainfalls and erosion until crops can produce a protective canopy.

Keywords

Agronomy, Agricultural and Biosystems Engineering

Disciplines

Agricultural Science | Agriculture | Agronomy and Crop Sciences | Bioresource and Agricultural Engineering

INTEGRATED CROP MANAGEMENT

A person is visible in the background of the title image, working in a field of tall grass or crops. The text 'INTEGRATED CROP MANAGEMENT' is overlaid on the image in a large, stylized font.

Methods for measuring crop residue

It is a good time to measure crop residue, or the stems and stalks remaining from last year's crop. Crop residue provides a very important cover for the soil during this time of year, shielding soil particles from heavy rainfalls and erosion until crops can produce a protective canopy.

Crop residue cushions the force of raindrops

In a normal rainfall, raindrops of 6 millimeters in diameter can hit the ground at 20 miles per hour. The cumulative impact of millions of raindrops hitting the ground in a normal rainfall can be very destructive to topsoil. With no crop residue to protect the soil from the impact and erosive properties of rainfall, the pounding of raindrops can quickly dislodge soil particles, moving them up to 3 feet away from their original location.

The process of "soil splash" is only the beginning of the problem. The splashed particles begin clogging soil pores, effectively sealing off the soil's surface, resulting in poor infiltration. Rainwater also starts to collect and move down slope, carrying with it dislodged soil particles. Often, this process causes severe rill erosion or the formation of gullies. Crop residues retard the process of soil erosion by limiting soil splash and protecting the soil's surface from the direct erosive impact of raindrops. Therefore, crop residue increases water infiltration rate by reducing water runoff velocity.

Now is a good time to check your crop residues

High levels of residue translate directly into better soil conservation, but what is considered a high residue level? Most experts agree that conservation tillage practices must leave at least 30 percent crop residue cover after planting to be considered as a conservation tillage practice--or one that retains high residue levels. Knowing how to measure crop residue as new crops emerge helps determine how well soil is protected from water erosion, and the success of your conservation plan.

How does your crop residue measure up?

Use the following techniques (line transect, meter stick, photo comparison, and calculation) to determine your residue cover. The best estimates are the averaged results of repeated measurements at several areas in each field (exclude end-rows).

Line transect

Count the number of times a marked line intersects with a piece of residue. Use a 50- to 100-foot tape measure (or a rope with marks spaced at 1-foot intervals). Stretch the tape (or rope) between two stakes placed diagonally (at a 45 degree angle) of the crop rows. Looking directly from above the tape (vertically), count the number of times where a "foot" mark intersects with crop residue. Make consistent judgments--use only the left or right side of the foot mark on the tape (or rope) to avoid over counting residue. The resulting count converts directly into the percentage of crop residue remaining in that sample area. (Example: 38 occurrences of intersection equals 38 percent crop residue remaining). (As an alternative, a 50-foot tape measure can be used; just evaluate the marks at 6-inch intervals instead.)

Meter stick

Places for measurement can be determined randomly by throwing the meter stick (a yardstick with metric markings also can be used) into the air and taking measurements where it lands. Once the meter stick is on the soil, evaluate at each centimeter mark the crop residue occurring along one edge of the meter stick, and total these measurements. (Example: if the residue occurs at 35 centimeter marks along a meter stick, the percentage of residue remaining is 35 percent.)

Photo comparison

Compare your fields' residue cover to that in the photos herein that show a known percentage of crop residue. Remember that the perspective from an angle can be misleading. Look straight down when comparing photos.

Calculation

Calculation is a good way to get a rough estimate of remaining residue without going to the field. But remember that it is only a general guide and may not reflect what is really on the field because too many variables, including weather and differences between operations of tillage equipment, are involved. See Table 1 for information on residue cover percentage remaining on the soil surface after each operation . Multiply the factor for each operation by the existing percentage of residue left to find how much residue cover will be left after each operation.

Table 2 gives an example of calculating residue losses from fall harvest to after corn planting. First, determine the percentage of existing residue cover after harvest and then multiply that by the percentage of remaining residue after each following operation.

Conclusion--more residue equals less erosion.

Strive for at least 30 percent crop residue after planting. It's one of your best allies in fighting soil erosion.

Table 1. Crop residue cover percentage after various 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)	0.40-0.70	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

Table 2. Example of calculating residue losses from fall harvest to after corn planting.

Field Operation/Conditions	Residue Remaining after Each Operation	Final Residue Cover Percentage
Harvest	$0.95 \times 100 =$	95
Winter decomposition	$0.90 \times 95 =$	86
Spring chiseling (straight spikes points)	$0.55 \times 86 =$	47
Spring disking (tandem disk, secondary tillage)	$0.55 \times 47 =$	26
Planting (double disk openers)	$0.90 \times 26 =$	23
Estimated residue remaining in this example is		23

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* [1] (D.P. Shelton and P.J. Jasa).



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[1] <http://www.ianr.unl.edu/pubs/fieldcrops/g1134.htm>

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