

Subpart 503E Crop residue

503.40 Benefits of managing crop residue

Crop residue management is paramount to improving soil health. Without residue left on or only partially incorporated in the soil surface, there will be continued degradation of soil organic matter levels and soil health will not be maximized. Lower soil organic matter leads to lower cation exchange capacity, lower pH, lower water holding capacity, greater susceptibility to soil erosion, and poorer soil structure. Poor soil structure results in less pore space, decreased infiltration, and increased surface runoff.

Soil organic matter is an extremely important component of a productive soil. Because organic matter has many exchange sites it is capable of buffering many soil reactions. For example, by holding hydrogen ions, their content is reduced in soil solution that results in less soil acidity. At a pH near neutral (pH 7.0), plant nutrients are most available. In addition, organic matter increases soil aggregate stability and thereby reduces detachment by falling raindrops and surface runoff. Declining levels of soil organic matter over time is a strong indicator of declining soil health.

Research in Morris, Minnesota, (Riecosky 1995) reported that as much carbon (C) was lost to the atmosphere as CO₂ in just 19 days after moldboard plowing wheat residue as was produced by the crop. Carbon is the key component of soil organic matter and serves as an energy source for microbial activity.

Tillage stirs the soil similar to *poking a fire* that results in more rapid loss of carbon. Therefore, the primary reason organic matter levels of continuous cultivated soils have declined to less than half of their original level is directly related to tillage and the resulting loss of carbon to the atmosphere. To increase organic matter levels of the soil, crops that produce large amounts of residue should be grown with a significant reduction in tillage. Undisturbed root systems are the main contributor to increased soil carbon levels.

503.41 Crop residue production

(Under development)

503.42 Crop residue retention

(Under development)

503.43 Estimating crop residue cover

The line transect method — The line transect method has been proven effective in estimating the percent of the ground surface covered by plant residue at any time during the year.

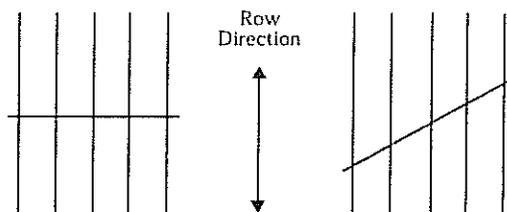
Estimates of percent cover are used for determining the impact of residue on sheet and rill erosion. They cannot be used directly for determining the impact of residue on wind erosion.

Estimates of percent cover obtained using the line transect method to evaluate the impact of residue on sheet and rill erosion are most accurate when the residue is lying flat on the soil surface and is evenly distributed across the field.

The following is the recommended procedure for using the line transect method:

1. Use a commercially available 50- or 100-foot long cable, tape measure, or any other line that has 100 equally spaced beads, knots, or other gradations (marks) at which to sight.
2. Select an area that is representative of the field as a whole and stretch the line out across the crop rows. The line may be oriented perpendicular to the rows, or in a direction that is at least 45 degrees off the row direction (fig. 503-1).

Figure 503-1 Acceptable orientations for residue measurement lines



The locations in the field where the line is stretched out to make measurements should be selected randomly from among the areas of the field that are typical of the entire field. End rows, field borders, and parts of the field that appear different are probably not typical of the entire field and should be avoided.

3. Walk along the line, stopping at each mark. Position the eye directly over the mark, and look down at it. When sighting, do not look at the entire mark. Rather look at a single point on each mark.

A point has an area about like the end of a needle. On commonly used equipment, the knots, beads, or gradations have much larger areas than the end of a needle. A measurement is not based on whether or not some portion of a mark is over the residue. It is based on whether or not a specific point associated with the mark is over residue.

If using a commercially available beaded line, one way to accomplish the above is to select as the point of reference the place along the line where a bead begins.

4. Determine the percent residue cover by counting the number of points at each mark along the line under which residue is seen. Count only from one side of the line for the single, selected point count at each mark. Do not move the line while counting.

Count only that residue that is large enough to intercept raindrops. A rule of thumb is to count only residue that is 3/32 inch in diameter or larger (fig. 503-2). When using a line with 100 points, the percent residue cover is equal to the number of points under which residue is seen.

5. Three to five transects should be done in each field, using the procedure described in steps 1 through 4. Five transects are recommended.

With five measurements, estimates of percent residue cover are accurate to within ± 15 percent of the mean. Three measurements will give estimates accurate to within ± 32 percent of the mean.

For example, if the mean of five measurements was 50 percent cover, you could be confident (at the 95% confidence level) that the true mean was between 42 percent and 57 percent cover. For a 30 percent cover average based on five measurements, you could be confident that the true value was between 25 percent and 34 percent cover.

6. The documentation of individual transects and computations made to determine average percent residue amounts should be done in a professional manner.

Documentation should be done in a way that permits easy tracking from the field measurements to the final answer.

The development and use of a documentation worksheet is recommended. Example worksheet formats are illustrated at the end of this section.

Converting pounds of residue to percent cover—For some applications, the weight of the crop residue needs to be known rather than the percent cover. Figure 503-3 illustrates the relationship between residue weight and percent residue cover for various crops. It also illustrates the procedure for estimating the amount of surface cover provided by a known weight of residue.

503.44 Determining the weight of standing vegetative cover

In many instances, the amount of above-ground biomass needs to be known. The procedures for estimating and measuring the weight of standing vegetation are given in the National Range and Pasture Handbook, Part 600.0401(c).

Figure 503-2 Counting residue pieces along a line transect

