TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE STATE OF COLORADO NATURAL RESOURCES CONSERVATION SERVICE

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To: All Offices

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Estimating Residue with the Line Transect Method

The Line Transect Method is an effective method to estimate the percent surface-cover by plant residues at any time of the year.

Estimates of percent residue surface-cover can help determine the impacts of residue on rill and interrill erosion. To measure residue for wind erosion, an estimate of standing residue is needed as well surface cover. The Revised Universal Soil Loss Equation (RUSLE2) and the Wind Erosion Prediction System (WEPS) estimate residue amounts throughout the year, however, it is a good practice to measure the actual residue from time to time to ensure the models are predicting the amount of residue correctly based on the planned conservation system. This methodology is also useful to estimate the percent residue surface-cover for applied mulch materials.

Estimates of percent surface residue-cover obtained using the line transect method are most accurate when the residue lies flat on the soil surface and is evenly distributed across the field.

Recommended procedures 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 of the field that is representative of the field as a whole and stretch the line out across the crop rows. The line may be orientated perpendicular to the rows, or in a direction, that is at least 45 degrees off the row direction. Select locations in the field 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 areas of the field.
3. Walk along the line, stopping at each mark. Position the eye directly over the mark, and look down on 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 the 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 (fig. 503-44). When using a line with 100 points, the percent residue cover is equal to the number of points under which residue is seen.

Three to five transects should be completed in each field, using the procedure described in steps 1 through 4. Five transects are recommended. With five measurements, estimates of percent 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.

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 measurement to the final answer. The development and use of a documentation worksheet is recommended. An example worksheet is included at the end of this technical note.

Converting pounds of residue to percent cover – For some applications, the weight of residue is needed rather than percent cover. Figure 503-45 illustrates the relationship between residue weight and percent cover for various crops. The dashed lines with arrows illustrate the procedure to convert residue weight to percent cover. It also illustrates the procedure to estimate the amount of surface cover provided by a known weight of residue.

Figure 503–44 Counting residue pieces along a line transect

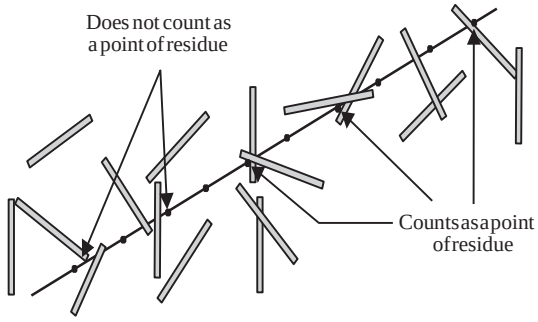
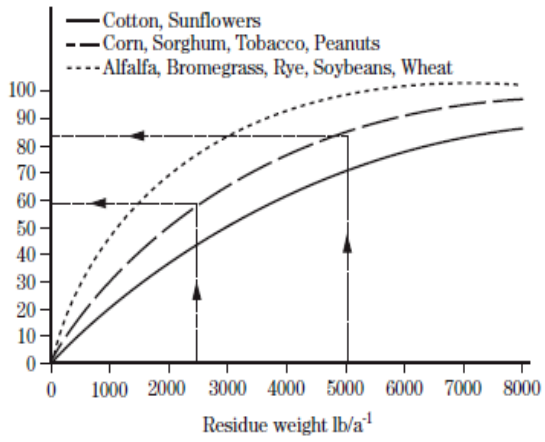


Figure 503-45 Relationship of residue weight to percent cover for various crops



Reference

USDA, NRCS. 2011. Estimating crop residue cover. 190-V-NAM (National Agronomy Manual), 4th Ed. Part 503.51. Washington, D.C.

Residue Measurement Worksheet
(for use with the line transect method)

Cooperator	Field Office/Planner	Tract

Field no. **Planned residue level** **percent** **Residue type**

Transect number	Total number of points 1/	Number of points with residue 2/	Percent residue this transect
1			
2			
3			
4			
5			
Average percent residue cover for field			

Field no. **Planned residue level** **percent** **Residue type**

Transect number	Total number of points 1/	Number of points with residue 2/	Percent residue this transect
1			
2			
3			
4			
5			
Average percent residue cover for field			

Field no. **Planned residue level** **percent** **Residue type**

Transect number	Total number of points 1/	Number of points with residue 2/	Percent residue this transect
1			
2			
3			
4			
5			
Average percent residue cover for field			

1/ To achieve the degree of accuracy quoted in the NAM-recommended procedure for using the line transect method, each transect must be based on looking at a total of at least 100 points.
2/ Attach a map or sketch showing the location of each line transect within the field. All measurements shall be made using the line transect procedure contained in the National Agronomy Manual.

Data collector ______________________________ Title __________________ Date ________________