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Stubble Mulching in South Dakota

Cooperative Extension South Dakota State University

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stubble mulching

in SOUTH DAKOTA

Cooperative Extension Service
SOUTH DAKOTA STATE UNIVERSITY
Brookings, South Dakota
stubble mulching in south dakota

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During recent years, wind erosion has damaged topsoil on as many as 175,000 acres annually in South Dakota. Wind erosion causes additional losses by literally cutting off and destroying young plants such as winter wheat and barley. Such extensive crop damage can occur in small grain-fallow cropping rotations on very sandy soil.

Stubble mulch farming can economically and effectively control soil erosion and crop damage. Stubble mulch farming uses surface plant residue to protect against wind erosion. Seedbed preparation, planting, cultivating and harvesting are done in such a way that remaining plant residues protect the surface soil against wind and water erosion until new crops can provide adequate protection.

Stubble mulching uses Nature's principle in controlling wind and water erosion: it keeps the soil surface covered with plant residues. Surface residues intercept and disperse most of the erosive force of raindrops and also increase water movement into the soil. Residues lower wind velocity at soil surface and thus reduce soil erosion. Residues also trap snow, which helps increase soil moisture reserves.

MOST IMPORTANT FOR SUMMER FALLOW

Stubble mulching, while applicable to row crops and other annual crops, is most important on summer fallow. Plant residues protect the soil from wind and water erosion during the long fallow period.

USE MINIMUM AMOUNTS OF TILLAGE

A guide for good stubble mulching: use no more tillage operations than you need to control weeds. Excessive tillage increases farming costs, reduces amount of protective residue and breaks down clodliness and tilth of soil.

PLAN YOUR STUBBLE MULCHING PROGRAM

Consider these factors when arranging your stubble mulch operations:
1. Total plant residue existing before first tillage.
2. Amount of residue required for protection under existing field conditions.
3. Plan equipment use to assure adequate final amounts of residue.

Planned tillage operations help avoid unnecessary overhead costs and retain protective amounts of residue.

A wheat crop produces about 100 pounds of residue for each bushel of grain. This provides a rule of thumb to determine amount of available stubble. Poor soil fertility, limited moisture, diseases and insect problems can reduce this initial per acre amount of residue.

Tillage implements—depending on type and adjustment—destroy varying amounts of surface residue. Table 1 lists maximum amounts of residue destroyed by each operation of equipment.

Table 2 shows typical amounts of wheat and sorghum residue needed on surface soils of various textures. Column (1) is the minimum usually required before stubble mulch tillage starts. Column (2) is the minimum crop residue needed after stubble mulching to protect soil when the next crop is seeded.

These minimum amounts of residue at seeding time may be reduced, for example, if field strips 40

Standing residue (at right) traps snow more effectively than when it is incorporated into the soil (at left).
rods wide or less are established at right angles to the prevailing winds.

If the original amount of residue after harvest is less than in column (1), more care in tillage methods will be needed to end up with a sufficient amount of residue on the surface to protect the soil.

You can determine the amount of surface residue rather easily: Select at random three, 1-square-yard sample areas in your field. Weight in ounces of the air-dry residue from the three, 1-square-yard areas multiplied by 100 gives pounds of residue per acre. For example, 16 ounces of residue times 100 equals 1,600 pounds of residue per acre. The amount of residue in the 1-yard-square areas should be representative of the field.

Local SCS technicians can determine the minimum amounts of surface residue needed after seeding to protect any given field against wind erosion. With this and the above information, tillage programs such as the following example can be planned to assure that adequate amounts of residue will be left.

EXAMPLE OF TILLAGE PLANNING:
Assume a 20-bushel per acre spring wheat crop on a silt loam field. Estimated yield of straw is 2,000 pounds per acre after harvest. The goal is 750 pounds of residue per acre on the surface at the next seeding time. You expect to use five tillage operations to control weeds. You have a one-way, heavy-duty cultivator with shovels 12 inches apart and a rodweeder.

TILLAGE PLAN:
Heavy duty cultivator three times, rodweeder twice.

(Residue calculations from table 1).
Residue after harvest 2,000 lbs.
Residue after first cultivator operation \[2,000 - (2,000 \times 15\%)\] = 1,700 lbs.
Residue after second cultivator operation \[1,700 - (1,700 \times 15\%)\] = 1,445 lbs.
Residue after third cultivator operation \[1,445 - (1,445 \times 15\%)\] = 1,230 lbs.
Residue after first rodweeder operation

\[ [1,230 - (1,230 \times 10\%)] = 1,105 \text{ lbs.} \]

Residue after second rodweeder operation

\[ [1,105 - (1,105 \times 10\%)] = 995 \text{ lbs.} \]

As the remaining residue of 995 pounds is more than the 750 pounds needed (table 2), this plan is satisfactory.

**TILLAGE EQUIPMENT**

Blade-, sweep-, and rodweeder-type machines are better because they destroy the least amount of residue—only 10% to 15%. Disk-type implements destroy up to 50%. Disk-type implements may be used, however, when field conditions are too wet for blades and rodweeders or for reducing excess residue. They are sometimes essential for early spring control of winter annual bromegrasses.

Sweep- or blade-type equipment should operate 3 to 4 inches deep to conserve moisture and control weeds most economically. In some soils it may be best to till 5 or 6 inches deep with a chisel type implement to help prevent formation of a tillage pan.

**HERBICIDES CAN REDUCE TILLAGE**

Chemicals may be used to control broad-leaved weeds. This means fewer tillage operations and greater conservation of residue. Most herbicides that control grassy weeds, however, are relatively expensive and/or leave chemicals in the soil that may damage the next crop. In isolated conditions where extremely small amounts of plant residue are available, chemicals and tillage or chemicals alone may be used to control weeds thus destroying as little residue as possible.

**HOE TYPE DRILLS ARE IMPORTANT**

Deep-furrow press drills with hoe shovels 4 to 5 inches wide leave soil ridges that effectively resist wind erosion. These drills work well in varying amounts of residue and also supplement stubble mulching by keeping residue in the ridges.

Soil protection provided by residue is also important in row crops. Disk-type lister planters or similar once-over tillage and planting equipment destroy less crop residue than other row crop tillage practices.
implements destroy residue

Table 1.

Table 2.

minimum residue needed pounds per acre

<table>
<thead>
<tr>
<th>Soil Textures</th>
<th>Wheat Start (1)</th>
<th>Wheat End (2)</th>
<th>Sorghum Start (1)</th>
<th>Sorghum End (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coarse Sand</td>
<td>2,500</td>
<td>1,750</td>
<td>4,000</td>
<td>3,500</td>
</tr>
<tr>
<td>Loamy sand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loamy fine sand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderately coarse and fine</td>
<td>2,000</td>
<td>1,250</td>
<td>3,500</td>
<td>2,500</td>
</tr>
<tr>
<td>Fine sandy loam</td>
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<td></td>
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<tr>
<td>Sandy loam</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Silty clay</td>
<td></td>
<td></td>
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<tr>
<td>Clay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium and moderately fine</td>
<td>1,500</td>
<td>750</td>
<td>3,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Very fine sandy loam</td>
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<td></td>
<td></td>
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<tr>
<td>Loam</td>
<td></td>
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<tr>
<td>Silt loam</td>
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</tr>
<tr>
<td>Clay loam</td>
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<td></td>
</tr>
<tr>
<td>Sandy clay loam</td>
<td></td>
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</tr>
</tbody>
</table>

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