Tillage Management Basics

CALS Short Course
Soil and Water Management
Tillage Management Begins at Harvest
Stalks - Chop or not to chop?

- Improved flow through equipment
- Surface matting in no-till
- Cost for time, fuel, equipment
- 42% vs. 56% residue after chisel plowing chopped stalks

Chop or not to chop?
## EFFECT OF STALK CHOPPING ON SURFACE CROP RESIDUE

<table>
<thead>
<tr>
<th>TILLAGE</th>
<th>CHOPPED</th>
<th>NOT CHOPPED</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO-TILL</td>
<td>98</td>
<td>100</td>
</tr>
<tr>
<td>CHISEL</td>
<td>42</td>
<td>58</td>
</tr>
</tbody>
</table>

SINGLE PASS WITH TWISTED SHANK COULTER CHISEL
Stalks – A little N for decomposition?

Bundy and Andraski, 2002

- UAN or AmSul @ 30 lb
- Did not increase residue breakdown
- Did not affect N mineralization
- Did not increase spring soil temperature
- Did not increase yield
Measuring Surface Crop Residue

- **Estimate residue cover with line transect method**
  - % residue = number of ‘hits’/100 ft. of line
  - must be viewed straight down
  - larger than BB shot
  - manure counts, stones don’t
Line transect method of measuring residue

Stretch tape diagonally

Count “hit” per tape length
Typical Chisel Plow
CHISEL PLOW POINTS AND THEIR APPLICATION (SOURCE: CASE IH)

- SUITED TO HEAVY STUBBLE
- LEAVES SURFACE ROUGH
- USE RIGHT AND LEFT-HANDED SHOVELS IN EQUAL QUANTITY

3” TWISTED SHOVEL
CHISEL PLOW POINTS AND THEIR APPLICATION (SOURCE: CASE IH)

- SUITED TO DEEPER OPERATIONS
- LEAVES SURFACE SMOOTHER THAN TWISTED SHOVEL
- USEFUL FOR SHATTERING PLOWPANS

2” REVERSIBLE POINT
CHISEL PLOW POINTS AND THEIR APPLICATION (SOURCE: CASE IH)

- SUITED TO OPERATIONS ON MOST SOILS
- LEAVES SMOOTHEST SURFACE AND MOST RESIDUE
- ALSO AVAILABLE IN 10" AND 14"

16" SWEEP
Comparison of chisel points

Twisted shovel
Comparison of chisel points

Sweep
### General Estimate of Surface Crop Residue After Chisel Plowing

<table>
<thead>
<tr>
<th>Type</th>
<th>Point</th>
<th>Non-Fragile</th>
<th>Fragile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>No Disks</td>
<td>Sweep</td>
<td>70-85</td>
<td>50-60</td>
</tr>
<tr>
<td></td>
<td>Point</td>
<td>60-80</td>
<td>40-60</td>
</tr>
<tr>
<td></td>
<td>Shovel</td>
<td>50-70</td>
<td>30-40</td>
</tr>
<tr>
<td>Coulter</td>
<td>Sweep</td>
<td>60-80</td>
<td>40-50</td>
</tr>
<tr>
<td></td>
<td>Point</td>
<td>50-70</td>
<td>30-40</td>
</tr>
<tr>
<td></td>
<td>Shovel</td>
<td>40-60</td>
<td>20-30</td>
</tr>
<tr>
<td>Disk</td>
<td>Sweep</td>
<td>50-70</td>
<td>30-50</td>
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<tr>
<td></td>
<td>Point</td>
<td>50-60</td>
<td>30-40</td>
</tr>
<tr>
<td></td>
<td>Shovel</td>
<td>40-50</td>
<td>20-30</td>
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</table>
# Chisel Point and Surface Residue After Tillage

<table>
<thead>
<tr>
<th>SITE</th>
<th>TILL. DEPTH</th>
<th>INITIAL COVER</th>
<th>4” TWIST</th>
<th>2” POINT</th>
<th>16” SWEEP</th>
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<tbody>
<tr>
<td>VERNON</td>
<td>10</td>
<td>71</td>
<td>23</td>
<td>33</td>
<td>41</td>
</tr>
<tr>
<td>DANE</td>
<td>8</td>
<td>95</td>
<td>35</td>
<td>52</td>
<td>58</td>
</tr>
<tr>
<td>SHEB.</td>
<td>8</td>
<td>90</td>
<td>34</td>
<td>57</td>
<td>53</td>
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</tbody>
</table>

*Disk chisel, 15” shank spacing, 5 mph, stalks not chopped*
TROUBLE-SHOOTING TIPS

CLOGGING BETWEEN SHANKS

- LEVEL MACHINE
- ADJUST COULTER OR DISK DEPTH
- INCREASE SHANK SPACING
- CHANGE DIRECTION OF SOIL THROW
- OPERATE AT AN ANGLE TO CROP ROWS
TROUBLE-SHOOTING TIPS

CLOGGING BETWEEN COULTERS OR DISKS

- SHARPEN OR REPLACE WORN COULTERS OR DISKS
- DECREASE COULTER OR DISK DEPTH
- VERIFY THAT COULTERS OR DISKS ARE ROLLING
TROUBLE-SHOOTING TIPS

DIFFICULTY PENETRATING SOIL/EXCESSIVE DRAFT

- LEVEL MACHINE
- REPLACE WORN POINTS OR SWEEPS
- ADD SHIMS TO INCREASE PITCH OF SWEEPS
TROUBLE-SHOOTING TIPS

MACHINE DOESN’T TRAIL PROPERLY

- LEVEL MACHINE SIDE TO SIDE
- VERIFY SHANKS ARE MOUNTED CORRECTLY
- STRAIGHTEN HITCH
- CHECK FOR UNEVEN TRACTOR TIRE PRESSURE
PAY ATTENTION TO DIRECTION OF PLOWING

- UP/DOWN vs. ACROSS
- RUNOFF PROBLEMS MAY CONTINUE AFTER SEEDBED PREP.
- CHISELING UP/DOWN RESULTS IN 10x SOIL LOSS

MANNERING, 1979
Soil Management and Strip-tillage

Dick Wolkowski
Extension Soil Scientist
University of Wisconsin
DEFINING STRIP-TILLAGE

LESS THAN FULL-WIDTH TILLAGE OF VARYING INTENSITY WITH THE ROW DIRECTION

- **ROW OR RESIDUE CLEARING**
  - Remove residue
  - Finger coulters, brushes, sweeps

- **STRIP-TILLAGE (SHALLOW)**
  - Move residue, seedbed prep., Row fertilizer
  - Fluted coulters, discs

- **STRIP-TILLAGE (DEEP)**
  - Disrupt compaction, deep place fertilizer
  - Knives
  - Some with coulters to move residue or create mini-ridges
Fall stripping
SOIL TEMPERATURE AFFECTED BY TILLAGE AND CROP RESIDUE

Effect on crop residue, Arlington, Wis.

Effect on in-row soil temperature, Arlington, Wis.

Wolkowski, 2000
CORN GRAIN YIELD AS AFFECTED BY FERTILIZER PLACEMENT IN STRIP-TILL

Four Year Avg. (2001 - 2004)
DETERMINING THE NEED FOR SUBSOILING

- Evaluate depth and severity of compaction
- Check with penetrometer, probe, shovel
- Dig plants to examine roots
- Leave untreated strips for comparison
- Subsoiling is not a cure-all
OTHER SUBSOILING CONSIDERATIONS

- Burial of crop residue
- Destruction of natural channels
- Sidewall smearing
- May bring stones, clay, infertile soil to the surface
- Does not address compaction cause
Manure management challenge in continuous corn

Alternatives to full-width tillage

- NO-TILL
- LIGHT DISKING
- STRIP-TILL
Effect of tillage and manure on corn yield at four Wisconsin locations, 2003

Wolkowski, 2003 (30 ton straw-bedded manure/a)