Purpose of Tillage

- Weed Control
- Decomposition of crop residue
- Prepare seed bed
- Increase soil temperature
- Alleviate compaction
Conservation Tillage

• The term encompasses many tillage practices
• Traditionally the NRCS used this term for any tillage system resulting in 30% or more residue cover at planting of the next crop
  – Mulch tillage = full width tillage with at least 30% residue cover.
• This was generally acceptable to reduce erosion to below T if structural controls were in place
Residue Cover for Sorghum

- 7,000 lbs/A, 80 percent cover, 2,200 lbs SGe
- 700 lbs/A, 30 percent cover, 240 lbs SGe
- 2,300 lbs/A, 50 percent cover, 775 lbs SGe
- 590 lbs/A, 15 percent cover, 200 lbs SGe
Residue Cover for Wheat

1,200 lbs/A  75 percent cover  1,900 lbs SGe

350 lbs/A  25 percent cover  700 lbs SGe

875 lbs/A  45 percent cover  1,400 lbs SGe

225 lbs/A  15 percent cover  500 lbs SGe
Line Transect Method for Determination of Residue Cover

- Pull a tape measure to 100 ft
- Count the # of foot marks that touch a piece of residue
- Residue should be greater than 3/32 inch to be counted
- University of Nebraska Factsheet

http://www.itap.purdue.edu/tlt/facultyshowcase/ifarm/index.cfm  Picture
Estimating Residue From a Tillage System

- Missouri factsheet on conservation tillage planning
- Residue cover can be estimated based on yield of crop, and type of tillage used.
Primary and Secondary tillage

• Primary:
  – Provide initial fracture of soil surface
  – Initiate the decomposition of residue
  – Kill weeds

• Secondary:
  – Seedbed preparation
    • firm soil and break clods
  – Weed control
  – Countless Options!
Primary Tillage Implements

- Moldboard plow
  - Full inversion of soil surface
  - Removes 90 to 100% of residue
  - 10-12 inches deep
Primary Tillage Implements

• Heavy Offset Disk
  – Can bury 40 to 75% of residue depending on depth and ground speed.
Primary Tillage Implements

- **Chisel**
  - Can be pulled as deep as 10 inches or bit more?
  - Sweeps and twisted points bury more residue than straight shanks
Secondary Tillage

• Cultivator
  – Lighter shanks than chisel
Secondary

• Harrow
  – Smooth the surface
Combination equipment

Disk ripper

Coulters followed by rotary harrow
Estimating Residue From a Tillage system

- Missouri factsheet on conservation tillage planning
- Residue cover can be estimated based on yield of crop, and type of tillage used.
Soil Tillage Intensity Rating (STIR)

- Value calculated from RUSLE2
- Low #'s represent less overall soil disturbance
- No-till must have a STIR less than 15%
- Values are influenced by:
  - Operational speed
  - Tillage type and depth
  - Percent of soil surface disturbed
- Provide better assessment of soil quality degradation
- NRCS Factsheet
“Conservation” Tillage Equipment

• Sweep plow:
  – Under cuts soil and weeds
  – Most common primary tillage in stubble mulch system
  – Sweeps blades can range from 6ft to 8 inches
  – Wide blades minimizes surface disturbance
Conservation” Tillage (Vertical Tillage)

- Designed for a single pass tillage operation combined with capacity to plant into high residue
  - Residue to break down faster (Bt corn)
  - Anchor so it doesn’t wash or blow
  - Some levelling capability—improves “plantability”
  - Seedbed preparation

- This is a diverse class of equipment
  - Some are very aggressive, while others simply cut residue and fracture surface
Landoll

Great Plains

Conservation Tillage: >30% crop residue on the soil surface
Mulch Tillage: Full width tillage that leaves >30% residue on the surface

Vertical tillage is not no-till (NRCS...), it is mulch tillage, which is conservation tillage

Other forms of Conservation Tillage include: No-till, Strip-till, and Ridge
Vertical tillage: 2009 soybean yield (Kansas, No-Till fields)

- NT yield: 65.9
- VT yield: 67.1
- Not significant at $p<0.05$
2010 Results: Meade Co.
Continuous, Irrigated Corn

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<th>Stand *1000/ac</th>
<th>Disease % pop</th>
<th>Severity lesions/plt</th>
<th>Yield bu/ac</th>
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<td>204</td>
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<tr>
<td>LSD*</td>
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High levels of disease on all treatments

*0.05 level, all sites
### 2010 Results: Jefferson Co. Continuous Corn

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</table>

Difference in disease didn’t translate into significant difference in yield