Vertical Tillage

Is it a Practice for Wisconsin Soils

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Vertical tillage

- As the name implies vertical tillage is designed to create loose zones up and down in the soil
- A continuum between strict no-till and moldboard plowing
- Avoids horizontal smearing and the creation of tillage pans
- Various implements can be used and effective depth will be dependent on implement
- Many producers unknowingly practice vertical tillage (and I was unknowingly doing vertical tillage research)
- All systems must incorporate wise tillage management
Typical advertising

Specific product names are for educational purposes only and do not represent the endorsement of the author or UWEX.
Earthworms: Nature’s vertical tillage machine

(Images courtesy of Dr. Randall Reeder, Ohio State Univ.)
Vertical tillage claims

- Break up compaction (shallow or deep)
  - Improved rooting, drainage, aeration
- Move, but maintain surface residue
- Promote soil drying and warming
- Incorporate manure and fertilizer
- Manage cover crop material
- Address some pest and weed issues
- Smooth soil surface to create seedbed
Vertical tillage (Patent description)

- Tillage tool having a number of gangs of fluted-concave disc blades, rolling baskets, and wheels connected to a main frame.
- The fluted-concave disc blades move the soil in a direction lateral to the side of the blades as well as up.
- The rolling bars aid in leveling the seedbed and crushing the remaining large pieces of soil.
- The vertical tilling implement reduces the amount of subsoil compaction and cuts through heavy residue making it ideal for use in the fall or in the spring.
Horizontal vs. vertical tillage tools

**Horizontal tillage**
- Moldboard plow
- Field cultivator
- Tandem disk

**Vertical Tillage**
- Chisel plow
- Strip-tillage
- Zone-builder type subsoilers
- Aerway
- Phoenix harrow
- Coulter disk tools
Producers should set “tillage goals” based on conservation, soil and residue condition, and crop rotation

- Quantity and type of residue, and soil condition prior to tillage
- Desired final residue cover, distribution, surface roughness, and seedbed
- Presence of compaction and rutting
- Power and time requirement
- Planter capability
- Other management issues

(Ron Schuler, UW BSE, 2007)
Tillage does remove surface compaction
(Wolkowski, unpublished)

Arlington, Wis., 2002 (6 t vehicle)
Many existing tools perform vertical tillage

- Combination chisel plows
- Strip-tillage
- Straight-shanked subsoilers
- AerWay
“Newer” vertical tillage tools

- Fluted concave disk gangs
- Spike harrow
- Rolling basket
One pass with Turbo-till, Arlington 2005

Corn Stubble  Heavy Manure
Response of soybean to tillage, Arlington, WI, 2005 (Wolkowski, unpublished)

Average of six measurements

Pr>F = 0.25 and 0.55 in 2004 and 2005, respectively

Pr>F = 0.52 and 0.62 in 2004 and 2005, respectively
Soil bulk density profile, Arlington, WI
1998 (Wolkowski, unpublished)
Effect of tillage on corn and soybean yield, Arlington, WI (Wolkowski, 2000)

<table>
<thead>
<tr>
<th>Tillage</th>
<th>Corn Yield (bu/a)</th>
<th>Soybean Yield (bu/a)</th>
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<tbody>
<tr>
<td>Fall Chisel</td>
<td>223</td>
<td>206</td>
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<tr>
<td>Fall Subsoil</td>
<td>218</td>
<td>201</td>
</tr>
<tr>
<td>Spring Field Cult.</td>
<td>223</td>
<td>204</td>
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<tr>
<td>Pr&gt;F</td>
<td>0.15</td>
<td>0.44</td>
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Effect of subsoiler type on soybean and corn yield on a silty clay loam soil (Wolkowski, unpublished)

Manitowoc, Co.
Effect of tillage and field location on corn and soybean yield, Elrosa, MN (DeJong-Hughes, UMEX)

<table>
<thead>
<tr>
<th>Tillage</th>
<th>2003 Corn Yield (bu/a)</th>
<th>2004 Soybean Yield (bu/a)</th>
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<tr>
<td></td>
<td>Upland</td>
<td>Depression</td>
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<tr>
<td>Ridge-till</td>
<td>183</td>
<td>156</td>
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<tr>
<td>Ridge-till w/ Subsoil</td>
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<td>155</td>
</tr>
<tr>
<td>Pr&gt;F</td>
<td>NS</td>
<td>NS</td>
</tr>
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Summary

- Set reasonable goals for tillage management
  - Conservation requirements
  - Crop residue and soil condition
  - Power requirements
  - Time and cost limitations
  - Planter capability
- Control traffic and avoid compaction
- Producers are encouraged to compare tillage systems and select tools that fit their specific crop and soil needs