CONSIDER THE STRIP-TILLAGE OPTION

Dick Wolkowski
Extension Soil Scientist
University of Wisconsin
Soil conservation requirements
Reduced yield with no-till
High fuel and equipment costs
Timeliness of operations
Equipment/technological advances
Zip Code Map for Midwest Strip-tillage Expo Attendees

Waterloo, IA - 2007

Arlington, WI - 2008

MIDWEST STRIP-TILLAGE EXPO
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 placement
  - Fluted coulters, discs

- **STRIP-TILLAGE (MODERATE)**
  - Disrupt surface compaction, deep place fertilizer
  - Mole knives
  - Coulters move soil to create mini-ridges

- **STRIP-TILLAGE (DEEP)**
  - Remove subsoil compaction
  - Straight-shanked knife with minimal soil inversion
RESEARCH SUGGESTS BENEFITS COMPARED TO NO-TILL

- Dryer and warmer soil (Wolkowski, Wis.)
- Earlier planting (Vyn et al., Ontario/Ind.)
- More consistent seed depth (Swan et al., Minn.)
- Better stands (Kaspar and Erbach, Iowa)
- Faster early season growth (Wolkowski, Wis.)
- Yield response (Vetsch and Randall, Minn.)
- Net return (Yiridoe et al., Ontario)
RUSLE2 treats strip-till similar to no-till
- Surface disturbance 30 % vs. 15 %
- 15 - 20 % less residue
- Actual soil loss differences are minimal
- Variability of coulters, knives, etc.

Strip-till on the contour whenever possible
- May provide some additional infiltration capacity
- Potential erosion where strips run uphill/ downhill

Best suited to fragile crop residue - soybean, alfalfa, etc.

Equipment has been developed for corn residue
TILLAGE EFFECTS ON CROP RESIDUE

First-year corn after soybean, Arlington, Wis.
STRIP-TILLAGE AND SOIL LOSS, LANCASTER, WIS.

Runoff collector in strip-till

Rick Cruse and Hillary Owen

Sediment in chisel

Collecting sediment
# Soil Loss – A Tale of Two Years

<table>
<thead>
<tr>
<th>Date</th>
<th>Precip</th>
<th>Chisel</th>
<th>Strip</th>
<th>Date</th>
<th>Precip</th>
<th>Chisel</th>
<th>Strip</th>
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<tr>
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<td>0.12</td>
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<td>5-21</td>
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<td>0.14</td>
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<td>5.00</td>
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<tr>
<td>5-24</td>
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<td>2.82</td>
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<td>6-1</td>
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<td>0.39</td>
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<td>0.10</td>
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<td>6-17</td>
<td>2.51</td>
<td>0.71</td>
<td>0</td>
<td>8-19</td>
<td>3.28</td>
<td>0.05</td>
<td>0.01</td>
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<tr>
<td>7-12</td>
<td>1.24</td>
<td>0.27</td>
<td>0.009</td>
<td>9-19</td>
<td>1.44</td>
<td>0.02</td>
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<tr>
<td>8-4</td>
<td>1.11</td>
<td>0.22</td>
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**Total**

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<tr>
<th>2004</th>
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<td>4.67</td>
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STRIP-TILLAGE AND EARLY GROWTH
SOIL TEMPERATURE AFFECTED BY TILLAGE AND CROP RESIDUE

Effect on crop residue, Arlington, Wis.

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

Wolkowski, 2000
**MAIN EFFECTS OF TILLAGE ON CORN EMERGENCE, ARLINGTON, 1994-1996**

Measurements taken ~ 3 weeks after planting
# EARLY GROWTH AND SILKING PROGRESS AS AFFECTED BY TILLAGE

<table>
<thead>
<tr>
<th>Tillage system</th>
<th>V6</th>
<th>V12</th>
<th>Silking</th>
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<tr>
<td>Chisel</td>
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<td>29</td>
<td>80</td>
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<tr>
<td>Strip-tillage</td>
<td>1.1</td>
<td>28</td>
<td>62</td>
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<tr>
<td>No-till</td>
<td>0.7</td>
<td>18</td>
<td>36</td>
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</tbody>
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*Arlington, avg. of 3 years*
**Tillage/rotation study since 1997**

- **Plano silt loam soil**
- **Strip-till added in 2000**
  - ’97 – ’99 row clearing
- **Continuous corn, Soybean/corn, Corn/soybean**
- **PK fertilizer: None, broadcast, deep, and row-placed at crop removal rate**
EARLY SEASON K UPTAKE IN STRIP-TILL

Soybean/corn rotation

K UPTAKE (mg/plant)

<table>
<thead>
<tr>
<th>Year</th>
<th>None</th>
<th>BDCT</th>
<th>2x2</th>
<th>DEEP</th>
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<td></td>
<td>150</td>
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<tr>
<td>2002</td>
<td></td>
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<td>50</td>
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<td></td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td>50</td>
<td>50</td>
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</table>
CORN GRAIN YIELD AS AFFECTED BY FERTILIZER PLACEMENT IN STRIP-TILL

Yield (bu/a)

4-year avg. (2001 - 2004)

Cont. Corn  Soybean/Corn

None  BDCT  2x2  DEEP
Tillage and Rotation Effect on Corn Yield, Arlington, Wis. 1997 – 2007 (10 Year Avg.)

<table>
<thead>
<tr>
<th></th>
<th>Yield (bu/a)</th>
<th>CC</th>
<th>SbC</th>
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<tbody>
<tr>
<td>Chisel</td>
<td></td>
<td>155</td>
<td>185</td>
</tr>
<tr>
<td>Strip-till</td>
<td></td>
<td>-4%</td>
<td>-5%</td>
</tr>
<tr>
<td>No-till</td>
<td></td>
<td>-8%</td>
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</table>
MANURE AND TILLAGE RESPONSE

Arlington, Wis. (2 year avg.)
AUTO-STEER AND GUIDANCE CONSIDERATIONS

Tim Stombaugh, Univ. of KY
BENEFITS OF AUTO-STEER

► Reduce overlap and skips
► Optimizes fuel use, time, chemical and nutrient inputs, and implement wear
► Maximizes plant growth
► Controls traffic to reduce compaction
► Reduces operator fatigue

Tim Stombaugh, Univ. of KY
DIFFERENTIAL GPS CORRECTION

- Sub-meter (3 ft.)
  - WAAS, USCG Beacon, Omnistar VBS, Starfire I,

- Decimeter (2-6 in.)
  - Starfire II, Omnistar XP & HP
  - Requires subscription

- RTK (1 in.)
  - Real Time Kinematic
  - Survey in the base station
  - Line of sight required

Tim Stombaugh, Univ. of KY
GPS ACCURACY

- Pass-to-Pass vs. Long Term (Year-to-Year)
- Time of day
- Extended breaks during field operations
- Multiple operations
- Loss of signal near treelines, buildings, etc.
## Economic Considerations

<table>
<thead>
<tr>
<th>Rotation/Tillage</th>
<th>Avg. Yield (BU/A)</th>
<th>COP ($/BU)</th>
<th>Compared to CH ($/BU)</th>
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</thead>
<tbody>
<tr>
<td><strong>Continuous Corn</strong></td>
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<tr>
<td>Chisel</td>
<td>182</td>
<td>2.55</td>
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<tr>
<td>Strip-till</td>
<td>174</td>
<td>2.53</td>
<td>- 0.02</td>
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<tr>
<td>No-till</td>
<td>167</td>
<td>2.63</td>
<td>0.08</td>
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<tr>
<td><strong>Corn after Soybean</strong></td>
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<tr>
<td>Chisel</td>
<td>194</td>
<td>2.39</td>
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<tr>
<td>Strip-till</td>
<td>194</td>
<td>2.27</td>
<td>- 0.12</td>
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<tr>
<td>No-till</td>
<td>185</td>
<td>2.36</td>
<td>- 0.03</td>
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<tr>
<td><strong>Soybean after Corn</strong></td>
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<tr>
<td>Chisel</td>
<td>52</td>
<td>6.41</td>
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</tr>
<tr>
<td>Strip-till</td>
<td>52</td>
<td>6.23</td>
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<tr>
<td>No-till</td>
<td>50</td>
<td>6.15</td>
<td>- 0.26</td>
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*Arlington, Wis. (1997 - 2007)*
SUMMARY

- Strip tillage offers a residue management compromise between no-till and full-width systems.
- Under conditions of intensive rainfall, strip-tillage conserved soil.
- The creation of a residue-free strip offers warmer and drier conditions at planting.
- Response to fertilization similar to no-till.
- Compared to chisel, 10-year average grain yield similar in first-year corn; 4% lower in continuous corn.
- Carefully evaluate upgrades to auto-steer and RTK GPS.
- Production economics favor strip-tillage in first-year corn and no-till in soybean after corn.