Strip-till Research Results: Rotation, Automatic Guidance, and Fertilizer Placement

Tony J. Vyn & Graduate Students, Colleagues & Farmers
Berms after Soybean Harvest
Berm Heights in Spring after Successful Strip Tillage
No-till vs. Strip-till Following Soybean
Wanatah, IN, 2008
Corn Yield Response to Tillage and Planting Date in Indiana, 2003-04

Silty Clay, Corn-Soy

- Early: Strip-Till ab, No-Till abc, Chisel c
- Normal: Strip-Till b, No-Till b, Chisel b

Loam, Cont. Corn

- Early: Strip-Till ab, No-Till a, Chisel ab
- Normal: Strip-Till a, No-Till abc, Chisel ab

Purdue Agronomy

Purdue University
Spring Strip-till Berms
Other Spring Tillage Options?
Spring Strip-Till vs. Turbo-Till® or FC
North-East Purdue Ag Center, Columbia City (2004)

Horizontal bar chart showing:
- Turbo once Field Cultivate: 200
- Field Cultivate: 190
- Strip-till: 180
- No-Till: 170

Courtesy: Phil Walker and Allen County SWCD
Fall Strip Tillage
Strip-till versus No-till Corn after Wheat (Ontario)
Wheat Residue Effect on No-till Corn vs. Strip-till Corn

Centralia & Wyoming, Ontario (1994-96)

Yield (bu/ac)

- Fall Strip-till: 149
- No-till (not baled): 135
- No-till (baled): 142
- No-till (bare): 149

Opoku, Vyn & Swanton (Agron. J. 89:549)
Strip Tillage for Corn after Corn?
Split the middle w/o guidance

Source: Norm Larson, Elburn Co-op, IL
Surface Residue Cover (%) after Planting
Loam Soil, Wanatah, IN, 2001-2005

Previous Crop

- Soy
- Corn

Chisel
Strip-till
No-till
No-Till vs. Strip-till following Corn (Wanatah, IN, 2008)
Strip Tillage for Corn after Soybean and Corn in N. Indiana, Loam Soil (2001-07)

Yield (bu./ac)

<table>
<thead>
<tr>
<th>Previous Crop</th>
<th>Soybean</th>
<th>Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Chisel</td>
<td>204</td>
<td>192</td>
</tr>
<tr>
<td>Strip-till</td>
<td>208</td>
<td>192</td>
</tr>
<tr>
<td>No-till</td>
<td>201</td>
<td>180</td>
</tr>
</tbody>
</table>

*Note: The different letters (a, b) indicate significant differences in yield.*
RTK Automatic Guidance
Precision of Planting Following Strip Tillage?
Row Position is Critical

Source: Norm Larson, Elburn Co-op, IL
RTK Planting after Strip-Till
(West Lafayette, 2006)
Maximum soil temperature at 2-inches deep in row, first 2 weeks after planting, ACRE, 2007.

<table>
<thead>
<tr>
<th>Planting Date</th>
<th>1 Strip-till RTK</th>
<th>2 Strip-till Visual</th>
<th>3 Strip-till Displaced</th>
<th>4 No-till</th>
<th>5 Chisel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60</td>
<td>65</td>
<td>70</td>
<td>75</td>
<td>80</td>
</tr>
</tbody>
</table>

Degrees F

Purdue University
RTK Plot Harvest 2006
Average Corn Yield Response to RTK Precision at West Lafayette, IN, 2006-2007

Mean of April 11 and 27

- **Strip-till RTK**
- **Strip-till Visual**
- **Strip-till off 7"**
- **No-till**
- **Chisel Plow**

*Note: Letters indicate significant differences in yield response.*
RTK + Pre-plant UAN Application 2006
RTK Planting after Pre-plant UAN
(West Lafayette, 2006)
RTK and Pre-plant UAN at Wanatah, IN, 2006

200 N at 5” versus 200 N at 0”

200 N at 5” (background) vs. 200 N at 0” (foreground)
RTK Row Position Effects on Plant Population Response to Pre-Plant UAN Rates
Wanatah, IN, 2006-2007

Population/acre

On-Row  |  5" beside  |  10" beside

Zero Pre | 35,000 a | 30,000 a | 25,000 a
50 Pre   | 30,000 a | 25,000 a | 15,000 b
100 Pre  | 20,000 a | 15,000 a | 10,000 c
200 Pre  | 10,000 a | 10,000 a | 10,000 a
RTK Row Position Effects on Corn Yield
Response to Pre-Plant UAN Rates

Wanatah, IN, 2006-2007

Corn Yield (bu/ acre)

On-Row  5" beside  10" beside

0  20  40  60  80  100  120  140  160  180  200  220  240

Zero Pre  50 Pre  100 Pre  200 Pre

a a a a a b c a a a
Strip Tillage with Fertilizer Banding
Strip-till Corn Yield Results in Illinois
(Mean of 11 site years 1999-2002)

ARLINGTON, WI STRIP-TILLAGE PROJECT

- Tillage/rotation study since 1997
  - Plano silt loam soil
  - Strip-till added in 2000
  - Cont. corn, Soybean/corn, Corn/soybean
  - PK fertilizer: None, broadcast, deep, and row-placed at crop removal rate
  - Summarize 2001 – 2004, strip-till only
### Arlington Soil Test

<table>
<thead>
<tr>
<th>Year</th>
<th>pH</th>
<th>Soil test P (ppm)</th>
<th>Soil test K (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>None</td>
<td>Bdct.</td>
</tr>
<tr>
<td>2001</td>
<td>6.7</td>
<td>6.7</td>
<td>41</td>
</tr>
<tr>
<td>2005</td>
<td>6.7</td>
<td>6.6</td>
<td>38</td>
</tr>
</tbody>
</table>

Source: D. Wolkowski, University of Wisconsin, 2007
CORN GRAIN YIELD AS AFFECTED BY FERTILIZER PLACEMENT IN STRIP-TILL

Four Year Avg. (2001 - 2004)

Source: D. Wolkowski, University of Wisconsin, 2007
Corn Response to P Fertilizer Placement in Iowa (Malarino et al.)

Soil-test Classification

VL  L  O  H  VH

Grain Yield (bu/acre)

Control  Control + Coulter  Broadcast  Deep-banding  Starter

Soil-test Classification
Strip Tillage with Nutrient Banding in Small-plot Research (West Lafayette, IN)

Note: $P_2O_5$ rate = 88 pounds/acre, and $K_2O$ rate = 115 pounds/acre

All plots received a uniform 2 x 2” starter of 14 – 28 – 14 (N,P,K), plus a total N rate of 250 pounds/acre.
Corn Response to Deep Banding at 6” Depth
2005 – 2006 Experimental design

Field 54-55 July 7, 2006

Split-split Plot Design

A) Block  -2005: 5   - 2006: 6

B) Hybrid
   1_ Pioneer 31N28  (119 CRM)
   2_ Pioneer 31G68  (118 CRM)

C) Fertility Placement
   1_ Check
   2_ Broadcast P+K
   3_ Banded P+K
   4_ Banded P
   5_ Banded K
   (applied in the previous fall)
Residual Effects of Fertilizer P and K Placement in Corn on Subsequent No-till Soybean (2002-2006)

Planting 5/10/04

Soil sampling (June/04)
Six inch Band P and K Placement Effects on Strip-till Corn Yield (mean of 2 hybrids, 2001-2006)

Yield (bushels/acre)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil-test P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0-4”):</td>
<td>22</td>
<td>104</td>
<td>164</td>
<td>125</td>
</tr>
<tr>
<td>(4-8”):</td>
<td>21</td>
<td>94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil-test K</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0-4”):</td>
<td>186</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4-8”):</td>
<td>94</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- Control
- Broadcast P & K
- Deep-Band P & K

*Note: Data for 2001-2003 and 2004-2007 are combined.*

* Starter was 10-34-0
Soil P conc. (ppm) in spring 2008 following third strip-till corn cycle for a corn-soybean rotation
Soil K conc. (ppm) in spring 2008 following third strip-till corn cycle for a corn-soybean rotation

Control  Broadcast P & K  Deep Banded P & K

<table>
<thead>
<tr>
<th></th>
<th>In-row 0-4''</th>
<th>In-row 4-8''</th>
<th>Middle 0-4''</th>
<th>Middle 4-8''</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>180</td>
<td>140</td>
<td>120</td>
<td>100</td>
</tr>
<tr>
<td>Broadcast P &amp; K</td>
<td>200</td>
<td>160</td>
<td>140</td>
<td>120</td>
</tr>
<tr>
<td>Deep Banded P &amp; K</td>
<td>180</td>
<td>140</td>
<td>120</td>
<td>100</td>
</tr>
</tbody>
</table>
Root zone optimization in Strip-till?


2. RTK Guidance may be beneficial for centering on the berm even when fertilizer is not deep banded.

3. Spring Pre-plant N application in the row area?
4. Who is going to do the Research!
Acknowledgments

Funding:
USDA-CASMGS
Purdue University (Mary S. Rice & Mission Oriented Funds)
Foundation for Agronomic Research (PPI or IPNI)
Fluid Fertilizer Foundation
John Deere & Co.

Equipment:
John Deere Cropping Systems Unit
  Case-DMI (Goodfield, IL)
  Remlinger (Kalida, OH)

Seed:
Pioneer Hi-Bred, Int.
Thanks!

tvyn@purdue.edu
home page:
//www.agry.purdue.edu/staffbio/vyn