Strip-Till: A Closer Look

Tony J. Vyn, with assistance from farmers, graduate students, technicians, and colleagues
Indiana Tillage Data, 1990-2003
(percent of total cropland for specific crop in a no-till system)

Source: Purdue University-Transect Data
2002 Indiana Cropland Tillage Map
Percent of all Corn Fields planted using No-till

2002 Indiana Average is 21%

Source: Purdue University-Transect Data
So What is Problem?

- Planting Date?
- Nutrient Availability?
- Pests?
- Yields?
- Maturity?
Poor Stand Establishment?
## Corn Response to Tillage and Rotation

West Lafayette, IN, (1975-2003)

<table>
<thead>
<tr>
<th>Tillage</th>
<th>Corn/Soybean</th>
<th>Continuous Corn</th>
<th>Yield Gain for Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bu/ac</td>
<td>% of plow yield</td>
<td>Bu/ac</td>
</tr>
<tr>
<td>Plow</td>
<td>176</td>
<td>- - -</td>
<td>169</td>
</tr>
<tr>
<td>Chisel</td>
<td>177</td>
<td>100</td>
<td>164</td>
</tr>
<tr>
<td>Ridge*</td>
<td>182</td>
<td>103</td>
<td>167</td>
</tr>
<tr>
<td>No-till</td>
<td>173</td>
<td>98</td>
<td>146</td>
</tr>
</tbody>
</table>
Population densities of Soy. Cyst Nematode under different crop sequences and tillage.
Potassium Stratification
Long-Term Tillage (IN, 1975-94)

Moldboard

Chisel

No-till

Depth

Soil K (ppm)

Source: Holanda et al. (1998)
Conservation Tillage Doesn’t Alter K distribution appreciably
Planter Setup and Nutrient Banding?
Mean Soil-test K Stratification at Davis, EC Indiana

Source: Vyn et al., Better Crops #4, 2002
Soil K variability
High oil corn yields in response to K placement (EC Indiana, 2000-01)

Source: Vyn et al., Better Crops #4, 2002
RESPONSE OF CORN TO ROW-APPLIED K ON A SILTY CLAY LOAM SOIL (3 yr. avg.)

Dr. Wolkowski, UW, Oshkosh, Wis. (45 lb K$_2$O/a)
Going Deeper??
Strip Tillage for Corn
Fall Strip-till Option?
Strip Tillage with Fertilizer Banding
What are we after?

- **Yields**
  (relative to no-till; stability)

- **Planting Timeliness**
  (pre-plant soil conditions)

- **Fertilizer Placement Efficiencies**
  (systems approach)
Soil Drying Pattern (0-6”) after Wheat (ON, 1999)

![Graph showing moisture levels over time for different tillage methods: Moldboard, Strip-till 12”, Strip-till 6”, No-till.](image-url)
Strip-till versus No-till Corn after Wheat (Belmont, ON)
Tillage Effects on Corn Yield After Wheat

Centralia and Wyoming, ON (1994-96)

Yield (bu/ac)

Moldboard 153
Chisel 148
Fall Disk 149
Strip-till 149
No-Till (baled) 142

Yield (bu/ac)
Wheat Residue Effect on No-till Corn Yields

Centralia & Wyoming (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)
Tillage Effects on Corn Yields After Soybeans
(Hooker, Avg. of Alvinston and Fingal, ON, 1994-96)

Yield (bu/ac)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plow</td>
<td>127</td>
</tr>
<tr>
<td>Chisel</td>
<td>120</td>
</tr>
<tr>
<td>Strip-till</td>
<td>127</td>
</tr>
<tr>
<td>No-Till</td>
<td>120</td>
</tr>
</tbody>
</table>
Fall Strip-till 8” depth

DMI 2500 with Mole Knife
Fall Strip-till 12-14” depth

John Deere 955 Deep Ripper

Rolling Basket
Accumulated Soil GDD Pre-Planting 1999-2001, IN

![Bar graph showing soil GDD for different tillage methods]
1999 Soil Penetrometer Resistance
Average Soil Moisture = 25%
2000 Soil Penetrometer Resistance
Average Soil Moisture = 36%

Lsmeans covariate from 8-20cm depth.
Depth of Strip-till and Corn Yields Sandy loam (IN, 2001)

<table>
<thead>
<tr>
<th>Tillage System</th>
<th>Yield (bu/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Chisel</td>
<td>158</td>
</tr>
<tr>
<td>Strip-till 8&quot;</td>
<td>161</td>
</tr>
<tr>
<td>Strip-till 5.5&quot;</td>
<td>158</td>
</tr>
<tr>
<td>No-till</td>
<td>153</td>
</tr>
</tbody>
</table>

Yield (bu/ac)
Fall tillage effects on corn yield after wheat (averaged over 98-00) in Ontario.
Fall tillage effects on corn yield after soybeans (averaged 1998-00) in Ontario.

<table>
<thead>
<tr>
<th>Tillage Treatments</th>
<th>Yield (bu/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moldboard</td>
<td>a</td>
</tr>
<tr>
<td>Strip-till 12&quot;</td>
<td>a</td>
</tr>
<tr>
<td>Strip-till 6&quot;</td>
<td>ab</td>
</tr>
<tr>
<td>Strip-till 3&quot;</td>
<td>ab</td>
</tr>
<tr>
<td>No-till</td>
<td>b</td>
</tr>
</tbody>
</table>

Symbols: a, ab, b indicate statistical significance levels.

- Moldboard: Black Bar
- Strip-till 12" (Strip-till 12"
- Strip-till 6" (Strip-till 6"
- Strip-till 3" (Strip-till 3"
- No-till (Green Bar)
Fall tillage effects on corn yield after wheat (averaged over 98-00) in Ontario.
Corn yields in Indiana following soybeans in Indiana (1999-2001)

Yield (bu/ac)

- Moldboard: 197
- Strip-till 13": 185
- Strip-till 8": 185
- No-till: 186

Legend:
- Moldboard
- Strip-till 13"
- Strip-till 8"
- No-till
# 2001-2003 Ontario Yield Summary
(courtesy of Greg Stewart, 2004)

<table>
<thead>
<tr>
<th>Year</th>
<th>PLOW</th>
<th>FALL STRIP</th>
<th>NO-TILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>100</td>
<td>101</td>
<td>100</td>
</tr>
<tr>
<td>2002</td>
<td>105</td>
<td>102</td>
<td>100</td>
</tr>
<tr>
<td>2003</td>
<td>103</td>
<td>103</td>
<td>100</td>
</tr>
<tr>
<td><strong>AVE.</strong></td>
<td><strong>103</strong></td>
<td><strong>102</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Represents 38 site/year comparisons over the three years.
Strip Tillage for Corn after Corn?
Strip Tillage for Corn in N. Indiana, Loam (2001-03)

Yield (bu/ac)

<table>
<thead>
<tr>
<th>Previous Crop</th>
<th>Fall Chisel</th>
<th>Strip-till</th>
<th>No-till</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean</td>
<td>193</td>
<td>196</td>
<td>192</td>
</tr>
<tr>
<td>Corn</td>
<td>180</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b</td>
<td>169</td>
</tr>
</tbody>
</table>

Legend:
- Fall Chisel
- Strip-till
- No-till
Planting Date Effects in Indiana, 2003

W. Lafayette

Early

Optimum?

Pinney-PAC

Early

Optimum?

Strip-Till

No-Till

Chisel
Recent Strip Tillage Options
Strip Tillage with Fertilizer Banding
Conclusions

1. No-till corn adoption lower than for soybean, reservations on increased adoption similar in most Mid-west farming areas.
2. Technology changes have improved success rate of No-till and Strip-till.
3. Strip tillage permits increased planting flexibility and opportunity for fertility placement.
Conclusions (continued):

- Fall strip-till provides warmer and drier soil conditions, relative to undisturbed no-till, in the spring before planting. These improved conditions may allow 2-3 days earlier planting in comparison to no-till.

- Fall strip-till resulted in lower penetrometer resistance in comparison to no-till at certain depth intervals.

- Deeper depths of fall strip tillage resulted in a yield advantage when no-till yields were below conventional-till yields.
Thanks!

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Acknowledgements

- Case-DMI (Goodfield, IL.)
- Yetter Equipment (Colchester, IL)
- John Deere (Columbus, OH and Des Moines, IA)
- Remlinger (Kalida, OH)
- Purdue Research Foundation
- OCPA, CanAdapt, OMAFRA, AAFC.