Strip-Till Soybean Production

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Does Strip Tillage or Fertilizer Placement Influence the Soybean Row Spacing Yield Response?

- Strip tillage adoption in corn and soybean has increased
- Can alleviate cold, compacted soils in rotated production systems
- Potential agronomic benefits
  - earlier planting dates
  - warmer soil temperatures
  - greater fertilizer efficiencies
  - less soil disturbance and fertilizer incorporation
  - soybean yield response to strip till has tended to be less consistent than in corn

The Objective of this study is:
- Quantify the effect of strip tillage and fertilizer placement on soybean stand establishment and seed yield
2016-17 Strip Tillage Research

- Two small-plot studies at Arlington Agricultural Research Station
  - Previous crop corn
  - Replicated RCB design
  - 4 row by 30” Remlinger strip-till unit with shanks set to till 6” deep
  - All strip till treatments in 30” spacing regardless of the soybean row spacing
  - Fertilizer (15-38-131 lbs/a N-P-K) was applied either on the surface prior to strip tilling or deep banded with the strip tiller

- Two large field-scale trials in Sharon, WI
  - Previous crop corn
  - Replicated RCB design
  - Kuhn Krause Gladiator strip till unit (12 row by 30”)
  - All strip till treatments in 30” spacing
  - Fertilizer (15-38-131 lbs/a N-P-K) was applied either on the surface prior to strip tilling or deep banded with the strip tiller
Strip tillage equipment

Small plot research

4 row by 30” Remlinger strip-till unit
Gandy fertilizer applicator boxes

Field scale research

Kuhn Krause Gladiator strip-till unit
12 row by 30”
Montag fertilizer applicator
Field scale plots
#### Strip-till treatments

All strips were on 30” centers

<table>
<thead>
<tr>
<th>Small plot #1 treatments</th>
<th>Treatment</th>
<th>Tillage</th>
<th>Soybean row space</th>
<th>Fertilizer</th>
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<tbody>
<tr>
<td>1</td>
<td>Fall strip</td>
<td>15&quot;</td>
<td>Surface</td>
<td></td>
</tr>
<tr>
<td>2</td>
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<td>Spring strip</td>
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<td>Surface</td>
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<td>No-till</td>
<td>15&quot;</td>
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<tr>
<td>6</td>
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<tr>
<td>7</td>
<td>Spring strip</td>
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<tr>
<td>8</td>
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<table>
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<td>30&quot;</td>
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<table>
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<tr>
<th>On-farm treatments</th>
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<th>Tillage</th>
<th>Soybean row space</th>
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</table>
Strip tillage and planter alignment

For 30” soybean planted into 30” corn, set strip-till steering shift 15”
For 15” soybean planted into 30” corn, set strip-till steering shift 7.5”
Penetration resistance by depth
Small plot experiments. 2017

Custom leaf barrier

-----Shank depth-----
Penetration resistance by depth
On-farm and small plot. 2017

On-farm experiments

All trials

-----Shank depth-----
Canopy closure

Canopeo: rapid green canopy cover measurement tool
App or desktop version with MatLab
Effect of row spacing on canopy closure
Small plot data with fall strip-till treatments. 2017

Canopy Closure (%) vs. Date

- 15"
- 30"

Significantly Different
Effect of row spacing on canopy closure
Small plot data combined over all spring treatments. 2017

LSD (0.10) = NS
Effect of strip tillage on plant population
On-farm trials. 2017

LSD (0.10) = NS
Effect of strip tillage on soybean yield
Small plots trials. 2016-17

Yield (bu/a)

30" row spacing

<table>
<thead>
<tr>
<th></th>
<th>NT</th>
<th>ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield</td>
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<td>A</td>
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</table>

A

B
Effect of strip tillage on soybean yield
On-farm trials. 2017

Yield (bu/a)

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<tbody>
<tr>
<td>Surface 30 Strip-till 2</td>
<td>61.27</td>
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<tr>
<td>Banded 30 Strip-till 4</td>
<td>60.47</td>
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<tr>
<td>Surface 15 Strip-till 1</td>
<td>60.01</td>
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<tr>
<td>Banded 15 Strip-till 3</td>
<td>58.04</td>
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<tr>
<td>Surface 15 No-till 5</td>
<td>56.39</td>
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Effect of strip tillage on soybean yield
On-farm trials. 2016-17

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<tbody>
<tr>
<td>Banded 30 Strip-till 4</td>
<td>72.16</td>
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<tr>
<td>Surface 15 Strip-till 1</td>
<td>71.78</td>
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<tr>
<td>Banded 15 Strip-till 3</td>
<td>71.35</td>
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<tr>
<td>Surface 30 Strip-till 2</td>
<td>70.33</td>
</tr>
<tr>
<td>Surface 15 No-till 5</td>
<td>70.30</td>
</tr>
</tbody>
</table>

LSD (0.10) = NS
Early season growth of plants in strip-till (ST) and non-strip tilled (NST) rows
Determining yield of individual rows

Visual difference in growth

Individual row harvest
Yield of individual row harvest
On-farm experiments. 2017

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Daily **high** soil temperature by date
Small plot data with fall strip tillage treatments. 2017

Soil Temperature (°F)

- No-Till High
- Spring Strip-till High
- Fall Strip-Till High
- Air

*optimal germination temperature.*

Begin planting temperature.
Daily average soil temperature by date
Small plot data with fall strip tillage treatments. 2017

Soil Temperature (°F)

- No-till Avg
- Spring Strip-till Avg
- Fall Strip-till Avg
- Air

Begin planting temperature.
Conclusions and lessons learned

• Hybrid between no-till and conventional till
• Ability to apply fertilizer below soil surface (P)
• Strip-till and planter guidance setup very important if using 15” soybean rows and 30” strips
• Early growth of soybean rows in non-strip tilled rows were visibly less vigorous than those in the adjacent strip tilled rows
Strip-Till Soybean Production
Conclusions and lessons learned

Small plots

- Penetration resistance was reduced in the top 7” of the soil profile where strip tillage was used vs no till
- Plant stands at V1 in the 30” row spacing were significantly higher than in 15” row spacing

2 year results:

- In no-till only, 15” row spacing significantly outyielded 30” row spacing by 14.9 bu/a
- In 30” no-till plots, in-furrow fungicide application significantly improved yield by 7.7 bu/a
- Strip tillage significantly out yielded no-till by 10.4 bu/a in 30” row spacing plots.
On-farm

– 2017

All strip tillage 30” row treatments yielded significantly higher than the no-till 15” row treatment

– 2016-2017

No differences among tillage or fertilizer placement treatments were noted