Wheat Stubble Height on Subsequent Crops

Alan Schlegel
Southwest Research-Extension Center – Tribune, Kansas

2013 Oklahoma No-Till Conference
Why do I want tall stubble?

- Decreases wind speed at the soil surface (direct impact on evaporation)
- Raises the wind profile, stripped stubble has been shown to effect the wind profile up to 80 inches above the surface
Why do I want tall stubble?

- Standing and larger pieces of stubble take longer to decompose, the benefits of residue last further into the rotation

- Improves snow catch
Wheat stubble
2-7-07
Wheat stubble - strip
2-16-07
Table 1 – Effect of stubble height on snow catch and equivalent precipitation at three site years in the west-central Great Plains.

<table>
<thead>
<tr>
<th>Stubble Height</th>
<th>Precipitation Value of Snow</th>
<th>Lebanon - TCT†</th>
<th>Lebanon - FAH</th>
<th>Tribune - SWREC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stripped</td>
<td></td>
<td>(2.27)a ‡</td>
<td>(0.45)a</td>
<td>(1.94)a</td>
</tr>
<tr>
<td>Tall Cut</td>
<td></td>
<td>(1.28)b</td>
<td>(0.33)b</td>
<td>(1.58)b</td>
</tr>
<tr>
<td>Short Cut</td>
<td></td>
<td>(0.68)c</td>
<td>(0.31)b</td>
<td>(1.09)c</td>
</tr>
</tbody>
</table>

‡Letters within a column represent differences at LSD (0.05)
Why do I want tall stubble?

- Better residue distribution behind the combine
Stubble Height affects Distribution

High Cut Stubble

Low Cut Stubble

Wheat Residue

Machine Center

Adapted from Douglas et al., 1992.

Easier to evenly distribute residue when cut tall
Why do I want tall stubble?

- Better wildlife habitat
Western Kansas
Pheasant Population

- Northwest
- Southwest

Pheasants Per 100 Miles

Year

Combined January, April, July, and October Rural Mail Carrier Survey RMCS

Randy Rodgers, KDWP

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Effect of Wheat Cutting Height on Pheasants

Randy Rodgers, KDWP
• Producers are hesitant to cut their stubble high for fear of grain losses
• Heads lower in height contribute a minimal amount of grain, and its generally of lower quality (test weight)
• The “losses” appear much worse from the cab than they do in reality
Cutter bar height and head loss

TAM 111 - Mean Head Height of 32 inches

0.5% Loss = 22 in. cut height

Relationship derived from McMaster et al., 2000

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Materials and Methods

- Initial stubble height research
- No-till practices
- Mostly Wheat-Corn-Fallow (WCF)
- Started with 2 stubble heights
Wheat Stubble Height Affect on Subsequent Crops

Corn all years except 2004 when grain sorghum was planted

- Low
- High
- Strip

Grain Yield, bu/a

2001 2002 2003 2004 2005 2006
Evaluating the Impacts of Stripper Stubble on Corn Yields in NW Kansas Year 3 (2008)

12th Annual Kansas Agricultural Research Association (KARA) Conference
January 22 and 23, 2009
Salina, Kansas

www.ksagresearch.com
• In NW Kansas, water (soil water at planting and in-season rainfall) is the most limiting factor in corn production.

• Small-plot research at Akron, Co. and Tribune, Ks. suggest that using a stripper head for wheat harvest increases yields for the following corn or grain sorghum crops due to the inherent water savings characteristics of the taller stubble.
Project Objectives

• Use a 32’ Shelbourne Stripper header for harvesting part of the 2005, 2006 and 2007 winter wheat crops.

• Collect detailed planting and harvest data from the 2006, 2007 and 2008 corn crop.
Thirty-two foot Shelbourne stripper on Case IH 2388.
Data Collection – Fall crops

- Farmworks SiteMate was used to collect all planting information associated with a John Deere 1770 16-row in 2006 and 2007 while a JD GS2 2600 was used in 2008 with a JD 1770 24-row planter.

- Yield monitors were used on all machines for the fall crop harvest in each of the three years and then post-processed using in-house developed software to ensure data quality.

- After harvest, the planting and harvest data were merged and two additional identifiers were added to each harvested data point.
  - Headland presence (any point within 100’ of the field boundary)
  - Stripper vs. straight cut
Analysis

- In 2006, all data points were used and each field was aggregated and treated as a side by side. For 2007 and 2008, true in-field side by side comparisons were made across all fields and crops that had stripper stubble present using 0.50 acre grids. A total of 17 test sites were used in 2007 and 24 test sites in 2008.

- No headland areas were included in the analyses and an attempt was made not to collect from areas where other research plots were located or across different hybrids (a different hybrid for each of the 0.50 acre side by side aggregation grids).

- Standard paired t-tests were used for evaluation.
Analysis – Example Field
## Results

### 2006-2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Obs</th>
<th>Yield in Strip (bu/ac)</th>
<th>Yield in Straight (bu/ac)</th>
<th>Adv. Strip (bu/ac)</th>
<th>PTtest</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>12</td>
<td>35.14</td>
<td>29.79</td>
<td>5.35</td>
<td>0.01</td>
<td>98.9%</td>
</tr>
<tr>
<td>2007</td>
<td>17</td>
<td>118.87</td>
<td>120.01</td>
<td>-1.14</td>
<td>0.29</td>
<td>70.9%</td>
</tr>
<tr>
<td>2008</td>
<td>24</td>
<td>101.69</td>
<td>92.10</td>
<td>9.59</td>
<td>0.00</td>
<td>99.6%</td>
</tr>
</tbody>
</table>
Final Thoughts

• Our 2008 wheat crop was 100% harvested using stripper heads. The results from 2008 further justify that we made the correct decision in moving away from straight cut heads.

• What we like about stripper heads
  – Optimal residue distribution behind the machines
  – Improved harvest efficiency and ability to get down wheat
  – Improved transport from field to field
  – Improved field conditions at planting time (complete, uniform ground cover).
  – Increased corn yields in most years and possibly increased yields throughout a whole rotation.
  – Ability to reduce surface evaporation for multiple years
  – Improved animal habitat (good for PR purposes)
Materials and Methods

• No-till production practices for all crops

• Wheat-Corn-Fallow (WCF) and Wheat-Sorghum-Fallow (WSF) rotations
Materials and Methods

• Three wheat harvest treatments
  – Stripped ~ 27 inches (range 21-36”)
  – Optimal (High) height ~18 inches (range 14-24”)
  – Short cut ~ 9 inches (range 7-12”)
Site characteristics

• Richfield silt loam soil

• Level (<1% slope)

• Annual precipitation - 17 inches
Wheat Stubble Height
Corn

Grain Yield, bu/a

2007 2008 2009 2010 2011 2012

Low
High
Strip

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Wheat Stubble Height
Corn

2007-2012

Grain Yield, bu/a

Low
High
Strip

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Wheat Stubble Height

Corn Yield Components

Kernels per ear

2007-2012

Low
High
Strip
Wheat Stubble Height
Corn Residue

Residue, lb/acre

2007-2012

Low
High
Strip

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Wheat Stubble Height
Sorghum Residue

Residue, lb/acre

2007-2012

Low
High
Strip
Wheat Stubble Height
Sorghum WUE

2007-2012

WUE, lb/acre-inch

Low
High
Strip

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Wheat Stubble Height
Sorghum Planting

Profile ASW, inch

2007-2012

6 ft profile

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Wheat Stubble Height
Wheat after Sorghum

Grain Yield, bu/a

<table>
<thead>
<tr>
<th>Year</th>
<th>Low</th>
<th>High</th>
<th>Strip</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>40</td>
<td>30</td>
<td>45</td>
<td>35</td>
</tr>
<tr>
<td>2010</td>
<td>80</td>
<td>70</td>
<td>85</td>
<td>75</td>
</tr>
<tr>
<td>2011</td>
<td>50</td>
<td>60</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>2012</td>
<td>30</td>
<td>40</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

Mean: 55

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Conclusions

• Could not detect differences in soil water at corn planting due to differences in wheat stubble height.
• However, taller wheat stubble increased subsequent corn grain yield and residue amounts.
• Yields of following wheat crop was also greater with taller stubble.
• Could not detect differences in soil water at sorghum planting due to differences in wheat stubble height.

• Taller wheat stubble had little affect on subsequent sorghum production or following wheat crop.
Conclusions

• With a traditional grain platform, cutting wheat stubble low can have a negative impact on subsequent crop yields.