THE IMPACT OF BALING AND LIVESTOCK GRAZING CORN RESIDUE ON SOIL COMPACTION AND CROP YIELD

TRIAL OVERVIEW

- This study was initiated in 2013 to determine if baling or grazing corn stalk operations caused compaction resulting in subsequent penalties in crop yield.
- This study was a collaborative effort between University of Nebraska and Monsanto.

RESEARCH OBJECTIVE

<table>
<thead>
<tr>
<th>Location</th>
<th>Soil</th>
<th>Previous Crop</th>
<th>Tillage Type</th>
<th>Planting Date</th>
<th>Harvest Date</th>
<th>Potential Yield/Acre</th>
<th>Planting Rate/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gothenburg, NE</td>
<td>Silt Loam</td>
<td>Corn</td>
<td>Strip-Till/No-Till</td>
<td></td>
<td></td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

SITE NOTES:

- A 20-year eastern Nebraska study showed a slight increase in crop yield potential following grazing.\(^1\) A Nebraska farmer survey indicated that 40% of the respondents did not graze their fields; of these 40% indicated that they did not graze due to fear of soil compaction problems.\(^2\)
- Baling corn residue is an increasing practice due to the expansion of the ethanol industry. This practice may contribute to soil compaction due to heavy tractors and balers driving across wet soils.
- A 109 RM corn product was selected for the three-year study. Study treatments included: 1) Baled corn stalks - Corn stalks were harvested with a rotary blade windrower and large round baler 2) Grazed corn stalks - Cattle were grazed for residue removal at the recommended rate of 1.5 animal unit month (AUM)/acre. 3) No residue removal.
- The main treatment blocks had five replications and were split into sub-treatments: 1) Irrigation - A) Full irrigation and limited irrigation during the growing season B) Limited irrigation was targeted at 2-4 inches less than full irrigation; 2) Tillage: Strip-till and no-till
- Annual soil penetrometer readings were taken in the no-till plots within the three residue removal main treatments at one-inch increments down to 10 inches.

UNDERSTANDING THE RESULTS

<table>
<thead>
<tr>
<th>Residue Treatment</th>
<th>Depth 0-1&quot;</th>
<th>1-2&quot;</th>
<th>2-3&quot;</th>
<th>3-4&quot;</th>
<th>4-5&quot;</th>
<th>5-6&quot;</th>
<th>6-7&quot;</th>
<th>7-8&quot;</th>
<th>8-9&quot;</th>
<th>9-10&quot;</th>
<th>10-11&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baled</td>
<td>95a</td>
<td>149a</td>
<td>217a</td>
<td>206a</td>
<td>207a</td>
<td>215a</td>
<td>218a</td>
<td>221a</td>
<td>222a</td>
<td>211a</td>
<td>219a</td>
</tr>
<tr>
<td>Grazed</td>
<td>89a</td>
<td>141a</td>
<td>183b</td>
<td>184b</td>
<td>193b</td>
<td>193b</td>
<td>193b</td>
<td>193b</td>
<td>193b</td>
<td>193b</td>
<td>205a</td>
</tr>
<tr>
<td>No Removal</td>
<td>19B</td>
<td>91B</td>
<td>134b</td>
<td>155c</td>
<td>137c</td>
<td>182c</td>
<td>191b</td>
<td>187c</td>
<td>181c</td>
<td>179c</td>
<td>176b</td>
</tr>
</tbody>
</table>

Table 1. Penetrometer psi results for top 11 inches of soil with different residue treatments.

Average Crop Yield Results - When averaged over the three-year study there was no significant difference in yield among the previous crop removal treatments. However, in 2014 the previous no residue removal treatment had a significantly higher yield compared to the baled and grazed treatments.\(^3\) This could be due to dry conditions during the late vegetative and early reproductive corn growth stages that year. Environmental conditions in 2015 and 2016 provided adequate moisture for successful pollination; therefore, no significant differences in average yield for the residue treatments were reported for the three-year study.

Figure 1. Effect of tillage interaction and residue treatment on average corn yield.

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There was a significant yield difference among the tillage treatments, strip-till showed an average yield increase of 8 bu/acre over no-till (Table 3). There was also an interaction between residue treatment and tillage operation as evidenced in Figure 1. Treatments which left higher residue (grazed and no removal) benefited from a strip-till operation.

There was a significant difference among the irrigation treatments (Table 4). Full irrigation reported an average yield increase of 7 bu/acre over limited irrigation. However, there was no interaction between removal method and irrigation treatments. The lack of interaction is likely due to maintaining near the minimum recommended residue level (4,000 lbs/acre) for reducing soil water evaporation.  

**WHAT DOES THIS MEAN FOR YOUR FARM?**

- In a continuous irrigated corn system, when compared to no residue removal, baled, and grazed treatments increased penetrometer readings, but did not reduce yield potential.
- Baled and grazed treatments may improve stands and yields when cool, wet springs occur.
- Aggressive baling and grazing operations should be avoided to maintain sufficient residue levels to limit soil water evaporation.
- In high residue conditions, strip-till may improve stands and yields in a cool, wet spring.

**SOURCES**

4 Lyon, D. 2012. Seeding populations for Western Nebraska dryland corn. CropWatch. University of Nebraska.