Southern Iowa tillage results

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Abstract
The McNay Memorial Research Farm near Chariton is located in the south-central Iowa agroclimatic zone and presents several unique challenges for farmers in that area. The McNay Research Farm is characterized by a series of irregular-shaped upland flats, flanked by gentle-to-steep slopes. The upland flats constitute about 20 percent of the land area.

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Disciplines
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The McNay Memorial Research Farm near Chariton is located in the south-central Iowa agroclimatic zone and presents several unique challenges for farmers in that area. The McNay Research Farm is characterized by a series of irregular-shaped upland flats, flanked by gentle-to-steep slopes. The upland flats constitute about 20 percent of the land area.

As with many research farms, soil and climatic characteristics determine the prevailing farm activities and management practices, depending on what is most suitable and profitable in that area. At the McNay Research Farm, the primary research focus is livestock, with studies on crops focused on how they contribute to forage and feed for the livestock. Crops in this part of the state are largely for support of livestock programs, not cash grain.

In 1987, the farm established a tillage demonstration and research project evaluating reduced-tillage systems for corn, including no-till and strip-cropping practices, to demonstrate the use of no-till and other energy- and soil-conserving tillage systems. Results from the project at the McNay Research Farm are unique in Iowa, with a slight trend toward higher yields with no-till (Table 1).

The plots were located on silt loam soil with level-to-slightly concave slopes of 0.5 percent or less. The tillage systems project was conducted in continuous corn, and included full-width tillage, strip-till ridge, no-till flat (without ridges), and no-till on ridges.

The tillage systems were established in 1987 (in an area that had been meadow in 1986), and the first research data were taken in 1988. There are three predominant soils in the area: Haig, Grundy, and Shelby. The Haig soil occurs on upland flats on 0 to 2 percent slopes. It has a silt loam surface horizon and siltly clay subsoil horizon. It is developed in loess with poor internal drainage. The Grundy soil occurs adjacent to the upland flats on slopes of 2 to 7 percent. It has a silt loam surface horizon and silty clay loam in the upper part of the subsoil horizon, grading to a silty clay texture in the lower subsoil horizon. It is developed in loess with a somewhat poor internal drainage. The Shelby soil occurs on the steeper and lower slopes ranging from 9 to 14 percent slope gradient. It has a loam to clay loam-textured surface horizon and clay loam subsoil horizon. It is developed in glacial till that is moderately well drained.

The soils characteristic of southern Iowa tend to be poorly drained if they are level. And that, combined with the wet springs that have occurred in the 1990s, has made most cropping practices in this region difficult.

In the study, corn did not follow corn on the flat no-till planting (a wheat-clover cover crop added nitrogen) so yields did not decline. If nitrogen prices were to rise, the value of nitrogen
from clover could be profitable.

For the 5-year period (1988-1992), the no-till treatment planted on ridges had the highest average yield of 115 bushels per acre compared with 112 for no-till without ridges, 110 for strip-till on ridges, and 109 for full-width tillage (Table 1).

**Table 1. Five-year average results of continuous corn on the tillage demonstration project at the McNay Memorial Research Farm.**

<table>
<thead>
<tr>
<th>System</th>
<th>Yield (bu/acre)</th>
<th>Harvest(% moisture)</th>
<th>Cost ($/acre)</th>
<th>Cost (bu/acre)</th>
<th>Residue cover (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-till ridge</td>
<td>115</td>
<td>21.8</td>
<td>255</td>
<td>2.31</td>
<td>45</td>
</tr>
<tr>
<td>No-till flat</td>
<td>112</td>
<td>22.2</td>
<td>258</td>
<td>2.41</td>
<td>50</td>
</tr>
<tr>
<td>Strip-till ridge</td>
<td>110</td>
<td>21.5</td>
<td>257</td>
<td>2.42</td>
<td>40</td>
</tr>
<tr>
<td>Full-width tillage</td>
<td>109</td>
<td>20.5</td>
<td>277</td>
<td>2.72</td>
<td>25</td>
</tr>
</tbody>
</table>


The first 2 years showed a pattern similar to the 5-year average, except that the three no-till systems had statistically higher yields than the full-width tillage system. However, the last 3 years resulted in higher yields for the full-width tillage system, even though they were not statistically different from the two no-till treatment yields. The full-width tillage system yields were statistically higher than yields with strip-till on ridges.

Residue cover also was measured for the four tillage systems. For the no-till without ridges system, residues ranged from 60 percent cover after planting to 25 percent cover after planting with full-width tillage. The two ridge treatments did not have significantly different residue cover, falling between 40 and 45 percent.

Finally, the per-acre cost of production for the full-width tillage system was significantly higher (about $20) than the other three systems. The per-bushel cost for the full-width system was between 30 and 40 cents higher than the other systems. If the yield of the full-width system were 120 bushels per acre, the cost would be $2.30 per bushel or equal to the no-till ridge.

For farmers in the area of the McNay Research Farm, it is important to protect your soils with no-till cropping systems, and the research in southern Iowa shows that no-till yields are equal to or greater than yields in other systems.

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