Erosion Control in Potato Production Using Reduced Tillage

Paul Krause, Conservation Tillage Specialist
Central Wisconsin Windshed Partnership

Interest in various methods of conservation tillage for potato and vegetable production is steadily increasing in Central Wisconsin. There are a number of potential benefits from conservation tillage, but, perhaps the most significant is the reduction in wind erosion losses. A number of growers have made a transition to conservation tillage methods throughout the entire farm, while others are reluctant to make a change from conventional tillage based on fears of crop failure. The purpose of this demonstration was to compare Russet Norkotah potatoes grown using conventional tillage to those grown with conservation tillage. Two basic comparisons were made: 1) early effects of the crop residue on soil temperature and 2) the effects on overall management, final yield/quality, and profitability.

Plot organization

The trial took place on a 140 acre field in Waushara County operated by A&W Farms. The field is comprised of a Richford loamy sand soil. Sweetcorn was grown on the field in 1997. After harvest, the sweetcorn was stalk chopped and disked and then a rye cover was spread and disked in. In 1998, for this comparison, the field was split in half along the pivot road. The west half was deep tilled diagonal to the rows using a Tye Paratill on April 10, and then moldboard plowed and packed on April 16. The east half was deep tilled diagonally to the rows using a Tye Paratill on April 10 and then tilled using one pass of a Landoll Potato Special on April 17. Approximately 2% residue remained on the conventional plot while 24% remained on the conservation plot prior to planting. Row marking was done on April 23 and planting took place on April 24. Residue remaining after planting was less than 2% on the conventional plot and 20% (a fair amount of this was standing live rye) on the conservation plot. No planting problems were experienced due to the amount of residue.

Results

Soil temperatures were measured at four and eight inch depths from the top of the hill, at about 9:00 am, three days per week until just after emergence. The air temperature was also measured for reference. The temperature comparisons are shown in Figure 1.
The conventional plot averaged 0.6 degree warmer at the four inch depth and 0.4 degree warmer at the eight inch depth. These differences were statistically insignificant.

The conservation plot received an application of Gramoxone Extra (1.5pt/a) on May 9 to control the rye cover crop that had continued to grow. Both plots received a 0.75 lb/ac application of Lexone DF on May 20. All other management practices (ie. insecticide, fungicide, fertilizer, etc.) were the same on both plots. Emergence occurred on May 18th and plant growth was normal and consistent in both plots. Minimal weed pressure occurred in both plots.

Vine kill occurred on August 19. Hand harvesting was done on September 2 and samples were graded at the Hancock Agricultural Research Station. Mechanical harvest began on September 15. A summary of the harvest results are shown in Table 1 on the following page. In the hand sampled harvest the conservation plot yielded approximately 60 cwt/a more US No 1 potatoes than the conventionally tilled plot. Both plots had essentially the same percentages of B’s, Cull’s, and US No 1 yield. The higher percentage of scab in the conventional plot can be attributed to one replicate sample. When this replicate is removed from consideration, percentages affected by scab were equal in both plots. A&W Farms mechanical harvest field data showed a 33 cwt/a advantage in the conservation tillage. The mechanical harvest yields are an average of an approximately eight acre sample area in each of the plots.
Table 1

<table>
<thead>
<tr>
<th>Method</th>
<th>Mechanical Yield (cwt/a)</th>
<th>Hand Yield (cwt/a)</th>
<th>Under size (%)</th>
<th>Cullage (%)</th>
<th>Specific Gravity</th>
<th>Internal Defects (%)</th>
<th>External Scab (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation</td>
<td>420 ab</td>
<td>511</td>
<td>14 aa</td>
<td>4 aa</td>
<td>1.066</td>
<td>0</td>
<td>2.5</td>
</tr>
<tr>
<td>Conventional</td>
<td>387</td>
<td>440</td>
<td>13</td>
<td>5</td>
<td>1.065</td>
<td>0</td>
<td>17.5</td>
</tr>
</tbody>
</table>

Hand Harvest | US No 1 Yield (cwt/a) | Size Categories (% of US No 1 Yield) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(%)</td>
<td>2-4 oz</td>
</tr>
<tr>
<td>Conservation</td>
<td>419ab</td>
<td>20 ab</td>
</tr>
<tr>
<td>Conventional</td>
<td>359 82</td>
<td>15</td>
</tr>
</tbody>
</table>

aa - difference between plots was not statistically significant using a t-test of 95% confidence
ab - difference between plots was statistically significant using a t-test of 95% confidence

The difference in the cost of production between the two tillage types in this demonstration was limited to the cost of the Gramoxone application at $11.50/ac on the conservation plot. The costs related to operating the moldboard plow compared to the Landoll implement were estimated to be similar. All other inputs were equal.

Using 82% of the total mechanical yield results in a 27 cwt/a US No 1 yield advantage in the conservation plot. At a base price of $4.80/cwt (without adjustments), and $11.50/ac for the Gramoxone application results in $118/ac more profit in the conservation tillage plot.

Summary

The results of this comparison indicate that conservation tillage was successfully implemented on this field in 1998. A&W Farms also used the Landoll implement for tilling oat, soybean, and snap bean residue before planting potatoes on a majority of the acres they grew in 1998 and had similar success. Perhaps the greatest benefit of their efforts was the reduction of costs related to wind erosion, which were not given a dollar value in this comparison.
This page intentionally left blank.