have been developed that generate less vibration. The spiral roller/crimper (Figure 9.3a) do
not generate adequate force to kill the plant, so supplemental herbicide application is necessary.
Newer designs have a smooth roller to flatten the cover crop and a separate bar that crimps the cov-
er crop at regular intervals, moving up and down as the roller goes forward (Figure 9.3b).

Some roller/crimpers have been designed specifically for raised-bed vegetable production. Figure 9.4a shows 8-foot wide equipment that simulta-
neously terminates cover crops on two row tops and three furrows. Figure 9.4b shows equipment
that simultaneously terminates one row top and two furrows.

Figure 9.4c shows a 6-foot-wide two-stage roller/
crimper designed to operate with smaller tractors
(40 horsepower). Note this roller is not for raised
beds. The 12-inch-diameter smooth drum flattens
the cover crop and the 6-inch-diameter drum has
six equally spaced, quarter-inch thick crimping
bars on its surface. By adjusting the springs on
either side of the small drum, the crimping force
can be tailored to the cover crop and amount of
biomass.

The two-stage roller/crimper has proven to be as
effective as the original straight-bar roller. The
percentage of the rye killed with the two-stage
roller/crimper was the same as the straight-bar
roller one week after rolling/crimping and better
than the straight-bar roller two and three weeks
after rolling/crimping (Figure 9.5).

TABLE 9.1. The amount of glyphosate spray solution and glyphosate formulation used for different treatments and
termination achieved¹

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Glyphosate spray solution applied (qt/ac)</th>
<th>Glyphosate formulation applied (qt/ac)</th>
<th>Glyphosate formulation amount of continuous spray, percent</th>
<th>Rye termination one week after rolling, percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2006</td>
</tr>
<tr>
<td>Continuous spray</td>
<td>59.5</td>
<td>1.0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Spray every other crimp</td>
<td>17.2</td>
<td>0.3</td>
<td>29</td>
<td>97</td>
</tr>
<tr>
<td>Spray every fourth crimp</td>
<td>7.6</td>
<td>0.1</td>
<td>13</td>
<td>99</td>
</tr>
</tbody>
</table>

¹The continuous spray application was calibrated to apply 1 quart (32 fluid ounces) of the glyphosate formulation per acre.
Fine-textured soils sometimes stick to and accumulate on the shank, disturbing too much soil and making the slit too wide. This can impede planter operations and is referred to as “blowout.” Plastic shields that fit over the shank prevent soil from sticking, therefore minimizing blowout (Figure 9.11).

Another way to reduce blowout is to install splitter points on the subsoil shanks. The splitter points look like shark fins that attach vertically upright to the tips of the shank points (Figure 9.8 and Figure 9.12). They fracture the soil at the bottom of the trench, preventing soil upheaval to the soil surface. The modifications discussed in this section are primarily for older-model in-row subsoiling equipment. Current equipment incorporates these modifications to improve performance in high-residue situations.

## NO-TILL PLANTERS FOR FIELD CROPS

The objective when no-till planting in cover crop residues is adequate seed-to-soil contact at a desired seeding depth. Planters designed for operation in residues are heavier than conventional planters. The additional weight allows the planter to maintain the desired seeding depth in rough soil conditions and prevents the planter from floating across the soil surface, which results in uneven seed placement. Individual planter row units are typically equipped with heavy-duty down-pressure springs to maintain seeding depth in uneven soil conditions. In extreme cases, additional weight can be added directly to the planter.

Row cleaners sweep residue away from the opening disks of the planter units. They are useful when planting in heavy cover crop residue. There are different types of row cleaners for different types of planters (Figure 9.13).

Removing residue near the row reduces the chance of hairpinning. Adjust row cleaners to move residue without digging into the soil. If too much soil is disturbed, it will dry out and may crust over, which hinders emergence. In addition, disturbed soil can promote weed emergence in the row. Setting row cleaners too deep will cause residue to wrap around the row cleaners, which affects planting depth and seed coverage. Position row cleaners so that they rotate and “brush” residue away from the seed furrow.

When growing cotton after rye in a no-till system, the best cotton stand is obtained by rolling/crimping and herbicide application, 2008

### TABLE 9.2. Cost (dollars per acre) of various combinations of rolling and crimping with herbicide application, 2008

<table>
<thead>
<tr>
<th>Practice</th>
<th>Herbicide application without rolling/crimping</th>
<th>Rolling/crimping and herbicide application as two separate passes</th>
<th>Rolling/crimping with continuous spray</th>
<th>Rolling/crimping with spray every second crimp</th>
<th>Rolling/crimping with spray every fourth crimp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roller/crimer⁴</td>
<td>-</td>
<td>$6.06</td>
<td>$6.06</td>
<td>$6.06</td>
<td>$6.06</td>
</tr>
<tr>
<td>Sprayer equipment⁵</td>
<td>$6.26</td>
<td>$6.26</td>
<td>$1.15</td>
<td>$1.15</td>
<td>$1.15</td>
</tr>
<tr>
<td>Herbicide³</td>
<td>$11.20</td>
<td>$11.20</td>
<td>$3.21</td>
<td>$3.21</td>
<td>$3.21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$17.46</strong></td>
<td><strong>$23.52</strong></td>
<td><strong>$18.41</strong></td>
<td><strong>$10.42</strong></td>
<td><strong>$8.60</strong></td>
</tr>
</tbody>
</table>

Source: [5]

1 Costs include variable and fixed costs of application.
2 This practice, not part of the study, was included for comparison purposes and is utilized in the Southeast.
3 Based on the cost of a roller 9.1 feet wide from [6].
4 Sprayer costs for experimental treatments are estimated based on the fixed cost, repair and maintenance, and hand labor costs when the sprayer is attached to the roller.
5 Herbicide costs are based on rates taken from Table 9.1 and a cost of glyphosate of $11.20 per quart.