Crop Residue Management

- Crop residue provides soil health benefits that should be considered during management.
- Harvest is a time to focus on residue distribution and amount, and height of stubble.
- A variety of tillage implements that are less aggressive than moldboard plows are available to conserve residue.
- Consider additional management options if residue accumulates in continuous corn systems.

Residue Management

Crop residue can help reduce erosion, maintain soil moisture, improve soil tilth and quality, reduce nutrient runoff, and provide wildlife cover. These benefits can be related to potential yield benefits and should be considered when managing residue (Table 1). Conservation tillage practices resulting in greater sustainability of cropping systems are being adopted on a wider scale compared to the traditional moldboard plowing.

Residue can be managed through harvesting steps and tillage; however, tillage may not be desirable in all fields. Depending on crop rotation, additional steps may help decompose residue or allow for residue handling during planting of the next crop.

Harvest

- For proper residue distribution, combines or similar machines used for harvesting should be equipped with spreaders capable of uniformly distributing residue over the working width of the header.
- Chopper attachments can be adjusted to help with spreading residue the full width. Chaff spreaders attached to the rear axle are most effective for spreading wheat and soybean residues because a larger percentage of the harvested residue is handled by the cleaning shoe of the combine.¹
- To reduce evaporative losses and to provide adequate snow retention in no-till and strip-till operations it may be helpful to keep stubble height at a minimum of 10 inches for crops with a row spacing of less than 15 inches. For crops with a row spacing of 15 inches or greater, crop stubble height can be kept at a minimum of 15 inches.² This crop height should be present over at least half the field. Leaving stubble taller than 10-inches can help capture more snow and provide better insulation to plant roots.
- After harvest, grazing is another option if residue is accumulating over years, especially for areas that have frozen soils over winter. In a typical corn stalk or grain sorghum grazing period, cattle generally consume 25 to 50 percent of the available residue, depending on stocking density and grazing time.³

Planting

- Planters equipped with row cleaners should be utilized to move residue and enhance seed to soil contact. Row cleaners can allow earlier soil warming and help reduce the chance of pinning residue into the seed slot.
- Seed products should be selected with disease resistance and high ratings for emergence, seedling vigor, and root and stalk strength.
- In wet conditions, consider increasing seeding rates to help compensate for germination problems and stand loss.

Tillage Considerations

- “Vertical” tillage, a form of conservation tillage, helps size residue while limiting soil disturbance. Vertical tillage tools cut the residue into smaller pieces for even distribution and better soil contact.
- Strip-tillage leaves the soil undisturbed except for narrow strips where tillage and residue removal are performed to facilitate planting. This allows for quicker soil warming in the planting area and helps reduce the potential for equipment-induced compaction.

### Table 1. Comparison of water savings and yield on bare soil and residue-covered soil.

<table>
<thead>
<tr>
<th>Year</th>
<th>Crop</th>
<th>Yield (bu/acre)</th>
<th>Water Savings (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Residue</td>
<td>Bare</td>
</tr>
<tr>
<td>2007</td>
<td>Corn</td>
<td>197</td>
<td>172</td>
</tr>
<tr>
<td>2008</td>
<td>Corn</td>
<td>186</td>
<td>169</td>
</tr>
<tr>
<td>2009</td>
<td>Soybean</td>
<td>68</td>
<td>58</td>
</tr>
<tr>
<td>2010</td>
<td>Soybean</td>
<td>61</td>
<td>53</td>
</tr>
</tbody>
</table>

Crop Residue Management

- Consider the amount of residue remaining after each tillage operation. Chisel plowing can leave about 50 to 85 percent of non-fragile residue (corn or small grains) on the soil surface.\(^1\) Approximately 70 to 95 percent of the remaining residue is maintained over winter. Remaining residue is reduced further by 60 to 80 percent with spring cultivation. Multiplying these factors together, an estimated 21 to 65 percent of residue would remain at planting time.

Residue in Continuous Corn Systems

- Consider harvesting continuous corn first to help maximize the time and availability of warmer weather, which aids microbial activity and thereby decomposition of residue.

- Combine heads should be set to cut corn about a foot (or more) above the ground (Figure 1).\(^4\) Harvesting at this height can: 1) help reduce potential tire damage during field operations, 2) be easier to plant through because of less surface residue, and 3) still provide wind and water erosion protection. Some heads chop the residue as it feeds through the head.

- In wet springs, approximately two to three days before planting, consider running an empty planter across the field with row cleaners to move aside residue. This allows the top few inches of soil to dry.\(^5\)

- Corn stover could be chopped or baled and removed from fields. This would also remove phosphorus and potassium, and could increase soil moisture loss.

- Spring applications of additional nitrogen (N) would depend on environmental conditions that can influence microbial mediated residue degradation and release of N from residue. Residue decomposition is largely influenced by temperature and moisture that drives soil microbial populations. A corn crop that follows a late harvest, cold winter, and early planting season may benefit from more N compared to a corn crop that follows an early harvest, warm winter, and normal planting season. Research has not consistently shown a benefit to fall applied N for the purpose of aiding residue decomposition.\(^4\)

Residue Estimation

It may be helpful or required for conservation programs to estimate the percentage of crop residue cover. In some areas, about 12 to 20 percent residue is needed to protect relatively flat fields from water erosion. Fields with long or steep slopes may require at least 50 to 60 percent residue cover.\(^6\) The USDA recommends using the line-transect method for estimating and reporting percent residue cover. This method involves simple field observations and measurements using a 50- to 100-foot long measuring tape, line, or rope that can be marked at 100 equal intervals. Percent cover is determined by counting the number of marks that lie directly over a piece of residue. For complete details on the line-transect method and worksheets for reporting percent residue cover please refer to the USDA National Agronomy Manual (pages: 503-126 to 503-127) found at http://www.nrcs.usda.gov.

For a more general estimate of crop residue cover, when reporting is not necessary, the photo-comparison method can be used. This involves comparing sections of the field that are representative of typical residue cover throughout the field and comparing them to photographs of known percentage cover. Example photographs and a more detailed explanation on this method can be found in the Purdue University Agronomy Guide AY-269-W at https://www.extension.purdue.edu.

Summary

Harvest and planting are times to focus on residue management. The benefits of residue have led farmers to use less aggressive tillage to conserve some crop residue. Additional residue management options can be used in continuous corn systems.

Sources:

For additional agronomic information, please contact your local seed representative. Developed in partnership with Technology, Development, & Agronomy by Monsanto.

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