

Management Options for Crop Residue

- Crop residue can furnish soil health benefits that should be considered during management.
- Residue distribution and amount, and height of stubble can be managed at harvest.
- 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.

Management of Crop Residue

Crop residue can help maintain soil moisture, reduce erosion and nutrient runoff, improve soil tilth and quality, and provide wildlife cover. These benefits can be related to potential yield benefits and should be considered when managing residue (Table 1). About 12 to 20 percent residue is needed to protect relatively flat fields from water erosion.³ Fields with long or steep slopes require at least 50 to 60 percent residue cover.³ Conservation tillage practices resulting in greater sustainability of cropping systems are being adopted on a wider scale compared to traditional moldboard plowing and black-top fields.

Residue can be managed at harvest and planting. Tillage can be evaluated on a field by field basis. Depending on crop rotation, additional options may help decompose residue or allow for residue handling during planting of the next crop.

Planting

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

Tillage Considerations

- Consider the reduction of residue over winter and with each field operation. For example, 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.
- Strip-tillage leaves the soil surface undisturbed except for narrow strips where tillage and residue removal are performed to aid planting. This allows for quicker soil warming in the planting area and helps reduce the potential for equipment-induced compaction.
- “Vertical” tillage, a form of conservational tillage, and helps size residue while limiting soil disturbance. Vertical tillage tools cut residue into smaller pieces for better soil contact and even distribution.

Harvest

- For even residue distribution, combines or similar machines used for harvesting should be equipped with spreaders

Year	Crop	Yield			Water Savings		
		Residue	Bare Soil	Difference	Yield	Soil	Total
		Bu/ac	Bu/ac	Bu/ac	Inch	Inch	Inch
2007	Corn	197	172	25	3.0	0.0	3.0
2008	Corn	186	169	17	2.0	1.5	3.5
2009	Soybean	68	58	10	3.0	2.0	5.0
2010	Soybean	61	53	8	2.5	0.0	2.5

Source: Van Donk, S. J. and N. L. Klocke. 2012. Tillage and crop residue removal effects on evaporation, irrigation requirements, and yield. Proceedings of the 24th Annual Central Plains Irrigation Conference

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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, the USDA National Conservation Practice Standards specify that crop stubble height should be 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 should be a minimum of 15 inches. Following harvest, at least 50 percent of the crop stubble should be left standing for snow catch. Leaving stubble taller than the 10-inch minimum can help capture more snow and provide better insulation to plant roots.
- Grazing is a post-harvest option if residue is accumulating over years, especially in areas that freeze during winter. Cattle grazing on cornstalks or grain sorghum residue generally consume 25 to 50 percent of the available residue, depending on stocking density and grazing time, in a typical grazing period.⁵

Residue in Continuous Corn Systems

- Continuous corn can be harvested 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.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.
- Corn stover could be chopped or baled and removed from fields. This would also remove phosphorus and potassium, and could increase soil moisture loss.
- 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.²
- Effectiveness of increased nitrogen (N) rates applied in the spring 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 conditions that drive soil microbial populations. Consider a corn crop that is following a late harvest, cold winter, and early planting season; fields under this scenario may benefit from more N

compared to a corn crop that is following 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. 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>.



Figure 1. Residue estimation can help determine if there is enough residue to protect the soil surface over winter and through planting operations.

For general estimates 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 Purdue University's Agronomy Guide AY-269-W at <https://www.extension.purdue.edu>.

Summary

The benefits of residue have led farmers to use less aggressive tillage to conserve crop residue. Residue management begins at harvest and planting times. Additional residue management options can be used in continuous corn systems.

Sources: ¹ Eck, K.J. and D.E. Brown. 2001. Managing crop residue with farm machinery. Agronomy Guide. AY-280-W. Purdue University Extension; ² Al-Kaisi, M. 2009. Tips for managing corn residue in continuous corn. Iowa State University. Integrated Crop Management News; ³ Residue management and cultural practices. 2009. Iowa State University Extension, PM 1901a; ⁴ Al-Kaisi, M. 2007. Tillage challenges in managing continuous corn. Iowa State University Extension. Integrated Crop Management. ⁵ Rasby, R. J. et al. 2008. Grazing crop residues with beef cattle. Publication EC278, University of Nebraska-Lincoln.

For additional agronomic information, please contact your local seed representative.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. **ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS.** Leaf Design® is a registered trademark of Monsanto Company. ©2014 Monsanto Company. 130809060641 092314SEK