

Harvesting Crop Residue: What is it worth?

Iowa Fact Sheet

Natural Resources Conservation Service
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Dollar Value of Crop Residue

The plant residue left in the field after harvest is a valuable resource. Increasing demand for harvested crop residue has left many producers wondering whether they should bale and sell their crop residue or leave it in the field. To help make that decision producers should consider the following:

Cost of harvesting the residue

Based on a custom baling price of \$13 per large round bale (\$22/ton) and custom raking at \$3/ton, it costs about \$25/ton (based on 1,200 lb bales) to harvest residue.

Value of removed nutrients

Based on data from the Agricultural Research Service's (ARS) National Soil Tilth Lab, a ton of corn residue contains about 37 lbs. of nitrogen (N), 3.5 lbs. of phosphorous (P₂O₅), 33 lbs. of potassium (K₂O). Based on 2016 crop production prices, the estimated cost of nutrients removed would be about \$33/ton (see table). If you remove 3-4 tons of residue per acre (5-6 round bales) the value of the nutrients removed would be \$99 to \$132 per acre.

Fertilizer Value of Nutrients in One Ton of Corn Residue*

Element	Concentration in residue (%)	Pound/ton	Fertilizer nutrient price (\$/.lb)**	Value of nutrients in residue (\$/ton)
a	b	$c = (b/100) \times 2,000$	d	$e = c \times d$
N	1.85	37	.40	\$14.80
P ₂ O ₅	.175	3.5	.45	\$1.58
K ₂ O	1.65	33	.35	\$11.55
Total Value				\$33.05

*Based on Table 1 from Al-Kaisi, et al, 2008. The Effect of Residue Management on Soil and Water Quality. **Based on 2016 Crop Production Costs from Iowa State University. Substitute current prices in column d and multiply by column c to get value of each nutrient per ton of corn residue.



Erosion Control

The value of maintaining crop residue on the soil surface to control soil erosion is well documented. All NRCS conservation plans for highly erodible land (HEL) require that a minimum amount of crop residue be present to control soil erosion. The amount of residue required varies depending on soil type, crop rotation, tillage system and existing conservation practices. Producers with HEL fields should contact their local NRCS office to review their conservation plan and discuss the potential impact of harvesting crop residue before they remove any from the field.

Soil Organic Matter/Soil Health

Perhaps the most important factor to consider before harvesting crop residue is the impact on soil organic matter. Soil organic matter contributes directly to the nutrient availability, nutrient holding capacity, and water holding capacity of a soil. It also plays a significant role in the formation of water stable aggregates which affects infiltration, aeration and drainage.

Soil organic matter also provides carbon, a food source for soil microorganisms. These fungi, bacteria and other organisms are essential for nutrient cycling in the soil. Some form mutually beneficial relationships with plant roots providing nutrients to the plants in exchange for energy in the form of simple sugars.

Removing crop residue in excess of what the soil can tolerate will ultimately result in the deterioration of the soil resource and declining yield. Research by the USDA-Agricultural Research Service at the University of Nebraska Agricultural Research and Development Center found an average yield decrease of 6% over five years for continuous no-till corn when an average of 50% of the crop residue was removed each year (Varvel et al, 2008). While the nutrients removed can be replaced, the functions of soil organic matter are not so easily mitigated.

References:

Mahdi Al-Kaisi, Associate Professor, Iowa State University, *The Effect of Residue Management of Soil and Water Quality*.

Douglas Karlen. 2008. *Agricultural Research Center National Soil Tillage Lab, Ames, Iowa. GSA-SSSA 2008 Presentation Alabama Energy Summit, Sept. 17, 2008.*

Reducing the Impact of Residue Removal

Producers who do decide to harvest crop residue have several options to reduce or minimize the impact of crop residue removal.

1. Reduce or eliminate tillage operations

Tillage operations could bury much of the remaining crop residue and increase the rate of residue decomposition adding to the negative effects of crop residue removal. Switching to a no-till system would reduce the negative impacts of crop residue removal.

2. Reduce the number of years low residue crops are grown in the crop rotation

The negative impact of harvesting crop residue is greater if the rotation includes low residue crops such as soybeans. Switching from a corn-soybean rotation to a continuous corn, corn-corn-soybean or corn-soybean wheat rotation would somewhat offset the negative impact of removing crop residue.

3. Consider growing a cover crop

Establishing a cover crop prior to harvest or immediately after harvesting crop residue would minimize the negative impacts of crop residue removal. Cover crops protect the soil surface, enhance soil biology, capture remaining nutrients and, if legumes are included, add nitrogen back into the system.

4. Consider adding manure

Manure will not only replace some of the nutrients that were removed with the crop residue but will also add some organic matter back into the system. Manure alone would not be adequate for soil erosion control on HEL fields because it would not provide enough cover to protect the soil. Manure would work best in combination with a cover crop.