

TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE STATE OF COLORADO NATURAL RESOURCES CONSERVATION SERVICE

Economics Technical Note No. 3

May 23, 2013

To: All Offices

From: Aaron Waller – State Economist

Subject: Harvesting Corn Stover

Harvesting the residue of corn is a common practice to supply bedding material or feed. Current trends also include using corn stover as a feedstock for cellulosic ethanol. While stover is an essential feed for livestock in drought years, soil quality and economics can give us some guidelines for regular stover harvest.

Quantity – A field usually has as much stover as grain by weight (i.e. a 1:1 ratio). A 160 bu/ac grain yield will produce about 3.6 *dry* tons of total residue per acre and produce about 3 to 4 round bales/ac. This assumes that you rake and bale the stover and leave some residue to prevent erosion.

Nutrient Content¹ – If you harvest stover, you are removing nutrients that would have enriched the soil. According to various Midwestern extension bulletins, the fertilizer equivalent content of removed corn stover is approximately (dry weight):

- N – 16 lbs/ton
- P₂O₅ – 6 lbs/ton
- K₂O – 30 lbs/ton



Harvest methods² – There are three main techniques to harvest stover that have different impacts on the residue left in the field:

- Windrow from the combine and bale ~ 38% of available stover is removed.
- Rake into a windrow and bale ~ 55% of available stover is removed.
- Shred stalks, rake into a windrow and bale ~ 70% of available stover is removed.

¹ J. Sawyer & A. Mallarino. 2007. Nutrient Removal when Harvesting Corn Stover. Integrated Crop Management, IC- Publication 498(22) -- August 6, 2007. ISU Extension. <http://www.ipm.iastate.edu/ipm/icm/2007/8-6/nutrients.html>

² Montross, M.D., T.S. Stombaugh, S.A. Shearer, S.G. McNeill, and S. Sokhansanj. 2002. Collection and characterization of corn stover in Kentucky. Presented at the Bioenergy 2002 Conference. Boise, ID. September 23-25, 2002.

How much residue should be left?³ – NRCS uses the WEPS model to calculate the amount of crop residue that will prevent soil loss greater than 5 tons/acre from wind. As a general guide, no-till fields would need *at least* 1.5 tons of residue per acre while a conventional tilled field *at least* 2 tons. High and moderately erosive locations need even more residue left on the field.

What are the costs and thresholds for safe and economical stover harvest?⁴

CONSERVATION GUIDELINES FOR HARVESTING CORN STOVER					
		↓ No-Till ↓		↓ Conventional Tillage ↓	
Corn Grain Yield (bu/ac) ↓	Total Residue (Dry Tons)	Harvest Method	Nutrient Cost \$/ac	Harvest Method	Nutrient Cost \$/ac
<i>less than 120</i>		NONE	\$0	NONE	\$0
120	2.7	Bale (38%)	\$27		\$0
140	3.1		\$33		\$0
160	3.6	Rake & Bale (55%)	\$53	Bale (38%)	\$37
180	4		\$60		\$41
200	4.5		\$67	Rake & Bale (55%)	\$67
220	4.9		\$73		\$73

Fertilizer Prices: (82-0-0 @ \$770/tn) (11-52-0 @ \$700/tn) (0-0-60 @ \$660/tn).

- Corn stover harvest should NOT occur on fields with corn yields less than 120 bu, regardless of tillage method!
- Rake and bale harvest (55% removal) will cost approximately \$0.33/bu in nutrient loss. (\$0.33 x bu x acres = field nutrient cost)
- Highly erosive sites will require higher residue levels in order to maintain wind erosion at acceptable levels.



³ Charles Wortmann, Robert Klein & Charles Shapiro. 2012 (rev). Harvesting Crop Residues. University of Nebraska Extension publication G1846. <http://ianrpubs.unl.edu/e-public/live/g1846/build/g1846.pdf>

⁴ Edwards, William. 2011. Estimating the Price of Corn Stover. ISU Extension File A1-70. <http://www.extension.iastate.edu/agdm/crops/html/a1-70.html>