Pricing Drought Stressed Corn Silage

by Joe Lauer, Dan Undersander, Kevin Schoessow, Jim Faust, Lee Milligan, and Greg Blonde, University of Wisconsin Extension

Getting a fair and equitable price for corn silage is hard due to dynamic and biologically variable factors (i.e. production/harvesting/grain drying costs, grain/hay prices, forage hauling/storage, stover fertility/organic matter value and forage quality - especially starch content and neutral detergent fiber digestibility). Growers calculate price based on corn grain yield as the alternative harvestable crop while dairymen calculate price based on alternative forages (primarily alfalfa). Either way, regional supply/demand affects final price. Key calculation steps: 1) estimate silage yield for grain/forage; 2) determine harvest moisture content, especially if sold on tonnage basis; 3) determine forage quality estimate and discount value accordingly; 4) consider changes in harvesting costs.

1. Estimating Yield

Example Using Corn Grain Equivalents

For drought stressed corn – 1 ton of silage/ac obtained from 5 bu of grain/ac:

Corn field has 37 bu/ac average, thus 1 ton/ac for each 5 bu of corn (37 bu/ac at 5 bu/ton) = 7.4 tons/ac.

Calculate the length of row equal to 1/1000 ac – divide 43.56 sq ft by the row spacing in feet:

With 30" row spacing, 1/1000 ac = 43.56/(30/12) = 17.42' or 17' 5" of row.

Yield components – corn field had 12,000 plants/ac[a] with partially pollinated ears (14.3 rows/ear; 24 kernels/row average).

12,000 x 24 x 14.3/110,000[b] = 37 bu/ac

[a]Determined by evaluating 17.5' of row on 30" row corn. [b]Drought stressed corn may have 110,000 kernels/bu (normal corn has ~90,000).

Example Using Corn for Silage

For drought stressed corn – a rough pre-harvest yield estimate can be made by assuming 1 ton of 30% DM silage obtained for each plant height foot, excluding tassel (average corn is 6' tall below tassel).

Corn is chopped leaving 1' stalk (5' of corn harvested), thus 1 ton/ac per 1' plant height harvested (1 x 5 = 5 tons/ac).

Calculate whole-plant silage yield – choose sample field area, measure between rows, midway between two plants cut to row length based on width (Table 1), weigh harvested corn (lbs = tons of silage/ac), repeat for 5-7 representative field areas (average to estimate field average).

Corn silage planted in 30" rows and harvested from 8'8" of row is 15.5 lbs = 15.5 tons green silage/ac.

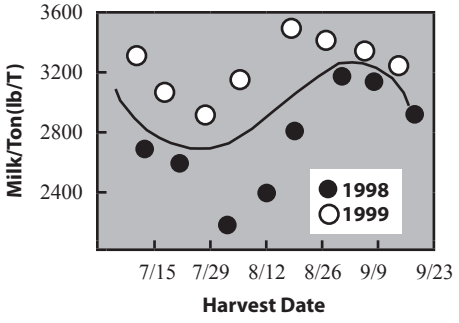
2. Determining Silage Moisture

When harvesting crop for ensiling, proper moisture for storage/fermentation is a main consideration. Moisture testing is critical since the crop looks drier than it actually is. Test whole-plant moisture of chopped corn for acceptable fermentation. Use a forced air dryer (i.e. Koster), oven, microwave, electronic forage tester, NIR, or the rapid "Grab-Test" method (squeeze a handful of finely cut plant material as tightly as possible for 90 seconds, release grip noting condition of plant material ball. If juice runs freely or shows between fingers, crop contains 75-85% moisture; if ball holds shape and hand is moist, it has 70-75% moisture; if ball expands slowly and no dampness appears, it has 60-70% moisture; if it springs out in opening hand, it has less than 60% moisture).

For drought stressed and normal corn, proper harvest moisture content depends on the storage structure. Harvest when moisture content ensures good preservation/storage: 65-70% in horizontal silos (trenches, bunkers, bags), 60-65% in upright stave silos, and 55-65% in upright oxygen limiting silos.

Example of Influence of Moisture when Establishing Price

Using $24.50/ton of 65% moisture silage, each ton contains 700 lbs of DM (2000 x .35). Value/cwt DM = $24.50/7 = $3.50. If moisture content is 70%, then each ton contains 600 lbs of dry matter. To have comparable value, this silage would have to be priced at $21.00 (6 x $3.50) per ton. On the other hand, if moisture content was 60% then a comparable price would be (2000 x .40 = 800; 8 x $3.50) $28.00 per ton.



Corn stover price at 20% moisture (80% DM), using price of $24.50/ton of 65% moisture (35% DM) silage.

($/ton x Actual DM)/DM for silage.

($24.50 x 80)/35 = $56/ton at 80% dry matter

3. Determine Forage Quality

Forage quality generally suffers from drought stress and other factors, forcing harvest other than at normal maturity stage (Figure 1). However, forage quality of stressed corn silage is highly variable. The best estimate is a forage analysis, without, one must assume reductions in quality based on average, which may or may not be true in specific situations. See Table 2 for recommended feeding value based on animal production.

4. Consider Changes in Harvesting Costs

Silage harvesting costs generally run $3-5/ton of forage. When harvesting drought stressed silage, yield is lower and more acres must be covered, raising costs by $1.50-2.50/ton.

Buyers (livestock feeders) should start with their ideal price for ready-to-feed silage. When pricing in field values, consider discounts (i.e. lower feed value due to drought stress, harvest/silage costs, transportation, feeding loss – Table 3).

Sellers (corn producers) should look at corn for grain and fertilizer values that will be removed if entire plant is harvested (Table 4).

Corn Silage (ready-to-feed) Pricing Rules of Thumb:

- 1 silage ton = 10 times price bu of corn
- 1 silage ton = 6 times price bu of corn + harvest costs
- 1 silage ton = 1/3 price alfalfa hay *(energy based, no protein adjustment)*

Example Calculation

Assume the value of good corn silage is $22-25/ton stored in a bunker silo. Poor silage for dairy herds with milk production of 80 lbs/day or less is about 80-85% of the value of good silage ($18-21/ton stored in a bunker silo). For dairy herds producing over 80 lbs/day, drought stressed silage is probably worth 70% of the value of good silage ($15-18/ton). Custom choppers charge $3-5/ton of silage packed into a bunker. Poor silage may take 1.5-1.75 times longer to harvest per ton due to poor yield and increased travel to harvest, adding $1.50-$2.50 ($12-16/ton).

Table 1. *Length = 1/1000 ac at varying row spacing.*

Width Between Rows	20”	30”	36”	40”
Length of Row to Cut	26.1’	17.4’	14.5’	13.1’

Table 2. *Feeding value of drought stressed corn silage compared to good silage.*

Corn Growth Stage	Dairy Herd Below 80 lb Average	Dairy Herd Above 80 lb Average
Pre-tassel	90%	80%
Silk	80%	70%
Soft Dough	85%	80%
Early Dent	90%	87%
Half Kernel Milk Line	100%	100%
Black Layer	90%	90%
Source: Darby and Lauer, 2002 – see graph		

Table 3. *Buyer calculation of value of corn silage.*

Value of Silage Ready-to-Feed	$25.00/ton
Deduct Feed Value Loss for Drought Stress (10-30% see table)	$2.50/ton
Deduct Cost of Harvesting and Silage Making*	$12.00/ton
Maximum Value of Corn in Field	$10.50/ton
** $60/ac (chopping/hauling custom rate) divided by 5 ton/ac = $12/ton*	

Table 4. *Seller calculation of corn silage value.*

Value of Fertilizer Removed from Silage* (5 tons $7/ton)	$35.00/ac
Value of Grain (37 bu x $2.00/bu)	$74.00/ac
Deduct Harvest and Marketing Cost	$28.00/ac
Value Per Ton Standing in Field ($81/ac)	$16.20/ton
**12 lbs nitrogen removed/ton (12x35¢=$4.20/ton); 4l bs phosphorus removed/ton (4x25¢=$1.00/ton); 12 lbs potassium removed/ton (12x15¢=$1.80/ton).*	

Buying/Selling Corn Silage Worksheet – *What's A Fair Price?*

1. Base price at 65% moisture

- 10 times price of shelled corn — $2.00 x 10 = **$20/ton**
- cost + return — $275 ÷ 15 ton/ac + 10% = **$20/ton**
- 1/4 to 1/3 price of baled hay — $100 x 0.25 = **$25/ton**

2. Adjusted price for moisture

	Base Price ($/ton as fed) at 65% moisture					
% Moisture	**$16**	**$18**	**$20**	**$22**	**$24**	**$26**
71%	$13.26	$14.91	$16.57	$18.23	$19.89	$21.55
69%	$14.17	$15.94	$17.71	$19.49	$21.26	$23.03
67%	$15.09	$16.97	$18.86	$20.74	$22.63	$24.52
65%	$16.00	$18.00	$20.00	$22.00	$24.00	$26.00
63%	$16.91	$19.03	$21.14	$23.26	$25.37	$27.48
61%	$17.83	$20.06	$22.29	$24.51	$26.74	$28.97
59%	$18.74	$21.09	$23.43	$25.77	$28.11	$30.45

3. Quality adjustment factor for maturity

Corn Growth Stage	Herd < 80 lb Ave	Herd > 80 lb Ave
Pre-tassel	90%	80%
Silk	80%	70%
Soft Dough	85%	80%
Early Dent	90%	87%
Half Kernel Milk Line	100%	100%
Black Layer	90%	90%

4. Final price adjusted for moisture/quality

**If buyer harvests, use guides below to establish credit for final payment.*

	With Kernel Processor		Without Kernel Processor	
Pull-Type	**$/Acre**	**$/Hour**	**$/Acre**	**$/Hour**
Chop	NA	$75-$100	$25-$50	$50-$100
Chop & Haul	NA	NA	$40-$60	$100-$160
Self-Propelled	**$/Acre**	**$/Hour**	**$/Acre**	**$/Hour**
Chop	$30-$90	$100-$400	$25-$50	$125-$275
Chop & Haul	$45-$100	$175-$450	$50-$90	$175-$425