Pricing Drought Stressed Corn Silage

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Arriving at a fair and equitable price for corn silage is difficult due to the number of factors involved that are dynamic and biologically variable. Some factors include production costs, grain price, harvesting costs, costs of handling, hauling and storage of forage, grain drying costs, fertility and organic matter value of stover, and forage quality (especially starch content and neutral detergent fiber digestibility-NDFD). The amount of moisture has a major influence on its feed value and needs to be considered to accurately determine fair silage prices. Some growers will want to calculate the price based on corn grain yield (as the alternative harvestable crop) and some dairymen will want to calculate the price based on alternative forages (primarily alfalfa as the alternative forage source). In either case the final price is affected by supply and demand within a region.

Let's begin by assuming the value of good corn silage is $22-25/ton stored in the bunker silo in good years. Poor silage for dairy herds with milk production of 80 pounds per day or less is about 80-85% of the value of good corn silage putting it in the range of $18-21/ton stored in the bunker silo. For dairy herds producing over 80 pounds of milk per day, drought stressed silage is probably worth 70% of the value of good silage putting drought stressed silage in the range of $15-18/ton stored in the bunker silo.

Custom choppers charge about $3-5/ton of silage packed into the bunker. Poor silage may take 1.5 to 1.75 times longer to harvest per ton due to poor yield and increased travel to harvest a ton. This would add $1.50 to $2.50 putting it in the range of $12-16/ton.

Estimating Yield

Corn for grain example
<u>Using grain equivalents:</u> For drought stressed corn, about one ton of silage per acre can be obtained from each 5 bushels of grain per acre. For example: A corn field was determined to have an average of 37 bu/acre, thus 1 ton/acre for each 5 bu of corn (37 bu per acre at 5 bu per ton) = 7.4 tons/acre.

To calculate the length of row equal to 1/1000 acre divide 43.56 sq ft by the row spacing in feet

Example: With 30 inch row spacing, 1/1000 acre = 43.56/(30/12) = 17.42 ft or 17 ft 5 inches of row.

<u>Using yield components:</u> It was determined that the corn field has 12,000 plants/acre* with ears that are partially pollinated; each ear has on average 14.3 rows per ear with 24 kernels per row.

12,000 x 24 x 14.3/110,000** = 37 bu/acre

* Determined by evaluating 17.5 feet of row on 30 inch row corn
** Drought stressed corn may have 110,000 kernels/bushel (normal corn has ~90,000)

Corn for silage example
If little or no grain is expected, a rough pre-harvest estimate of yield can be made by assuming that one ton of 30 percent dry matter silage can be obtained for each foot of plant height (excluding the tassel). For example: a field of drought stressed corn is on average 6 feet tall below the tassel. The corn is chopped at 30% dry matter leaving one foot of stalk left in field (5 foot of corn is harvested), thus 1 ton/acre for each 1 foot in plant height (minus tassel) harvested 1 x 5 = 5 tons/acre

To calculate whole-plant corn silage yield:
1. Select representative area in field for sampling
2. Determine inches between row
3. Start midway between two plants, cut to row length based on row width (see below)
4. Weight corn harvested.
5. Weight of corn in pounds = tons of silage per acre
6. Repeat for 5 to 7 representative areas in the field
7. Average the 5 to 7 areas to obtain an estimated field average

Width between corn rows	**20”**	**30”**	**36”**	**40”**
Length of row to cut (1/2000 acre)	**13’**	**8’8”**	**7’3”**	**6’6”**

Example: Your corn silage is planted in 30 inch rows. The corn harvested from 8'8" of row is 15.5 pounds. This is equal to 15.5 tons of green silage per acre.

Things to consider if you are a Buyer or Seller

Buyer (livestock feeder): Start with the price you are willing to pay for ready-to-feed silage. When pricing in the field values take in to account these discounts; lower feed value due to drought stress, cost of harvest and making silage, transportation and any feeding loss. For example:

Value of Silage ready-to-feed =	**$25.00/ton**
Deducts (10% feed value loss for drought stressed corn) =	**$2.50/ton**
Deduct cost of Harvesting and Silage Making* =	**$12.00/ton**
Maximum Value of Corn in Field =	**$10.50/ton**
**** $60/acre (custom rate for chopping and hauling) divided by 5 ton/acre = $12/ton***	

Seller (Corn Producer): Look at the value of the corn for grain and the fertilizer value that will be removed if the entire plant is harvested. For example:

Estimated Yield = 5 tons forage/acre and 37 bu grain /acre	
Value of fertilizer removed from silage* (5 tons $7/ton) =	**$35.00/acre**
Value of grain (37 bu x $2.00/bu) =	**$74.00/acre**
Deduct Harvest and Marketing cost =	**$28.00/acre**
Value per ton standing in field ($81/acre) =	**$16.20/ ton**
**** assumes 12 lbs of Nitrogen removed/ton (12 x $0 .35 = $4.20/ton); 4 lbs of Phosphorus removed/ton (4 x$0.25 = $1.00/ton); and 12 lbs potassium removed/ton (12 x $0.15 = $1.80/ton).***	

Determining silage moisture

If the decision is made to harvest the crop for ensiling, the main consideration will be proper moisture for storage and fermentation. The crop will look drier than it really is, so moisture testing will be critical. Be sure to test whole-plant moisture of chopped corn to assure yourself that acceptable fermentation will occur. Use a forced air dryer (i.e. Koster), oven, microwave, electronic forage tester, NIR, or the rapid "Grab-Test" method for your determination. With the "Grab-Test" method (as described by Hicks, Minnesota), a handful of finely cut plant material is squeezed as tightly as possible for 90 seconds. Release the grip and note the condition of the ball of plant material in the hand.

- If juice runs freely or shows between the fingers, the crop contains 75 to 85% moisture.
- If the ball holds its shape and the hand is moist, the material contains 70 to 75% moisture.
- If the ball expands slowly and no dampness appears on the hand, the material contains 60 to 70% moisture.
- If the ball springs out in the opening hand, the crop contains less than 60% moisture.

The proper harvest moisture content depends upon the storage structure, but is the same for drought stressed and normal corn. Harvesting should be done at the moisture content that ensures good preservation and storage: 65-70% in horizontal silos (trenches, bunkers, bags), 60-65% in upright stave silos, and 55-65% in upright oxygen limiting silos.

Influence of moisture when establishing price

Example: $24.50 per ton of 65% moisture silage has been established. Each ton at 65% moisture contains (2000 x .35) = 700 lbs of dry matter. Value per cwt DM = $24.5/7 = $3.50. If, however, moisture content is 70%, then each ton contains only 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).

($ per ton x actual dry matter)/dry matter for silage

Example: Determine price of corn stover at 20% moisture (80% dry matter) using reference price of $24.50/ton of 65% moisture (35% dry matter) silage.

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

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

- 1 ton of silage= 10 times the price of bu of corn
- 1 ton of silage= 6 times the price of bushel of corn + harvest costs
- 1/3 the price of alfalfa hay (based on energy no adjustments for protein)

Discounts to keep in mind

Feed value comparisons (silage)

Condition of drought corn	**% feed value of normal corn silage**
20 - 40 bu/acre	**90 - 100%**
0 – 20 bu/acre	**80 - 90%**
Short barren stalks	**70 – 80%**

Value of Drought-Stressed Corn Silage, Based on Corn Grain and Soybean Meal Prices.*

Price of soybean meal	Price of corn grain ($/bu)						
	1.80	2.00	2.20	2.40	2.60	2.80	3.00
$/cwt	Value of corn silage ($/ton)						
6.00	16.97	18.54	20.11	21.68	23.24	24.81	26.38
6.50	17.21	18.77	20.34	21.91	23.48	25.05	26.62
7.00	17.44	19.01	20.58	22.15	23.72	25.29	26.86
7.50	17.68	19.25	20.82	22.39	23.96	25.53	27.09
8.00	17.92	19.49	21.06	22.62	24.19	25.76	27.33
8.50	18.16	19.72	21.29	22.86	24.43	26.00	27.57
9.00	18.39	19.96	21.53	23.10	24.67	26.24	27.81
9.50	18.63	20.20	21.77	23.34	24.91	26.47	28.04
10.00	18.87	20.44	22.01	23.57	25.14	26.71	28.28
10.50	19.10	20.68	22.24	23.81	25.38	26.95	28.52
11.00	19.34	20.91	22.48	24.05	25.62	27.19	28.76
11.50	19.58	21.15	22.72	24.29	25.86	27.42	28.99
12.00	19.82	21.38	22.96	24.52	26.09	27.66	29.23
12.50	20.06	21.62	23.19	24.76	26.33	27.90	29.47
13.00	20.29	21.86	23.43	25.00	26.57	28.14	29.71

**** Find the current price for corn grain in the row at the top of the table and the current price for soybean meal in the far left-hand column. You will then find the value of silage at the intersection of these prices. (From National Corn Handbook Utilizing Drought-Damage Corn NCH-58).***

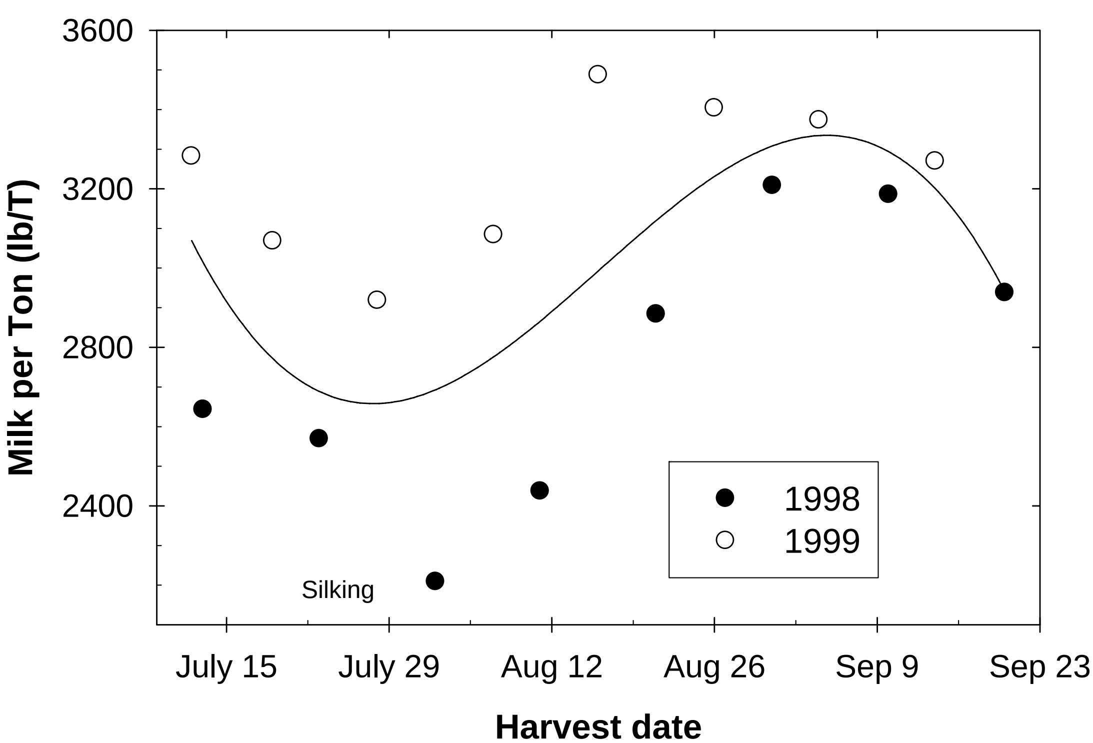

Figure 1. Forage quality (Milk per Ton) changes during the corn life cycle (Darby and Lauer, 2002).

Worksheet for Buying and Selling Corn Silage:
What's A Fair Price?

1.) Base price at 65% moisture .... $__________ / ton

…7 to 9 times the price of shelled corn…$2.00 x 8 = **$16 / ton**
…cost + return…$275 ÷ 15 ton/a + 10% = **$20 / ton**
…1/4 to 1/3 price of baled hay…$100 x 0.25 = **$25 / ton**

2.) Adjusted price for moisture (see table below).. $__________ / ton

	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.. x __________ %

Corn growth stage	**Dairy herd below 80 pound average**	**Dairy herd above 80 pound average**
pre-tassel	**90%**	**80%**
silk	**80%**	**70%**
soft dough	**85%**	**80%**
early dent	**90%**	**87%**
1/2 kernel milk line	**100%**	**100%**
black layer	**90%**	**90%**
Source: Darby and Lauer, 2002…see attached graph		

4.) Final price adjusted for moisture and quality .... = $__________ / ton

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If the buyer is responsible for harvesting, then use the following custom rate guides to establish credit toward the 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**