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Estimating Corn and Sorghum Silage Value

Arriving at fair and equitable prices for silage requires judgment and attention to detail.

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Arriving at fair and equitable prices for silage requires judgment and attention to detail. The amount of grain and moisture contained have major influences on its feed value, and can be used to increase the accuracy of silage pricing.

Grain usually comprises 50 to 55 percent of the dry matter and produces 65 to 70 percent of the protein and energy value in corn varieties selected for grain production. On the other hand, silage varieties are more variable, with some having considerably lower grain yields and percentages of grain dry matter. Because of this, using grain production per acre or estimated percentage of grain in the harvested crop as a base for determining the value of the crop can contribute to a fair and equitable price.

Grain yields appear to be a less reliable base for pricing forage sorghums. A greater variation in grain-to-forage content and perhaps more lignin in some varieties complicates pricing sorghum on the basis of grain yield or content.

In calculating the value of corn silage, grain can be used as the base in two ways: 1) to determine the acre value of the grain without regard to the tonnage of forage by using grain yield per acre and an adjusted corn price, or 2) to determine price per ton of the whole plant by using the estimated dry matter

content from grain to calculate the value. This can be estimated by 1) weighing both silage and grain harvested from sample plots, and 2) requesting average grain-forage ratio data for the specific variety from the seed producer. For either method, you will need the following information:

- a. Corn price at the elevator,
- b. grain harvesting costs,
- c. costs of hauling grain to the elevator,
- d. drying costs, and
- e. fertility value of the stover.

Calculating Standing Corn Crop Value

Feeders who purchase crops for making silage often prefer to harvest the crop themselves. In this case, a price needs to be determined for the standing crop. This can be done in one of two ways.

Table I. Length of row to give .01 acre.	
Row Space (in.)	Row Length (ft.)
30	174
36	145
42	124

A. Using grain yield per acre.

Yield per acre can be estimated from harvesting a sample area of the field. A few rows can be left throughout the field for later grain harvest to determine yield per acre or, if preferred, several plots of .01 acre each can be harvested by hand and the grain weighed to determine average yield (*Table I*).

B. Using assumed percent dry matter from grain.

Most varieties of corn recommended for grain yield about 50 to 55 percent of the total plant dry matter in grain. If you find it inconvenient to use method A to determine value, you can estimate value fairly closely using one of these two percentages. Some varieties designated especially for silage will have lower percentages of grain. For these, the average yield of grain and silage used by the company marketing the seed should give a close estimate of the percentage of grain in the whole plant chop.

Weather conditions may cause a variation in grain and total silage yield. Generally, however, the silage dry matter value is not affected appreciably, except for severe hail or drought which reduces yield of grain to less than 20 bushels per acre.

In both cases, moisture content of the grain must be determined to convert yields to dry matter or to 15.5 percent moisture (No. 2 basis). If small plots are harvested by hand with no yield loss, an allowance for harvest losses (6 percent) should be deducted from the calculated yield. Example calculations are shown in *Tables II* and *III*. Since conditions change from location to location and year to year, you will need to substitute your own costs and figures.

Table II. Calculation of price to charge or pay for corn standing in field using estimated yield.

		Example Figures	Your Figures
Yield bu/A ¹		135	—
A.	Price No. 2 Corn (15.5% moisture)/bu	\$ 2.50	—
B.	Less picker sheller cost/bu	.23	—
C.	Less drying cost/bu	.16	—
D.	Less hauling cost/bu	.10	—
E.	Add fertilizer value/bu ²	.09	—
Net charge/bu		2.10	—
Net value/A		283.50	—
Silage value per ton (18.25 T/A)		\$ 15.53	—
¹ From harvest of test rows (or from harvest of plots minus 6% estimated harvest loss). ² Value in stover removed.			

Table III. Calculations of price to charge or pay for corn standing in the field assuming 50% and 55% of dry matter from grain.

	Estimated Grain Content	
	50%	55%
Net Price No. 2 corn/bu	\$ 2.10	\$ 2.10
Price of dry matter/lb (2.10 ÷ 56 ÷ .845)	.044	.044
Silage price/ton 100% dry matter (Corn price x 2.000 x % grain)	44.38	48.82
30% dry matter ¹	13.31	14.64
35% dry matter ¹	15.53	17.09
40% dry matter ¹	17.75	19.52
¹ Dry price x % dry matter.		

Calculating the Value Delivered to the Silo

Some feeders prefer to purchase and some producers prefer to sell the chopped crop delivered to the feedlot. Where this is the case, costs of chopping and hauling must be added to the price of the standing crop. These costs will vary substantially, depending on length of haul, type of equipment, and the volume of operation. If the crop is to be purchased on the basis of per ton weight at the silo, the price will also vary considerably with the moisture content.

Per acre costs should not change very much as the crop to be ensiled dries during the harvest season.

Thus, the cost of harvesting on a per ton basis increases as the crop to be ensiled drops in moisture content. Some extra power will be required for chopping the drier material, but this will be largely offset by having to haul less weight per acre to the silo location.

If we assume that harvest and delivery charge for corn yielding 135 bu/acre is \$75.00, then cost of this operation is near that shown in *Table IV*.

Table IV. Harvest and delivery costs of chopped forage.¹		
	Estimated Grain Content	
	50%	55%
	T/A	T/A
100% Dry Basis		
Estimated Yield	6.4	5.8
Cost/ton	\$11.74	12.91
35% Dry Matter		
Estimated Yield/A	18.3	16.6
Cost/ton	\$ 4.11	4.52
40% Dry Matter		
Estimated Yield/A	16.0	14.5
Cost/ton	\$ 4.70	5.17
¹ Based on 135 bu/A yield and \$75/A harvest and delivery charge.		

Pricing Silage into the Feed Bunk

Arriving at the price to charge for silage as fed involves two additional costs:

1. The cost of filling and removal from the silo, and
2. storage costs, including allowance for cost of the storage structure and silo losses.

Filling and removal costs will vary with the type of storage, but usually range from \$1.50 to \$2.50/ton. For calculating the price to charge at feeding time, we are using \$1.50/ton of 35 percent dry matter material.

Storage costs must involve charges for both storage structures and storage losses, since one is usually dependent on the other—i.e., the higher the cost of storage structure, the lower the silo losses. The range in silo losses is shown in *Table V*. You will need to estimate your own silo losses and storage costs, and then combine them into per ton costs. For arriving at the price used in our example, a total of 20 percent increase in cost of the silage was used to cover storage cost and loss.

Table V. Silage losses with various storing methods.			
Type of Silo	Top Spoilage	Fermentation	Total
Gas Tight	—	3-6%	3-6%

Concrete Stave			
Covered	—	3-7%	3-7%
Uncovered	3-4%	3-7%	6-11%
Concrete Bunker			
Covered	3%	7-11%	10-14%
Uncovered	6-12%	7-11%	13-23%
Stack			
Uncovered	10-20%	7-11%	17-31%
¹ Both top spoilage and fermentation losses are reduced as depth of the silo increases.			

Price estimates for corn chop or silage (dry matter) are shown in *Table VI*. In *Table VII*, "as fed" estimated prices are shown for 30, 35, and 40 percent dry matter silages. Data in these two tables emphasize the importance of both moisture and percent grain in determining silage prices.

Table VI. Price/ton of silage dry matter at various corn prices.							
Corn Price		50% Dry Matter From Grain			55% Dry Matter From Grain		
At Elevator¹	Net for Pricing Silage²	Field Price³	Delivered Price⁴	Fed Price⁵	Field Price³	Delivered Price⁴	Fed Price⁵
\$/bu	\$/bu	\$/T	\$/T	\$/T	\$/T	\$/T	\$/T
1.50	1.10	23.25	34.99	47.14	25.57	38.47	51.34
1.60	1.20	25.36	37.10	49.67	27.90	40.81	54.12
1.70	1.30	27.47	39.21	52.20	30.22	43.13	56.90
1.80	1.40	29.59	41.33	54.74	32.54	45.45	59.69
1.90	1.50	31.70	43.44	57.28	34.87	47.78	62.48
2.00	1.60	33.81	45.55	59.81	37.19	50.10	65.27
2.10	1.70	35.93	47.67	62.35	39.52	52.43	68.06
2.20	1.80	38.04	49.78	64.88	41.84	54.75	70.85
2.30	1.90	40.15	51.89	67.42	44.17	57.08	73.54
2.40	2.00	42.27	54.00	69.95	46.69	59.40	76.43
2.50	2.10	44.38	56.11	72.48	48.82	61.73	79.22
2.60	2.20	46.49	58.23	75.01	51.14	64.05	82.01
2.70	2.30	48.60	60.34	77.56	53.47	66.38	84.80
2.80	2.40	50.72	62.46	80.10	55.79	68.70	87.59
2.90	2.50	52.83	64.57	82.63	58.12	71.03	90.38
3.00	2.60	54.94	66.68	85.16	60.44	73.35	93.17
3.10	2.70	57.05	68.80	87.70	62.76	75.67	95.95

3.20	2.80	59.17	70.90	90.23	65.09	78.00	98.75
3.30	2.90	61.28	73.02	92.77	67.41	80.32	101.53
3.40	3.00	63.40	75.14	95.32	69.74	82.65	104.33
3.50	3.10	65.51	77.25	97.85	72.06	84.97	107.11

¹Price of No. 2 yellow corn (15.5% moisture)/bu.

²Adjusted as in Table II.

³Calculated as follows: price/bu (adjusted for harvest costs and fertilizer value of stalks) x (2000 lb/ton) 50 or 55% grain - (56 x .845 lb/bu).

⁴Estimated using field price plus harvest costs of \$75/A. for 50 and 55% grain, respectively.

⁵Estimated using delivered price plus \$1.50/ton of 35% dry matter silage packing and loading costs plus 20.0% storage costs (silo losses + structure costs).

Table VII. Price per ton of silage when fed containing different dry matter levels¹

Corn Price	50% Dry Matter From Grain			55% Dry Matter From Grain		
	Dry Matter When Fed			Dry Matter When Fed		
	30%	35%	40%	30%	35%	40%
\$1.50	14.14	16.50	18.86	15.40	17.97	20.54
1.60	14.90	17.38	19.87	16.24	18.94	21.65
1.70	15.66	18.27	20.88	17.07	19.92	22.76
1.80	16.42	19.16	21.90	17.91	20.89	23.88
1.90	17.18	20.05	22.91	18.74	21.87	24.99
2.00	17.94	20.93	23.92	19.58	22.84	25.10
2.10	18.70	21.82	24.94	20.42	23.82	27.22
2.20	19.46	22.71	25.95	21.26	24.80	28.34
2.30	20.22	23.60	26.96	22.09	25.77	29.46
2.40	20.99	24.48	27.98	22.93	26.75	30.58
2.50	21.74	25.37	28.99	23.77	27.73	31.69
2.60	22.50	26.25	30.00	24.60	28.70	32.80
2.70	23.27	27.14	31.02	25.44	29.68	33.92
2.80	24.03	28.04	32.04	26.28	30.66	34.03
2.90	24.79	28.92	33.05	27.11	31.63	36.15
3.00	25.55	29.81	34.06	27.95	32.61	37.27
3.10	26.31	30.70	35.08	28.78	33.58	38.38
3.20	27.07	31.58	36.09	29.62	34.56	39.49
3.30	27.83	32.47	37.11	30.46	35.54	40.61
3.40	28.60	33.36	38.13	31.30	36.52	41.73
3.50	29.36	34.25	39.14	32.13	37.49	42.84

Adjusting Price for Additional Variation in Grain Content

Research at the University of Nebraska West Central Research Center indicates that silage containing 30 to 40 percent of the dry matter as grain is 90 to 95 percent as valuable as silage containing 50 percent grain. Silage containing 20 to 30 percent grain had approximately 80 to 90 percent the feed value of silage containing 50 percent grain. Varieties of corn having a high percentage of stalk and leaf in relation to grain may come in one of these two categories and should be discounted in price accordingly. Occasionally, you may find corn varieties with an exceptionally high grain to stalk and leaf ratio. In these cases, you could adjust price upward compared to that used in the tables.

What Price for Drouth Damaged Silages?

Drouth damaged silages are those when the growth of most plants is stopped at a very immature stage and the yield of grain is usually below 15 to 20 bushels per acre. These silages usually have 80 to 90 percent the feed value of high grain corn silage per unit of dry matter if the moisture content of the crop is 70 percent or less when harvested. If the moisture content is much above 70 percent, silages of this type tend to be unpalatable and of much lower feed value.

When drouth causes reduction of yields to 20 to 40 bushels, the silage produced appears to be equal to much higher yielding corns, but the tonnage per acre is reduced proportionally.

Both drouth damaged and drouth reduced silage crops are likely to have higher harvesting costs than normal crops. This must be taken into consideration in estimating silage costs.

Rules of Thumb for Silage Pricing

Silage at 35 percent dry matter containing 50 and 55 percent of the dry matter from grain has 7.4 and 8.1 bushels of corn/ton, respectively. Multiplying these by the corn price and adding an adjustment factor will give a ball park estimate of prices to charge. A set rule of thumb like 10 times the price of corn cannot be very accurate when the great variation in silage is considered. However, 9 times the price of corn plus \$3 adjustment for silage containing 50 percent dry matter from grain, and 10 times the price of corn plus \$2.50 or \$3.00 for silage containing 55 percent dry matter from corn is reasonably close to the calculated price for 35 percent dry matter silage shown in *Table VII*.

Pricing Sorghum Silage

Until more detailed information is available, we suggest pricing sorghum silages in relation to corn silage of the same moisture content. Forage sorghums with fairly high grain yield in relation to forage (sorgo types) usually have 80 to 90 percent the value of corn silage per unit of dry matter. Sudan and sudan-sorghum crosses, or sorghum varieties with low grain yields, may have only 65 to 80 percent the feed value of corn silage per pound of dry matter.

Estimating Value of Silage in the Silo

Occasionally, you may need to buy or sell silage in the silo without benefit of weighing or determining the moisture content. Weight of the material can be estimated using data in *Table VIII*. Dry matter per cu. ft. increases with depth up to 17 to 18 pounds in silos above 100 feet height.

The estimated tonnage should be adjusted to exclude spoiled or moldy silage. The cost of hauling to the feedlot should also be deducted from the estimated value.

Table VIII. Several factors affect amount of corn silage stored (dry matter).¹		
		lbs/cu. ft.
Dry Matter Content (moisture)		
29.5 (70.5)		12.1
45.8 (54.2)		11.8
Fineness of Chop		
1/4-3/8 inch		12.8
5/8-3/4 inch		11.2
Depth of Settled or Packed Silage		
10'		10.5
15'		11.5
20'		12.2
30'		13.1
¹ Grass and forage sorghum and immature corn silages are 1 to 2 lbs heavier than well-eared corn silage/cu. ft.		

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