Extension
University of Missouri

Pricing Corn Silage

Silage is the harvest of whole corn plants at 60 to 70 percent whole plant moisture. Optimal harvest occurs when kernels are at ½ milk line to black layer.

Corn silage can be made from corn planted for silage or from corn planted for harvest as a grain crop. Frequently corn harvested for silage was planted for harvest as a grain crop. Farmers have several reasons to reconsider their harvest method. They or a neighbor may have a need for silage that was not anticipated at planting time. Drought may have reduced grain yields substantially so the value of the crop is greater as silage than for grain.

Silage and other forage crops remove more phosphorus and potassium from the soil than grain crops. Removal of phosphorus and potassium can be an additional expense if the soils are low in those nutrients. But silage can also be used in intensive manure spreading areas to purposefully remove crop nutrients from the soil. In areas that have high concentrations of phosphorus and potassium and where runoff potential exists, planting silage can quickly remove excess nutrients.

Farmers have priced silage using the rule of thumb that silage value per ton is 8 to 10 times the price of a bushel of corn. A factor of 8 to 9 times is used to price silage in the field; the factor of 9 to 10 times is used for pricing it in storage. A higher factor is used for lower priced corn and a lower factor for higher priced corn. This rule of thumb needs to be reconsidered given current corn and input prices. Currently, silage priced in the field may be closer to 7 times the price of a bushel of corn.

In addition, the rule of thumb may err in valuing silage because it does not take into account the dry matter percent of the silage. Dry matter percentage has a large effect on the value of silage to the livestock producer considering the purchase.

This guide is intended to help farmers estimate the breakeven price needed to justify harvesting a corn crop as silage rather than for grain. The estimated breakeven price of the standing crop becomes the corn farmer's lower boundary price for negotiations with a livestock producer wishing to purchase and harvest a field as silage. The value of silage delivered to storage accounts for harvest and transportation costs incurred by either the crop or livestock farmer.

The livestock farmer's interest is in knowing the cost of silage (on a dry matter basis) delivered to the feed bunk, after accounting for storage losses and shrink. Livestock farmers compare silage's delivered cost per ton against costs of other feedstuffs.

Figure 1. Agricultural producers should consider the current price of corn and inputs for pricing corn silage.

Important factors affecting the breakeven price of silage are the price of corn, the expected grain yield of the growing crop and who incurs the costs of harvest and transportation of the silage. A downloadable spreadsheet is available to customize a silage value estimation (https://extension.missouri.edu/publications/g4591).

This guide focuses on the wet basis price of silage. Determining the breakeven price of silage on a wet basis — as it stands in the field — is most normal for grain farmers and for estimating handling and storage costs.

Livestock producers price feed and balance rations on a dry matter basis. This guide shows how to convert the wet basis value to a dry matter value.

Revised by
Ray Massey, Professor, Agricultural Business and Policy Extension
Joe Horner, State Specialist, Agricultural Business and Policy Extension

Pricing silage in the field

Crop farmer perspective: *The value calculated is the breakeven price for harvesting as grain or as silage. Negotiate a price for a standing field of grain greater than or equal to this price.*

Livestock farmer perspective: *Recognize that this is the lowest price a crop producer is willing to sell a standing field of grain. Consider the costs of the harvest, transport, storage and use to determine whether this price makes sense for a feedstuff.*

The basic principle of pricing a crop harvested as silage rather than grain is to estimate the value of the grain in the field, and make additions and subtractions to the value depending on the impact of changing the harvest method. Negotiations between crop and livestock farmers can proceed with this breakeven price in mind.

Silage harvest requires specialized equipment. Because silage choppers and wagons are not found on many grain farms, livestock producers who purchase standing corn crops for making silage may harvest the crop themselves with their own equipment. In this situation, because the crop farmer does not incur a harvest cost, the breakeven price of the standing crop is reduced by the cost of grain harvest.

Silage also removes more biomass – removing more phosphorus and potassium from the soil. The value of the standing crop is increased by the value of nutrients removed by the whole plant versus just the grain.

Begin calculating the value of the standing grain by first estimating bushels of grain 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. Alternatively, harvesting by hand the grain from 174 feet of corn planted in 30-inch rows gives an estimate of the grain yield of 1/100th of an acre. Multiple the grain yield from the sample by 100 to estimate the yield per acre.

If small plots are harvested by hand with no yield loss, a one to four percent allowance for harvest loss should be deducted from the calculated yield. Choose an estimate that fits your experience in harvest loss.

Table 1 presents a process for valuing a growing crop that may be harvested as silage. A breakeven price between harvesting corn for grain or silage is needed. Start by estimating the harvest time market price likely to be received if the corn is harvested as grain. Decrease this price by subtracting the costs such as combining,

Table 1. Calculation of silage price for corn standing in field using estimated yield.

Description	Example	Units	Your farm
A. Estimated yield[1]	150	Bushels per acre	
B. Harvest time price of #2 yellow corn	6.25	Dollars per bushel of corn	
C. Less: Combining/harvest cost[2]	0.25	Dollars per bushel of corn	
D. Less: Drying	0.20	Dollars per bushel of corn	
E. Less: Hauling	0.25	Dollars per bushel of corn	
F. Add: Fertilizer removal value[3]	0.46	Dollars per bushel of corn	
G. Breakeven corn grain price (B – C – D – E + F)	6.01	Dollars per bushel of corn	
H. Value of standing crop (A x G)	901.50	Dollars per acre	
I. Estimated silage yield, wet basis	18	Tons per acre	
J. Silage price standing in field, wet basis (H ÷ I)	50.08	Dollars per ton	
K. Dry matter in silage	35	Percent	
L. Silage price standing in field, dry matter basis [(J ÷ K) x 100]	143.09	Dollars per ton	

1. From harvest of test rows (or from harvest of plots minus 1 to 4 percent estimated harvest loss).
2. Divide custom charge per acre by expected yield to obtain a per bushel cost.
3. Value of phosphorus and potassium removed in forage portion of plant.

trucking and drying that will not be incurred by the crop farmer if the crop is harvested as silage by the livestock farmer. Convert any per acre costs, such as grain combining, to a per bushel basis. Increase the price by the cost of additional nutrients that will be extracted because harvesting as silage removes more biomass.

Multiply this breakeven corn grain price by the estimated yield to get a value per acre of the standing crop.

Two conversions of the value per acre may be important to the livestock producer. First, the value per ton of silage can be obtained by dividing the value per acre by the expected number of tons of silage to be harvested. Information from Table 2 can be used to estimate the tons of silage expected for various grain yields.

Table 2. Relationship between grain and silage yield.

Grain yield (bushels/acre)	Silage yield (wet tons/acre)	Silage yield (dry tons/acre)
40	9	3
101	14	5
148	20	7
184	26	9
207	31	11
220	40	14

Source: Lauer and Undersander (2004).

The livestock producer may also benefit by knowing the value of the silage on a dry matter basis. To obtain a dry matter value, divide the wet basis price value by the percent dry matter in the silage. Silage moisture content can vary considerably and the variability can affect the dry matter value of silage.

Pricing silage delivered to storage

Crop farmer perspective: *If the crop farmer harvests and delivers the silage to the livestock farmer storage structure, the value calculated is the breakeven price for harvesting as grain or delivered silage. Negotiate a price for harvested and delivered silage greater than or equal to this price.*

Livestock farmer perspective: *If the livestock farmer harvests and transports the silage from a standing corn crop, this step is an intermediate step to determine what can be paid for the silage. Variable costs of storage, shrink and transport to the feed bunk are still needed to determine whether this price makes sense for a feedstuff.*

When estimating the breakeven price of chopped silage delivered to silage storage, costs of chopping and hauling must be added to the value of the standing crop. Relevant units change from bushels of grain to tons of silage per acre.

Custom rates for harvesting and delivering silage are typically charged on a wet basis. It is simplest to compute a wet basis price of silage delivered to the storage structure.

Table 3 presents steps needed to take the results of Table 1 and estimate the value of silage delivered to storage. Custom silage harvest and transportation are usually priced on wet basis dollars per ton. The costs of harvest and delivery vary substantially depending on hauling distance, type of equipment and volume of silage.

Table 3. Calculation of silage price delivered to storage.

Description	Example	Units	Your farm
A. Price of silage in the field, wet basis (Table 1, row J)	50.08	Dollars per ton	
B. Add: Silage harvest charge, wet basis	8.00	Dollars per ton	
C. Add: Silage delivery and fill charge, wet basis	4.50	Dollars per ton	
D. Silage price delivered to storage, wet basis (A + B + C)	62.58	Dollars per ton	
E. Dry matter in silage	35	Percent	
F. Silage price delivered to storage, dry matter basis [(D ÷ E) x 100]	178.80	Dollars per ton	

Pricing silage delivered to feed bunk

Crop farmer perspective: *This information is not normally used by a crop farmer whose typical interest stops at delivering a product to a user.*

Livestock farmer perspective: *Estimated price of silage, when converted to a dry matter basis, provides the point of comparison to other feedstuffs available. The livestock producer needs to estimate the dry matter price of silage to make wise feeding decisions.*

Livestock farmers are interested in cost of silage as a feed delivered to their animals. To estimate the cost of silage delivered to the feed bunk, several additional costs need to be considered. The process is summarized in Table 4. All added costs are made on a wet basis because that is a more common way to estimate silage cost.

The variable costs associated with storage (e.g., silage bags, bale wrap or silage cover) are added to the price of silage initially delivered to storage. Cost of permanent storage is not added as it is already a sunk cost that does not change with the decision to buy additional silage.

The costs of dry matter loss and shrink during storage need to be considered. Table 5 contains research estimates of dry matter loss for various storage types. While permanent storage structure costs are not considered in Table 4 computations, it is obvious that different storage structures have varied storage losses and are an important decision for livestock producers wishing to feed silage to their animals.

Handling cost of removing silage from storage and delivering to the feed bunk needs to be added. Handling costs will vary with type of storage structure. Estimate only the additional costs of handling the silage relative to using other feedstuffs.

Livestock producers compare feedstuffs on a dry matter basis. Once a wet basis cost of procuring and using silage is estimated, convert it into a dry matter cost by dividing by the percent dry matter in the silage.

Table 4 begins with the estimated silage value from Table 3 and adjusts for storage losses and handling costs. Dry matter silage value is of most value at this step because the livestock producer needs to compare it to the cost of other feed stuffs available.

Drought-damaged corn

Drought-damaged silage results when the growth of most plants is stopped at an immature stage and grain yield is drastically reduced. Drought-damaged silage usually has 80 to 90 percent of 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 moisture content is much above 70 percent, silage tends to be unpalatable and have lower feed value.

When drought causes yield reduction of 20 to 40 percent below normal, the silage produced appears to be equal to much higher yielding corn, but tons per acre are reduced proportionally.

Drought stressed corn silage may contain aflatoxin or other mycotoxins that can become worse with improper moisture at ensilaging or lack of proper packing. Dairy producers need to avoid aflatoxin contaminated silage as aflatoxin detection in milk can lead to milk rejected by processors. Segregating suspect silage supplies for further quality control sampling before feeding is a good practice in drought years.

Table 4. Calculation of silage value delivered to the feed bunk.

Description	Example	Units	Your farm
A. Price of silage delivered to storage, wet basis (Table 3, row D)	62.58	Dollars per ton	
B. Add: Annual supplies (bags, covers, etc.)	1.00	Dollars per ton	
C. Estimated losses in storage, wet basis (see Table 5)	16	Percent	
D. Feedable percentage (100 - C)	84	Percent	
E. Add: Cost of storage losses, wet basis {[A ÷ (D ÷ 100)] - A}	11.92	Dollars per ton	
F. Add: Cost of removing from storage and delivering to feed bunk, wet basis	1.50	Dollars per ton	
G. Silage price delivered to feed bunk, wet basis (A + B+ E + F)	77.00	Dollars per ton	
H. Dry matter in silage	35	Percent	
I. Silage price delivered to the feed bunk, dry matter basis [(G ÷ H) x 100]	220.00	Dollars per ton	

Table 5. Estimate of silage losses during filling, storage and feed out.

Silo type	Moisture (percent)	Dry matter loss percentage					
		Filling	Seepage	Gaseous	Top surface	Feed out	Total
Conventional tower	50	2 to 4	0	5	3	1 to 5	11 to 17
	60	1 to 3	0	6	3	1 to 5	11 to 17
	65	1 to 3	0	8	3	1 to 5	13 to 19
	70	1 to 2	1	8	4	1 to 5	15 to 20
	80	1 to 2	7	9	3	1 to 5	21 to 26
Gas-tight tower	40	2 to 4	0	4	0	0 to 3	6 to 13
	50	2 to 3	0	4	0	0 to 3	6 to 12
	60	1 to 2	0	5	0	0 to 3	6 to 11
	70	0 to 1	1	7	0	0 to 3	8 to 12
Silage bags	60 to 70	1 to 2	0	5	2	1 to 5	9 to 14
	80	1 to 2	2	6	2	1 to 5	12 to 17
Stack, covered	60	4 to 7	0	6	6	5 to 15	21 to 34
	70	3 to 6	0	7	4	3 to 10	17 to 27
	80	3 to 6	5	8	2	3 to 10	21 to 31
Stack, no cover	60	4 to 7	0	12	24	5 to 15	45 to 58
	70	3 to 6	1	11	19	3 to 10	37 to 47
	80	3 to 6	7	10	11	3 to 10	34 to 44
Trench or bunker, covered	60	3 to 6	0	6	4	5 to 15	18 to 31
	70	2 to 5	1	7	3	3 to 10	16 to 23
	80	2 to 5	4	9	2	3 to 10	20 to 30
Trench or bunker, no cover	60	3 to 6	0	10	12	5 to 15	30 to 43
	70	2 to 5	1	9	9	3 to 10	24 to 34
	80	2 to 5	6	10	6	3 to 10	27 to 37
Wrapped silage bales	50 to 60	2 to 3	0	6	6	1 to 5	15 to 20
	60 to 70	1 to 2	0	8	5	1 to 5	15 to 20

Source: Holmes and Muck (2000).

Silage value to the crop producer versus livestock feeder

This guide has looked at breakeven silage prices at three stages. The breakeven price of the standing crop is important information for the crop farmer choosing between harvesting as a grain crop or allowing a livestock producer to harvest as silage. The breakeven price of silage delivered to storage is important information for whoever incurs the costs of silage harvest and transportation to storage. Each of these estimates are probably best understood on a wet basis value.

The livestock farmer will be interested in the cost of silage delivered to livestock, which can be compared to other feedstuffs. Cost of silage delivered to livestock estimated in this guide does not value the silage on its nutrient content. It is simply an estimate of its cost relative to harvesting the crop as grain – an estimate of an opportunity before the livestock farmer. The feed value of silage would be established by comparing it to alternative feedstuffs and rations that provide similar nutrients.

This guide estimates the breakeven price of silage for a mid-season opportunity to change harvest to silage rather than for grain. Because this is a short-term decision, only additional and reduced costs associated with harvest as silage are important.

A crop farmer wanting to build a longer-term business as a corn silage supplier to a livestock farmer faces a different set of concerns. Selection of silage corn varieties, optimal harvest maturity and ownership of silage harvest equipment can add feed value to silage. Livestock farmers may be interested in contracting with crop farmers who will regularly supply them with silage.

For the livestock farmer, the fact that the silage decision under consideration in this guide is short-term means that the cost of owning silage storage is not a factor in estimating silage cost. Only the incremental costs of acquiring, storing and feeding silage are important at this time.

See MU Extension publication G664, Corn Silage Planning Budget (https://extension.missouri.edu/publications/g664) to estimate costs for growing corn silage.

Sources

Holmes, B.J. and R.E. Muck. 2000. Preventing Silage Storage Losses. University of Wisconsin.

Lauer, J. and D. Undersander. 2004. Pricing corn silage for sale. In Proceedings and Joint Meeting of the Professional Nutrient Applicators of Wisconsin, Wisconsin Custom Operators and Wisconsin Forage Council. Eau Claire, WI. p. 87–91.

Extension
University of Missouri

Issued in furtherance of the Cooperative Extension Work Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Director, Cooperative Extension, University of Missouri, Columbia, MO 65211 • MU Extension provides equal opportunity to all participants in extension programs and activities and for all employees and applicants for employment on the basis of their demonstrated ability and competence without discrimination on the basis of race, color, national origin, ancestry, religion, sex, sexual orientation, gender identity, gender expression, age, genetic information, disability or protected veteran status. • 573-882-7216 • extension.missouri.edu