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Estimating Silage Value to the Crop Producer

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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. Early frost may necessitate harvesting the crop as silage. Drought may have reduced grain yields substantially so that the value of the crop is greater as silage than for grain.

For many years 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 8–9 is used to price silage in the field; the factor of 9–10 is used for pricing it in storage. A higher factor is used for lower priced corn; a lower factor for higher priced corn. While the rule of thumb has merit it may err in valuing silage because it does not take into account the percent dry matter of the silage. Percent dry matter has a large effect on the cost of silage.

The value of silage is useful information for anyone considering the harvest of corn for silage. A farmer planting and harvesting silage for his own use needs to know the profitability of silage relative to alternative crops that could be grown. A farmer wanting to sell it to a neighbor needs to know its value relative to the price that could be obtained by allowing the crop to mature and harvest as grain. A farmer may want to contract with nearby dairies to grow silage and needs to know the profit potential.

Silage, and other forage crops, can also be used in intensive cropping systems to purposefully remove crop nutrients from the soil. In areas that have high concentrations of phosphorus and potassium and where runoff potential exists, it may be prudent to plant silage in order to more quickly remove some of the nutrients. Use of forage crops to harvest nutrients may become increasingly important as environmental regulation of animal feeding operations requires that manure-applied nutrients be limited to the removal capacity of the crops grown on the land receiving the manure.

> Silage is the harvest of whole corn plants at 60 to 70 percent whole plant moisture with kernels at ½ milk line to black layer. At this stage, maximum dry matter yield silage quality occurs.

Valuing silage in the field

Silage harvest requires specialized equipment. Because silage choppers and wagons are not found on many grain farms, livestock producers who purchase corn crops for making silage may harvest the crop themselves with equipment that they already own and operate. Then the value of the standing crop in the field needs to be determined.

Grain from corn varieties selected for grain production, but harvested as silage, typically supplies 50 to 55 percent of the dry matter of the silage and 65 to 70 percent of the protein and energy value of the silage. These percentages allow using grain production per acre or estimated percentage of grain in the harvested crop as a base for determining the value of the crop, contributing to a fair and equitable price.

Value can be determined either by using grain yield per acre or by assuming dry matter from grain.

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 (see Table 1).

If small plots are harvested by hand with no yield loss, a 5–6 percent allowance for harvest losses should be deducted from the calculated yield. Typical threshing loss should be less than 5 percent. Losses increase beyond 5 percent if lodging has occurred.

Table 1. Length of row to give .01 acre.

Row space (in.)	Row length (ft)
30	174
36	145

Table 2. Calculation of price for corn standing in field using estimated yield.

	Example	Your farm
Yield bu/A[1]	75	
Price no. 2 corn (15.5% moisture), $/bushel	$2.50	
Less combining/harvest cost, ($/bushel) **Note:** Convert custom charge per acre to charge per bushel by dividing the per acre charge by the number of bushels anticipated.	$.29	
Less drying, $/bu	$.10	
Less hauling, $/bu	$.10	
Add fertilizer value, $/bu[2]	$.09	
Net charge/bu (2.50 - .29 - .10 - .10 + .09)	$2.10	
Gross value/acre (75 bu x $2.10)	$157.50	
Estimated silage yield, tons/acre	10	
Silage value $/ton (wet basis)	$15.75	

[1]From harvest of test rows (or from harvest of plots minus 6% estimated harvest loss).

[2]Value in stover removed.

Gross value of the crop in the field is estimated by multiplying the estimated yield by the market value of the grain (see Table 2). The price to charge for harvesting as silage is the gross value of the grain adjusted for various economic impacts of harvesting the crop as silage. Expenses that the farmer does not incur (expenses that would be subtracted from the charge for silage) include grain harvest (combining), drying and hauling costs. An expense that the farmer might incur because of silage harvest is increased fertilizer requirements due to the removal of additional nutrients from the land in the form of stover. These expenses would need to be added to the gross value of the grain in the field.

The silage can be priced by the acre by stopping at the computation of gross value per acre. The livestock producer purchasing the silage will probably want an estimate of the silage value per ton by dividing the gross value per acre by the estimated yield in tons.

Using assumed percent dry matter from grain

Rather than estimating silage yield (tons / acre), you can estimate value by taking advantage of the fact that most varieties of corn recommended for grain yield about 50 to 55 percent of the total plant dry matter in grain. Weather conditions may cause a variation in grain and total silage yield. Generally, however, the silage dry matter value is not affected appreciably, except when severe hail or drought reduces yield of grain to less than 20 bushels per acre.

Table 3. Calculations of price for corn standing in the field assuming 55% of dry matter from grain.

	Example	Your farm
Net price no. 2 corn, $/bu (from Table 2)	$2.10	
Price of dry matter, $/ton (2.10 x 42.265)[1]	$88.76	
Estimated grain dry matter content (%)	55%	
Silage price, $/ton: dry matter basis (88.76 x .55)	$48.82	
Percent dry matter in silage	35%	
Silage price, $/ton: wet basis (48.82 x .35)	$17.09	

[1]42.265 = 56 lb/bushel x 84.5% dry matter in grain x 2,000 lb/ton

Convert the net price per bushel computed in Table 2 to a dry matter price per ton by multiplying by 42.265. The silage price per ton of dry matter is obtained by multiplying the price of dry matter in grain by the estimated grain content (typically 50 to 55%). This price can be converted to a wet basis by multiplying the dry matter basis times the percent dry matter in the silage (see Table 3).

Corn varieties planted for silage are more variable, and some of these 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.

Moisture content of the grain and harvested silage needs to be estimated to accurately price the silage. A 5 percent increase in dry matter can raise the value of the grain in the silage by 11 to 14 percent. Normal silage usually ranges from 30 to 40 percent dry matter at harvest.

Valuing silage delivered to the silo

When estimating the value of the chopped silage delivered to the feedlot, costs of chopping and hauling must be added to the price of the standing crop (see Table 4). These costs vary substantially, depending on length of haul, type of equipment, and volume of silage harvested and delivered. If a custom charge is used, the charge per acre is divided by the number of tons of silage to put it on a per-ton charge.

Care must be taken to ensure that the basis of pricing the silage is consistent. If the silage is priced on a dry matter basis, the dry matter tonnage is used to compute per acre harvest cost. If the price is on a wet basis, the wet

Table 4: Silage value delivered to the silo.

	Dry matter basis	Wet basis
Value of silage in the field, $/ton (from Table 3)	$48.82	$17.09
Harvest and delivery charge $/acre	$75.00	$75.00
Tons of silage	3.5	10
Cost of delivery,[1] $/ton	$21.43	$7.50
Value of silage delivered to silo	$70.25	$24.59

[1]$75/acre ÷ tons/acre

basis tonnage is used to compute per acre harvest cost.

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.

To compute the costs of chopped forage delivered to the silo, add the per-*ton* cost of harvesting to the value in the field.

Valuing silage delivered to the bunk

If silage is priced as delivered to the feed bunk, the cost of filling and removal from the silo and the cost of storage must be included. Storage costs include allowance for cost of the storage structure and for silo losses.

Filling and removal costs vary with the type of storage but range from $1.50 / ton to $2.50 / ton. Table 5 assumes $1.50 / ton filling and removal cost of 35 percent dry matter material.

Storage costs must involve charges for both storage structures and storage losses. The two usually are dependent on each other in that the higher the cost of the storage structure, the lower the silo losses will be. The range in silo losses is shown in Table 6. You will need to estimate your own silo losses and storage costs, and then combine them into costs per ton. The example in Table 5 assumes a total of 20 percent increase in cost of the silage to cover storage cost *and* loss.

Special considerations

Drought-damaged corn

Drought-damaged silage results when the growth of most plants is stopped at an immature stage and yield of grain is usually below 15 to 20 bushels per acre. 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 the moisture content is much above 70 percent, silage of this type tends to be unpalatable and of much lower feed value.

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

Table 5. As fed cost of silage.

	Dry matter basis	Wet basis
Value of silage delivered from the field, $/ton (from Table 4)	$70.25	$24.59
Cost of filling and removing from silo, $/ton	$1.50	$1.50
Percent dry matter	35%	NA
Value of silage considering filling and removing	$74.53 (70.25 + 1.50/.35)	$26.09 (24.59 + 1.50)
Storage costs and loss in silo, (%)	20%	20%
Value of silage delivered to bunk	$89.44 (74.53 x 1.2)	$31.31 (26.09 x 1.2)

Table 6. 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%

Early frost damage corn

If a crop damaged by early frost can be allowed to field dry to an acceptable moisture range (60–70%) without excessive leaf loss or lodging, the feeding and storage quality of the damaged crop is similar to normal silage. The value of such a crop is similar to that of normal silage.

If the silage is harvested above 70 percent or below 60 percent moisture levels, a discount should be taken to the normal silage price.

Storage equipment and when silage is harvested

For bunker and pit silos, harvesting silage from 65 to 70 percent moisture is ideal for packing and storage quality. For conventional upright silos and sealed silos, harvesting the silage in the 60 to 65 percent range is better for storage.

Silage value to the crop producer versus the livestock feeder

This paper has looked at the value of the silage to the crop producer. It does not address the value of the silage as a feedstuff. A silage market requires that the cost to the crop producer be less than the value to the livestock feeder so that incentive exists for market-oriented trade.

Evaluating silage costs to determine the possibility of trade implies that a short-term decision is being

considered. The crop producer is attempting to decide in the middle of the growing season what is the best business opportunity.

If a crop producer desires to build a longer term business as corn silage supplier to a livestock producer, selection of specific varieties, optimal harvest maturity and harvest handling can add feed value to the silage, for which the livestock producer might be willing to pay. Negotiating additional compensation for the silage producer willing to accommodate the livestock producer's needs can result in significant profitability increases for both parties.

The feed value of silage would be established by comparing it to alternative feedstuffs and rations that provide similar nutrients.

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