

Corn Silage Price Calculation

I. SUMMARY

Challenge in pricing corn silage exists as there are no widely quoted market prices for corn silage. This document is meant to help quote the corn silage (recommend using only for short-term sales, not for long-term contracts). *Corn silage value* is usually regarded as a function of corn grain yields and price of corn per grain bushel. Specifically,

$$(1) \text{ Corn silage value} = [\text{Adjusted quantity of silage}] \times [\text{Price of silage}]$$

■ Quantity of silage

From the potential *corn yield*, you can approximate the expected amount of silage.

■ Price of silage

Corn silage in the field can be valued at 8-10 times the price of corn per grain bushel.

■ Moisture adjustment

In addition, the moisture level of silage should be considered to estimate the precise silage value (i.e., *adjusted quantity of silage*).

II. Price Calculation Steps

In this section, the general procedure to price corn silage is provided.

Step 1) Price Estimate:

What is the *unit price* of my silage?

You can calculate the value of standing silage using the following formula:

$$(2) \text{ Standing silage price (\$/ton)} = [\text{Multiplying factor}] \times [\text{Expected corn price (\$/bu)}]$$

- The multiplying factors are dependent on the potential yield.

- If the potential yield is low (< 100 bu/acre), using 8 as a multiplying factor is recommended.

- If the potential yield is high (\geq 200 bu/acre), using 10 is recommended.

Step 2) Quantity Estimate:

How much silage can I expect based on the potential yield?

It is recommended to refer to **Table 1** when approximating the potential corn yield (bu/acre) to corn silage (tons/acre). For example, with 65% moisture level, 150 bu/acre approximately returns 20.2 tons/acre.

Table 1. Conversion table: from potential corn yield (bu/acre) to silage (tons/acre)

Corn yield (bu/acre)	Yield of silage (tons/acre)		
	Dry matter (Moisture level)		
	30 (70%)	35 (65%)	40 (60%)
25	7.7	7.3	6.9
50	9.9	9.4	8.9
75	12.3	11.7	11.1
100	14.9	14.2	13.5
125	17.8	17.0	16.2
150	21.2	20.2	19.2
175	25.3	24.1	22.9
200	30.8	29.3	27.8

Note: Generated based on Lauer and Undersander (2004)



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Step 3) Adjust Quantity:**Adjustments for moisture levels**

Suppose that your silage moisture level is $x\%$, then $(100-x)\%$ would be the dry matter level of your silage. So, the moisture level should be taken into account to precisely measure the value of your silage.

Step 4) Value of Silage:**Calculate the price in dollars per acre**

Multiplying the “Adjusted Quantity” in Step 3 to the unit price of silage in Step 1 would give you the per-acre silage value.

III. Application:**Corn Silage Price Estimates in Athens County, Ohio****■ Assumptions**

- In this section, we will consider 3 cases of yield potential: (a) low yield (75 bu/acre), (b) mid yield (150 bu/acre), and (c) high yield (200 bu/acre).
- Moisture level is assumed to be 70%.
- Let us assume the expected corn price is \$6.48/bu, which is the cash corn price level of Ross County, OH – one of the closest counties whose county-level cash corn price is available (see **Figure 1** below).

Table 2 shows how the aforementioned calculation process can be applied to the case of Athens County.

Table 2. Valuing standing corn silage, Athens, OH

	(a) Low Yield	(b) Mid Yield	(c) High Yield
Step 0. Parameter numbers (given by the above assumptions)			
Potential corn yield	75 bushels /acre	150 bushels /acre	200 bushels /acre
Expected corn price	\$6.48 /bu	\$6.48 /bu	\$6.48 /bu
Step 1. [Price] of silage (use equation (2))			
Unit price of standing silage (\$/ton)	8 x \$6.48 = \$51.84	9 x \$6.48 = \$58.32	10 x \$6.48 = \$64.80
Step 2. [Quantity] of silage (use Table (1))			
Yield of corn silage	11.7 tons /acre	20.2 tons /acre	29.3 tons /acre
Step 3. [Adjustment] of moisture level: 70% (given) → 65% (standard)			
Quantity needs to be adjusted in order to meet the standard moisture level (say, 65%). This means the quantity estimate in Step 2 needs to be multiplied by $(30/35)$ according to the relative weight of dry matter.			
Adjusted yield of silage	$11.7 \times (30/35)$ = 10.0 tons /acre	$20.2 \times (30/35)$ = 17.3 tons /acre	$29.3 \times (30/35)$ = 25.1 tons /acre
Step 4. [Value of Silage]: Multiply the silage price to the adjusted quantity of silage			
Value of silage per acre	51.84 (\$/ton) × 10 (tons/acre) = 519.90 (\$/acre)	58.32 (\$/ton) × 17.3 (tons/acre) = 1,009.80 (\$/acre)	64.80 (\$/ton) × 25.1 (tons/acre) = 1,627.40 (\$/acre)



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IV. Notes on Bargaining Range

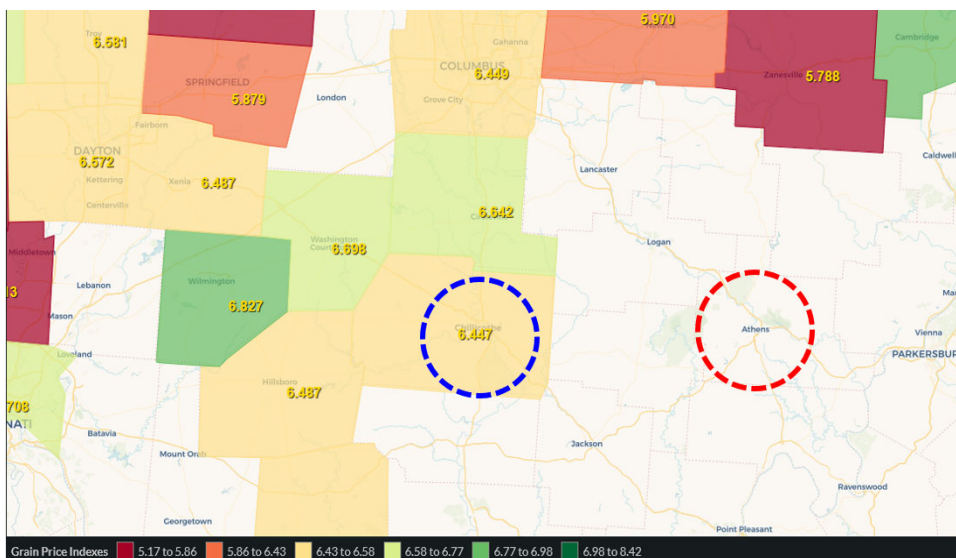
- Although I did not cover further analyses about bargaining in this version, I want to briefly sketch the idea of how to estimate the bargaining range.
 - **Buyer side:** Feed value to the buyer can be measured by explicitly considering the value of corn stover. This will be the *maximum bid price* of buyer.
 - **Seller side:** Seller can appeal to the opportunity costs, especially from the removal of nutrients when selling the corn silage. The net cost will be the *minimum bid* the seller can afford to accept.
 - Bargaining range can be obtained by comparing the feed value to the buyer to the seller's net cost reflecting the opportunity cost. Of course, the value agreed upon may also be impacted by elements, including transportation distance, crop health, silage quality, and residue coverage loss.

- LaPorte (2019) provides detailed discussion about several practical issues, as well as the bargaining range.

V. Reference

- Edwards, W. and Hart, C., 2018. Pricing forage in the field. Iowa State University Extension. <https://www.extension.iastate.edu/agdm/crops/pdf/a1-65.pdf>
- LaPorte, J., 2019, Pricing standing corn silage. Michigan State University Extension. <https://www.canr.msu.edu/news/pricing-standing-corn-silage>
- Lauer, J. and Undersander, D., 2004, January. 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 (pp. 87-91).

Figure 1. County-level corn cash prices near Athens County



Note: Delivery is set as September 2022. Athens County, and Ross County, are highlighted by a red circle and a blue circle, respectively. (Source: Barchart Commodity View, accessed on 9/13/2022)

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