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Finding Value in Producer-Dairyman Corn Silage Contracts

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Grain producers and dairyman annually debate the question, "What is corn silage worth this year?" Most grower-dairyman silage contracts are based upon prices determined at some point during the growing season using CBOT and CME grain markets. A fair price must be negotiated from the seller's (minimum to accept) and buyer's (maximum to pay) perspectives. Buyers and sellers need to consider local market conditions that will influence the final negotiated price. If the seller minimum is greater than the buyer maximum, then it would be more economical to harvest the crop as grain.

The seller (grain producer) has opportunities with marketing grain and opportunities with marketing stover (i.e. bedding, fertilizer value, decreasing soil erosion, etc.). The seller starts with the value of the standing corn minus grain harvest costs. The price is adjusted for the value of phosphorous and potassium harvested in the stover.

The buyer (dairyman) starts with the price of standing corn in terms of quality and harvesting costs. The buyer usually assumes harvesting costs when corn is standing, and adjusts the value of corn silage based on what it would cost to purchase corn and straw to replace nutritional value of corn silage. Forage quality adjustments can be derived through opportunities with marketing milk. Some corn, like brown midrib hybrids (bmr), have more stover value than non-bmr hybrids.

Corn silage is often harvested after kernels are fully dented, with most acres harvested at about 50% kernel milk before grain is physiologically mature (black layer). Corn grain yield increases 0 to 43% between full dent and black layer, with about 9 to 13% of the final grain yield determined after 50% kernel milk (Afuakwa and Crookston, 1984). A major factor in negotiating a silage price is predicting what the final grain yield would be in any given cornfield.

Since the 1990s, an objective the University of Wisconsin Corn Agronomy program has been to determine the relationship between silage starch content and final grain yield. Silage starch content is a common silage quality measurement routinely evaluated by forage testing laboratories. Our approach uses paired plots for collecting data to predict final grain yield using silage yield and quality measures. Half of the plot is harvested for silage yield and quality, while the other half is left standing for subsequent grain harvest using a combine. Experiments have been conducted at numerous locations over many years and experimental factors including hybrid, plant density, date of planting and row spacing along with interactions.

Grain equivalents (grain yield at 15.5 % moisture / forage yield at 65% moisture) are often used in corn silage contracting. However, grain equivalents can be quite variable and likely changing over time and environment/management thereby not reflecting the true value of a cornfield. In 1972, grain equivalents were estimated to be 5.0 to 7.0 grain bushels per silage ton for typical grain yield levels at the time (Jorgensen and Crowley, 1972). In modern hybrids used in this study, average grain equivalents were 5.1 to 8.6 bu/T depending upon grain yield (Table 1). However, depending upon hybrid and environment, grain equivalents could be as low as 3.8 bu/T and as high as 10.5 bu/T.

In order to accurately use grain equivalents in contract negotiations measurements need to be taken "after the fact" (after silage harvest). Few growers are willing to leave "check strips" in the field. Weather, wildlife and hybrid standability and ear droppage can influence post-silage harvest grain yield measurements. A better approach might be to use a silage yield or quality estimate to predict final grain harvest.

Forage yield was a good predictor of final grain yield (R^2= 0.70). The forage quality parameters NDF and NDFD were not good predictors of grain yield (R^2 = 0.04 to 0.10, respectively). Starch content improved the prediction (R^2= 0.29). Assuming that starch was 70% of the grain, we used starch content and forage yield to back calculate grain equivalents (Starch method in Table 1). This method consistently underestimated true grain yield equivalents. The difference (or bias) between these two methods was affected by the grain yield level. However, by using a forage yield measurement, a more accurate contract could be arrived at between grain producers and dairymen.

In conclusion, corn silage buyer and seller perspectives are different with each needing to develop a price from the seller's (minimum to accept) and buyer's (maximum to pay) perspectives. Cost of corn silage production has increased over time, so it is imperative to get a handle on these costs. Grain equivalents in modern hybrids are greater than older hybrids. The relationship between forage and grain yield is quite variable. Starch content of corn forage can be used to predict grain yield, however, grain equivalents using starch content underestimate final grain yield and must be adjusted using a bias.

Table 1. Corn grain equivalents (at 15.5% moisture) per Ton of Silage (at 65% moisture).

Grain Yield	Forage Yield	Starch content	Bushels of Grain / Ton Silage (1972)	Bushels of Grain / Ton Silage (Revised 2016)	Bushels of Grain / Ton Silage (Starch method)	Difference (bias)
Bu/A	T/A	%	Bu/T	Bu/T	Bu/T	Bu/T
Less than 90	3.8	20.9	5.0	5.1	4.4	0.7
90-110	5.4	27.3	5.5	6.6	5.8	0.8
110-130	6.0	29.0	6.0	7.1	6.1	1.0
130-150	6.7	30.4	6.5	7.5	6.4	1.1
150-170	7.3	31.4	7.0	7.8	6.6	1.2
170-190	7.9	32.2	7.0	8.1	6.8	1.3
190-210	8.6	32.6	7.0	8.3	6.9	1.4
210-230	9.3	32.6	7.0	8.5	6.9	1.6
230-250	9.9	32.4	7.0	8.6	6.8	1.8

An android app for phones is called "Corn Silage Pricing" available at the Google Play Store. Silage price calculators can be found on-line at:
http://corn.agronomy.wisc.edu/Season/DSS/UWEXCornSilagePricingDecisionAid.xls and
http://corn.agronomy.wisc.edu/Season/DSS.aspx.

Literature Cited

Afuakwa, J.J., and R.K. Crookston. 1984. Using the kernel milk line to visually monitor grain maturity in maize. Crop Science 24:687-691.

Jorgensen, N.A., and J.W. Crowley. 1972. Corn silage for Wisconsin cattle: Production, harvesting, storage, use in dairy rations. UWEX Bulletin A1178, University of Wisconsin, Madison.

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