Pricing Corn Silage in the Field

It is difficult to determine a fair price for corn silage in the field.

Category: Dairy, crop management, feed, forage, marketing

It is more difficult to price corn silage than corn harvested as grain for several key reasons. First, when harvesting corn for grain the exact yield and total amount of grain harvested is known with a high degree of accuracy. On the other hand, it is much more difficult to determine corn silage yields with the same degree of accuracy. This is especially true when the corn silage crop harvested varies in moisture content or is damaged by drought, frost, or hail.

Second, most corn silage pricing schemes focus primarily on the grain content of the silage per ton. The grain content of corn silage may vary for a number of reasons such as differences among hybrids and environmental conditions under which the corn was grown. Plus, grain content is usually only estimated and not measured directly. These factors make it problematic for the seller to determine exactly how much crop is being sold and likewise for the buyer to determine how much is being purchased.

Third, when corn is harvested as silage the stover is not left in the field. Thus, pricing corn silage simply on the value of its grain content fails to account for the value of the stover. The stover is valuable both to the buyer and the seller. To the seller, the stover contains fertilizer value in the form of nitrogen (N), phosphorus (P), potassium (K), and organic matter (OM). At today's high fertilizer prices, the value of soil nutrients in the stover represents a significant economic loss for the seller. To the buyer, the nutritional value of corn silage to the dairy animal is more than just the energy supplied by its grain content. The stover also supplies digestible fiber and effective fiber that are important in achieving high milk production and maintaining good rumen function. Therefore, a viable corn silage pricing scheme should make some consideration for the value of stover.

No corn silage pricing scheme will be perfect, however, a viable pricing scheme should do at least two things. First, the scheme should arrive at an initial negotiable price that at least assures the seller of breaking even if he/she had sold the crop as dry shelled corn. Second, the scheme should provide the buyer with an initial negotiable price that is competitive with alternative feeds. This article will describe a corn silage pricing scheme that will achieve those two goals. This pricing scheme arrives at an initial negotiable price by pricing the crop from the perspective of the seller. It is primarily based on the price of dry shelled corn, but also accounts for the seller's cost of bringing dry shelled corn to market, the value of the stover for fertilizer, and for variation in dry matter (DM). Once an initial negotiable price has been calculated both seller and buyer should consider several non-quantifiable factors to arrive at the final price.

Step #1: *Determining grain value in the corn silage.* This portion of the total corn silage value is:

Grain Yield (bushels per ton of wet silage)

X **Grain Price** ($ per dry bushel shelled corn @15.5% moisture)

= **Base Value of Silage** ($ per ton of wet silage @35% DM)

The grain price used in the calculation should be the local cash corn price. Most use the price that is current at the time of silage harvest. However, it is also possible to use an average price determined over a period of time. This is obviously something the seller and buyer must mutually agree upon and should be written into the contract. This calculation assumes a silage dry matter content of 35%.

Determining grain yield per ton of silage is a bit more difficult because research has shown corn silage grain content varies with total grain yield and the environmental conditions during the growing season. Research from Wisconsin indicated grain content per ton of silage for corn grown under normal conditions contains about 7.5 bushels of corn per wet ton of silage when grain yields are in the 125 to 150 bushels per acre range. This study also showed that as total dry grain yield decreased below 125 bushels per acre or

increased above 150 bushels per acre, grain yield per ton of wet corn silage declined. For example, at 100 bushels per acre grain yield, grain per ton of wet silage declined to 7.2 bushels per ton, while at 200 bushels per acre grain yield, grain per ton of wet silage fell to 6.8 bushels per ton. Estimating grain content of immature or drought stressed corn is even more difficult. To get the most accurate price the seller and buyer should insist on an actual grain yield estimate, especially if the crop is immature or drought-stressed. One method involves physically counting kernels per ear and number of ears for a small portion of the field and then using a formula to extrapolate this out for the entire field. You can obtain many good articles on this topic and grain yield calculators on the internet by searching for "estimating corn yield." A second method is to leave representative test strips in the actual corn fields harvested for silage and later combining these strips and directly measuring corn yield.

Step #2: *Adjustments to the silage price.* Normally the seller harvests the crop as grain and sells it as dry shelled corn. Since the buyer is buying the crop "in the field" several adjustments should be made that will reflect costs not borne by the seller in this situation. These adjustments are deductions for: 1) grain combining costs, 2) grain drying costs (if applicable), 3) grain transportation costs (to first point of storage), and 4) grain storage costs (only if shelled corn pricing methods use an average of several months instead of a "sold off the combine" price).

Combining Costs ($ per bushel)

[Equals Combining Costs ($ per acre) ÷ Grain Yield (bushels per acre)]

\+ **Drying Costs** ($ per bushel)

[Equals Cost Per Point of Moisture ($ per point) X Points of Moisture Removed]

\+ **Transportation Costs** ($ per bushel)

\+ **Storage Costs** ($ per bushel)

[Equals Cost Per Month of Storage ($ per bushel per month) X Number of Months Stored]

= **Total Seller Deductions to Corn Price** ($ per bushel)

Typically combining costs are expressed on a per acre basis and run about $30.00 per acre ($0.20/bu @150 bu/acre). Drying costs (on farm) usually run about $0.040 per point of moisture (per bushel). Storage costs are around $0.03 per bushel per month. Transportation costs run another $0.05 per bushel (for the first 10 miles to initial storage). The total of these costs ($ per bushel) are deducted from the base grain price used in step one because the seller does not pay these costs when the corn is harvested as silage. So the calculation for seller adjusted corn silage value becomes:

Grain Yield (bushels per ton of wet silage)

X **Seller Adjusted Grain Price** ($ per dry bushel shelled corn @15.5% moisture)

[Equals Grain Price ($ per dry bushel shelled corn) - Total Seller Deductions to Corn Price ($ per bushel)]

= **Seller Adjusted Value of Silage** ($ per ton of wet silage @35% DM)

Step #3: *Adjustments for the fertilizer value of stover.* The philosophy of this pricing model is from the seller's perspective. Thus the harvested stover has a fertilizer value that will be lost to the seller when the crop is harvested as silage versus grain. The fertilizer value is derived from the stover's N, P_2O_5, K_2O content. The contribution of stover to soil P and K is pretty straightforward. The contribution of stover

to N is a more complex issue. This model allows you to consider an N contribution, but many agronomists would disagree, therefore, you may want to discount N's contribution or leave it out entirely.

The first item to determine is the dry stover yield per acre of silage harvested. Above ground corn plant dry matter at typical grain yields (125-150 bu/acre) consists of 50% of weight as grain and 50% as stover. Research from the University of Wisconsin has shown that at very low and very high yields this 50:50 relationship does not necessary hold. However, this effect on the value of a ton of silage is very low because the total value of stover only accounts for about 3% (or less) of the value of silage in our pricing model. Therefore, in our pricing model we ignore changes in the grain to stover ratio and assume it is always 50:50. Therefore, dry stover yield per acre is calculated:

1 - (beginning grain moisture content [% moisture] **- 15.5** [ending grain moisture content])

X **Grain Yield** (bu/ton of wet silage) X **56** lbs grain/bu (@15.5% moisture)

= **Stover Yield** (lbs/acre @15.5% moisture)

÷ **2,000**

X **0.845**

= **Stover Dry Matter Yield** (tons/acre)

According to an average of several university reports, each ton of dry stover contains 17.4 pounds of N, 6.2, pounds of P_2O_5, and 27.5 pounds of K_2O. The current (6/2012) value (local to Michigan's Thumb area) of N is $0.473 per pound (from urea), P_2O_5 at $0.485 per pound, and K_2O at $0.546 per pound. The addition to the silage price for the fertilizer value of the stover becomes:

N (lbs/ton silage DM) X **Stover Dry Matter Yield** (tons/acre) X **N Price** ($/lb of N) X **35% DM**

+ **P_2O_5** (lbs/ton silage DM) X **Stover Dry Matter Yield** (tons/acre) X **P_2O_5 Price** ($/lb of P_2O_5) X **35% DM**

+ **K_2O** (lbs/ton silage DM) X **Stover Dry Matter Yield** (tons/acre) X **K_2O Price** ($/lb of K_2O) X **35% DM**

= **Addition to Silage Price For Stover Fertilzier Value** ($/ton @ 35%DM)

Then

Seller Adjusted Value of Silage ($ per ton of wet silage @35% DM)

+ **Addition to Silage Price For Stover Fertilzier Value** ($ per ton of wet silage @35% DM)

= **Stover Adjusted Silage Price** ($ per ton of wet silage @35% DM)

Step # 4: *Adjustments for changes in dry matter.* Corn silage dry matter may vary considerably due to differences between or within fields and other factors (e.g., stage of maturity, harvest delay). Therefore, it is critical to check the silage moisture content periodically so adjustments can be made to the silage price. If dry matter content is below 35% the wet price of the silage is reduced accordingly and if dry matter content is above 35% it is increased. Every load of silage harvested should be weighed, or at least given an estimated weight, and the price adjustment corresponding to that load's estimated moisture content can be applied to determine its value. By keeping a record of the weight of each load of silage and its associated moisture content the overall value of the entire crop harvested can then be calculated. The calculation becomes:

Actual Moisture Content (% moisture)

÷ **35.0%**

= **Silage Price Adjustment Factor**

Then

Silage Price Adjustment Factor

X **Stover Adjusted Silage Price** ($ per wet ton of silage @35% DM)

= **Final Negotiable Silage Price** ($ per wet ton of silage)

Step #5: *Final considerations.* Once the initial negotiable silage price is determined it is critical for both seller and buyer to realize this is the *initial negotiating point*. For the seller the initial negotiable silage price should be viewed as the minimum. This price represents the breakeven price for the seller below which he/she would be better off harvesting the crop and selling it as shelled corn. Also, there are other factors the seller might consider, for example, are the field conditions at silage harvest time such that undesired soil compaction might occur? Should I as the seller assign a value to stover as a ground cover to prevent soil erosion? The buyer should also consider that the stover has value from digestible fiber and effective fiber. The buyer should also consider if alternative feeds are available that are competitive with corn silage on both a price and nutritional basis. Before making this decision the buyer must remember that he/she will incur the costs of chopping, hauling and packing the silage which typically adds another $6 to $8 per ton of harvested silage.

Drought Stressed Silage: The nutrient composition of drought-stressed corn silage is highly variable, but in some instances can be much higher than expected. According to *DuPont Pioneer*, quality "estimates range from 70-100% of normal silage: 75% for barren plants with no or very few ears, 85% for 0-20 bu/A and 95% for 20-40 bu/A of grain." Additionally, *DuPont Pioneer* and the *National Corn Handbook* report that drought-stressed corn silage yields about 1 ton per acre of silage per foot of plant height, or about 1 ton per acre of silage per 5 bushels of grain yield per acre. We have developed a simple spreadsheet model that allows you to determine the initial negotiable price for both normal and drought-stressed corn silage. To obtain a copy send me an e-mail request to: thomasc@anr.msu.edu.

Final Considerations: It is critical for both buyer and seller to agree on the pricing method, values of inputs to the pricing model, how and when payments will be made, and other considerations before harvest begins. These considerations may include such things as manure application on the silage harvested acres in lieu of including nutrient removal values in the pricing model. It is wise to write up the agreement and carefully review it before signing on the dotted line. Doing so will potentially save money, frustrations and friendships.

References:

Bay, T. 2011. *Pricing Corn Silage*. University of Wisconsin-Extension. http://grant.uwex.edu/files/2011/09/Pricing-Corn-Silage-2011-6-50-corn2.pdf

Chase, L.E. 2011. *How Do I Price Corn Silage?* Department of Animal Science, Cornell University. http://ansci.cornell.edu/pdfs/HowtoPriceCornSilage.pdf

Fernadez, F. Oct. 2007. What Is the Nutrient Value of Corn Stover Removal? Issue No. 23, Article 9, the Bulletin, Univ. of Illinois. http://bulletin.ipm.illinois.edu/article.php?id=860

Forage Byte. DuPont Pioneer. July, 2012.

Lang, B. Dec. 2004, Estimating the Nutrient Value in Corn and Soybean Stover. Iowa State Univ., Fact Sheet BL-112. http://www.extension.iastate.edu/NR/rdonlyres/5D3BD06C-F585-413C-826B-8452EF7A22DB/4744/stovervalue.pdf

Mullen, R. Oct. 2007. Nutrient Value of Corn Stover. C.O.R.N. Newsletter 2007-33, Ohio State University Extension. http://corn.osu.edu/newsletters/2007/article?issueid=205&articleid=1262

National Corn Handbook. 2012. http://corn.agronomy.wisc.edu/Management/NCH.aspx

Neilson, R. L. 2004. *Estimating Corn Grain Yield Prior to Harvest.* From Corny News Network Articles, Purdue University Department of Agronomy. http://www.beckshybrids.com/agronomy/documents/EstimatingCornYields.pdf

Rankin, M. Putting a Value on Corn Stover. Univ. of Wis. http://www.uwex.edu/ces/crops/CornStoverValue.htm

Tranel, L. F. *Pricing Standing Corn For Silage*. University of Wisconsin-Extension. http://www.extension.iastate.edu/NR/rdonlyres/B090C051-8602-4456-B3D6-1ED769C2D495/46847/CORNSILPricing.pdf

Vagts, T. Nutrient Content and Value of Corn Stover. Iowa State Univ. http://www.extension.iastate.edu/nwcrops/corn_stover.htm

Warnke, D., J. Dahl, L. Jacobs and C. Laboski. 2004. Nutrient Recommendations for Field Crops in Michigan. Extension Bulletin E2904, Michigan State Univ. Ext. http://www.ipm.msu.edu/cat09field/pdf/E2904.pdf

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