Pricing Standing Soybeans for Silage

Normand St-Pierre[1], Bill Weiss[1] and Dianne Shoemaker[2]
Department of Animal Sciences[1], Department of Extension[2]
The Ohio State University

First it was corn, now it is soybeans. The devastating drought that covers a large portion of the eastern United States in 2002 is forcing livestock and crop producers to evaluate alternative sources of feeds and new uses for their crops. The severe reduction in corn yields in most of Ohio has generated many questions regarding the use of drought-stressed corn for silage production. Additional questions are now surfacing about the possibility of using normal or drought-stressed soybeans for silage, how to ensile such a crop and how to price the standing crop.

Pricing nutrients

Feedstuffs are used exclusively as suppliers of nutrients. A "feed" without nutrients, such as sand, has little economic value as a feed. Thus, to truly determine what a feedstuff is worth, you need to know its composition in nutrients of nutritional and economic importance. In dairy nutrition, Net Energy for lactation (NE_L), rumen degradable protein (RDP), rumen undegradable protein (RUP), effective neutral detergent fiber (e-NDF), and non-effective neutral detergent fiber (ne-NDF) are the primary nutrients used in balancing rations. These are the nutrients that account for well over 95% of the market pricing of feedstuffs used in dairy rations.

These nutrients are supplied in variable proportions in a variety of commodity feedstuffs available in Ohio. Such feeds would include wheat middlings, corn gluten feed, canola meal, soybean hulls, shelled corn, etc. The method that we have derived factors in all five nutrients, and the composition and prices of 22 commodity feed ingredients in calculating what soybean silage is worth to a cow. The computer program, *SESAME*™, makes these complex calculations in seconds. The *SESAME*™ software[3] is available for purchase, or your county extension agent may be able to run the program for you. Prices for these 22 commodities were obtained from a national feed price survey list with normal margins factored in for delivery and handling charges.

Pricing the nutrients in soybean silage

The nutritional composition of drought-stressed soybean silage will vary tremendously depending on the extent of the drought. As a "guesstimate" we used the following figures: 35% dry matter, 0.58 Mcal NE_L/lb (lower energy due to

[1] Contact at st-pierre.8@osu.edu (614-292-6507) or weiss.6@osu.edu (330-263-3622).
[2] Contact at shoemaker.3@osu.edu (330-263-3831).
[3] SESAME software is available for purchase from the Ohio State University Department of Animal Sciences. Contact Amanda Hargett at (614) 688-3143 or hargett.5@osu.edu.

lower fat content), 18% crude protein, 82% protein degradability, 45.7% total NDF, 37.5% e-NDF, and 8.2% ne-NDF. Actual numbers from laboratory analyses would be preferred, especially for the dry matter content because it has a direct effect on the price due to its dilution effect on nutrient content. The breakeven price calculated by *SESAME* for this silage is $41/ton at the time of feeding.

Example 1

DROUGHT-STRESSED SOYBEAN SILAGE

Nutrient value at feeding[4,5] (per ton)	$41.00
Less:	
Harvest costs	$ 5.00
Storage costs	$ 4.00
Fermentation loss (10%)	$ 4.10
Estimated value of standing crop	~ $28.00
Reasonable pricing range:	$24 to $26/T

[4]Calculated using the SESAME computer program and local commodity prices, Sept. 2002
[5]Estimated nutrient values: 35% DM, 0.58 Mcal NE_L/lb. 18%CP, 82% RDP, 45.7% total NDF, 37.5% e-NDF and 8.2% ne-NDF.

Example 2

"NORMAL" SOYBEAN SILAGE

Nutrient value at feeding[6,7] (per ton)	$44.00
Less:	
Harvest costs	$ 5.00
Storage costs	$ 4.00
Fermentation loss (10%)	$ 4.40
Estimated value of standing crop	~ $30.60
Reasonable pricing range	$27 to $29/T

[6]Calculated using the SESAME computer program and local commodity prices, Sept. 2002
[7]Based on 35% DM, 0.64 Mcal NE_L/lb., 18% CP, 82% RDP, 45.7% total NDF, 37.5% e-NDF and 8.2% ne-NDF.

Using these prices, normal, non-drought stressed soybean silage (35% dry matter, 0.64 Mcal NE_L/lb, 18% crude protein, 82% protein degradability, 45.7% total NDF, 37.5% e-NDF, and 8.2% ne-NDF) currently has a breakeven price of $44/ton. This is the price that a dairy producer should be willing to pay when the silage hits the mixer wagon or the feed manger. This is not the price that he should be willing to pay when the crop is still standing in the field. Especially not this year.

Costs of making silage

Standing soybeans must first be harvested, then ensiled, then fed. Costs and losses occur at each of these steps. Harvesting costs are very situation dependent. We use a cost of $5/ton as a representative figure. Storage costs range between $3 to $6/ton. We used $4/ton. Some of the material put in the silo is lost during fermentation through seepage and production of gases, primarily CO_2. A 10% loss is a reasonable figure. Using these assumed costs, we estimate the breakeven value of standing, drought-stressed soybeans at approximately $28/ton.

Risk

Factoring the risks taken (uncertainty of the actual nutrient composition, possibility of bad fermentation, etc., which we value at $3/ton) a reasonable range of $24 to $26/ton is suggested. Using a current soybean price of approx. $5.50/bu, it is very tempting to suggest a quick rule-of-thumb of 7 times the price of soybeans to figure out the price per ton of soybean silage. Similar to the corn rule, frequently used to price standing corn for silage, this rule will be wrong most of the time, and very wrong this year. Simple… but wrong.

Ensiling the soybean plant

The soybean plant brings additional problems and concerns when it comes to ensiling. To have a chance at making good silage, the beans must be wilted to 30 to 35% DM. Wilting to higher DM concentrations can greatly increase leaf shatter, which will increase NDF substantially and decrease CP. At lower DM, soybean silage will not ferment correctly and will produce a very low quality silage.

Soybean plants at more advanced stages of maturity (assuming pods contain beans) have excessively high oil concentrations that can inhibit fermentation resulting in very low quality silage. One way to greatly reduce the risk of a poor fermentation is to mix chopped soybeans with chopped whole plant corn (1 part soybeans to *at least* 1 part corn) at the time of ensiling. This usually works best in a bunker because alternate loads can be mixed during filling.

Adjusting price based on moisture content

The previous examples established a price for soybean silage with 35% dry matter (DM). When the crop is finally harvested, actual DM may not be exactly 35%. If the dry matter content is higher or lower, the price should be adjusted accordingly. When DM is higher, a ton of feed contains more nutrients

and less water. When DM is lower, a ton of feed contains more water and fewer nutrients.

Sample calculation:

The price of standing soybeans was set at $24/T at 35% DM

One ton of silage at 35% DM contains:

2000 lb x 0.35 = 700 lbs of dry matter

and

2000 lb x 0.65 = 1,300 lbs of water

- If silage is valued at $24 per ton, then the DM is worth

  $24 ÷ 700 lbs = $0.0343 or 3.43¢ per lb.

- If, when silage was actually chopped, the average DM was 38%, then the silage contains:

  2000 lb x 0.38 = 760 lbs of dry matter

  and

  2000 lb x 0.62 = 1,240 lbs of water

  The adjusted price would be 760 lbs DM x $0.0343/lb = $26.07/T

- If, when the silage was chopped, the average DM was 30%, then the silage contains:

  2000 lb x 0.30 = 600 lbs. of dry matter

  and

  2000 lb x 0.70 = 1,400 lbs of water

  The adjusted price would be 600 lbs DM x $0.0343/lb. = $20.58/T

Discounting very wet or very dry silage

The final price for very wet (less than 30% DM) and very dry (greater than 38% DM) silage should be discounted further from the calculated price adjusted for DM. Very wet soybeans will not ferment properly and have a high potential to cause lower feed intakes. Very dry soybean silage also does not ferment well and frequently results in lower digestibility due to heat damage and mold growth. This silage will likely have lower CP and higher NDF levels due to excessive leaf shatter and loss during harvest. Dry soybean silage will likely have a shorter bunk life than soybean plants ensiled at the proper moisture level.