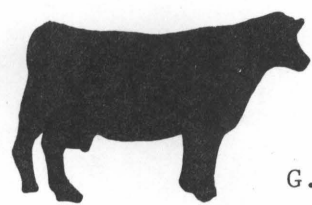


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Dairy guidelines

EXTENSION DIVISION VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY BLACKSBURG, VIRGINIA
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HOW MUCH ARE YOUR FORAGES WORTH?

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The question often raised is, "What price do I assign to my forages when trying to estimate my total feed costs?" This question will have increasing significance as the technology of feeding dairy cattle increases in the future. For example, a new computerized feeding management system, developed at Virginia Tech, considers the price of forages, in addition to the prices of concentrate ingredients. These prices are evaluated by the computer, as under certain circumstances it may not be economical to make maximum utilization of forages.

Feedstuffs vary in their content of protein and energy. These two nutrients constitute about 95% of the total nutrient cost for producing milk. Previously, the value of corn silage was determined by equating its energy value to the market value of corn grain. However, this method was not satisfactory for other forages, such as hays, hay crop silages, etc. The contribution of protein was ignored by the above procedure.

A relatively simple method of pricing forages would be to consider the value of their protein and energy in relation to the cost of these nutrients in several commonly available feedstuffs (grain corn and soybean meal). As corn silage was previously priced on the basis of selling the grain, it would be appropriate to use the price received by farmers for corn. Thus, when farmers receive \$2.75 per bushel (56 lb) for corn, this is equivalent to \$4.90 per 100 lb (\$98 per ton).

<u>Basal feedstuffs</u>	<u>Crude protein (lb/100 lb)</u>	<u>Net energy (Mcal/100 lb)</u>	<u>Price \$/ton</u>
Soybean meal	44.0	74	240
Shelled corn	9.0	84	98

The next procedure is to set up and solve some simple mathematical equations for the cost of protein (x)* and energy (y)*.

$$(1) \quad 44.0x + 74y = 240$$

$$(2) \quad 9.0x + 84y = 98$$

Divide all values in equation (1) by 74, the net energy in soybean meal, to give equation (3). Divide all values in equation (2) by 84 to give equation (4).

*To eliminate one mathematical equation, the crude protein and net energy contents are per 100 lb, the price is per ton. Subsequently x and y values become \$/20 lb protein and \$/20 lb Mcal net energy.

$$\begin{array}{rcl}
44.0x & \div & 74 = 0.59x \\
74y & \div & 74 = 1.00y \\
240 & \div & 74 = 3.24 \\
\\
9.0x & \div & 84 = 0.11x \\
84y & \div & 84 = 1.00y \\
98 & \div & 84 = 1.17
\end{array}$$

The new equations become

$$\begin{array}{l}
(3) \quad 0.59x + y = 3.24 \\
(4) \quad 0.11x + y = 1.17
\end{array}$$

Subtract equation (4) from equation (3) and solve for x

$$\begin{array}{rcl}
0.59x & - & 0.11x & = & 0.48x \\
1y & - & 1y & = & 0 \\
3.24 & - & 1.17 & = & 2.07 \\
\\
(5) \quad 0.48x & = & 2.07 \\
\\
x & = & \frac{2.07}{0.48} & = & \$4.31 \text{ per 20 lb protein}
\end{array}$$

In equation (3) substitute 4.31 for x and solve for y

$$\begin{array}{l}
(0.59 \times 4.75) + y = 3.24 \\
y = 3.24 - 2.54 \\
y = \$0.70 \text{ per 20 Mcal net energy}
\end{array}$$

Using the values for x (\$ per lb protein) and y (\$ per Mcal net energy), you can now determine the value of your forages, providing you have the results from forage analysis.

The net energy (N.E.) value of forages can be determined from the crude fiber content.

$$\text{N.E. corn silage} = 104.4 - 1.32 \times \% \text{ crude fiber}$$

$$\text{N.E. legumes or sorghum silage} = 104.4 - 1.23 \times \% \text{ crude fiber}$$

$$\text{N.E. grasses} = 108.5 - 1.50 \times \% \text{ crude fiber}$$

Example: Corn silage at 30% crude fiber and 7% crude protein

$$\text{N.E. (Mcal/100 lb DM)} = 104.4 - 1.32 \times 30)$$

$$\text{N.E.} = 64.8 \text{ Mcal/100 lb D.M.}$$

$$\begin{array}{rcl}
7.0 \text{ lb crude protein/cwt D.M.} & \times & \$4.31 = \$30.17 \\
64.8 \text{ Mcal N.E./cwt D.M.} & \times & \$0.70 = \underline{45.36} \\
& & \underline{\$75.53}
\end{array}$$

The value of this corn silage is \$75.53 per ton D.M. or at 35% D.M., the value would be \$26.44 (\$75.18 x 0.35).

Table 1. Examples of determination of various forage values

Feedstuff	(% Crude protein)	\$Prot. x value)	% AD fiber	(N.E. Mcal/cwt x value)	Price (\$/ton DM)	% DM	Price (\$/ton)
Base prices [†] : corn, \$2.25/bu; 44% soybean meal, \$240/T							
Corn silage	7.5	4.75	26.6	69.3	66	40	26
	7.5	4.75	30.4	64.3	64	35	22
	7.5	4.75	34.2	59.3	62	25	15
Alfalfa	18	4.75	40.5	54.6	110	88	96
	18	4.75	40.5	54.6	110	40	44
	20	4.75	35.4	60.8	122	40	49
Grass Hay	9.8	4.75	46.7	38.4	63	87	55
Sorghum silage	8.7	4.75	42.2	52.6	64	35	23
Base prices: corn, \$2.75/bu; 44% soybean meal, \$260/T							
Corn silage	7.5	4.81	30.4	64.3	80	35	27
Alfalfa	18	4.81	40.5	54.6	122	88	107
Grass hay	9.8	4.81	46.7	38.3	72	87	63
Base prices: corn, \$1.90/bu; 44% soybean meal, \$280/T							
Corn silage	7.5	6.09	30.4	64.3	56	35	20
Alfalfa	18	6.09	40.5	54.6	118	88	104
Grass hay	9.8	6.09	46.7	38.3	66	87	57
Base prices: barley, \$1.98/bu; 44% soybean meal, \$240/T							
Barley silage	8.7	4.86	36	56.8	63	41	26

[†]Cereal grain prices should be market prices at the time of harvesting the forage.

A Guide for Determining Relative Value of Forages

1. Basal feeds

Soybean meal: 44% CP, 74 Mcal. NE/cwt., 13.50\$/cwt.

Shelled corn: 9% CP, 84 Mcal. NE/cwt., 3.75\$/cwt.

2. Solve for x (\$ for protein) and y (\$ for NE)

(1) Divide soybean meal price by 74

$$\underline{270} \text{ \$/T} \div 74 = \underline{3.65} \text{ (Factor A)}$$

(2) Divide shelled corn price by 84

$$\underline{75} \text{ \$/T} \div 84 = \underline{0.89} \text{ (Factor B)}$$

(3) Subtract Factor B from Factor A

$$\underline{3.65} \text{ (Factor A)} - \underline{0.89} \text{ (Factor B)} = \underline{2.76} \text{ (Factor C)}$$

(4) Divide Factor C by 0.4875

$$\underline{2.76} \text{ (Factor C)} \div 0.4875 = \underline{5.66} \text{ (x = \$ for protein)}$$

(5) Multiply x (\$ for protein) by 0.5946

$$\underline{5.66} \text{ x times } 0.5946 = \underline{3.37} \text{ (Factor D)}$$

(6) Subtract Factor D from Factor A

$$\underline{3.65} \text{ (Factor A)} - \underline{3.37} \text{ (Factor D)} = \underline{0.28} \text{ (y = \$ for NE)}$$

3. Determine value of forages

(7) Multiply % crude protein x \$ for protein (eq. 4)

$$\underline{6} \text{ \% CP} \times \underline{5.66} \text{ \$ for protein} = \underline{33.96} \text{ (protein value)}$$

(8) Multiply Mcal. NE x \$ for NE (eq. 6)

$$\underline{67.7} \text{ Mcal. NE} \times \underline{0.28} \text{ \$ for NE} = \underline{18.94} \text{ (NE value)}$$

(9) Add \$ for protein value to \$ NE value = Price per ton DM

$$\underline{33.96} \text{ \$ protein value (eq. 7)} + \underline{18.94} \text{ \$ NE value (eq. 8)} = \underline{52.90} \text{ (\$ per ton DM)}$$

(10) Multiply price by DM content

$$\underline{52.90} \text{ \$ price (eq. 9)} \times \underline{42} \text{ (DM)} = \underline{22} \text{ \$ value per ton}$$