



Economics of Feeding Distillers Grains to Dairy Cows

Alvaro Garcia, Dairy Science Department,
and Gary Taylor, Economics Department

Dairy producers need reliable information before purchasing specific feeds. Along with the price of a commodity it is very important to have a complete nutrient analysis of the feed as well as an estimation of its energy content. The cost/nutrient method can be used to evaluate the economics of using distillers grains versus other feeds.

Cost/Nutrient Method

This is a simple method for calculating cost per unit of protein, energy, fiber, or any other nutrient. You need two pieces of information: cost and nutrient content. Price per ton will be the unit of analysis since most feedstuffs are sold on that basis. An example of the computations to calculate the cost per pound of protein (CP) follows:

$$\left(\frac{\% \text{ CP, dry matter basis}}{100}\right) \times \left[\frac{(\% \text{ dry matter})}{100}\right] \times 2000 \text{ lb/ton} = \text{lb CP/ton, dry matter}$$

Example: Dry distillers grains with a CP content of 30% and at \$90/ton.

$$\left(\frac{30}{100}\right) \times \left[\frac{(89)}{100}\right] \times 2000 = .30 \times 1780 = 534 \text{ lb CP/ ton, dry matter}$$

The cost per pound of CP can then be calculated from the cost per ton:

$$90/534 = \$0.169/\text{lb CP, dry matter}$$

The protein and energy content and an estimation of the cost per pound of protein and per Megacalorie (Mcal) of net energy of lactation (NEL) of some common feedstuffs are in Table 1.

Two main weaknesses must be considered when using the cost/nutrient method. Feeds should be evaluated on their most valuable nutrient or what the feed is purchased for, whether it is protein, energy, or some other nutrient. Distillers grains (DG) are difficult to evaluate with this method as they supply both energy and protein. They are also a good source of rumen undegradable protein, which is usually required to sustain higher milk production levels.

Other factors not accounted for are feed palatability, digestibility, and quality. In the cost/nutrient method, all feeds are treated equally, when in reality there might be differences in animal performance.

Inclusion of Dry DG in Dairy Rations

To evaluate the economic impact of adding DG to dairy rations, simulations were run using the SPARTAN ration balancer. Three fixed amounts of dry DG (10, 20, and 30% of dry matter intake) were used in total mixed rations formulated for three different milk production levels (53, 66, and 79 lb of milk per day), equivalent to cows producing 16,000, 20,000, and 24,000 lb in a 305-day lactation. The amounts of dry

Table 1. Nutrient content and cost per nutrient supplied of selected feeds.

Feed/main nutrient supplied	Dry Matter (%)	CP (%)	NEL (Mcal/lb)	\$/ton as fed	\$/ton dry matter	\$/lb of CP (DM)	\$/Mcal of NEL (DM)
Energy							
Corn	89	9.0	0.90	71.4	80	0.44	0.044
Barley	88	12.4	0.84	172	196	0.79	0.117
Oats	89	13.2	0.80	132	148	0.56	0.093
Protein							
Soybean meal	90	54	1	185	206	0.19	0.103
Protein ("Bypass")							
Fish meal	92	68.0	1	490	533	0.39	0.267
Blood meal	90	90.0	1	330	367	0.20	0.184
Protein and energy							
Distillers grains	90	30	0.89	90	100	0.17	0.056

Nutrient values from: Nutrient Requirements of Dairy Cattle. NRC 2001

DG were forced as constraints in the program. Other assumptions for this analysis were feed prices as follows:

- distillers grains \$90/ton
- shelled corn \$2.30/bushel
- soybean meal \$185/ton
- limestone \$7.25/cwt
- dicalcium phosphate \$20.00/cwt
- corn silage, \$25/ton
- alfalfa haylage, \$45/ton.

In addition, milk was priced at \$12/cwt, and the roughage in the ration was set at 50% silage and 50% haylage (Table 2).

Adding distiller's grains to the diets decreased feed costs, resulting in an improvement in income over feed costs. At the low production level (53 lb), including 20% DG in the diet improved net returns by 20 cents per cow when compared to no inclusion, but there seems to be no economic advantage of this amount.

The greatest economic impact was verified at the highest production levels where each 10% increment of DG in the diet dry matter resulted in close to 10 additional cents per cow per day.

Table 2. Economic impact of including distiller's grains in dairy rations.

Milk lb	Distillers grains % diet DM	Feed cost	Value of milk produced Dollars per day	Income over feed costs	Protein Excess of requirements, lb	Phosphorus Excess of requirements, lb
53	0	1.88	6.36	4.48	0.2	0.0
53	10	1.78	6.36	4.58	0.0	0.0
53	20	1.68	6.36	4.68	0.1	0.0
53	30	1.68	6.36	4.68	0.6	0.0
66	0	2.17	7.92	5.75	0.1	0.0
66	10	2.06	7.92	5.86	0.0	0.0
66	20	1.96	7.92	5.96	0.0	0.0
66	30	1.92	7.92	6.00	0.2	0.0
79	0	2.45	9.48	7.03	0.0	0.0
79	10	2.35	9.48	7.13	0.0	0.0
79	20	2.24	9.48	7.24	0.0	0.0
79	30	2.16	9.48	7.32	0.0	0.0

One of the concerns when feeding high amounts of DG is the environmental impact of excess nitrogen and phosphorus. Phosphorus was adequately balanced even at the highest inclusion rate and lowest production level, provided that sources of inorganic

phosphorus were balanced accordingly. Protein was in excess of requirements when DG was included at 30% of the diet dry matter in cows producing either 53 or 66 lb/day.

These results imply that when priced competitively, distillers grains can be cost-effective in dairy rations. The question is what is a competitive price?

Distillers grains can be priced based on protein and energy, using respectively the prices of soybean meal and corn as standards for both nutrients. The following formula determines the price you can afford to pay for DG:

$$\begin{aligned} \$/\text{cwt of DG} &= (\$/\text{cwt of corn} \times 0.531) \\ &+ (\$/\text{cwt of soybean meal} \times 0.514) \end{aligned}$$

(Natzke 2002)

The constants in the above equation are feed evaluation factors for estimating the dollar value of feeds based on energy and protein levels (Linn et al 1996). Using our prices from the previous example, corn would be priced at \$4.11/cwt and soybean meal at \$9.25/cwt. This would make our formula:

$$(\$4.11 \times 0.531) + (\$9.25 \times 0.514) = \$6.94/\text{cwt}$$

or \$138.8/ton

This indicates that as long as dry DG are priced below \$139/ton they are economical to include in dairy rations. For wet DG this would translate into a maximum of \$48 per ton as fed, which should include delivery, storage, handling, and a correction for possible spoilage.

Storage Costs and Availability

Storage costs and losses can be quite high and highly variable depending upon the form fed (wet or dry) and the time of year.

Dry DG, like shelled corn or soybean meal, are relatively easy to handle and store. Feeding the products in this form will minimize both handling and storage costs for the dairy producer.

Storage losses for wet DG can be higher. Wet DG range from 30 to 50% dry matter and have an average storage life of 5 to 7 days, depending upon the time of year (Natzke 2002). Conversely, losses for dry material stored in bulk bins are typically in the range of 2 to 5%. Storing wet DG in a 9- or 12-foot sealed bag can extend its storage life. Bagging expenses are estimated to be approximately \$5 to \$7 per ton, including the rental cost of a dump table bagging machine, bags, and fuel (Natzke 2000).

Among the benefits of using the wet product are that it might act as a palatability enhancer in those diets where dry feeds predominate. The decision of which to use will be influenced by herd size (rate of use of wet DG) and handling/labor issues for a particular dairy.

With new ethanol plants going up across many parts of South Dakota, availability of distillers grains should increase. If the laws of supply and demand hold, it is expected that the price of this co-product will decrease in the future. This should allow distiller's grains to become common components in South Dakota dairy rations.

References

- Linn, J.G., M.F. Hutjens, R. Shaver, D.E. Otterby, W.T. Howard, and L.H. Kilmer. Feeding the dairy herd. North Central Regional Extension Publication 346. University of Minnesota Extension Service.
- Natzke, D. 2002. Fueling a feed source. Midwest Dairy Business, July issue:48-51.

**This publication and others can be accessed electronically from the SDSU
College of Agriculture & Biological Sciences publications page at
<http://agbiopubs.sdstate.edu/articles/ExEx4025.pdf>
or from the Extension Service Drought Information Website at**

South Dakota State University, South Dakota counties, and U.S. Department of Agriculture cooperating. South Dakota State University is an Affirmative Action/Equal Opportunity Employer and offers all benefits, services, education, and employment opportunities without regard for race, color, creed, religion, national origin, ancestry, citizenship, age, gender, sexual orientation, disability, or Vietnam Era veteran status.