

The Effects of Milk Prices and Corn Prices on the Profitability of Feeding Corn to Dairy Cows

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Does it make sense to feed corn to dairy cows when corn is nearly \$5.00 per bushel? This is the question that many dairy producers are asking these days. Most people would expect the answer to this question is no. This is an incorrect assumption, however, because there are still cases where it is profitable to feed higher priced corn. The purpose of this paper is to explain how it can be economically rational for dairy producers to continue to feed corn when it is relatively expensive.

Profit Maximization and Feeding Corn

A basic principle of economics is the assumption that businesses, such as dairy farms, attempt to maximize profits. Businesses achieve this goal by adhering to a relatively straightforward decision criterion: produce outputs in all cases where the value of the outputs exceed the costs of inputs. In the case of dairy farms, producers feed corn to dairy cows as long as the value of the milk produced exceeds the cost of the corn that is fed.

As dairy producers attempt to maximize profits, they evaluate the costs and returns associated with each successive bushel of corn that could be fed to dairy cows. Producers will commit more and more bushels of corn to a dairy cow's ration until the value of the milk produced from adding the last bushel of corn to the ration is exactly equal to the cost of a bushel of corn. When this point is reached it is no longer possible to gain profits from increasing the corn in a dairy cow's diet.

The profitability of feeding corn changes as the prices for milk and corn vary. This change in profit occurs because the cost of corn and value of milk both vary as prices rise and fall. This is an important point because it means dairy producers need to adjust feeding practices as corn becomes more or less expensive or milk becomes more or less valuable.

The potential for earning profits from feeding corn to dairy cows will increase (decrease) as the price of milk rises (falls) and/or the price of corn declines (increases). Given this, it follows that dairy producers would be inclined to feed more (less) corn to dairy cows when corn is cheap (expensive) and/or milk prices are relatively high (low). The extent to which dairy producers are willing to make adjustments in their feeding of corn depends on how

much the cost of corn and the value of milk change as a result of variations in the prices of corn and milk.

In addition to responding to price changes, dairy producers also make adjustments in feeding programs as the production response from feeding corn declines over time. Persons familiar with dairy cows understand that at about the eighth week of lactation, a cow's milk production peaks and then steadily falls over the remainder of the lactation period. This decline in the productive capacity of a dairy cow over a lactation period means the quantity of milk produced from a bushel of corn in, say, the 25th week of lactation will be less than the milk obtained from the bushel of corn in, say, the 12th week of lactation. Dairy producers need to be aware of this naturally occurring decline in a dairy cow's productivity in order to adjust feeding practices as the value of milk production falls in the latter stages of the lactation period.

Profits From Feeding Corn at Various Points of a Lactation Period

Table 1 shows how the ratio of marginal value product to marginal cost varies depending on the price of milk, the price of corn, and the stage of lactation for a dairy cow. This ratio is a profitability measure that indicates whether the value of milk (marginal value product) is equal to the cost of corn (marginal cost). Values of one or more for these ratios are an indication that it would be profitable to feed additional corn because the value of milk exceeds the cost of corn. Ratios of less than one are an indication that it would be advisable to cut back on feeding corn because the value of milk is less than the cost of corn.

The ratios reported in Table 1 are divided into groups so that it is possible to see how the profitability of feeding corn varies depending on whether a cow is in the early (10th week), mid (20th week), or late stage (30th week) of lactation. This grouping was done with an understanding that cows are more (less) productive in the early (late) stages of a lactation period.

The ratios presented for a cow in the 10th week of lactation are all greater than one. This means that it is profitable to feed corn even when it costs \$6.00 per bushel early in the lactation when a cow is likely to have a high production response to corn. This finding is somewhat surprising but it seems plausible given that the value of milk gained from feeding corn should be relatively high on the early weeks of lactation.

The ratios reported for the 20th week of lactation show that feeding less corn in a ration is a profitable action when corn is \$4.00 or more and /or the price for milk is \$13.00 or less. This is evidenced by the ratio values of less than one that are reported for those cases where the corn is relatively expensive and the milk price is on the low side. These data show that the profitability of feeding corn declines as a dairy cow's productivity falls through the course of a lactation.

The ratios reported for the 30th week of lactation are generally less than one. This information is evidence that it is difficult to gain returns from feeding corn in the latter stages of lactation. Given these data it would seem that in almost all cassia dairy producer would be very likely to cut back on the feeding of corn in the last weeks of a cows lactation period.

Conclusion

In this paper it has been shown that the price of corn is only one of the factors that producers need to consider when they are trying to decide whether it is profitable to feed corn. In addition to looking at corn prices, producers must also consider the price of milk and the production response from feeding corn. In general the information presented here says that feeding corn in the early stages of lactation is generally profitable, even when corn is relatively expensive. Other information presented here suggests that the returns from feeding corn in the latter stages of lactation are relatively low. Thus it follows that producers should be somewhat hesitant to feed high corn diets to cows late in lactation, particularly when corn is relatively expensive.

Hopefully the information presented in this paper will help producers understand how they should go about analyzing these three variables when they are making decisions about whether they should or should not be adjusting the corn that is going into the rations they are feeding dairy cows.

Table 1: Ratios of Marginal Value Product to Marginal Cost for Corn fed to Dairy Cows *

Cow in 10th Week of Lactation	Price of Corn (Per Bushel)				
Milk Price	2.00	3.00	4.00	5.00	6.00
10.00	4.65	3.10	2.32	1.86	1.55
11.00	5.11	3.41	2.56	2.05	1.70
12.00	5.58	3.72	2.79	2.23	1.86
13.00	6.04	4.03	3.02	2.42	2.01
14.00	6.51	4.34	3.25	2.60	2.17

Cow in 20th Week of Lactation	Price of Corn (Per Bushel)				
Milk Price	2.00	3.00	4.00	5.00	6.00
10.00	1.80	1.20	.90	.72	.60
11.00	1.98	1.32	.99	.79	.66
12.00	2.16	1.44	1.08	.86	.72
13.00	2.34	1.56	1.17	.94	.78
14.00	2.52	1.68	1.26	1.01	.84

Cow in 30th Week of Lactation	Price of Corn (Per Bushel)				
	2.00	3.00	4.00	5.00	6.00
Milk Price					
10.00	.85	.57	.42	.34	.28
11.00	.93	.62	.47	.37	.31
12.00	1.02	.68	.51	.41	.34
13.00	1.10	.73	.55	.44	.37
14.00	1.19	.79	.59	.47	.40

* The values reported in this table were calculated using a milk production model estimated by this author. This model was used to simulate the production of a dairy cow that was assumed to be fed a total mixed ration of hay equivalent (H), soybean meal (SBM), corn (C), and minerals (M). The percentage breakdown of the assumed ration, on a dry matter basis, is as follows: 68.2% H, 5.2% SBM, 24.8% C, and 1.8% M. Readers should understand that different ratio values would have been obtained if a different base ration had been assumed. The trends in the ratios (declining over course of the lactation) would not change however.