

The Economic Trade-offs Between Annual Milk Production and the Productive Lives of Dairy Cows.

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It is generally accepted that the average productive life of a dairy cow is around three lactations. Given this average useful life for dairy cows, the typical culling rate in a dairy herd is somewhere between 30 and 40 percent for most commercial dairy herds.

In recent years it has been claimed by many persons familiar with dairy that culling rates in larger scale commercial herds have moved up to the range of 35 to 50 percent. These high culling rates are typically blamed on management programs that are geared at getting dairy cows to milk at peak capacity while they are in the herd. The thought in these cases is that forcing cows to milk at peak levels causes them to “wear out” sooner than they would if they were allowed to produce less milk.

The belief that pushing cows to milk at peak levels shortens their productive lives suggests that dairy producers might be able to extend the useful lives of their dairy cows by one or two lactations if they have cows milk at lower levels. The payoff from extending the useful lives of dairy cows is lower culling rates; which mean dairy producers will not need to invest as much money in replacement heifers over time. This lower investment in replacement heifers results in higher profits for dairy producers because lowering investment in replacement heifers reduces costs.

The management question confronting a dairy producer thinking about cutting milk production in order to extend the useful lives of dairy cows (assuming for the sake of this discussion that such a trade-off exists) is whether the resulting cost savings from reducing culling rates exceeds the net returns that are lost from cutting back a cow’s milk production. If the cost savings from less culling are greater than the milk returns that are lost, a net gain is achieved from cutting back on a cow’s milk production. Alternatively a loss occurs if the returns lost from cutting milk production are greater than any cost savings resulting from longer productive lives for dairy cows.

The purpose of this paper is to present the results of a case study that was performed to determine the possible financial impacts of reducing annual milk production to extend the useful life of dairy cows. This analysis is not based on any research that confirms or quantifies a trade-off between annual milk production and the productive life of a dairy cow. Rather the work focuses on determining what financial gain or loss could result if milk production is reduced from some base level such that a cow’s useful life is

extended by one or two lactations. Using this information, it can be determined if there could be any merit in extending a cow's productive life by having it milk at lower levels across its productive life.

MODELING RETURNS AND COSTS FOR A DAIRY COW

This analysis was conducted using a spreadsheet model which computes estimates of the annual returns for a dairy cow based on a set of specific assumptions about annual milk production, feed consumption, milk prices, feed prices, and other factors that affect returns and costs of producing milk. This model computes returns and costs on a daily basis and then discounts these daily returns and costs by a specified opportunity cost of capital in order to compute a net present value of the returns and costs for a cow. The spreadsheet also converts these net present values to annualized returns by making adjustments which reflect the length of the time period over which the returns and costs occur. The adjusted values, known as annuity equivalents, allow for a meaningful comparison of income and expense streams of differing lengths of time.

For this analysis only milk price specifications and annual milk productions were allowed to vary. All other input specifications were held constant so that it was possible to determine the effects that milk price and annual milk production have on the net returns for a dairy cow.

The primary concern of the analysis was determining how much net annual returns vary depending on the level of milk production of a dairy cow. This was done by computing net annual returns for dairy cows at five different levels of milk production. The base milk production level (which was assumed to be the production for a "high producing cow") was 30,000 pounds of milk. The other levels of milk production, in pounds, considered for this analysis were: 28,000, 26,000, 24,000, and 22,000. The measures of net income obtained for these different levels of milk production were used to determine what could occur if milk production was cut in order to extend the useful life of a dairy cow.

As stated earlier, the milk price specifications for the model were also varied for this analysis. This was done to see if the financial incentives for cutting milk production to extend the useful life of dairy cows varied depending on whether the price of milk is high or low. Two milk price specifications were used to compute two sets of annual returns across the previously described levels of milk production. The "high" milk price results were computed using specifications that resulted in an average milk price of \$18.17 per cwt. The "low" milk price results were obtained under the assumptions that the average milk price of \$10.05 per cwt.

RESULTS OF THE ANALYSIS

The values in Table 1 are the results of the analysis that was performed under the assumption that the price of milk was relatively high (\$18.17 per cwt). The base level of

returns for this analysis is roughly \$2,405 per year for a cow producing 30,000 pounds of milk per year over a useful life of three lactations (This was also 3 years since a lactation was assumed to be 305 of days milking followed by a 60 day dry period).

The other values presented in Table 1 are for lower levels of milk production over 4 or 5 lactations. These values reflect the net annual returns a dairy producer could receive of the cut back on annual milk production and extended the useful life of a dairy cow 1 or 2 lactations beyond the three lactations useful life that is associated with high annual milk production.

The Table 1 values show that in almost all cases, cutting back annual milk production to get one or two additional lactations from a dairy cow results in lower annual returns. There are exceptions in the case where milk production is reduced from 30,000 pounds to 28,000 and the useful life of the dairy cow increases from 3 to 5 lactations. In this case, the annual returns increases by about \$10 from \$2,407 to \$2,417.

The values in Table 2 are for the case where the milk price averages \$10.05 per cwt. The results associated with the “low price” case are quite similar to those for the “high price” case presented in Table 1. In all cases where milk production is 26,000 pounds or less, the net annual returns for useful lives of 4 to 5 lactations are less than those gained when annual milk production is 30,000 pounds over a useful life of only three lactations.

The net annual returns values presented in Table 2 for the milk production level of 28,000 pounds and useful lives of 4 and 5 lactations are both greater than the net annual returns for milk production of 30,000 pounds over 3 lactations. These higher returns for the 28,000 pounds of milk production are an indicator that dropping milk production by 2,000 pounds per year could be financially advantageous if it extends the useful life of a dairy cow 1 or 2 lactations. In this case where milk price is around \$10 per cwt, a gain of \$4 per year is realized if the useful life increases from 3 to 4 lactations and the gain grows to almost \$90 per year if useful life is extended by 2 lactations from 3 to 5.

CONCLUSIONS

According to the results of the case example reported here, the net financial effect of sacrificing milk production for a longer productive life for dairy cows is generally a loss. Cutbacks in milk production of 4,000 pounds or more from a base level of 30,000 pounds, consistently yielded lower net returns even though they were assumed to extend the useful lives of dairy cows 1 to 2 lactations.

The only situations where the losses from lower annual milk production were offset by gains (cost reductions) from holding cows for more lactations was when milk production was cut by 2,000 pounds annually from 30,000 to 28,000 pounds. For the case where milk was relatively high priced, a gain of about \$10 per year could be realized if the useful life of a cow increases two lactations when milk production is cut by 2,000

pounds. In the case where the milk price is relatively low, the increase in annual net returns is around \$4 per year for a one lactation extension in a cow's useful life and it is roughly \$85 per year for a two lactation extension in the useful life of a cow.

Based on the case study results reported here, it would appear that managing cows to produce milk at maximum capacity, even though it shortens the useful lives of cow, is more profitable than having cows milk at lower levels and stay in the herd longer. The results reported here suggest that modest cuts in milk production from 30,000 pounds to 28,000 pounds might yield additional returns. However it is questioned that such a modest reduction in milk production will result in a dairy cow lasting one or two more lactations. This is something that should be researched in the future.

The cull rates of 30 to 40 percent being observed in dairy herds may seem "too high" but the case studies discussed here suggest that efforts to achieve lower culling rates by managing cows to produce less milk is not a profitable option for dairy producers to consider. Lower milk production might extend the useful life of dairy cows but the cost saving from extending dairy cow's productive lives generally do not exceed the income that is lost when milk production is cut. Thus it would appear that dairy producers should not be alarmed if their culling rates are around 30 to 40 percent if their cows are milking at or around 30,000 pounds of milk per year.

Table 1: Annual Net Returns for Various Levels of Milk Production and Useful Lives (Defined in Lactations) for a Dairy Cow With a Milk Price of About \$18 per CWT

Milk Production (305 DIM)	Lactations Completed	Annual Net Returns
30,000	3	2,407.57
28,000	4	2,304.08
	5	2,417.37
26,000	4	2,006.12
	5	2,116.71
24,000	4	1,708.16
	5	1,816.06
22,000	4	1,410.20
	5	1,515.41

Table 2: Annual Net Returns for Various Levels of Milk Production and Useful Lives (Defined in Lactations) for a Dairy Cow With a Milk Price of About \$10 per CWT

Milk Production	Lactations Completed	Annual Net Returns
30,000	3	118.62
28,000	4	122.44
	5	205.81
26,000	4	-15.85
	5	66.26
24,000	4	-154.14
	5	-73.28
22,000	4	-292.43
	5	-212.82