

Understanding Your Break-Even Cost of Production

Jason Karszes, Cornell CALS PRO-DAIRY

With earnings dropping from 2017, and this becoming the fourth year of low or negative earnings for many dairy farms, understanding different financial aspects of your business is critical. A key starting point is to understand different measures of cost of production and what a break-even milk price may be for your farm.

The costs that have to be covered by the milk price determine the break-even point, or price. The challenge becomes what to include, or not include, to determine what those costs may be. Several different measures of cost of production can be calculated for your farm, each with different implications. The following discussion highlights different costs of production, utilizing data from the Dairy Farm Business Summary and Analysis Program to show averages and ranges for both 2016 and 2017

When looking at any cost of production numbers, it is important that accrual or accrual adjusted income and expenses are utilized, rather than cash-based numbers. Having accurate information for revenue and expenses after adjustments for accounts receivable, grown feed and cattle inventories, purchased inventory, pre-paid expenses, and accounts payable is critical to calculate meaningful measures for the business.

Total Farm Operating Costs

This is a starting point for many farms, as this addresses the checks that are written every day before any family expenses or payment of principal to the bank. This is the total cost to operate the farm, so not only does it include costs to produce milk, but also costs to grow any crops that might be sold, along with costs associated to raise animals that are eventually sold for beef. The challenge with looking at just the Total Farm Operating Costs and comparing them to milk price is that other sources of revenue are not accounted for. In addition, there is no charges of any type for family resources, ownership costs for capital investments, or principal paid back to the lender. While Total Farm Operating Costs is a natural starting point to look at costs of production, it isn't an accurate number to compare to milk price, considering these other sources of revenue, and cash and non-cash expenses.



Table 1.

Total Farm Operating Costs, Per Cwt.
2016 & 2017, New York State, Dairy Farm Business Summary

	2016 ¹		2017 ²	
	Per Cow	Per Cwt.	Per Cow	Per Cwt.
Total Farm Operating Costs	\$4,530	\$17.30	\$4,559	\$17.55

¹ Average of 173 Farms ² Average of 143 Farms

Operating Cost to Produce Milk

Operating Cost to Produce Milk is a measure that is calculated to represent those costs associated with producing milk, or those costs that have to be covered by sale of milk only. To calculate this measure, a key assumption is made associated with revenue from non-milk sales. This assumption is that for every dollar of non-milk revenue, such as animal and crop sales, it cost one dollar of expenses to generate. With this assumption, the non-milk revenue can be subtracted from the total farm operating costs to get to the Operating Costs to Produce Milk. If there were any cattle purchased that led to a herd size increase that were not included in the farm operating costs, these are also added in as a cost to properly calculate this measure.

Operating Cost to Produce Milk is the first measure that can be compared to gross milk price. This number represents those operating costs that are paid during the year and generally must be covered over time to stay in business. This is also generally the lowest cost of production number that is calculated. It is the lowest cost of production because there are no expenses associated with owners, nor are expenses associated with capital investments included. This number is before depreciation expenses, value of owner operators, value of unpaid family labor, and return to equity invested in the business. For 2016, for the average farm participating in the DFBS, a gross milk price of \$14.75 was needed to cover Operating Cost to Produce Milk. This rose to \$14.96 in 2017 (Table 2).

Table 2.

Operating Cost to Produce Milk, Per Cwt.
2016 & 2017, New York State, Dairy Farm Business Summary

	2016 ¹		2017 ²	
	Per Cow	Per Cwt.	Per Cow	Per Cwt.
Total Farm Operating Costs	\$4,530	\$17.30	\$4,559	\$17.55
Non-Dairy Revenue	-\$705	-\$2.69	-\$728	-\$2.80
Expansion Cattle	+\$36	+\$0.14	+\$55	+\$0.21
Operating Cost to Produce Milk	\$3,861	\$14.75	\$3,885	\$14.96

¹ Average of 173 Farms ² Average of 143 Farms

Purchased Input Cost to Produce Milk

With Operating Costs to Produce Milk calculated after other sources of revenue have been accounted for, this number can be used as a starting point to add in other expenses associated with the farm to determine additional cost of production measures. The next cost of production measure that can be calculated is Purchased Input Cost to Produce Milk. This measure starts with the Operating Costs to Produce Milk and adds in the additional expenses associated with the farm, primarily associated with capital investments that have been made over time.

To expense capital investments made over the years against earnings, depreciation expenses are calculated. Depreciation is an annual expense associated with the capital investment and is generally based on some length of time that the investment will be used in the business, or the useful life. This expense isn't associated with any principal paid back during the year for any money that may have been borrowed to pay for the asset, rather it is based on the initial capital investment. By adding this expense to the Operating Costs to Produce Milk, the total cost of all inputs and assets that were purchased can be determined. Table 3 highlights these calculations for 2016 and 2017.

The Purchased Input Cost to Produce Milk will be higher than the Operating Cost to Produce Milk, and increased by \$1.63 from \$14.75 to \$16.38 in 2016 and increased by \$1.68 from \$14.96 to \$16.64 in 2017. This cost measure is still before any costs associated with owner labor and management, unpaid family labor, and equity capital is considered.

Table 3.

Purchased Input Cost to Produce Milk, Per Cwt.
2016 & 2017, New York State, Dairy Farm Business Summary

	2016 ¹		2017 ²	
	Per Cow	Per Cwt.	Per Cow	Per Cwt.
Operating Cost to Produce Milk	\$3,861	\$14.75	\$3,885	\$14.96
Machinery Depreciation	+\$248	+\$0.95	+\$248	+\$0.96
Building & Land Improv. Depreciation	+\$179	+\$0.68	+\$183	+\$0.70
Extra-Ordinary Expense	+\$0	+\$0.00	+\$5	+\$0.02
Purchased Input Cost to Produce Milk	\$4,287	\$16.38	\$4,321	\$16.64

¹ Average of 173 Farms ² Average of 143 Farms

Total Cost of Producing Milk

The Total Cost of Producing Milk adds in costs associated with family contributions to the business. These are charges, or expenses, for owner labor and management, unpaid family labor, and equity capital. These expenses are then added to the Purchased Input Cost to Produce Milk to determine the Total Cost of Producing Milk.

A key question for this measure is what to use for expenses, or charges, for the family contributions to the farm. With a focus on economic sustainability over time, opportunity charges are used for the family costs in this calculation, and not cash expenses. While the cash expense associated with family is captured under non-farm cash expenses within the DFBS, there are no cash expenses for unpaid family labor or use of equity within the business.

Opportunity charges is a concept that focuses on what the value or cost would be if the resources were invested elsewhere, or are paid for. For the equity the family has in the businesses, while there is no check written for interest on this investment, over time the goal is to make a positive return on the investment into the business, similar to what could be earned if the dollar amount of equity was invested in some other investments, such as mutual funds. For the unpaid family labor, what would the cost be if the business actually had to pay for it? For the owner's labor and management, we can think about this in a few different ways. If the owner was doing the same job somewhere else, what would the compensation be? If the business was going to hire someone to do this job, how much would it cost to do so? For the opportunity costs used to determine Total Cost of Producing Milk, participants assign a value to their labor and management contribution to the farm. For unpaid family labor, a standard

charge per hour is used to determine the opportunity cost. For a return on equity, a charge of five percent is used.

Table 4 highlights the changes for 2016 and 2017 to move from Purchased Input Cost to Produce Milk to Total Cost of Producing Milk.

Table 4.

Total Cost of Producing Milk, Per Cwt.
2016 & 2017, New York State, Dairy Farm Business Summary

	2016 ¹		2017 ²	
Purchased Input Cost to Produce Milk	\$4,287	\$16.38	\$4,321	\$16.64
Value of Owner Labor & Management	+\$196	+\$0.75	+\$188	+\$0.73
5% Return on Average Equity	+\$404	+\$1.54	+\$399	+\$1.54
Un-paid Family Labor	+\$4	+\$0.01	+\$3	+\$0.01
Total Cost of Producing Milk	\$4,891	\$18.68	\$4,911	\$18.91

¹ Average of 173 Farms ² Average of 143 Farms

The opportunity charge for return on equity is the largest of the additional expenses added in to get to Total Cost of Producing Milk, averaging \$1.54 per cwt. for both 2016 and 2017. The value of labor and management was an additional \$0.75 per cwt. in 2016 and \$0.73 per cwt. in 2017. With these additions, the Total Cost of Producing Milk averaged \$18.68 in 2016 and \$18.91 in 2017.

The Total Cost of Producing Milk is the break-even price milk price needed to cover all costs associated with operating and owning the dairy farm over time. For the long-term success of the business, this is the number that needs to be covered by the sale of milk to allow the family to generate a rate of return on their investment, cover the value of their time, and provide the ability to reinvest in the business as machinery, buildings, and other capital improvements need to be made.

There is a large range in the Total Cost of Producing Milk every year for farms that participate in the Dairy Farm Business Summary and Analysis Program. Table 5 highlights selected cost of production numbers and adjustments sorted by the Total Cost of Producing Milk for 2017 by decile (10 percent increments).

Table 5.

Selected Cost of Production Measures by Total Cost of Production,
Per Hundredweight, 143 Dairy Farms, New York State, 2017

<i>Total Cost of Producing Milk</i>	<i>Total Farm Operating Costs</i>	<i>Non- Milk Revenue</i>	<i>Expansion Cattle</i>	<i>Operating Cost to Produce Milk</i>	<i>Depreciation and Extra – Ordinary Expenses</i>	<i>Purchased Input Cost</i>	<i>Value of Family Resources</i>	<i>Operating Cost Plus Cash Commitments</i>
\$16.71	\$15.56	\$3.10	\$0.14	\$12.61	\$1.59	\$14.20	\$2.51	\$14.36
17.71	17.07	3.44	0.51	14.14	1.56	15.71	2.01	16.83
18.32	17.59	3.09	0.05	14.56	1.62	16.18	2.14	16.96
18.90	17.03	2.58	0.07	14.52	1.99	16.51	2.39	16.93
19.38	17.37	2.52	0.06	14.91	1.76	16.67	2.72	16.89
19.88	18.47	2.74	0.28	16.00	1.76	17.76	2.12	18.56
20.25	17.50	2.23	0.15	15.42	1.43	16.85	3.40	18.17
20.86	18.80	2.50	0.02	16.33	1.77	18.10	2.76	19.51
21.60	18.70	2.57	0.20	16.32	1.86	18.18	3.41	19.36
26.25	19.39	2.79	0.03	16.63	2.52	19.15	7.10	20.38

Operating Cost Plus Cash Commitments to Produce Milk

The Total Cost of Producing Milk is the long-term cost of production amount that needs to be covered by the gross milk price. However, during periods of lower earnings, this number most likely will be above the milk price. This number also doesn't reflect what the actual cash expenses associated with capital investments and non-farm expenses, which might be of higher interest to managers during periods of lower or negative earnings.

Starting with the Operating Cost to Produce Milk, the manager can focus on non-operating cash commitments, or those things the farm needs to pay every month that isn't considered an operating expense, instead of non-cash expenses and opportunity costs that were utilized to determine Total Cost of Producing Milk. Instead of depreciation expenses, the current portion due of intermediate and long-term debt are utilized, along with any short-term structured debt. The three opportunity charges for value of labor and management, return to equity capital, and unpaid family labor are replaced by actual non-farm cash expenses. Table 6 highlights these changes and calculates the Operating Cost Plus Cash Commitments to Produce Milk.

Table 6.

Operating Cost Plus Cash Commitments To Produce Milk, Per Cwt.
2016 & 2017, New York State, Dairy Farm Business Summary

	2016		2017	
Operating Cost to Produce Milk	\$3,861	\$14.75	\$3,885	\$14.96
Short Term Debt – Structured	+\$20	+\$0.08	+\$12	+\$0.05
Current Principal Due Intermediate Loan	+\$284	+\$1.09	+\$287	+\$1.10
Current Principal Due Long Term Loan	+\$130	+\$0.50	+\$125	+\$0.48
Non-Farm Cash Expenses	+\$275	+\$1.05	+\$208	+\$0.80
Operating Cost Plus Cash Commitments To Produce Milk	\$4,569	\$17.45	\$4,518	\$17.39

¹ Average of 173 Farms ² Average of 143 Farms

The Operating Cost Plus Cash Commitments to Produce Milk is a number that is highly dependent on the individual farm circumstances and can be quite variable across farms and should only be utilized in the short term. It can also potentially be misleading. This measure is based on historical performance. If

your purpose in calculating this number is to project what the next year might bring, then some additional budgeting efforts need to be made to update the operating costs of producing milk for the upcoming year, along with the planned principal payments to the lender and non-farm cash expenses. It is important to note that this number is only valid for short periods of time, and if this is the only number that is covered over time by the gross milk price, there may be challenges for the family to meet their goals and maintain an economically sustainable business.

As with Total Cost of Producing Milk, there is a large range in the Operating Cost Plus Cash Commitments to Produce Milk, as shown in Table 7.

Table 7.

Selected Cost of Production Measures by Operating Costs Plus Cash Commitments to Produce Milk, Per Hundredweight, 143 Dairy Farms, New York State, 2017

<i>Operating Cost Plus Cash Commitments</i>	<i>Total Farm Oper. Costs</i>	<i>Non- Milk Revenue</i>	<i>Expansion Cattle</i>	<i>Operating Cost to Produce Milk</i>	<i>Depreciation and Extra – Ordinary Expenses</i>	<i>Purchased Input Cost</i>	<i>Value of Family Resources</i>	<i>Total Cost of Prod. Milk</i>	<i>Loan Principal Due</i>
\$13.71	\$15.32	\$2.81	\$0.05	\$12.56	\$1.79	\$14.35	\$3.12	17.47	\$0.34
15.52	16.34	2.65	0.00	13.70	1.88	15.58	2.50	18.08	1.09
16.26	17.27	3.63	0.21	13.85	2.47	16.31	4.37	20.69	1.35
16.85	16.97	2.69	0.17	14.45	2.04	16.49	2.88	19.38	1.35
17.32	17.28	2.83	0.38	14.83	1.85	16.68	2.87	19.55	1.60
18.05	18.10	3.01	0.08	15.17	1.59	16.76	3.72	20.48	1.45
18.52	18.26	2.20	0.06	16.12	1.42	17.54	2.68	20.21	1.57
19.11	18.02	2.61	0.05	15.46	1.65	17.11	2.95	20.05	2.09
20.12	18.55	2.23	0.35	16.67	1.50	18.17	2.63	20.80	2.18
22.51	21.36	2.88	0.16	18.63	1.69	20.32	2.81	23.13	2.53

Understanding what different cost of production measures represent is important to understand when thinking about milk prices and how the milk price may relate to different costs. It is critically important that accurate and complete records are available for the business to correctly calculate cost of production measures, and for these measures to have value in determining a break-even milk price. For long-term financial sustainability of the business, the Total Cost of Producing Milk represents all the costs that need to be covered by milk prices. In the short-term, when thinking about the ability to pay the bills and service debt, other measures can be utilized, as represented by the Operating Cost + Principal + Non-Farm Cash Expenses to Produce Milk measure. When utilizing some of these other measures, it is crucial to understand what is and isn't included and what the implications may be over time if the milk price only covers these expenses within the business.

Reference: "Business Summary, New York State 2015", R.B 2016-1, Wayne A. Knoblauch, Dymond, Cathryn, and Karszes, Jason, College of Agriculture and Life Sciences, Cornell University, Ithaca, NY, December 2016.