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2023 Cost of Production on Grass-fed Dairy Farms in the Northeast

Introduction

Since 2018 our research team has been collecting and analyzing financial data from 100% grass-fed dairy producers in the northeast with the goal to better understand the cost of producing milk in this production system. With several years of data, we have been able to create a useful benchmark for northeast grass-fed dairy producers.¹ This article will summarize the 2023 dataset and begin to explore management system and production practice impacts on cost of production and profitability.

Dairy farms located in NY, NH, and VT that are shipping 100% grass-fed milk were able to participate in the study. Data are presented as an overall average for all farms in the study and also divided into groups by total cost of production. Three groups were created representing low (<\$45), medium (\$45-\$55), and high (>\$55) production costs on a hundredweight equivalent (cwt eq.) basis. Total cwt eq. shipped for each farm was determined by converting dairy-related non-milk income (i.e., crop sales, calf sales, etc.) into an equivalent number of milk hundredweights which is then added to the milk hundredweights sold. While our focus is on the cost to produce grass-fed milk, the data collected included information on changes in inventory (herd, equipment, etc.), and asset values allowing net farm income from operations (NFIFO), return on assets (ROA), and operating profit margin (OPM) to be calculated. These data are reported in Table 1.

2023 Farm Demographics

Participating farms were selling milk to Organic Valley (58%), Maple Hill Creamery (19%), and other local markets (23%). The herd size ranged from 30 to 123 milking cows with an average of 60 cows per farm. Farms were managing an average of 295 acres resulting in 4.5 acres available per mature cow (Figure 1). The farms estimated they purchased on average 34.2% of their herd's forage needs.

Herds were mainly composed of crossbreeds, however, there were farms milking pure-bred Holstein, Jersey, and other breeds which differ in milk and fat production. While most farms milked year-round, there were some fully seasonal herds (16%) and herds milking at frequencies other than twice daily (16%).

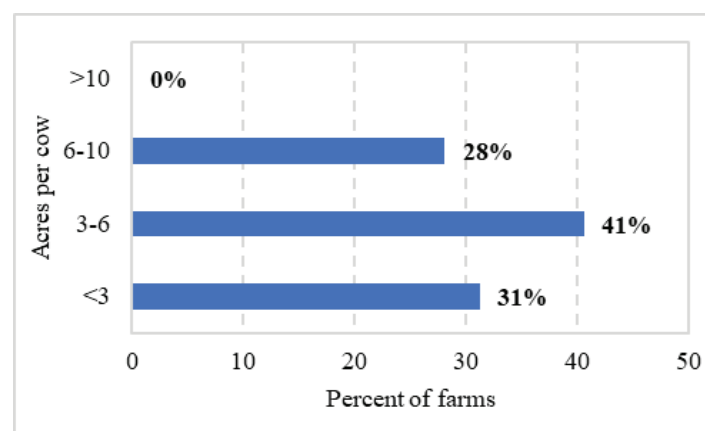


Figure 1. Distribution of acres per cow for participating farms

Income and Expenses

Farm production practices and management varied widely among the farms and for obvious reasons this influenced farm income and expenses. Farms shipped an average of 513,321 lbs of milk per year (Table 1). Milk sold averaged 8,503 lbs per cow per year but ranged from 2,338 to 12,984 lbs per cow per year. These values reflect only milk that was shipped off the farm and does not include milk fed to youngstock or diverted for other uses and therefore does not reflect total milk production. Since the quantity of milk being diverted to youngstock was collected in 2023, that amount can be added to the pounds of milk sold to estimate total milk produced. The average total milk production for the farms was 568,627 lbs compared to the average milk sold of 513,321 lbs. Therefore, milk production per cow averaged 9,250 lbs/cow while milk shipped averaged 8,503 lbs/cow. In 2023, farms fed an average 1.76 gallons/calf/day for 5.25 months which equated to 2,407 lbs/milk/calf. These farms raised on average 17 calves which consumed \$15,173 worth of milk per farm. With an average herd size of 60 cows, these farms could raise only 12 calves to meet their replacement rates. The extra 5 calves (21% cull rate) represent \$4,824 of lost milk income for each farm on average. If extra animals are going to be raised to sell, the quantity of milk and high-quality forage fed prior to sale needs to be considered as this may not be a profitable venture.

¹ https://www.uvm.edu/sites/default/files/Northwest-Crops-and-Soils-Program/Articles_and_Factsheets/2018-2020_COP_Report_1_Cost_of_Grassfed_Production.pdf

Table 1. Average farm summary statistics by total cost group, 2023.

	Low cost ≤\$45 per cwt eq. Average (n = 12)	Medium cost \$45-\$55 per cwt eq. Average (n = 12)	High cost >\$55 per cwt eq. Average (n=8)	All farms Average (n = 32)
Farm Information				
Herd size	61	64	55	60
Acres	218	350	330	295
Acres per cow	3.32	4.84	5.76	4.50
Fertilizer & seed expense (\$/cow)	\$140	\$117	\$149	\$134
Fertilizer & seed expense (\$/acre)	\$46	\$26	\$26	\$34
Purchased forage expenses (\$/cow)	\$568	\$399	\$90	\$385
Purchased forage expenses (\$/acre)	\$217	\$134	\$20	\$137
Milk Information				
Milk sold (lbs/year)	597,809	483,730	430,976	513,321
Milk sold (lbs/cow/year)	10,009	7,831	7,252	8,503
Milk sold (lbs/acre)	3,443	2,069	1,425	2,423
Fat sold (lbs/cow)	436	365	327	382
Fat sold (lbs/acre)	150	98	65	110
Labor Efficiency				
Full-time Equivalents (FTEs)	2.16	2.29	2.52	2.26
Cows managed (cows/FTE)	31	28	24	28
Milk sold (cwt eq. per FTE)	3,367	2,546	1,830	2,675
Unpaid labor (hrs)	5,077	5,229	6,848	5,577
Unpaid labor (\$)	\$73,791	\$71,331	\$91,486	\$77,292
Return to labor	\$73,990	\$25,532	\$8,757	\$39,510
Labor earnings (\$/hr)	\$14.24	\$7.50	\$1.81	\$8.61
Farm Income				
Milk price (\$/cwt)	\$39.08	\$41.13	\$41.57	\$40.47
Gross Milk Income	\$233,802	\$197,646	\$174,704	\$205,469
Gross Cull, Calf, & Livestock Sales	\$11,741	\$12,548	\$12,885	\$12,330
Gross Crop Sales	\$3,441	\$283	\$1,452	\$1,759
Other Income	\$9,184	\$15,986	\$4,256	\$10,503
Total Gross Income	\$258,168	\$226,423	\$193,296	\$230,061
Net				
Net Cash Income (NCI)	\$107,855	\$74,606	\$62,045	\$83,934
Inventory Change	-\$10,823	-\$13,329	-\$19,390	-\$13,905
Net Farm Income From Operations (NFIFO)	\$97,032	\$61,277	\$42,655	\$70,030
4% Equity Charge	\$23,042	\$35,745	\$33,898	\$30,520
Return on Assets (ROA)	3.10%	-1.70%	-7.10%	-1.25%
Operating Profit Margin (OPM)	7.20%	-6.80%	-38.00%	-9.38%
Asset Turnover Ratio (ATR)	51.11%	31.63%	22.69%	36.70%
ATR length (years)	2.16	3.76	5.06	3.48

The average pay price farms received for their milk was \$40.47 but ranged from \$31.03 to \$47.10 per cwt of milk sold. There were several different milk buyers which pay different premiums and base rates, and it is important to note that some of the farms included were not receiving a grass-fed premium and therefore were receiving a lower price per cwt. Gross farm income averaged \$230,061 with \$205,469 from milk sales and an additional \$24,592 of other income (i.e., calf sales, crop sales, cull beef and other income). Note that COVID-19 grant funds and federal and state milk insurance program payments were not included in the data, however, other dairy program income (e.g. organic certification reimbursement) was included in the other income category.

Data were collected using the Dairy TRANS financial analysis tool with a standardized method (<https://www.extension.iastate.edu/dairyteam/files/page/files/DairyTRANS44.pdf>). In-depth interviews were also conducted for each participating farm in 2023 to gain additional details relating to management on grass-fed dairies. In addition to cash expenses, this method includes an unpaid labor charge per owner/operator and per additional unpaid full-time worker (3,000 hours). It also includes inventory change adjustments (to factor in changes in herd size or equipment inventory and value), and a 4% charge on the farm's assets instead of loan and interest payments. These standardizations allow farms with no debt and farms with significant debt to be more evenly compared. The unpaid labor charge of \$40,000 has been used in previous years, however, to account for cost-of-living increases this has been increased to \$46,045 in 2023. This unpaid labor charge standardizes owner/worker income allowing for fair comparison between owners who draw an income, and those who rely on off-farm income or another enterprise to cover living expenses.

With these standardizations, the average total cost per cwt eq. across all farms was \$49.63, which is very similar to what has been observed in previous years. The average pay-price per cwt of milk sold was \$40.47, however it should be noted that some farms

Table 2. Average of cash expenses (\$/cwt eq.) by total cost group

	Low cost <\$45 per cwt eq.	Medium cost \$45-\$55 per cwt eq.	High cost >\$55 per cwt eq.	All
Bedding*	\$1.00	\$0.76	\$0.72	\$0.84
Breeding fees	\$0.12	\$0.22	\$0.28	\$0.20
Custom hire	\$0.69	\$1.13	\$0.72	\$0.86
Machine rental	\$0.17	\$0.32	\$0.31	\$0.26
Land rental	\$1.46	\$0.72	\$1.01	\$1.07
Dairy supplies	\$1.62	\$2.63	\$3.25	\$2.41
Farm insurance	\$0.27	\$1.05	\$1.25	\$0.81
Fuel, gas, and oil	\$1.55	\$2.05	\$2.51	\$1.98
Hired labor	\$1.91	\$3.39	\$1.63	\$2.39
Property taxes	\$0.78	\$1.66	\$2.20	\$1.46
Purchased forages	\$5.32	\$4.57	\$1.16	\$4.00
Minerals	\$0.71	\$0.88	\$0.90	\$0.82
Energy supplements	\$0.17	\$0.18	\$0.63	\$0.29
Repairs	\$2.35	\$2.63	\$3.50	\$2.74
Seed and fertilizer	\$1.23	\$1.32	\$1.59	\$1.35
Utilities	\$0.62	\$0.84	\$1.34	\$0.88
Veterinary and medicine	\$0.12	\$0.34	\$0.52	\$0.30
Stop and hauling	\$0.75	\$1.23	\$1.43	\$1.10
Other	\$3.71	\$4.27	\$6.28	\$1.16
Total cash expense (\$/cwt eq.)**	\$22.20	\$27.42	\$27.22	\$25.41
Total cash expense (\$/cow)	\$2,482	\$2,423	\$2,145	\$2,376
Total cash expense (\$/farm)	\$150,314	\$151,857	\$131,251	\$146,126
Total cost (\$/cwt eq.)***	\$39.57	\$49.72	\$64.59	\$49.63

*Costs and cost groups expressed on a \$/CWT eq. basis adjusted for additional non-milk income.

**As calculated in Dairy TRANS; interest expenses are not included

***Total cost per cwt eq. includes balance sheet adjustments such as inventory change, a 4% charge on farm equity in lieu of interest payments, and a standard charge for unpaid labor.

in the study were not receiving a grass-fed milk premium. The additional non-milk income per farm (\$24,592 per year per farm on average) may be due to farmers trying to diversify their income with other enterprises which can subsidize the dairy business. Of the participating farms, only 28% relied solely on the dairy enterprise for income. Farms were raising other livestock, producing maple products, growing bedding plants, processing meat, and running other on-farm enterprises. Some farms (9%) also indicated they earned off-farm income. The lowest cost group, representing approximately 38% of farms, had a total cost per cwt eq. of \$39.57, slightly below the average pay price of \$40.47. The other two groups (62% of farms) had a total cost of production which exceeded the average pay price. It is important to recognize that this includes the standardized family living draw which may differ considerably from what they may choose to pay themselves. Many participants in the study here were paying themselves significantly less or nothing at all.

Looking at some of the expenses in more detail, cash expenses ranged widely across farms (Table 2). Note that in Dairy TRANS a 4% charge on the farm's equity is included instead of interest. The largest cash expense on farms was purchased forage which accounted for 15.7% of cash expenses. Other major expenses included repairs, supplies, and hired labor. Acreage ranged from 1.9 to 9.5 acres per mature cow, with some farms purchasing a significant portion of their forages, while other farms produced all their own feed and even sold hay. Some of the lowest expense categories included breeding fees, machine rental, veterinary expenses, and energy supplements (e.g. molasses) which each accounted for <2% of cash expenses respectively. Interestingly, in previous years energy supplements accounted for approximately 2% of cash expenses and 3-4% for the high-cost groups. Supplemental energy costs increased in 2022 compared to 2019 and 2020 levels which may be due to farmers utilizing energy supplements to balance poorer quality forage. In 2023, however, supplemental energy only accounted for 1% of cash expenses on average and while the high-cost group is still spending significantly more than the other groups on energy, it still only accounts for 2.3% of cash expenses. This may be due to higher quality forage being produced or farmers deciding not to purchase energy due to its significant cost. In previous years we have found that farms that purchased supplemental energy had a cost of production that averaged \$11.25 per cwt eq. higher than those who did not, and they did not ship more milk per cow. However, if those farms were utilizing supplemental energy to overcome poor quality forage perhaps the milk shipped per cow would have been significantly lower.

Labor Efficiency

The average number of full-time equivalent (FTE) workers operating a farm was 2.3. One FTE is defined as 3,000 labor hours per year and includes both paid and unpaid labor. Therefore, the average number of cows managed by 1 FTE was 28. This metric had an enormous range from 11 to 51 cows per FTE, indicating large differences in labor efficiency. Some of these differences may be attributed to inefficient milking systems. Fifty percent of farms in the high-cost group milked in tie stalls compared to only 25% in the low-cost group. Similarly, the high-cost group milked on average three fewer cows per labor hour compared to the low-cost group. However, we must also consider milk production to better understand the economic implication of these labor differences. The average milk sold per FTE was 2,675 cwt eq./FTE but ranged from 1,118 to 4,620 cwt eq./FTE across all farms. The average milk sold on the high-cost farms was 1,830 cwt eq./FTE while it was more than twice that at 3,367 cwt eq./FTE on the low-cost farms. As described previously, some of this discrepancy may be due to milk being diverted to feed youngstock and possibly too many replacement animals being raised. As grass-fed dairy farms work to find ways to be financially sustainable, labor efficiency is clearly one of the areas that will benefit from additional focus.

Farm Financial Health Metrics

The Net Cash Income (NCI) is the farm's total gross income minus the farm's total cash expenses. Dairy TRANS does not include the farm's interest expense in NCI, instead it uses a 4% equity charge on assets in the calculation of total cost. The calculation of NCI also does not include adjustments for inventory change, principal payments on loans, or unpaid labor (family living expense). Assigning a 4% equity charge and assigning \$46,045 per owner/operator and per FTE of additional unpaid labor allows farms' total cost of production to be compared on a more level playing field.

Net Farm Income from Operations (NFIFO) is the farm's NCI plus inventory change, depreciation, and other capital adjustments. So, this calculation includes changes in numbers and value of feed, livestock, machinery, equipment, accounts payable and receivable, and real estate from the beginning to the end of the year. The average NFIFO was \$70,030 but ranged from -\$26,001 to \$185,691. For easier interpretation, this value can be looked at per cwt of milk sold. In doing so the average NFIFO was \$11.97 per cwt eq. and ranged from -\$7.23 to \$21.64 per cwt eq. The NFIFO is not farm profit; it is just what is left over after cash expenses and inventory changes to pay the opportunity costs of unpaid family labor and unpaid equity.

Return on Assets averaged -1.25%, however it ranged from -17.6% to 12.7%. This indicates that on average grass-fed dairy farms are losing 1.25 cents on every dollar of assets on the farm. Operating Profit Margin (OPM) averaged -9.38% but ranged from -106% to 19.3%. The low-cost group had a positive OPM average of 7.2% while the medium- and high-cost groups were negative with the high-cost group averaging -38%. The OPM is the percentage of profit generated from every dollar of output prior to paying interest and equity costs. This means on average grass-fed dairies are losing 9.38 cents on every dollar of output before interest and equity payments are made. However, in both ROA and OPM calculations here, it is important to remember that the total cost calculation used does not reflect the farm's actual family living expense or interest but instead uses the standardized \$46,045 per operator and additional FTE of unpaid labor as well as a 4% equity charge. Many of the farms that participated here were paying themselves substantially less than this standardized wage or nothing at all, meaning they were relying solely on off-farm or other enterprise income. The standardizations provide a fairer assessment of the dairy enterprise alone.

Next Steps

As we gain a better understanding of this production system and the range of management practices within it, we continue to refine our data collection and analysis to gain better insights into the most widely successful strategies for grass-fed dairy farms in the northeast. The information presented here is just the beginning of more in-depth analysis that will continue to develop over the next few years as we explore the connections between management, cost of production, and profitability.

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For the purposes of this publication, grass-fed dairy is defined as dairy production in which the ration does not contain any grain or grain byproducts. Nutrient needs on these farms are met with grazed and stored forages.