# Larger-Herd, Low-Overhead Dairy Grazing in the Northeast: Estimating Financial Performance

## Introduction

This report presents hypothetical financial results for a 240-cow dairy herd managed in a low-overhead operation with spring calving and intensive grazing in the Northeast U.S. The financials for this scenario were developed with the use of an expert panel of dairy farm financial experts and farmers who are experienced with this system. The estimates were designed to be conservative but representative. There are many ways that this farm could be designed and managed; what is described below is just one of those ways.

## Farm Description

The owner/operator (farmer) has a 15-year lease on a 360-acre farm with an empty 120-cow free-stall barn and typical outbuildings and infrastructure. The lease payments are $78,000/year for the farm. The farmer borrows $240,000 to retrofit a 20-unit swing parlor, a 250' double-sided feed bunk with concrete pad, and a bedded pack for emergency housing. Although unusual to invest in the facilities of a leased farm, the internal rate of return (IRR) on this investment indicates that it is a sound business decision. The farmer also borrows $285,000 to purchase 240 medium-framed cows ($1,150/cow at 7% for 5 years) and has an existing loan for the $270,000 worth of equipment that s/he owns (owes $135,000 at 7% for 7 years). The farmer's total assets equal $1.25 million or

$5,197/cow, which would be higher if s/he owned the farm. Assets per cow range from $10,000 to $22,000/cow for Northeast dairy farms, according to Farm Credit's 2021 Dairy Farm Summary.

## Production System

This is a spring-calving seasonal herd that is bred to calve in March and April. The farmer manages the pastures to maximize the herd's nutrient intake from grazed pasture and also supplements with 12 lbs of grain throughout the lactation. During the grazing season, the herd also receives an average of 6 lbs dry matter (DM) of corn silage (CS) for additional energy. When there is not pasture available, the herd gets 12 lbs DM of CS plus 17 lbs DM of haylage. During the dry period, the herd gets 12 lbs DM of CS and 18 lbs DM of haylage. Because there is a learning curve and adjustment period, this analysis is run for five years and the Year 5 results are what is described in this report. By Year 5, the herd averages 15,000 lbs of milk/cow/year.

By Year 5 the herd has an 18% cull rate. All heifer calves are raised and those not needed as replacements are sold as bred heifers. The total farm labor is 3 workers. Managing 80 cows/worker is not easy and will require a very efficient system. The farmer works an average of 60 hours/week and is paid $55k/year for their labor and management. There are two FT hired workers who work an average of 40 hours per week. These averages include vacation; hours per week will be greater during busy periods and less during slow periods and include 2 weeks of vacation time for the farmer and both FT workers. Both hired workers are paid $20/hour (in Year 1) plus 7.65% for Social Security and Medicare contributions. Salary and wages increase by 2% per year.

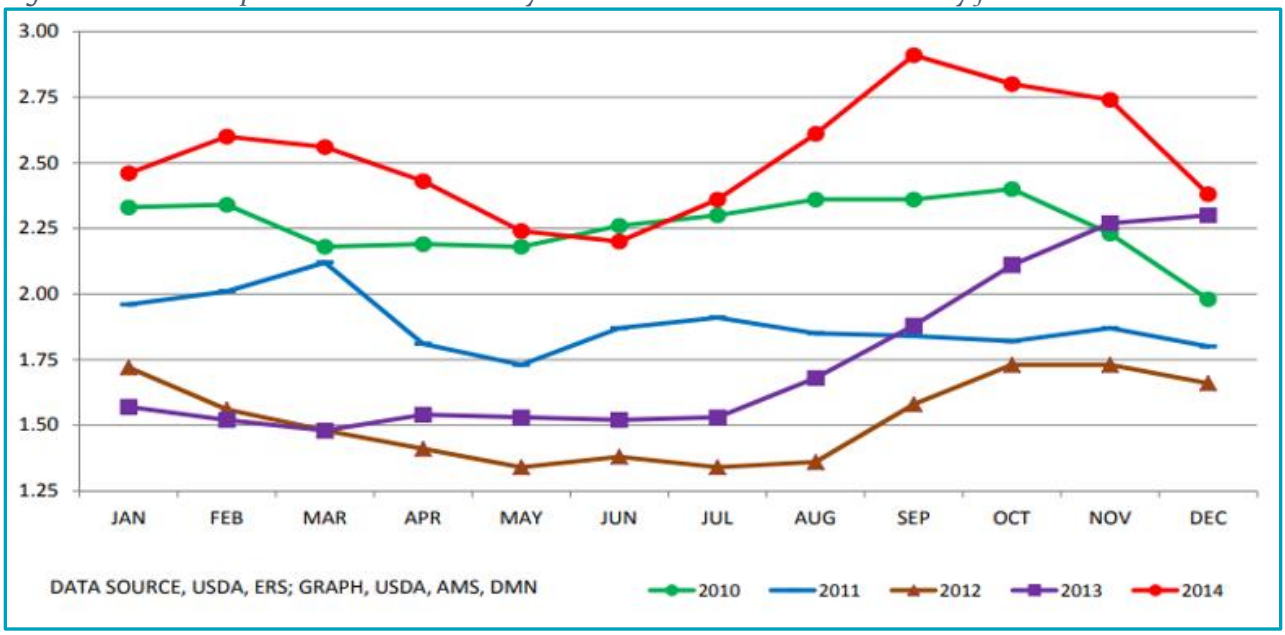
## Milk and Feed Price Data

The milk price is the single most important factor determining dairy farm profitability and it has been increasingly volatile over the past 20 years. The price of grain is also an important factor. For this analysis, milk and grain price data from 2011-2021 for the Northeast were used. The average mailbox milk price over that period was $19.20/cwt for milk that averages 3.9% butterfat (BF) and 3.3% protein. This herd would receive component premiums that averaged at least $1.50/cwt greater than region's mailbox price, resulting in an average milk price of $20.70/cwt for this farm.

Using an average to represent a number that is highly variable can be misleading, so this analysis used a Monte Carlo simulation which calculates the profitability 10,000 times and each time it pulls a milk price randomly from a price distribution based on the data (i.e. using the mean and standard deviation of the milk price data). The Monte Carlo simulation produces a distribution of results (e.g. profit/cwt, profit/cow, etc.) that show the associated probabilities. The Monte Carlo simulation also pulled a grain price and an average milk/cow level (from 14,000 to 16,000 lbs/cow) for each of the 10,000 iterations.

The ratio of milk price to grain price is also important for farm profitability, with a higher ratio being more profitable. The data show that milk and grain prices are positively correlated. The calculated correlation coefficient from the data (0.56) was used in the Monte Carlo simulation. The USDA published milk-to-grain price ratio results for 2010-2014 which ranged from 1.3 to 2.85 (Figure 1) The average ratio across the 10,000 Monte Carlo runs was 1.51, which is near the low-end of the range and is conservative (i.e. will not overestimate profitability).

*Figure 1. Milk:Feed price ratio calculated by USDA-ERS based on 16% CP dairy feed*




## Financial Results

In addition to revenue from milk sales, this farm sells cull cows and heifers, bull calves, and farm-raised replacement animals. The farm revenues can be seen in Table 1 for Years 1 through 5. There is a learning curve with this system for the manager and the animals; Year 5 results represent after getting up the learning curve. Total revenue is $3,493/cow and $23.68/cwt in Year 5.

**Table 1. Farm revenue for Years 1-5**

| Hypothetical Low-Overhead Dairy Grazing Retrofit | | | | | | Cows | CWTs |
|---|---|---|---|---|---|---|---|
| Somewhere, Northeast USA | Profit & Loss Statement | | | | | 240 | 35,404 |
| | Year 1 2022 | Year 2 2023 | Year 3 2024 | Year 4 2025 | Year 5 2026 | Year 5 Avg Per Cow | Year 5 Avg Per CWT |
| **REVENUES** | | | | | | | |
| Farm cash receipts | | | | | | | |
| Milk sales (1) | $672,525 | $697,728 | $719,938 | $731,097 | $731,097 | $3,046 | $20.65 |
| Cull cow sales (2) | $42,000 | $36,961 | $30,240 | $30,240 | $30,240 | $126 | $0.85 |
| Cull heifer sales | $8,652 | $8,972 | $9,463 | $9,690 | $9,690 | $40 | $0.27 |
| Calf sales | $12,096 | $12,544 | $13,230 | $13,548 | $13,548 | $56 | $0.38 |
| Farm-raised replacement sales | $34,720 | $31,360 | $44,800 | $50,400 | $53,760 | $224 | $1.52 |
| **TOTAL REVENUES** | $769,993 | $787,566 | $817,671 | $834,974 | $838,334 | $3,493 | $23.68 |

The farm expenses can be seen in Table 2. Feed costs are the largest expense category at just over $8/cwt. All feed, including grain, haylage, and corn silage (but not grazed pasture) is assumed to be purchased at market prices. In reality, some of the stored forages would likely be produced on the

farm when pasture growth exceeds grazing. Feed costs are inclusive of all youngstock on the farm. The next largest expense is labor at $4.55/cwt. This includes the $55,000/year paid to the owner-operator for his/her labor and management, although most dairy farm financial analyses do not include the opportunity cost of the owner-operator. At 80 cows/worker (i.e. 3 workers for 240 cows), this farm has to be extremely labor efficient. The next biggest costs are farm rent ($2.20/cwt) and depreciation ($1.11/cwt). The total expenses are $3,060/cow and $20.75/cwt. The resulting net farm income (NFI) from operations, which is the primary measure of farm profits, can be seen in bottom row of Table 2. By Year 5, the annual NFI is $103,837 which equals $433/cow and $2.93/cwt.

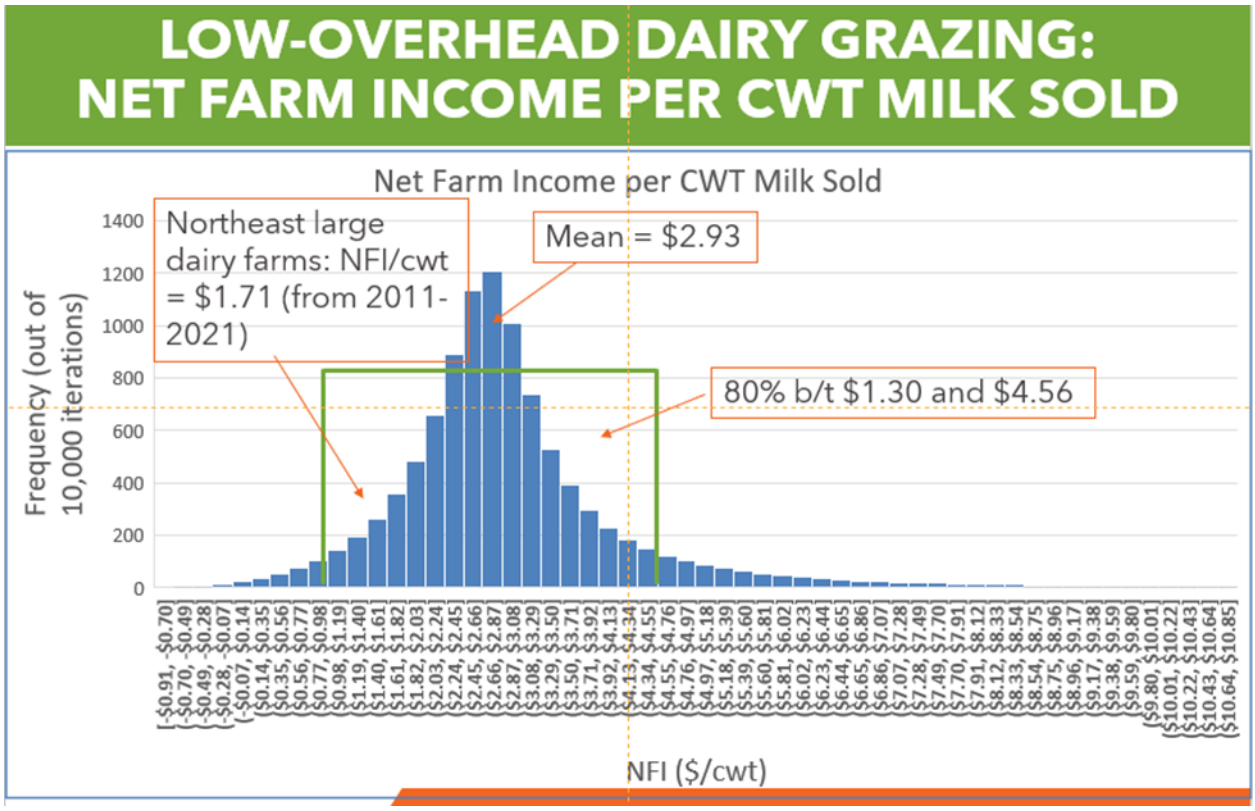
As mentioned above, focusing on the average result does not tell the entire story when there is a lot of variability. Figure 2 below shows the distribution of NFI/cwt across the 10,000 iterations run in the Monte Carlo analysis. The results show that NFI/cwt ranged from $-0.91 to $10.73/cwt. Eighty percent of the iterations resulted in NFI/cwt between $1.30 and $4.56. Figure 1 shows that the further from the average of $2.93, the less likely is that result. Only 0.29% (29 out of 10,000) of the iterations resulted in a negative NFI/cwt.

To put this result in context for the Northeast during the period from 2011-2021 we compare these to results from dairy farm analyses done by Farm Credit East for this period (2011-2021). Their data set averages 385 farms included per year, with an average herd size across these years of 446 cows per farm. The average NFI/cwt is $1.71. The low-overhead dairy grazing results are 71% greater.

**Table 2. Farm expenses for Years 1-5**

| Hypothetical Low-Overhead Dairy Grazing Retrofit | | | | | | Cows | CWTs |
|---|---|---|---|---|---|---|---|
| Somewhere, Northeast USA | Profit & Loss Statement | | | | | 240 | 35,404 |
| | Year 1 2022 | Year 2 2023 | Year 3 2024 | Year 4 2025 | Year 5 2026 | Year 5 Avg Per Cow | Year 5 Avg Per CWT |
| **EXPENSES** | | | | | | | |
| Purchased concentrates (3) | $164,575 | $165,548 | $168,058 | $170,224 | $170,890 | $712 | $4.83 |
| Purchased hay | $80,626 | $80,849 | $81,837 | $82,930 | $83,352 | $347 | $2.35 |
| Purchased corn silage | $47,368 | $47,368 | $47,368 | $47,368 | $47,368 | $197 | $1.34 |
| Labor and mngmnt ind benefits (4) | $148,772 | $151,748 | $154,783 | $157,878 | $161,036 | $671 | $4.55 |
| Bedding | $12,000 | $12,240 | $12,485 | $12,734 | $12,989 | $54 | $0.37 |
| DHIA testing | $6,240 | $6,240 | $6,240 | $6,240 | $6,240 | $26 | $0.18 |
| Semen/breeding | $6,000 | $6,000 | $6,000 | $6,000 | $6,000 | $25 | $0.17 |
| Farm Rent | $78,000 | $78,000 | $78,000 | $78,000 | $78,000 | $325 | $2.20 |
| Repairs (7) | $12,000 | $12,000 | $12,000 | $12,000 | $12,000 | $50 | $0.34 |
| Vet/medicine (8) | $8,400 | $8,400 | $8,400 | $8,400 | $8,400 | $35 | $0.24 |
| Parlor supplies | $8,400 | $8,568 | $8,739 | $8,914 | $9,092 | $38 | $0.26 |
| Utilities | $12,000 | $12,240 | $12,485 | $12,734 | $12,989 | $54 | $0.37 |
| Insurance | $9,600 | $9,792 | $9,988 | $10,188 | $10,391 | $43 | $0.29 |
| Fertilizer (9) | $10,800 | $11,016 | $11,236 | $11,461 | $11,690 | $49 | $0.33 |
| Seed/spray (9) | $7,200 | $7,344 | $7,491 | $7,641 | $7,794 | $32 | $0.22 |
| Custom hire | $15,000 | $15,300 | $15,606 | $15,918 | $16,236 | $68 | $0.46 |
| Truck and fuel | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 | $42 | $0.28 |
| Other expenses | $7,200 | $7,200 | $7,200 | $7,200 | $7,200 | $30 | $0.20 |
| Depreciation: Machinery (10) | $39,294 | $39,294 | $39,294 | $39,294 | $39,294 | $164 | $1.11 |
| Interest (11) | $44,324 | $39,642 | $34,632 | $29,272 | $23,536 | $98 | $0.66 |
| **TOTAL EXPENSES** | $727,799 | $728,788 | $731,842 | $734,396 | $734,497 | $3,060 | $20.75 |
| | | | | | | | |
| **NET FARM INCOME** | **$42,194** | **$58,777** | **$85,829** | **$100,578** | **$103,837** | $432.65 | $2.93 |

**Figure 2. Distribution of net farm income per cwt milk sold (10,000 iterations)**




The rate of return on assets (ROA) represents the efficiency of the farm's assets for producing a profit. Although not widely used by farmers, the ROA allows for comparison with any other kind of investment. This farm produced an average ROA of 10.2% by Year 5. This ROA is helped by renting rather than owning the farm, but even with owning the farm the ROA would be close to 6%. The 2021 Dairy Farm Summary compiled by Farm Credit East shows a 10-year average ROA of 4.0%.

One of the most important financial outcomes of having low overhead costs per cow is the ability to be more responsive and resilient to low milk-to-grain price ratios. Many dairy farms with high overhead costs per cow require high milk production per cow to achieve positive cashflow. When milk prices drop, such farms need to produce more milk to keep cashflow positive. The farm described in this report is more flexible; it can achieve positive cashflow and profitability using grazed pasture forage as the primary feed and producing only 15,000 lbs/cow. When the price of milk is too low relative to the price of grain, this farm could more easily reduce grain feeding (and milk production) without having negative cashflow. Because this farm has less investment in dairy-only infrastructure, it could also consider switching to beef production during a sustained lull in milk prices.

While the financial results described above are encouraging, it is important to understand that such results require a high-level of management. This type of dairy farm will require a highly efficient design, excellent management, and a dogged focus on minimizing overhead costs.

## Impacts Beyond the Farm

A multitude of research projects have shown that dairy grazing provides environmental and social benefits of many kinds. These benefits have value which could be parlayed into premium milk prices, environmental payments, and/or favorable financing terms, each of which would increase the farms profitability.

Maintaining all land in permanent, well-managed pasture can help protect water quality and fight climate change. Cows in a grazing system, with lower milk production, will on average have less incidence of mastitis, require less frequent antibiotic treatment, and will have a longer productive life, which are all benefits for the food system. There can also be benefits for rural communities. More farms that are economically viable in a community will have greater economic multiplier effects and cows out on pasture can create a more aesthetic working landscape that generates more tourism that can help rural regions.

*This analysis was funded by the Northeast Dairy Business Innovation Center under contract #43342. The project's goals are to help interested farmers and others to better understand the financial performance of low-overhead dairy grazing. For more information on these results or on this project, please contact Dr. Jon Winsten at Winsten.VT@gmail.com.*