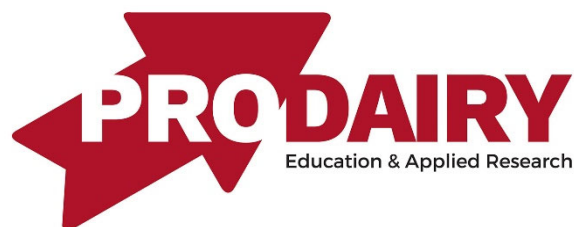


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Dairy Replacement Program: Cost & Analysis Summer 2019



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Dairy Replacement Programs: Costs & Analysis Summer 2019

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As the dairy industry becomes more competitive and farms increase in size, economic performance of the dairy replacement enterprise has become an integral component of farm profitability, and a focus of strategic decisions within the business. The dairy replacement enterprise offers opportunities for decreasing costs, improving efficiencies, and maximizing the quality of the animal entering the dairy herd. The purpose of this project is to identify the costs associated with raising heifers and to highlight the critical expense areas associated with raising dairy replacements.

STUDY METHODOLOGY

When analyzing heifer replacement programs on dairy farms, it has been difficult to generate the actual costs associated with raising dairy replacements as few farms keep records detailed enough to separate expenses between the various enterprises over multiple years.

To estimate the costs to raise dairy replacements, 26 participating farms² completed surveys to collect information concerning the inputs and investments utilized within their replacement programs. This data set is not designed to represent the average raising costs for dairy replacements in New York or the Northeast. The data set represents a descriptive study of costs for the 26 participating farms. Out of the 26 farms that completed the study for all animals being raised, 17 farms raised all of the heifers on their farm, with nine of the farms utilizing custom services to some extent. The data from all 26 farms are summarized for this study, with the costs reflecting amounts spent in each expense category.

¹ The authors would like to thank John Hanchar, Extension Associate, NWN Dairy, Livestock and Field Crops Program, Cornell Cooperative Extension for his comments, edits, and improvements to this project.

² Data compiled by: Lauren Hill, Jason Karszes, Anna Richards and Jessica Skellie, PRO-DAIRY, Cornell University; and Kelsey O'Shea, North Country Regional Agricultural Team, Cornell Cooperative Extension.

To complete the survey, farms used a combination of approaches: 1) They tracked inputs and costs over a short period of time, 2) Analyzed their records over the last year and longer if needed, and 3) Estimated input use to determine expenses and capital investment for inputs that were utilized by the replacement enterprise. This information was collected for each specific group of replacements on the farm, as determined by the participating farm. Heifer groups on participating farms were determined by ration changes, or facility changes as the animals moved through the replacement program. Using all input data collected per group of animals, the average daily raising cost per group was determined. Combining the average daily cost per heifer per group with the number of days in each group determines the total raising costs per animal completing each group. The totals for each group are then summed to determine the total raising costs per heifer completing the replacement program.

With this approach, key assumptions are that prices and amounts of inputs being utilized during the study period would remain the same for the 22 to 24 months that the animal is in the replacement program. With the increasing variability of input prices and seasonal impacts on labor hours, this would not be the case. Costs incurred for a replacement that entered the dairy herd of one of the study farms in December of 2019 would not be expected to equal the current costs as determined by the survey. The input costs for feed, fuel, and bedding have varied almost monthly over the last two years as the animal progressed through the replacement program. Additionally, labor input was captured for the summer months, which doesn't capture additional hours of labor that might be utilized in the winter months for taking care of the animals. However, if the input amounts and prices remained consistent over the two years, then animals completing the replacement program would reflect these costs and serve as a basis for identifying the most significant costs.

The focus of the study was to determine costs for the individual farm participating, utilizing their actual input costs. With this focus in mind, only a few variables were standardized across all farms. The following assumptions were utilized across all participating farms:

- Value of calf entering program \$150
- Opportunity cost 7% nominal rate
- Value of whole milk fed May 2019 farm milk price

TOTAL INVESTMENT IN RAISING THE ANIMAL

Table 1 is a summary of the total costs associated with raising dairy replacements for 26 farms in the Northeast that participated in the cost study during the summer of 2019. This study doesn't represent the average costs associated with raising dairy replacements in New York or the Northeast and only represents what occurred on these 26 farms. However, the data are useful for evaluating the costs associated with dairy replacements. These farms are above average in herd size for New York and the northeast, with an average herd size of 1,254 milking and dry cows.

Table 1

TOTAL COSTS TO RAISE HEIFERS 26 Northeast Dairy Farms, Summer 2019				
Total Cost per Animal Completing	Average	Percent of Total	60 th Percentile Range	
Feed Total	\$1,088	46.2%	\$846	\$1,314
Grown Feed	\$634		\$396	\$838
Purchased Feed	\$454		\$255	\$682
Labor	\$311	13.2%	\$233	\$421
Bedding	\$94	4.0%	\$51	\$144
Health	\$50	2.1%	\$29	\$64
Breeding	\$45	1.9%	\$33	\$59
Maternity Pen	\$18	0.8%	11	26
Trucking	\$1	0.1%	\$0	\$0
Insurance	\$4	0.2%	\$0	\$6
Machinery Operation	\$38	1.6%	\$21	\$59
Machinery Ownership	\$39	1.6%	\$21	\$52
Building Operation	\$25	1.1%	\$10	\$37
Building Ownership	\$137	5.8%	\$88	\$191
Manure Storage Operation	\$0	0.0%	\$0	\$1
Manure Storage Ownership	\$6	0.3%	\$0	\$12
Manure Spreading	\$62	2.6%	\$28	\$90
Custom Boarding	\$146	6.2%	\$0	\$354
Professional Services and Fees	\$18	0.8%	\$0	\$30
Non-Performance Expenses	\$122	5.2%	\$76	\$155
Interest on Daily Investment	\$152	6.4%	\$137	\$165
Total	\$2,355		\$2,094	\$2,607
Number of Heifers	969		203	1,395
Age, Months	22.5		21.8	23.3
Calving Weight, Pounds	1,340		1,262	1,417
Average Daily Gain	1.87		1.73	1.99
All Heifers per Labor Hour	36		21.7	51.1
Pre-Weaned Heifers/Labor Hour	11.4		7.3	13.9
Post-Weaned Heifers/Labor Hour	56.9		30.3	78.2
Total Investment in Animal	\$2,505		\$2,244	\$2,757
% Non-Completion Rate	14.8		9.9	22.1
Cost per Worker	\$50,797		\$42,208	\$57,139

The average total investment that these farm operators had in the animal at first calving was \$2,505 (Table 1). This represents all the costs that were assigned to the dairy replacement enterprise, the initial value assigned to the calf when she entered the system and charges for interest on investment and non-performance. Raising costs averaged \$2,355 per animal, with the initial value of the animal for all farms assumed to be \$150. This value represents an estimate of the cost to get a heifer calf born alive, not the value for which the animal could be sold as a newborn. The 60th percentile range for the raising costs for these 26 farms ranged from \$2,094 to \$2,607. The 60th percentile range represents where the middle 60% of the farms fell and does not include the high or low extremes.

The largest expense was feed costs, representing 46.2% of the total raising costs. Labor was the second largest expense, representing 13.2% of the total raising costs. Interest on investment is the next largest expense at 6.4% of the total, followed closely by custom boarding fees at 6.2%. Building ownership, non-performance expense, and bedding are the next three largest expenses and the only other expenses over 4% of the total. All costs are defined and explained at the end of the paper. Two additional approaches to evaluate the costs associated with raising dairy replacements are to use cost per day per heifer and cost per pound of gain, reported in Table 2 and Table 3, respectively.

COST PER DAY PER ANIMAL

Average raising cost per day per heifer was \$3.45 (Table 2). This cost does not include the initial value of the calf. Sixty percent of the farms were within the \$3.12 to \$3.80 range for costs per day per heifer. Feed cost was \$1.59 per day and labor cost was \$0.45 a day. All remaining costs equaled \$1.41 per day per heifer.

While the average cost per day per animal was \$3.45, there was a large difference in cost per day based on the age of the animal. Changes in feed intake, changes in feed type, labor requirements as the heifer grows, changes in group size, and changes in housing systems all impact this difference. The cost per day per animal averaged over \$6.50 during milk feeding, \$2.20 to \$2.80 from weaning to breeding and \$2.80 to \$3.20 from breeding to moving to close up/calving groups (Figure 1). In the close-up/calving groups, feed cost rose back up to \$5.00. Switching from fluid based feed to a dry feed and from individual or small group housing to larger, loose housing, which decreased labor requirements, were the primary reasons costs dropped over \$4.00 per day per heifer when the animal was weaned. The increase in feed intake around puberty/breeding and the increased feed required to support a growing calf led to the increase in daily cost per day as the heifer approached calving.

Table 2

COST PER DAY PER ANIMAL 26 Northeast Dairy Farms, Summer 2019				
Cost per Day per Animal	Average	Percent of Total	60 th Percentile Range	
Feed Total	\$1.592	46.1%	\$1.207	\$1.955
Grown Feed(Per Animal on Farm)	\$1.246		\$0.793	\$1.399
Purchased Feed (Per Animal on Farm)	\$0.979		\$0.487	\$1.152
Labor	\$0.454	13.2%	\$0.344	\$0.606
Bedding	\$0.138	4.0%	\$0.079	\$0.205
Health	\$0.073	2.1%	\$0.042	\$0.094
Breeding	\$0.067	1.9%	\$0.048	\$0.087
Maternity Pen	\$0.026	0.8%	\$0.016	\$0.036
Trucking	\$0.002	0.1%	\$0.000	\$0.000
Insurance	\$0.006	0.2%	\$0.000	\$0.009
Machinery Operation	\$0.055	1.6%	\$0.032	\$0.083
Machinery Ownership	\$0.057	1.6%	\$0.031	\$0.082
Building Operation	\$0.036	1.1%	\$0.015	\$0.054
Building Ownership	\$0.200	5.8%	\$0.124	\$0.263
Manure Storage Operation	\$0.001	0.0%	\$0.000	\$0.001
Manure Storage Ownership	\$0.009	0.3%	\$0.000	\$0.017
Manure Spreading	\$0.091	2.6%	\$0.042	\$0.13
Custom Boarding	\$0.221	6.4%	\$0.000	\$0.52
Professional Services and Fees	\$0.026	0.7%	\$0.000	\$0.044
Non-Performance Expenses	\$0.177	5.1%	\$0.112	\$0.218
Interest on Daily Investment	\$0.222	6.4%	\$0.206	\$0.240
Total	\$3.452		\$3.121	\$3.800
Number of Heifers	969		203	1,395
Age, Months	22.5		21.8	23.3
Calving Weight, Pounds	1,340		1,262	1,417
Average Daily Gain	1.87		1.73	1.99
All Heifers per Labor Hour	36.0		21.7	51.1
Pre-Weaned Heifers per Labor Hour	11.4		7.3	13.9
Post Weaned Heifers per Labor Hour	56.9		30.3	78.2
Total Investment in Animal	\$2,505		\$2,244	\$2,757
% Non-Completion Rate	14.8		9.9	22.1
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Cost Per Pound of Gain

The average raising cost per pound of gain was \$1.886, with an 60th percentile range of \$1.710 to \$2.107 (Table 3). This cost was based on an average of 1.87 pounds of gain per day, with an 60th percentile range of 1.73 to 1.99 pounds per day. The average daily rate of gain was based on a combination of actual and estimated weights at birth and at calving as more farms are utilizing scales within the replacement program. Feed costs were \$0.867 per pound of gain, ranging from \$0.649 to \$1.061 per pound of gain. Labor costs contributed another \$0.249 per pound of gain, with all remaining expenses equaling \$0.770.

The average cost per pound of gain by weeks of age followed the same trend as did the cost per day per heifer: \$3.30 to \$3.40 per pound of gain prior to weaning, \$1.30 to \$1.50 range per pound of gain from weaning to breeding, approximately \$1.90 around breeding, and approaching \$2.00 from breeding to calving (Figure 1). Feed and labor costs had the largest impact on costs as the heifer grew. These two costs represent 59.2% of the total raising cost of a heifer. Feed costs were in the \$1.60 per lb. of gain range prior to weaning, lowered into the \$0.60 to \$0.70 per lb. of gain range after weaning, and steadily increased towards \$1.00 per pound of gain as the animal neared calving (Figure 2). Switching to a non-fluid based feed when the animal was weaned lowered feed costs. The biological changes in body composition and organ size that the animal went through during puberty and breeding led to a higher feed cost per pound of gain.

Table 3

COST PER POUND OF GAIN 26 Northeast Dairy Farms, Summer 2019				
Cost per Pound of Gain	Average	Percent of Total	60 th Percentile Range	
Feed Total	\$0.867	46.0%	\$0.649	\$1.061
Grown Feed	\$0.690		\$0.417	\$0.731
Purchased Feed	\$0.555		\$0.236	\$0.676
Labor	\$0.249	13.2%	\$0.181	\$0.338
Bedding	\$0.075	4.0%	\$0.043	\$0.109
Health	\$0.040	2.1%	\$0.022	\$0.053
Breeding	\$0.036	1.9%	\$0.026	\$0.047
Maternity Pen	\$0.014	0.8%	\$0.009	\$0.021
Trucking	\$0.001	0.1%	\$0.000	\$0.000
Insurance	\$0.003	0.2%	\$0.000	\$0.005
Machinery Operation	\$0.030	1.6%	\$0.017	\$0.046
Machinery Ownership	\$0.031	1.6%	\$0.017	\$0.045
Building Operation	\$0.020	1.1%	\$0.008	\$0.029
Building Ownership	\$0.110	5.8%	\$0.069	\$0.156
Manure Storage Operation	\$0.000	0.0%	\$0.000	\$0.001
Manure Storage Ownership	\$0.005	0.3%	\$0.000	\$0.009
Manure Spreading	\$0.050	2.7%	\$0.024	\$0.068
Custom Boarding	\$0.121	6.4%	\$0.000	\$0.272
Professional Services and Fees	\$0.014	0.7%	\$0.000	\$0.024
Non-Performance Expenses	\$0.097	5.2%	\$0.064	\$0.127
Interest on Daily Investment	\$0.121	6.4%	\$0.106	\$0.136
Total	\$1.886		\$1.710	\$2.107
Number of Heifers	969		203	1,395
Age, Months	22.5		21.8	23.3
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Figure 1

**Average Heifer Total Costs
26 Northeast Dairy Farms, Summer 2019**

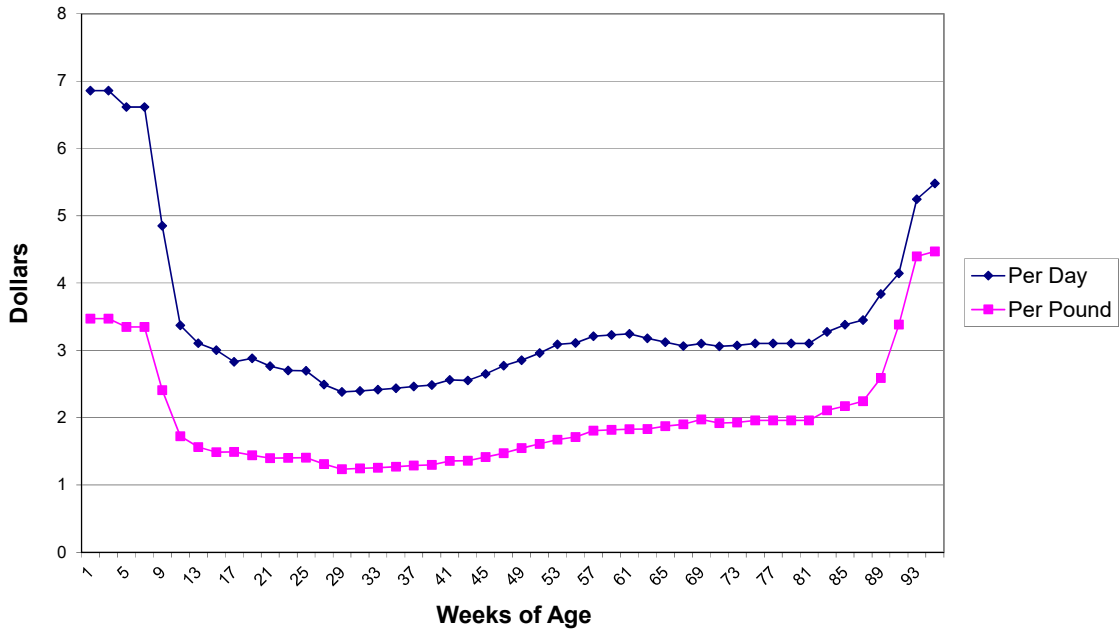
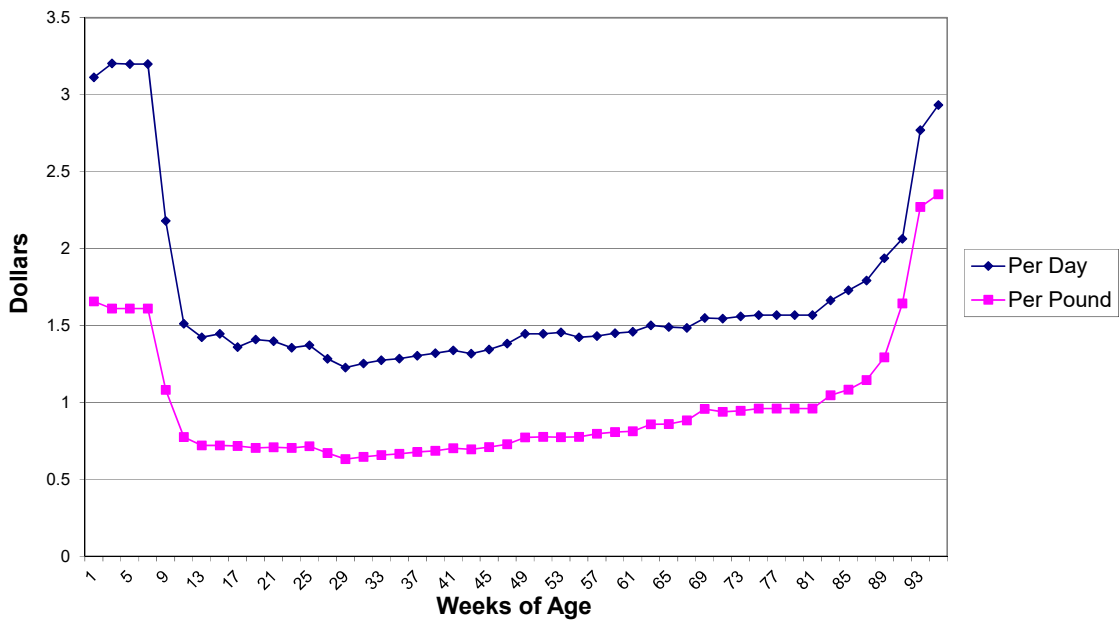


Figure 2

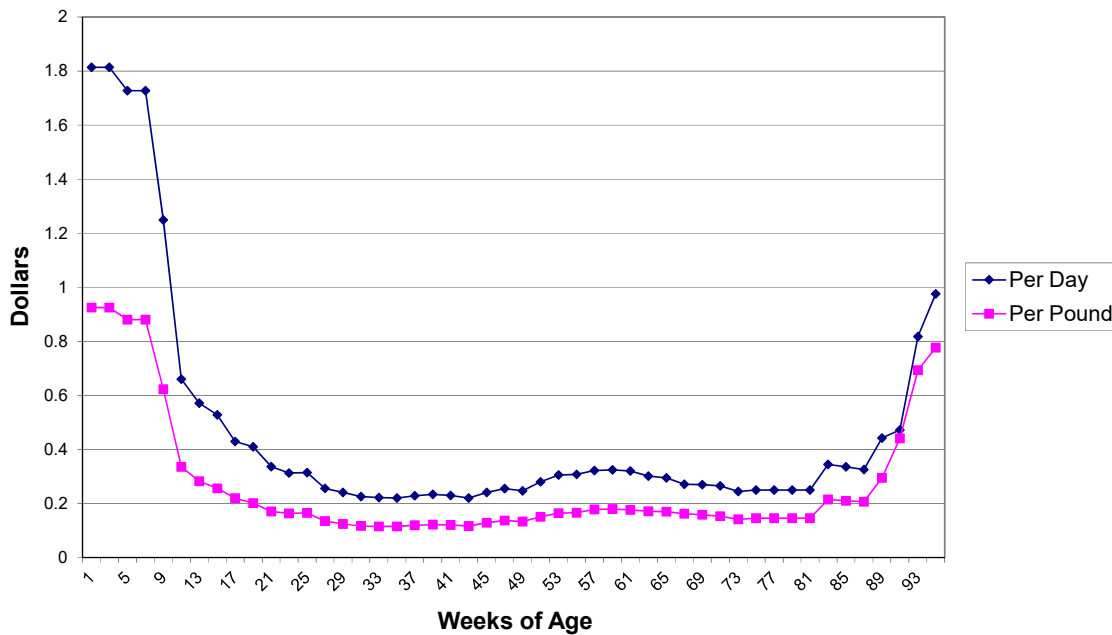
**Average Heifer Feed Costs
26 Northeast Dairy Farms, Summer 2019**



Labor costs demonstrate the impact of changing labor requirements on costs of raising heifers (Figure 3). Labor costs started at just over \$1.70 per day per animal during milk feeding, then dropped dramatically to approximately \$0.22 per day per animal after the animal was weaned. Around puberty and breeding, labor increased slightly, and then fell back down to around to the low \$0.20s per day until entering close-up calving groups (Figure 3). This reflects the decrease in labor required to maintain heifers after weaning.

Figure 3

**Average Labor Costs
26 Northeast Dairy Farms, Summer 2019**



BREAKDOWN OF EXPENSES BY STAGE OF GROWTH

The periods from birth to weaning, weaning to puberty, puberty to breeding, and breeding to calving were used to further analyze dairy replacement programs. Table 4 shows the breakdown for each of these groups by weight, the average cost per pound of gain, and the average total raising costs per heifer. Costs are broken down into feed costs, labor costs, and all other costs.

The period of birth to 200 pounds represented 15.4% of the total costs, but only accounted for 8% of the weight gain, with an average cost per pound of gain of \$3.31. The weaning to puberty period was 38% of the growth of the animal, but only 31.3% of the total cost. This equated to an average of \$1.48 cost per pound of gain. The breeding stage added another 12% of growth, and 10.2% of cost, with this stage averaging \$1.60 cost per pound of gain. The greatest cost occurred while the animal was pregnant, representing 43.1% of the total cost and 35% of the growth. The average cost per pound of gain during this stage was \$2.20.

Table 4

Breakdown of Costs of Raising Heifers by Stage of Growth 26 Northeast Dairy Farms, Summer 2019				
Cost in Dollars Per Pound of Gain	Stage of Growth			
	Birth to 200 lbs	201-700 lbs	701-850 lbs	851-Calving
Feed	\$1.57	\$0.68	\$0.70	\$0.96
Labor	0.86	0.18	0.13	0.23
All Other Costs	0.88	0.62	0.77	1.01
Total	\$3.31	\$1.48	\$1.60	\$2.20
Total Raising Cost in Dollars Per Animal	Stage of Growth			
	Birth to 200 lbs	201-700 lbs	701-850 lbs	851-Calving
Feed	\$172	\$342	\$105	\$443
Labor	95	88	18	92
All Other Costs	97	310	116	469
Total	\$364	\$739	\$240	\$1,017
% of Total Cost	15.4%	31.3%	10.2%	43.1%
% of Total Growth	8%	38%	12%	35%

FEED COSTS

Feed cost was the largest expense associated with raising heifers. With an average of \$1,088 per heifer, feed cost represented 46.2% of the total costs associated with the dairy replacement program. To further analyze feed costs, costs were:

- determined for the period when the animals were on the farm, and, for any period when animals were off-farm in the care of a custom provider of housing and labor, and for which the heifer owner provided all feed.
- broken down between grown and purchased feed (Table 5).

Please note that these numbers will be slightly higher than the costs reported in Tables 2 and 3 as they will represent the feed costs while the animal was on the farm and on feed that is included in the feed expense. The feed costs reported in Tables 2 and 3 are correct for the breakdown of where costs were incurred to grow the heifer on a per day or per pound of gain basis for the participating farms. They do not represent what the animal actually consumed to grow as time spent and weight gained at the custom grower are not included in these tables. However, the feed that was provided by the custom grower is included in the custom boarding expense. Data are summarized from the 22 farms that provided all feed for the dairy replacements.

Grown feed, which includes corn silage, haylage, dry hay, and any grain that was grown on the farm, along with raw milk if fed to wet calves, averaged \$685 per heifer, or 58.8% of the total feed costs. The 60th percentile range was from \$496 to \$856 per heifer. For this study, producers valued grown forages based upon estimates of their costs to grow and harvest the forages.

Purchased feed, which includes milk replacer, all purchased grains, and any purchased hay, averaged \$482 per heifer, or 41.3% of the total feed costs. The 60th percentile range was from \$297 to \$678 per heifer. The majority of farms participating in this study did not feed any purchased corn silage or haylage, with only one farm feeding purchased haylage. For purchased ingredients, an average of the prices paid over a 3 month period was utilized to determine the price per ton.

Table 5

Feed Summary 22 Northeast Dairy Farms, Summer 2019				
	Average	60 th Percentile Range		
Daily Weight Of Gain, On-Farm ³	1.83	1.72	1.94	
Feed Conversion Ratio (Lbs of Gain/Lbs of DM)	0.111	0.096	0.128	
Average Daily Dry Matter Intake per Animal	16.95	15.02	18.97	
Feed Cost per Day per Animal, On-Farm	\$1.70	\$1.54	\$1.97	
Feed Cost per Pound of Gain, On-Farm	\$0.929	\$0.82	\$1.06	
Feed Cost per Lb. of Dry Matter	\$0.101	\$0.093	\$0.107	
Total Days Analyzed	689	667	714	
Total Feed Costs per Animal Completing System	\$1,168	\$1,044	\$1,317	
Grown Feed vs Purchased				
Per Animal Completing				
Grown Feed	\$677	57.9%	\$446	\$856
Purchased Feed	\$492	42.1%	\$297	\$707
Per Animal per Day				
Grown Feed	\$0.99		\$0.65	\$1.26
Purchased Feed	\$0.71		\$0.44	\$1.03
Per Pound of Gain				
Grown Feed	\$0.535		\$0.361	\$0.672
Purchased Feed	\$0.394		\$0.244	\$0.545
Number of Animals On Feed	993		201	1,479
Weight Gained in System, On Farm, Pounds	1,254		1,195	1,329

³Information summarized for the period when the animal was on farm and consuming feed or the feed was provided to the custom grower if animal housed off-site.

WHOLE MILK AND MILK REPLACER COSTS

One of the most significant feed factors while raising replacements is when the animal is on liquid feed. For these 26 farms, 17.6% of the total feed cost in this study was due to the value of the whole milk or milk replacer fed, and 7.7% of the total costs to grow the replacement heifer. Out of these 26 farms, seven were feeding milk replacer, using an average of 1.82 lbs. of powder per calf per day for 83.1 days. With an average cost of \$2,660 per ton, this equaled \$2.43 per animal per day for the milk replacer.

Thirteen farms fed whole milk only to their calves, feeding on average 16.1 lbs. of milk per calf per day over 64.5 days. For this study, milk fed to calves was charged at the farm's milk price for the month of May 2019, which averaged \$17.37 per cwt. With \$17.37 per cwt of milk equaling \$348 per ton, this equates to \$2.83 per calf per day for the whole milk. This feed cost doesn't include any costs for pasteurizing the milk, which some of the farms utilized. Pasteurization costs would be included in the appropriate expense's areas, such as supplies, machinery, and utilities.

Six farms fed a combination of whole milk and milk replacer to their calves. These farms fed on average 1.6 lbs. of dry matter from whole milk, and 0.72 lbs. of dry matter from milk replacer for 58.9 days. Total liquid feed cost per day per animal equaled \$3.25 per animal per day, with whole milk being \$2.32 per day, and milk replacer \$0.94 per day.

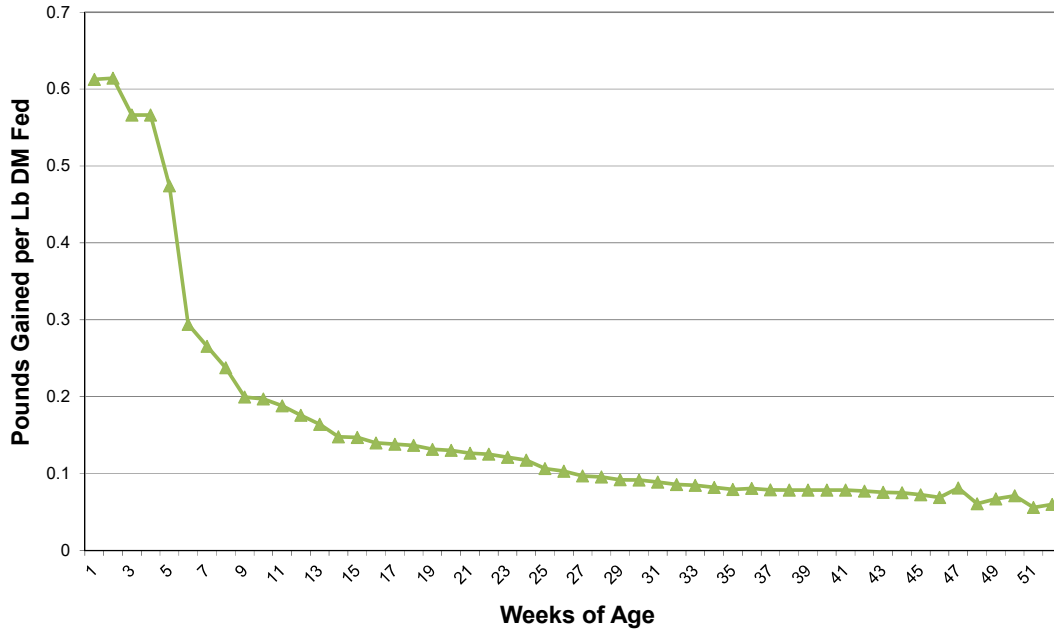
For the purpose of this study, the price received for the month of May was used for all farms feeding whole milk, which averaged \$17.83 per cwt. For the purposes of comparing to the cost of milk replacer, all milk was assumed to be 100% saleable. However, the whole milk used on these farms was made up of a combination of saleable and waste milk. Of the 19 farms that fed whole milk, 49% of the milk fed was considered saleable and 51% was considered waste milk. The spread ranged from 100% waste milk to 100% saleable milk. There is continued debate on what value should be assigned to waste milk fed to calves.

For these farms feeding whole milk that was considered waste milk, the feed costs were re-calculated utilizing \$2 per cwt. or \$40 per ton, for the portion of the milk that was considered waste. This change in the cost of the whole milk that was waste milk lowered total costs to raise the animal by \$120.47 per animal for these farms. This is a difference of \$95.45 in feed costs, and \$25.02 in opportunity costs.

Feed conversion plays an important role in determining feed costs for raising dairy replacements. Figure 4 shows how feed conversion changed as the animals moved through the dairy replacement program. While on liquid feed, the animals averaged the highest conversion ratio for feed delivered to the animal. When the animal transitioned from liquid feed to dry feed, and as the animal grew, feed conversions slowed down, steadily decreasing as the animal got larger and older.

Figure 4

Average Feed Conversion
Pounds of Gain per Lb of Dm Fed
26 Northeast Dairy Farms, Summer 2019



LABOR EFFICIENCY

Labor expense was the second largest expense associated with raising heifers and the expense with the greatest range. Measuring labor efficiency is one way to analyze how well labor is being utilized. To analyze labor associated with dairy replacements, a measure called “heifers per labor hour,” is used. Heifers per labor hour measures how many dairy replacements are taken care of in one labor hour. This measure includes time to feed, clean, bed, move, and manage heifers. The higher the value, the more efficiently labor is being utilized. To calculate the measure, the total number of hours of labor used was determined, placed on a per day basis and then divided into the average daily number of heifers on the farm.

The average heifer per labor hour for these 26 Northeast dairy farms was 36.0, with the highest quarter of efficiency farms averaging 56.7. The average for the lowest quarter of efficiency farms was 18.7. (Table 6). To further analyze labor efficiency within the dairy replacement program, heifers per labor hour was determined for pre-weaned and post-weaned animals. The average pre-weaned heifers per labor hour were 11.4, while post-weaned heifers per labor hour was 56.9.

The difference between the highest efficiency group and the other three groups for pre-weaned heifers per labor hour was a third higher, averaging 14.4 heifers per hour. The difference for the post-weaned heifers was even greater, with the lowest group averaging 28.5 heifers per labor hour and the highest group averaging 93.8 heifers per labor hour.

Table 6

Labor Evaluation 26 Northeast Dairy Farms, Summer 2019					
	Average	Lowest Quarter	2 nd Quarter	3 rd Quarter	Highest Quarter
Number of Heifers	969	648	659	1,447	1,148
All Heifers per Labor Hour	36.0	18.7	28.5	39.6	56.7
Pre-Weaned Heifers/Labor Hour	11.4	10.2	10.8	9.8	14.4
Post-Weaned Heifers/Labor Hour	75.8	28.5	40.9	62.8	93.8
Corresponding Labor Costs/Animal	\$311	\$348	\$367	\$322	\$215
Cost per Worker Equivalent	\$50,797	\$45,991	\$51,873	\$53,017	\$52,777
Worker Equivalents per 1,000 Heifers	3.7	7.1	4.6	3.3	2.3

A second method used to measure the total labor requirements for the dairy replacement enterprises was calculating worker equivalents for the enterprise. On these 26 Northeast dairy farms, an average of 2.14 worker equivalents was used within the heifer enterprise, standardized to 1,000 dairy replacements being raised. One worker equivalent is defined as one person working 55.2 hours per week for 50 weeks, or a total of 2,760 hours per year. Using the number of 1,000 heifers, the average high efficiency group would need 2.3 worker equivalents. The average low efficiency group would need 7.1 worker equivalents. The third measure used to evaluate labor was total labor cost, which averaged \$311 per animal and ranged from \$215 to \$367.

Considering the relationships among these measures indicates potential cost reductions on dairy farms. As heifers per labor hour increased, worker equivalents decreased and total costs of labor per animal decreased. If labor efficiency can be improved, less labor will be required in the heifer enterprise and the cost of raising heifers will decline.

With nine farms utilizing custom services, all labor hours aren't reflected in the labor efficiency across the 26 farms as the labor provided by the custom boarder isn't reflected in the labor hours. For the 17 farms that provided all of the labor to raise the dairy replacement, the average heifers per labor hour equaled 41.4 with an 60th percentile range of 26.9 to 55.4 (Table 7).

Table 7

Labor Summary 17 Northeast Dairy Farms Providing all Labor to Raise Dairy Replacements Summer 2019			
		60 th	
	Average	Percentile Range	
Heifers per Weighted Daily Labor Hour	41.4	26.9	55.4
Cost per Heifer Per Day	\$0.48	\$0.34	\$0.64
Cost per worker Equivalent	\$51,128	\$42,492	\$57,626
Pre-Weaned Heifers per Hour	11.3	6.9	14.0
Post-Weaned Heifers per Hour	66.9	39.6	91.6

Health and Turnover

Health expenses were another aspect of the heifer raising program that was analyzed. The health cost summary includes the costs for preventative vaccines, treatments, veterinarian health checks, hoof trimming, and foot baths that are associated with the care of the dairy replacements. Table 8 below shows that the greatest portion of the health care expenses was the preventative costs category which accounts for 58.5% of the total health care costs.

For the 26 Northeast dairy farms that participated in the study, health costs accounted for 2.1% of the total cost to raise heifers. The 60th percentile range for the cost per animal per day for health expenses was \$.042 to \$.094. The cost per animal completing the program had an 60th percentile range of \$28.50 to \$64.30.

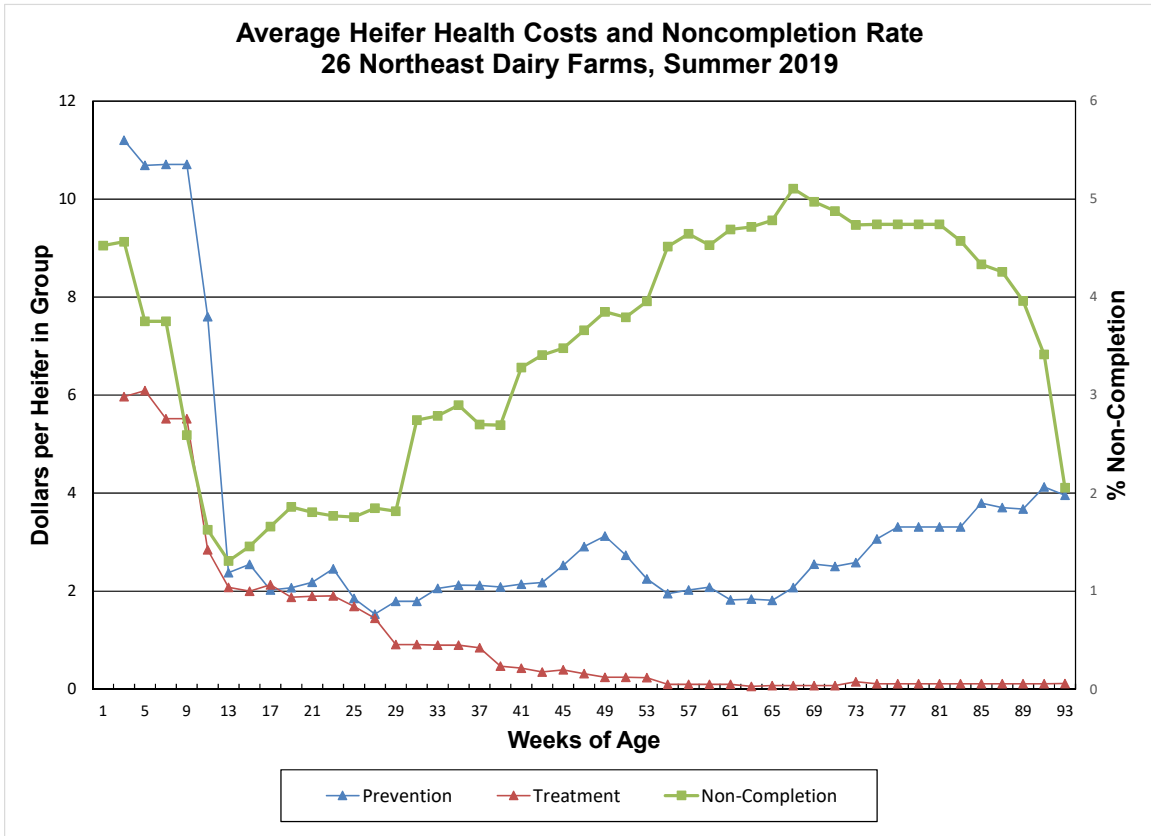
Herd turnover data was collected by recording the number of heifers that left each group over a 12 month range. The replacements that left the herd were categorized as died, sold for beef, or marketed as a dairy replacement. The average non-completion rate for the 26 participating farms was 14.8% with an 60th percentile range of 9.9% to 22.1%. The non-completion rate doesn't include animals sold as dairy replacements. A non-performance expense was calculated to determine the cost of the time and money that was invested in an animal that died on the farm or was sold before completing the replacement program. This number was based on the number of days the animal was on the farm and the cost per day for the groups on the farm. The average non-performance expense per animal completing the system was \$121.60 with an 60th percentile range of \$75.80 to \$154.50.

Table 8

Health Summary 26 Northeast Dairy Farms, Summer 2019			
Per Animal Per Day	Average	60th Percentile Range	
Preventative	\$0.043	\$0.023	\$0.056
Treatment	\$0.015	\$0.003	\$0.026
Veterinary	\$0.003	\$0.000	\$0.009
Hoof Care	\$0.012	\$0.000	\$0.021
Total	\$0.073	\$0.042	\$0.094
Per Pound of Gain			
Preventative	\$0.023	\$0.013	\$0.030
Treatment	\$0.008	\$0.002	\$0.015
Veterinary	\$0.002	\$0.000	\$0.005
Hoof Care	\$0.006	\$0.000	\$0.053
Total	\$0.040	\$0.022	\$0.053
Percent of Total			
Preventative	58.5%		
Treatment	20.9%		
Veterinary	4.7%		
Hoof Care	15.9%		

Table 9 represents the relationship between heifer health costs and non-completion rate by weeks of age. Non-completion rate was the highest during the wet calf stage of 1-4 weeks of age and again at about 67 weeks of age, which was most likely attributed to poor breeding performance. The most expensive period of time for treatments and vaccinations was the first 12 weeks of age and as heifers get older treatment rates decreased. There are small increases in dollars spent for preventative purposes right before breeding and again right before calving.

Table 9.



TOTAL ECONOMIC COST

The approach taken for summarizing the costs associated with raising heifers in this project includes economic costs for all inputs that are utilized by the dairy replacement program, a full cost allocation approach. Non-performance expense and interest on investment are economic charges that are assigned to the replacement program. Ownership costs associated with capital investment are non-cash costs that are also assigned to the replacement program. The cost value assigned to the forage that is utilized by the replacement program may or may not accurately reflect the costs of production for the feed on the participating farms.

For dairy farms that also raise their own heifers, there may be some synergies associated with combining the replacement program with the dairy enterprise. Some potential synergies are:

- The ability to manage forage inventories to feed lower quality forage to the replacement program, while maximizing the quality of forage fed to the dairy cattle.
- A potential use for feed refusals from the dairy herd.
- The potential to fully utilize management resources on the farm.
- The ability to spread fixed costs over more activities.
 - Utilize machinery more fully
 - Utilize existing facilities
 - Utilize available land base

While potential synergies exist for farms that are raising dairy replacements, synergies will vary in value for individual farms. Too, these values are difficult to estimate. Some of the questions that have come up when discussing this topic with individual farms are:

- What is the value obtained by having the ability to not feed the lowest quality feed to the milking herd while still feeding it to the heifers?
- How much is it really costing to produce all the feed needed for both milking age animals and replacements while properly handling the manure?
- Are other cost areas, such as high labor costs due to poor facility designs, offsetting synergies that may be present?

For farms that are analyzing their dairy replacement program and thinking about changing heifer raising practices, or thinking about whether they should be even raising their heifers, these are important questions to think about. Determining the economic costs associated with the dairy replacement program is always the first step in analyzing the replacement program.

SUMMARY

Dairy replacement programs within dairy farms are one of the largest expenses within the dairy. For these 26 above average herd size farms, dairy replacements entered the milking herd with a total investment of \$2,505 per animal, including the value of the animal when it was born. These animals are calving at 22.5 months of age and weighing 1,340 pounds. The animals averaged 1.87 pounds of gain per day at a total raising cost of \$3.45 per day per heifer, or \$1.89 per pound of gain.

Feed costs were the most significant cost, followed by labor. These two costs comprised 59.4% of the total cost to raise a dairy replacement. Significant changes in cost per day per heifer and per pound of gain occurred when the animal was weaned and when the animal went through puberty. There was also a large range in total costs to raise heifers, with the 60th percentile range from \$2,094 to \$2,607.

Labor efficiency on these farms is considered to be above average and equaled 36.0 heifers per labor hour. Housing systems used, design, and location played a significant role in determining the labor efficiency for the replacement enterprise.

The results reported from this study are considered to reflect above average heifer management systems, and only represent the results achieved by the 26 participating farms. Size of operation, housing system, rate of gain, calving age, and level of management all impact the total cost to raise a dairy replacement. Depending upon these factors, individual farms may or may not achieve the performance levels achieved by these 26 farms.

Explanation of Expenses Calculated

Feed

Feed expense is the cost of all feed that is fed to the animal, by group as defined by the participating farm. Feed usage is based on the average amount fed per day per animal for each group. The cost is determined by utilizing costs associated with growing forages, 3 month averages for purchased grain & concentrates, purchased hay & milk replacers, and market price received for per cwt. for whole milk to reflect the opportunity cost of the net milk price for milk sold.

Labor

Labor expense is the cost of the labor used during the year in the heifer enterprise. The cost is based on the number of hours per day spent on the different groups of heifers and the hourly wage rate, including all benefits. Daily, weekly, and monthly labor requirements by employee and task were determined to develop the number of hours of labor utilized within the replacement program. Labor hours associated with producing feed or spreading manure from storage wasn't counted in this expense.

Bedding

Bedding expense is the cost of the bedding used for the group. This cost is determined by the number of times the group is bedded, the amount of bedding used each time, and the purchase price of the bedding, or the cost of production if grown on the farm.

Health

Health expense is the cost of all health related expenses that can be attributed to the animals while in specific groups. These expenses can include vaccinations, worming programs, and veterinarian health checks, hoof trimming, foot baths, and other expenses incurred for every animal. This expense also includes treatments used during the year to treat individual animals for specific issues, such as scours, along with supplies utilized to treat animals.

Breeding

Breeding expense is the cost of getting the animal pregnant. This number consists of the breeding costs associated with artificial insemination along with the costs of a bull. The artificial insemination costs consist of the average semen cost and service fee weighted by the conception rate. The cost of the bull is determined by the original cost of the bull along with the amount per day that it costs to maintain the bull on the farm.

Maternity Pen

Maternity pen expense includes the labor associated with feeding colostrum, dipping navels, ear tagging, giving boluses, applying dehorning paste, moving the calf to the first 'group', and any management tasks that are performed while the calf is still in the maternity pen (entering data into the computer, etc.).

Trucking

Trucking expense is the cost associated with the use of custom livestock transportation services.

Insurance

Insurance expense is the cost of any insurance that is carried on dairy replacements. This doesn't include insurance expenses associated with buildings or machinery.

Machinery Operation

Machinery operation expense is the cost of the equipment associated with the feeding, bedding, and manure removal for the heifers. The cost includes the cost of fuel, oil, and repairs, which are determined from actual records or based on horsepower, life, and cost of machinery. Machinery costs were assigned to different groups of heifers based on usage levels.

Machinery Ownership

Machinery overhead expense includes the fixed costs associated with the equipment used in the heifer enterprise. These costs are the depreciation, opportunity interest costs, and the insurance on the equipment. The costs are determined from farm records or estimated from the amount of investment and useful life of the equipment, and assigned to the appropriate group based on usage.

Building Operation

Building operation expense includes the repair costs of maintaining buildings, fences, etc., along with utility costs. Building operation expenses were determined by facility and assigned to the appropriate group.

Building Ownership

The building overhead expense includes the fixed costs associated with the buildings used by the heifer enterprise. These costs include depreciation, opportunity interest, taxes, and insurance. The cost were determined by facility and assigned to the appropriate group.

Manure Storage Operation

Manure storage operation expense includes the repair and utility costs associated with maintaining manure storages. The costs were determined by storage complex and assigned to the appropriate groups of heifers.

Manure Storage Ownership

Manure storage ownership expense includes the fixed costs associated with the manure storage complex. These costs include depreciation, opportunity interest, taxes, and insurance. The cost were determined by storage complex and assigned to the appropriate group of heifers.

Manure Spreading

Manure spreading expense is the expense associated with spreading heifer manure back onto the land. Costs were determined by number of loads spread per year, loads per hour,

and cost per hour for manure spreading operations. Costs were determined by storage complex or spreading operation and assigned to the appropriate group.

Professional Services and Fees

Professional services and fees expense includes those costs associated with forage testing, nutritional consulting, and business consulting assigned to all heifers within the replacement program.

Non-Performance Expense

Non-performance expense is the cost of the time and money that was invested in an animal that died on the farm or was sold before completing the replacement program. This number is based on the number of days the animal was on the farm and the cost per day for the groups on the farm. The expense for the animal(s) that died or were sold as non-performers is assigned to the animals in the group from which the animal leaves.

Interest on Investment

Interest on investment expense is the interest cost for the operating capital that is invested in the animals over time. It is based on an annual rate of return of seven percent, the beginning value of the animal, and the average investment in the animal by group. This expense doesn't include the costs associated with capital investments in buildings and machinery, which are calculated in the corresponding ownership cost areas.

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OTHER A.E.M. EXTENSION BULLETINS

EB No	Title	Fee (if applicable)	Author(s)
2020-08	Dairy Replacement Programs: Costs and Analysis Summer 2019		Karszes, J. and Hill, L.
2020-07	Dairy Farm Business Summary New York State 2018		Karszes, J, Hill, L, Christman, A, and Knoblauch, W.
2020-06	Sensitivity Analysis of Profits for V. Vinifera Grapes in the Finger Lakes Region of New York - 2019		Davis, T., and Gomez, M.
2020-05	Progress of the Dairy Farm Report Selected Financial and Production Factors Dairy Farm Business Summary New York State, 2019 153 Farms		Karszes, J., Hill, L., and Knoblauch, W.
2020-04	Business Tools for NYS Berry Growers		Williams, K., Kalaitzandonakes, M., Gómez, M.
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2020-01	Cost of Establishment and Production of V. Vinifera Grapes in the Finger Lakes Region of New York - 2019		Davis, T., Gómez, M., Moss, R., Walter-Peterson, H.
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