

# Dairy Replacement Programs: Costs & Analysis December 2007



**Jason Karszes  
Cathy Wickswat  
Frans Vokey**

**Department of Applied Economics and Management  
College of Agriculture and Life Sciences  
Cornell University  
Ithaca, New York 14853-7801**

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**Jason Karszes**  
**Senior Extension Associate, PRO-DAIRY**  
**Department of Applied Economics and Management**  
**College of Agricultural and Life Sciences**  
**Cornell University**

**Cathy Wickswat**  
**Farm Management & Dairy Extension Educator**  
**Cornell Cooperative Extension of Rensselaer County**

**Frans Vokey**  
**Dairy Extension Educator**  
**Cornell Cooperative Extension of Lewis County**

As the dairy industry becomes more competitive and farms increase in size, economics of heifer management has become an integral component of farm profitability and will be utilized in making strategic business decisions within the business. The dairy replacement enterprise offers opportunities where costs can be decreased, efficiencies improved, and quality of animal entering the dairy herd maximized. The purpose of this paper is to review the costs associated with raising heifers and to highlight the critical expense areas associated with raising dairy replacements.

## **STUDY METHODOLOGY**

When analyzing dairy replacement programs on dairy farms, it has been difficult to generate accurate values of costs associated with raising dairy replacements as few farms keep detailed records to separate expenses between the various enterprises.

To estimate the costs to raise dairy replacements, surveys have been utilized by 17 participating farms to collect information concerning the inputs and investments utilized within the replacement program. This data set is not designed to represent the average raising costs for dairy replacements in New York, but is a descriptive study of what costs are for the 17 participating farms.

A combination of approaches was utilized by the farms to complete the survey. Approaches included tracking the individual heifer groups over a period of time for input use, analysis of records over the last year or more, and capital investments incurred. This information was collected by grouping of replacement animals on the farm, as determined by the participating farm. A group was primarily determined by different rations being fed, and secondly by when animals switched facilities. With all the input data collected per group, 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, the key assumption is the price for inputs being utilized during the study period would remain the same for the 23 to 24 months that the animal is in the replacement program. With the rapidly increasing variability of input prices, this has not been case. A replacement that entered the dairy herd of one of the study farms in December 2007 didn't cost what the survey determined the current costs to be. The input costs for feed and bedding were considerably lower two years ago when the animal entered the replacement program than today when they complete the program. However, if the input prices remain consistent over the two years, animal's completing the replacement program would have these costs.

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

- Value of calf entering program \$150
- Opportunity Cost 8%
- Value of corn silage, as fed basis \$30 per ton
- Value of haylage, as fed basis \$40 per ton
- Value of owner labor utilized for management purposes \$25 per Hour

**TOTAL INVESTMENT IN RAISING THE ANIMAL**

Table 1 is a summary of the total costs associated with raising dairy replacements for 17 farms in New York that participated in the cost study in late 2007. While this study doesn't represent the average costs associated with raising dairy replacements in New York and only represents what occurred on seventeen farms, the data can be used as a guide to evaluate the costs associated with dairy replacements. These farms are above average in herd size and are considered to have high quality dairy replacement programs. The average calving age for the farms on the study was 22.9 months.

The average total investment that these farm operators had in the animal at calving was \$1,884. This represents all the costs that were assigned to the dairy replacement, the initial value assigned to the calf when she entered the system and charges for interest on investment and non-performance. Raising costs averaged \$1,734 per animal, with the initial value of the animal for all farms assumed to be \$150. This 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 inter-quartile range for the raising costs for these 17 farms ranged from \$1,598 to \$1,867. The inter-quartile range represents a middle range of values reported and does not include the high and low extremes. For each of the three tables, the inter-quartile range is sorted independently to show the middle range for each expense item. Therefore, they can't be summed, as no one farm is represented in the high or low for each expense item.

The largest expense was feed costs, representing 51% of the raising costs. Labor was the second largest expense, representing 14% of the raising costs. Interest on investment is the next largest expense at 8% of the total, followed by building ownership costs at 7%. 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 cost per day per heifer and cost per pound of gain. Table 2 summarizes the costs per day per animal. Table 3 summarizes the costs on per pound of gain basis.

### **COST PER DAY PER ANIMAL**

Average raising cost per day per heifer was \$2.49 (Table 2). This cost does not include the initial value of the calf. Half of the farms were within the \$2.31 to \$2.67 range for costs per day per heifer. Feed cost was \$1.28 per day and labor cost was \$ 0.33 a day. All remaining costs equaled \$0.88 per day per heifer.

While the average cost per day per animal was \$2.49, there was a significant difference in cost per day based on the age of the animal. This difference was caused by changes in feed intake and labor requirements as the heifer grows and groups change housing systems. The average cost per day per animal averaged over \$5.00 during milk feeding, \$1.90 to \$2.00 from weaning to breeding and \$2.39 to \$2.50 from breeding to close-up-to-calving and back over \$3.00 right before calving. (Figure 1) Switching from fluid based feed to dry feed and from hutches to loose housing decreased labor requirements and feed costs, which were the primary reasons costs dropped over \$3.00 per day per heifer when the animal was weaned. The increase in feed intake around puberty/breeding and for the support of a growing calf led to the increase in daily cost per day as the heifer approached calving.

**Table 1**

| TOTAL COSTS TO RAISE HEIFERS<br>17 New York Dairy Farms, December 2007 |                |         |                      |                |
|--|----------------|---------|----------------------|----------------|
| Total Cost per Animal Completing                                       | Average        | Percent | Inter-Quartile Range |                |
| Feed Total   | \$885          | 51.0%   | \$824                | \$997          |
| Grown Feed   | \$550          |         | \$445                | \$609          |
| Purchased Feed   | \$336          |         | \$241                | \$425          |
| Labor  | \$234          | 13.5%   | \$139                | \$282          |
| Bedding  | \$63           | 3.7%    | \$49                 | \$73           |
| Health   | \$40           | 2.3%    | \$22                 | \$59           |
| Breeding   | \$47           | 2.7%    | \$42                 | \$54           |
| Trucking   | \$3            | 0.1%    | \$1                  | \$4            |
| Insurance  | \$7            | 0.4%    | \$6                  | \$7            |
| Machinery Operation  | \$35           | 2.0%    | \$25                 | \$44           |
| Machinery Ownership  | \$25           | 1.4%    | \$15                 | \$33           |
| Building Operation   | \$25           | 1.4%    | \$12                 | \$36           |
| Building Ownership   | \$125          | 7.2%    | \$93                 | \$126          |
| Manure Storage Operation   | \$0            | 0.0%    | \$0                  | \$0            |
| Manure Storage Ownership   | \$4            | 0.2%    | \$0                  | \$6            |
| Manure Spreading   | \$57           | 3.3%    | \$39                 | \$63           |
| Custom Boarding  | \$5            | 0.3%    | \$0                  | \$0            |
| Professional Services and Fees   | \$4            | 0.2%    | \$0                  | \$5            |
| Non-Performance Expenses   | \$39           | 2.2%    | \$27                 | \$50           |
| Interest on Daily Investment   | \$137          | 7.9%    | \$122                | \$146          |
| <b>Total*</b>  | <b>\$1,734</b> |         | <b>\$1,598</b>       | <b>\$1,867</b> |
| Number of Heifers  | 865            |         |                      |                |
| Age, Months  | 22.9           |         | 22                   | 23.8           |
| Calving Weight, Pounds   | 1,290          |         | 1,250                | 1,350          |
| Average Daily Gain   | 1.73           |         | 1.64                 | 1.82           |
| All Heifers per Labor Hour   | 43.6           |         | 34.85                | 53.77          |
| Pre-Weaned Heifers per Labor Hour                                      | 11.2           |         | 7.26                 | 13.74          |
| Post Weaned Heifers per Labor Hour                                     | 65.9           |         | 49.5                 | 86.9           |
| Total Investment in Animal   | \$1,884        |         | \$1,748              | \$2,037        |
| % Non-Completion Rate  | 8.2            |         | 7.1                  | 9.8            |
| Cost per Worker  | \$36,778       |         | \$34,046             | \$39,789       |
| *Total many not add up due to rounding                                 |                |         |                      |                |

**Table 2**

| COST PER DAY PER ANIMAL                |          |         |                      |          |
|--|----------|---------|----------------------|----------|
| 17 New York Dairy Farms, December 2007 |          |         |                      |          |
| Cost per Day per Animal                | Average  | Percent | Inter-Quartile Range |          |
| Feed Total                             | \$1.281  | 51%     | \$1.15               | \$1.41   |
| Grown Feed                             | \$0.79   |         | \$0.69               | \$0.91   |
| Purchased Feed                         | \$0.49   |         | \$0.33               | \$0.64   |
| Labor                                  | \$0.333  | 13%     | \$0.20               | \$0.40   |
| Bedding                                | \$0.091  | 4%      | \$0.07               | \$0.11   |
| Health                                 | \$0.056  | 2%      | \$0.03               | \$0.09   |
| Breeding                               | \$0.067  | 3%      | \$0.06               | \$0.08   |
| Trucking                               | \$0.004  | 0%      | \$0.00               | \$0.01   |
| Insurance                              | \$0.010  | 0%      | \$0.01               | \$0.01   |
| Machinery Operation                    | \$0.049  | 2%      | \$0.04               | \$0.06   |
| Machinery Ownership                    | \$0.035  | 1%      | \$0.02               | \$0.04   |
| Building Operation                     | \$0.036  | 1%      | \$0.02               | \$0.05   |
| Building Ownership                     | \$0.175  | 7%      | \$0.13               | \$0.18   |
| Manure Storage Operation               | \$0.000  | 0%      | \$0.00               | \$0.00   |
| Manure Storage Ownership               | \$0.006  | 0%      | \$0.00               | \$0.01   |
| Manure Spreading                       | \$0.082  | 3%      | \$0.05               | \$0.10   |
| Custom Boarding                        | \$0.007  | 0%      | \$0.00               | \$0.00   |
| Professional Services and Fees         | \$0.006  | 0%      | \$0.00               | \$0.01   |
| Non-Performance Expenses               | \$0.056  | 2%      | \$0.04               | \$0.07   |
| Interest on Daily Investment           | \$0.196  | 8%      | \$0.19               | \$0.21   |
| Total*                                 | \$2.494  |         | \$2.31               | \$2.67   |
| Number of Heifers                      | 865      |         |                      |          |
| Age, Months                            | 22.9     |         | 22                   | 23.8     |
| Calving Weight, Pounds                 | 1,290    |         | 1,250                | 1,350    |
| Average Daily Gain                     | 1.73     |         | 1.64                 | 1.82     |
| All Heifers per Labor Hour             | 43.6     |         | 34.85                | 53.77    |
| Pre-Weaned Heifers per Labor Hour      | 11.2     |         | 7.26                 | 13.74    |
| Post Weaned Heifers per Labor Hour     | 65.9     |         | 49.5                 | 86.9     |
| Total Investment in Animal             | \$1,884  |         | \$1,748              | \$2,037  |
| % Non-Completion Rate                  | 8.2      |         | 7.1                  | 9.8      |
| Cost per Worker                        | \$36,778 |         | \$34,046             | \$39,789 |
| *Total many not add up due to rounding |          |         |                      |          |

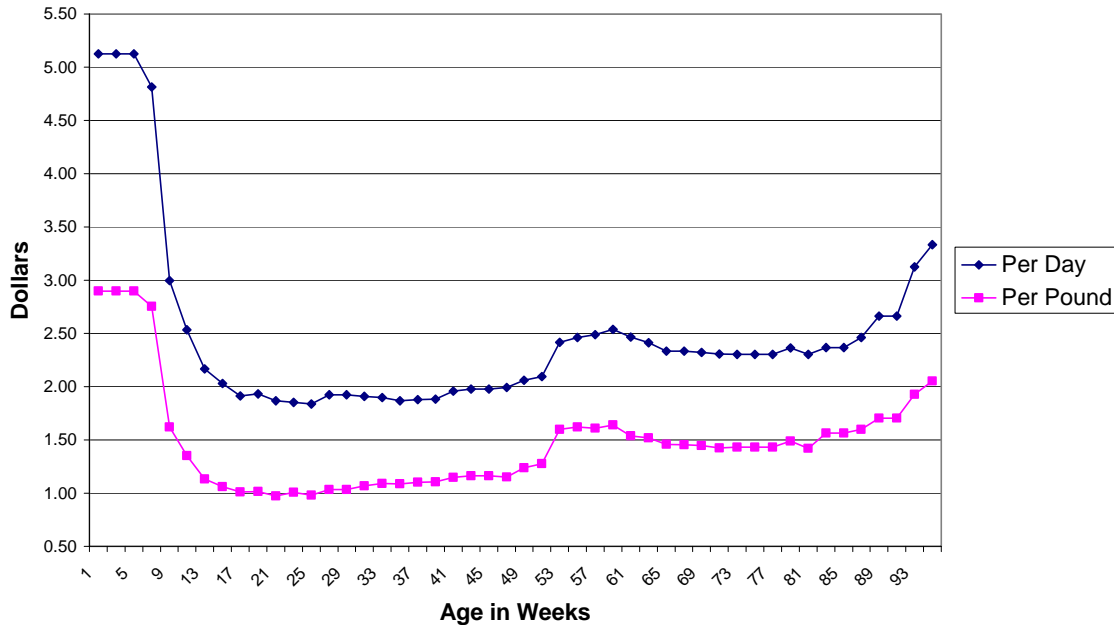
**Table 3**

| COST PER POUND OF GAIN<br>17 New York Dairy Farms, December 2007 |                |         |                      |               |
|--|----------------|---------|----------------------|---------------|
| Cost per Pound of Gain   | Average        | Percent | Inter-Quartile Range |               |
| Feed Total   | \$0.740        | 51%     | \$0.64               | \$0.84        |
| Grown Feed   | \$0.46         |         | \$0.38               | \$0.51        |
| Purchased Feed   | \$0.28         |         | \$0.18               | \$0.35        |
| Labor  | \$0.196        | 13%     | \$0.13               | \$0.23        |
| Bedding  | \$0.053        | 4%      | \$0.04               | \$0.07        |
| Health   | \$0.033        | 2%      | \$0.02               | \$0.05        |
| Breeding   | \$0.039        | 3%      | \$0.03               | \$0.04        |
| Trucking   | \$0.002        | 0%      | \$0.00               | \$0.00        |
| Insurance  | \$0.006        | 0%      | \$0.00               | \$0.01        |
| Machinery Operation  | \$0.029        | 2%      | \$0.02               | \$0.04        |
| Machinery Ownership  | \$0.021        | 1%      | \$0.01               | \$0.03        |
| Building Operation   | \$0.021        | 1%      | \$0.01               | \$0.03        |
| Building Ownership   | \$0.105        | 7%      | \$0.08               | \$0.10        |
| Manure Storage Operation   | \$0.000        | 0%      | \$0.00               | \$0.00        |
| Manure Storage Ownership   | \$0.003        | 0%      | \$0.00               | \$0.00        |
| Manure Spreading   | \$0.048        | 3%      | \$0.03               | \$0.06        |
| Custom Boarding  | \$0.004        | 0%      | \$0.00               | \$0.00        |
| Professional Services and Fees                                   | \$0.004        | 0%      | \$0.00               | \$0.00        |
| Non-Performance Expenses   | \$0.033        | 2%      | \$0.02               | \$0.04        |
| Interest on Daily Investment                                     | \$0.114        | 8%      | \$0.11               | \$0.12        |
| <b>Total*</b>  | <b>\$1.451</b> |         | <b>\$1.31</b>        | <b>\$1.55</b> |
| Number of Heifers  | 865            |         |                      |               |
| Age, Months  | 22.9           |         | 22                   | 23.8          |
| Calving Weight, Pounds   | 1,290          |         | 1,250                | 1,350         |
| Average Daily Gain   | 1.73           |         | 1.64                 | 1.82          |
| All Heifers per Labor Hour                                       | 43.6           |         | 34.85                | 53.77         |
| Pre-Weaned Heifers per Labor Hour                                | 11.2           |         | 7.26                 | 13.74         |
| Post Weaned Heifers per Labor Hour                               | 65.9           |         | 49.5                 | 86.9          |
| Total Investment in Animal                                       | \$1,884        |         | \$1,748              | \$2,037       |
| % Non-Completion Rate  | 8.2            |         | 7.1                  | 9.8           |
| Cost per Worker  | \$36,778       |         | \$34,046             | \$39,789      |
| *Total many not add up due to rounding                           |                |         |                      |               |



**Figure 1**

**Average Total Heifer Raising Costs  
17 New York Dairy Farms, December 2007**



**Cost Per Pound Of Gain**

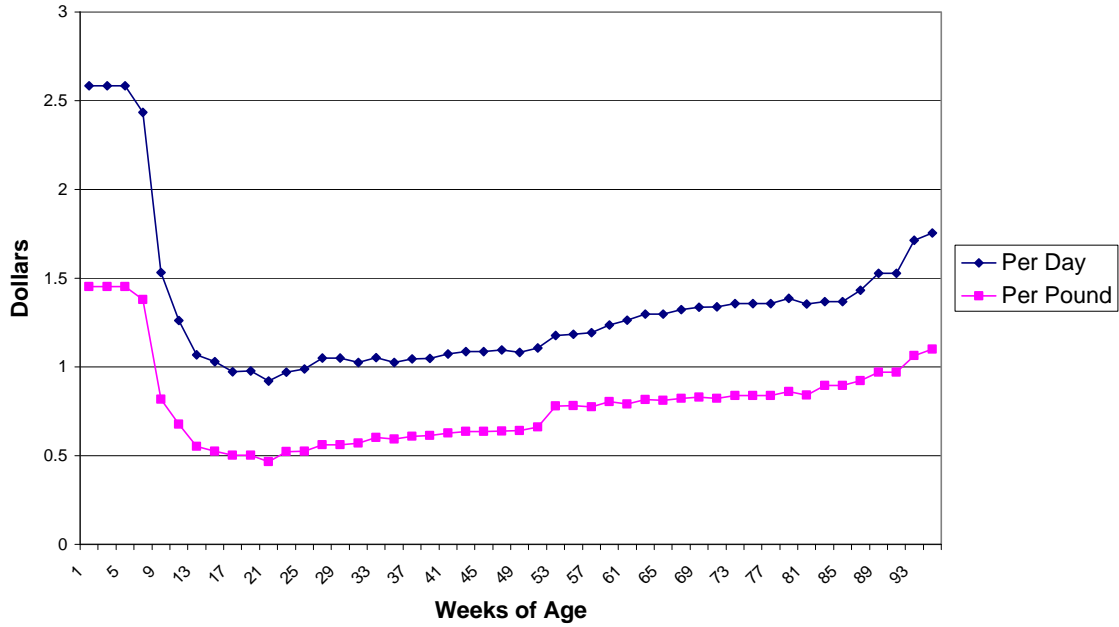
The average cost per pound of gain to raise a heifer was \$1.45, with an inter-quartile range of \$1.31 to \$1.55 (Table 3). This cost was based on an average of 1.73 pounds of gain per day, with an inter-quartile range of 1.64 to 1.82 pounds per day. The average daily rate of gain was based on estimated weights at birth and at calving. Feed costs were \$0.74 per pound of gain, ranging from \$0.64 to 0.84 per pound of gain. Labor costs contributed another \$0.20 per pound of gain, with all remaining expenses equaling \$0.51.

The average cost per pound of gain had the same trend as did cost per day per heifer: \$2.61 per pound of gain prior to weaning, \$1.00-\$1.10 range per pound of gain from weaning to breeding, and approximately a \$1.50 from breeding to calving. (Figure 1)

Feed and labor costs had the largest impact on costs per pound of gain as the heifer grew. These two costs represent 64% of the raising cost of a heifer. Feed costs were in the \$1.40-\$1.50 per pound range prior to weaning, lowered into the \$0.50 per pound range after weaning, and steadily increased to \$1.00 per pound of gain as the animal nears 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 the animal went through during puberty and breeding lead to a higher feed cost per pound of gain.

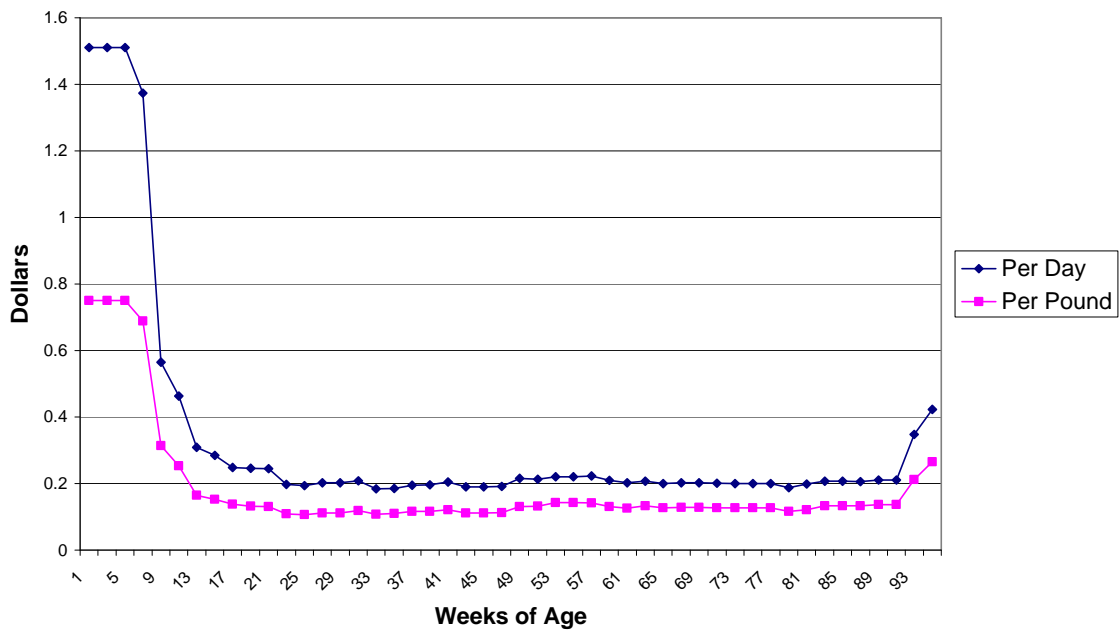
**Figure 2**

**Average Heifer Feed Costs  
17 New York Dairy Farms, December 2007**



**Figure 3**

**Average Heifer Labor Costs  
17 New York Dairy Farms, December 2007**



Labor costs demonstrate the impact of labor requirements on costs of raising heifers. Labor costs started at \$0.75 plus per pound of gain during milk feeding, then dropped dramatically to approximately \$0.10 per pound after the animal was weaned. Around puberty and breeding, labor increased slightly, and then fell back down below \$0.15 per pound until calving. (Figure 3) This reflects the decrease in labor required to maintain heifers after weaning.

### **BREAKDOWN OF EXPENSES BY STAGE OF GROWTH**

The periods from birth to weaning, weaning to puberty, puberty to breeding and breeding to calving are 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 other costs.

**Table 4**

| Breakdown of Costs of Raising Heifers by Stage of Growth<br>17 New York Dairy Farms, December 2007 |                  |                 |                |                |
|--|------------------|-----------------|----------------|----------------|
| <b>Per Pound of Gain</b>   | Birth to 200 Lbs | Stage of Growth |                | 851-Calving    |
|  |                  | 201-700 lbs     | 701-850 lbs    |                |
| Feed   | \$1.303          | \$0.564         | \$0.698        | \$0.837        |
| Labor  | 0.702            | 0.111           | 0.122          | 0.144          |
| All Other Costs  | 0.601            | 0.386           | 0.544          | 0.580          |
| <b>Total</b>   | <b>\$2.606</b>   | <b>\$1.061</b>  | <b>\$1.364</b> | <b>\$1.561</b> |
| <b>By Total Raising Cost</b>   | Birth to 200 Lbs | Stage of Growth |                | 851-Calving    |
|  |                  | 201-700 lbs     | 701-850 lbs    |                |
| Feed   | \$143.4          | \$282.1         | \$104.8        | \$401.5        |
| Labor  | 77.2             | 55.4            | 18.3           | 69.2           |
| All Other Costs  | 66.1             | 192.9           | 81.6           | 278.2          |
| <b>Total</b>   | <b>\$286.7</b>   | <b>\$530.5</b>  | <b>\$204.7</b> | <b>\$749.2</b> |
| % of Total Cost  | 16.2%            | 30.0%           | 11.6%          | 42.2%          |
| % of Total Growth  | 8%               | 42%             | 12%            | 38%            |

The period of birth to 200 pounds represented 14% of the total costs, but only accounted for 8% of the weight gain, with an average cost per pound of gain of \$1.81. The weaning to puberty period was 38% of the growth of the animal, but only 29% of the total cost. This equated to an average of \$0.81 per pound of gain. The breeding stage added another 12% of growth, 11% of cost, and an average of \$1.04 cost per pound of gain. While the animal was bred the greatest cost occurred, representing 35% of growth and 46% of cost. The average cost per pound of gain during this stage was \$1.46

## **FEED COSTS**

Feed cost was the largest expense associated with raising heifers. With an average of \$885 per heifer, this represented 51% of the total costs associated with the dairy replacement program. Feed costs were further broken down in grown and purchased feed. 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 the wet calves, averaged \$550 per heifer, or 62% of the total feed costs. The range was from \$445 to \$609 per heifer. For this study, the price per ton for corn silage was \$30, and the price per ton for haylage was \$40, both on an as fed basis.

Purchased feed, which includes milk replacer, all purchased grains and purchased hay, averaged \$336 per heifer, or 38% of the total feed costs. The inter-quartile range was from \$241 to \$425 per heifer. In this study no purchased corn silage or purchased haylage were utilized.

One of the significant feed factors while raising replacements is when they are on liquid feed. About 17% of the total feed cost in this study was due to the value of the waste milk or milk replacer being fed during the first couple months. Out of these 17 farms, 10 were feeding milk replacer, using on average 1.48 pounds of powder per calf per day. With an average cost of \$2,766 per ton, this equaled \$2.09 per animal per day for the milk replacer.

Seven farms fed whole milk to their calves, feeding on average 10.1 lbs of milk per calf per day. With this study, milk fed to calves was charged at a value of \$19.00 per cwt to reflect the higher value of milk in 07. With \$19.00 per cwt of milk equaling \$380 per ton, this equaled \$2.09 per calf per day for the whole milk. This feed costs doesn't include any costs for pasteurizing the milk, which some of the farms did and would be included in the appropriate expenses areas, such as supplies, machinery, and utilities.

While for this study, \$19.00 per cwt was utilized for the whole milk; only a small portion of the whole milk fed on these seven farms was considered saleable, with the rest classified as waste milk. There is continued debate on what value, or cost, should be assigned to waste milk fed to calves. While it is outside the scope of this study to determine this value, Table 5 demonstrates the change in costs to feed the wet calf on these seven farms as determined by amount fed and value assigned.

For these seven farms, recognizing that there was value assigned to the milk fed in the first two months of life and the opportunity costs, a value of \$0 for the waste milk would lower the total raising costs of the replacement an average of \$154 per animal. This is a difference of \$134 in feed costs, and \$20 in opportunity costs.

**Table 5**

| <b>Value of Whole Milk Used to Feed Calves<br/>Total Dollars per Animal on Feed for 60 Days</b> |                        |      |      |      |      |       |       |       |
|---|------------------------|------|------|------|------|-------|-------|-------|
| Amount Fed  | Price per Cwt. of Milk |      |      |      |      |       |       |       |
|   | \$0                    | \$3  | \$6  | \$9  | \$12 | \$15  | \$18  | \$21  |
| 7.5lbs  | 0                      | 13.5 | 27   | 40.5 | 54   | 67.5  | 81    | 94.5  |
| 8   | 0                      | 14.4 | 28.8 | 43.2 | 57.6 | 72    | 86.4  | 100.8 |
| 8.5   | 0                      | 15.3 | 30.6 | 45.9 | 61.2 | 76.5  | 91.8  | 107.1 |
| 9   | 0                      | 16.2 | 32.4 | 48.6 | 64.8 | 81    | 97.2  | 113.4 |
| 9.5   | 0                      | 17.1 | 34.2 | 51.3 | 68.4 | 85.5  | 102.6 | 119.7 |
| 10  | 0                      | 18   | 36   | 54   | 72   | 90    | 108   | 126   |
| 10.5  | 0                      | 18.9 | 37.8 | 56.7 | 75.6 | 94.5  | 113.4 | 132.3 |
| 11  | 0                      | 19.8 | 39.6 | 59.4 | 79.2 | 99    | 118.8 | 138.6 |
| 11.5  | 0                      | 20.7 | 41.4 | 62.1 | 82.8 | 103.5 | 124.2 | 144.9 |
| 12  | 0                      | 21.6 | 43.2 | 64.8 | 86.4 | 108   | 129.6 | 151.2 |
| 12.5lbs   | 0                      | 22.5 | 45   | 67.5 | 90   | 112.5 | 135   | 157.5 |

## **LABOR EFFICIENCY**

Labor expense was the second largest expense associated with raising heifers and was the expense with the greatest range. Measuring labor efficiency is one way to analyze how well labor is being used. 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 efficient that labor is being utilized. To calculate, total number of hours of labor that were utilized was tracked for a period of time or estimated, placed on a per day basis and divided into the average daily number of heifers on the farm.

The average heifer per labor hour for these 17 New York dairy farms was 43.6, with the average of the six highest efficiency farms being 62.6. The average for the six lowest efficiency farms was 29.6. (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 was 11.2, while post-weaned heifers per labor hour was 65.9. The difference between the top and bottom groups of farms for pre-weaned heifers per labor hour was more than double, ranging from 7.4 to 16.9. The difference for the post-weaned heifers was even greater, with the

lowest group averaging 42.8 heifers per labor hour with the highest group averaging 95.0 heifers per labor hour.

**Table 6**

| Labor Evaluation<br>17 New York Dairy Farms, December 2007 |          |                    |                       |                        |
|--|----------|--------------------|-----------------------|------------------------|
|  | Average  | Low Third<br>Farms | Middle<br>Third Farms | High<br>Third<br>Farms |
| Number of Heifers  | 865      | 445                | 895                   | 1,261                  |
| All Heifers per Labor Hour                                 | 43.6     | 29.6               | 37.6                  | 62.6                   |
| Pre-Weaned Heifers/Labor Hour                              | 11.2     | 7.4                | 8.8                   | 16.9                   |
| Post-Weaned Heifers/Labor Hour                             | 65.9     | 42.8               | 59.0                  | 95.0                   |
| Corresponding Labor Costs/Animal                           | \$234    | \$326              | \$246                 | \$132.9                |
| Cost per Worker Equivalent                                 | \$36,778 | \$38,002           | \$37,380              | \$35,051               |
| Worker Equivalents per 865 Heifers                         | 3.0      | 4.0                | 3.05                  | 1.86                   |

A second method used to measure the total labor requirements for the dairy replacement enterprises was to calculate worker equivalents for the enterprise. On these 17 New York dairy farms, an average of 2.96 worker equivalents was used within the heifer enterprise. One worker equivalent is defined as one person working 55.2 hours per week for 50 weeks, or a total of 2760 hours per year. Using the average of 865 heifers, the average high efficiency group would need 1.86 worker equivalents. The average low efficiency group would need 4.0 worker equivalents. The third measure used to evaluate labor was total labor cost, which averaged \$234 per animal and ranged from \$133 to \$326.

Combining 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 required in the heifer enterprise and the cost of raising heifers will decline.

## **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 with the dairy replacement program, or 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 market value assigned to the forage that is utilized by the replacement program may or may not accurately reflect what the costs to produce that feed were for the participating farms.

For dairy farms that also raise their own heifers, there also 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 poorer quality forage in the replacement program while maximizing the quality fed to the dairy cattle.
- A potential use for sweepings 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 there is potential for synergies for farms that are raising dairy replacements, they will vary in value for individual farms and is hard to estimate. Some of the questions that have come up when discussing this with individual farms are:

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

For farms that are analyzing their dairy replacement program and thinking about changing how they raise their heifers or if they even should be 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 17 above average herd size farms with high levels of management, their dairy replacements entered the herd with a total investment of \$1,884 per animal, including the value of the animal when it was born. These animals are calving at 22.9 months of age and weighing 1290 pounds. The animals averaged 1.73 pounds of gain per day at a total raising cost of \$2.49 per day per heifer, or \$1.45 per pound of gain. Feed costs were the most significant cost, followed by labor. These two costs explained 64% 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 inter-quartile range from \$1,748 to \$2,037.

Labor efficiency on these farms is considered to be above average and equaled 43.6 heifers per labor hour. Housing systems used, design and location, played a significant role in determining what the labor efficiency was for the replacement enterprise.

The numbers reported from this study are considered to be from farms doing an above average job, resulting in potentially lower than average costs and only represent what the seventeen participating farms achieved. Size of operation, housing systems, rate of gain, calving age, and level of management all impact the total cost for a dairy replacement.



## **Explanation of Expenses Calculated**

### Feed

Feed expense is the cost of all feed that is fed to the animal, by grouping system as assigned by the participating farm. The feed usage is based on the average amount fed per day per animal for each group. The cost is determined by utilizing assigned values of \$30 per ton for corn silage, \$40 per ton for haylage, \$19 per cwt for whole milk, and prices paid for purchased feeds.

### 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, or market value of the bedding.

### Health

Health expense is the cost of all health related expenses that can be attributed to the group. These expenses can include vaccinations, worming programs, and pregnancy checks and other expenses that every animal will be exposed to. This expense also includes treatments that were used during the year to treat individual animals for specific issues, such as scours, along with supplies utilized to treat animals. Hoof trimming and foot bath costs are also included in this expense category.

### 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.

### Labor

Labor expense is the cost of the labor that is 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.

### Trucking

Trucking expense is the cost of picking up, delivering, or moving animals between locations. This cost is based on the number of trips made, the miles round trip, and a round trip charge per mile.

### Insurance

Insurance expense is the cost of any insurance that is carried on the 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 costs 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 is 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 are assigned to the appropriate group based on usage.

### Building Operation

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

### Building Ownership

The building overhead expense is 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 is 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 is 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 are those costs associated with forage testing, nutritional consulting, and business consulting that were 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 in 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 8 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.

## Additional Resources

“Raising Dairy Replacements: Practices and Costs, New York, 1990”, Karszes, Jason and B.F. Stanton, A.E. Ext 91-12, Department of Agricultural Economics, College of Agriculture and Life Sciences, Cornell University, May 1991.

“Custom Raising Dairy Replacements: Practices and Costs, 1990”, Karszes, Jason and B.F. Stanton, A.E. Ext. 91-24, Department of Agricultural Economics, College of Agriculture and Life Sciences, Cornell University, August, 1991.

“Dairy Replacement Programs: Costs and Analysis Western New York, 1993”, Karszes, Jason, E.B. 94-8, No. 174, Department of Animals Science and Agricultural, Resource, and Managerial Economics, College of Agriculture and Life Sciences, Cornell University, May, 1994

“Contracts and Agreements For Custom Dairy Heifer Growing”, Karszes, Jason and Roger A. Cady, E.B 2000-10, Department of Agricultural, Resource, and Managerial Economics, College of Agriculture and Life Sciences, Cornell University, August 2000

“Dairy Replacement Programs: Costs and Analysis”, Karszes, Jason, *Dairy Calves and Heifers: Integrating Biology and Management* , Proceedings NRAES-175, Pg 10-23, Natural Resources, Agriculture, and Engineering Service, January, 2005

[www.ansci.Cornell.edu/ProDairy](http://www.ansci.Cornell.edu/ProDairy)

“Calculating Replacement Heifer Daily Feed Costs by Group”, Excel Template, Karszes, Jason, January 2007

“Determining Replacement Heifer Labor Efficiency”, Excel Template, Karszes, Jason, January 2007

## OTHER A.E.M. EXTENSION BULLETINS

| EB No   | Title   | Fee<br>(if applicable) | Author(s)  |
|---------|---|------------------------|--|
| 2008-15 | Implications of Growing Biofuels Demands on Northeast Livestock Feed Costs – Understanding the Technical Relationships between Ingredient Prices and Feed Costs |                        | Schmit, T., Verteramo, L. and W. Tomek   |
| 2008-14 | Dairy Farm Business Summary, Southeastern New York Region, 2007   | (\$12.00)              | Knoblauch, W., Putnam, L., Kiraly, M., Walsh, J., Hulle, L. and C. Wickswat              |
| 2008-13 | Dairy Farm Business Summary, Western and Central Plateau Region, 2007   | (\$12.00)              | Knoblauch, W., Putnam, L., Karszes, J., Grace, J., Munsee, D., Petzen, J. and L. O'Brien |
| 2008-12 | Dairy Farm Business Summary, New York Small Herd Farms, 80 Cows or Fewer, 2007  | (\$16.00)              | Knoblauch, W., Putnam, L., Kiraly, M. and J. Karszes                                     |
| 2008-11 | Cognitive Therapy for Suicidal Patients (3 Video Tapes) **Outside NYS cost is \$25.00**   |                        | Mastronardi, K.  |
| 2008-10 | Dairy Farm Business Summary, Northern Hudson Region, 2007   | (\$12.00)              | Conneman, G., Putnam, L., Wickswat, C., Buxton, S., Smith, R. and J. Karszes             |
| 2008-09 | New York FarmNet Stress on the Farm Video (26min)   | (\$20.00)              | Mastronardi, K.  |
| 2008-08 | An Inventory of Educational Resources for Directors of US Agricultural Cooperatives   |                        | Henehan, B. and T. Schmit  |
| 2008-07 | Dairy Farm Business Summary, Western and Central Plain Region, 2007   | (\$12.00)              | Knoblauch, W., Putnam, L., Karszes, J., Hanchar, J. and K. Getty                         |
| 2008-06 | Dairy Farm Business Summary, New York Large Herd Farms, 300 Cows or Larger, 2007  | (\$16.00)              | Karszes, J., Knoblauch, W. and L. Putnam   |

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