Improving Profit Through Decreased Culling

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Introduction

Recently there has been increased discussion among dairy producers concerning the cost of high culling rates on profitability. Many dairy producers feel that their culling rates are high, but have little information on what is “normal” and to make comparisons amongst peer groups. The average cost of replacement animals for a dairy is estimated to be about 20% of the overall operating cost (1). Every time a cow is culled, the dairy incurs a cash cost. The cash cost is simply the price of the replacement animal minus the salvage value of the culled cow.

Culling Economics

There are three fundamental questions a dairy producer needs to ask when culling a cow (6):

1. **Is the barn filled to capacity?** If the barn is not at capacity, the first goal should be to fill the barn. In virtually every economic analysis it is more profitable to fill a stall with a milking cow vs. leaving the stall empty. The lost profit from having an empty stall is typically $600 to 800 dollars per cow per year (6).

2. Once the barn is full, the profitability of every cow in the herd should be questioned. **Is it more profitable to keep her or to replace her?** The answer depends on milk price, feed cost, the difference between cull and replacement values and the availability of capital.

3. **What is your overall cull rate?** Is it too high or too low? What benchmark are you comparing it to?

The answer to questions #2 and #3 are independent of each other. Question #2 is basically "When is it most profitable to replace any particular cow?" whereas, question #3 is “On a herd level, is the herd cull rate higher than desired? For example, culling rate can be easily decreased by not selling any cows. However, it surely isn't more profitable to keep a cow that’s open 400 days, milking 25 lb with a high SCC than to replace her with a fresh healthy cow. Still, this is the strategy implemented by many dairy producers with high cull rates. If your herd cull rate is too high you must determine the reason(s) cows are breaking and fix those management deficiencies.

Why Cows Leave Herds

When comparing cull rate information and benchmarks it is important to compare similar information. There are a couple of different ways cull rate is defined. Turnover rate is defined as the number of cows leaving the herd divided by the average herd size times 100. For example: A 100-cow dairy freshens 40 new heifers and sells 40 cows. The turnover rate for this herd is 40 / 100 = 40%. Cull rate is the percent of cows starting a lactation that are culled.
In our example, 40 cows left the herd where 140 animals (100 cows + 40 fresh heifers) started a lactation for a culling rate of \( \frac{40}{140} = 28.6\% \). In this paper I will use cull rate unless otherwise indicated as turnover rate.

There have been a plethora of studies done over the years indicating "normal" culling rates and why cows are culled. Most of these studies have determined average cull rates are between 25 to 40%. For many herds with stable herd numbers culling rate is determined by number of replacements available. Many of our Midwest herds have high cull rates because they do an excellent job of raising replacements and therefore have high numbers of heifers available. Recent DHI data showed that Midwest Holstein herds have an average annual turnover rate of 38% and a death rate of 6% (3). Table 1 summarizes 8 different research reports of why cows were culled. One of the challenges of interpreting culling data is that culling categories are not consistent. Many summaries don't include death loss as a category. Only one report prior to 1982 listed feet and legs as a category.

<table>
<thead>
<tr>
<th>Reason</th>
<th>NAHMS (^1)</th>
<th>Older studies (^2)</th>
<th>Range</th>
<th>Percent of freshenings (^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voluntary</td>
<td>21.3</td>
<td>39.1</td>
<td>22.5 - 49.0</td>
<td>7.5</td>
</tr>
<tr>
<td>Reproduction</td>
<td>25.3</td>
<td>22.1</td>
<td>15.8 - 34.9</td>
<td>8.9</td>
</tr>
<tr>
<td>Mastitis</td>
<td>25.1</td>
<td>15</td>
<td>7.8 - 25.1</td>
<td>8.8</td>
</tr>
<tr>
<td>Disease/injury</td>
<td>4.1</td>
<td>12</td>
<td>5.2 - 20</td>
<td>1.4</td>
</tr>
<tr>
<td>Death</td>
<td>5.1</td>
<td>5.8</td>
<td>0.6 - 11.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Disposition</td>
<td>0.9</td>
<td>0.7</td>
<td>0.5 - 0.9</td>
<td>0.3</td>
</tr>
<tr>
<td>Feet and legs</td>
<td>14.2</td>
<td>3.6</td>
<td>1.8 - 14.2</td>
<td>5.2</td>
</tr>
<tr>
<td>Other</td>
<td>3.9</td>
<td>8.5</td>
<td>3.4 - 12.8</td>
<td>1.4</td>
</tr>
</tbody>
</table>

\(^1\) % of cows culled - NAHMS, 1996 (10).
\(^2\) % of cows culled - Adapted from Fetrow, 1988 (5), studies from 1962-1986.
\(^3\) Culling as a percentage of cows freshening using the 1996 NAHMS data and assuming a total cull rate of 35%.

Comparing the older studies to the more recent NAHMS (10) survey indicates that voluntary culling has decreased. Culling for reproductive reasons is approximately the same and culling for mastitis and feet and legs has increased. In more current research Beaudreau (1) estimated at least one-half of all cows leaving herds is related to disease. However, Table 1 information underestimates death rate based on DHI data (3) and personal observations. Summaries from California indicate that herd turnover rates have increased from 31.7% in 1981 to 36.4% in 2000 (8).

Most culling summaries report reasons for culling on a percentage of animals leaving the herd. Culling reasons should be reported as a percentage of cows that freshen, not as a percentage of culls. The following example shows why culling reported as a percentage of animals leaving the herd can be misleading. One dairy producer has a 25% total culling rate with 35% of the culls sold for reproduction. The reproductive culling rate is 8.8% (0.25 \times 0.35) of all cows that calved. Another dairy producer has a 49% total culling rate with 25% of the culls removed for reproduction. This dairy producer is culling 12.3% (0.49 \times 0.25) of all cows that calve for reproduction. The herd that reports 35% of cows culled sold for reproduction is actually selling
fewer reproductive culls than the dairy producer that is reporting 25% of cows culled for reproduction.

**When Cows Leave Herds**

There is a big difference in the cost of culls depending upon when they leave the herd. Cows that leave the herd by culling or dying in early lactation are much more costly than a cow that leaves after milking 500 days. Cows that leave the herd during the first 100 days are almost always involuntary culls. Examine how many cows leave the herd at less than 30 days in milk (DIM) and how many leave less than 100 DIM. The goal should be to keep this number as low as possible. Virtually all of the cows that leave the herd during the first 100 DIM can be traced to cow management during the transition (3 weeks prior to and 3 weeks after calving) period. Metabolic or related diseases increase the likelihood that a cow will be culled (Table 2). Cows having milk fever, retained fetal membranes, displaced abomasum, ketosis, cystic ovaries and mastitis were at greater risk of getting culled than cows without these diseases. Reneau (11) reported that cows with mastitis are 2 to 3 times more likely to be culled than the herd average cull rate.

**Table 2. Lactational incidence and risk of culling for certain diseases.**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Lactational incidence</th>
<th>Culling risk&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Culling percentage&lt;sup&gt;3&lt;/sup&gt;</th>
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</thead>
<tbody>
<tr>
<td>Milk fever</td>
<td>0.9</td>
<td>47.1</td>
<td>0.42</td>
</tr>
<tr>
<td>Retained fetal membranes</td>
<td>9.5</td>
<td>31.7</td>
<td>3.01</td>
</tr>
<tr>
<td>Displaced abomasum</td>
<td>5.3</td>
<td>26.9</td>
<td>1.43</td>
</tr>
<tr>
<td>Ketosis</td>
<td>5.0</td>
<td>32.5</td>
<td>1.63</td>
</tr>
<tr>
<td>Metritis</td>
<td>4.2</td>
<td>17.1</td>
<td>0.72</td>
</tr>
<tr>
<td>Ovarian cysts</td>
<td>10.6</td>
<td>20.9</td>
<td>2.22</td>
</tr>
<tr>
<td>Mastitis</td>
<td>14.5</td>
<td>32.7</td>
<td>4.74</td>
</tr>
<tr>
<td>No treatment</td>
<td>61.7</td>
<td>21.5</td>
<td>13.27</td>
</tr>
</tbody>
</table>

<sup>1</sup> Grohn, et al., 1998 (7).
<sup>2</sup> Percentage of cows with a particular disease that was culled during lactation.
<sup>3</sup> Percentage of all cows culled due to a particular disease. Example: Milk fever 0.9 x 0.471 = 0.42.

There is a tremendous variation between herds in the rate that cows leave. Table 3 shows the culling information from 12 herds in Minnesota. This information supports DHI information (3) that death rates have increased or may be under reported in some of the previous research. In herds A and J, more than 10% of all cows that calve leave the herd during the first 30 DIM compared to only 4% leaving in Herd I. Three herds (A, J, and G) have greater than 20% of cows leaving within 100 days after freshening. Only 1 herd (D) culls less that 10% of cows during the first 100 days after calving. Buelow (2) indicated well managed herds consistently cull 5% of the cows within 30 days of calving and 10% or less leave during the first 100 DIM. On an average, Table 3 herds are higher than this.
Table 3. Culling rate and other production parameters of several Minnesota Herds.1

<table>
<thead>
<tr>
<th>Herd</th>
<th>Culling rate &lt;30 DIM Sold</th>
<th>Died</th>
<th>Culling rate &lt;100 DIM Sold</th>
<th>Died</th>
<th>Culling rate</th>
<th>First projection2</th>
<th>SCC3</th>
<th>1st log4 Metabolic disease</th>
<th>Milk/cow5</th>
<th>Pregnancy rate6</th>
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<tbody>
<tr>
<td>A</td>
<td>5.4</td>
<td>4.7</td>
<td>12.5</td>
<td>7.2</td>
<td>47.2</td>
<td>17,252</td>
<td>662</td>
<td>3.2</td>
<td>6.2</td>
<td>9.6</td>
</tr>
<tr>
<td>B</td>
<td>2.8</td>
<td>3.6</td>
<td>6.2</td>
<td>5.6</td>
<td>39.3</td>
<td>20,596</td>
<td>481</td>
<td>2.9</td>
<td>6.8</td>
<td>6.9</td>
</tr>
<tr>
<td>C</td>
<td>4.0</td>
<td>1.3</td>
<td>9.0</td>
<td>2.7</td>
<td>37</td>
<td>22,563</td>
<td>272</td>
<td>2.9</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>D</td>
<td>1.8</td>
<td>3.1</td>
<td>4.5</td>
<td>3.8</td>
<td>24</td>
<td>25,000</td>
<td>395</td>
<td>2.4</td>
<td>N/A</td>
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<tr>
<td>E</td>
<td>6.1</td>
<td>3.4</td>
<td>16.6</td>
<td>4.4</td>
<td>36.8</td>
<td>18,311</td>
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<td>F</td>
<td>4.7</td>
<td>0.8</td>
<td>11.7</td>
<td>1.8</td>
<td>39.9</td>
<td>19,541</td>
<td>567</td>
<td>3.1</td>
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<td>G</td>
<td>6.1</td>
<td>3.1</td>
<td>17.5</td>
<td>3.1</td>
<td>38.7</td>
<td>23,594</td>
<td>652</td>
<td>3.0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>H</td>
<td>4.5</td>
<td>1.5</td>
<td>8.9</td>
<td>1.5</td>
<td>37.3</td>
<td>22,913</td>
<td>364</td>
<td>3.2</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>I</td>
<td>2.0</td>
<td>2.0</td>
<td>7.7</td>
<td>4.0</td>
<td>33.7</td>
<td>20,400</td>
<td>576</td>
<td>3.3</td>
<td>8.0</td>
<td>N/A</td>
</tr>
<tr>
<td>J</td>
<td>5.1</td>
<td>5.8</td>
<td>11.6</td>
<td>8.1</td>
<td>49.0</td>
<td>22,852</td>
<td>330</td>
<td>2.8</td>
<td>10.1</td>
<td>12.8</td>
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<td>K</td>
<td>3.2</td>
<td>2.5</td>
<td>9.3</td>
<td>4.6</td>
<td>27.2</td>
<td>19,948</td>
<td>526</td>
<td>3.5</td>
<td>5.0</td>
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<tr>
<td>L</td>
<td>2.9</td>
<td>3.2</td>
<td>7.8</td>
<td>5.6</td>
<td>37.6</td>
<td>17,517</td>
<td>499</td>
<td>3.4</td>
<td>3.1</td>
<td>N/A</td>
</tr>
<tr>
<td>Avg</td>
<td>4.0</td>
<td>2.9</td>
<td>10.3</td>
<td>4.4</td>
<td>37.3</td>
<td>20873</td>
<td>508</td>
<td>3.1</td>
<td>6.4</td>
<td>9.2</td>
</tr>
</tbody>
</table>

1 Herds were randomly selected based on my experience and confidence that their records were accurate.
2 Average first 305-day mature equivalent over the past 365 days.
3 Average somatic cell count of all cows at last DHI test.
4 First log SCC score after freshening.
5 Milk per cow on last DHI test.
6 Average 21-day pregnancy rate for the past 365 days.
7 Percentage of cows calving in the past year with displaced abomasum.
8 Percentage of cows calving in the past year with retained fetal membranes.
This information surely doesn't support the myth that pushing cows for high production results in higher cull rates and cows dying. Herd D is the highest producing herd and yet has the lowest early lactation cull rates and total cull rate, whereas Herd A has one of the highest cull rates and is the lowest producing herd. Both herds milk 3X and use bST. There is basically no correlation between milk production and early lactation or total culling. As expected, herds with high early lactation culling rates have higher total culling rates.

Managing Culling During Expansion

In a recent survey, Faust et al. (4) reported that one of the biggest challenges for dairy herds that expanded was maintaining a healthy herd. This survey indicated that introducing cattle with unknown backgrounds and health status resulted in more disease problems than introducing animals with known background and health status. Although this seems logical, dairy producers are often pressured by lenders to fill the barn fast, even if it means purchasing at risk animals. Not only is cull rate of purchased animals with unknown backgrounds higher, the risk of spreading disease to the home raised or established dairy herd is increased. In addition, very few expansion herds followed basic biosecurity practices like disease testing and quarantining. Based on the decreased risk of culling and higher milk production, heifers with known backgrounds were worth $681 more than heifers of unknown background (4).

Other factors that caused increased culling during expansion were lame cows, foot and leg problems due to new concrete and problems with poor design and construction of freestalls. More cows from the original herd were culled for reproduction during expansion because management time was taken away from reproduction and directed to construction. Another reason there was increased culling during the start up phase was because of stress due to insufficient labor while calving large numbers of animals and increased calving difficulties due to unknown sires and due dates. Cash flows often become tight during expansion because low cull rates and low heifer prices have been used in budget planning. Herd owners suggested using cull rates of 35 to 40% during expansion planning.

Fixing Your Culling Problem

High culling rates can be very frustrating and unprofitable, especially for expanding herds with empty stalls and limited replacements available. To fix the problem, why and when cows are being culled need to be identified. Below is a system to help define and determine culling rate and some suggestive actions to decrease it.

1. **Define the problem.** All culls fit into two categories, voluntary and involuntary culls. Voluntary culls are cows sold for dairy purposes or healthy cows replaced because her replacement is more profit to the dairy. High voluntary cull rates would mean that high-producing cows would remain in herds for many years. Mastitis, lameness and disease often shorten the productive life of these high-producing cows resulting in involuntary culling. Dairy producers should focus on the cause of involuntary culling because these are the culls that greatly decrease profitability. Selling cows without fixing management deficiencies only decreases profitability.
a. **Cull rates**

- If the total involuntary culling rate is greater than 35% there is opportunity to improve it. A guideline of 25 to 28% should be achievable. However, the goal should be to minimize the involuntary cull rate.

- Cows leaving the herd less than 30 DIM usually are cows that have died or have serious metabolic or infectious disease problems at calving. It is important to separate cows that are culled from cows that died. A good guideline is 6% or less of cows that calve leave during the first 30 DIM.

- Cows leaving the herd less than 100 DIM are cows that have had a transition problem around calving. Separate cows sold from those that have died. Less than 12% of all cows that calve should be culled during the first 100 DIM.

b. **Determine why cows are culled.** To lower the culling rate, the most important information needed is why cows are being culled. It is very important to develop a clearly defined list of reasons cows are culled. This can be a challenge. For example: A 150-day pregnant cow 700 days in milk with a 500,000 SCC and milking 35 lb is culled. Management needs to ask: Would this cow have been culled if she had got pregnant in a timely manner? Did she not come in heat because she had sore feet and couldn't walk? Would I keep her if her SCC were low? Did she not conceive because she had retained fetal membranes and severe metritis? Often cows are culled because of a combination of factors, however, a decision as to the major reason a cow was culled needs to be made.

Categories for reasons cows leave herds:

**Voluntary culls** - These are healthy cows, but a new replacement animal would be more profitable. This would include animals sold for dairy and cows that are just low producers.

**Lameness/feet and legs** - An increasing number of cows are being culled due to lameness or feet and leg problems. Early lactation laminitis may be an indication of a poor transition program. A guideline is less than 5% of cows that freshen leave due to lameness/feet and legs.

**Mastitis** - These are cows that have an acute case of mastitis or chronically elevated SCC. If cows are culled during the first 60 days of lactation for mastitis there is 50 to 70% chance that infection started during the dry period. The guideline is less than 7% of cows that freshen leave due to mastitis. This includes cows that die because of complications from mastitis.

**Reproduction** - These are cows that do not conceive or do not conceive in a timely manner. It also includes cows that abort. Set a guideline that less than 7% of cows that freshen leave due to reproduction.

**Transition cow problems** - This is a very broad category that is difficult to categorize. It could include retained fetal membranes, metritis, displaced abomasum, milk fever, calving injuries, cows dying at or around calving and early
lactation low producers. Many cows culled within the first 100 DIM likely belong in this category. The goal should be to have less than 10% of cows die or be culled because of transition cow problems.

**Other** - This category should have a very limited number of animals. This would include animals culled for Johne’s, pneumonia, hardware or other unknown reasons. Less than 2% of cows should be in this category.

All animals leaving the herd should be categorized in one of these broad areas. Another level of detail within each of these categories is needed. For example within the transition cow category, determine which disease is causing an individual cow to leave. This will help to solve specific problems. Cows that die should be placed in one of these categories. However, they should also be tracked separately. A good guideline would be to have less than 4% of all cows that calve die during their lactation.

2. **Identify the major reason(s) cows are getting culled and generate possible solutions.**

   a. **Analyze the records** to determine early lactation culls and the broad category or categories causing cows to leave. If all categories are higher than desired, begin by focusing on one or two categories to determine causes and begin action plans to correct the problems.

   b. **Further investigation** is needed once a category has been selected to better understand reasons for culling and generate possible solutions. Below is an example of a flow chart for identifying causes of culling due to lameness/feet and legs problems.
3. **Develop an action plan.** Work with the appropriate team of advisors and employees to develop an action plan based on your investigative work.

4. **Set up a monitoring plan.** Develop some key monitors to determine if your action plan is working?

   In the above example, if your investigation reveals that cows have foot rot, develop the appropriate monitors to track changes.

   - How many times per week is foot bath used?
   - How often is the solution changed?
   - What % improvement in cows is expected per week?
   - Monitor hoof trimmer evaluation of foot health.

5. **Implement the plan.** A similar process could be developed for any of the major broad categories.

6. **Make modifications to the plan as needed.** A similar process could be developed for any of the major broad categories.

**Conclusion**

High cull rates are very costly to dairy producers. Involuntary cull rates of less than 30% are being achieved in many herds. Early lactation culls should be monitored and tracked and investigated if too high. There is tremendous opportunity to improve profitability by decreasing the number of cows culled in early lactation. If your cull rate is higher than desired, develop a system that helps you analyze the reason(s) it is high. Then work with your nutritionist, veterinarian, dairy extension personnel, milk plant field representative and other dairy advisors to develop a plan to decrease it and improve your profitability.

**References**


