Dynamics and Strategies for Culling in a Dairy Herd

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Culling is an inevitable management practice on any dairy operation and depending on cull cow prices can represent 5 to 15% of a dairy's gross income. Culling dairy cows from the lactating herd and replacing them with heifers are essential to maximize herd profitability. Culls can either be voluntary, the farmer chooses when a specific cow leaves the herd, or involuntary. Limiting incidences of involuntary culls is important to allow one to decide when and which cows should be culled. This paper will explore the dynamics and strategies of culling in a dairy.

Give Every Cow a Value

Giving every cow a financial value helps one make an objective decision as to whether a cow should be considered for culling. This calculation allows one to identify cows that are the most profitable as well as the least profitable cows within a herd. Multiple methods and formulas have been developed to calculate the value of a cow. Inputs into these formulas can vary slightly, but they usually come to the same conclusion about a specific animal and her profitability ranking within a herd. These formulas are unique in the fact that they do not just calculate the value of a cow solely off present conditions, but instead they make projections based on her past performance, overall state of health, and reproductive performance.

Starting Point to Calculate a Cow's Value

A crude formula for calculating a cow's net value is:

$$Cow\ value = [Milk\ Price\ (adjusted\ for\ \%\ butterfat) \times Milk\ per\ lactation\ (in\ cwt)]$$
$$- [Cost\ of\ feed\ for\ the\ year\ (both\ lactation\ and\ dry\ period)]$$

The calculation above represents the value of a cow over her entire lactation. To more accurately determine a cow's net worth, milk price should be adjusted to account for the average butterfat percentage of this cow. A positive value is good because it indicates that she is generating more income than feed expenses. The opposite is true for when her value is negative, her expenses are higher than the income she is generating. Cow values can be used for comparing one animal to another when making culling decisions as well, especially when identifying voluntary culls within a herd.

How to Calculate How Much a Cow Should Produce

An equation to find the quantity of milk a cow must produce in a day to cover her feed cost is represented below:

$$Daily\ pounds\ of\ milk\ needed\ to\ cover\ feed\ cost = \frac{Current\ daily\ cost\ of\ feed}{Milk\ price\ per\ cwt} \times 100$$

Finding the minimum quantity of milk that a cow needs to produce is an important benchmark to evaluate her current performance and to make decisions of when to cull or dry her off. Using current regional metrics, a value can be established for the following hypothetical situation. Using a feed cost of $0.12/lb dry matter, feeding daily 50 lbs dry matter (or 100 lbs TMR at 50% moisture/dry matter) and a milk price of $18/cwt the quantity of milk a cow must produce to cover feed expenses can be calculated as follows:

$$lbs\ milk\ to\ cover\ feed\ cost = \frac{(\frac{\$0.12}{lb\ dry\ matter}) \times (50\frac{lb\ dry\ matter}{day})}{(\frac{\$18}{cwt\ milk})} \times 100 = 34\ lbs/day$$

Under these conditions if a cow is not producing the minimum of 34 pounds a day, she is not covering her feed costs and it does not make economic sense to keep her milking. In general, feed costs represent 50-60% of the costs to produce milk, but other costs are associated with a lactating cow. If we assume an additional 25% of production costs are associated with the production of milk, an additional 17 lbs of milk are needed to cover costs or a total of 51 lbs milk. For discussion, when a cow drops below the 50 lbs/day, her place in the herd should be evaluated. Using cow values, she can be assessed on her overall production and a decision can be made to dry off or cull.

More Intensive Calculator Options

The University of Florida and the University of Wisconsin offer calculators to determine a cow's value as well as other economic benchmark calculators. The on-line calculators have slightly different modifications or emphasize different factors, but they both use many of the same parameters. The information required by each program originates from both DHI reports and user-entered data. Data from an individual cow includes lactation number, days in milk, current reproductive status, and current milk production. Economic variables included are the average price of a culled cow, cost of a replacement, calf

Description	Default	3rd cow	Difference
Milk sales	4480	4787	307
Cow sales	330	296	−34
Calf sales	224	220	−4
Total revenue	5035	5304	269
Feed cost	2340	2424	84
Breeding supply cost	52	51	−1
Heifer purchase cost	860	786	−74
Veterinary cost	84	82	−2
Involuntary culling loss	0	0	0
Variable labor cost	402	401	−1
Fixed labor cost	182	182	0
Fixed other cost	730	730	0
Total cost	4714	4721	7
Total profit	320	582	262

Figure 1: The image to the left was taken from the DairyVIP program, a calculator from the University of Florida. The program evaluates the potential value of cows using many inputs and unique algorithms or equations. This calculator, and others like it, can be used to make culling decision in a herd. The DairyVIP program can be accessed using the link: https://animal.ifas.ufl.edu/dairy/spreadsheets-and-tools/.

value, price of milk, price of butterfat, cost of breeding, and price of feed for dry and lactating cows. The principle behind the calculations is to compare the income a cow generates to her maintenance costs. A cow generates income and increases her value through calving, producing milk, and becoming pregnant. Her expenses include feed and breeding attempts.

To determine when it is appropriate to cull or keep a cow, the net value of a cow must be compared to the net value of a replacement heifer. Net values originate from inputted data and are generated by the culling calculators offered by either the University of Florida or Wisconsin and use a more dynamic formula than just feed and additional costs. A retention-pay off value predicts the future profitability of a current decision of whether to cull a cow or not. It is calculated by subtracting the projected value of a replacement heifer from the projected value of the cow whose spot she would take. The projected values used include the income the animals would potentially produce less their expenses for raising or maintaining them. When the retention-pay off value is positive, it means it is predicted that the cow will produce more in the present time frame than her replacement would, so she should be kept. When the value is negative the opposite is true so the heifer proves to be more valuable and the cow should be culled at that time. If a cow with a positive retention-pay off value is culled or a cow with a negative value is kept, the retention-pay off value becomes the opportunity cost or unrealized income of those decisions. A cow culled too soon has a retention-pay off value that is equal to the amount of income lost and that she could have produced had she been kept longer. The retention-pay off value from holding on to a cow that should have been culled is equal to the income lost from not putting a better producing heifer in her place. Choosing the prime time to cull a cow is critical to optimizing the net income from individual animals.

Identify "Do Not Breed" Cows Early

Well managed herds identify their voluntary cull cows early into lactation. These cows are then placed on a "Do Not Breed" List to eliminate the extra expense of breeding. The cows that should be placed on this list include those that have reproductive tract abnormalities, fail to become pregnant after multiple services, or have chronically high somatic cell counts. These cows have the potential to generate lower net income. Cows who will hurt the bottom line should not have a place in the herd. Identifying these cows early results in cost savings as money is not spent breeding these cows. The cow continues to be milked until her production drops below the amount which generates revenue offset the cost of feed and other costs. When they reach the point they are no longer able to cover costs, they should be culled. Early identification of "Do Not Breed" animals is crucial in maximizing the profit.