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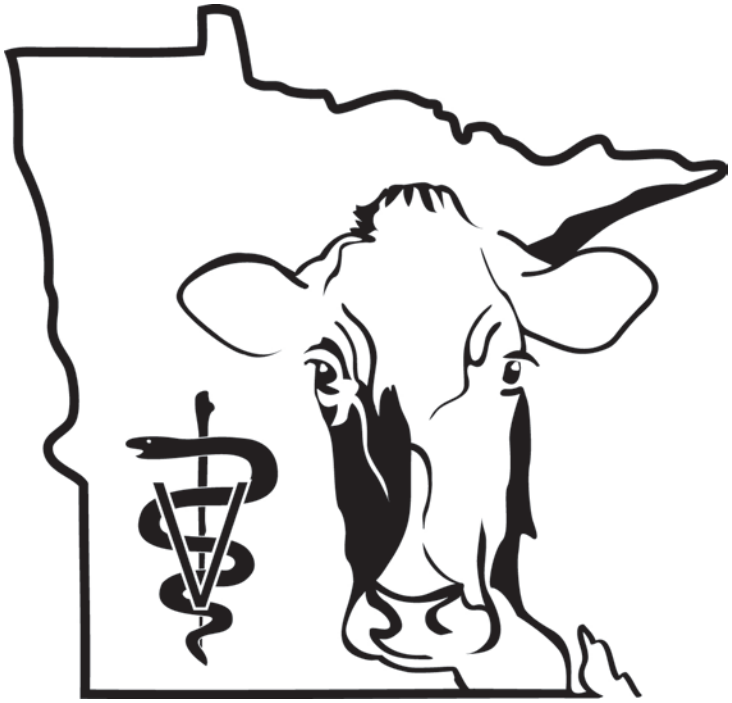

ST. PAUL, MINNESOTA
UNITED STATES OF MINNESOTA

New Decision Tools for REPLACING Unprofitable Cows

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Introduction

Traditionally, culling of dairy cows has been viewed from a historical viewpoint. Many dairy farmers and their consultants calculate their annual culling rate, and focus on the percentage of cows culled for a variety of reasons. High cull rates have been considered a sign of management failure, and recently, semen companies have even been marketing "longevity". Clearly, many diseases affect dairy profitability, and premature replacement is one of those costs. Reproductive failure also decreases profit, again, partially due to premature replacement.

A more prospective approach is needed. Every cow gets replaced. Replacing a cow prematurely incurs additional costs; waiting to replace a cow well after she is no longer profitable can forgo significant profit, even if it the lost cash is not obvious. Current culling practices often rely on hunches, or maybe guidelines. We present a tool to help fine-tune the optimum time of replacement.

Principles

1. *A dairy farm should always be operated at capacity.*
This capacity may be obvious, as in a stanchion barn, or may be less clear, in a free-stall or dry lot. This optimum capacity may even vary with different seasons, environments, and prices. However, the lost profit from having one empty stall is huge. The major incremental (marginal) costs are purchase price, and feed costs. There are also veterinary, BST, breeding costs, and some parlor supply costs. But for practical purposes, most of the overhead costs (labor, mortgage, utilities, etc) are unchanged. The incremental income is essentially the milk production. Under current prices, a new heifer has usually returned her investment well before the end of her first lactation.

Not running the dairy at capacity due to financial constraints means lost profit. It usually means that a lender has erred, as the incremental cow will help the dairy pay back their other loans. There are very few investments on a dairy that have that payback potential.

It is certainly possible to overcrowd a dairy to the detriment of profit. There are extreme examples where selling over 20% of the cows resulted in more <u>total</u> milk production! Each dairy should estimate their optimum capacity on a semi-annual basis.

2. *Maximizing the profit at each stall maximizes the profit on the dairy.*
Once each "space" is full, the next goal is to maximize the profit from each space. This approach requires comparing the feed costs, and milk income between the current cow and her potential replacement. For practical purposes, the maintenance costs of these two cows are similar (accepting some minor effects of growth and weight loss/gain). It then becomes necessary to estimate marginal feed cost. This is the average incremental cost to feed a group of cows that produce an additional 100 pounds of milk. It does not include the maintenance feed which she consumes regardless of her milk production.

3. *Diseases cost dairies money.*
Diseases incur costs in a number of different categories: decreased milk production, decreased milk sold, treatment costs, labor, drugs, decreased reproductive performance, and premature replacement. It is common knowledge that mastitis is the most costly disease on dairy farms. However, recent work by Chuck Guard has shown that on many dairies, lameness losses exceed the losses from mastitis, as clinical cases have decreased dramatically, whereas lameness incidence and severity have increased. Although it is rarely justified to attempt to eliminate a disease, as a general rule, most investments in disease control are justified. Finally, the average cost of either mastitis or lameness is dwarfed in comparison to the cost of empty stall disease.

4. *Last year's culling is a poor method of monitoring herd performance.*
It is already established that diseases cost dairies money. Premature culling is a small percentage of that loss. Appropriate surveillance systems should warn the dairy of problems long before the cows actually leave the herd. The situation is similar for reproduction. A dairy (or consultant) that needs to wait until cows actually leave the herd is not utilizing appropriate monitoring techniques. But most important, the culling records from last year should never be used to make a decision about the culling of an individual cow. No dairy ever says "Gees, I culled too many cows for mastitis last year, I guess I will start keeping more of these low-producing, high-SCC, chronic-mastitis cows."

5. *Longevity can decrease replacement costs, but profit is more important.*
Replacement costs are currently very high – nearly $1000 above cull prices. If the average cow is productive for 4 years, this is about $0.85 per day; if she is kept two years, it costs nearly $1.70 per day.

A 33% cull rate means the average cow stays for three years; her replacement cost is about $1 per day. At current feed and milk prices, this is slightly more than 10 pounds. In simplistic terms, if a replacement would average more than 10 pounds per day over the next three years, she will pay off her investment. Because of this fact, it appears some dairies tend to keep cows when replacing them would be more profitable.

6. *Each cow is eventually replaced with a heifer.*
In certain cases, a cow will be replaced with another milking cow, but this is extremely rare. Actually, that heifer will be replaced with another heifer, etc, so really, each stall is kept constantly occupied with a stream of replacement heifers.

7. *A 50% cull rate is likely with excellent reproductive, heifer, and health management.* With good reproductive performance (13 month calving interval), and an excellent heifer program (little death loss, 23 month age at freshening), approximately 50% of the herd will have female offspring, which will be entering the herd two years later. This means that about 50% of the herd will need to be sold each year. That dairy has the choice between the next springing heifer, or the least profitable cow. Some dairies will elect to the worst cow, others will sell these "excess" heifers. The model will help dairy farms make the correct decision.

The Model

The model calculates the "net present value" of each cow. Basically, it estimates each cows' future income and expenses, then discounts the cash flow to today. By necessity, the model makes numerous assumptions. Three important ones are:

1. Stalls are full – the dairy is at capacity. If not, fill empty stalls.
2. All cows are replaced with an average heifer – either raised or purchased.
3. Dairy farms will make replacement decisions based on maximum future profit.

Management Questions

There are many herd level (policy) decisions made on a dairy –what is the ration, should young sires be used, what is the BST policy, etc. But there is still much profit involved in decisions on each individual cow each day. There are three fundamental questions:

1. Should this cow be replaced today with a new heifer?
2. If this cow is sick, should she be treated, or shipped?
3. If this cow is in heat, should she be bred, or should we stop inseminating her?

Cow Value

Cow Value is the expected net present value compared to the average replacement heifer. A fresh heifer will have a CowValue of approximately $1000, (assuming the current replacement cost is $1400, and the cull value is $400). The average CowValue on most dairies is somewhat less than the fresh heifer. Perhaps that helps explain why most dairy farmers value replacement heifers higher than previously owned milking cows.

If a cow has a negative CowValue, replacing her would likely be more profitable. A potential cull list typically contains cows sorted by CowValue, with the most negative on top. Thus, CowValue can help answer question the question: Should this cow be replaced today?

A cow that is diagnosed with a displaced abomasum that has a CowValue of $1150 may be more profitable treated than shipped. On the other hand, a repeat mastitis case that has a CowValue of $150 may be an excellent opportunity for replacement. Dairies can use CowValue as an additional tool to determine whether to treat a diseased cow.

Pregnancy Value

Once CowValue is estimated, a second model is run. If the cow is not pregnant, the model assumes she got pregnant today. PregValue is the change in her CowValue if she was successfully bred today. If she is already pregnant, it assumes she aborted today. PregValue is the change in her Cow Value if she aborted today. Typically, PregValue is about $200 for open cows. That means getting the average cow pregnant is worth $200. However, the average PregValue for a pregnant cow is much higher. However, they are already over 150 days with calf. Those abortions are expensive.

If an open cow has a negative PregValue, it means she will be worth less pregnant than she is open. She should not be bred. It is likely that denoting this cow as a DNB cow will increase her cow value.

Perhaps the most thought provoking concept arises when an open cow has a negative cow value, and also has a negative pregnancy value. This means she is worth less pregnant that if she remains open. However, the software algorithm assumes that cows that are not coded DNB are still trying to get pregnant, and that a percentage of the time they will. Thus, this cow will have a lower cow value while she is still eligible to be breed. Her value should INCREASE once she is flagged as a DNB. This makes sense - it is sometimes a profitable decision to flag a cow as a DNB cow. Note that a cow flagged as DNB may still have a positive cow value, until her milk production decrease below that cull/cutoff value.

The flip side is also of interest. Any DNB cow that has a positive pregnancy value has hopefully been flagged DNB because of some reason other than current milk production. This pregnancy value may be a crude estimate of the cost of culling her.

Cow Factors

For each cow, the model guesses at her future profit until she is replaced. It needs to know her future milk production, both for this lactation, and for future lactations. The following factors are used to help estimate the remaining life of this cow:

- Current milk production
- Current days in milk
- Age (older likely to have fewer future lactations)
- Reproductive status
- Days carried calf?
- Days since last heat? (if not confirmed)

Interestingly, adding health factors to the model has little effect. Health factors are very important, but most, if not all, health factors of importance result in decreased production. And if there is no disease effect on milk production, it does not matter. The other important point is that because the reproductive status of a cow can change (she is in heat, bred, diagnosed pregnant or open), and her milk production can change, her value can change. In general, cow value should be recalculated on a daily basis.

Herd Factors

Because each cow is always compared to a replacement heifer, the model also must be able to predict the performance of the average heifer. This entails estimating her production by lactation, how quickly she will become pregnant, and her chance of being replaced. The following factors can be set for each herd.

- Expected milk production by lactation
- Expected future cull rate by lactation
- Heat detection, conception rate, VWP
- Heifer cost, cull value
- Feed cost (Maintenance, Marginal)
- Milk price
- Discount rate

Pregnancy Rate	0.25	Lact 1 305 Milk	22000
Conception Rate	0.40	Lact 2 305 Milk	24000
Heat Detection	0.40	Lact 3 305 Milk	26000
VWP	60	Lact 1 CullRate	0.20
Avg Dopn	130	Lact 2 CullRate	0.30
		Lact 3 CullRate	0.45
Heifer Cost	1200	Lact 4 CullRate	0.55
Cull Value	300	Lact 5 CullRate	0.65
		Lact 6 CullRate	0.70
Milk Price/cwt	13.00	Lact 7 CullRate	0.75
Marginal Feed	3.00	Lact 8 CullRate	0.80
Maint Feed/day	1.50	Lact 9 CullRate	0.90
Discount Rate	0.10		

Assume that a pregnancy is $200. A cow bred yesterday is 40% pregnant. Because 40% of $200 is $80, her CowValue will increase about $80. If she were bred 35 days ago, she is even more likely, depending on HDR at 21 days.

Conclusion

The bottom line is that every cow will be replaced on your dairy. Keeping every one $50 "too long" is bad. Selling every one $50 "too soon" is bad. There is money to be made by replacing cows at the appropriate time. These predictions should be used as guidelines. They are not meant to replace sound judgement, but to augment it.