To Keep or to Cull

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Sometimes choosing when to replace something is easy. For example, a light bulb works equally as well on the day you first put it in and the minute before it stops working. When it stops working, it completely stops working and you know it is time to replace it. This is involuntary replacement; your only options are to go without light or to replace the light bulb.

Often times, choosing when to replace a dairy cow is more difficult. There are still times that involuntary culling is necessary. For example, if a cow dies, then the options are to go without a cow or to replace her. However, if a cow does not die, then she always still has some production potential. Therefore, the key to culling is determining at what point the cow's production potential has dropped enough to warrant replacement. This type of culling is termed voluntary. Voluntary removal refers to cows that are removed from the herd in an unforced manner – it is completely up to the farmer to keep or cull her. Reasons for voluntary culling might include low production or bad temperament. Voluntary culling is a tool dairy farms can use to improve their overall herds (by keeping the best cows and replacing the worst), to keep the herd size from growing beyond capacity, and to maximize profits.

Which cows to voluntarily cull and at what point in time can quickly become complicated. The simplest way to think of voluntary culling is by comparing it to managing employees in an office environment. Each employee has their own office space. If one employee is not being productive enough to pay for that office space or if there is an employee that could increase profits more than the current employee, then the employee is replaced. Similarly, on a dairy farm, each cow has a stall. If that cow is not being productive enough to pay for that stall or if another cow could increase profits even further, the current cow should be replaced. In short, a cow should be culled when higher profits are expected from her replacement.

Mathematically, we can calculate the "optimal time of replacement" for a cow using a fairly straight-forward equation:

Optimal moment of replacement = the moment when expected future profits from the current cow < expected future profits from a replacement cow

Unfortunately, calculating the individual pieces of this equation is not easy. The expected future profits from the current cow depends on many things including the cow's age, production, days in milk, reproductive status, previous and current diseases, etc. Combining all of these things not only for today but also for many years to come AND estimating the expected lifetime of the cow is difficult. On top of that, estimating the future profits and lifespan of her replacement makes the task twice as difficult. Here are some tips to help with on-farm culling decisions:

1) ***Know and keep in mind your target herd size.*** Culling is the best strategy a farmer has to controlling herd size. Being aware of your current and target herd size dictates if, when, and how many cows to cull. When defining a target herd size, keep in mind limitations like housing, feed resources, and labor.
2) ***Be aware of replacement availability.*** Replacement availability depends on where your heifers come from. Are heifers raised on farm, bought, or some combination? Do you use sexed semen? If you do not have a heifer to replace a cow you want to cull, culling may not be a good strategy. Additionally, be aware of the quality of your incoming heifers. In most cases, the best genetics on the farm are in your heifers. Therefore, it's important to realize that you are not replacing a cull cow with an identical animal but actually a (genetically) superior animal.
3) ***Cow ranking.*** Consider ranking your cows according to their potential profitability. This allows you to easily identify the best cows to cull when you have an opportunity for voluntary culling. Additionally, ranking cows allows you to determine how much it is worth to try and keep a cow (i.e. you would be more likely to treat a mastitis case for a cow ranked 10th than a cow ranked 350th in the herd). There are some herd management software programs that will rank cows for you. For example, the CowVal option in DairyComp will rank cows according to their value and their expected value after becoming pregnant. Ranking cows allows you to consider many factors at once including production level, pregnancy status, disease history (and likelihood of repeat), etc. Sometimes other factors can play into culling that don't relate specifically to expected profit (i.e. cow temperament, etc.).
4) ***Good records are important.*** In order to rank cows and to be able to estimate their future value, good record keeping is essential. Although most farmers tend to keep good production and reproduction records, disease records are especially valuable for culling decisions (yet often overlooked).

Culling is not only a science, but also an art. Unfortunately, perfect prediction of exactly the best time to cull a cow is not possible. Dairy is a risk-filled business and there is always a risk that a cow will get a disease, abort a calf, or even die unexpectedly. There will always be some of these involuntary culls no matter how strategic your voluntary culling is.

Other Resources:

Kristensen, A. R., E. Jorgensen, N. Toft. 2010. Herd Management Science I. Basic concepts. Academic Books, Copenhagen, Denmark.

Schutz, M. and J. Townsend. 2003. Culling dairy Cows: An Opportunity for Improvement When Feed Supplies are Tight. https://www.extension.purdue.edu/dairy/articles/CullingDairyCows.pdf

Gröhn, Y. T., P. J. Rajala-Schultz, H. G. Allore, M. A. DeLorenzo, J. A. Hertl, and D. T. Galligan. 2003. Optimizing replacement of dairy cows: modeling the effects of diseases. Preventive Veterinary Medicine 61(1):27-43.