Management Strategies: Culling

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Key Points

- Cull rates are higher on most commercial dairy farms than is optimal for maximum net revenue. This is probably due to high heifer pressure. High cull rates can also mask management problems that exist in a herd.
- Cows should be kept as long as possible. 33% of the cows should be kept past five lactations. The decision to cull an animal should be made when she is considered for insemination. A table of reference values is provided to help in deciding if a cow should be inseminated.
- Cows to be culled, but not replaced, should be removed at 40-50 pounds of milk/day. Cows that are to be replaced should be removed from the herd when they reach 80% of the average milk production.

Introduction

Although culling occurs one every farm, it is a topic that never seems to receive much attention. Part of the problem is that losses associated with culling occur in small increments and are difficult to identify. Furthermore, the impact of culling is different on every farm. Some farms make money with a high cull rate while others lose money with the same cull rate. One thing that is certain, however, is that cull rates are increasing. In 1972, the average herd in New York had 61 cows and culled 19 for a 31% cull rate. The average age of the herd was 55 months. In 1993, the average New York herd increased to 89 cows and culled 32 for a 36% cull rate. The average age of herds has decreased to 49 months. This is a result of higher culling and expanding herds. If culling rates are increasing for the wrong reasons, this might be an area where some managers can increase their economic situation by reevaluating and correcting culling policies.

Culling is the active decision to remove a cow from the herd. Usually, culling is divided into involuntary and voluntary reasons. Involuntary culling results from a disorder which makes the cow no longer profitable to keep. Examples of involuntary reasons include mastitis, infertility, health, etc. Voluntary culling occurs when a low producing cow or a cow that has outlived her productive life is removed from the herd. To maximize efficiency of facilities, culling is usually associated with replacement with a heifer. Consequently, the decision to cull a cow should be made whenever the net revenue projected for the cow is lower than the net revenue for a replacement heifer. In this paper, we'll examine some underlying thinking that should go into establishing a culling policy. Three primary questions will be addressed:

1) What is an optimal cull rate?
2) Which cows should be culled?
3) When should cows be culled?

These questions will be examined using a case farm approach. Data from a case farm will be used to illustrate general culling principles.

Table 1. Case farm statistics.

Rolling Herd Average	21,200	Age at First Calving	24 mo
Herd Size	146 cows	Average Age	40 mo
Milk/day	65 lbs	Calving Interval	14.2 mo
Percent Fat	3.6%	Cull Rate	33%
Average ME305	24,100 lbs	First Calf Heifers	43%
Linear Score	2.4	Number of Heifers	130

What is an optimal cull rate?

Finding the optimal cull rate for a specific herd is very difficult. Therefore, the common approach for analyzing multiple cull rates is to use a computer simulation. The most famous culling model was developed by Johan van Arendonk in the Netherlands and has been adapted to US conditions (Rogers, 1988a)

Almost all published research has shown that cull rates are too high and that annualized net revenues are compromised. Optimal cull rates are reported to be 25 to 28% for commercial herds (Rogers, 1988a; 1988b). This is much lower than generally observed on most commercial farms. It is not unusual to see cull rates between 35 and 45%. Rogers' results suggest that lowering involuntary culling by one cow per year in a 100-cow herd improves net revenue by approximately $750 to $900/yr (Rogers, 1988b). The increase in net revenue results from lower replacement rates, increased culling of low producers and increased longevity of high producers.

Optimal cull rates are sensitive to changes in replacement heifer prices and cull cow prices, but cull rates are only slightly sensitive to average ME milk yield, milk price, and feed price. Table 2 provides the optimal cull rates listed by differences between heifer price and cull cow price. The optimal cull rate was not over 30%.

Table 2. Effect of cull cow and heifer values on optimal cull rates.

Replacement heifer value minus cull cow value	Optimal Cull Rate
$450	28%
$550	25%
$650	24%

The cull rate of a herd is controlled by three main forces. The major force is the goal for herd size. Herds that are expanding tend to have lower cull rates while herds that are not growing tend to have higher cull rates. The next factor is heifer pressure. This is the pressure that springing heifers put on the herd to make room for them. And the last factor is the number of herd health problems. This factor moves culling between voluntary and involuntary culling. A stable herd size and good heifer programs are probably the cause of high cull rates on most commercial farms.

The case farm has 146 cows. During the last year, 135 cows calved (note the 14.2 month calving interval) which should have produced approximately 69 heifer calves. If we assume a 5% loss at birth and a 5% loss before entering the herd, this leaves 61 calves to enter the herd in 24 months. If every calf is kept, this farm will need a 42% cull rate to accommodate these calves or else expand herd size. Table 3 contains the actual heifer inventory according to NeDHIA. There currently are 62 heifers between 12 and 24 months of age. The cull rate during the next year is likely to be over 40% if the herd does not expand and all heifers are brought into the herd.

A high cull rate solely due to heifer pressure can be costly. Such a practice will lower longevity and profitability if there is a significant difference between the cost of replacement heifers and cull cow prices (Congleton and King, 1984). The first step is to determine the optimal cull rate. For the case farm we'll assume $1,200 to raise a replacement heifer and $750 salvage value for culled cows. The difference is $450 which correlates to a 28% cull rate from Table 2. If the optimal cull rate is 28%, then the case herd is culling at least 7 more cows per year and raising 7 more heifers per year than is necessary. If the assumption of $750/culled cow/ 100 cows is correct, then the case farm would increase net revenue by $3596/year by lowering their cull rate.

Table 3. Heifer inventory for the case farm by age of the heifers.

Age (months)	Inventory
0-6	23
6-12	27
12-18	38
18-24	24
24-30	18

Depending on the price for springing heifers and the cost of raising heifers, a decision should be made about raising all heifers. Most farms cannot raise heifers for less than $1100 and the price for springing heifers is usually around $1200. Under these conditions, calves from inferior parents should be sold shortly after birth. This practice also frees management time and forage resources plus it alleviates manure disposal problems. One disadvantage of this practice is that heifers will not be available if a decision to expand is made without proper planning. The "safe" position is to raise all heifers. This, however, generally leads to high cull rate and lower net revenues.

The next step in lowering the overall cull rate is to determine the reasons for culling and management changes that could be made to reduce involuntary culling. Table 4 lists the reasons for culling for the case farm. These data suggest that the case farm has a reproduction problem (infertility and abortion) that is being managed through culling. Removing the heifer pressure would require fewer animals to be culled in this category in particular.

Table 4. Reported reasons for culling in the case farm.

Reason	Percentage	Reference
Infertility	30	15
Health	16	15
Low Production	14	30
Died	11	10
Mastitis	9	15
Abortion	9	2
Injury	5	5
Other	4	3
Feet & Legs	2	5

Which cows should be culled?

The decision to cull an animal is usually made at two different times. The primary one is when a cow is considered for insemination. Cows which should be culled probably should not be inseminated. The other time is when a cow has a severe problem. The decision to cull based on a particular problem is dependent on the severity of the problem. In general, only the best cows should be kept beyond 6 or 7 lactations, but 33% of the cows should be kept past 5 lactations.

Table 5 provides a guide to decide if a cow should be inseminated. It is based on ME305 values as a percentage of the herd mean and was generated by comparing the net revenue stream when the cow was inseminated with that when the cow was left open and culled. For example, a first lactation cow would need to have an ME305 day value greater than 78% of the mean at the third month of lactation to be considered for insemination.

Table 5. Production level (% of herd ME305) below which insemination would not be optimum by parity (Rogers, 1988b).

	Month of Lactation		
Parity	3	5	7
1	78	82	86
2	78	82	86
3	78	82	90
4	82	86	90
5	86	90	94
6	90	94	102
7	94	98	106
8	98	106	110
9	106	110	118
10	110	118	126
11	122	126	...
12	...	...	...

Note that higher production is needed to offset delayed insemination. This is due to lower revenues associated with prolonged calving intervals. Also, higher production is needed in later lactations to justify insemination. This is due to increased risk of problems associated with age.

Practice selecting cows to be culled. From the cows in List 1, decide for which cows would it not be profitable to inseminate if they come into heat.

When should cows be culled?

Once it has been decided that a cow will be culled, the next question is when should she be culled. In the

List 1. All cows not confirmed pregnant in the case farm.

Name	CULL	Fresh	Lact No.	DIM	Milk	LS	# bred	Last Bred	DCC	ME305	-%
425		10/02/93	1	49	41	1.7				15250	63
416		10/01/93	1	50	51	2.6				17536	73
306		09/28/93	3	53	85	6.3				21185	88
4		09/26/93	9	55	95	2.8				20800	86
432		09/26/93	1	55	69	0.3				23623	98
264		09/24/93	3	57	86	1.8				20937	87
338		09/21/93	2	60	60	2.7				16558	69
431		09/20/93	1	61	76	1.4				26176	109
87		09/18/93	6	63	67	2.8				16270	68
367		09/13/93	2	68	74	3.2				21720	90
362		09/12/93	2	69	80	1.5				23091	96
348		09/07/93	2	74	64	1.4				16481	68
434		09/06/93	1	75	67	0.7	1	11/11/93	9	23685	98
435		09/04/93	1	77	53	4.7				19103	79
354		09/01/93	2	80	87	1.8	1	11/08/93	12	25411	105
423		08/23/93	1	89	73	2.4	1	10/22/93	29	26130	108
316		08/15/93	2	97	70	4.3	1	10/30/93	21	21358	89
438		08/11/93	1	101	61	5.2	1	11/16/93	4	21353	89
266		08/10/93	3	102	75	7.3	1	10/18/93	33	22758	94
254		08/05/93	3	107	58	3.1	2	10/18/93	33	18764	78
274		08/05/93	3	107	49	6.6	2	11/15/93	5	15667	65
371		08/04/93	2	108	78	2.3	1	10/25/93	26	28002	116
406		07/24/93	1	119	67	2.1	2	10/14/93	37	25322	105
412		07/21/93	1	122	60	4.9				23255	97
336		07/15/93	2	128	68	4.1	1	10/15/93	36	23123	96
297		07/13/93	2	130	84	1.3	2	10/25/93	26	27091	112
363		07/02/93	2	141	76	2.4	1	10/30/93	21	27780	115
417		06/29/93	1	144	67	5.3	2	11/05/93	15	27440	114
23		06/28/93	6	145	69	1.9	2	10/15/93	36	20021	83
314		06/26/93	2	147	51	2.0	3	11/09/93	11	19474	81
402		06/22/93	1	151	74	4.1	2	10/15/93	36	30893	128
329		06/13/93	2	160	58	2.3	5	11/09/93	11	22114	92
390		06/11/93	1	162	62	4.8	1	11/09/93	11	25412	105
255		05/16/93	3	188	66	1.8				20658	86
312		05/15/93	2	189	56	2.8	3	11/02/93	18	24413	101
277		04/23/93	2	211	62	4.7				22199	92
399		04/05/93	1	229	36	1.7	3	10/24/93	27	20336	84
370		03/23/93	1	242	43	2.1	2			19960	83
325		02/28/93	2	265	52	3.6	4	10/19/93	32	25583	106
305		02/16/93	2	277	65	1.2	3	10/28/93	23	30924	128
20		02/04/93	7	289	75	2.0	2	10/16/93	35	28686	119
137		12/13/92	6	342	56	3.5				24004	100
47		12/02/92	8	353	44	7.0				17054	71

simulation studies, the average days in milk for involuntary culling was 168 days and for voluntary culling at 263 days (Rogers, 1988a). In another study (Congleton, 1987), the cumulative net income for cows was shown to peak between 32 and 35 weeks of lactation.

Case 1: **The cow is not to be replaced.** A cow that is going to be culled but not replaced only needs to pay for the feed she eats and her maintenance. Traditionally, a milk production of 40 to 50 pounds is needed for a cow to pay for herself.

Case 2: **The cow will be replaced with a heifer.** If the cow is to be replaced with a heifer, then the cow should be able to pay for the feed she eats, her maintenance, and return a net revenue that is consistent with the profitability of the herd. A good rule-of-thumb is that this level of production is 80% of the average production. For the case farm, cull level would be 52 pounds.

Using the list of animals that you selected for cull candidates, select 5 animals that could be culled. The case farm has 5 heifers that are due to calve in the next month and room is needed for them.

List 2 contains all mature animals that were culled during the last year for the case farm. The animals are sorted by days in milk when they were culled. The first column is their name. The next column is a representation of their days in milk. Each * represents 15 days and the ¦ represents a month. The following columns are the days in milk, their last milk production, their ME305 day value as a percentage of the herd mean, and the reason reported for leaving.

List 2. Animals culled during third+ lactation in the case farm.

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Name                                      DIM  MILK % of ME   Reason left

17        *¦*                              49   32   43       SOLD HEALTH
11        *¦*                              53   46   52       SOLD HEALTH
176       *¦*                              54   31            SOLD MASTITIS
132       *¦*                              59   65   65       SOLD HEALTH
547       *¦*¦                             65   19   25       SOLD LOW PROD
180       *¦*¦*                            77   48   55       SOLD MASTITIS
273       *¦*¦*¦*¦                        130   81   92       SOLD OTHER
230       *¦*¦*¦*¦*¦*¦*                   198   43   65       SOLD LOW PROD
210       *¦*¦*¦*¦*¦*¦*¦*                 229   32   72       SOLD INJURY
131       *¦*¦*¦*¦*¦*¦*¦*¦*               265   16   71       SOLD ABORTION
24        *¦*¦*¦*¦*¦*¦*¦*¦*¦              271   29   41       SOLD LOW PROD
141       *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦            307   58   83       SOLD HEALTH
21        *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦            307   38   71       SOLD INFERTIL
168       *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦            310   45   90       SOLD INFERTIL
150       *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦            311        93       DIED
200       *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦            314   42   81       SOLD ABORTION
214       *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*           315   37   64       SOLD INFERTIL
152       *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*           327       116       DIED
30        *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦        363   24   68       SOLD INFERTIL
96        *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦->      368   21  110       SOLD INFERTIL
47        *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦->      380   44   71       SOLD INFERTIL
169       *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦->      399   40   99       SOLD INFERTIL
128       *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦->      472        96       DIED
159       *¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦*¦->      508   33  106       SOLD INFERTIL
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There is heavy culling during the first 75 days of milk. Six animals were culled primarily for health and mastitis problems. The overriding reason for culling is reproductive problems (infertility and abortion). Only 2 animals were sold for low production. Most animals were below the 52 pound "cull level" established above, but a few were culled with higher milk production. Only 3 animals had ME305 day values above the herd mean. In general, this culling is for involuntary reasons.

Let's look at the cost for culling cow 273. If she had been milked for the entire lactation, she would have produced approximately 21,000 pounds of milk. However, in the 129 days that she was in the herd, she only produced 10,000 pounds. We can assume a return over variable cost of $2/cwt; therefore, approximately $220 was lost by the decision to cull her. If the need to cull her could have been avoided by a change in management practices, then an additional $220 would have been realized for fixed expenses and net farm income.

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Abstract

A serological comparison of some animal herpesviruses.

W. B. Martin, G. Castrucci, F. Frigeri, and M. Ferrari.

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Bovine herpesvirus 1 (BHV-1) isolates (Cooper-type strain 4975 and Oxford) were compared in neutralization tests with bovine herpesvirus 4 (BHV-4) isolate (85/16TV) and the herpesviruses of red deer (D2839/1) and goats (E/CH). Hyperimmune antiserum was prepared in rabbits against the plaque-selected viruses and end-point and kinetic neutralization tests were made. BHV-4 was clearly different from the other four viruses. The closely-related BHV-1 strains were also related in these tests to the red deer herpesvirus. The Oxford strain seemed rather closer antigenically than the Cooper-type strain to the red deer herpesvirus. Antiserum to the caprine herpesvirus failed to neutralize either BHV-1 strain or red deer virus, but antiserum to the Cooper-type and red deer herpesviruses did neutralize caprine virus to a limited extent.