

CAUSES FOR CULLING FIRST CALVING COWS ON FARMS WITH DIFFERENT LEVELS OF PRODUCTION

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Original scientific paper

Abstract: It is general knowledge that management influences results in cattle production to the highest extent, and that the culling of cows is a very good indicator of the success of farm management. A comparison of results of culling for first calving cows on farms with various levels of production in 2011 established differences both for the number of culled animals and the reasons for culling. On farms with higher levels of production, the share of first calving cows in overall culling was 25.9% or 4.5% less than on farms with a lower level of production, i.e. 4.8% less died, and 0.7% first calving cows had to be slaughtered, while 5.6% more first calving cows were culled for economic reasons. At both levels of production, dominant reasons for culling were diseases of the legs and hoofs, which can be linked to the tie stall system (more pronounced on farms with higher production) and metabolic disorders (more dominant on farms with lower production). Reproduction was a more considerable problem on farms with higher milk production, while culling due to selection was more pronounced on farms with lower production. In early lactation of first calving cows, regardless of the level of production, dominant reasons for culling on farms are leg and hoof problems and metabolic disorders (total: 55% i.e. 55.9%). When reasons for culling of first calving cows after 100 days of lactation are investigated, on farms with high production the significance of diseases of legs and hoofs remains almost unchanged, but culling due to reproduction grows to 28%. On farms with lower production, culling due to leg and hoof diseases is considerably reduced after 100 days of lactation, however culling due to selection is tripled (62%).

Key words: Holstein, first calving cows, level of production, culling

Introduction

Under conditions of high milk production, management strives to decrease differences between cows in the herds, i.e. to homogenize the herd as much as possible. This is most often realized by applying a comprehensive rearing technology, using quality genetics and planned culling, which contributes to selection efficiency by a more reliable evaluation of heritability (*Djedović et al., 2002 and Stojić et al., 2000*).

As for the culling cows, depending on the level of production, dominant reasons for culling also change. According to research by numerous authors, total culling, including also deaths, is 32-36% (*Stojić et al., 2012; Chiumia, 2011; Pinedo et al., 2010; Seegers et al., 1998 and Dürr, 1997*), while *Maher et al., (2008)* established total culling at a level of 21.3%. In high producing herds, according to research by *Nienartowicz-Zdrojewska et al., (2009)*, cows were most frequently culled because of problems with reproduction, mastitis and leg and hoof diseases. The relationship between low production, metabolic disorders and low reproductive efficiency was noted by *Beaudeau et al., (2000)*. However, relevant to the free and tie stall system, *Beaudeau et al., (1993)*, established that the rearing system influences culling caused by mastitis and distortions, but not culling caused by metabolic disorders or diseases of the locomotion apparatus.

By analyzing culling in Quebec, Canada, in the 1981-1994 period, *Dürr, (1997)*, established that voluntary culling of cows due to low production, age, constitution, is decreasing more rapidly, while forced (involuntary) culling is increasing, and that according to *Fetrow et al., (2006)*, this has to be controlled and gradually decrease. *Pinedo et al., (2010)*, established that low production and mastitis, as reasons for planned culling, had a 2.5 fold lower share in culling in relation to reproductive problems and injuries. *Stojić et al., (2012)* established that culling due to leg and hoof problems was more dominant than culling for reasons of selection (28.4% : 23.27%). The most frequent reasons stated for unplanned i.e. culling not due to selection are reproduction (*Ansari-Lari et al., 2012; Stojić et al., 2012; Chiumia, 2011; Pinedo et al., 2010; Fetrow et al., 2006; Seegers et al. 1998 and Allaire et al., 1976*), followed by mastitis (*Chiumia, 2011 and Fetrow et al., 2006*), and leg and hoof diseases (*Stojić et al., 2012; Chiumia, 2011 and Fetrow et al., 2006*). The causes of culling of first calving heifers on farms were also studied by *Novaković et al. (2009)* and *Petrović M.D. et al. (2004)*.

For first calving cows, it was established that first calving cows that became pregnant later are culled earlier, due to a higher risk of low production, as well as cows with a weaker expression of characteristics of type (*Dürr, 1997*). In the overall structure of culled cows, first calving cows accounted for 1/5 (*Pinedo et al., 2010 and Maher et al., 2008*) to 1/3 (*Stojić et al., 2012 and Chiumia, 2011*).

The most frequent reasons for culling were selection and low production (20-29.2%), followed by reproductive problems (13-27%) (Stojić *et al.*, 2012; Seegers *et al.*, 1998 and Allaire *et al.*, (1976). In the tie stall system, 26.7% of first calving cows were culled due to leg and hoof diseases, and 13.5% due to metabolic disorders (Stojić *et al.*, 2012). According to research by Dürr, (1997), on the average, first calving cows were culled 215.6 days after calving.

Materials and Methods

Results for cow culling on seven large farms with a tie stall system located in the northeastern part of the Belgrade region were investigated. In 2011, average of 8837 dairy cows was reared on these farms, with cow numbers by farms of 1080 to 1524. They realized an average annual production (daily milk production/number of cows x 365 days) of 7587 liters of milk. The analysis of culling first calving cows at different levels of milk production was done on results for culling from two farms each with the highest and the lowest annual production.

On all four farms, cows are reared in a tie stall system in semi-open barns (closed during the winter with bales of hay, during the summer acting as overhangs, with only a minority of barns that are fully enclosed), housing 120-130 cows. Cows are milked using machines and each barn has a milk line, vacuum line and its own lacto-freeze. Cows are grouped by production and fed mixed meals with individual addition of minor quantities of concentrated feeds. In essence, meals consist of alfalfa hay, alfalfa haylage, whole plant maize silage, complete concentrate mixtures, soy meal, molasses and other additions.

According to reasons for culling, all culled animals were divided into 8 groups, while according to the time of culling they were divided into two groups: up to 100 and over 100 days. Data was analyzed using standard mathematical-statistical procedures.

Results and Discussion

The two farms with the highest milk production had an annual production per cow of 8175 liters i.e. 8061 liters, while the two farms with the lowest production productions of 7013 liters and 7321 liters (Table 1). On all farms, rearing conditions were almost identical (facilities, milking equipment), the same bulls were used for artificial insemination, the same operative meals and complete concentrate mixtures were used and the conditions for production of roughages were the same. For this reason, it can be said that to the most extent, differences in production, are in fact a consequence of farm management.

Table 1. Annual milk production per cow on the observed farms

Level of production	Farms	Annual Production			
		ANC	MILK	Fat	Prot
High	H1	1524	8175	3.49	3.31
	H2	1106	8061	3.31	3.29
Low	L1	1345	7013	3.33	3.30
	L2	1080	7321	3.33	3.29
Average of 7 farms		8837	7587	3.36	3.29

Abbreviations:

ANC – Average number of cows; MILK – Annual milk production per cow, kg; Fat – Average fat content,%; Prot – Average protein content,%

Research results indicate that on farms with a high level of production, the share of culled first calving cows in total culling was 4.5% lower, amounting to 25.9% (Table 2). When the structure of culling is investigated relevant to the basic reasons for culling, it can be established that farms with better production have 5.6% more culling of first calving cows for economic reasons (ER) and 0.7% more because of forced slaughter (FS), i.e. of the total number of culled first calving cows, 7% less died (D). It is to be expected that the number of cows culled as a consequence of death and forced slaughter must be reduced, if we strive for higher milk production, all the more so, because the economic effect is also better if more cows are culled for economic reasons.

Table 2. Number of culled first calving cows by primal reasons of culling

Level of production	Farms	TNCC	NCFCC	Primal reasons of culling		
				D	FS	ER
High	H1	528	136 (25.8%)	17 (12.5%)	3 (2.2%)	116 (85.3%)
	H2	422	110 (26.1%)	22 (20.0%)	3 (2.7%)	85 (77.3%)
	H1+H2	950	246 (25.9%)	39 (15.9%)	6 (2.4%)	201 (81.7%)
Low	L1	434	119 (27.4%)	33 (27.7%)	7 (5.9%)	79 (66.4%)
	L2	391	132 (33.8%)	19 (14.4%)	1 (0.8%)	112 (84.8%)
	L1+L2	825	251 (30.4%)	52 (20.7%)	8 (3.2)	191 (76.1%)

Abbreviations:

TNCC – Total number of culled cows; NCFCC – Number of culled first calving cows; D – Death; FS – Forced slaughter; ER – Sale for economic reasons

Similar results for culling of first calving cows in relation to the total number of cows were established by *Stojić et al., (2012); Chiumia, (2011) and Seegers et al., (1998)*, while considerably lower results were established by *Pinedo et al., (2010) and Maher et al., (2008)*.

Table 3. Reasons of culling on farms with different levels of production

Reasons of culling	Farm H1		Farm H2		High production level (H1+H2)		Farm L1		Farm L2		Low production level (L1+L2)	
	n	%	n	%	n	%	n	%	n	%	n	%
Reproductive diseases	40	29.4	9	8.2	49	19.9	1	0.8	4	3.0	5	2.0
Difficult calving and abortion	4	2.9	3	2.7	7	2.8	1	0.8	4	3.0	5	2.0
Metabolic disorders	12	8.8	15	13.6	27	11.0	29	24.4	13	9.8	42	16.7
Diseases of legs and hooves	15	11.0	65	59.1	80	32.5	15	12.6	41	31.1	56	22.3
Mastitis	19	14.0	2	1.8	21	8.5	1	0.8	0	0.0	1	0.4
Udder damage	9	6.6	0	0.0	9	3.7	0	0.0	0	0.0	0	0.0
Other diseases	14	10.3	13	11.8	27	11.0	21	17.6	9	6.8	30	12.0
Selection reasons	23	16.9	3	2.7	26	10.6	51	42.9	61	46.2	112	44.6

Table 3 shows that on farms with better milk production first calving cows were dominantly culled due to leg and hoof diseases (32.5%), followed by reproduction problems (19.9%), metabolic disorders (11%), as well as for selection reasons (10.6%). On farms with lower production, dominant reasons for culling were selection (44.6%), leg diseases (22.3%), and metabolic disorders (16.7%).

Table 4. Reasons of culling on farms with different levels of production by duration of lactation

Reasons of culling	High production level (H1+H2)				Low production level (L1+L2)			
	≤100 days in lactation		≥101 days in lactation		≤100 days in lactation		≥101 days in lactation	
	n	%	n	%	n	%	n	%
Reproductive diseases	5	5.6	44	28.0	0	0.0	5	3.5
Difficult calving and abortion	2	2.2	5	3.2	5	4.6	0	0.0
Metabolic disorders	19	21.3	8	5.1	31	28.4	11	7.7
Diseases of legs and hooves	30	33.7	50	31.8	30	27.5	26	18.3
Mastitis	9	10.1	12	7.6	1	0.9	0	0.0
Udder damage	2	2.2	7	4.5	0	0.0	0	0.0
Other diseases	11	12.4	16	10.2	18	16.5	12	8.5
Selection reasons	11	12.4	15	9.6	24	22.0	88	62.0

In the first 100 days post calving (Table 4), on farms with higher milk production most first calving cows were culled die to leg and hoof problems (33.7%), metabolic disorders (21.3%) and mastitis (10.1%). 12.4% first calving cows were culled because of selection. The significance of leg and hoof diseases remained almost at the same level for culling after 100 days post calving (31.8%),

however the number of cows culled due to reproduction (28%) significantly increased.

On farms with a lower level of production, during the first 100 days, most first calving cows were culled due to metabolic disorders (28.4%), which are in fact a problem of inadequate nutrition, with nutrition being the most important key to good management. This was followed by leg and hoof problems (27.5%), and culling due to selection (22%). As for culling after 100 days of lactation, culling due to leg and hoof diseases (18.3%), was significantly reduced, but culling because of selection almost tripled (62%). It is very difficult to provide a realistic explanation for this phenomenon, all the more so since reproductive problems are not dominant in the later phase of lactation, and leg and hoof problems also decrease.

Table 5. Longevity of culled first calving cows on farms with different levels of production

Items	High production level (H1+H2)				Low production level (L1+L2)			
	n	x	SD	CV	n	x	SD	CV
Days in milking	246	248.13	197.83	79.73	251	251.42	233.40	92.83
Milk production per milking day, kg	246	16.91	8.67	51.29	250	15.55	8.95	57.55
Milk production per day of life, kg	246	4.49	3.57	79.48	251	3.77	3.28	87.12

Differences for culling due to selection can maybe be explained by differences in production between first calving cows (Table 5), although they are not high. Maybe the sequence of significance of the diagnosis stated as the reason of culling is more important for this phenomenon, because it depends on management. For this reason the system for making final diagnoses for cow culling should be unified. Thus, farms could be compared more easily, but existing problems in production could also be better perceived.

Considerably lower values for the culling of cows due to leg and foot diseases were established by *Stojić et al., (2012); Chiumia, (2011) and Fetrow et al. (2006)*, as well as for total culling and culling of first calving cows. Other authors mainly established higher numbers of culling, both total and of first calving cows, resulting from reproductive diseases (*Ansari-Lari et al., 2012; Chiumia, 2011; Fetrow et al., 2006, Seegers et al., 1998 and Allaire et al., 1976*).

Conclusion

After a comparison of results for culling of first calving cows on farms with different levels of production in 2011 it can be said that there were differences

for the numbers of culled cows, but also for reasons for culling. On farms with higher levels of production, the share of first calving cows in total culling was 25.9%, or 4.5% less than on farms with lower levels of production, i.e. there were 4.8% less deaths and 0.7% less forced slaughter among first calving cows, while 5.6% more first calving cows were culled for economic reasons.

For both levels of production, dominant reasons for culling were leg and hoof diseases (more pronounced on farms with higher production), and metabolic disorders (more dominant on farms with lower production). Reproduction was a more dominant problem on farms with higher milk production. The most dominant reason for culling on farms with low production is culling due to selection (44.6%).

In early lactation of first calving cows and on farms with higher and with lower production, the dominant reasons for culling are leg and hoof problems and metabolic disorders (total 55% i.e. 55.9%). When investigating reasons for culling first calving cows after 100 days of lactation, on farms with high production, the importance of leg and hoof diseases remained almost unchanged, but culling due to reproduction increased to 28%. On farms with lower production, culling due to leg and hoof diseases is considerably lower after 100 days of lactation, but the number of first calving cows culled due to selection reasons is tripled (62%).

In the coming period, it would be desirable to unify the system for making final diagnoses for culling cows.

Uzroci izlučenja prvotelki na farmama sa različitim nivoom proizvodnje

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Rezime

Opšte je poznato da menadžment u najvećoj meri utiče na rezultate u govedarskoj proizvodnji, a izlučenja krava su vrlo kvalitetan pokazatelj uspešnosti upravljanja farmama. Poredeći rezultate izlučenja prvotelki na farmama sa različitim nivoom proizvodnje u toku 2011. god. ustanovljene su razlike i u broju izlučenih grla, ali i u razlozima izlučenja. Na farmama sa višim nivoom proizvodnje učešće prvotelki u ukupnim izlučenjima bilo je 25.9% što je za 4.5% manje nego na farmama sa nižim nivoom proizvodnje, odnosno uginulo je za 4,8% manje i prinudno je zaklano za 0,7% manje prvotelki, a iz ekonomskih razloga izlučeno za 5.6% prvotelki više.

Na oba nivoa proizvodnje dominantni razlozi izlučenja su bili oboljenja nogu i papaka što se može dovesti u vezu sa vezanim sistemom držanja (izraženije na farmama sa većom proizvodnjom) i metabolički poremećaji (dominantnije izraženi na farmama sa nižom proizvodnjom). Reprodukcijski je bio znatniji problem na farmama sa većom proizvodnjom mleka, odnosno selekcijska izlučenja na farmama sa nižom proizvodnjom. U ranoj laktaciji prvotelki, bez obzira na nivo proizvodnje, na farmama kao razlozi izlučenja dominiraju problemi sa nogama i papcima i metabolički poremećaji (ukupno 55% tj. 55.9%). Kada se posmatraju razlozi izlučenja prvotelki nakon 100 dana laktacije, na farmama sa visokom proizvodnjom značaj oboljenja nogu i papaka je gotovo nepromenjen, ali izlučenja usled reprodukcije rastu na 28%. Na farmama sa nižom proizvodnjom, izlučenja usled oboljenja nogu i papaka su znatno smanjena nakon 100 dana laktacije, ali je zato utrostručen broj izlučenih iz selekcijskih razloga (62%).

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Received 7 May 2013; accepted for publication 15 June 2013