

## CAUSES OF COW CULLING IN THE TIE STALL SYSTEM

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Original scientific paper

**Abstract:** Causes for cow culling in a tie stall system were investigated on a sample of 3060 cows culled in 2011, on seven large dairy farms in the Belgrade region. The total level of culling was 34.58% of the average number of cows. The number of cows culled decreased with lactation order (from 981 cows in the first to 294 cows in the sixth and later lactations). The most dominant cause for culling were diseases of the legs and hooves (28.4%), as was expected, having in mind the tie stall system. If selection (low production) is abstracted as the reason for culling, what stands out by importance are metabolic diseases (15.7%) and problems of reproduction (reproductive diseases – 8.6%, and difficult calvings and abortions 5.7%). With the increase of duration of the lactation during which cows were culled, reproductive diseases gained importance as the reason for culling, while the importance of metabolic diseases and diseases of the legs and hooves in this context decreased. When culled, on the average, cows were 5.2 years old, having on the average spent 1112 days in production, of which 978 days in milking. Their average milk production per day of milking was 22.00 kg, per day of life 10.6 kg, and per day of production 19.8 kg.

**Key words:** Holstein cows, culling, tie stall

### Introduction

The world we live in suffers frequent, often also dramatic changes in all aspects of human activities, therefore also in agriculture. With the growth of the global human population, food production is definitely becoming more and more of a priority. An additional pressure is exerted because of the use of agricultural products and byproducts (cereals, manure, remnants of animal feed...) to obtain renewable sources of energy, especially after experiences in countries that had been subjected to natural disasters, and had had nuclear reactors. On the other hand,

natural conditions for production are becoming increasingly harsh. Climate conditions have substantially changed. Global warming is a reality that we must accept as a serious problem, and face.

Milk production from cows and the production of other ruminants is by no means exempt from these problems. Provision of animal feed and profitability of cow production are facing severe competition from the production of ethanol, biogas, etc. Animal feed is becoming the most significant direct expense. For a long time already, high production in itself is not a priority. The priority is profit, however it may be measured: per animal, per area of arable land, per unit of product... For this reason, when one speaks of success in milk production, it does not suffice to speak only of production per lactation or production per dairy cow, but also of the number of cows culled during a year, of how long cows remain in production, if they are healthy and if they calve regularly, of the quantity of milk produced per productive day, of the level of expenses, and where additional profit can be found...

For a farmer, each culled cow is a considerable loss (*Dhuyvetten et al., 2007; Forbes et al., 1999*), especially in case of unplanned culling. The first source of loss is the difference between the market value of the culled cow and the pregnant heifer to replace it, followed by the difference of their production (first calver : adult cow), and then the value of the calf. In addition, unplanned culling disturbs the plan of herd turnover, herd structure, and reduces the possibility to sell animals for future breeding. If only basic losses were translated to our local conditions, the loss per culled cow would amount to over 1000 euro.

Causes for culling cows differ according to cow age, the region where they are reared, level of production, manner of housing, breed, genetics... (*Yaylak et al., 2011; Oltenacu et al., 2010; Raguz et al., 2010; Novakovic et al., 2009; Grohn et al., 1997, 1998*). This is also influenced by breeding culture, ideas, breeders' desires and potentials. When cows were subjected to selection for body size, it was noted that large cows have more problems with feet, and small cows with udders (*Hansen et al., 1999*), while cows with well-connected fore and rear udders and a strong central ligament have a longer functional productive life (*Vacek et al., 2006*), although there is the view that the emphasizing of udder constitution decreases the significance and relationship between other traits of type and milk yield (*Larroque and Ducrocq, 2001*).

This is the reason why it cannot be decisively said to what extent specific diseases influence the age at culling, but dominant reasons for culling are reproduction, diseases of the legs, udder, metabolic disorders... (*Yaylak et al., 2011; Mohammadi and Sedighi, 2009; Moussavi, 2008; Erdogan et al., 2004; Garcia, 2001; Seegers et al., 1998; Martin et al., 1982*). Also, it is very difficult to define the duration of life and productive life of a cow, as well as their production. *Madgwick and Goddard, 1989*, are of the opinion that the productive life of dairy cows in Australia is between 5.8 and 6.6 years, with similar results established by

*Novakovic et al., 2009* for Serbia, while in Poland, according to *Pytlewski et al., 2010*, the average life span was almost 1.5 years shorter. On the other hand, *Petrovic et al., 2004*, have established that Simmentals have an average productive life of 7.22 years.

According to the facts that type of cow's housing has strong impact on cow's health and longevity, the main goal is to investigate culling reasons in the tie stall system.

## Materials and Methods

Research was done using data for 3060 cows culled in 2011, on seven large farms in the region of Belgrade. These farms hold almost 9000 dairy cows, i.e. a total of over 22000 head of cattle, taking into account female breeding stock and bullocks in fattening. Cows are held in tie stalls in barns housing 120-130 animals. Barns are mostly semi-enclosed (fully closed in the winter using bales of straw, in the summer acting as overhangs, with only few barns with solid walls on all sides). Milking is done using machines, and every barn has a milk line, vacuum line, and own lactofreeze. Cows are grouped by production, and fed complete mixed rations, with the addition of minor quantities of concentrates, for each cow individually. Meals are based on alfalfa haylage, whole maize plant silage, ready-made concentrate mixtures, soy meal, molasses, and other additives.

The number of days in milk, duration of productive life and total life, as well as milk production per all of these three indicators of longevity, were established for each cow individually. In addition, all cows were distributed into five groups according to the duration of the last lactation, with 100 day intervals between groups. Reasons for culling were distributed into nine groups according to the diagnosis for diseases i.e. culling. Data was analyzed using standard mathematical and statistical procedures.

## Results and discussion

In 2011, the total number of cows culled on investigated farms was 3060 cows, or 34.58% of the average number of cows, of which 605 cow died, 106 cows had to be slaughtered, and 2350 cows were sold to slaughterhouses for processing (Table 1). Having in mind the level of production (average milk yield of 8364 kg in a standard lactation, with 3.59% butterfat), conditions of comfort (old buildings, with low volumes per cow and with short bunks), and the tie stall system, the total culling, which also included deaths, can be considered acceptable.

**Table 1. Cow culling in 2011**

Reason for culling	Culled	
	n	%
Death	605	6.84
Forced slaughter	105	1.19
Sale for economic reasons	2350	26.56
TOTAL	3060	34.58

Of the total number of cows culled, most were culled due to foot and hoof diseases (870 or 28.4%), somewhat less (712 or 23.3%) were culled due to selection reasons, primarily because of low production, followed by cows culled due to problems of metabolism (481 or 15.7%). Reproductive problems were the cause for culling 264 cows, and the consequences of difficult calving and abortions for another 173 cows. Relatively few cows were excluded from further production due to digestive problems, mastitis or physical udder damage, and 345 cows were culled due to chronic and acute diseases (Table 2).

The analysis of reproductive problems as the cause for culling, leads to the conclusion that most animals were culled in the second and the third lactation, and that the significance of reproductive diseases in total culling decreases in later lactations. The same trend exists also for difficult calvings and abortions, although for these reasons most cows were culled in the first lactation. However, in the case of metabolic diseases, importance grows with the age of cows, the same being true for diseases of the legs and hooves. As the reason for culling, selection reasons, dominated by milk production, lost importance with the increase of lactation order, and the same regularity can be noted in relation to mastitis and udder damage. (Table 2)

**Table 2. Cow culling in 2011, by reasons for culling, by lactation order**

Reason for culling	Lactation order												TOTAL	
	1		2		3		4		5		6+			
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Reproductive diseases	82	8.4	77	12.7	49	9.3	35	8.7	6	2.4	15	5.1	264	8.6
Difficult calving and abortion	49	5.0	39	6.4	39	7.4	21	5.2	13	5.2	12	4.1	173	5.7
Metabolic diseases	132	13.5	99	16.3	68	12.9	71	17.6	59	23.7	52	17.7	481	15.7
Diseases of the legs and hooves	262	26.7	156	25.7	157	29.9	124	30.7	86	34.5	85	28.9	870	28.4
Mastitis	26	2.7	11	1.8	10	1.9	7	1.7	1	0.4	7	2.4	62	2.0
Udder damage	21	2.1	7	1.2	8	1.5	7	1.7	2	0.8	2	0.7	47	1.5
Other diseases	95	9.7	63	10.4	70	13.3	44	10.9	36	14.5	37	12.6	345	11.3
Diseases of the digestive tract	28	2.9	16	2.6	28	5.3	19	4.7	7	2.8	8	2.7	106	3.5
Selection reasons	286	29.2	138	22.8	97	18.4	76	18.8	39	15.7	76	25.9	712	23.3
TOTAL	981	100	606	100	526	100	404	100	249	100	294	100	3060	100

**Table 3. Cow culling in 2011, by duration of last lactation**

Reason for culling	Duration of the last lactation									
	≤100 days		101-200 days		201-300 days		301-400 days		≥ 400 days	
	n	%	n	%	n	%	n	%	n	%
Reproductive diseases	28	2.01	21	6.10	31	9.78	55	14.36	129	20.77
Difficult calving and abortion	69	4.95	1	0.29	11	3.47	31	8.09	61	9.82
Metabolic diseases	373	26.74	49	14.24	23	7.26	23	6.01	13	2.09
Diseases of the legs and hooves	425	30.47	137	39.83	120	37.85	97	25.33	91	14.65
Mastitis	26	1.86	7	2.03	10	3.15	14	3.66	5	0.81
Udder damage	10	0.72	16	4.65	5	1.58	10	2.61	6	0.97
Other diseases	202	14.48	27	7.85	29	9.15	42	10.97	45	7.25
Diseases of the digestive tract	72	5.16	14	4.07	7	2.21	4	1.04	9	1.45
Selection reasons	190	13.62	72	20.93	81	25.55	107	27.94	262	42.19
TOTAL	1395	100	344	100	317	100	383	100	621	100

With the increase of the number of milking days after the last calving, reproductive diseases gained importance as the reason for culling, and if selection reasons are abstracted, they are the most dominant reason for culling cows at 400 or more days after calving (Table 3). The same regularity is noted also in cows culled due to difficult calvings and abortions, probably as a result of additional problems in reproduction in such animals. Metabolic diseases as the reason for culling lost importance as the last lactation became longer, and the same trend also exists for diseases of the legs and hooves. The importance of mastitis grew with the duration of the last lactation.

**Table 4. Life span and production of cows culled in 2011**

Reason for culling	N	Number of days						Milk production per day					
		Milking		Life		Production		Milking		Life		Production	
		x	SD	x	SD	x	SD	x	SD	x	SD	x	SD
Reproductive diseases	264	957.1	566.6	1838.1	668.8	1062.4	667.6	23.4	4.9	11.6	4.4	21.6	4.4
Difficult calving and abortion	173	1008.4	663.7	1908.1	776.4	1131.0	771.4	21.4	8.0	11.1	5.2	19.2	7.1
Metabolic diseases	481	927.5	702.1	1847.1	831.3	1068.2	822.6	21.5	7.3	10.1	5.6	19.0	6.3
Diseases of the legs and hooves	870	978.9	701.3	1894.9	829.9	1118.1	825.7	22.7	6.7	10.9	5.6	20.4	5.9
Mastitis	62	747.3	678.0	1636.4	807.7	842.5	782.8	21.5	8.0	9.0	5.8	19.6	7.3
Udder damage	47	703.0	527.7	1541.2	627.5	779.8	609.6	20.8	6.6	9.0	5.3	19.2	5.7
Other diseases	345	977.0	690.3	1901.3	819.8	1123.1	811.5	23.0	7.4	11.0	5.6	20.4	6.6
Diseases of the digestive tract	106	896.5	673.0	1802.4	791.3	1031.7	799.1	21.8	6.8	10.0	5.4	19.4	6.0
Selection reasons	712	1063.0	749.8	1985.4	896.6	1199.8	882.3	20.6	6.3	10.4	5.1	18.7	5.5
TOTAL	3060	978.2	698.0	1891.1	827.9	1112.0	819.8	22.0	6.8	10.6	5.4	19.8	6.0

On the average, cows culled in 2011 were 1891 days (5.2 years) old, and were in production for 1112 days (3.0 years), i.e. were milked for 978 days. Their average milk production per day of milking was 22.00 kg, per day of life 10.6 kg, and per productive day 19.8 kg. The shortest life and production spans were found for cows culled due to mastitis and udder damage. Cows culled for selection reasons, as well as those culled due to difficult calvings and abortions lived the longest. At the same time, cows culled due to reproductive diseases realized the highest average production per day of milking, day of life, and day of production. (Table 4)

Based on available literature, as well as results of this research, one cannot decisively rank the importance of reasons for culling cows, although diseases of the feet and hooves, metabolic diseases, reproductive diseases and mastitis were by all means the most important reasons other than selection. What reason for culling will be the most dominant, how long a cow would remain in production, and what production she will realize depend on numerous factors: rearing conditions, breed, breeding culture, climate factors, intensity of production, cow age... (*Yaylak et al., 2011; Pytlewski et al., 2010; Mohammadi and Sedighi, 2009; Novakovic et al., 2009; Erdogan et al., 2004; Petrovic et al., 2004; Garcia, 2001; Seegers et al., 1998; Madgwick and Goddard, 1989; Martin et al., 1982*). But, all the same, unplanned culling influences the success and profitability of milk production to a high extent.

## Conclusion

In 2011, on seven large dairy farms in the Belgrade region, a total of 3060 cows (34.6% of the average number of dairy cows) were culled. By lactations, the number of culled cows decreases with increasing lactation order (from 981 cows in the first to 294 cows in the sixth and later lactations). Having in mind the tie stall system, it was expected that diseases of the feet and hooves would be the most dominant reason for culling (28.4%), and if selection reasons are abstracted, by importance metabolic diseases (15.7%) and problems of reproduction (reproductive diseases – 8.6% and difficult calvings and abortions – 5.6%) were pronounced. With the increase of the duration of the lactation during which cows were culled, reproductive diseases gained importance as the reason for culling, while metabolic diseases and diseases of the feet and hooves became less prominent. At the moment of culling, the average age of cows was 5.2 years, and they had been in production for 1112 days, of which 978 days in milking. Their average milk production per day in milking was 22.00 kg, per day of life 10.6 kg, and per productive day 19.8 kg.

The tie stall system will not be replaced with free housing system very soon. Use of information from analysis of cow's culling, could improve management and provide better condition for cows and more profit for farmers.

## Acknowledgment

Research was financed by the Ministry of Education, Science and Technological Development, Republic of Serbia, project TR 31053.

## Uzroci izlučenja krava u vezanom sistemu držanja

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## Rezime

Ispitivanje uzroka izlučenja krava u vezanom sistemu držanja izvršeno je na uzorku 3060 izlučenih krava tokom 2011. godine na sedam velikih farmi za proizvodnju mleka u Beogradskom regionu. Ukupna stopa izlučenih krava iznosila je 34,58% od prosečnog broja krava. Broj izlučenih krava se smanjivao sa porastom laktacije po redu (od 981 krave u prvoj do 294 krave u šestoj i ostalim laktacijama). Najdominantniji uzrok izlučenja su bila oboljenja nogu i papaka (28,43%), što je i očekivano s obzirom na vezani sistem držanja. Ako se izuzmu selekcijski razlozi (niska proizvodnja), kao razlozi izlučenja po značaju se izdvajaju metaboličke bolesti (15,72%) i problemi sa reprodukcijom (reproduktivne bolesti – 8,63% i teška telenja i abortusi 5,65%). Sa porastom trajanja laktacije u kojoj su krave izlučene, reproduktivne bolesti su sve više dobijale na značaju kao razlog izlučenja, a metaboličke bolesti i bolesti nogu i papaka gubile. U momentu izlučenja krave su u proseku bile stare 5,18 god. i u proizvodnji su prosečno provele 1112 dana, od toga 978 dana u muži. Njihova prosečna proizvodnja mleka po danu u muži je bila 21,96 kg, po danu života 10,63kg i po produktivnom danu 19,75 kg.

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