

Reasons for culling of Polish HF Black-and-White cows, managed in a high production farm

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Analyses conducted within this study concerned a population of 812 Polish Holstein-Friesian Black-and-White cows, which were culled in the years 2006-2010 from a dairy herd in a commercial farm located in south-western Poland. Recorded culling rates ranged from 7.31% in 2006 to 26.80% in 2010. Taking into account all the analysed years, the investigated cows were culled most frequently due to sterility (23.40%) and clinical mastitis (16.13%). The other causes for culling included also low productivity (9.73%), limb defects (8.62%), metabolic diseases (7.88%), structural disorders of the udder (6.16%), casualties (5.54%), abortions (5.42%), other causes (4.31%) and other diseases (1.72%), as well as deaths (4.68% culling cases). Highly significant differences were shown between culling causes and mean daily milk yield, percentage protein content in milk of culled cows, mean lifespan and mean productive life of the cows in the dairy herd, as well as mean interval between the last calving and culling of those cows.

KEY WORDS: dairy cattle / HF cows / reasons for culling

Culling of cows is an important element of breeding practice. It affects both the economics of production and genetic progress. Causes for culling may generally be divided into economic and biological [4]. Culling for economic reasons is a conscious action of the breeder, aiming at improvement of the breeding and productive value of the herd, while biological causes include all kinds of diseases, casualties, sterility, etc. [13]. The primary aim of selection in many dairy cattle herds is to ensure high milk yields, which in turn may result in high culling rates of cows. This leads to a reduction of productive lives of those cows and a decrease in milk production efficiency [3, 12]. Results of many studies suggest that an excessively high increase in milk production may cause many adverse consequences, including metabolic diseases, problems with reproduction and mastitis [7]. A high rate of culling due to biological reasons limits the potential to cull cows for reasons related with breeding, such as low productivity, and this approach hinders breeding pro-

gress [14]. Excessive elimination of very young animals from the herd leads to losses in the form of unreimbursed costs of heifer rearing, as well as the need to purchase new animals required for herd replacement [14, 15]. Introduction of new animals to the herd is also connected with the adaptation period, necessary for the animals to adapt to new environmental conditions, which in turn results in a reduced milk production [14]. As it is frequently shown in literature sources on the subject, the most frequent culling causes include sterility, udder diseases and lameness [8, 10]. Problems with the reported increased incidence of udder diseases, lameness and reproduction disorders affect primarily large commercial farms focusing on high milk production. High-producing cows have a very high nutrient requirement, which needs to be met to produce adequate amounts of milk. In their studies Gnyp et al. [5] and Juszczak and Hibner [6] were of an opinion that high milk production has a negative effect on fertility of cows, particularly those with are inappropriate fed.

The aim of this study was to analyse causes for culling of cows and the relationship between culling causes and selected indicators of fertility and milking performance, as well as productive life in the herd in a large commercial farm keeping Polish Holstein-Friesian Black-and-White cattle.

Material and Methods

Material for analyses conducted within this study comprised a population of Polish Holstein-Friesian (HF) Black-and-White cows (812 head), eliminated from productive life in the dairy herd in the years 2006-2010 in a large commercial farms located in south-western Poland. Animals were kept in a loose housing system and fed TMR. Mean productivity of cows in the herd in the analysed period was 10 314 kg milk in the 305-day lactation. Data concerning the date of birth, the date and cause of culling, as well as the length of calving interval were recorded from the respective heifer-cow records. Age at first calving, length of productive life in the herd, length of life and length of the period from the last calving and culling were calculated based on the above-mentioned data. Mean daily milk production and mean percentage contents of protein, fat and lactose in milk were calculated using data available in milk recording data (performance records RW-2). Causes for culling were divided into five main groups. The first group comprised cows culled due to diseases (metabolic diseases, infectious diseases, pneumonia, parturient paresis, clinical mastitis, other diseases). The second group comprised animals removed from the herd due to productivity concerns (low milk production, high SCC), while the third group consisted of cows culled due to reproductive problems (abortion, sterility and dystocia). In turn, the fourth group of culling causes was made up of animals suffering from malformations (i.e. various types of developmental anomalies, limb and udder defects), whereas the fifth group comprised animals, which suffered accidents, died or were culled for many other reasons. Statistical analysis was conducted using the Statistica programme and it was performed applying one-way analysis of variance and Scheffé's method.

Results and Discussion

Table 1 presents the number and percentage of culling cases in individual analysed years. Culling rate ranged from 7.31% in 2006 to 26.80% in 2010. Antkowiak et al. [1] indicated that the optimal cow culling rate in a European herd of dairy cattle should amount to 20-30%. In the years 2006-2008, i.e. in the period, in which the herd started to be formed, the highest percentage of culling cases was recorded in the 1th lactation and it ranged from 95.24% to 53.90% total number of culling cases in a given year, which was connected with considerable pressure of the modified environment. In the successive years cows were also culled in the 3rd, 4th and 5th lactations. Investigations conducted by Żukowski [15] showed that the greatest culling rate of cows was recorded among primiparous cows (29% total culling cases). Such a situation is economically highly disadvantageous, since it prevents any possibility to compensate for the high costs of heifer rearing. Cows reach the highest yields as late as in their 3rd and 4th lactations. Culling of primiparous cows makes it impossible for breeders to fully use the genetic potential of animals to produce high milk yields [15]. This was also observed in the analysed dairy cattle farm.

Table 2 presents values of selected fertility indexes as well as mean lifespan and mean productive life of cows culled for various reasons, while Table 3 provides data on selected milking performance indexes of these animals. Taking into account all the years analysed in this study cows were most frequently culled due to sterility, which accounted for 23.40% all culling cases (Table 2). Mean lifespan of cows culled for that reason amounted to

Table 1

The number and percentage of cow culling in the year taking into account the next lactation

Specification	2006		2007		2008		2009		2010	
	n	%	n	%	n	%	n	%	n	%
The number of cows, which were present in the herd at the beginning of the year	287	100	952	100	1009	100	1217	100	1209	100
The number and percent of cow culling in the year	21	7.31	67	7.04	141	13.97	260	21.36	324	26.80
lactation 1	20	95.24	54	80.60	76	53.90	84	32.31	63	19.44
lactation 2	1	4.76	12	17.91	53	37.59	105	40.38	78	24.07
lactation 3			1	1.49	11	7.80	58	22.31	124	38.27
lactation 4					1	0.71	13	5.00	52	16.05
lactation 5									7	2.16

Table 2
Fertility indices and average lifespan and performance in the herd of cows, which were culled due to different reasons

Reason for cow culling	Number of cows (heads)	%	The average age of first calving (days)	The average productive life in the herd (years)	The average lifespan of cattle (years)	The average period between the last calving and cow culling (days)	The average length of calving interval (days)
Diseases							
metabolic diseases	64	7.88	770.58	1.99 ^J	4.06 ^A	60.43 ^{ABCEDEFGH}	426.94
infectious diseases	5	0.62	742.60	1.58 ^K	3.68	162.60	447.75
pneumonia	12	1.48	812.67	1.66	3.81	118.00	418.30
parturient paresis	13	1.60	759.15	2.38 ^A	4.46 ^F	343.85	385.73
clinical mastitis	131	16.13	771.64	2.16 ^L	4.15 ^B	153.20 ^{AIJK}	409.25
other diseases	14	1.72	750.00	1.83	3.97 ^I	162.69 ^L	414.10
Production causes							
low production	79	9.73	752.87	1.69 ^{ABCM}	3.69 ^{BCDJ}	297.48 ^{BIJL}	400.26
high SCC	13	1.60	766.77	2.33	4.59	344.00	386.46
Reproductive causes							
abortions	44	5.42	765.62	2.39 ^{HI}	4.47 ^{CEG}	362.90 ^{JP}	403.48
sterility	190	23.40	780.09	2.13 ^{GN}	4.26 ^{BIJK}	473.84 ^{IKLLMNK}	408.07
difficult calving	3	0.37	750.67	2.23	4.30	446.25	361.00
defect of body conformation	6	0.74	13.00	2.46	4.36	361.17	421.67
Defects of body							
limbs' defects	70	8.62	750.63	1.69 ^O	3.74 ^{CEHL}	198.69 ^{EPK}	407.83
defect of the udder	50	6.16	769.28	1.92 ^{IP}	3.95 ^{EL}	224.72 ^{DM}	398.14
Other causes							
accidents	45	5.54	756.35	1.73	3.73	181.13	414.16
death	38	4.68	776.32	2.05 ^R	4.07 ^M	223.97 ^{GN}	411.81
other causes	35	4.31	764.00	2.69 ^{IKLMNOPR}	4.72 ^{MIKLLM}	323.25 ^H	411.85

A-R – differences significant at $P \leq 0.01$

4.26 years and it differed highly significantly from the mean lifespan of cows, which were culled as a result of low productivity, limb defects and other causes. In turn, mean daily milk yield in the lactation, during which individual cows were culled, amounted to 28.67 kg in animals culled due to sterility (Table 3). This mean value differed significantly from mean milk yields of cows, which were culled as a consequence of clinical mastitis and low productivity. It was shown that in milk of cows culled due to sterility mean protein content was 3.58% and this value was markedly higher than the percentage protein content recorded in milk of cows, which were culled due to such causes as metabolic diseases, limb defects, casualties and clinical mastitis (Table 3). In turn, highly significant differences were shown between the length of the period from the date of last calving to the date of culling and causes of cow culling. In the case of cows, which were culled due to sterility this period lasted on average 474 days and it was markedly longer than the respective period in animals culled for other reasons. Such a long productive life in the herd was most probably related with unsuccessful insemination attempts. In studies by Łukasiewicz and Krencik [9] and Borkowska and Januś [2] sterility was the main cause for culling, accounting for 35% and 32.4% all culling cases. In a study by Borkowska and Januś [2] the mean period from last calving to culling for cows removed from the herd due to sterility was 433 days and, similarly as in this study, it was longer than in the case of other culling causes.

Another reason for culling of cows in the investigated 5-year period was connected with clinical mastitis, which accounted for 16.13% total number of culling cases (Table 2). Mean lifespan of cows removed from the herd for this reason amounted for 4.15 years and it was highly significantly longer than the mean lifespan of cows culled due to low productivity. Cows culled due to clinical mastitis remained in the herd on average for 153 days from the last calving. For animals suffering from metabolic diseases the length of this period was on average 2.5 times shorter, while for those culled due to sterility it was approx. 3-fold longer (Table 2). In the studied herd the greatest daily milk yields were recorded for cows, which were culled due to clinical mastitis (34.73 kg). It was also shown that this productivity differed highly significantly from mean daily milk yields of cows removed from the herd due to metabolic diseases, low productivity, limb defects and sterility (Table 2). The course of the lactation curve indicates that cows reach peak lactation at approx. 60 days after calving, while later their milk yields decrease. In their study Topolski et al. [13] showed that the most rapid drop in milk yield in the first months of lactation is observed in the case of low-producing cows, whereas milk production is most uniform in medium-producing cows. In view of the above, during the 153-day lactation cows removed from the herd due to clinical mastitis had higher mean daily milk yields than it was during lactation lasting either 60 or 474 days, as it was the case with cows culled due to metabolic diseases and sterility (Table 2). It results from a study by Reklewski et al. [11] that udder diseases ranked third as a cause for culling of cows (14.2%), immediately after sterility and casualties, i.e. this percentage was slightly lower than in this study (16.13%).

Another cause for culling in the analysed cattle herd was connected with low productivity (9.73% total culling cases). Mean daily productivity of cows removed from the herd for that reason amounted to 23.87 kg milk (Table 3). In a study by Borkowska and Januś

Table 3
The average daily milk production and average percentage of fat, protein and lactose in the milk of cows, which were culled due to different reason

The reason for cow culling	Number of cows (heads)	%	The average daily milk production (kg)	The average percentage of fat	The average percentage of protein	The average percentage of lactose
Diseases						
metabolic diseases	64	7.88	27.70 ^A	4.33	3.14 ^A	4.64
infectious diseases	5	0.62	23.93	4.26	3.30	4.90
pneumonia	12	1.48	31.04	4.46	3.23	4.81
parturient paresis	13	1.60	30.00	3.61	3.39	4.78
clinical mastitis	131	16.13	34.73 ^{ABCD}	3.89	3.21 ^{DE}	4.79
other diseases	14	1.72	30.48	5.08	3.11	4.74
Production causes						
low production	79	9.73	23.87 ^{BDHFGHIJ}	4.12	3.47 ^{DF}	4.84
high SCC	13	1.60	29.37	3.85	3.48	4.71
Reproductive causes						
abortions	44	5.42	31.64 ^D	3.92	3.38	4.85
sterility	190	23.40	28.67 ^{CE}	4.06	3.58 ^{ABCE}	4.83
difficult calving	3	0.37	30.11	3.82	3.47	4.78
Defects of body						
defect of body conformation	6	0.74	29.68	4.10	3.49	4.81
limbs' defects	70	8.62	29.43 ^U	4.32	3.20 ^{BF}	4.83
defect of the udder	50	6.16	31.06 ^F	4.03	3.38	4.85
Other causes						
accidents	45	5.54	33.13	4.00	3.20 ^C	4.89
death	38	4.68	32.63 ^G	4.20	3.35	4.86
other causes	35	4.31	32.17 ^H	4.05	3.35	4.78

A-J – differences significant at $P \leq 0.01$

[2] cows removed from the herd due to low milk yields produced on average 5144 kg milk during 296-day lactation, i.e. approx. 17.38 kg milk a day. In the course of the five analysed years 70 cows were removed from the herd due to limb defects, which accounted for 8.62% all culling cases. In those cows mean daily milk yield was 29.43 kg and it was highly significantly lower than the mean daily productivity of cows culled due to clinical mastitis (Table 3). Lower productivity of cows with limb defects may be explained by hindered access to feed. Dystocia was responsible for the smallest percentage of culling cases in the investigated dairy cattle herd, as in the course of five years only three such cases were reported. No significant differences were observed between culling causes, age at first calving and mean length of calving interval. In a study by Borkowska and Januś [2] age at first calving also played no major role in the causes for the removal of animals from the herd.

Summing up the results recorded in this study it may be stated that the percentage of culled cows in the investigated herd ranged from 7.31% in 2006 to 26.80% in 2010. In the years 2006-2008, i.e. in the period when this herd was being formed, mainly cows in their 1st lactation were culled (95.24% – 53.90%). Taking into account all the analysed years, cows were most frequently culled due to sterility and mastitis, at 24.30% and 16.13% all culling cases, respectively. Highly significant differences were shown between causes for culling and mean length of productive life in the herd, mean lifespan of those animals as well as mean length of the period between last calving and culling. Mean daily milk yields and mean percentage protein contents in milk varied highly significantly between animals depending on culling causes.

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