

## **ANALYSIS OF LONGEVITY AND REASONS FOR CULLING HIGH-YIELDING COWS**

Adam Oler, Anna Sawa, Paulina Urbańska, Marek Wojtkowiak

University of Technology and Live Science in Bydgoszcz, Poland

**Abstract.** The study was carried out in 2006–2011 in a farm located in the Kujawsko-Pomorskie province and keeping about 290 Polish Black-and-White Holstein-Friesian cows with a mean yield of almost 11,000 kg milk. GLM and FREQ procedures of the SAS package were used for statistical analysis. The lifespan and length of productive life of high-yielding cows tended to decrease, with an alarming tendency for the increasing proportion of cullings among young cows, especially in the first lactation. Culling intensity was found to be high (32%). The proportion of voluntary culling decisions by the breeder, which include selling for further breeding, low productivity and old age, decreased from about 6% in 2006–2007 to about 2% in the following years. High-yielding cows were mainly culled for infertility and reproductive diseases (35.9%), diseases of the locomotor system (15.1%), udder diseases (13.1%), and metabolic and digestive diseases (12.9%).

**Keywords:** high-yielding cows, longevity, reasons for culling

### **INTRODUCTION**

Longevity, which can be measured through lifespan, length of productive life, survival to a certain age or certain calving, is considered one of the most important indicators of cow production efficiency. Cows with long productive lives have higher lifetime yields of milk and its components and give birth to more calves [Gnyp et al. 1998, Zdziarski et al. 2002, Sobek et al. 2005]. Longer productive life also makes it possible to reduce herd replacement costs [Juszczak et al. 2003]. In summing up the results of cow longevity studies conducted in national research centres, Sawa [2011] reports that in recent years cows in Poland are culled at 4.5 to 6.6 years of age, which is too early considering the cow's natural lifespan of 18–20 years and the significant effect of lifespan on the economic result of production.

A cow's lifespan is inextricably linked to animal health, production level, reasons for culling, and culling intensity [Varisella et al. 2007]. Culling of cows is an important factor to consider from a breeding and economic perspective. Herd culling rate is a measure

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Corresponding author – Adres do korespondencji: dr inż. Adam Oler, University of Technology and Live Science in Bydgoszcz, Department of Cattle Breeding, Mazowiecka 28, 85-084 Bydgoszcz, oler@utp.edu.pl

of selection intensity, and environmental and feeding conditions. It shows the rate of generation turnover. In the Polish cattle population, the intensity of selection is 20-30% [Antkowiak et al. 2003].

The results of many studies [Sawa and Maciejewski 2000, Tarkowski and Piech 2002, Morek-Kopeć and Żarnecki 2009, Sawa and Bogucki 2009] show that the distribution of culling reasons is unfavourable because as much as 89.2% of the cows are removed from the herd for reasons unintended by the breeder [Reklewski et al. 2004]. According to Reklewski et al. [2004], from the perspective of economic aspects of production, the right reasons for culling are low productivity and the possible sale of animals suitable for further raising, as well as old age.

The aim of the study was to analyse longevity and causes of culling high-yielding cows.

## MATERIALS AND METHODS

The study was carried out in a selected farm located in the Kujawsko-Pomorskie province, which maintains about 290 Polish Black-and-White Holstein-Friesian cows with an average yield of almost 11,000 kg milk. Animals were kept in a free-stall barn and fed TMR diets, and had access to feeding table, water and salt licks at all times.

Breeding documentation was used to collect data on longevity (lifespan, length of productive life, number of calvings) and reasons for culling 557 cows (including reasons provided by the SYMLEK database) that were removed from the herd between 2006 and 2011.

The GLM and FREQ procedures of SAS were used for statistical analysis.

In addition, the pattern of longevity traits in cows culled during the years 2006–2011 was expressed by linear regression equations, which served to plot trends in linear traits according to the formula given by Zajac [1988]:

$$Y_t = a + b_t$$

where:

a – value of longevity trait at zero time (year 2006),

b – slope of the regression line expressing an increase or a decrease in the value of a trait,

t – time expressed as successive years.

## RESULTS AND DISCUSSION

The cow herd under study had an average milk yield of almost 11,000 kg, with a lactation yield of 9,820 kg milk in culled cows. The average proportion of cows removed from the herd in 2006–2011 was high (almost 32%) and exceeded the figures for the national population of cattle [Antkowiak et al. 2003]. Culling rate was the highest (33.9%) in 2007 and the lowest (29.2%) in 2011 (Table 1).

These high-producing cows had a lifespan of 5.59 years and their productive life was 3.26 years, with the number of calvings averaging 3.19 (Table 1). The results obtained fall

within the range reported in relevant Polish literature [Sawa 2011], which shows that over the last 20 years, the average lifespan of cows ranged from 4.5 to 6.6 years and the length of productive life varied between 2.8 and 4.6 years. Like in other studies [Wroński 2003, Sobek et al. 2006, Varisella et al. 2007], we found that the cows' lifespan and length of productive life tended to decrease. Throughout the study, cows that left the herd during their first lactation made up the greatest proportion of all culled cows. Alarmingly, there was a clear tendency for increasing proportions of young (especially first-lactation) cows among all culled cows. According to Kancer et al. [2001], from the economic point of view the utilization of cows should last at least four lactations to be profitable.

Table 1. The longevity of cows culled in 2007–2011

Tabela 1. Długowieczność krów wybrakowanych w latach 2007–2011

Year Rok	Number of cows Liczba krów w stadzie	Culling cows Krowy wybrakowane		Proportion of culling cows in lactation, Chi <sup>2</sup> = 58,9 <sup>xx</sup>								Lifetime, years Długość życia, lat	Lifetime performance, years Długość użytkowania, lat	Number of calving Liczba wycieleń
		n	%	1	2	3	4	5	6	7	8			
Total Ogółem	291	557	31.9	22.3	17.4	18.5	16.9	14.0	7.9	2.5	0.5	5.59	3.26	3.19
2006	291	87	29.9	12.6	13.8	18.4	16.1	20.7	13.8	3.5	1.1	6.40 <sup>A,B,c</sup>	3.85	3.79
2007	283	96	33.9	20.8	13.5	22.9	27.1	9.4	5.2	1.0	0.0	5.40 <sup>A</sup>	3.21	3.10
2008	290	93	32.1	22.6	12.9	18.3	16.1	18.3	11.8	0.0	0.0	5.60	3.39	3.30
2009	292	95	32.5	19.0	24.2	15.8	12.6	18.9	7.4	1.1	1.0	5.27 <sup>c</sup>	3.10	3.20
2010	294	99	33.7	28.3	25.3	15.2	12.1	8.1	5.0	5.0	1.0	4.95 <sup>B</sup>	2.87	2.87
2011	298	87	29.2	29.9	13.8	20.7	17.2	9.2	4.6	4.6	0.0	5.43	3.17	2.94

AA –  $P \leq 0.01$ ; aa –  $P \leq 0.05$ .

Longevity trends were unfavourable and negative (Fig. 1), with lifespan showing the greatest decrease (by 0.186 year). When analysing genetic trends for longevity of daughters of Red-and-White bulls born in 1982–1999, Kruszyński [2008] found that the lifespan and length of productive life decreased from one generation to the next (by 0.025 and 0.023 months, respectively), while the number of lactations remained unchanged, which the author believed was the result of decreasing age at first calving.

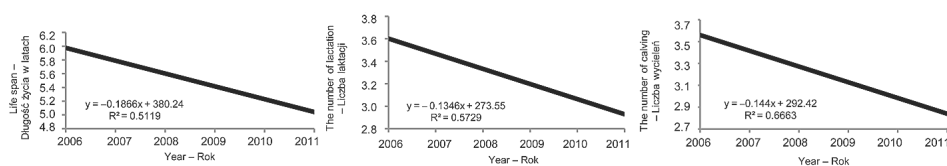


Fig. 1. Time trends of longevity of cows in 2007–2011

Rys. 1. Trendy czasowe długowieczności krów w latach 2007–2011

Analysis of the reasons for culling high-producing cows revealed that the most frequent causes were infertility and reproductive diseases (35.9%) followed by locomotor (15.1%), udder (13.1%), metabolic and gastrointestinal diseases (12.9%) (Table 2). These four causes were responsible for 77% of the cows being removed. Among the main rea-

sons for culling the population of Polish Black-and-White Holstein-Friesian cows in 2003–2007, Morek-Kopeć and Żarnecki [2009] reported accidents (28%), infertility and reproductive diseases (27%), and sale for further breeding (25%).

Table 2. Proportion of cows (%) depending on the reasons for culling in 2007–2011  
Tabela 2. Udział (%) krów w zależności od przyczyny brakowania w latach 2007–2011

Reasons for culling from the herd Przyczyny ubycia ze stada	Culled cows Krowy wybrakowane		Year, $\text{Chi}^2 = 87,3^{xx}$ Rok, $\text{Chi}^2 = 87,3^{xx}$						
	N	%	2006	2007	2008	2009	2010	2011	
Sold for further breeding Sprzedaż do dalszego chowu	7	1.3	2.3	4.2	0.0	0.0	1.0	0.0	
Low milk yield Niska wydajność	3	0.5	0.0	1.0	1.1	1.1	0.0	0.0	
Udder diseases Choroby wymienia	73	13.1	15.0	14.6	18.3	11.6	8.1	11.5	
Fertility and reproductive diseases Jałowość i choroby układu rozrodczego	200	35.9	32.2	41.7	36.5	25.3	37.4	42.5	
Advanced age Starość	7	1.3	3.5	1.0	1.1	0.0	1.0	1.2	
Metabolic and digestive diseases Choroby metaboliczne i układu pokarmowego	72	12.9	10.3	8.3	4.3	20.0	23.2	10.4	
Respiratory diseases Choroby układu oddechowego	2	0.4	0.0	0.0	0.0	0.0	2.0	0.0	
Diseases of the locomotor system Choroby układu ruchu	84	15.1	24.1	7.3	18.3	18.9	6.1	17.2	
Accidents Wypadki losowe	42	7.5	10.3	6.3	8.6	10.5	4.0	5.7	
Other Inne	67	12.0	2.3	15.6	11.8	12.6	17.2	11.5	

While low milk yields (next to respiratory diseases) were the least frequent reason for culling high-producing cows from the herds, the main causes were infertility and reproductive diseases. The proportion of cows culled for infertility ranged from 25.3% in 2009 to 42.5% in 2011. The high proportion of cows culled for infertility (36% on average) confirms the well-known fact that high milk yields adversely affect cow fertility. Gnyp et al. [1995] and Juszczak et al. [2003] report that culling due to infertility increases with the increasing proportion of Holstein-Friesian genes, while Sawa and Maciejewski [2000] indicate that culling due to infertility clearly increases in higher producing herds.

The proportion of cows culled for locomotor system diseases was considerable (15%), with notable differences according to the year, ranging from 6.1% in 2010 to 24.1% in 2006. When analysing the causes of culling the population of Polish Black-and-White Holstein-Friesian cows in 2003–2007, Morek-Kopeć and Żarnecki [2009] showed that about 5% of the cows were culled for this reason. The relatively high proportion of high-yielding cows

culled for locomotor diseases may be due to the fact that the direction of breeding towards higher milk yield has a negative effect on leg condition, increasing the incidence of leg and claw diseases and locomotor disorders [Shaw et al. 1982]. Lameness is among the most serious cattle diseases due to its negative effects on milk production [Warnick et al. 2001], reproductive capability [Lucey et al. 1986] and animal health and welfare.

Udder diseases were the third most frequent (13.1%) reason for culling high-yielding cows, but the proportion of cows culled for udder disease tended to decline in the subsequent years.

Almost 12% of the high-yielding cows were culled because of metabolic and gastrointestinal diseases, with particularly great numbers (20–20.3%) culled in the years 2009–2010. According to Studziński et al. [2003], there is a growing incidence of losses due to metabolic disorders in the periparturient period, which results in 15 to over 40% of the cows from high-yielding herds being eliminated from further breeding. In the study by Morek-Kopeć and Żarnecki [2009] with Polish Holstein-Friesian cows from the national active population, which has lower milk yields compared to the cows investigated in our study, the proportion of cows culled for this reason was 3.3%.

The incidence of culling due to “old age” was sporadic (1.3%), with most cases (3.5%) observed in 2006. This corresponds to the results given in Table 1, which show a tendency for the lifespan of cows to decrease in the years 2006–2011.

In the analysed population, the percentage of voluntary culling decisions by the breeder, which include the sale for further breeding, low milk yield and old age, was about 6% during 2006–2007 and decreased to about 2% in the subsequent years. This also indicates an increased incidence of forced culling, which has a negative effect on the profitability of breeding. When analysing the reasons for cow culling in many countries and populations, Morek-Kopeć and Żarnecki [2009] found that among all causes, culling for reasons beyond the breeder’s control accounted for 75 to 85%, with the main role played by health problems.

## CONCLUSIONS

During the years 2006–2011 the lifespan of high-yielding cows and the length of their productive life tended to decrease, with an alarming tendency for the increasing proportion of young, especially first-lactation cows among all culled cows. Culling intensity was considerable (32%). In the analysed population, the percentage of voluntary culling decisions by the breeder decreased from about 6% during 2006–2007 to about 2% in the subsequent years. High-yielding cows were most frequently culled for infertility and reproductive diseases (35.9%) as well as locomotor (15.1%), udder (13.1%), metabolic and gastrointestinal diseases (12.9%).

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## ANALIZA DŁUGOWIECZNOŚCI I PRZYCZYN BRAKOWANIA KRÓW WYSOKO WYDAJNYCH

**Streszczenie.** Badania przeprowadzono w latach 2006–2011 w gospodarstwie na terenie woj. kujawsko-pomorskiego, utrzymującym około 290 krów rasy polskiej holsztyńsko-fryzyjskiej odmiany czarno-białej, o średniej wydajności blisko 11 000 kg mleka. W opracowaniu statystycznym wykorzystano procedury GLM i FREQ z pakietu SAS. Stwierdzono tendencję do skracania długości życia i użytkowania krów wysoko wydajnych, przy czym niepokojąca wydaje się wyraźna tendencja do wzrostu wśród ogółu wybrakowanych udziału krów młodych, zwłaszcza w pierwszej laktacji. Wykazano znaczącą, bo 32% intensywność brakowania. Procent niewymuszonych, zależnych od decyzji hodowcy brakowań, które obejmują sprzedaż do dalszego chowu, niską wydajność i starość, zmniejszył się z około 6% w latach 2006–2007 do około 2% w kolejnych latach. Krowy wysoko wydajne brakowano głównie z powodu jałowości i chorób układu rozrodczego (35,9%), chorób układu ruchu (15,1%), wymienia (13,1%), metabolicznych i układu pokarmowego (12,9%).

**Słowa kluczowe:** długowieczność, krowy wysoko wydajne, przyczyny brakowania

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