

Survival of Holstein Friesian heifers through to fourth calving on a research farm

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Abstract

This study monitored survival up to fourth calving and reasons to culling of a number of 202 Holstein Friesian heifers on research farm at Agricultural Research and Development Station (ARDS) Simnic, Craiova. Heifers born between 2016 and 2019 were monitored from 1 months of age trough to forth calving. The survival of animals was calculated during 4 lifetime phases: (1) rearing period; (2) lactation 1; (3) lactation 2; (4) lactation 3. Also 4 longevity traits were calculated for all animals culled before forth calving: (1) age to culling; (2) herd life; (3) total lifetime days in milk (DIM); and 4 longevity index.

During the rearing period 6.9% of the total heifers at 1 month did not survive until first calving (0% longevity index). Of those that did calve (n = 188), 12.7% were culled in lactation 1, with a longevity index of 28.4%. In the second lactation 15.2% of the cows that did calve for the second time (n = 164) were culled, with a longevity index of 44%, and in the third lactation 19.4% of the cows that did calve for the third time (n = 139) were culled with a longevity index of 53.5%. Of all animals recruited at 1 month of age 55.4% (n = 112/202) calved for a fourth time. The primary cause for culling was infertility. These results show that some of heifers never become productive or are culled before they reach their full lactation potential.

Keywords: culling, longevity traits, survival.

1. Introduction

Replacement heifers represent the future of the dairy farm, and the management of the rearing herd is an important factor in the sustainability of the farm.

Management decisions on planes nutrition, housing, disease control and breeding, all influence growth and development [1] of dairy heifers.

In dairy production systems, rearing heifers is the second longest annual expense after feed for the milking herds [1]. To receive a return on this significant investment, heifers must get in calf quickly, calve without difficulty, produce well and get back in calf easily.

Worldwide, it seems that too many heifers are culled too early. The culling rate describes the percentage of female animals removed from the herd [2]. Based on various economics models, many experts advocate a 20 percent to 30 percent cull rate as ideal. The average annual culling rate in ARDS Simnic dairy herd is about 25%. In U.K. herds is about 22 to 25% [3, 4, 5]. In the U.S. few Holstein cows survive beyond their fifth parity and their average lifetime parity number has fallen from 3.4 in 1989 to only 2.8 in 2004 [6, 7, 8]. The age distribution of Holstein has shifted toward younger ages; approximately 37% of cows in large U.S. herds are in their first parity, and 83% are within the first 3 parities [9]. Rocha et al., (2010) [10] reported in Portugal a high culling rates of Holstein cows, with only 15% of first calves reaching a fourth lactation [10]. These figures indicate that a large number of relatively young animals are culled in the early stages of their productive life.

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The dairy herd is divided into the milking herd and the replacement herd, and the interaction between these governs the number of replacements required by the milking herd and, consequently, the number of replacements reared by the dairy producer.

Replacement rate affects the age structure and genetic merit of the dairy herd and productivity and profitability of the dairy farm.

A long herd life is more profitable. Herd life is often calculated from first calving, but in economic calculation costs including feed, labor, reproduction, health and housing in the rearing period should be taken into account.

The aim of this paper was to perform a perspective study to monitor Holstein Friesian heifers from 1 month of age until fourth calving to give an estimate of survival times on a sample of research dairy form.

2. Materials and methods

The dairy from ARDS Simnic – Craiova has a herd size of 280 animals and dairy cows produced on average 9440 kg of milk per 305 days lactation. Full details from management are not included here because the intention of this study was to document the timing and frequency of culling rather than to assess risk factors for the individual causes of culling.

A number of 202 heifers were monitored from 1 month of age to fourth calving. All heifers were fed whole milk until weaning at approximately 10 weeks of age. From the heifers were group – housed and offered diets of concentrate and ad libitum forage.

Before the start of the breeding period (at 15 months of age) heifers were housed in straw yards with straw bedding and fed concentrate and forage (grass or maize silage). Heifers were artificially inseminated (by a trained technician). Successful conceptions were confirmed by rectal palpation after insemination at 60 ± 7 days.

Milk production records were used to calculate the total Days in Milk (DIM) and days dry in each lactation.

For heifers that were culled the date reason of culling were collected as recorded on the farm information system.

The survival of animals was calculated during 4 life time phases: (1) rearing period (the number of heifers culled between 1 month of age and first

calving); (2) lactation 1 (number of heifers culled between first and second calving); (3) lactation 2 (number of heifers culled between second and third calving), and (4) lactation 3 (number of heifers culled between third and fourth calving). In addition 4 longevity traits were calculated for all animals culled before fourth calving: (1) age at culling (number of days from date of birth to the day of cull); (2) herd life (number of days from first calving to day of cull, included dry period); (3) total lifetime DIM (sum of the DIM during lactation 1, 2 and 3, excluding dry periods); and (4) longevity index (lifetime DIM divided by age in days at culling expressed as a percentage).

All descriptive statistics were performed in Excel and SPSS version 17.0; (SPSS Inc. Chicago, IL).

3. Results and discussion

All records were obtained from 202 heifers that either calved 4 times or were culled before fourth calving. During the rearing period 6.9% ($n=14/202$) of the total heifers at 1 month did not survive until first calving of those that did calve ($n=188$); 12.7% ($n=24/188$) were culled during lactation 1. In the second lactation 15.2% ($n=25/164$) of the cows that did calve for the second time ($n=164$) were culled and 19.4% ($n=27/139$) in lactation 3. Of all animals recruited at 1 month of age 55.4% ($n=112/202$) calved for a fourth time.

During the rearing period 6.9% of heifers alive at 1 month failed to calve for the first time. Eight heifers died in culled before the start of the first breeding period; 5 heifers before 6 months of age and 3 between 6 and 15 months. Heifers were bred for the first time at 461 ± 8 days. Six heifers culled after receiving at list 1 insemination (3 failed to conceive and 3 were sold).

Age at first calving for the remaining 188 heifers (93.1%) was 758 ± 12 days.

During lactation 1, 12.7% ($n=24$) of heifers were culled. Losses occurred throughout lactation 1, with primiparous animals culled on average 1062 ± 28 days of age and at 304 ± 21 days in milk (DIM) for a variety of reasons (table 1). The primary reason for heifer culled was infertility ($n=7$). The remaining 17 cows were culled for reasons including low milk yield ($n=4$), dairy sale ($n=3$), poor animal ($n=2$), uterine infection ($n=2$), abortion ($n=1$), calving injury ($n=1$), mastitis

(n=1), displacement abomasum (n=1), lung problems (n=1) and behavior problems (n=1). Of the original herd, 164 cows (81.8%) calved for a

second time at 1178 ± 19 days following a dry period of 60 ± 14 days.

Table 1. The reasons for culling during each lifetime phase

Reason	Animals culled (n)			
	Rearing period n = 14	Lactation 1 n = 24	Lactation 2 n = 25	Lactation 3 n = 27
Voluntary culling:				
Low milk yield		4	3	2
Conformation/poor animal		2		2
Behavior problems		1	1	1
Involuntary culling				
Infertility	3	7	6	5
Abortion		1	1	2
Calving injury		1		1
Mastitis		1	2	3
Udder problems			1	2
Lameness			1	3
Skeletal injury			1	1
Displacement abomasum		1	2	2
Uterine infection		2	2	1
Lung problems	3	1		1
Died	5		1	
Dairy sale	3	3	4	1

During lactation 2, 15.2% (n=25) of heifers were culled. Losses again occurred throughout the lactation, with heifers culled on average at 1460 ± 22 days of age for a variety of reasons (table 1).

The cows were culled for reasons including: infertility (n=6), dairy sale (n=4), low milk yield (n=3), mastitis (n=2), displacement abomasum (n=2), uterine infections (n=2), behavior problems (n=1), abortion (n=1), udder problems (n=1), lameness (n=1), skeletal injury (n=1) and died (n=1). The remaining 139 cows (68.81% of original herd) calved for a third time at 1588 ± 28 days of age, falling a dry period of 60 ± 8 days.

During lactation 3, 19.4% (n=27) of heifers were culled.

For reasons including: infertility (n=5), mastitis (n=3), lameness (n=3), low milk yield (n=2), poor animal (n=2), abortion (n=2), udder problems (n=2), displacement abomasum (n=2), behavior problems (n=1), calving injury (n=1), skeletal injury (n=1), uterine infection (n=1), lung problems (n=1) and dairy sale (n=1). The remaining 112 cows (55.44% of the original herd) calved a fourth time at 1986 ± 26 days of age following a dry period of 59 ± 6 days.

Heifers culled during lactation 1 had an average DIM of 304 ± 21 days. Heifers culled during lactation 2 had an average DIM of 282 ± 22 days,

and in the third lactation of 302 days. Their total DIM was 888 ± 20 days. The main reason for culling at all ages was infertility, which accounted for 23.33% of the total losses.

The longevity index (lifetime DIM divided by age in days at culling, expressed as a percentage) for heifers not reaching the first calving was 0%. The mean longevity index for cows culled in lactation 1 was 28.4%. For cows culled in lactation 2, the mean longevity index was 44% and for cows culled in lactation 3 was 53.5%.

In this study 44.55% of potential replacement heifers alive at 1 month of age failed reach their fourth lactation on research dairy farm. Heifers are critical component of a dairy farm but the number available are limited by dairy herd reproductive performance and perinatal and postnatal losses during the rearing period.

Overall in this study the longevity index increased with lactation number from 28.4% in the first lactation to 44% in the second lactation and to 53.5% in the third lactation. Brickell and Wathes (2011) [11] reported a longevity index for heifers culled in seventeen commercial dairy farm and 1 primarily research farm of 24% in lactation 1, and 40% in lactation 2. Similar results reported Haworth et al. (2008) [12] on 1 farm in North Queensland. Increasing the length of productive

life for those animals that do enter the herd, would help to offset the high costs incurred during the rearing period.

In the United States, the average lactation length for cows without a subsequent lactation was 386 days and 279 days for lactation 1 and 2 respectively [7].

The longevity index used here expresses the efficiency of an individual cows in terms of the proportion of its total life spent producing milk [12].

Another important consideration is the length of dry period, and shortening this non-income-producing period has been proposed due to the obvious benefit of increasing lactation length and improvement to postpartum energy balance [13]. The effect of dry period length on reproduction and colostrum quality must also be considered [14]. High quality colostrum is vital to ensure the survival of newborn calves.

4. Conclusions

This study showed that some of heifers never become productive or were culled before they reached their full lactation potential.

A large sample size from a wider area would be useful in identifying risk factors for poor survival. The longevity index has the potential benefit as a trait in selection indices.

Increasing the productive lifetime of dairy cow would improve the efficiency of dairy production by capturing a greater proportion of potential lactation milk yield from mature cows.

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