

Benchmarks for Reproduction at the Herd Level

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■ Take Home Messages

- ▶ Reproductive performance has improved in herds larger than 150 cows in central and western Canada since 2011.
- ▶ Improvements in heifer inventory management can be seen in age at first calving data since 2011.
- ▶ Only 16% of herds achieve conception rates $\geq 40\%$ and insemination rates $\geq 50\%$, whereas 29% of herds have conception rates below 40% and insemination rates below 50%.
- ▶ With widespread use of sexed semen, the number of heifers produced should be monitored and management of herd inventory should be the focus going forward.

■ Introduction

Over the past decade, the use of reproductive and genetic technologies has increased in dairy herds across Canada. With the evolution of electronic activity monitoring and timed artificial insemination (AI) protocols, overall reproductive performance has increased in CanWest DHI herds greater than 150 cows. As well, sexed semen has now become a widely accepted product. The ability to create more female pregnancies and subsequent female calves opens new opportunities for herd level genetic strategies.

■ Reproductive Benchmarks

CanWest DHI started to annually publish reproductive performance data by herd size in 2011. For this paper, the focus is on herds greater than 150 cows. Using herd size above 150 cows helps to give a large enough cow population to limit the variability in pregnancy, insemination and conceptions that can be seen in herds smaller than 150 cows. In herds with more than 150

cows, lactating cow reproductive performance improved in 2017 compared with 2011 (Table 1). Pregnancy, insemination and conception rates increased by 2.5, 4.0 and 3.5 percentage units, respectively. Also, changes in herd demographics are reflected with 135 more herds milking 150 or more cows.

Table 1. Comparison of 2011 to 2017 CanWest DHI reproductive benchmarks for herd size > 150 cows for all provinces

Year	Number of Herds	Pregnancy Rate	Insemination Rate	Conception Rate
2017	590	19.0%	51.0%	39.5%
2011	455	16.5%	47.0%	36.0%
Change (2017-2011)	135	2.5*	4.0*	3.5*

*percentage units

The increase in reproductive performance should not be a surprise given the significant investment in technology and tools that have entered the industry during this period. Activity monitoring technologies and timed AI protocols have evolved over this period. Activity monitoring technologies now rely on the radio transmission of data to the farm computer allowing data to be analyzed in “real-time”. Activity monitoring technologies have also added features such as rumination time, standing and laying time, feeding time, and panting time. A survey conducted by the University of Guelph in 2014 on reproductive management showed that 24.9% of freestall or bedded pack dairy farms (n = 317) bred over 50% of their cows at first service from an activity monitoring system (Denis-Robichaud et al., 2016). The Canadian National Dairy Study reported that 747 herds milked their cows with robotics in 2015 (Canadian National Dairy Study, 2018). The growth in robotics as well as modern milking parlor systems bring with them upgraded monitoring technologies.

The University of Guelph survey also showed that 81% of herds used timed AI at some point in their reproductive protocol (Denis-Robichaud et al., 2016). Additionally, 27.6% of tie-stall herds and 12.0% of loose housing herds used timed AI for > 50% of first services.

<p>27% of Herds</p> <p>< 50% insemination rate ≥ 40% conception rate</p>	<p>16% of Herds</p> <p>≥ 50% insemination rate ≥ 40% conception rate</p>
<p>< 50% insemination rate < 40% conception rate</p> <p>29% of Herds</p>	<p>≥ 50% insemination rate < 40% conception rate</p> <p>28% of Herds</p>

Figure 1. Two by two table of 2017 reproductive data from CanWest DHI herds > 150 cows, with conception rate ≥ or < 40% and insemination rate ≥ or < 50%

Figure 1, which shows the CanWest DHI reproductive data from 2017, demonstrates that many herds were meeting both insemination and conception rate goals. For the purpose of this analysis, insemination and conception rate goals were set at 50% and 40%, respectively. The insemination rate goal was set at 50% because the DHI data assumes that the voluntary waiting period is 50 days in milk. Because not all herds start at 50 days, some herds' insemination rate data will be lower than the actual rate on farm. If over 50% of available cows are being inseminated over a cycle, the breeding program is being managed to a higher degree. A conception rate of 40% was chosen as it is an achievable goal for dairy herds to target and slightly above the 2017 average.

Sixteen percent of the herds achieved both insemination and conception rates above the cut-points (≥ 50% and ≥ 40%, respectively), whereas 29% of herds had both insemination and conception rates below the cut-points. Being above both cut-points means a pregnancy rate ≥ 20%, whereas being below both cut-points means a pregnancy rate < 20%. As shown in Figure 1, 27% of herds had a conception rate ≥ 40% while having an insemination rate < 50%. The remaining 28% of herds had conception rates < 40% and insemination rates ≥ 50%.

Table 2. Comparison of 2011 to 2017 CanWest DHI heifer reproductive benchmarks for herd size > 150 cows for all provinces

Year	Number of Herds	Age at First Calving	% of Heifer Pregnant at First Breeding
2017	478	24.2	56.0%
2011	314	25.3	58.5%
Change (2017-2011)	164	-1.2	-2.5*

*percentage units

One of the shifts in herd management over the past decade has been the increased focus on heifer management. Whether it was intentional or not, changes in heifer management have likely impacted the age at first calving. The age at first calving has been reduced by over a month over the last seven years in DHI herds above 150 cows that are recording heifer data in accordance with DHI guidelines (Table 2). While the age at first calving has come down, the percentage of heifers pregnant at first breeding has also declined. The reduction of 2.5 percentage units in first service pregnancy may be the result of more aggressive insemination strategies, which can lead to a reduction in conception because more marginal animals are being bred. As well, increased use of sexed semen likely has had a slight negative impact on conception rates.

Other trends in the industry can be seen by looking at herd data; for this study 15 herds with more than 200 cows were analyzed (Table 3). These herds had an available Dairy Comp 305 file with fertility rates, calving information and general individual cow data. All herds were on DHI, in Ontario and clients of EastGen Genetics.

Table 3. Percentage of heifer calves produced by lactation from 15 Ontario dairy herds milking more than 200 cows between October 2017 - 2018.

Lactation	Number Fresh	Mean	Minimum	Maximum
1	2994	72%	48%	88%
2	2228	49%	43%	64%
3+	3117	46%	33%	54%

One area of interest is the percentage of female calves being produced by cows starting their first lactation. Sexed semen has changed the ways that genetics are managed within a herd. For example, first lactation cows are now calving with an average of 72% female offspring. At the highest, a herd was able to achieve an 88% female calf rate from first lactation calvings.

The ability to have heifers produce a higher percentage of female calves changes the way producers manage their genetic inventory. When a herd generates a higher percentage of female calves, and the producer manages fertility, calf mortality and herd culling rates, additional flexibility in managing the herd's genetics is presented. Sexed semen gives the producer the ability to cull "bottom-end" animals, increase selection intensity on the desirable animals, and selectively breed to produce dairy-beef crossbreds, creating a whole new management dynamic. Balancing the number of heifers and dairy-beef crossbreds produced and timing the culling of heifers to reduce inventory will become a bigger focus for dairies going forward.

■ References

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