

Benchmarking of farms with automated milking systems in Canada and associations with milk production and quality

R.D. Matson,¹ M.T.M. King,¹ T.F. Duffield,² D.E. Santschi,³ K. Orsel,⁴ E.A. Pajor,⁴ G.B. Penner,⁵ T. Mutsvangwa,⁵ and T.J. DeVries¹

¹Department of Animal Biosciences, University of Guelph, Guelph, ON; ²Department of Population Medicine, University of Guelph, Guelph, ON; ³Lactanet, Sainte-Anne-de-Bellevue, QC; ⁴Faculty of Veterinary Medicine, University of Calgary, Calgary, AB; ⁵Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, SK

Why is this important?

Automated milking systems (AMS) continue to gain popularity across Canada. From 2011 to 2018, the number of farms with AMS (that also used milk recording) increased from 158 to 701, a 444% increase! The rapid adoption of AMS has primarily been to reduce the need for labour on farms and to improve the lifestyle of dairy farm families. However, there have also been reported improvements in cow health and production and a perception of improved farm profitability overall. All great reasons to consider this system.

Use of AMS continues to improve as the software programs and sensors get better. There are several herd-level predictors of milk production that have been found, included barn layout (traffic system), AMS density per pen, and concentrate feeding in the AMS. For instance, barns with forced (or guided) traffic, where one-way gates are used to guide cows to milking, feeding, and resting areas, have been associated with decreased milk production compared with free traffic systems, where cows have access to all areas of the barn without restriction. These studies have been limited in their design (region-specific or only considering one brand of AMS) and there is a need to profile all AMS herds across Canada regarding management and housing.

The objective of this study was to benchmark the herd-level housing and management strategies of AMS farms

across Canada and to determine the associations of herd-level housing factors and management practices with production (milk yield, milk fat, and protein content) and milk quality (SCC).

What did we do?

There were 197 herds enrolled in this study. Herds were visited once between April and September 2019. Farm distribution included 11 herds in Atlantic Canada, 50 in Western Canada, 77 in Ontario, and 59 in Quebec. The AMS brands represented were 121 Lely, 50 DeLaval, 17 GEA, and 9 Boumatic. On farm, a survey of management, housing, and nutrition management was conducted orally and included a variety of housing and management categories (Table 1). Additional data on milk yield, milk fat and protein content, and SCC was also collected.



What did we find?

The majority of farms managed their herd in 1 lactating group with 2 AMS within that group, resulting in an average of 47.5 cows/AMS unit, which is well below the capacity of 60 cows/AMS unit. The categorical housing and management variables are summarized in Table 1.

Table 1. Categorical housing and management variables for study herds across Canada (n = 197).

Variable	No. of herds	Percent of herds
Lying area type		
Free-stall	180	91.4
Pack	11	5.6
Mixed	6	3.0
Feeder type		
Headlocks	110	50.9
Post and rail	45	20.8
Mixed	61	28.3
Flooring type		
Grooved concrete	84	42.7
Mix	43	21.8
Rubber	53	26.9
Slatted	17	8.6
Bedding Type		
Organic	145	73.6
Inorganic	52	26.4
Bedding base		
Deep bedding	80	41.7
Mattress	112	58.3
Breed		
Holstein	178	90.4
Non-Holstein	19	9.6
Cow traffic system		
Free flow	173	87.8
Guided	24	12.2
Footbath		
Yes	146	76.8
No	44	23.2
Alley-cleaning method		
Automatic scraper	171	86.8
Autonomous scraper	18	9.1
Human-operated machine	6	3.1
None	2	1.0
Ventilation		
Ceiling fans & natural	58	29.6
Panel fans & natural	42	21.4
Panel, ceiling fans & natural	19	9.7
Tunnel or cross-ventilated	61	31.1
Natural	16	8.2
Feed push-up method		
Robot	140	71.1
Human	38	19.3
Contained bunk	19	9.6
Feed delivery method		
Robotic (conveyor/automatic)	41	20.8
Other	156	79.2

The average milk yield, milk fat, milk protein, and SCC for AMS herds in Canada was 36.7 kg/d, 4.13%, 3.40%, and 186,500 cell/mL, respectively.

Overall, AMS herds with greater feed push-up frequency (each additional 5 feed push-ups/day was associated with 0.35 kg/d greater milk yield), greater feed bunk space per cow (each 10-cm increase in feed bunk space per cow was associated with 0.3 kg/d greater milk production), and ventilation systems that included some form of mechanization in addition to natural ventilation had greater milk yield (ranging from 2.6 kg/d with panel fans and natural ventilation to 4.2 kg/d with panel, ceiling and natural ventilation together). Additionally, greater milk yield per cow and lower herd-average SCC were reported for herds using sand bedding compared to organic bedding. Greater alley-cleaning frequency was also associated with lower herd-average SCC; each 5 additional alley cleanings/day was associated with 7,012 cells/mL lower SCC.

What does it mean?

These results largely confirm what previous research has told us about optimal housing and herd management. That said, benchmarking data is an extremely useful tool for producers. The data collected allows producers to compare their own herd's performance against that of others using similar systems in Canada. It can provide incentive to learn more, improve management practices or housing, or could even encourage some producers to transition from traditional systems to AMS.

Summary Points

- AMS herds with greater feed push-up frequency, greater feed bunk space per cow, and ventilation systems other than natural ventilation alone had greater milk yield.
- Greater milk yield and lower SCC were reported for herds using sand bedding.
- Greater alley-cleaning frequency was associated with lower herd-average SCC.