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Effect of transitioning to automatic milking systems on producers' perceptions of farm management and cow health in the Canadian dairy industry

C. Tse,* H. W. Barkema,* T. J. DeVries,† J. Rushen,‡ and E. A. Pajor*¹

*Department of Production Animal Health, University of Calgary, Calgary, AB T2N 4N1, Canada

†Department of Animal Biosciences, University of Guelph, Guelph, ON N1G 2W1, Canada

‡Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC V6T 1Z4, Canada

ABSTRACT

Automatic milking systems (AMS), or milking robots, are becoming increasingly common, but there is little documentation of how AMS have affected farms as a whole and what challenges and benefits producers are experiencing during their transition to AMS. The objective of this national survey was to document the effect of transitioning to AMS on producer perceptions of change in housing, farm management, and cow health. In total, 217 AMS producers were surveyed from 8 Canadian provinces. Median time since transition for respondents was 30 mo. The mean number of lactating cows per robot was 51 cows, with a median of 2 AMS units per farm. Fifty-five percent of producers built a new barn to accommodate the AMS. Changing housing systems was necessary for 47% of producers, not necessary for 50%, and not applicable to 3% (as the AMS farm was their first farm). Cleaning and feeding practices remained the same. Overall, farms increased herd size from a median of 77 to 85 lactating cows with the transition to AMS. After the transition to AMS, 66% of producers changed their health-management practices. Producers reported either a decrease or no change in rate of clinical mastitis. Reports on change in rate of lameness and total bacterial count varied. Conception rate was reported to have increased for 63% of producers. Culling rate was perceived to have stayed the same for 59% of producers. Overall, producers perceived their transitions to AMS as successful. Findings from this project provide a benchmark of the effects of AMS on important aspects of Canadian dairy farming, as well as provide producers, AMS manufacturers, veterinarians, and dairy advisors with more detailed knowledge on what to expect when transitioning to AMS.

Key words: robotic milking, adoption, precision dairying

INTRODUCTION

When functioning optimally, an automatic milking system (AMS) permits cows to voluntarily visit a robotic milking unit multiple times per day to be milked without requiring human labor. Demonstrated benefits of AMS include increased milk production, improved cow comfort, a more flexible lifestyle for producers (de Koning, 2010), less labor for milking (Hansen, 2015), as well as improved cow health and more interesting or less routine activities for the producer (Jacobs and Siegford, 2012; Woodford et al., 2015). However, an AMS has higher capital costs (Wade et al., 2004), requires producers to be on-call, and changes management to be more data-based (Butler et al., 2012). Profitability or labor savings with AMS varies depending on the management capabilities of producers (van't Land et al., 2000).

Although Europe has the highest concentration of AMS dairy farms, this technology is becoming increasingly common in Canada (Barkema et al., 2015). The proportion of dairy farms in Canada that use AMS has grown from 5.6% in 2014 to 6.8% in 2015 (Canadian Dairy Information Centre, 2016). Despite this growing popularity, little documentation exists on how AMS has affected North American farms as a whole (inclusive of cow health, milk parameters, management, housing, and dairy producers).

Several AMS survey studies have been published (e.g., Helgren and Reinemann, 2006; Rodenburg and House, 2007; Rousing et al., 2007; Molfino et al., 2014; Moyes et al., 2014; Tousova et al., 2014), but many of these are non-Canadian studies that focus on a very specific aspect of dairy farming. The Canadian dairy industry is different from that of the United States and European Union in average herd size, milk price, and animal welfare standards (Barkema et al., 2015), sug-

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¹Corresponding author: eapajor@ucalgary.ca

gesting that AMS studies conducted abroad may not necessarily be reflective of the Canadian dairy industry. Furthermore, few published AMS studies focus on producers' perceptions of change with the transition to AMS and comprehensively describe the effects of adopting AMS on farms.

The objective of our study was to determine how producers perceive the transition to AMS in terms of resulting changes in housing, farm management, and cow health. Other topics addressed in the survey, as described below, will be reported in additional publications.

MATERIALS AND METHODS

This survey study received institutional human ethics certification before contacting participants (University of Calgary, certification no. REB14-0149_MOD1).

Farm Selection and Data Collection

Contact information for AMS producers was acquired through Alberta Milk (Edmonton, AB, Canada) and Dairy Farmers of Manitoba (Winnipeg, MB, Canada), which are provincial milk boards, as well as through Lely Canada (Woodstock, ON, Canada) and DeLaval Canada (Peterborough, ON, Canada). We obtained contact information for 530 Canadian AMS producers. All 530 producers in our sampling frame were contacted and data were only collected on those willing to participate. Participating AMS farms in the study were from British Columbia (BC; n = 8), Alberta (AB; n = 43), Saskatchewan (SK; n = 7), Manitoba (MB; n = 12), Ontario (ON; n = 73), Quebec (QC; n = 66), New Brunswick, and Nova Scotia (Table 1). The latter 2 provinces were grouped together due to the smaller sample size per province, and are referred to as the Maritimes (n = 7). The AMS farms in Prince Edward Island and Newfoundland were not surveyed because AMS producers from these provinces could not be reached. The participating farms were surveyed by telephone, email, and in person from May 2014 to the end of June 2015. Producers' consent was received before surveys were conducted. Respondents were given the option to stop the survey at any point, in which case those surveys were excluded.

The study consisted of a 2-part survey. All producers were initially contacted by phone with the general survey (defined below). After completing the general survey, producers who were interested were emailed a link to the second part of the survey with follow-up questions. Producers that could not be contacted by phone (i.e., if only an email address was provided) were emailed a link to the combined survey (defined below)

Table 1. Characteristics of the participating Canadian automatic milking system (AMS) farms

Item	Province ¹							Overall ²
	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	Maritimes	
Total surveyed [n (% of all respondents)]	8 (4)	43 (20)	7 (3)	12 (6)	73 (34)	66 (30)	7 (3)	217
Total in sampling frame [n (% of sampling frame)]	23 (35)	59 (73)	13 (54)	56 (21)	136 (54)	211 (31)	32 (22)	530 (41)
Changed housing system (% respondents)	25	38 ^a	33	25	38 ^a	74 ^b	0	47
Median herd size (lactating cows)	83	108 ^a	101	93	78 ^{ab}	75 ^b	57	85
1st-3rd quartile	62-108	86-140	93-103	66-143	55-120	55-110	53-88	59-116
Median AMS units/farm	2	2 ^a	2	2	2 ^b	2 ^b	1	2
1st-3rd quartile	1-2	2-3	2-2	1-2	1-2	1-2	1-2	1-2
Mean number of lactating cows/robot ± SD	55 ± 9	51 ± 7 ^a	50 ± 5	56 ± 8	50 ± 9 ^a	51 ± 10 ^a	49 ± 7	51 ± 9
Brand of AMS ³ (% respondents)								
Lely	100	40	71	75	90	82	86	76
DeLaval	0	49	14	25	10	17	14	21
Other	0	12	14	0	0	2	0	3
Median months since transition to AMS	43	29 ^a	44	49	30 ^a	27 ^a	15	30
1st-3rd quartile	22-47	14-45	12-62	27-69	17-56	13-66	12-27	15-57

^{a,b}Medians and means within a row without a common superscript are significantly different ($P < 0.05$).

¹Only Alberta, Ontario, and Quebec could be tested for provincial differences due to small sample size in other provinces.

²Overall values included one anonymous respondent.

³Lely, Woodstock, ON, Canada; DeLaval, Tumba, Sweden; other brands included BouMatic (Madison, WI), Insemtec (Markness, the Netherlands), and unspecified.

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