Investigation into the labour and lifestyle impacts of automatic milking systems (AMS) on commercial farms in Australia

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ABSTRACT

The aim of this research was to create a pool of knowledge that will help researchers, farmers and industry representatives understand the impact of automatic milking systems (AMS) on labour and lifestyle on Australian farms. Labour audits were conducted on 5 commercial AMS farms to enable the development of case studies to raise awareness and knowledge of AMS impacts on pasture-based farms within the Australian dairy industry. Audits were conducted on each of the 5 farms for three days every month over a 12-month period. In addition each farmer was surveyed to capture qualitative data relating to labour and time management, labour implications during the transition to AMS, and the routines after the transition period. Labour efficiency ranged between 100 and 273 cows/Full time equivalent (1 FTE = 50 h per week). All 5 AMS farmers stated that AMS had a positive impact on their quality of life and that their expectations around the impact of the technology were successfully fulfilled. These findings will contribute to existing industry knowledge and awareness, enabling farmers to make informed decisions regarding the potential impact of robotic milking technology.

Keywords: Automatic milking systems; labour.

INTRODUCTION

In Australia, an automatic milking system (AMS) was first commercially adopted in Victoria in 2001, but it was not until 2008 that a second commercial farm started operation. At present there are 29 farms operating across 6 states (NSW, QLD, SA, TAS, VIC and WA).

As labour is the most significant operational cost likely to be affected by AMS (Mathijs 2004, Bijl *et al.* 2007), it is not surprising that farmers contemplating AMS seek sound data regarding the impact of AMS on labour. Whilst Steeneveld (2012) reported no difference in total full time equivalents employed, Mathijs (2004) reported labour savings in the order of 20%. Regardless of the results reported in the literature it is recognised that there is no published data regarding the labour requirements or lifestyle impact of AMS for pasture based systems. The vast differences between overseas and Australian operations create a level of discomfort (both at farm and industry level) with the use of overseas data for the development of realistic expectations and budget forecasting.

MATERIALS AND METHODS

Labour audits were conducted on 5 commercial AMS farms for three days every month over a 12-month period. Key selection criteria for determination of participant farms were that they had to have been operating for more than 10 months, that more than 50% of the herds' nutritional requirements were provided through grazed pasture and that no two farms had opted for AMS with the same core objective(s), i.e. the selected farms would demonstrate five unique operations. Four of the five farms selected were dairying prior to AMS adoption but one of those four was a new dairy conversion (managed in conjunction with an existing conventional milking system: CMS). Only the four farmers who had previous dairy experience with CMS were included in survey questions pertaining to pre vs. post-AMS adoption questions.

Each farmer/operator was surveyed in a face-to-face interview prior to the commencement of the study (March-May 2013). The survey was designed to capture general operational information that would be used to put context around the audit data.

Audits of labour were conducted on each farm for 3 days per month over a 12 month period with audits commencing between March and May 2013. Customised timesheets were developed for each farm in consultation with the farmer/operator with additional timesheets provided for staff as required. Each farmer/operator was offered a number of recording options including notebook, clipboard, electronic spreadsheet and audio data capture. All five farmers chose the clipboard option and submitted hardcopy timesheets at the conclusion of each three day recording period. The first auditing period and at least two additional auditing periods were conducted with the principal investigator on site to validate data captured by the farmer. These visits also allowed the investigator to observe the routines and develop an integral understanding of the whole operation.

Whilst the intention was to record each and every task conducted with a start time and a finish time or duration, this proved very difficult for tasks conducted within the dairy facility. In reality most tasks were

not conducted as discrete actions and operators were observed to do a considerable amount of multi-tasking and task switching. During the initial audits it became apparent that the most accurate records were obtained if time spent in the dairy was recorded and the tasks conducted during that 'session' were noted.

RESULTS AND DISCUSSION

Hours worked and routines

Labour audits were conducted on established AMS farms (>10 months of operation) with no data captured prior to AMS adoption. As a result, no potential existed for quantitative comparison of 'before' and 'after' AMS adoption. Despite this three of the four farmers who were dairying prior to the adoption of AMS agreed that they now work less hours than they did with their CMS operations. The fourth farmer shifted his time to different tasks and dramatically reduced the employed labour in his operation but did not capture a reduction in the time he spends on farm.

Average start and finish times for the farms are presented in Table 1. The audited farmers have developed routines which involve relatively short days (particularly in relation to start times) in comparison to typical CMS routines with average hours worked per day ranging from 5.35 to 10.84 hours. Whilst farmers were able to work reduced hours on given days (e.g. weekends with prior preparation) the audited days were appropriately proportioned to weekdays and weekends. It became apparent that short working days (i.e. later starts and earlier finishes) were possible (e.g. Farm B), but that farmers adopted working routines that appealed to them and that were practical. It is noted that Farm C has a late finish time as that farmer chooses to do an after-dinner fetch of cows that do not voluntarily traffic out of one pasture allocation followed by a final check of the dairy. Average start and finish times are not reported for Farm A (operating with batch milking) since they were extremely variable depending on how many herds he was milking and how often they were being milked. It was not uncommon for this farmer to get up in the early of the morning (i.e. 1am) to fetch a herd to the dairy before returning to bed.

The four farmers with prior dairy experience all indicated that they no longer need to manage and schedule their day around milking sessions which they deemed as a significant advantage to their routines and work efficiency. All 5 AMS farmers declared a positive impact in their quality of life and that the expectations they had of the technology were successfully fulfilled.

Time spent on specific tasks

With the adoption of AMS there has been a change in the nature of the work in comparison to a conventional dairy. Four of the five farms relied on voluntary cow traffic whilst one had adopted a batch milking management system fetching groups of cows to the dairy at regular intervals. Of the voluntary milking farms, farmers visited the dairy 3.48 times per day (range 2.40 to 5.73) and spent an average of 2.0 hours (range 1.67 to 2.24) at the dairy per day. These farmers averaged 3.15 paddock visits (range 2.3 to 3.9) per day to fetch cows and set up fresh pasture allocations and spent an average total time of 1.06 hours (range 0.61 to 1.43) hours per day in the paddocks or fetching cows that hadn't trafficked to the dairy voluntarily.

Shift in focus

Before the commissioning of the AMS, surveyed farmers reported they spent an estimated average 60% of their working day harvesting milk. The audited data indicates that the five farms now spend an average 26% of time on milk harvesting related tasks (46% if fetching and setting up new paddock allocations is included). Whilst this (46%) is not dramatically less than the 60% estimated for their CMS operations the total number of hours worked is also reduced.

Farmers scored their level of agreement on the statement; 'I have more time to focus on management aspects (e.g. pasture management, nutrition, animal health, reproductive performance, milk quality)', to which one farmer was neutral, two farmers agreed and one strongly agreed.

Monitoring system

Three of the surveyed farmers reported that they spend more time in the office compared to what they did with their conventional system. The predominant office tasks included monitoring performance (cow, herd, equipment and system level), managing cows (changing feeding, milking, drafting settings) and recording events (predominantly reproductive and health events). Interestingly one of the audited farmers conducted the vast majority of his office work remotely (either from the house or from his CMS operation) to ensure that his time at the AMS dairy was spent most efficiently and to accommodate the limited time he spent at the AMS dairy.

Less physical work

Three of the four farmers with prior dairy experience agreed that they are now doing less physical work on a daily basis. Not having to fetch the whole herd to the dairy and not having to stand on a concrete floor for several hours manually attaching cups are the two main physical activities that can be removed with AMS. The reduction in physical work may create occupational health and safety benefits for farmers and their staff. On average the surveyed farmers estimated that they averaged 5.5 hours/day

(range 4.5-7.0; across two milking sessions) when operating with a conventional system. The one farmer (farmer D) who responded that the amount of physical work has not decreased is continuing to operate both conventional and robotic dairies.

Employed labour

Three out of four farmers (with prior dairy experience) reported that they have reduced the total cost of employed labour in comparison to their previous CMS operation by reducing the number of employed labour and/or by reducing the number of hours worked. The one farmer that had prior CMS experience and that didn't report a drop in employed labour (farmer D, currently operating both CMS and AMS) has increased the total number of cows (by ~200 cows) being milked (across both dairies) without increasing the amount of employed labour. Some farmers also reported a reduction in the costs and reliance on hiring external contractors because they now have more time to do jobs like sowing, forage conservation and fencing.

Labour efficiency

Table 1 shows labour efficiency results from the labour audit and a comparison with the relevant regional average. Whilst it would be preferable to compare labour use efficiency with comparative data from farms of similar size and system type, such regional data is not available.

Table 1: Labour efficiency in five farms operating with AMS (Full time equivalent is a standardized people unit, calculated as 50 hours/week). Regional data sourced from: Tasmania Benchmarking 2013, Dairy Farm Monitor Project – Victoria Annual report 2012/2013 and Dairy Farm Monitor Project – New South Wales Annual Report 2012/2013

Farms	A	B	C	D	E
Average start time	-	08:20	07:05	07:30	07:00
Average finish time	-	17:13	20:49	17:20	17:24
Average total hours worked per day	10.84	5.35	9.50	5.35	10.28
Cows	152	140	210	205	275
FTE	1.52	0.75	1.33	0.75	1.44
Cows/FTE	100	186	157	273	191
Regional Average	99	99	108	137	137
Improvement	+1%	+88%	+45	+99	+39%

Labour efficiency ranged between 100 and 273 cows/FTE. Through one-on-one discussions and survey data we understand that the labour efficiency is strongly affected by the objectives of the farmer. On average, the audited farms were achieving labour use efficiencies (cows/FTE) that were 54% higher than the regional averages. Farmer A achieved a similar labour use efficiency to the regional average, and is an interesting case as he operates the system with batch milking rather than voluntary milking. His main objective when adopting robots was to decrease the number of employees and eliminate the need to physically milk cows. Reducing the amount of physical work (by shifting his time to herding cows rather than milking cows) has allowed him to remain in the industry when his only alternative was to exit the industry due to health issues. At the other extreme, Farmer D has achieved a cows/FTE ratio that is 99% higher than his regional average. This farmer continues to operate his CMS and has converted a dry stock block to AMS. He has not employed additional labour since commissioning the AMS and has been very strategic in ensuring his AMS is buffered by his CMS to allow him to achieve maximum efficiency at the AMS dairy. This buffering is achieved through many practices, one of which was by consolidating all of his dry stock and young stock management on the CMS farm.

Labour flexibility

All 5 farmers agreed with the statements; 'Most of my daily tasks can be conducted up to 2 hours earlier or later on occasions if needed' and' 'It is not a problem if I decide to sleep in and go to the farm a couple of hours later on occasions'. This is a reflection on the flexibility that the AMS provides to farmers and it is considered by them as one of the main advantages. Although all of them follow daily routines many of the tasks are not required to be conducted at fixed times. The farmer no longer needs to schedule their day around the milking sessions.

Farmers were asked if they have any off farm employment (not including off-farm employment of their spouses), and three out of five responded that they have a second (part-time) job not directly related to the dairy operation and that the flexibility the AMS provides them is key to allow them to do this.

CONCLUSION

The impact of AMS on labour and lifestyle on commercial farms varies between farms and is affected by the objectives of the farmer. However, it is also affected by the routines adopted by the farmer and is likely to be affected by other aspects of infrastructure, farm and herd management. The case study farmers chose to capture the benefits in different ways.

All five farmers reported a positive impact of the adoption of the automatic systems on labour and lifestyle. The scale of their operations allowed them all (except one) to operate their AMS

without regular employed (non-family) labour. The findings presented here increases the chance of farmers making informed decisions regarding the adoption of robotic milking technology when they are considering the installation of new milk harvesting equipment.

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REFERENCES

Bijl, R, Kooistra, SR & Hogeveen, H (2007) The Profitability of Automatic Milking on Dutch Dairy Farms. Journal of Dairy Science, vol. 90, no. 1, pp. 239-248.

Mathijs, E (2004) Socio-economic aspects of automatic milking in Automatic milking: A better

understanding. Conference proceedings, Lelystad, The Netherlands, March 2004, 46-55.

Steeneveld W, Tauer LW, Hogeveen H, Oude Lansink AG (2012) Comparing technical efficiency of farms with an automatic milking system and a conventional milking system. *J Dairy Sci. 2012* **95**, 7391-7398.