milking | edge

Comparing the profitability of Automatic and Conventional Milking Systems

A case study from West Gippsland

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Background

This report was commissioned by the Milking Edge project, an Australian dairy industry project by Dairy Australia, NSW Department of Primary Industries and DeLaval supporting farmers consider, invest and operate AMS successfully. Data collection, analysis and exploration were coordinated and conducted in a collaborative effort by Dan Armstrong (D-ARM Consulting), Kerry Kempton, Sheena Carter, Juan Gargiulo and Nicolas Lyons (NSW Department of Primary Industries).

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Introduction

There is significant interest in automatic milking systems (**AMS**) in the Australian dairy industry and there are now almost 50 farms operating AMS in the country. Over the last 10-15 years many of the practicalities of implementing an AMS in Australian grazing-based systems have been investigated and addressed both through research studies and on-farm adaptation. The potential for lifestyle benefits and labour efficiency improvements is clear and has been previously documented. However, it has been more challenging to address the issue of how the profitability compares between AMS and conventional milking systems (**CMS**). A study by Gargiulo et al. (2020) compared data from AMS and CMS farms milking between 100 and 400 cows, located across the main Australian dairy regions and collected over three years (2015–2016, 2016–2017, 2017–2018). However, this type of study presents some challenges due to differences in management skills and goals between farms, particularly with improved profitability not being the primary motivation for the adoption of AMS on many farms.

This case study farm, owned and managed by Grant and Leesa Williams in West Gippsland (VIC), provides a unique opportunity to compare AMS and CMS as both operations are run as part of the one business on adjoining properties. This means the climatic conditions are the same, soil types and feeding systems are very similar, and most importantly, the management team is the same across both operations.

Grant and Leesa purchased the original farm about 25 years ago, installed a 40-unit rotary dairy and currently milk about 320 cows in that operation. They purchased the neighbouring farm in 2008 and decided to operate the farm with an AMS. The main reasons behind looking at AMS were that they did not want to be milking 500+ cows through the rotary and wanted to keep their non-family labour requirements to a minimum. They were in the first handful of farms with AMS in Australia. They initially installed three AMS units on the second farm in 2009 and upgraded this to a four-unit AMS several years later. They currently milk about 225 cows on the AMS farm.

Data has been collected for both the AMS and CMS farms for the last five years (2015/16 to 2019/20) through the Milking Edge project. This provides some interesting insights into how the AMS and CMS systems compare.

Results

Summary and Overall Profitability

In the first couple of years of this study the AMS and CMS farms were less profitable than the average Gippsland DFMP farm. However, in 2018/19 and 2019/20 both the AMS and CMS farms have operated very efficiently and there was very little difference between them. In 2018/19 (which involved fairly tough operating conditions with high grain prices and a dry summer/autumn), the AMS and CMS farms were both above the average return on total assets (**ROTA**) for Gippsland Dairy Farm Monitor Project (**DFMP**) participating farms. In 2019/20 (which involved excellent seasonal conditions and a high milk price), a 6.6 % ROTA was achieved on the AMS farm and 7.2% for the CMS farm.

These findings suggest that when similar management is applied to the AMS and CMS farms (and there has been time to adapt to managing an AMS) the profitability of both systems can be very similar.

Despite having very similar total costs per kg MS, there are however, several differences in certain costs.

Labour Costs

Labour costs per kg of milk solids ($/kg MS) on the AMS farm were well below the Gippsland DFMP average for 2018/19 ($0.77/kg MS compared to $1.42/kg MS) and for 2019/20 ($0.81/kg MS compared to $1.41/kg MS). On the other hand, labour costs per kg milk solids for the CMS farm, which had the rotary, were similar to the Gippsland DFMP average (e.g. $1.38/kg MS compared to $1.42/kg MS for 2018/19).

Previous studies have found that the average AMS farm does not appear to have higher labour efficiency than the CMS farms, and that there was a large variability between AMS farms. However, the AMS farm in this particular study was one of the AMS farms that had exceptional labour efficiency (about 98,000 kg MS/labour unit in 2019/20) and very low labour costs per kg MS ($0.81/kg MS). There does not appear to be a great deal of opportunity for further improvements in labour efficiency on the Williams' AMS farm. However, it will be interesting to continue monitoring this over time. Therefore, it appears that many of the AMS farms are still in a development phase and have not captured the potential labour efficiency benefits of AMS as yet, or that increasing labour efficiency and reducing labour costs was not one of the main drivers behind the decision to install the technology.

Depreciation costs are higher on the AMS farm ($0.67/kg MS on average over the five years) compared to the CMS farm (about $0.23/kg MS) or the average Gippsland DFMP farm (about $0.18/kg MS), but this is the case for all AMS farms. With the higher milk production observed in 2019/20, the depreciation costs decreased to $0.50/kg MS on the AMS farm. These are not cash costs that can be managed. The key is to continue to ensure the robots are operated efficiently so that the benefits result in a good return on the capital invested in the system. This is done by optimising milk harvested per robot (in kg MS/robot.day).

Overall, on Grant and Leesa's AMS farm, the labour costs are lower than on the CMS farm, and the additional depreciation costs on the AMS farm are balanced out by the labour savings achieved.

Repairs and Maintenance Costs

The repairs and maintenance costs on the AMS farm (range of $0.66 to 1.02/kg MS between 2015/16 and 2019/20) were substantially higher than for the average Gippsland DFMP farm (about $0.30/kg MS). The repairs and maintenance costs for the AMS farm have always been well above the average farm, but the impression is that these appear to be increasing as the units age. It will be informative to monitor whether the trend continues into the future. High repairs and maintenance costs appear to be common for AMS farms, but investigating opportunities to minimise these costs is important given they are a large proportion of total costs.

The repairs and maintenance costs on the rotary farm ($0.47/kg MS in 2018/19 and $0.61/kg MS in 2019/20) were also higher than for the average Gippsland DFMP farm (about $0.30/kg MS). This is partly due to the ageing rotary dairy and the relatively low use of external contractors on the farm. Owning the silage/hay equipment does allow fodder conservation costs to be kept particularly low, which offsets the high repairs and maintenance costs to some extent.

Feed Costs and Pasture Consumption

The pasture consumption appears to be very similar between the rotary and AMS farm, which indicates that the voluntary movement of cows does not necessarily compromise pasture consumption. Both farms have generally achieved approximately 9 t DM/ha consumed, increasing to about 10 t DM/ha in 2019/20 with improved seasonal conditions. This would generally be considered above average performance from rainfed pasture where annual rainfall has been below 900mm in most recent years, except for 2019/20. The data does not provide a conclusive comparison regarding pasture utilisation or consumption on CMS versus AMS farms. However, it does provide strong anecdotal evidence that adopting an AMS will not necessarily lead to reduced pasture utilisation provided good management practices are applied.

The total Feed Costs per kg MS for the AMS farm and the CMS farm were very similar across all years. Both farms generally had feed costs per kg MS that were slightly lower than the average Gippsland DFMP farm.

Shed and Herd costs

The current herd costs are close to the regional average and opportunities for cost savings in this area are not large. However, herd costs did increase in 2019/20 with more sexed semen used. Shed costs on the AMS farm were above the average for a conventional farm due to higher electricity costs in the early years. However, the installation of solar panels on both the AMS and rotary farms resulted in a reduction in power costs in 2019/20, particularly for the AMS farm which operates throughout the day.

Concluding Comments

The analysis from this case study suggests that when similar management is applied to the AMS and CMS farms (and there has been time to adapt to managing an AMS) the profitability of both systems can be very similar. While total costs per kg MS were similar, there are however, several differences in certain costs. The labour costs are lower on the AMS farm than on the CMS farm, and the additional depreciation costs on the AMS farm were outweighed by the labour savings achieved in recent years. The repairs and maintenance costs on the AMS farm were higher than for the CMS farm and these appear to be increasing as the units age. Feed, herd and shed costs appeared to be very similar in total between the AMS and CMS farm.

This case study has provided valuable insights through comparing AMS and CMS on adjoining properties with the same management team. These insights will be particularly helpful for farmers who are considering adopting AMS.

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Table 1. Income, costs and profit for the AMS and CMS farm ($/kg milk solids) for 2015/16, 2016/17, 2017/18, 2018/19 and 2019/20.

Profit Report	AMS Farm 2015/16	CMS Farm 2015/16	AMS Farm 2016/17	CMS Farm 2016/17	AMS Farm 2017/18	CMS Farm 2017/18	AMS Farm 2018/19	CMS Farm 2018/19	AMS Farm 2019/20	CMS Farm 2019/20
Income										
Milk Income (net of levies and charges)	5.56	5.62	5.24	5.38	5.93	5.91	6.21	6.25	7.21	7.27
Total Gross Farm Income	5.91	6.08	6.08	6.21	6.36	6.25	6.62	6.62	7.87	8.11
Variable Costs										
Herd Costs	0.29	0.34	0.30	0.29	0.35	0.34	0.28	0.28	0.37	0.43
Shed Costs	0.33	0.20	0.36	0.27	0.30	0.22	0.27	0.22	0.21	0.20
Feed Costs	2.55	2.74	2.02	2.03	2.59	2.44	2.72	2.79	2.60	2.74
Total Variable Costs	3.18	3.28	2.67	2.59	3.23	3.00	3.27	3.29	3.17	3.37
Overhead Costs										
Employed Labour Costs	0.30	0.68	0.27	0.84	0.28	0.84	0.28	0.85	0.25	0.94
Farm Insurance	0.06	0.07	0.05	0.05	0.04	0.04	0.06	0.06	0.03	0.03
Repairs and Maintenance	0.66	0.66	0.70	0.36	0.79	0.37	0.67	0.47	1.02	0.61
Other Overhead Costs	0.14	0.15	0.17	0.16	0.12	0.11	0.14	0.15	0.18	0.20
Imputed Labour Costs	0.50	0.50	0.60	0.64	0.54	0.49	0.49	0.53	0.56	0.48
Depreciation	0.75	0.18	0.76	0.23	0.62	0.18	0.71	0.29	0.50	0.29
Total Overhead Costs	1.82	2.24	2.55	2.27	2.40	2.03	2.35	2.35	2.55	2.57
TOTAL OPERATING COSTS (Variable and Overhead)	5.58	5.52	5.23	4.87	5.63	5.03	5.62	5.63	5.72	5.93
EARNINGS BEFORE INTEREST & TAX (EBIT)	0.33	0.56	0.85	1.34	0.73	1.22	1.01	0.98	2.15	2.17
RETURN ON TOTAL ASSETS (ROTA)	1.0%	1.6%	1.8%	3.4%	2.0%	3.9%	2.7%	2.9%	6.6%	7.2%

Table 2. Physical performance for the AMS and CMS farm for 2015/16, 2016/17, 2017/18, 2018/19 and 2019/20.

	AMS Farm 2015/16	CMS Farm 2015/16	AMS Farm 2016/17	CMS Farm 2016/17	AMS Farm 2017/18	CMS Farm 2017/18	AMS Farm 2018/19	CMS Farm 2018/19	AMS Farm 2019/20	CMS Farm 2019/20
Cows milked	203	276	172	260	220	320	225	320	230	345
Stocking Rate (cows/ha milking area)	2.2	2.0	1.9	1.9	2.4	2.3	2.4	2.3	2.5	2.5
Milk Production (kg milk solids)	110,122	145,275	90,661	142,395	120,372	186,417	119,454	177,304	137,153	206,149
Pasture Consumption (t DM/ha milking area)	7.9	8.3	9.3	9.6	9.1	8.8	9.3	9.2	10	10
Labour Efficiency (kg milk solids per full-time equivalent labour unit)	110,122	52,827	90,661	47,465	92,594	61,120	91,888	53,728	97,966	62,469