

MILKSMART: WHAT MAKES A FARM DAIRY EFFICIENT?

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Summary

- Consider each phase of the milking process (fetching the herd, milking and cleaning) to capture maximum efficiency gains.
- It is important to select technology to match your goals for milking.
- Rotary dairies have become the most common technology for milking larger herds
- Drafting systems and automatic cup removers are delivering the greatest benefits for farmers allowing greater staff flexibility in task allocation.
- Benchmark data show that cows milked per hour at peak averaged 149 cows/hour for smaller 40 bail rotaries and up to 447 cows/hour for larger 80 bail rotaries
- Larger sheds can milk more cows per hour but they are not generally the most labour efficient when measured in cows milked per operator per hour.
- Variation of up to 130 cows per hour was observed within the same shed size category indicating that while shed size is important, how you operate the system is just as important
- Centralising data entry at the cups on position can minimise double entry, improve communication between staff on cow health and reduce the chance of error
- Keep systems simple and ensure all staff are adequately trained.

Introduction

Milking the herd is a significant job on a dairy farm. The task affects people, cows, the quality of the milk produced, as well as the capital investment, all of which influence the overall performance of the business. In this paper we consider what makes a farm dairy efficient and highlight some practical steps to make systems and procedures straightforward.

Benchmark data from 80 farms across New Zealand are used to describe the range of cow throughput rates achieved by farmers and to highlight the role technology can play in improving efficiency. Examples of systems and processes are drawn from a case study evaluation of a Canterbury farm that participated in the benchmark study and achieved high levels of efficiency.

Benchmarks for milking efficiency

There are three main phases to the milking routine: Fetching the herd, milking (first cups on to last cups off) and cleaning up. The set-up and cleaning phases typically make up 40% of overall milking time (Jago & Taylor, 2007) so it is well worth streamlining these tasks. Until recently few benchmarks have existed to gauge performance. Using the DairyNZ MilkSmart website (www.milksmart.co.nz) farmers can assess their performance against others and seek advice for improvements. The most recent effort to establish benchmarks for milking efficiency is a study of 80 farms that use rotary dairies.

Rotary dairies

The rotary has become an important technology on New Zealand farms and in 2010 40% of dairy cows were milked using a rotary. The larger the herd, the more likely it is to be milked in a rotary (Figure 3) indicating that this technology is particularly relevant to South Island farmers given the larger herds in these regions.

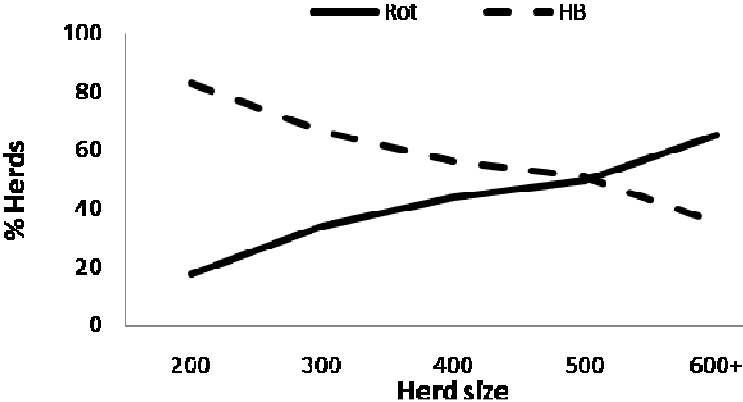


Figure 3. Percentage of herds milked using a rotary (Rot) or herringbone (HB) dairy according to herd size (Cuthbert, 2008).

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Eighty farms using rotary dairies participated in a study to provide benchmark data for a range of milking efficiency measures. Milking data were collected for 10 milkings between the end of calving and start of mating (Sep – Nov 2010, 65 farms) and again in late lactation (February – April 2011, 79 farms). Farms were selected for their ability to record milking data and all were equipped with a minimum level of technology including milk meters, automatic cluster removers (ACR) and herd management software that recorded individual milking events. A range of shed sizes were included to represent the systems in use.

A broad description of the farms in the study is given in

Table 2 and their geographic location in Figure 4. Compared to the national average, the study farms were larger in area and herd size. They had a larger area per full time equivalent (FTE) and higher ratio of cows to FTE. A high proportion used in-shed feeding systems (84%) and the majority (80%) of sheds were <7 years old. Many of the farms had technology in addition to the minimum required for the study and compared to industry averages (Table 3). These included automation in cleaning, feeding, cow management and animal health.

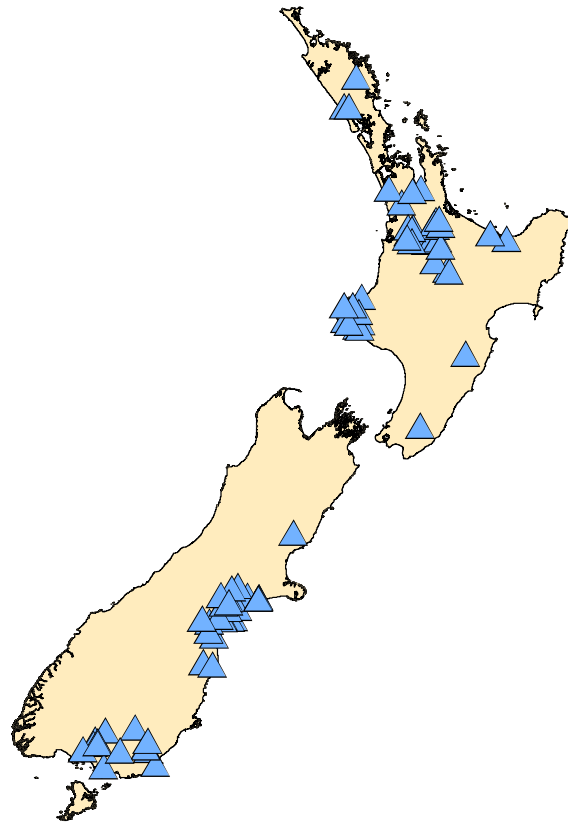


Figure 4. Locations of the benchmark study farms

Table 2. Physical description of benchmark farms

Feature	Study Farm Average	South Island	National average
Effective area (ha) ¹	242	194	134
Herd size at peak ¹	771	565	376
Ha per FTE ²	60	54	52
Cows per FTE ²	180	156	145

¹Comparative data from 2009/10 Dairy Statistics (LIC & DairyNZ, 2011)

²Comparative data from 2009/10 Economic Survey (DairyNZ, 2011)

Table 3. The use of automation technologies on benchmark farms compared to a 2008 industry survey of rotary dairies.

Function	Technology	Percentage of Farms	
		Benchmark Farms	Industry Survey ¹
Cleaning	Yard wash	97	32
	Plant wash ²	80	23
	Vat wash ²	54	48
Milking and feeding	ACR	100	54
	Teat sprayer	97	49
	In-shed feeding	84	43
Cow management	Drafting system	100	11
	Backing gate	97	83
Animal health	Mastitis detection ³	56	4
	Stock Weigher	45	3
	Heat detection ⁴	30	0

¹Survey of 252 farms with rotary dairies (Cuthbert, 2008).

² Push button and require no manual operation

³In-line electrical conductivity or SCC sensors

⁴Leg or neck mounted activity devices

Notes:

Measures of milking efficiency

Milk quality, cow health and the comfort and safety of people are important considerations when assessing the milking performance on a farm. An efficient farm focuses on all aspects of the milking process. On average, farmers spent 50 minutes per milking bringing herds in, however there were examples of farms using gate-release devices and herds walking to the dairy with minimal assistance which resulted in just 10 minutes required for the fetching phase.

All throughput measures have been calculated from first cups on to last cups off and excluding any sick or treatment herd. The number of cows milked per hour increased linearly with increasing shed size (Figure 5a). Smaller rotaries (40 bails) achieved, on average, 149 cows/hour at peak, increasing to 213 cows/hour in late lactation. The highest throughput was achieved by 80 bail systems at 447 cows/hour (with two cupping operators), and this rate did not change from peak to late lactation.

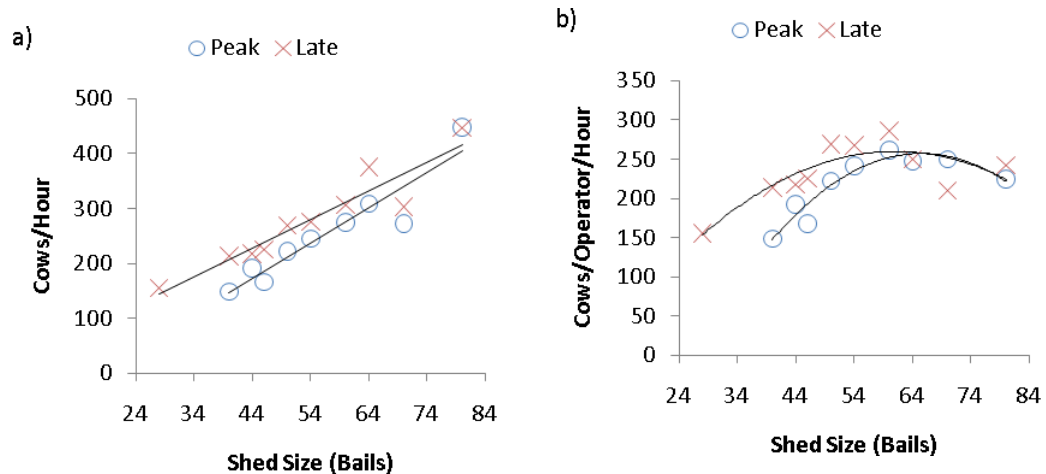


Figure 5. Average number of cows milked per hour (a) and number of cows milked per operator per hour (b) on the rotary benchmark farms during peak and late lactation.

Another common measure of efficiency is the number of cows milked/operator/hour (Figure 5b). Using this measure, 60 bail rotaries achieved the highest throughput per operator in both peak and late lactation. The data show that although larger sheds can achieve higher throughput measured in the number of cows milked per hour, and thus are able to process large numbers of cows in a short time, they are not generally the most labour efficient when measured in terms of cows milked per operator per hour. However, your goals for milking will determine the most suitable approach for your farm.

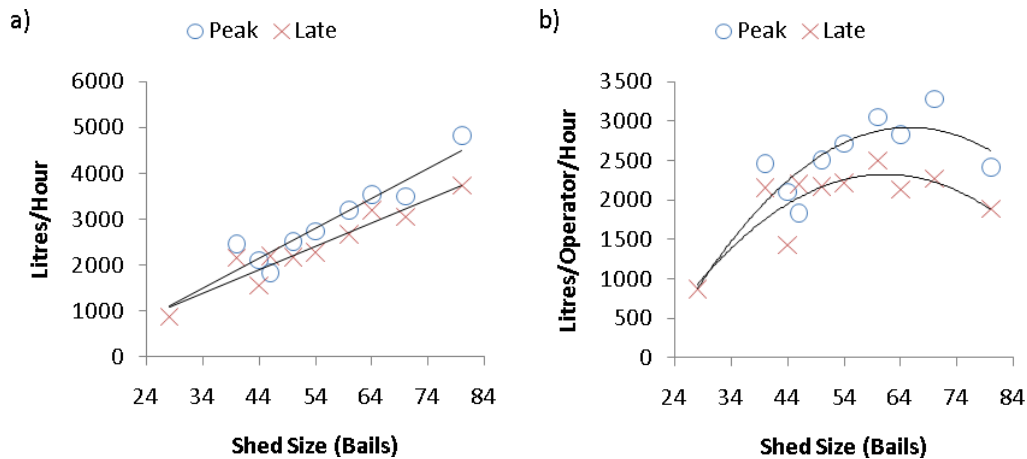


Figure 6. Average litres harvested per hour (a) and litres harvested per operator per hour (b) on the rotary benchmark farms during peak and late lactation.

A similar trend was seen when a third efficiency measure, litres per hour (Figure 6a) and litres per operator per hour (Figure 6b), was examined. Higher rates of efficiency were observed at peak lactation despite more cows per hour being milked at late lactation. This indicated that the number of cows milked per hour did not sufficiently increase to overcome the decline in milk yield. Litres per operator per hour peaked around the 60 bail size, as larger sheds often required two operators. Higher output was observed in peak lactation.

Although shed size determines the maximum potential throughput, the large variation in throughput rates (Figure 7a) show that other factors are influencing cow throughput. More analysis is required to explain the contribution of each factor, however, a large portion of the variation can be explained by the platform speed (seconds per bail) which is effectively the attention time per cow as she passes the cups on operator (Figure 7b).

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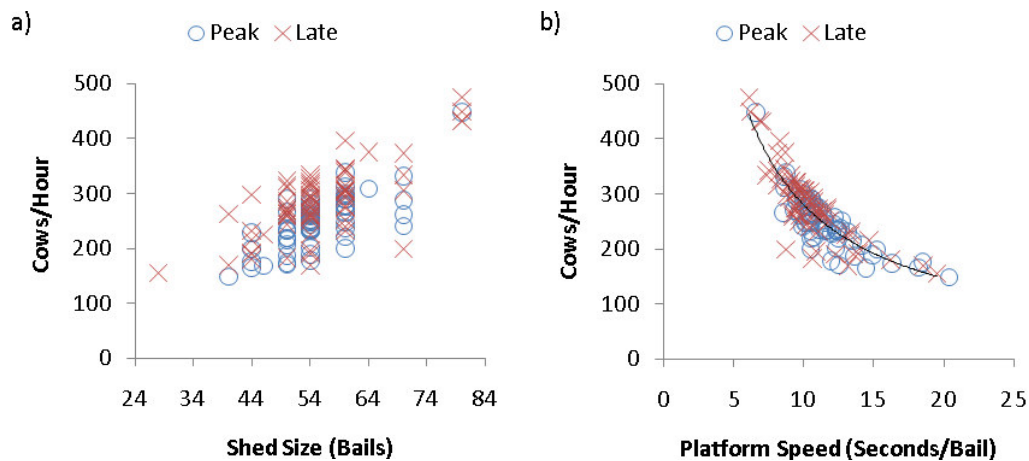


Figure 7. Range of throughput (a) and the relationship between platform speed and the number of cows per hour (b) for the benchmark farms at peak and late lactation.

The skill of the operator(s) and their ability to cup cows consistently at the required rate for extended periods of time is important in achieving an efficient yet sustainable platform speed. It is generally accepted that 10 seconds per cow is a comfortable rate to attach cups. However, there were examples of people cupping at 6.9 seconds per cow in some single operator 60 bail rotaries at late lactation. Rotaries with 2 cuppers tended to be the 70 and 80 bail sheds where speeds ranged from 5.8s/cow (late) to 8.1s/cow (peak). So it appears that somewhere between 7 and 8 seconds per cow is the limit for a single operator, however operator fatigue may be an issue at these speeds.

In the benchmark group, the average length of time one person spent cupping at peak lactation was 140 minutes, however, the range was from 60 to 345 minutes. Cupping time was reduced in late lactation to an average of 91 minutes in a milking session with a range of 31 to 196 minutes. A feature of many farms was that operators swapped tasks during a milking session. The average number of milkings per week was 8.5, and ranged from 3-14. It was interesting to note that 24% of the benchmark farms had a dedicated milk harvester position, either for part of a week, season or the whole season. Fifty six percent of the benchmark farms were single operator dairies for the whole season, and a further 24% were mostly single operator, i.e. had a cups off operator around calving and/or mating.

Many of the farms had invested in automatic plant and vat wash systems. Compared to farms that had partial automation or manual systems, these farmers saved an average of 20 minutes cleaning per milking, however the range was similar.

The systems and procedures put in place by the farm manager will influence how efficient a farm dairy operates. The next section focuses on one of the Canterbury

benchmark farms that achieved a high level of efficiency and explains the procedures in place to achieve his milking goals.

Case study of a Canterbury farm

Simon Scott farms in Ikawai. He is a managing equity partner on a farm that was converted from dairy grazing in 2008 (Table 4). Simon was new to dairying, having had no hands on experience milking except for 3 months milking over 2008 spring on the neighbour's property. He had specific goals in mind when deciding what shed and technology to build on the property.

Table 4. Farm details, Simon Scott.

Land	220 ha (milking platform)
Cows	675 milked in two herds based on age and production, Spring calving
Farm system	Winters on farm using home-grown and imported feed, supplement fed in-shed to lactating cows all season (average 1.5kg/cow/day). Twice daily milking
Dairy & Automation	60 bail rotary with ACR, EID, milk meters, drafting, in-shed feeding, weigher, teat sprayer, mastitis detection (SCC), yard wash
Staff	4 Full time equivalents, rostered 7 days on, 2 or 3 days off
Milking roster	1 person in shed all season, approximately 5 milkings per week, farm manager milks on staff days off

Goals for milking and technology selection

The primary goal was to be able to milk with one person in the shed, as having a single operator gave greater flexibility with staff and rosters. From the outset Simon wanted a comfortable work environment for staff so selected technology to achieve this goal. He chose a 60 bail rotary platform as he considered it was the most efficient use of 1 person and could be operated by a competent operator. This also required ACR and drafting, a system for identifying

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mastitis cows was also installed. A key technology is the computer at the cups-on position, which ensures there is no need to double-enter information. For example, mastitis data are entered as cows are inspected following alerts from the detection system. A mirror is positioned above the platform at the cups on position so assist with tail paint and Kamar observation during heat detection. An in-shed feeding system is used to supplement cows based on individual yield and herd condition.

Performance

Compared to all the benchmark farms Simon's operation was in the top 14% of cows milked per hour and in the top 8% of cows milked per operator per hour at peak. Approximately 8% of cows go around for a second rotation. The cups on operator is cupping at 8.6-11.7 seconds per cow. SCC last season averaged 130,000. This season they have had more mastitis cases but the SCC is only slightly higher at 150,000. Simon does not have automated plant and vat wash systems, which means his cleaning time is above average at 60 minutes total. This is an area that time savings could be made.

Procedures

Cows are managed in two herds based on production, body condition and age. This has helped with monitoring performance. The lower producing herd is fed less in-bail, and walks the longest distances, grazing further away paddocks.

Simon believes it is important that all staff know how to do each task on the farm. This gives greater flexibility and keeps variety. Simon thinks it is important that staff don't have to spend a lot of time consistently in the dairy. Staff work a roster of 7-on-2-off, 7-on-2-off, 7-on-3-off. The roster is very detailed outlining who does what each day. It allows for some mid to late starts rather than early mornings every day, so the roles each day are changing. In the early stages, two people were positioned in the shed in the morning milking until mating, but it was found that the second person was not required. Once through mating one person brings the first herd in and milks them, with a second person starting later and getting the second and penicillin herds. The third person starts at 8.00am doing jobs outside the shed. These roles are rotated on a daily basis. The person who milks in the morning is out of the shed in the afternoon and the person who was on late starts milks in the afternoon.

The computer at the cups on position is critical for ensuring that all data are entered that day (calvings, matings etc). Alerts on cows with withholding periods, high SCC, are also recorded. As cows are treated, the data are entered on the computer at cups on. This discipline makes it easier for all staff to know the status of any cow as they can check the computer.

It is important to train staff to be confident to use the computer. It took until the second season before staff were using the system confidently. They use DAL equipment and when the rep is on farm Simon takes the opportunity for staff to learn a new aspect of the software.

Mastitis detection: The detection system is based on SCC and is set to alert cows above a certain threshold. At the start of the season this facility is also used to draft cows into the colostrum herd for extra calf milk if required. Normally the system is set to alert at cups on so staff can strip the cow and check for mastitis. The cow is then drafted if clinical and requires treatment; otherwise she is left in the herd. Non-clinical high SCC cows repeatedly alert, but staff learn and remember these animals. Simon estimates they get about 20 alerts per milking with the alert SCC set at 400,000. His view is that they tend to find the mastitis earlier than by manual detection alone and has so far never had to strip the whole herd which is a huge labour saving.

Overall, Simon is happy with his system as it allows him to achieve his goal of greater staff flexibility through only one operator required in the dairy. If rebuilding he would do the same again. Although his equipment has been sourced from multiple suppliers he was able to select technologies for specific tasks and kept control over costs, knowing all parts of the system are there to perform a function.

Acknowledgements

We would like to thank the farmers who participated in the benchmark project. Their willingness to share data has assisted the understanding of key factors for effectively milking in rotary dairies.

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