DairyNZ

Technology and Workplace Practices Survey Report

2023

Overview

As herd sizes increase, labour pressures persist and more farming technologies emerge, New Zealand dairy farmers have been investing more on herd and milking management technology.

DairyNZ has been tracking this trend since 2008, using five-yearly surveys to collect objective data about dairy farmers' milking practices and technology use, as well as information on some farm-wide technologies and facilities.

The 2023 survey included over 500 farmers with herds larger than 100 cows.

Background to survey method

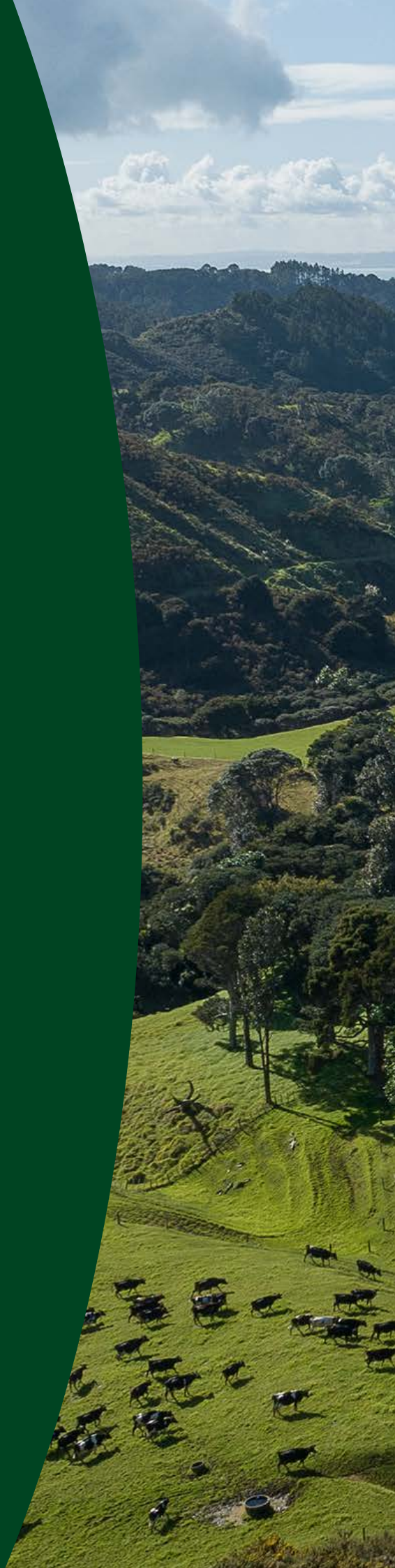
Around 67% of New Zealand dairy farms have herringbone dairies (HB), while 33% have rotary dairies (R). Rotary dairies have a higher number of technologies installed than herringbones.

To account for this difference, the survey intentionally over-sampled the rotary dairy population, so half of those surveyed run herringbone dairies and half have rotary dairies. This provides more detailed data on technology use.

In this report, data for herringbone and rotary dairies is usually reported separately. Where a value for 'all dairies' is provided, this has been calculated based on the actual proportion of these dairy types on farms.

The maximum margin of error (MOE) for data representing 'all farms' is +/- 4.3 percent at the 95 percent confidence interval. At the farm dairy level, the smaller sample size of 250 herringbone or rotary dairies presented separately, gives a maximum margin of error of +/- 6.1 percent.

This survey was conducted in March and April 2023 before the reduction in milk price announcements.



Key insights

- New Zealand dairy farmers have been investing in more technology to help with automation in the dairy shed and herd management.
- For rotary dairies, the biggest increases since 2018 have been in cow wearables (+24%), yard wash systems (+15%), teat sprayers (+13%), auto drafting (+12%) and cup removers (+11%).
- For herringbone dairies, in-shed feeding systems had the most installations (+15%), followed by auto drafting (+11%), cup removers (+10%), yard wash systems (+10%) and cow wearables (+10%).
- Just 36% of farmers were using a technology (22% using a rising plate meter) as their main method to measure pasture covers across the whole farm, and 45% record their pasture data in software for analysis.
- Around half (54%) of farmers are prepared for power outages, with access to a generator to run their milking plant.
- Milking routines can have a real impact on efficiency and show an opportunity to reduce the hours spent milking on many farms.

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Comparing herringbone and rotary dairies

The type of milking platform used on farm can have a large impact on the type of technology adopted. Farms with rotary dairies tend to also have more automation technology, usually driven by recent milking infrastructure investment and larger herds.

The survey highlighted the following similarities and differences for NZ farms with rotary or herringbone dairies:

- Rotary dairies were, on average, newer (years since built: R=20, HB=32), larger (sets of cups: R=48, HB=29) and milked more cows (cows milked at peak: R=603, HB=338).
- Both dairy designs had a major upgrade (e.g. new plant, more sets of cups, etc) on average 10 years ago.
- On farms with herringbone dairies at peak milk production, 84% of herds were milked twice a day (TAD), 14% once a day (OAD), and 2% at other milking intervals.
- On farms with rotary dairies at peak milk production, 92% milked herds TAD, 6% OAD, and 2% at other milking intervals.

Table 1: Age of dairies and years since last major upgrade

	Herringbone		Rotary		All dairies*	
	Age %	Last upgrade %	Age %	Last upgrade %	Age %	Last upgrade %
< 5 years	2	41	5	38	3	40
5-9 years	4	16	7	18	5	17
10-14 years	6	12	24	23	12	16
15-19 years	6	12	14	11	9	12
20-24 years	15	11	23	5	18	9
25-29 years	9	4	10	2	10	3
30-34 years	17	3	3	1	12	2
35+ years	42	2	14	1	31	1
Mean (average) years	32	10	20	9	28	10
Median years	30	7	20	8	25	7

* Weighted to represent the proportion of herringbone and rotary dairies on NZ dairy farms.

Note: columns may not add to 100% due to rounding effects

Q How long since the last major upgrade of your dairy, such as extending buildings or replacing key equipment?

What does the average working day look like?

Milking-related tasks make up around 50% of the hours worked on-farm and set the length of the working day. Here's what the survey found about milking durations, the start and end of the working day, and the length of the working day - at peak milk production.

Early starts are standard, with around half of farms (55%) releasing cows from the paddock before 5:00 am, and 57% have first cups on before 5:30 am.

According to respondents, there is little difference in the length of the working day between farms with herringbone and rotary dairies, even though rotaries have 265 more cows on average.

OAD and TAD herds had similar morning milking durations (2h:12m vs 2h:10m) but OAD herds have first cups on nearly 40 minutes later, at around 6:00 am, and finish the working day roughly 40 minutes earlier.

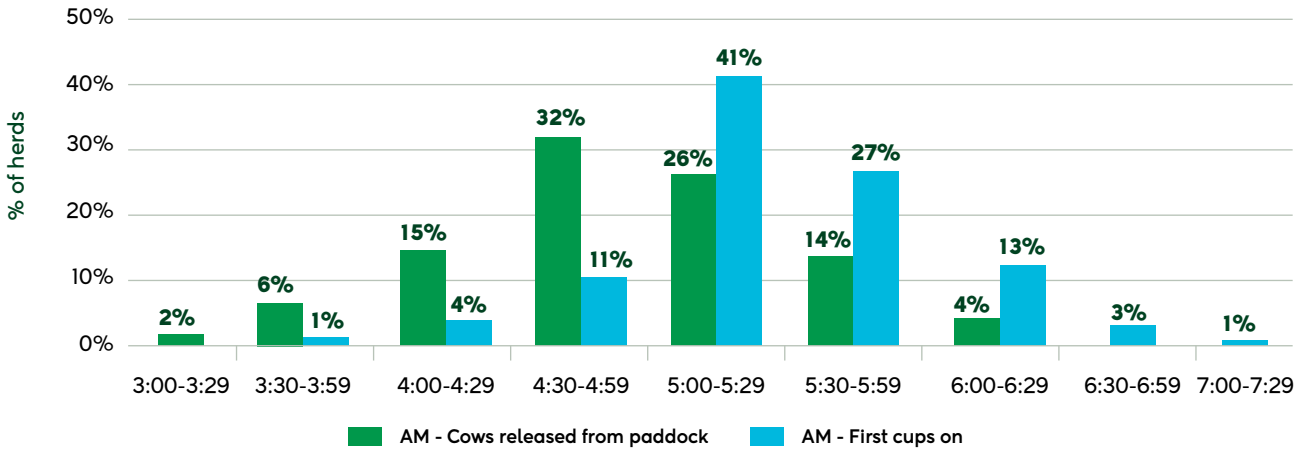
By improving milking efficiency and implementing flexible milking options (e.g. OAD, 10-in-7, 3-in-2), farms can reduce the total number of hours worked, minimise early starts, and often improve rostering options.

Table 2: Averages at peak milk production for farms surveyed.

	TAD	OAD	Herringbone	Rotary	All dairies
Herd size	440	313	338	603	427
Sets of cups	39	32	29	48	35
AM cows released from paddock	4:46	5:25	4:54	4:33	4:51
AM first cups on	5:20	5:58	5:28	5:06	5:25
AM last cups off	7:30	8:10	7:28	7:35	7:35
AM milking duration*	2h 10m	2h 12m	2h	2h 29m	2h 10m
PM first cups on	2:54		3:05	2:36	2:54
PM last cups off	4:50		4:54	4:44	4:50
PM milking duration*	1h 56m		1h 49m	2h 8m	1h 56m
PM cows returned to paddock	5:12		5:16	5:04	5:12
PM end of day (team)	5:38	4:56	5:43	5:26	5:32
Milking duration per day*	4h 6m	2h 12m	3h 49m	4h 37m	4h 6m
Length of day	12h 52m	11h 31m	12h 49m	12h 53m	12h 41m
Milking hours per week	29h 45m	16h	25h	31h 30m	27h 15m^

* Milking duration is from first cups on to last cups off only
^ includes OAD and flexible milking

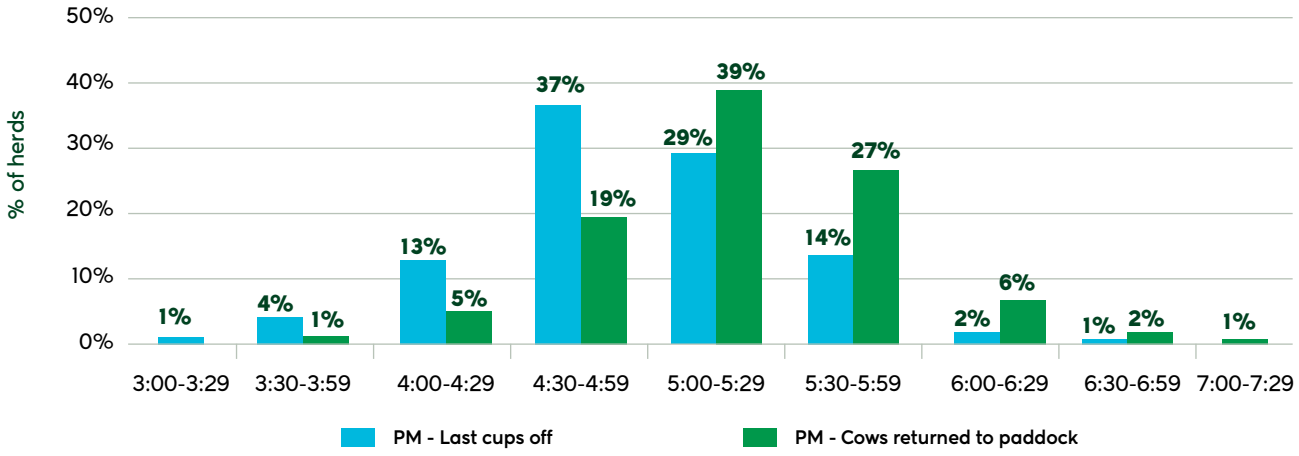
Figure 1: Morning milking start times on all farms milking TAD at peak production.



Note: totals may not add to 100% due to rounding effects

At peak of production, what is the typical start time for each milking (What time do the first cups go on)?

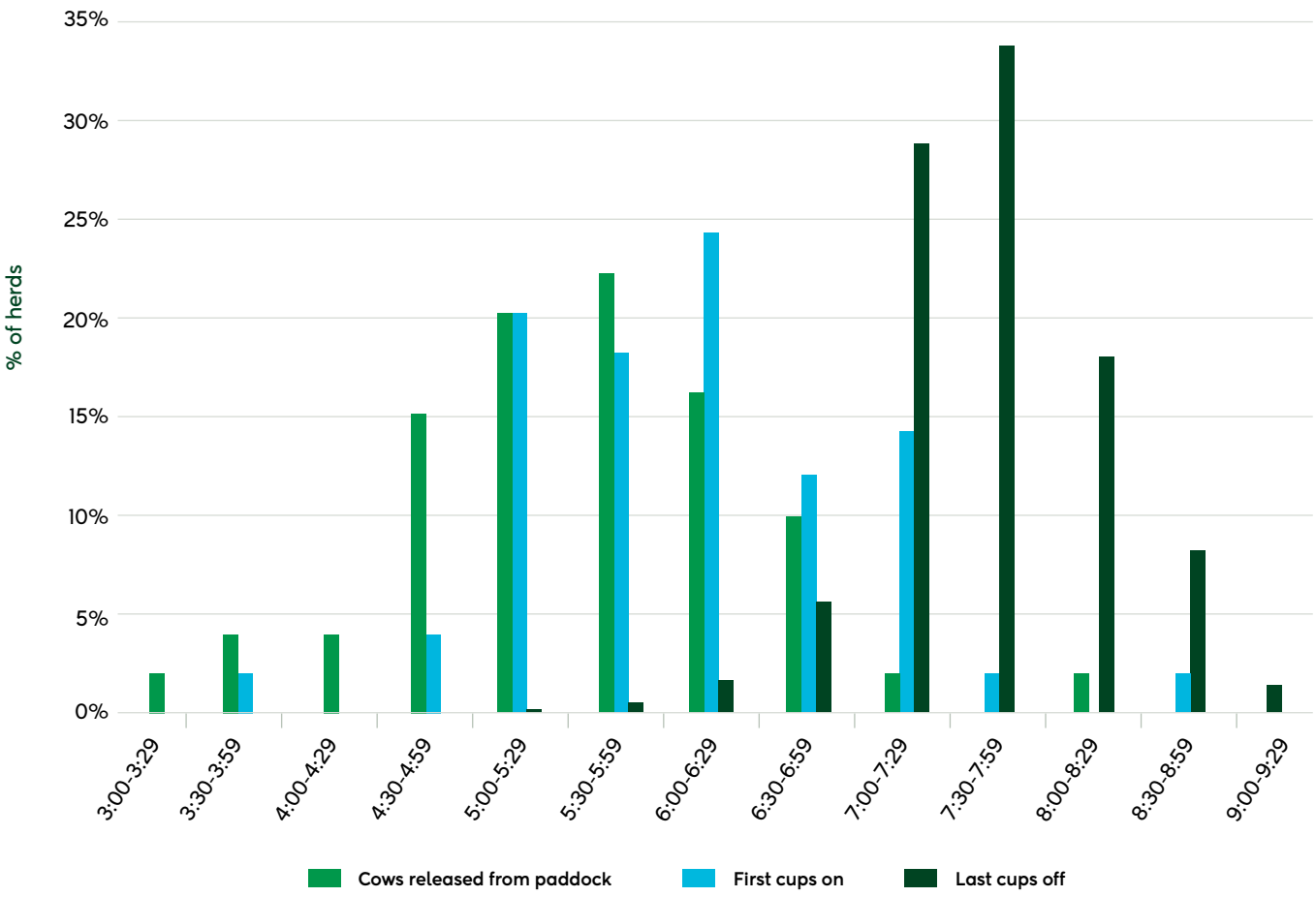
Figure 2: Afternoon milking finish times on all farms milking TAD at peak production.



Note: totals may not add to 100% due to rounding effects

At peak of production, what is the typical end time for each milking (What time do the last cups come off)?

Figure 3: Milking start and finish times for all farms milking OAD at peak production.



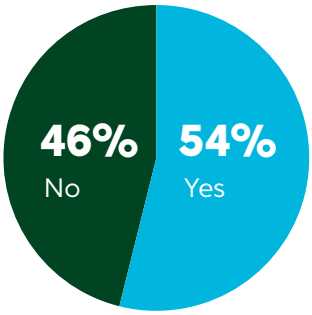
Note: timings may not add to 100% due to rounding effects

Q At peak, you said you were milking once-a-day. Typically, what time are the cows released from the paddock for the morning milking? What time do the first cups go on and the last cups come off?

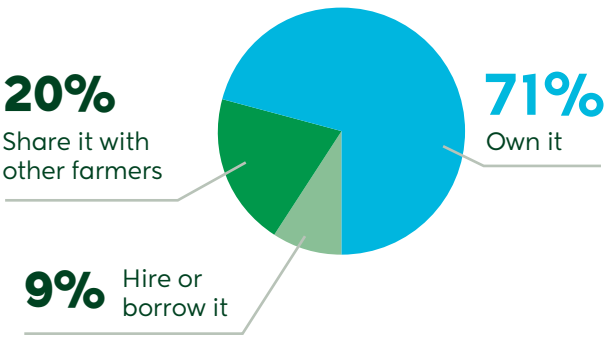
Access to back-up generator for milking

Power outages due to weather events or local incidents can be hugely disruptive, so we also asked farmers if they had access to a back-up generator to run their milking plant.

Do you have access to a back-up generator that could run your milking plant?



Of those with access



Technology at the dairy: Automation

Investing in efficiency – rotary and herringbone dairies

Since the 2018 survey, farmers have continued to invest in milking-related automation technology – particularly the options designed to make the job easier and reduce the number of people needed for milking. One-person milking is optimal for labour efficiency (cows milked per person per hour).

Rotary dairies have a significantly higher number of technologies installed than herringbone dairies, with uptake increasing by 2-3% per year in almost all types of automation since 2018.

Technologies like automatic cup removers (ACRs), automatic teat spraying, and automatic drafting in a rotary dairy can often replace a person working at the cups-off position, maximising labour efficiency.

Farmers with herringbone dairies have invested mainly in ACRs, automatic drafting and automatic yard wash systems, with investment increasing at a rate of around 2% per year.

In-shed feeding systems

In total, 44% of herringbone dairies have in-shed feeding systems, with 38% using manual systems and 6% using a computerised system that delivers the same amount of feed to each cow.

For farms with rotary dairies, a total of 68% had an in-shed feeding system. This included: 27% computerised systems capable of allocating different amounts of feed to each cow, 29% computerised systems that allocate the same amount of feed to each cow, and 12% were manual systems.

Automated cup removers (ACRs)

ACRs were much more likely to be used at rotary dairies. In fact, 88% of rotary dairies surveyed had ACRs fitted at every bail. In contrast, just 28% of herringbone dairies had ACRs at every bail, while 3% had them in some bails.

Figure 4: Adoption of automation technologies in rotary dairies from 2008 to 2023.

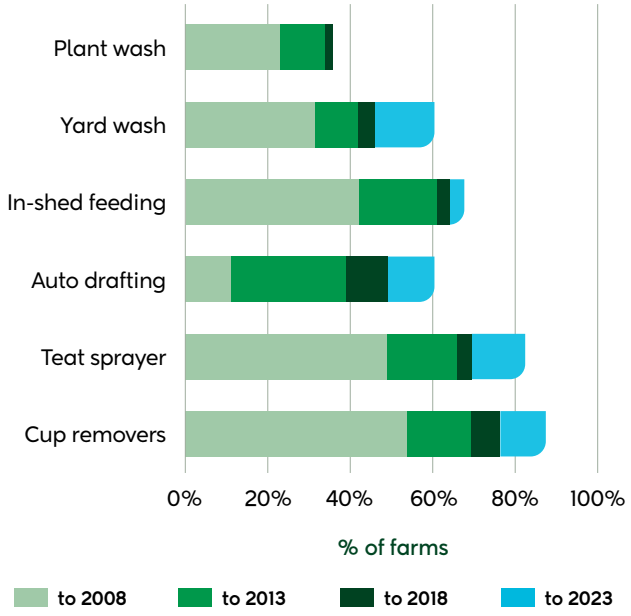


Figure 5: Adoption of automation technologies in herringbone dairies from 2008 to 2023.

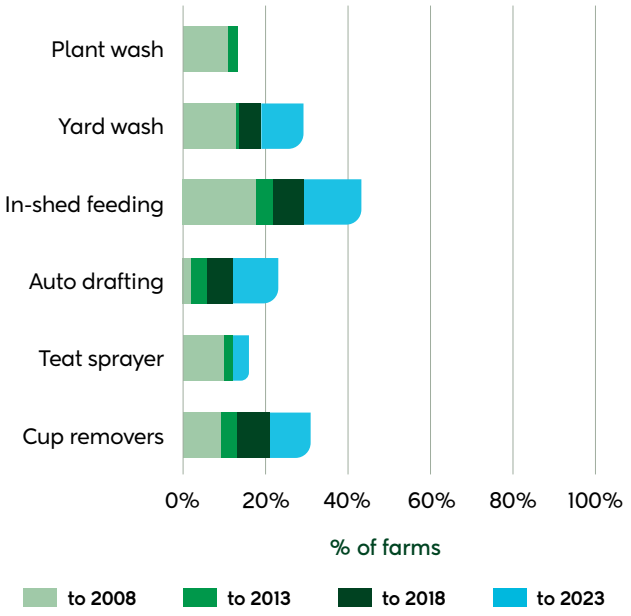
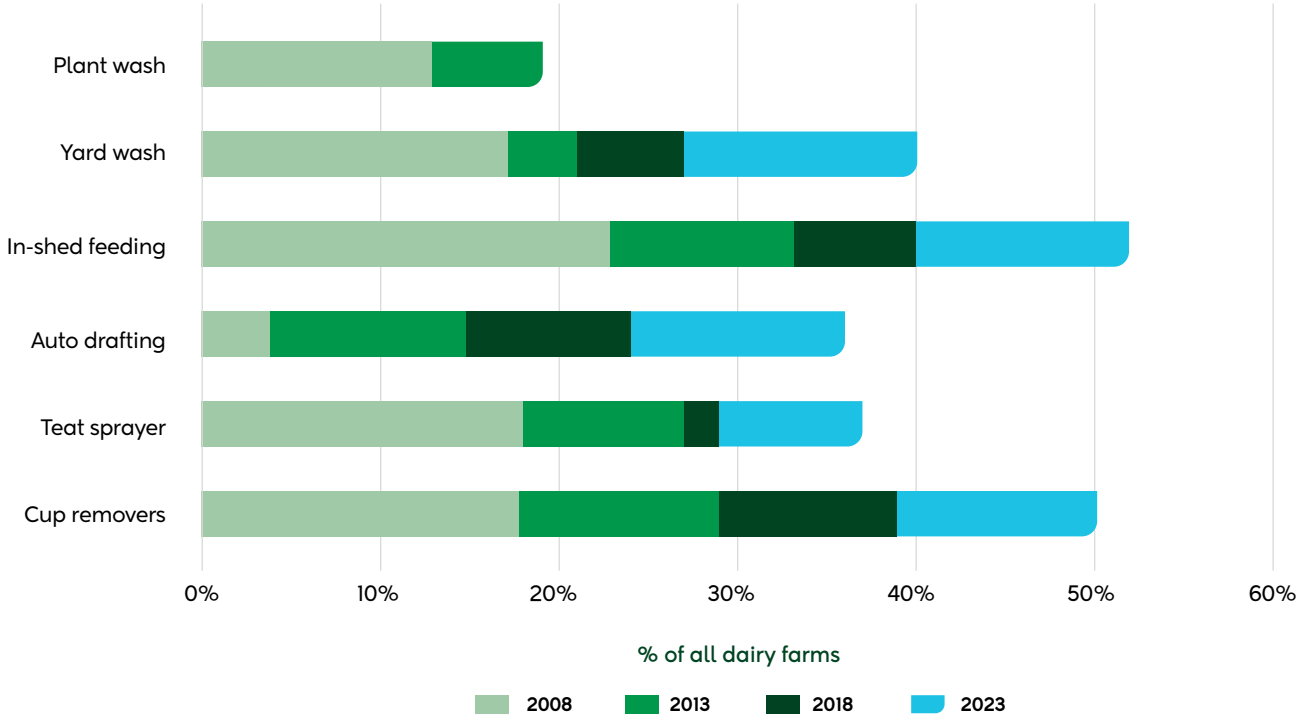


Figure 6: Total automation technologies on all farms surveyed in 2023.



Technology at the dairy: Animal monitoring technology

'Wearable' technology for cows

Cow wearables, which include sensors worn on collars, ear tags, leg tags or rumen bolus, have seen a large increase in uptake since 2018, led by large farms with rotary dairies. The technology has a range of uses, including monitoring heat and other health markers, tracking the location of cows, virtual herding and fencing.

Cow wearables are easy to implement because they're not reliant on other infrastructure. In some cases, they can integrate with other technologies – like automatic drafting. Wearables also transfer with the herd, which means they can be used by sharemilkers as well as farm owners.

Recently, more suppliers have introduced subscription payment models rather than outright purchase for wearables, which may make the technology more accessible for smaller farms.

Key statistics:

- 16% of farms reported using wearable technology, compared to just 3% in 2018.
- Collars are most popular (13%) followed by ear tags (4%).
- Most farmers were using wearables to automate heat detection, but there is interest in health monitoring and virtual herding.

Figure 7: Adoption of animal monitoring technologies in rotary dairies from 2008 to 2023.

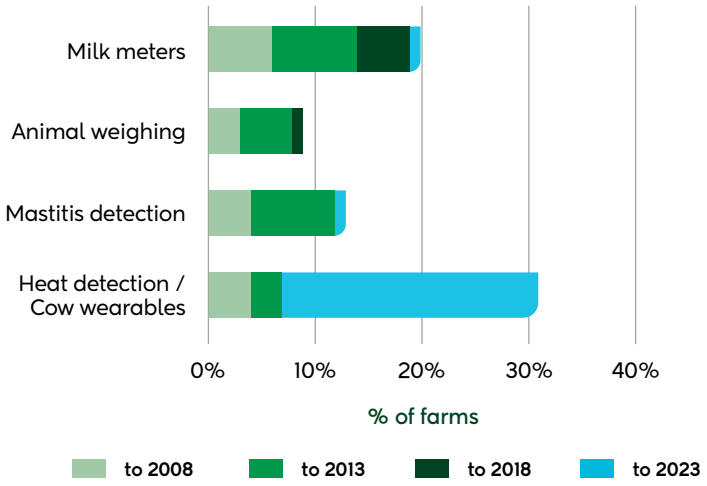


Figure 8: Adoption of animal monitoring technologies in herringbone dairies from 2008 to 2023.

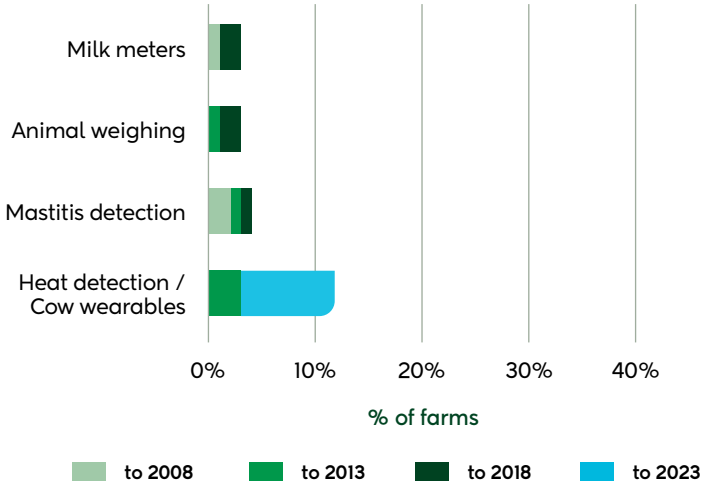


Figure 9: Total animal monitoring technologies on all farms surveyed in 2023.

* includes wearables and camera-based systems

^ there has been some reduction in these technologies, but this could reflect the margin of error in the survey

Q Do you have any of these animal monitoring technologies installed in your dairy?

Technology at the dairy: What's next?

When farmers were surveyed between February and April 2023, they were asked about their technology wishlists. If they had the means to invest in new technology, what would be at the top of the list? Their responses reflect the technologies already common on dairy farms.

Cow wearables

This technology topped the list for both herringbone and rotary operators, suggesting an increase in investment over the next 2-5 years (provided farmers have capital available to invest). The benefit? As well as the operational benefits of automating tasks like heat detection, heath monitoring and, in some cases, break fencing and herding, data from wearables can enable vets and farm consultants to provide insights on animal performance to capture more value from the data.

Automatic drafting systems

This technology, which automates the separation of individual cows after milking, saves time while also reducing risks associated with animal handling, was the second most popular on the farmer's wishlist.

Milk meters, weighing and mastitis detection systems

These technologies have a low level of adoption already, and that trend is likely to continue based on the lack of interest indicated by surveyed farmers. Why? There may be a range of farm-specific reasons, but farmers have told us that the value gained from using data from these sensor systems is often less obvious than automation technologies (e.g. auto drafting and cup removers) that save time and make tasks easier and less physical.

Figure 10: Existing and technology investment wishlist in the next 2 years on farms with rotary dairies surveyed in 2023 (when in a position to invest).

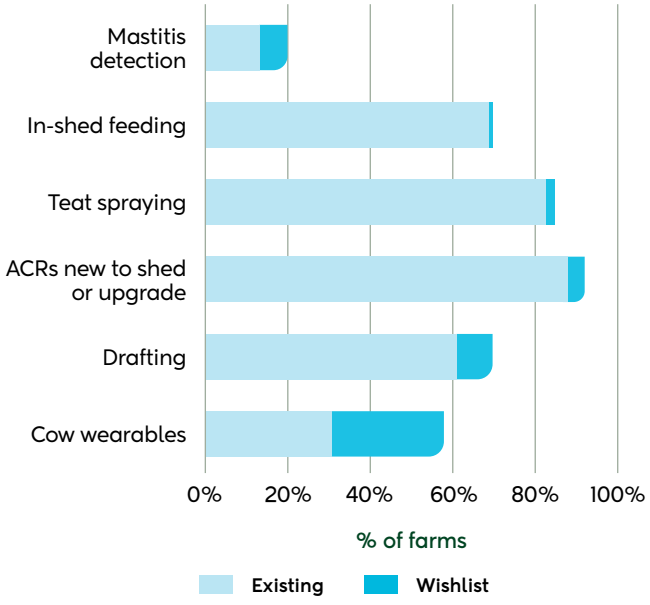
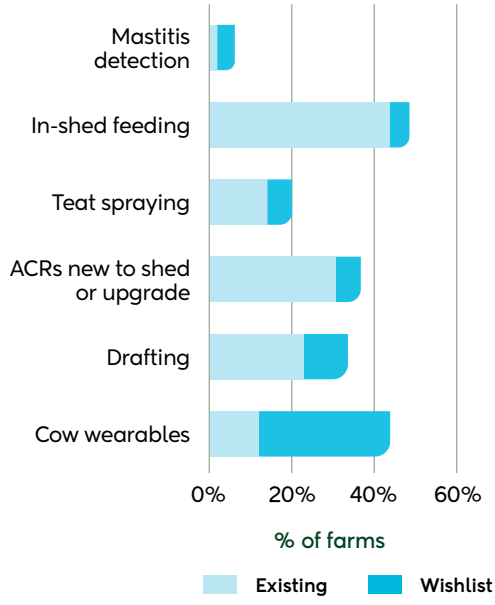


Figure 11: Existing and technology investment wishlist in the next 2 years on farms with herringbone dairies surveyed in 2023 (when in a position to invest).



Q Assuming you were in a position to do so, if you could invest in one technology in the next 2 years, what would be top of your list?

Measuring milking efficiency

Most farmers want to improve milking efficiency and reduce the amount of time spent milking. Of course, that goal must be balanced with the need for cow attention time as well as the health, safety and wellbeing of farm workers.

What does milking efficiency look like on the average farm?

These useful metrics can help farmers benchmark their performance against similar sized dairies:

- Cows milked per hour
- Cows milked per person per hour
- Litres per cluster per hour

Cows milked per hour

This result depends on the number of sets of cups in the dairy and the efficiency of milking routines.

Here, it is calculated as the number of cows milked at peak production, divided by the average number of hours spent on the AM and PM milkings. Hours represent the time between first cups on and last cups off at each milking (figures 12 & 13).

Figure 12: Cows milked per hour in rotary dairies.

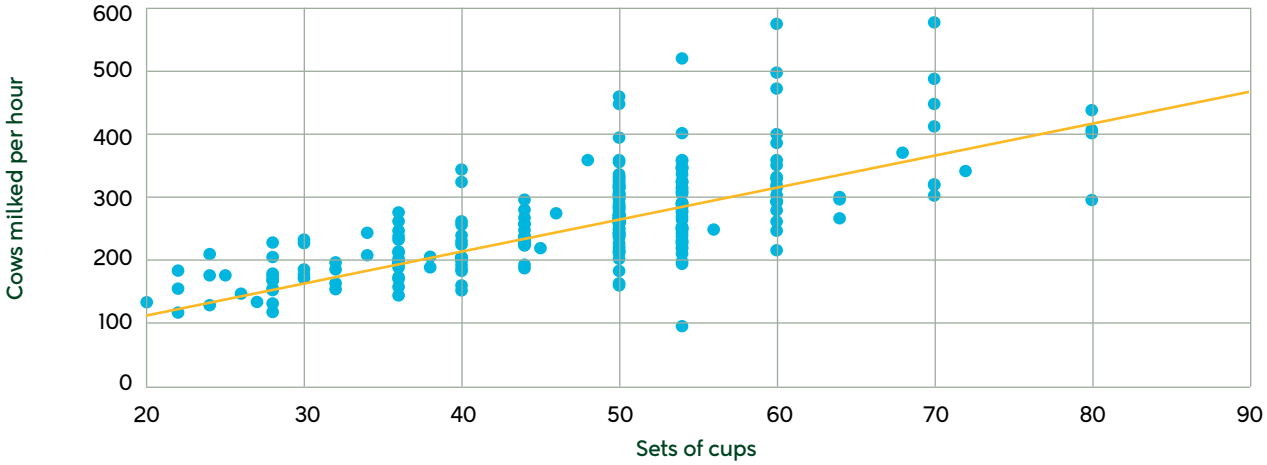
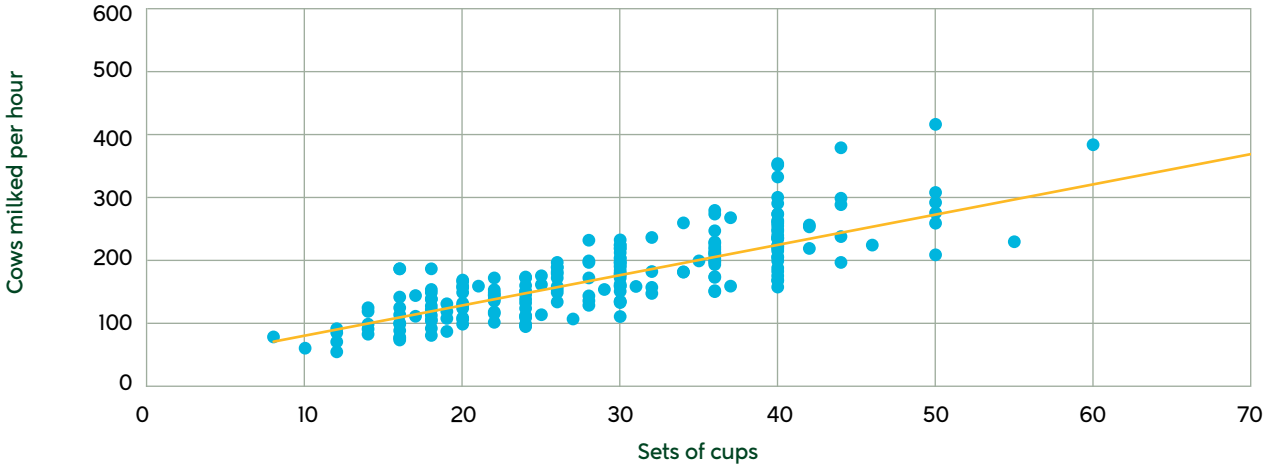


Figure 13: Cows milked per hour in herringbone dairies.



In the 2023 survey data, there are large variations in this metric, even between dairies with the same number of sets of cups. This shows that milking routines can have a real impact on efficiency, and represents an opportunity to reduce the hours spent milking on many farms.

Cows milked per person per hour

This metric is also influenced by the number of cups and number of people required in the dairy.

It's calculated as the number of cows milked per hour, divided by the number of people required in the dairy during milking. To reduce the total work hours required to milk the herd, a dairy with one person milking is optimal (figures 14 & 15).

Figure 14: Cows milked per person per hour in rotary dairies.

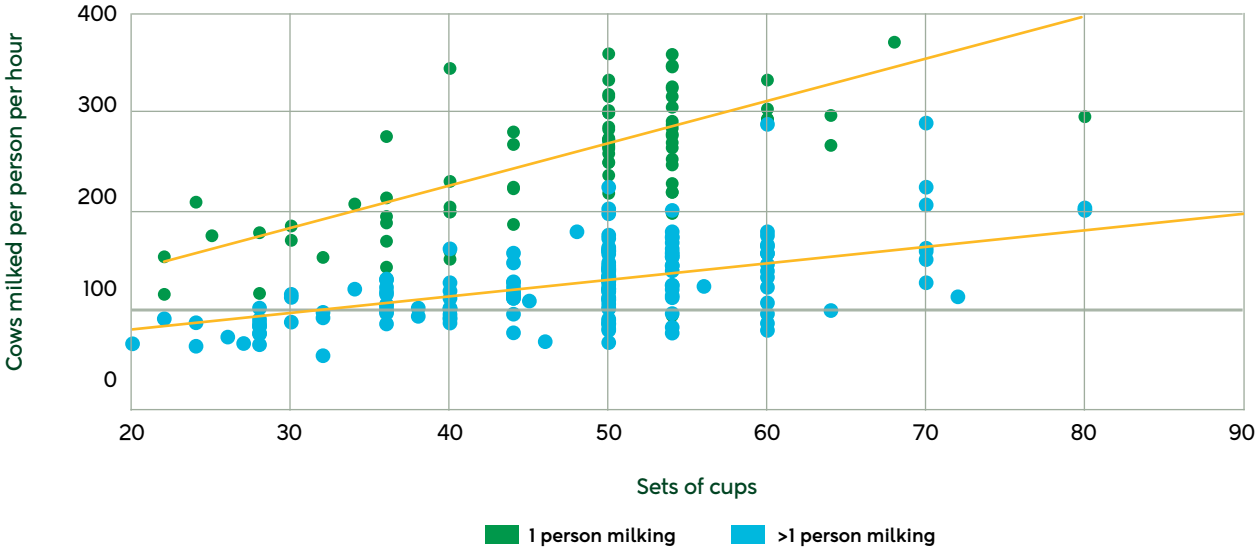
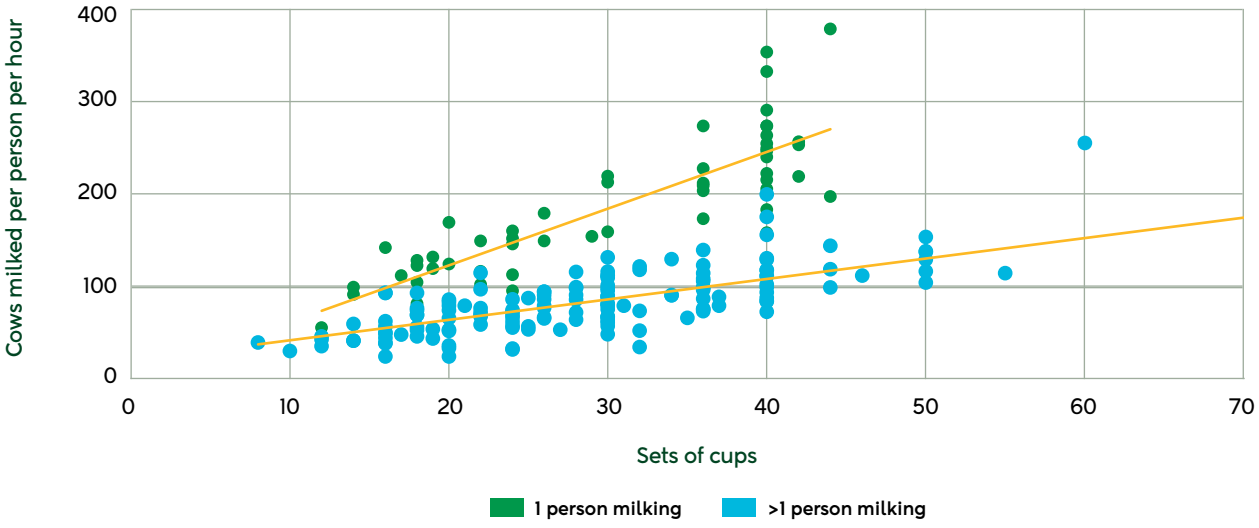


Figure 15: Cows milked per person per hour in herringbone dairies.



Litres per cluster per hour

This metric is a key indicator of milking routine efficiency. It's calculated as the total litres of milk produced per day at peak, divided by the total milking hours per day, divided by the number of clusters (sets of cups) in the dairy.

Figure 16: Milking efficiency (litres per cluster per hour) in rotary dairies.

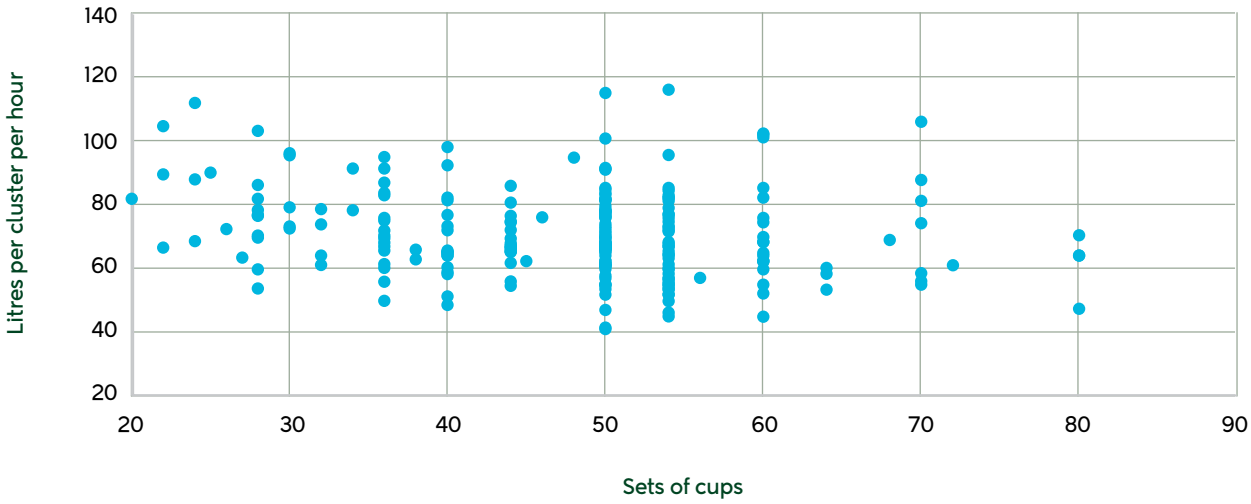
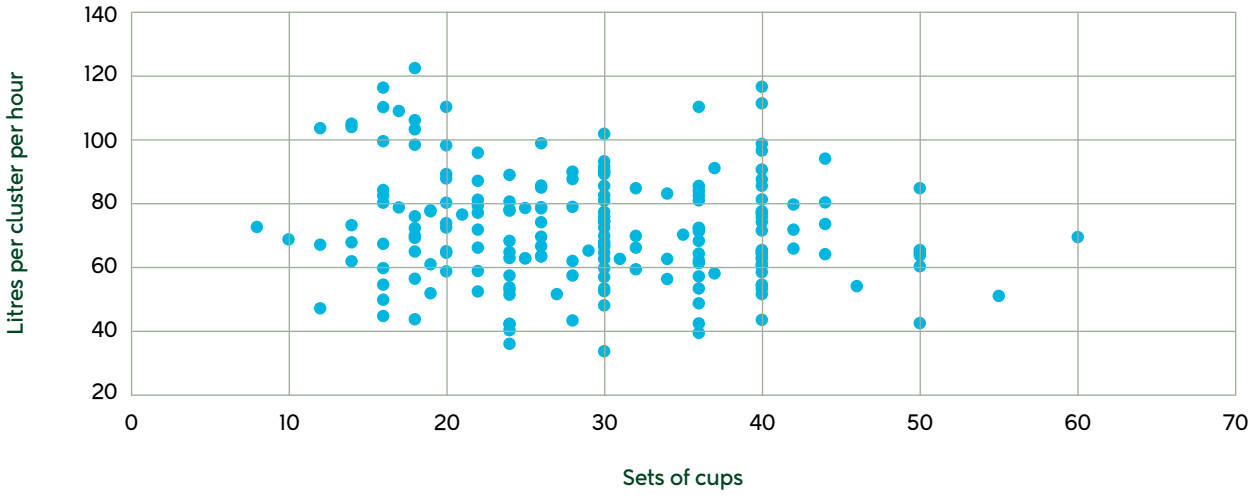


Figure 17: Milking efficiency (litres per cluster per hour) in herringbone dairies.



Key takeaways

Three factors that drive milking efficiency:

- More sets of cups = more cows milked per hour
- Fewer people milking = more cows milked per person per hour
- Good milking routines = higher litres per cluster per hour

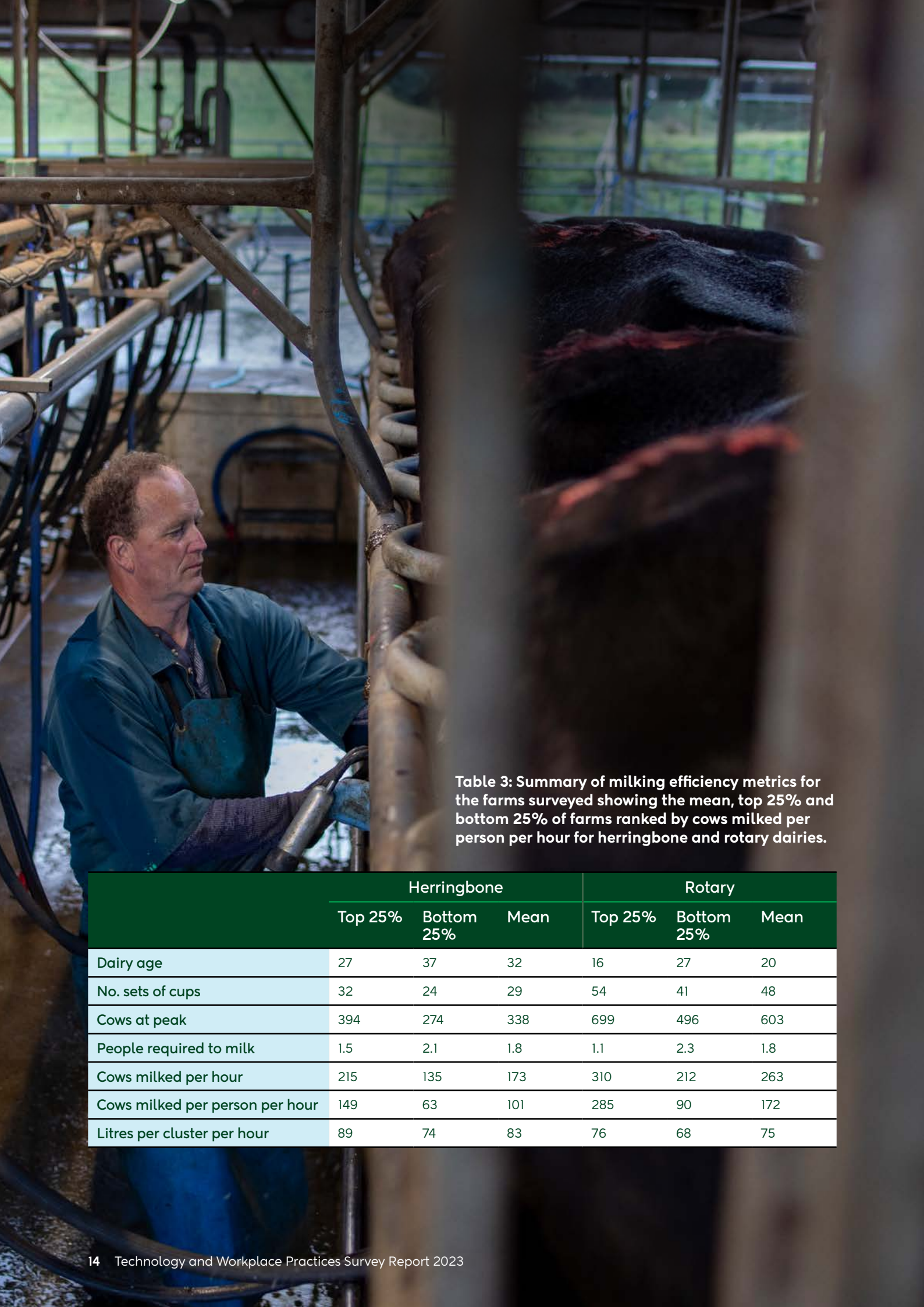


Table 3: Summary of milking efficiency metrics for the farms surveyed showing the mean, top 25% and bottom 25% of farms ranked by cows milked per person per hour for herringbone and rotary dairies.

	Herringbone			Rotary		
	Top 25%	Bottom 25%	Mean	Top 25%	Bottom 25%	Mean
Dairy age	27	37	32	16	27	20
No. sets of cups	32	24	29	54	41	48
Cows at peak	394	274	338	699	496	603
People required to milk	1.5	2.1	1.8	1.1	2.3	1.8
Cows milked per hour	215	135	173	310	212	263
Cows milked per person per hour	149	63	101	285	90	172
Litres per cluster per hour	89	74	83	76	68	75

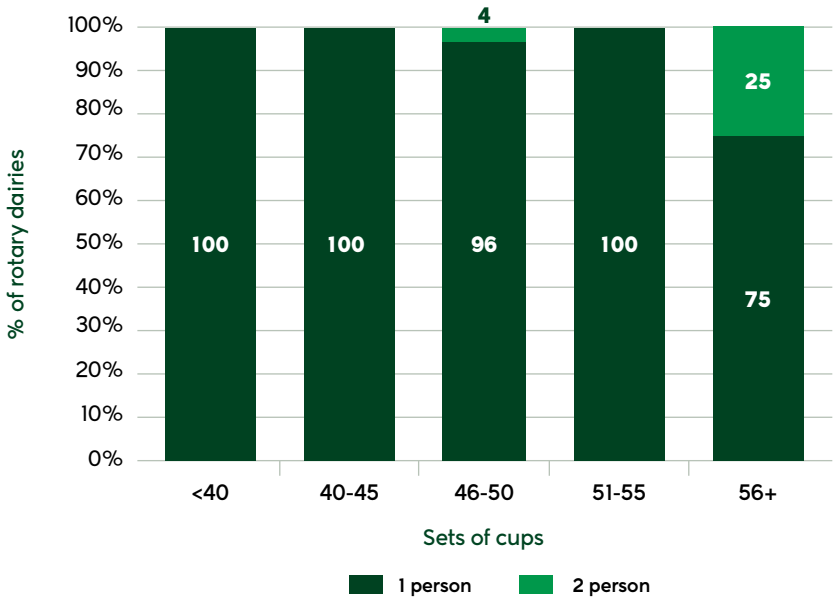
Using technology to boost milking efficiency

Rotary dairies

Most rotary dairies have three labour-saving systems in place – ACRs, automated teat spraying and automated drafting – to reduce the number of people needed for milking. These automation technologies can eliminate the need for a person working at cups-off, boosting milking efficiency overall.

The most labour-efficient rotary dairies, in terms of cows milked per hour, have only one person in the dairy. It is only in the larger rotary dairies (>55 sets of cups) where around a quarter of the dairies used a second person at milking (figure 18).

Figure 18: People required to milk in rotary dairies (in the top 25% labour efficient sheds).

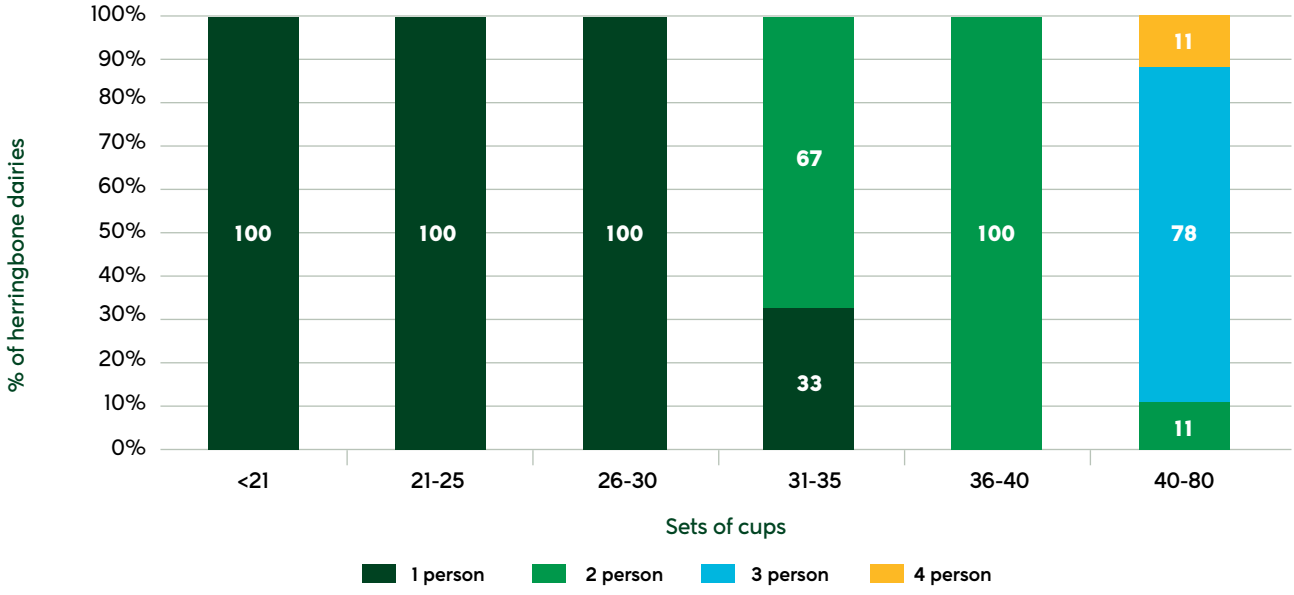


Herringbone dairies

In herringbone dairies, labour efficiency is slightly more complicated. While these dairies can be highly labour efficient (cows milked per person per hour) when there is one person milking, there is a limit to the number of sets of cups one person can comfortably manage – typically up to 30 sets (figure 19).

ACRs, automated teat spraying and automated drafting in herringbone dairies can make milking easier and less stressful, particularly in terms of keeping up and not overmilking cows. However, according to survey results, there's little difference in milking efficiency (cows milked per hour) between dairies with and without these technologies.

Figure 19: People required to milk in herringbone dairies (in the top 25% labour efficient sheds).

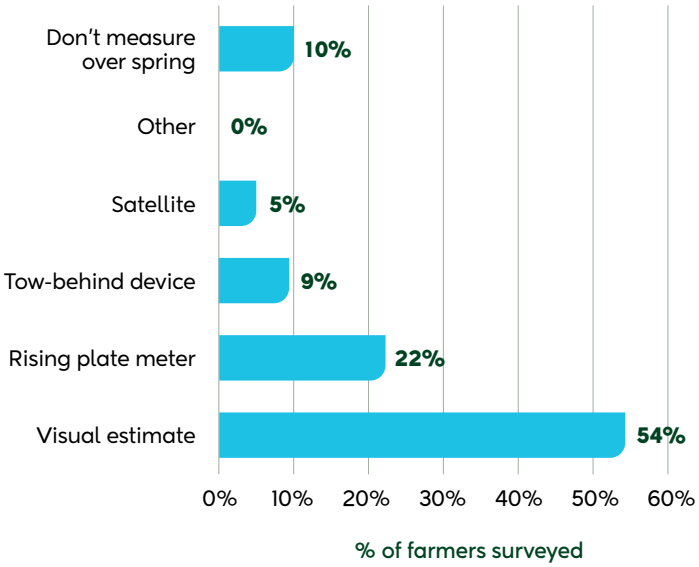


Pasture monitoring technology

Methods for measuring pasture cover

While technology is available for jobs outside the milking shed – like assessing pasture covers – most farms were still relying on manual methods. Over half the farmers surveyed used visual estimation to assess pasture growth in spring, with just 22% using rising plate meters (RPM) as the main method to assess pasture cover.

Figure 20: Method of measuring pasture cover.



Q Thinking about pasture measurement, how do you mainly assess pasture cover?

Frequency of measuring pasture cover

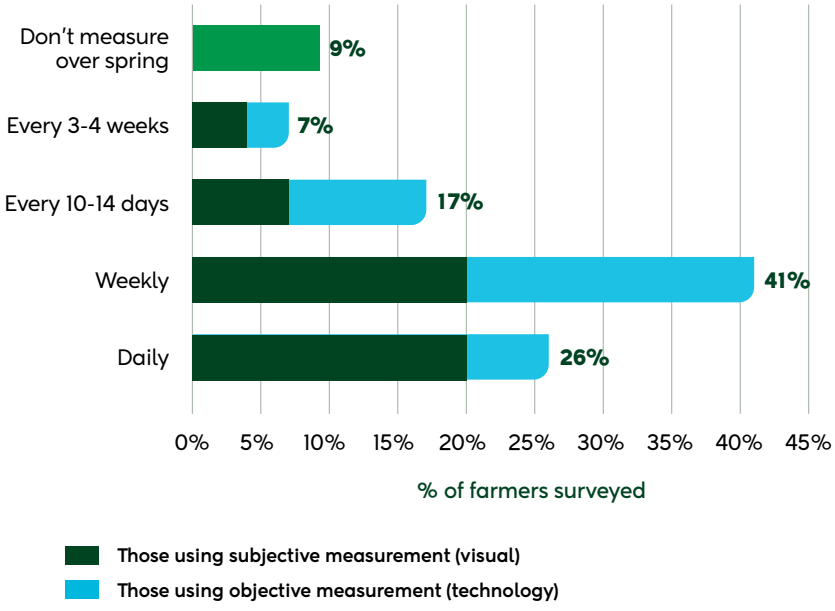
There was wide variation in the frequency of pasture measurement on farms.

More than half (58%) of farmers were measuring the cover across the farm weekly or every 10-14 days over spring. Farmers who said that they were measuring daily were likely to be focusing on a smaller area of the farm. Farmers who use subjective methods (visual estimation), tend to measure daily or weekly. Those using more objective methods (RPM, tow behind, satellite) were more likely to be measuring less often, with weekly or fortnightly measurements.

A lot of farmers use more than one method to assess pasture covers – for example, estimating by eye, then following up with an RPM. Because the survey format asked for the method used most, farmers tended to use the least technical method, e.g. 'eye-o-meter'.

Some farmers commented that they had more trust in their own estimations, and noted that technical solutions can fail or mismeasure. Commercially available satellite-based pasture measurement technology was emerging at the time of the 2018 survey. It was estimated that farmers would readily adopt this time-saving method, however the low adoption level in 2023 indicates that farmers have yet to gain confidence in the value of this technology and data.

Figure 21: Frequency of measuring pasture cover over the farm.



Q Approximately how regularly do you measure pasture covers across the whole farm over spring?

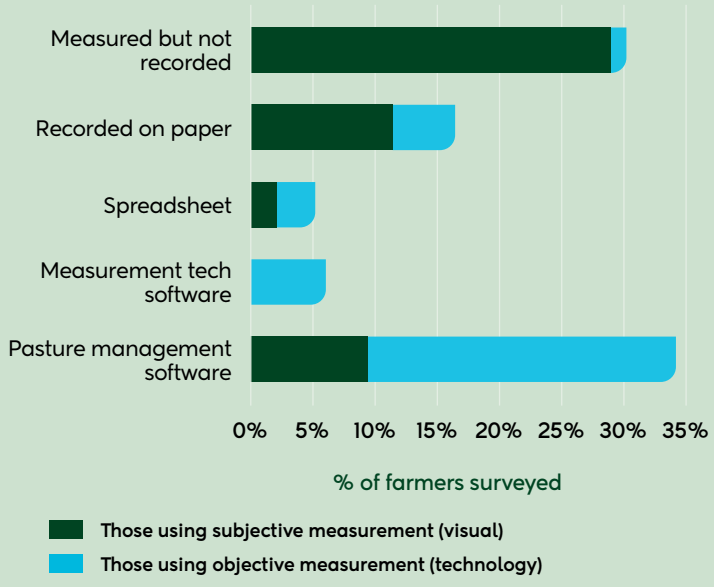
Recording and use of pasture data

The advantage of objective measurement is that data are readily recorded into management systems to support decision making.

Survey results showed that 45% of farmers use some form of software to record and analyse pasture data. Some farmers commented that they recorded their pasture data using a diary, whiteboard or yellow notebook, often supplied by their fertiliser or dairy company. Physical notes may make it more difficult for farmers to get an accurate sense of round length, annual paddock performance and pasture harvested, making it hard to look at change over time.

Only 18% of farmers were recording which paddocks were grazed, using a computer or App.

Figure 22: Method of recording pasture cover.



Q How are the pasture measurements recorded?

Brian Dela Rue
Research Engineer

Brian enjoys working alongside farmers and technology developers to better understand farmer needs and opportunities to improve workforce productivity and workplace design. Providing information to support farmers in making investment decisions in technologies that will add value to their farm business and work well for their farm teams is a key part of his role.

Dr Callum Eastwood
Senior Scientist

A social scientist, Callum leads projects in workplace design, workplace productivity, reducing dairy sprains and strains, and technology adoption. He specialises in technology adoption and integration using innovative and practical solutions on farm. Callum works closely with farmers and enjoys using co-design approaches to bring different perspectives to solving farming challenges, this includes having farmers and other stakeholders in the room together. For Callum, it's not just about creating science solutions, but ensuring they work for farmers.

DairyNZ

Progressing a positive future for New Zealand dairy farming

DairyNZ is the industry organisation that represents all New Zealand dairy farmers.

We support farmers by investing in research, resource development, extension and advocacy to ensure they can continue to lead the world in sustainable dairy farming.

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