InCalf Fertility Data Project 2011

Report for participating farms

Summary of findings

The records from 74 herds have provided an indication of current reproductive performance, factors that influence fertility, and trends in fertility between 2000 and 2009.

In 2009, the study herds had a typical:

- 6-week in-calf rate of 50%;
- 12-week not-in-calf rate of 31%;
- 3-week submission rate of 72%;
- first service conception rate of 38%.

The fertility of the study herds varied widely.

Better fertility was strongly associated with:

- higher milk protein concentration;
- ABVs for daughter fertility;
- middle-aged cows (4 -7 years);
- longer times from calving to mating start date.

Cows with very high and very low milk production were more likely to have lower reproductive performance. Herds with higher average 305-day milk solids per cow had slightly lower 6-week in-calf rates, higher submission rates and lower conception rates. Holstein-Friesians had lower 6-week in-calf rates compared to Jerseys and Holstein-Jersey crosses. However, good reproductive performance was achieved by some high-producing Holstein-Friesian cows and a high-producing Holstein-Friesian herd.

From 2000 to 2009, the reproductive performance of the study herds declined. No single factor that was looked at could explain the general decline in fertility. However, some of the decline was explained by a combination of factors. While some differences in breed performance were observed, the rate of decline over time was similar for Holstein-Friesians, Jerseys and cross breeds.

Introduction

There have been significant changes in the Australian dairy industry over the last 10 years. Farms are generally larger with higher per cow milk production, staff issues have become more challenging as farms get bigger, and grain and milk prices have fluctuated widely. Serious drought has also been endured in many dairy regions during this time. It is likely that dairy herd reproductive performance has also changed over this time.

The InCalf Fertility Data Project 2011 was initiated to find out if herd reproductive performance has changed, how much it has changed, and to explore some possible herd and cow factors involved. Records from 74 herds were used, covering almost 180,000 lactations from 1997 to 2010. Access to such a large pool of complete fertility records for Australian herds has been difficult until now; records for the same herds over a number of years have been particularly difficult to obtain. This investigation of Australian dairy herds is the largest of its kind thanks to the farmers, vet practices and ADHIS who supplied records. The study's results have provided extremely useful information about current fertility performance and trends, and are informing further investigations to help Australian dairy farmers achieve better herd fertility.

The herds used in the study were from Victoria and Tasmania, were seasonal or split calving, had complete records, and had used whole herd pregnancy testing within 17 weeks after mating start date. Herds with these data for multiple years were preferred. Most study herds were selected from veterinary practice clients. Thus, despite the size of the data set, it is possible that the findings do not apply to other types of dairy herds, including some Australian year-round calving herds.

Current reproductive performance

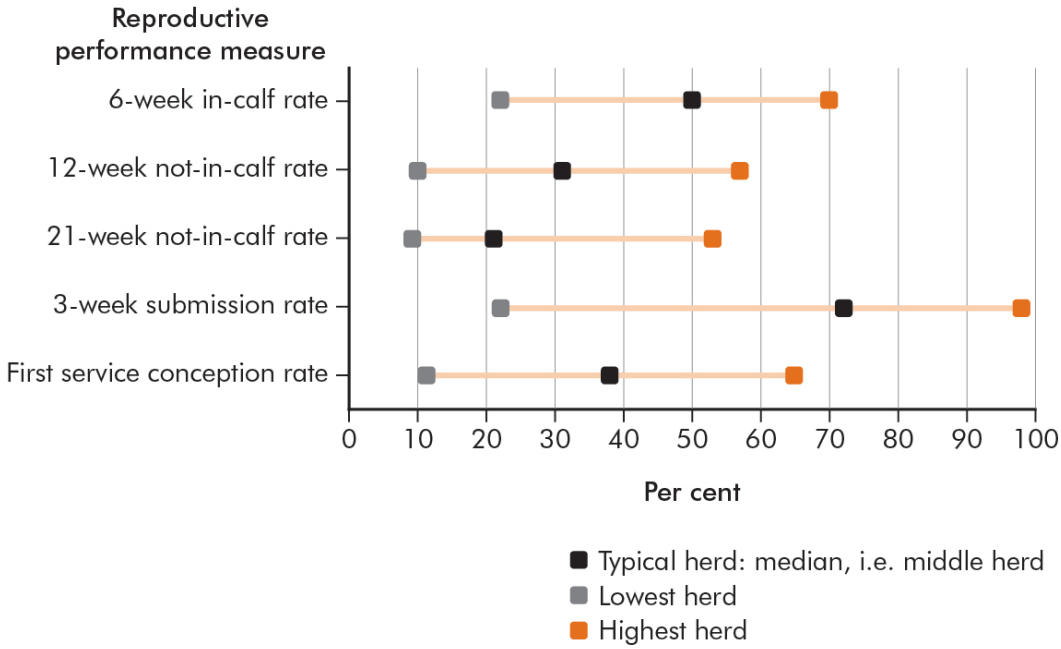
In 2009, the typical 6-week in-calf rate was 50%, 12-week not-in-calf rate was 31%, 3-week submission rate was 72% and first service conception rate was 38%. However, for all reproductive measures, there were large differences between mating periods and herds. For example, 6-week in-calf rate varied from as low as 22% to as high as 70%. This indicates that it was possible to get a lot of cows in calf quite soon after mating start date under appropriate herd management.

These results are summarised in the table and graph below.

Table 1: Measures of reproductive performance in 2009

Measure	Lowest herd	Typical herd	Highest herd
6-week in-calf rate	22%	50%	70%
12-week not-in-calf rate	10%	31%	57%
21-week not-in-calf rate	9%	21%	53%
3-week submission rate	22%	72%	98%
First service conception rate	11%	38%	65%

Graph 1: Measures of reproductive performance in 2009.



Definitions of the measures of reproductive performance

6-week in-calf rate
The percentage of cows that became pregnant in the first 6 weeks of the mating period.

12-week not-in-calf rate
The percentage of cows that were not pregnant 12 weeks after the start of the mating period. The 12-week not-in-calf rate is a more timely measure than the 21-week not-in-calf rate. It can be used to compare not-in-calf rates for short or long mating periods as seen in split and seasonal calving herds.

21-week not-in-calf rate
The percentage of cows that were not pregnant 21 weeks after the start of the mating period.

3-week submission rate
The percentage of cows submitted for mating at least once in the first 3 weeks of mating.

First service conception rate
The percentage of cows that became pregnant from their first insemination as determined by pregnancy testing.

Typical herd
The median i.e. the middle value – half the herds are below this value and half are above.

The typical 6-week in-calf rate, 3-week submission rate and first service conception rate were higher for seasonal than split calving herds, in the first mating period after calving. Not-in-calf rates were higher for the first mating period in split calving herds. This is partly because mating periods in split calving herds were generally shorter. The typical not-in-calf rate at the end of two mating periods for carry over cows was 8%, but this varied substantially between herds; the highest not-in-calf rate after two mating periods was 27%. The typical 6-week in-calf rate for the second mating period for carry-over cows was quite high (55%) but this varied from 15% to 86%. These results could have been biased. The true results may be worse if empty cows were culled before receiving pregnancy test results.

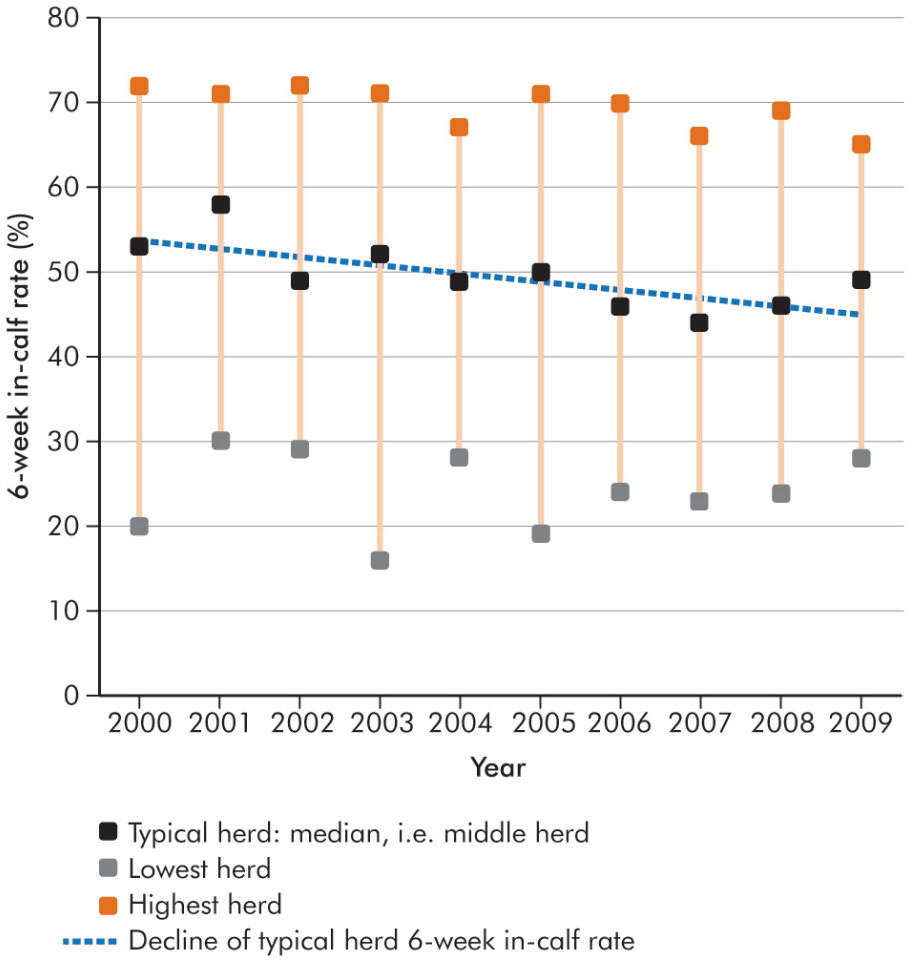
Changes in reproductive performance from 2000 to 2009

Of the 74 study herds, 30 had suitable data from 2000 to allow us to look at how reproductive performance has changed over the 10 years from 2000 to 2009.

For this group of herds, the typical 6-week in-calf rate decreased by 1% per year (see Graph 2), submission rates declined by 0.6% per year and conception rates declined by 0.7% per year from 2000 to 2009. However, these declines did not occur in all herds; some herds maintained about the same performance over the entire period. This means that despite the general decline in 6-week in-calf rates, it was still possible for some herds to maintain or improve performance.

Importantly, there were large differences between herds in each year (see the vertical bars in Graph 2). In fact, the spread between herds in any particular year was far greater than the decline over this 10-year period. Similar patterns were seen for 12-week and 21-week not-in-calf rates, 3-week submission rates and first service conception rates. Performance declined in some herds but stayed the same in others.

Graph 2: Measure of 6-week in-calf rates from 2000 to 2009. The vertical lines show the spread between the lowest and highest herd in each year. The blue, dashed line shows the decline of the typical herd 6-week in-calf rate.



Factors affecting fertility

A number of factors were investigated to assess their influence on fertility.

Production

Very low (305-day milk solids < 300 kg) and high producing (305-day milk solids > 700 kg) cows had reduced reproductive performance. If milk volume, fat, protein or solids yields were very low or very high, 6-week in-calf rates were lower and not-in-calf rates were higher.

However, three-quarters of the cows in the study herds had milk yields within the optimal range for reproductive performance.

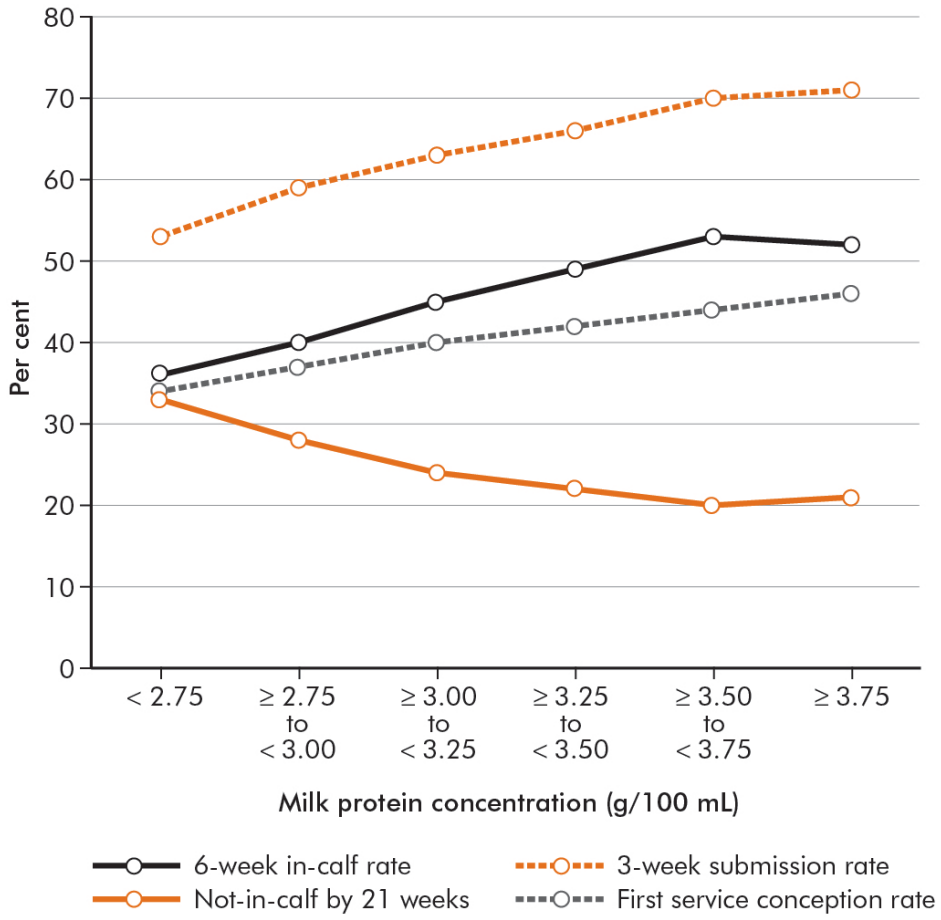
Herds with higher average 305-day milk solids per cow had slightly lower 6-week in-calf rates, higher submission rates and lower conception rates. However, some high-producing herds achieved good reproductive performance. For example, a 480-cow herd from East Gippsland with a herd average of 665 kg milk solids per cow had a 6-week in-calf rate of 64% in 2009.

Milk fat concentration was not related to in-calf rates but higher milk protein concentrations were associated with markedly improved 6-week in-calf rates, 3-week submission rates and first

insemination conception rates as well as lower not-in-calf rates. The association between milk protein concentrations and 6-week in-calf rates was seen at all levels of milk production but it was weaker at higher milk volumes.

Other work has shown that this milk protein concentration relationship is partly genetic and partly environmental, probably including nutritional factors. Further investigation is required to understand the mechanisms for this.

Graph 3: Relationship between milk protein concentration and measures of reproductive performance.



Rates are adjusted for source of data, herd (random effect), year, age at calving and calving to first service, Holstein-Friesian cows only

Age

Middle-aged cows (4-7 years) had better reproductive performance than young (2 and 3 year-olds) or old cows (> 7 years). This was partly because younger cows had lower 3-week submission rates and older cows had lower conception rates.

Calving pattern

All reproductive performance measures declined with later calving dates. Even cows calving 3 weeks after the herd's start of calving date had worse fertility than earlier calved cows. Cows calving 6 or more weeks after the herd's start of calving date had far worse fertility.

Much of the variation in herd performance could be explained by the differences in calving to mating start date intervals between herds. Having cows calve early to give them more time before the start of mating, should be a key area of focus on most farms.

Breed

Holstein-Friesians had lower 6-week in-calf rates but similar not-in-calf rates to Jerseys and lower reproductive performance than Holstein-Jersey first crosses and back crosses. Jerseys had lower 6-week in-calf rates than some crosses but similar rates to others. Milk protein concentration explained the lower 6-week in-calf rates of Holstein-Friesians compared with Jerseys but did not explain the better performance of the cross breeds.

The range of reproductive performance within each breed was very large - it was much greater than the differences between the breeds.

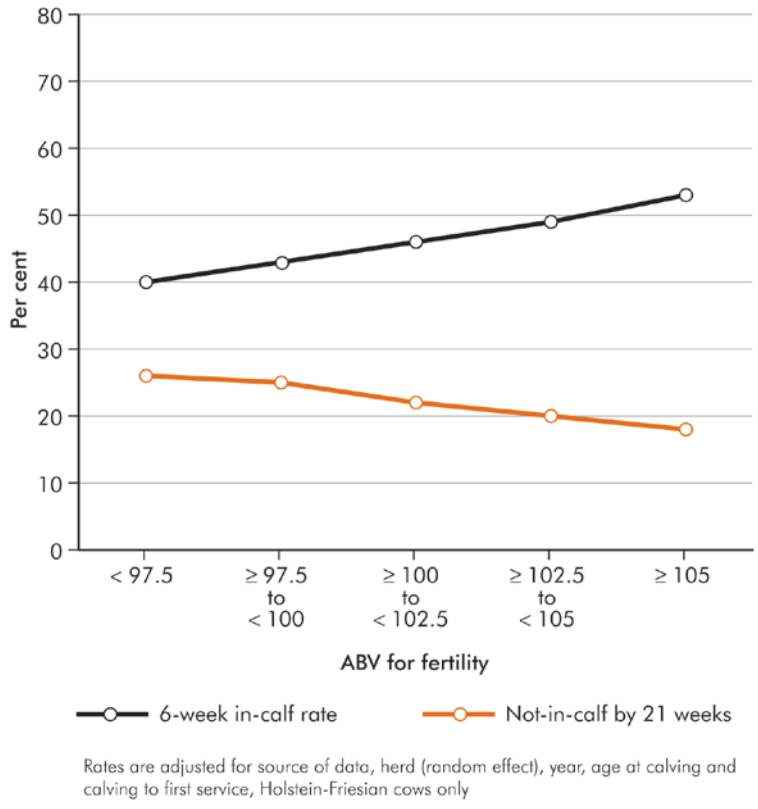
Fertility is just one aspect, amongst other important aspects of various breed options, to consider when determining whether to commence a cross-breeding program or change breeds.

ABVs

Cows with higher ABVs for daughter fertility had much better reproductive performance and cows with high ABVs for fat and protein yield had slightly worse reproductive performance. This demonstrates clearly the importance of having and using ABVs for fertility (in breeding indices or as a breeding objective).

Herds with higher average ABVs for daughter fertility also had significantly better reproductive performance.

Graph 4: Relationship between ABV for daughter fertility and measures of reproductive performance



Herd size

Reproductive performance was similar across the range of sizes of the study herds. The largest herd in the study had 1074 cows; most herds studied had between 180 and 600 cows.

Factors explaining fertility decline

The general decline in reproductive performance from 2000 to 2009 was partly due to reductions in submission rates and first service conception rates.

Rates of decline in reproductive performance were generally similar in Holstein-Friesians, Jerseys and Jersey-Holstein crosses.

No single factor that was assessed explained the general decline in in-calf rates and increases in not-in-calf rates over the 10 years.

The decline in fertility could not be explained solely by:

- calving spread;
- cow age;
- 120-day milk volume, fat or protein;
- milk fat concentration;
- milk protein concentration;
- breed;
- ABVs;
- heat detection efficiency as indicated by 3-week submission rate of early calved mature cows;
- replacement heifer management as indicated by percentage of 2-year-old cows calved within the first 3 and 6 weeks, and 2-year-old and 3-year-old to mature cow ratio of average 120-day milk volume; or
- herd size.

Combinations of these factors did explain some of the decline.

Improving fertility on farm

The findings of this study indicate that management practices to improve herd fertility should focus on:

- Having sufficient heifers to replace older and less fertile cows.
- Using *The Good Bulls Guide* to choose bulls with higher ABVs for daughter fertility.
- Calving as many cows and heifers in the first 6 weeks of the calving period. Ways of doing this include joining well grown heifers early, buying early calving cows, maximising submission and conception rates, and making sure any induction is well managed.
- Nutritional strategies that increase fertility and milk protein concentrations.

Regardless of farming system, fertility can be improved on most farms by following InCalf's recommendations for heat detection, AI, bull management, heifer rearing, calving pattern, nutrition and cow health. For more information go to Dairy Australia's website www.dairyaustralia.com.au/Animals-feed-and-environment/Fertility

What InCalf is doing to help

InCalf plans to look into areas that require more research such as:

- exploring other factors that could affect fertility that weren't looked at in this study;
- more detailed examination of high-producing herds to unpick what the herds with good fertility are doing well;
- exploring the interactions between milk protein concentration, nutrition, genetics and other potential factors.

InCalf will continue working with the ADHIS to collect reliable fertility data. This data will assist farmers when making choices that affect their farm breeding and fertility goals. It will also allow the industry to track fertility trends.

InCalf will keep farmers and advisers informed of the key findings from this data report and any new information that comes from further research.

InCalf will develop extension messages to help high producing and large herds manage their fertility.

InCalf will also continue working with dairy advisers to make sure they are able to assist farmers with improving herd fertility. Because getting nutrition right around calving and mating improves fertility, Dairy Australia's InCalf and Grains2Milk programs are running transition cow workshops for advisers and farmers to help them implement effective transition programs.