Final Project Summary

P2g: Heifers Early Calving

May 2026

This project investigated the effects of age at first calving on dairy cow production, health, reproduction and survival.

The findings give farmers greater confidence that earlier joining of well-grown heifers can improve farm efficiency and lifetime productivity while maintaining animal performance.

Unlocking the potential of cows

Dairy UP's P2 project aimed to unlock the potential of dairy cows to achieve their genetic potential under NSW conditions.

P2 was a suite of seven projects that collectively explored ways to profitably increase both productivity and wellbeing in commercial settings.

P2a: Cattle Longevity
P2b: Early Alerts
P2c: Milk as a Diagnostic Tool
P2d: Diet and Heat Load
P2e: Calf Husbandry
P2f: Infectious Diseases ('Infectome')
P2g: Heifers Early Calving

This document provides an update on P2g: Heifers early calving.

Age of first calving

The age that dairy heifers calve for the first time affects their health, welfare and lifetime productivity along with the economics of the dairy farm business. Australian dairy farmers with seasonal/split calving systems generally aim to calve their cows at about 24 months of age. In some Australian dairy herds, the average age of first calving is closer to 36. The main benefits of calving heifers earlier are:

- Earlier return on investment in breeding replacements.
- Improved lifetime production.
- Improved reproductive performance.
- Faster genetic gain through reduced generation interval.
- Fewer unproductive animals on the farm.
- Markedly reduced greenhouse gas (GHG) emissions intensity by producing more milk across an animal's lifetime.

Some dairy farmers with pasture-based, year-round calving systems have been hesitant to join heifers earlier due to concerns about calving difficulties, lower production and whether younger heifers are adequately grown before calving.

Key findings

This project found that well-grown Holstein heifers could be joined to calve earlier without compromising overall milk production, fertility or survival. Heifers first joined before 13 months-of-age were generally more productive and less likely to leave the herd than heifers first joined after 13 months-of-age.

Some studies included in the literature review identified lower first-lactation milk production in earlier-calving heifers, but this may be offset by fewer non-productive days before first calving and comparable longer-term reproductive and survival outcomes.

The literature review also found many traditional concerns about earlier calving could be reduced through good heifer growth and management.

Research and results

Research approach

This project investigated the effects of age at first joining and age at first calving on dairy cow production, health, reproduction and survival. The research also examined differences between pasture-based and intensive systems, along with hormonal and metabolic influences associated with earlier breeding and calving.

This project involved:

- Analysis of international research.
- Analysis of data from six commercial herds.

Analysis of international research

This part of the project involved a literature review and statistically analysing the results from multiple international studies (meta-analysis) to identify consistent trends associated with age at first calving.

The age at first calving around the world is generally between 24 and 28 months, which is similar to Australia. In the Australian Dairy UP dataset, heifers in intensive dairy systems generally calved at about 24 months-of-age, while heifers in pasture-based systems calved later at about 26.5 months, on average.

We also examined traditional concerns about earlier calving, including joining undergrown heifers, calving difficulties and lower production. Research included in the review reported no increase in calving difficulty for well-grown heifers joined at younger ages under good management conditions.

Some studies identified lower first-lactation milk production in younger-calving heifers. However, this may be offset by fewer non-productive days before first calving, with no major differences identified in reproductive performance or survival.

Commercial herds

The study included a total of 477 Holstein heifers, managed under normal conditions on six commercial farms. Heifers were grouped according to age at first joining, with comparisons made between heifers joined before and after 13 months-of-age. The target heifers mating weight was 330kg, with most being above this target.

During heifers' pregnancy and first lactation, data on production, reproductive performance, health and survival were collected.

Additional data collected during the project included bodyweight and body condition scoring, reproductive tract assessments and blood testing. The results were used to explore hormonal and metabolic factors associated with heifer growth, pregnancy and calving.

Results

Compared with heifers joined younger than 13 months-of-age, later-joined heifers produced 814 litres less milk over a 305-day period when averaged across all heifers in the study. This reflected a higher proportion of later-joined heifers failing to conceive, aborting or leaving the herd before contributing milk production data. However, there was no difference in milk production between heifers that successfully entered lactation.

Each additional kilogram of bodyweight at the start of the study was associated with an additional 13 litres of milk over a 305-day lactation, reinforcing the importance of growing heifers to target weights before joining and maintaining performance through the lifetime.

However, younger-calving heifers had a higher risk of medical treatment and stillbirth than heifers calving after 24 months-of-age.

Heifer joining age	**Early** (<13 months)	**Late** (>13 months)
First-lactation milk yield	Similar	Similar
Herd retention	Higher	Lower
Overall milk production across study group	Higher	814 L lower
Medical treatment risk	Higher	Lower

Blood testing and biochemical analysis identified differences in several hormone and protein measures associated with age at first joining. These findings may improve understanding of the biological factors influencing fertility, growth and performance of younger-joined heifers. However, further research is required to determine how these measures could be applied in practical herd management.

There were marked differences in the vitamin and mineral concentrations of heifers within and between herds, highlighting the importance of balanced supplementation with effective feed delivery in heifers.

PhD student

Andrew Lean, Charles Sturt University

Collaborators

The P2g project was a collaboration between Dairy UP, Scibus, the University of Sydney and Charles Sturt University.

Thank you to the commercial and research herds for their participation.

This project was closely linked with the following Dairy UP projects:

- P2a Cattle Longevity
- P2d Facility Design for Cow Comfort
- P2e Calf Husbandry

Journal articles

Lean A.K.G et al. 2026 Meta-analysis of the effects of age at first calving on production outcomes, calving difficulty, and reproduction in dairy heifers, Journal of Dairy Science, Volume 109, Issue 6 Pages 5819-6654

Lean, A.K.G. et al. (in review), Age at first breeding in Holstein dairy cattle: Effects on age at first calving, production, dystocia, health and reproduction in primiparous heifers.

Lean, A.K.G. et al. (in review), Age at first breeding in Holstein dairy cattle: Associations of hormone, biochemical and protein measures.

Previous research

Ettema, J. F., & Santos, J. E. P. (2004). Impact of Age at Calving on Lactation, Reproduction, Health, and Income in First-Parity Holsteins on Commercial Farms. *Journal of dairy science*, *87*(8), 2730-2742.

Hutchison, J. L., Null, D. J., Bickhart, D. M., Cole, J. B., & VanRaden, P. M. (2017). Genomic evaluation of age at first calving. *Journal of dairy science*, *100*(8), 6853-6861.

Krpalkova, L., Cabrera, V. E., Vacek, M., Stipkova, M., Stadnik, L., & Crump, P. (2014a). Effect of prepubertal and postpubertal growth and age at first calving on production and reproduction traits during the first 3 lactations in Holstein dairy cattle. *Journal of dairy science*, *97*(5), 3017-3027.

More info

P2 final report

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Delivery organisations

The University of Sydney Dairy Research Foundation | NSW Government Department of Primary Industries and Regional Development | Scibus | Dairy Australia

Partner organisations

NSW Farmers Growing the best | eastAUSmilk | Dairy NSW / Dairy Australia | AFMH | Leppington Pastoral Company Pty Ltd | NSW Government Local Land Services | Norco

Additional program supporters, collaborations or partnerships

Charles Sturt University | DairyBio | DataGene | Eagle Direct | Entegra
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