Project Update
P2e: Calf husbandry

The early life performance of a calves on dairy farms is strongly associated with lifetime productivity in the herd. Calves reared on dairy farms may include both female calves for replacements and non-replacement calves reared for dairy beef or other markets.

Improving calf care reduces antimicrobial use, lowers mortality rate, improves dairy business profitability and helps maintain social licence.

There are two elements to the project:
- Automated calf rearing.
- Rearing Holstein steers for dairy beef.

Automated calf rearing

The project was undertaken as part of Dr Sarah Legge's PhD thesis, titled '*The lasting impact of calf performance*'.

The study focussed on calves reared with automatic feeders on a large commercial dairy farm in NSW following industry best practices.

Research approach

The aim of this research was to determine the factors affecting calf growth and if there's an opportunity to intervene to improve lifetime performance.

This research was 'farmer-led' in that the project arose from the farmer's observation of a relatively large, unexplained variability in the size of calves at weaning. Despite uniform management and adherence to best practice standards, there was concern that calves with

Unlocking the potential of cows

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

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

P2a: Cattle Longevity: Age and Parity & Intensive Herds

P2a: Longevity: Future

P2b: Early Alerts

P2c: Milk as a Diagnostic Tool

P2d: Facility Design for Cow Comfort

P2e: Calf Husbandry

P2f: Infectious Diseases ('Infectome')

P2g: Heifers Early Calving

This document provides an update on P2e: Calf Husbandry.

problems were not always identified early enough for intervention or prevention of issues. The impact of this variability on lifetime productivity and profitability was not known.

Real-farm data underpinned the three studies in this research. On-farm records and the automatic feeders provided a rich data set including birth dates, weights at various ages, health indicators and feed intake.

The first and second study followed a cohort of 1,440 calves on reared automatic feeders.

The third study involved modelling, drawing upon a dataset of more than 14,000 calves.

Key findings

The first study looked at factors affecting the growth of calves reared with automated feeders. It found a wide variation (60kg) in weaning weight, despite a very low mortality rate (<0.1%). Birth weight, visitation and consumption had the greatest impact on weaning weight.

Underperforming calves on automatic feeders could be identified from day 5 in the feeder system (cumulative consumption), offering the opportunity for early management intervention.

The second study followed the long-term survival and lactation performance of the 1,440 calves in the milking herd. It looked at the association between weaning weight and future lactation performance (yield and number of lactations).

Of the 1,440 calves reared in the first study, only 55 reached their fourth lactation in the herd:

- 406 were removed between weaning and their first lactation (surplus to farm requirements or not in calf).
- 233 were removed after their first lactation.
- 392 removed after their second lactation.
- 354 removed after the third lactation.

A heavier weight at weaning translated to higher production (especially in lactation 1 and 2) and a longer life in the herd.

Weaning weight was more strongly associated with survival in the herd than birth weight. For example, a calf with a weaning weight of 50kg had a 17% likelihood of lasting three or more lactations in the herd, compared with 40% for a calf with a weaning weight of 100kg.

Weaning weight and cumulative consumption at day 5 had a significant impact on total lifetime milk production.

The third – modelling – study investigated the effect of preweaning factors on removal from the herd, using a dataset from more than 14,000 animals from the same herd.

Birth weight, weaning weight and days in milk significantly influenced the likelihood of a cow being removed from the herd. There were three points in the lactation where cows were more likely to be removed from the herd: early lactation (transition period), around 128 days in milk (not in calf) and after 305 days (long lactation cows). Cows with a lighter weaning weight were more likely to be removed from the herd early.

On-farm implications

This study quantified strong and positive associations between the performance of female dairy calves at weaning and their subsequent performance as lactating animals.

The findings provide the basis to develop early alert systems for calves being reared with automatic calf feeders.

This work is an example of the huge opportunity to use passive data collection from modern technologies such as automated calf feeders to improve farm management.

Progress update

This project is complete. The main outputs of the work are a PhD thesis, a paper in the Journal of Dairy Science and several others in preparation for submission.

Holstein steers for dairy beef

This project involves two studies to investigate the effectiveness of an integrated management strategy from Spain for rearing Holstein steers for the 'antimicrobial-free' beef market under Australian conditions.

The first study involved feeding Holstein steers (72) either a low starch (38%) diet with antimicrobials (monensin and flavophospholipol) or high starch (47.5%) diet for 452 days. They were evaluated for health, production, carcass measures and rumen function.

The second study looked at the differences between low and high performing steers over the 21 days of feedlot induction. Out of a population of 92 Holsteins, British and European breed steers, the 10 steers that gained the most and the 10 that gained the least for each breed (60 in total) were identified. Rumen samples were taken from these animals at feedlot induction

and 14 days prior to slaughter. They are being evaluated for rumen microbiota, rumen fermentation markers, production, carcass and health metrics.

Key findings

Under good management, dairy beef can successfully reach 550kg carcase liveweight by 15 months of age, with or without the use of antimicrobials. The Spanish system may allow farmers to market their beef as antimicrobial free. However, the incidence of liver issues may increase. Antimicrobials have an important role in the beef industry.

Identifying poor performing steers at feedlot induction provides the potential for intervention to produce a healthier and more valuable steer.

Progress update

This project is ongoing. An honours thesis was produced for each of the studies. Manuscripts are currently in preparation.

Collaborators/funders

The P2e project is a collaboration between SciBus, the University of Sydney and Charles Sturt University, Meat & Livestock Australia and Church and Dwight.

Read more

S.W.J. Legge, P.C. Thomson, C.E.F. Clark, S.C. García (2022) Milk consumption and behaviour of calves in automated calf-feeders as early indicators of weaning liveweight, JDS Communications

H. Golder, J. Rehberger, A. Smith, E. Block, and I.J. Lean (2024) Shifts in rumen profiles of Holstein steers fed antimicrobial and starch diets. Journal of Dairy Science, Vol 107 (Suppl 1), pg 431 (abstract 2712)

More info

Project lead

Professor Yani Garcia
University of Sydney
sergio.garcia@sydney.edu.au