Adapting to our climate with a roofed concrete feedpad

Farm systems transition case study

Farm Location

Hermitage Dairy, owned by Stuart and Sarah Crosthwaite, is a 389ha property located in Kergunyah South, North-east Victoria.

Farm history

Having been in the Crosthwaite family for 140 years, Stuart is the fifth generation to operate the farm.

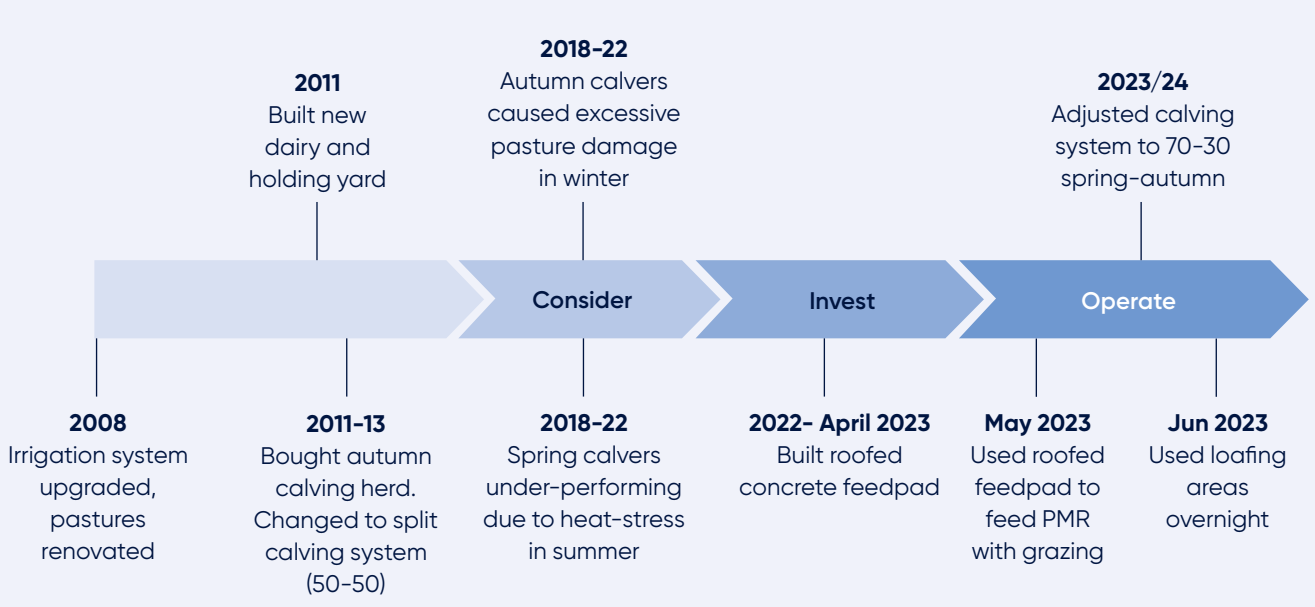
With its climate, abundant river flats and irrigation water, Hermitage Dairy has the capacity to grow significant quantities of irrigated forages over summer, making it very suitable for spring calving, while wet winter conditions make it less suitable for autumn calving.

Over his custodianship of the farm, Stuart's father had lasered 115ha, upgraded the dairy, and progressively grown the spring calving herd to be one of the largest herds in the district. Stuart returned to the farm in 2006 with Sarah on a basic lease arrangement before a family succession plan was developed and implemented with the help of a succession planning professional in 2008.

This succession plan provided a secure retirement for Stuart's parents while giving Stuart and Sarah the freedom to take the farm business in whichever direction they chose. Stuart and Sarah's top priority was to progressively increase annual milk production, which had become static in recent years. They recognised that the farm's dairy parlour was not well positioned on the farm and inadequate, with each milking taking up to four hours. Over the next few years, they invested in upgrading the farm's irrigation system, renovating pastures and fine-tuning grazing management, changing the herd breeding objectives, replacing older machinery and building a new, larger rotary dairy in the centre of the farm in 2011. Strategic and tactical decision-making was supported by the knowledge and experience that Stuart had gained studying agriculture and dairy systems at the University of Melbourne and Massey University, and worked as a factory field officer at Koroit and Bega before returning to the farm.

Annual milk production and herd numbers increased from strategic investments. However in 2011-13, Stuart started to notice declining fertility in spring calvers which had a knock-on effect on autumn calving. This inevitably meant the spring:autumn ratio was close to 50:50. In order to maintain a spring dominant herd they rolled autumn born heifers into spring calving which meant carrying them for a further six months. Numbers of stale, carry-over cows in the herd increased with the export of heifers and a lower herd replacement rate (10-15 per cent). This problem was recognised, leading to the herd replacement rate being increased to 25 per cent and the problem rectified.

Timeline



Consider phase

In recent years, without any farm infrastructure for feeding cows or protecting them from the weather, the Crosthwaites became increasingly concerned as they watched their spring calvers struggling in warm-hot summer conditions while in early lactation, and high wastage of silage fed under fence lines. They were also finding it difficult to manage their spring calvers' pre-calving transition program in late winter - early spring due to wet conditions. The impacts on the spring calvers were significant, with their annual milk production 30 per cent lower during November to April and six-week in-calf rate 20 per cent lower than the autumn-calvers'. However, calving more cows in autumn was not the solution. Pastures were already suffering considerable damage from cows under wet winter conditions, and with a flat milk price across the 12 months of the year being paid by the Crosthwaites' processor, there was nothing to be gained from increasing their winter milk flow.

"My thought process was to consider the climatic inadequacies we deal with here, with the wet river flats in winter and the hot summer, and the impacts on fertility and production, and think through what type of facility would suit us best, rather than just replicate one I had seen on another farm."

"We knew that an earthen feedpad with modular troughs would not work on the river flats, so we considered a concrete feedpad with troughs," said Stuart. "But I was concerned about staff having to manually clean out troughs."

"I looked at constructing a 1.2m wide trough and buying a dingo trencher to clear it regularly." However on further consideration, Stuart opted to construct a concrete feedpad with a central drive alley equipped with a nib wall and post and rail cow feed barrier. A robotic feed pusher was purchased dissolving manual labour requirements of the earlier option.

Stuart and Sarah then realised that to achieve all their aims, the feedpad would need to have a roof over it to.

Stuart and Sarah then considered that if the new facility also had loafing areas under the roof, either side of the feedpad, it could be used to accommodate milkers comfortably under cover during periods of hot weather in summer and when paddocks and tracks were very wet in winter. Part of the facility might even be used to accommodate transition cows (spring calvers and possibly also autumn-calvers) during their pre and post-calving transition period.

Aware that the new facility would have a working life of 30+ years, and keen to future-proof it from the outset as much as possible, Stuart considered how large the loafing areas would need to be to permanently house 500 cows, supported by total mixed ration feeding with zero grazing, should he and Sarah, or the next generation to manage Hermitage Dairy, decide to cease grazing and change to a contained housing system at some point in the years ahead. Stuart and Sarah realised that the investment was likely to be significant and therefore wanted to ensure their facility allowed the most flexibility in the future to allow adaptation to their changing climate.

Invest phase

It took 12 months to scope and design the facility and to obtain permits and finance. And roughly another 12 months to commission the project: the feedpad took five months while the shed took three months with a short break between projects. The total cost of all infrastructure projects was approximately $A1.8 million.

The facility, located behind the dairy holding yard, is 171m long and 49.7m wide (including a 1.8m eave on each side), on a 1 per cent slope and is oriented east-west.

The structure is widespan, with an open-web truss, portal frame and a corrugated iron roof with an 18° pitch. It has a 6m wide, concrete central drive alley, either side of which is a 5m wide, concrete cow feeding alley. The cow/feed barrier is post and rail. Each of the two loafing areas, intended to have a compost bedded pack, is 171m long and 14.6m wide, providing 500 cows with almost 12m^2 per cow.

The facility has several interesting design features:

- East-west orientation that maximises shade during summer.
- Six metre clearance under roof at the sides of shed to provide more headroom above the pack near the eaves for safe movement of machinery.
- Posts encased in PVC and concrete sleeves up to 1.5m to protect the steel from corrosion due to exposure to urine, manure and gases.
- Head and chest rails that can easily be adjusted in future if needed.
- Tipping water troughs every 20m behind each cow alley that are easy to clean.
- Ring-main water line that enables water to flow in both directions, for easier maintenance, less likely to block, and doesn't require as big a pump as a branched water line.
- Flood washing system designed by a local engineer and concreter with a hinged flap designed to prevent cow injuries and to capture the flood wash water/effluent.
- Extensive electrical cable system which can be readily upgraded in future.

"If I was going to invest nearly two million dollars, I wanted the facility to be cutting edge and innovative."

For example, the flood washing system's flap is automatically raised by a truck airbag when flushing commences, and automatically goes down again when flushing has finished.

Throughout the planning phase, Stuart's design consultant provided short, animated videos with commentary explaining specific details of the shed. These videos really helped Stuart visualise what the shed would be like when it was completed and allowed him to discuss any modifications. His consultant prepared detailed drawings ready for submission to council and for use by his builders.

Operate phase

Within a few weeks of commissioning the feedpad in May 2023 and with winter approaching, Stuart established the compost bedded pack in the loafing areas, installing a 200mm deep layer of sawdust over a compacted earth base. He intends to add further loads of sawdust to create a deeper pack. Stuart opted to use sawdust, which is considered the gold standard, for compost bedded pack bedding. It provides a large surface area to volume ratio, is easy to till, is very absorbent and composts well.

As wet, cold winter conditions set in, Stuart decided to accommodate the milkers in the shed following afternoon milking until morning milking. There were no problems introducing the cows to the shed's loafing areas. Cows appear very happy to spend nights in the shed.

"Having the cows so close to the dairy makes the morning really efficient."

After morning milking, cows go straight onto the concrete feedpad to eat a PMR and then make their way to their day paddock. Stuart then tills the cows' bedding and leaves it fluffed up to dry undisturbed until afternoon milking.

Stuart has noticed a change in the cows' grazing behaviour since they started using the shed overnight.

"They're not smashing the pastures like they used to. Particularly the new pastures sown in the autumn. They're not eating them to the ground now. There's a really good residual left. So the shed is giving us the tool to manage the wet times really effectively."

The shed will help to eliminate pugging in paddocks and along laneways in winter and enable 10ha to go back into production which was usually lost pasture due to calving cows/springers needing area in the wet winters. Now every hectare of the farm remains productive year round.

"I can see the shed being an amazing tool for us to manipulate the persistence of our pastures," Stuart says.

So far, a comfortable, clean, dry bedding surface is being maintained for cows to lie on. Daily herd production is 3,000L higher than at the same time last year and the bulk somatic cell count is sitting between 80,000 and 120,000 cells/ml.

Stuart is continuing to use a silage cart to feed a PMR comprising maize silage, pasture silage and by-products such as almond hulls and distiller's grains. This is resulting in problems with the flush system. Pasture silage in the PMR is being dragged by cows into the feed alley and is forming into a ball under the impeller, causing a blockage. However, Stuart will soon buy a mixer wagon and a bigger tractor, which will enable him to reduce the chop length of the silages and prepare uniformly mixed PMRs.

In summer, when cows are starting to feel hot in late morning/midday and stop grazing, Stuart will adopt a different daily routine. Milkers will be brought up to the shed and fed a PMR under cover with evaporative cooling provided by sprinklers and fans for a few hours before afternoon milking, with cups on at 3:30pm. Milking will no longer be delayed until 5:00pm to 6:00pm on hot days as Stuart used to do before he had the facility. After exiting the dairy, cows will then eat more PMR in the shed before walking to their night paddock, with more time to graze pasture in cooler evening conditions. This daily routine will also enable milking staff to clean up and get home earlier.

"We are locking ourselves into a more intensive system, and one of the big things I am conscious of is staff. We struggle to find skilled people. So having a system that is not too complicated and is more efficient is what we want," says Stuart.

What would you do differently?

"Not much, we are actually really happy with the facility and the initial results are amazing," says Stuart. Stuart explains that when designing the facility, he under-estimated the electrical system and had to upgrade it substantially. He also had to modify the design of the flood wash system during construction which delayed the concreter.

"In hindsight, it would have been more efficient and smoother if we had had a project manager overseeing the whole planning process rather than me.

"I probably didn't consider everything as thoroughly as I should have. The daily burden of just running the farm meant you were spread thinly while trying to oversee a massive engineering project like this."

If finances had permitted, Stuart would also have preferred to buy a mixer wagon and larger tractor before commissioning the facility.

Where to from here?

Stuart is aiming to operate an efficient, highly profitable farm. With the new facility, over the next year he aims to:

- Increase milk production per cow by a further 10-15 per cent, by driving feed intake and providing greater cow comfort in summer and winter.
- Change the calving system to 70-30 spring-autumn to protect pastures from damage during winter, while increasing spring calvers' reproductive performance and sustaining their milk yields under warm-hot summer conditions.
- Use the shed to better implement the pre-calving transition program for the spring calvers.

Stuart sees the investment in the new facility very much as "adapting to the inadequacies of our climate", while remaining committed to a grazing system. However, Stuart says that the new system "does open Pandora's box for what the future system is.

"It gives us the freedom to take the farm wherever we want, and the next generation," he says.

For further information

Visit **dairyaustralia.com.au** and search 'National Feedpad and Contained Housing Guidelines'

Visit **dairyaustralia.com.au** and search 'Farm Systems'

Visit **dairyaustralia.com.au/farmsystemevaluator**

Acknowledgement

Thank you to Stuart and Sarah Crosthwaite for agreeing to share his knowledge and experience.

Overview

Farm			
Farm size (ha)	389		
Grazing area (ha)	230		
Cropping area (ha)	159		
Production system	Grazing based, with roofed, concrete feedpad		
Dairy type	54-stand rotary		
Climate (BoM historical data for farm locality)			
Mean annual rainfall (mm)	703		
Mean no. rain days/year	118		
Mean no. days/year ≥ 35°C	15.5		
Mean no. days/year ≥ 40°C	1.7		
Mean annual daily solar exposure MJ/m^2	17.3		
Conditions over summer	**Dec**	**Jan**	**Feb**
Mean temperature (°C) at 3:00pm	27.5	30.6	30.3
Mean Relative humidity (%) at 3:00pm	34	30	32
Mean Temp. Humidity Index at 3:00pm	73	76	76
Mean wind speed (km/h) at 3:00pm	11.9	11.5	10.6
Mean daily solar radiation (MJ/m^2)	26.4	26.5	23
Herd			
Milking cow numbers	500		
Breed	Holstein-Friesian		
Calving pattern	Split (50:50 autumn:spring)		
Production per cow per year (L)	8,270		
Infrastructure and equipment			
Infrastructure	• Concrete feedpad with flood washed cow alleys and solid, pitched roof • Additional area under roof on either side for future use as resting areas with a compost bedded pack		
Equipment	• Silage cart and tractor		
People			
Full time equivalents (FTEs)	4.4		
Cows per FTE	108		

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