

Loose housing – with deep litter pack

David and Katrina Christie – Fairy Dell, North-central Victoria

Farm location



Farm history

David is the fourth generation of the Christie family to run the farm, which has been in their ownership for over 100 years.

In 1996, David returned to the farm after spending ten years working off the farm as a mechanic. In 2005, together with his wife Katrina, David took over ownership and management of the farm from his parents. Over the years, they expanded the farm from 45ha to 122ha by acquiring neighboring blocks of land.

They faced numerous challenges during wet Winters, including damage to pastures, increased levels of lameness, and mastitis. In 2003, the Christies constructed a basic earthen feedpad near the dairy, running parallel to the main lane from East to West. In 2011, they upgraded the eastern section of the feedpad, transforming it into a concrete, dry scrape feedpad. It featured a 5.3m wide central drive alley with nib walls and posts, along with 1m wide concrete strips along the feed alleys for cows to stand on with their front feet. While this feedpad worked well, rainy conditions caused cows to slip off the concrete strip, resulting in wet and spoiled feed.

To address this issue, David made further improvements to the feedpad in 2014. He added an additional 4m strip of concrete to each of the feed alleys, providing cows with a stable surface to stand on and making it easier to keep the feedpad clean. This investment proved beneficial. It did not fully solve the challenges posed by wet Winters however and did not alleviate heat stress on cows during the Summer. Therefore, more actions were required to tackle these issues.

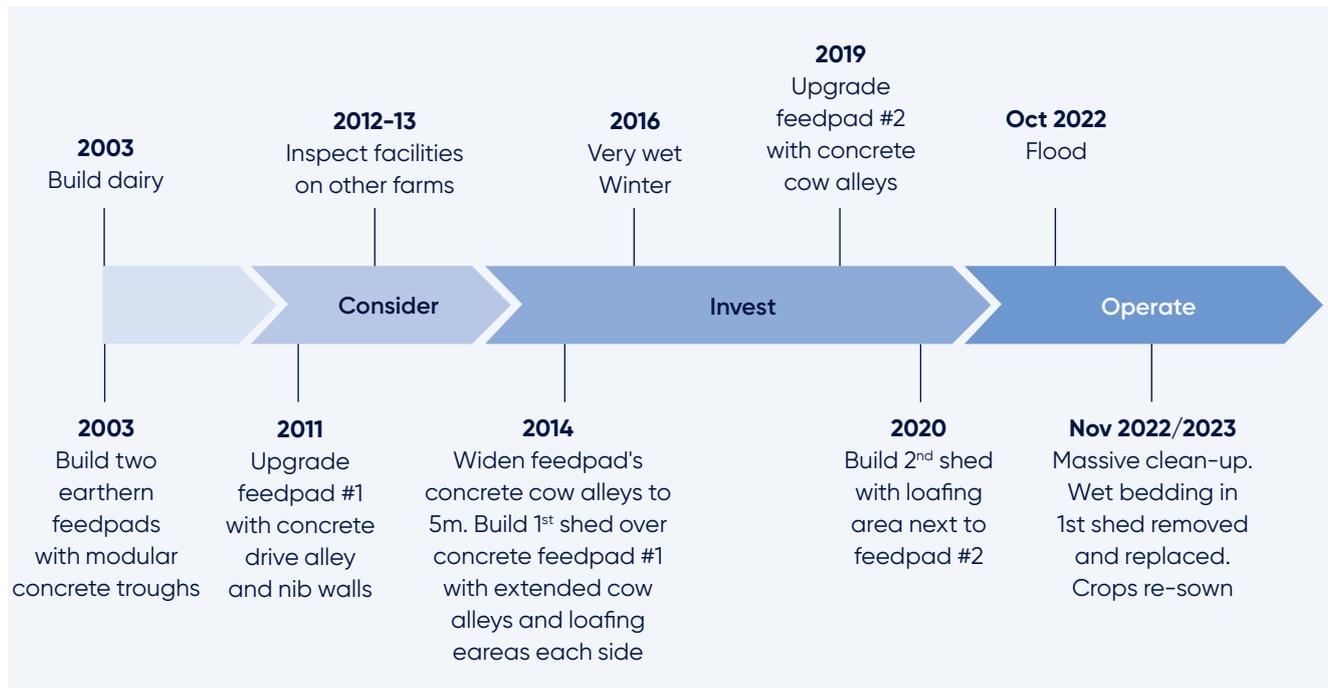
Consider phase

The Christies were considering expanding the milking area by purchasing more land. Land prices have risen significantly however in recent years. Additionally, if they bought a neighboring property, the paddocks would be too far from the dairy for cows to comfortably graze during wet Winters and hot Summers. As a result, they began contemplating the construction of a solid roofed structure over the eastern section of the feedpad, along with the central drive alley. This facility would allow cows to eat, loaf, and rest comfortably, protected from adverse weather conditions.

To explore their options, the Christies visited several facilities in New South Wales and northern Victoria. While freestall facilities with sand bedding were a proven choice, they decided to go with a loose housing facility because of its advantages:

- Lower capital cost.
- Cows can move freely on a soft surface instead of concrete.
- Cows of different sizes can use the facility without requiring any training.
- The facility could also be used for rearing beef cattle if the dairy business became marginally profitable due to lower milk prices in the future.

Timeline



David estimated that the proposed loose housing facility would prevent a decrease of over two litres per cow per day in milk production for 120 days during Summer. This decrease was primarily caused by the heat stress cows experienced while walking to and from grazing paddocks with limited or no shade. Moreover, David believed that the benefits of the loose housing facility would be even greater, potentially two to three times greater, in wet Winter conditions. It would help maintain milk production, reduce mastitis and lameness in cows, minimise cow health problems, and lower costs associated with maintaining tracks and renovating paddocks.

To finance the project, the Christies convinced their bank to provide a A\$400,000 principal and interest loan, repayable over 10 years. Environmental planning presented a greater challenge. Initially, the shire, local water authority, and Environmental Protection Agency (EPA) expressed concerns about manure management. After inspecting the site and witnessing how the Christies effectively managed the manure scraped from the feedpads and converted it into valuable compost without any effluent leaving the farm however they became supportive and provided assistance.

Since loose housing facilities were relatively new in the region at the time (2014), the Christies encountered some unusual requests. For instance, the shire insisted on fitting a fire extinguisher in every second bay of the shed, as required for commercial warehouses of similar sizes. David found this request illogical, questioning how a cow could use a fire extinguisher and what could potentially burn in the shed. Eventually, common sense prevailed.

When proposing the construction of the shed, the Christies were obligated to provide a ten-year plan. Initially, they included a second shed positioned in line with the first shed, running east-west, built over the western section of the feedpad. Over the following

seven to eight years however while utilising the shelter, David realised it was challenging to maintain a dry pack in relatively narrow bedding areas on either side of a central feedpad. Consequently, he adjusted his plans and decided to build a widespan shed about 25m from the south side of the feedpad, parallel to it rather than over it. This way, the entire area of the second shed would be dedicated to bedding, allowing for more cows to be accommodated compared to the first shed. Furthermore, this arrangement would make it easier to use the shed, with minimal risk of machinery colliding with posts or the roof. Since all the necessary effluent management and environmental approvals were obtained for both sheds before the construction of the first shelter, proceeding with the second shelter was a straightforward process.

Invest phase

The Christies' initial loose housing facility was constructed in 2014 at a cost of A\$400,000 when their herd consisted of 400 cows. The shed has an East-west orientation and measures 160m in length and 37m in width, totaling 5,920m². It features a 5.3m central drive alley, with a 5m cow feeding alley on each side, equipped with grooved concrete. The cow/feed barrier consists of posts and two cables. The shed operates on a dry scrape system, with the feedpad set on a slight 0.5 per cent slope. Adjacent to each cow alley is a loafing area measuring 10.9m by 160m.

The bedding is managed as a deep litter pack and consists of chipped recycled housing materials. The total loafing area of the shed is 3,488m², accounting for 59 per cent of the total shed area. This allocation provides 640 cows with only 5.5m² per cow. It's important to note that cows are only housed in this shed for approximately nine to ten hours per day, between the morning and evening milkings.

To maintain privacy from the road and neighboring properties, David utilised a cherry picker to determine the maximum height that would be concealed by trees. As a result, the roof pitch is only 13 degrees, which is less than optimal for effective air ventilation through the central ridge vent. David commented on the design, stating, "It's a basic design. I appreciate the absence of a web truss, but the roof angle is not steep enough."



Construction of the Christies' second loose housing facility commenced in September 2020 and was completed on Christmas Eve of the same year. The facility was built at a cost of A\$800,000 and follows an East-west orientation, measuring 147m in length and 40m in width. It occupies a similar area to the first shed, totaling 5,880m², but functions solely as a loafing area with a deep litter pack. This design provides each of the 640 cows with 9.2m² of space. When combined, both sheds offer a total loafing area of 14.7m² per cow, falling within the recommended range of 13-15m² for loose housing facilities. Unlike the first shed, the roof structure of the second shed features a widespan design, incorporating an open-web truss and portal frame, with an 18 degree pitch and a corrugated iron roof.



In 2019, the Christies implemented a significant improvement by installing a 5m wide patterned concrete cow alley on both sides of the troughs in the eastern section of the feedpad. This modification greatly facilitated the cleaning process. When the second shed was constructed a year later, they added four cables along the northern perimeter, with gates placed at five bays for cows to pass through when moving to and from the feedpad. David observed however that some cows encountered difficulties navigating these gates,

especially in wet weather conditions. Consequently, he decided to remove the cables and provide unrestricted access to the feedpad along the entire length of the shed.

Regarding water accessibility, both facilities ensure that cows have ample drinking water. The first shed is equipped with five tilting water troughs on each side of the cow alleys. In the area between the second shed and the external feedpad, eight large round concrete water troughs have been strategically positioned.



Operate phase

After the first loose housing facility was established in 2014, the Christies initially utilised it to house cows overnight, while sending them to graze in the paddocks during the day. However, as the herd size grew, maintaining a dry surface for cows in the shed became increasingly challenging. Consequently, when the second shed was commissioned six years later, the Christies made the decision to use it for housing cows overnight and designated the first shed for daytime use.

The daily routine on the farm follows this schedule:

- At 4:00am, one of the milkers brings the cows from the second shed (referred to as the "night shed") to the dairy. No drover is required for this task.
- After the morning milking, cows make their way to the first shed (referred to as the "day shed"), and the vacant second shed's bedding is tilled and left undisturbed to dry until the cows return to it after the afternoon milking.
- By 10:00am – 11:00am, cows have consumed the mixed ration provided the previous evening, prompting the preparation and delivery of another batch of feed.
- At 5:00am, David prepares two batches of feed using the mixer wagon and delivers them to the night shed. He then prepares and delivers batches to the dairy heifers, dairy beef cattle, cows on the calving pad, and dry cows, which are all fed in pens using feedpads. David remarks, "I can have all of these tasks done by 7:30am. Then you've got the day to focus on other duties."
- During each milking session, cows receive grain and a protein and mineral mix tailored to their current milk yield through a computerised feeding system. Mixed rations also include quantities of grain and canola meal.

- Staff members are not required between morning and afternoon milkings, unless specific tasks such as covering silage or cleaning feed troughs need attention. The staff resides on the farm in provided units.
- At 2:30pm, cows are moved from the day shed to the dairy for the afternoon milking. Despite the short distance of just 70m, cows may take up to an hour to transition from the comfortable day shed to the dairy on hot summer days.
- After milking, cows return to the night shed, with the option to rest outside on the southern side if weather conditions permit. Following the completion of the afternoon milking, staff members cut net wrap off hay for use in feed mixes the following morning, till the bedding in both the day shed and the feedpad adjacent to the night shed, and then conclude their tasks for the day. David takes care of scraping the cow alleys in the day shed and the feedpad next to the night shed.
- In the evening, David prepares eight tonnes of mixed ration and delivers it to the day shed for cows to consume after the morning milking. He acknowledges that it makes the day longer than ideal but emphasises, "I'm not getting up at 3:30am to mix feed."
- Katrina is responsible for managing all tasks related to the calves on a daily basis.

According to David, the loose housing system, with the day and night sheds, is far easier for the staff to handle compared to a rotational grazing system.

"Every day is exactly the same," he explains. "It's like Groundhog Day. It may be monotonous for the cows, but I love it because we can make adjustments quickly by modifying the feed mix. We have complete control."

To keep things simple, David has opted not to group cows based on their lactation stage and provide different rations. He points out the risk associated with a single gate being left open, which can disrupt all the hard work. Hence, simplicity is preferred. David has decided against transitioning to three times milking as he is extremely satisfied with his farm team and doesn't want to risk burning them out. In the past, the Christies used to invest significant time and money managing complex reproductive programs throughout the year. Now however they have streamlined the process by selling non-cycling cows and avoiding mating or calving during December-January and mid-Winter.



The mixer wagon just fits down the 5.3m wide central drive alley in the day shed. The mixer wagon has a door on each side. With both doors open, the wagon only needs to make one pass down the drive alley. Feed is pushed up three to four times per day using a blade on an ATV. The feedpad external to the night shed works very well but requires much maintenance, particularly in Winter, to keep it clean. "But I would have the same trouble in a paddock," said David. In 2021, David developed an innovative suction implement which he uses to remove slurry from the external feedpad's feed alleys and other wet, high traffic areas outside the sheds when it starts to build up.

The deep litter pack in the night shed, with its larger area, stays drier than that in the day shed. The packs in the two sheds are tilled daily to a depth of 150mm. David adds woodchips one to two times weekly in Autumn and Spring, and in Winter he may add them daily, depending on how wet the bedding becomes. David keeps 2,000 square metres of woodchips on hand, obtained from a supplier of clean, kiln dried hardwood material. When the pack is dry enough, he may also add small quantities of dried compost. Bulk somatic cell counts are maintained under 120,000 cells/ml.

Bedding in the sheds is removed every three years. In June 2022, the bedding in the day shed was removed and replaced at a cost of A\$40,000. Unfortunately, it was submerged just four months later under 300mm of water, during the floods in October 2022, and had to be removed and replaced again. Fortunately, the bedding in the night shed remained dry as the night shed is a little more elevated than the day shed. However, it was surrounded by water so could not be used. The standing crops in every paddock were also decimated by the flood and had to be re-sown. The Christies also lost a large quantity of lucerne hay. They are now working hard to replace this lost fodder.



Since transitioning to their loose housing system, the Christies have found that managing manure has become the most significant task on their farm. David humorously remarked, "Dairy farming with this system is very much about managing sh#t." However, they have actively worked on refining their composting methods since constructing their first shed. To facilitate composting, all manure on the farm is gathered and stockpiled in a designated area. The manure is then formed into windrows and turned on a weekly basis.

By composting at a temperature of 65°C and maintaining a dry matter content of 40-50 per cent for a period of three weeks, the Christies are able to produce compost that is biologically stable, free of pathogens, and devoid of unpleasant odors. Most of the compost is subsequently utilised as fertiliser on their paddocks. Recent analysis has revealed that the compost holds a nutrient value of A\$49 per wet tonne (at 30 per cent dry matter). This practice of spreading compost has allowed the Christies to reduce their reliance on synthetic fertilisers and decrease their irrigation water usage by half, as the soil retains moisture more effectively. Consequently, their lucerne crops now require watering only once between cuts, instead of twice.

Composting has proven to be a financially beneficial approach, particularly in years when the cost of irrigation water is high. David enthusiastically stated, "You can turn sh#t into something that's an asset. It's gold."



The Christies have implemented a double cropping program, which incorporates five different forage sources: ryegrass, sorghum, corn, cereal silage, and lucerne. To ensure the success of the system, they strive for a yield of 22-25 tonnes of dry matter per hectare on every paddock. In comparison, when they used a grazing system, only around seven to eight tonnes of dry matter per hectare were harvested and consumed by the cows.

"We used to calve in August-September so that we knew we had a Spring flush to put the cows on," David explains, "Whereas now our Spring flush is under the plastic."



To replenish their fodder reserves after the flood, David intends to harvest twice as much corn this year as compared to last year. Additionally, he avoids having too many silage pits open simultaneously, preferring to utilise only the ones that are currently open. This approach of keeping it simple ensures efficient management of the silage pits and reduces complexity.

What would you do differently?

David expressed that if given the chance to start over, he would have made several improvements to the first shed. He would have constructed a wider central drive alley, increasing it to 6m in width, and expanded the loafing area on each side. Additionally, he would have positioned the posts holding the cow/feed barrier closer together, reducing the distance between them from 3m to 2m to prevent cows from pushing through. Furthermore, he would have opted for a steeper roof pitch.

On the other hand, David is pleased with the second shed, as it meets his expectations and requirements.

Where to from here?

The flood that occurred in October 2022 had a significant impact on the Christies, and they are still in the process of recovering from its aftermath. This event has prompted them to reconsider their plans. Prior to the flood, David had intended to expand the second shed by adding a 10-meter wide skillion roof on the south side, along with a drive alley and feed alley underneath.

The shed would have been divided into two pens, with milkers occupying the southern pen and heifers and dry cows in the northern pen. However, due to the flood, this expansion plan has been temporarily postponed, and they will continue using the second shed's external feedpad as it is. They are considering installing sprinklers on the feedpad to provide cooling for the animals.

Moving forward, the Christies aim to maintain flexibility in their operations. As long as the milk price remains at a level that ensures profitability for their dairy business, they plan to continue dairy farming while also developing their beef enterprise. If milk prices were to significantly decline however they are prepared to shift their farm business entirely to beef production. After investing in their farm for many years, the Christies are now interested in diversifying their asset base by making some off-farm investments.

FOR FURTHER INFORMATION

myda.dairyaustralia.com.au/fse
dairyaustralia.com.au/nationalguidelines
dairyaustralia.com.au/farmsystems

ACKNOWLEDGEMENT

Thank you to David and Katrina Christie for agreeing to share their knowledge and experience with dairy intensification.

Overview

Farm			
Farm size (ha)	122		
Grazing area (ha)	0		
Cropping area (ha)	120		
Production system	Loose housing with deep litter pack		
Dairy type	50-stand rotary		
Climate (BoM historical data for farm locality)			
Mean annual rainfall (mm)	427		
Mean no. rain days/year	93		
Mean no. days/year $\geq 35^{\circ}\text{C}$	22.4		
Mean no. days/year $\geq 40^{\circ}\text{C}$	3.7		
Mean annual daily solar exposure (MJ/m^2)	18.1		
Conditions over Summer	Dec	Jan	Feb
Mean temperature ($^{\circ}\text{C}$) at 3:00pm	27.3	29.2	29.1
Mean Relative humidity (%) at 3:00pm	30	29	31
Mean Temp. Humidity Index at 3:00pm	72	74	74
Mean wind speed (km/h) at 3:00pm	15.0	14.3	12.4
Mean daily solar radiation (MJ/m^2)	27.5	27.5	24.3
Herd			
Milking cow numbers	750		
Breed	Holstein-Friesian plus some crossbreds and Jerseys		
Calving pattern	Split (50:50, Autumn:Spring)		
Production per cow per year (L)	9,000–9,500		
Infrastructure and equipment			
Infrastructure	<ul style="list-style-type: none"> Loose housing facility with deep litter pack and central, dry-scraped feedpad Loose housing facility with deep litter pack and external, dry-scraped feedpad 		
Equipment	<ul style="list-style-type: none"> Mixer wagon and tractor Electronic collars and milk meters for monitoring each cow's rumination 		
People			
Full time equivalents (FTEs)	6		
Cows per FTE	125		