

Freestall – with sand bedding



Mark and Kate Walpole – Yielima, Northern Victoria

Farm location



However, the lack of available options hindered their plans for increasing the milking area. As a result, Mark and Kate started considering the possibility of developing a contained housing operation on a nearby greenfield site.

Consider phase

The Walpoles initially expressed interest in developing a large dairy dry lot capable of accommodating 4,000 to 5,000 cows.

They were inspired by the success of their existing dry lot on the farm during the Summer months, despite its challenges during wet Winters. A dairy dry lot seemed like an appealing option due to its cost-effectiveness compared to constructing a freestall. However, their perspective shifted after experiencing the difficulties brought about by a prolonged wet winter that impacted the region in Spring 2016. Consequently, the Walpoles decided to prioritise the construction of a freestall instead. In addition to its ability to handle wet Winters, they recognised that a freestall would help mitigate heat stress in cows, optimise feed conversion efficiency, and make it easier to attract workers.

To gain valuable insights and knowledge, Mark and Kate dedicated their time to studying dairy dry lots and freestalls in the United States. They embarked on guided tours alongside their consultant, visiting Arizona and California in both 2012 and 2017. Mark reflected on their experiences, noting,

"We actually learned a lot more when we went back the second time because the first time it was just overwhelming."

Farm history

Mark's upbringing took place on his parents' dairy farm in Yalca, located in Northern Victoria. From the early 1990s onwards, Mark, alongside his father and brother, managed not only their home farm but also two other farms.

Throughout the years, they made various improvements, including the construction of a new dairy and a dairy dry lot on the home farm. These additions provided shelter and feed for the milking herd during the Summer months, while the cows grazed on pasture and received a Partial Mixed Ration (PMR) for the rest of the year. Gradually, the herd size grew from 500 to 1,200 cows.

In 2013, Mark's parents finalised their succession plan, leading to Mark's father and brother taking charge of the management of the two additional farms. Consequently, Mark and Kate assumed complete ownership and management of the home farm at Yalca. Eager to further expand the herd, they sought opportunities to purchase or lease adjacent parcels of land.

Timeline



Their commitment to continuous learning and improvement played a significant role in shaping their understanding and decision-making process.

In late 2017, the Walpoles discovered an ideal greenfield site just 12 kilometers west of their farm, consisting of three adjacent blocks in Yielima. They promptly purchased the land in March 2018, intending to establish a new operation within five years. In October 2018, Mark and Kate organised a meeting with the local council, water authority, and EPA to obtain approval for their plans. Fortunately, these entities supported the establishment of a dairy on the site. However, progress was delayed for nine months while an investigation was conducted to identify any culturally sensitive areas, which, ultimately, were not found on the site. To preserve a significant number of mature native trees, the development was relocated a few hundred meters south of the originally chosen location. Subsequently, the planning process proceeded smoothly, with the development encompassing a larger buffer zone than required. Furthermore, no objections were raised by neighboring parties.

In July 2019, the Walpoles embarked on a trip to the United States to meet with a consultant engineer responsible for designing their development. The initial phase involved two freestalls housing 1,000 cows each, equipped with an efficient effluent system, a dairy and a holding yard. A second stage was planned to include two additional 1,000 cow freestalls. Over the course of the next six months, design and costing work progressed steadily. In January 2020, Mark and Kate approached lenders in an attempt to secure financing for the project.

However, they encountered challenges due to the lenders' limited understanding of contained dairy housing systems and projected returns. Eventually, the Walpoles managed to secure the necessary funds from their existing bank. Unfortunately, in March 2020, the COVID-19 pandemic erupted, causing the cost of building materials to skyrocket by 40-50 per cent. This unexpected hurdle necessitated multiple re-costings for the development. Despite the setbacks, the Walpoles made the decision to persevere. Earthworks were successfully completed in 2021, followed by the commencement of building construction in January 2022. Finally, in February 2023, the development was commissioned, marking a significant milestone for the Walpoles.

Invest phase

The two freestall facilities are identical, each measuring 230m in length and 51m in width (including a 1.8m eave on each side). They are built on a 1 per cent slope, oriented east-west to maximise shade during the Summer.

These widespan structures feature an open-web truss, portal frame, and a corrugated iron roof with an 18° pitch. Concrete drive alleys, 5m wide, and feed alleys, 4m wide, run along each side of the building under the roofline. The cow/feed barrier consists of post and rail with sprays to cool cows during hot weather while eating. In the center of the building, three double rows of stalls are designed to accommodate cows weighing approximately 650kg (1,200mm wide) using a conventional design with adjustable rails and no brisket board. Above each double row of stalls, there are large, energy-efficient, magnetic-driven fans (43 in total). Temperature sensors automate the sprays and fans.



Above the platform, four large fans deliver the cooled air onto the cows during milking, and the air is then released over the holding yard.

The dairy holding yard, which is 70m long and 13m wide, is equipped with wobbler sprinklers and 34 fans on automatic controllers to keep cows cool and control flies. Rubber flooring is installed in the high traffic areas, particularly near the platform and down the exit race. The goal is to milk cows in groups of 500, ensuring that they spend no more than 60 minutes in the yard during each milking.



Initially, Mark planned to construct each freestall with a central feeding table. However, concerned about rain wetting the beds nearest the eave, he decided to opt for feed tables along both sides of the building, resulting in six double rows of stalls between them. This modification required widening each facility from 42m to 51m and using additional concrete, resulting in added costs. Nevertheless, this configuration offered two benefits: a 10.8m roof extension beyond the outermost row of stalls on each side, reducing the likelihood of beds getting wet during rainfall, and the need for only three rows of fans instead of four, thereby reducing both capital and running costs.

Initially, the Walpoles planned to use dried manure as bedding in the stalls. However, during the construction of the two freestalls, they received feedback from other farmers who faced mastitis problems when using dried manure in their freestalls. Consequently, they decided to change their plans and use sand instead. To accommodate this change, the Walpoles added a sand recovery system, which was designed to recover 90 per cent of the sand, incurring an additional cost of nearly A\$500,000. Fortunately, the Walpoles' design engineer, a strong advocate for using sand, had positioned the effluent pit so that a sand lane could be easily installed in front of it if the Walpoles chose to switch from dried manure to sand.

The new dairy parlour features an 80-stand rotary platform accessible from a roofed holding yard on the west side. Milk meters measure each cow's milk yield and conductivity. Herd testing every two months provides additional data on milk fat and protein concentrations as well as cell count. The parlour is enclosed on three sides and equipped with large, energy-efficient, variable-speed magnetic-driven fans on the north and south sides. These fans draw air into the parlour through misters, which operate in hot weather to provide evaporative cooling.



The construction cost for all the facilities completed thus far on the new farm, including the dairy parlour, holding yard, feed system, and effluent management system, amounted to approximately A\$10,000 per cow. However, the site has been designed to accommodate two additional freestalls, each capable of housing 1,000 cows, effectively increasing the overall capacity from 2,000 to 4,000 cows. Since the dairy parlour, holding yard, feed system, effluent management system, as well as the power and water systems have been scaled to support a 4,000-cow operation and can be seamlessly connected to the third and fourth sheds, the cost per cow for constructing these additional facilities will be significantly lower. This will help to dilute the capital cost per cow.

As part of their risk management strategy, the Walpoles aimed to accumulate a fodder reserve equivalent to two years' worth of silage usage as the development progressed. Unfortunately, due to challenging weather conditions experienced in Spring 2022, most of the cereal crops were harvested late and turned into lower-quality whole crop silage than usual. Additionally, they faced difficulties in sowing an adequate amount of corn in a timely manner.

Operate phase

In mid-February 2023, the first group of cows to be placed in the freestalls consisted of 400 cows from a neighboring farm with a herringbone dairy.

These cows adapted more easily to the new rotary platform compared to subsequent groups of cows transferred from the Walpoles' home farm, which utilised a rotary dairy spinning in the opposite direction. Mark noted that as the cows approached the bail, they instinctively looked for it to come from the right-hand side, but it was coming from the left. Currently, both freestalls are fully occupied, accommodating 1,000 cows each. One freestall houses the early lactation cow group and first-calvers, while the other freestall accommodates two mid-late lactation groups.



The close proximity of the new farm and the home farm, just 12km apart, allows for easy transportation of cows between the two. Only milkers are housed on the new farm, arriving four days after calving from the home farm and remaining there until dry-off, unless they develop mastitis or become sick. Far-off dry cows, close-up cows, mastitis cows, sick cows, and young stock are all cared for on the home farm by skilled staff. This means the Walpoles have not needed to invest additional capital

in building dry cow pens, maternity pens, sick cow pens, or facilities for calves and heifers at the new farm. The existing facilities at the home farm, including its rotary dairy, continue to be utilised. The combined workforce for both farms amounts to 23 full-time equivalents.

At present, all cows are milked twice a day, with cups attached just before 3:00am and at 2:00pm, approximately 11 and 13 hours apart respectively. After each group leaves the freestall for milking, the feed and stall alleys are flood-washed and scraped. Water from the third effluent pond is used for flushing and irrigation. Instead of large holding tanks, a dual pump system is employed for flushing to ensure a more even water flow rate down each alley, offering better control and lower capital costs.

Feed is mixed and delivered along each drive alley once in the morning, between 3:00am and 10:00am, and pushed up four times per day. Water troughs are emptied and scrubbed daily when cows leave the freestall for milking. The cows and staff are provided with full light for 16 hours per day to ensure comfort and safety. Adjustments were made to the position of the head rail in each stall, as some cows were lunging too far forward. Only six cows have had difficulty adapting to the stalls and were subsequently returned to the home farm. Mark is pleased with the small number of cows standing in the stall alleys, indicating overall cow comfort in the freestalls.



Mark emphasises the importance of ensuring the health and happiness of their cows while maximising milk production.

He observes that "as farmers, what we want is to make our cows healthy and happy, while getting as much milk as possible. The two things go hand in hand."

Mark is pleased to see that, when cows are moved from the home farm to the new farm, their milk production increases by 4 litres (0.3kg milksolids) per cow per day despite the lower nutritional quality of last season's forage crops. Mark finds that the cows are content, and managing the freestall system is much easier compared to a grazing system, which requires constant movement.

“Grazing is moving all the time. Whereas with this system, day-to-day management doesn’t change,” said Mark.

Each cow’s activity, rumination, milk production, and conductivity are being monitored. However, the integration of data from the collars and milk monitoring system is still pending to generate daily exception reports.

The Walpoles have set a target of recovering 90 per cent of the flushed sand using their sand recovery system, but it is still too early to determine if they are achieving this goal. The sand that is removed from the recovery lane is gathered and placed in stacks to dry and sterilise in the sun for a minimum of 30 days. Subsequently, it is transferred to a large shed originally intended for storing dried manure for bedding. From there, the sand is drawn as needed to replenish the beds in each freestall.

During the warmer months, Mark anticipates that the sand can be directly taken from the stacks to the freestalls. Currently, the stalls are topped up with sand twice a week, which poses a challenge as they are utilising an old, inefficient sand-throwing machine borrowed from another farm while awaiting the delivery of their new machine. The initial sand used in the stalls was gritty, leading to hoof lesions, prompting the Walpoles to replace it with finer sand from an alternative source.



Due to a delay in fitting the screen in the manure solid/liquid separator, slurry filled the first two separation ponds during the initial weeks of operation and had to be removed. However, the separator is now functioning as intended, producing a stream of pressed manure fiber with a dry matter content of 30 per cent. This fiber is conveyed up a belt and deposited on top of a stack. Periodically, it is then removed from the stack and spread over the paddocks as fertiliser.



The farm’s development is supported by its double cropping system. The Walpoles aim to harvest a minimum of 20 tonnes dry matter per hectare of corn along with 5-6 tonnes of cereal crops. This represents approximately three times the dry matter yield that would be obtained in a grazing system, with only a slight increase in water usage.

“Tonnes of feed per megalitre of water is what we aim to optimise,” Mark says, emphasising their goal.

What would you do differently?

Mark expresses satisfaction with the design of the facilities and would not make any changes if given the opportunity.

However, he acknowledges that, in hindsight, he would have opted for sand bedding right from the start. Additionally, he would have chosen to purchase fans and other electrical equipment directly from overseas suppliers, without the standard controllers that come with them, to minimise compatibility issues and reduce the installation time required by local electricians.

Where to from here?

Mark anticipates a further boost in daily milk production by improving the quality of forage and implementing three times a day milking for the high production group in the coming months.

A herd replacement rate of about 25 per cent will be maintained, with a 12-month inter-calving interval. Calf rearing facilities on the home farm will be updated over the next 12 months. Looking ahead, Mark is also contemplating the installation of a digester to enhance energy efficiency and reduce costs.

Having successfully navigated the entire development process, including planning, construction, commissioning, and operationalisation, the Walpoles now aim to consolidate their achievements. They will make minor adjustments to fittings in the freestalls and dairy, such as installing sprinklers and fans, and implement a rooftop solar system.

Clear operating procedures and comprehensive job descriptions for the farm team will be finalised and documented in a manual, incorporating the valuable insights gained from managing the facilities more efficiently. Integration of data streams from the cows' collars and milk meters is also on the agenda to fully leverage these technologies for early identification and management of at-risk cows using the automatic draft system in the dairy.

Initially, Mark and Kate had planned to commence phase two of the project, which involves constructing the third and fourth 1,000 cow freestalls, after a three to four-year interval. However, they are now contemplating an earlier start, recognising that expanding the cow population from 2,000 to 4,000 will effectively double their milk production and income, significantly reducing

the development's payback period to approximately five–seven years.

FOR FURTHER INFORMATION

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

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Overview

Farm			
Farm size (ha)	1,000ha (including 400ha lease)		
Grazing area (ha)	200ha		
Cropping area (ha)	800ha (including 400ha lease)		
Production system	Contained housing with 2 freestalls each accommodating 1,000 cows		
Dairy type	80 stand rotary		
Climate (BoM historical data for farm locality)			
Mean annual rainfall (mm)	449		
Mean no. rain days/year	110		
Mean no. days/year $\geq 35^{\circ}\text{C}$	17		
Mean no. days/year $\geq 40^{\circ}\text{C}$	2.6		
Mean annual daily solar exposure (MJ/m^2)	18.5		
Conditions over Summer	Dec	Jan	Feb
Mean temperature ($^{\circ}\text{C}$) at 3:00pm	28.1	29.9	29.9
Mean Relative humidity (%) at 3:00pm	31	30	33
Mean Temp. Humidity Index at 3:00pm	73	75	76
Mean wind speed (km/h) at 3:00pm	11.1	10.5	9.8
Mean daily solar radiation (MJ/m^2)	27.4	27.4	24.1
Herd			
Milking cow numbers	2,000		
Breed	Holstein		
Calving pattern	Year-round		
Production per cow per year (L)	9,000+		
Infrastructure and equipment			
Infrastructure	<ul style="list-style-type: none"> • 2 freestall facilities with sand bedding, flood-washed feed alleys and stall alleys, sprinklers and fans • 80-stand rotary dairy with misters and fans • Roofed dairy holding yard with sprinklers, fans and rubber flooring in high-traffic area 		
Equipment	<ul style="list-style-type: none"> • Mixer wagon and tractor • Tractor for push-ups • Manure separator • Electronic collars and milk meters for monitoring each cow's rumination, activity, milk yield and cell count 		
People			
Full time equivalents (FTEs)	23		
Cows per FTE	87		

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