

CASE STUDY - PURCHASING A MIXER WAGON AND CONCRETE TROUGHS

MARK, ANN & JACOB GARDINER, BAMAWM
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The dairy industry in the Murray region is undergoing significant transition as businesses adapt to reduced water availability, a changing climate, higher input costs, policy and market drivers. The last fifteen years has seen a steady change in the dairy feedbase in the region, with increased annual pastures, cropping and fodder conservation in the mix, and an evolution to partial and total mixed ration (PMR and TMR) systems.

The future operating environment is likely to be characterised by increasing variability and volatility, requiring adaptive management at all levels. Farm businesses in the Murray Dairy region are taking different approaches to managing these changes based on a range of factors related to the business and to the people behind it.

With the support of local dairy businesses, Murray Dairy has developed some case studies on aspects of system change occurring in the region. These are not intended to be a blueprint for change, rather to provide examples of the different strategies that businesses are using to manage risk and volatility in the current environment.



The Gardiners.

Following the transition from a pasture grazing system to feeding in concrete troughs

Milk production per cow increased (from 2.03 to 2.15 kg milk solids per day)

Feed cost were reduced (a combination of reduced wastage and the ability to include cheaper feed)

Despite a capital investment of \$255,000 and an increase in operating costs associated with additional labour, interest costs, depreciation, fuel and R&M, the increase in annual profit would allow the total investment to be repaid in under 2 years

Other benefits of the system included a more flexible and wider range of feed options, positive animal health outcomes and more consistent milk production

Some of the drawbacks included the timing of feed mixing clashing with milking time, and exposure to feeding issues if the mixer wagon broke down

Key leanings included the need for a good nutritionist and the need to feed test all fodder

Introduction

Over the last 30 years Mark and Ann Gardiner have grown their farm at Bamawm from 43ha, milking 190 cows, to around 300ha milking 900 cows. Until 2019, perennial ryegrass was the major component of their feedbase.

In recent years, the summer feeding system had been as follows:

- Cows received a grain mix in the dairy at reasonably high levels (up to 6kg per feed or 12kg/cow/day)
- They then had access to good quality hay, such as vetch, fed in 'waste not' style feeders in a sacrifice area after exiting the dairy
- They grazed perennial ryegrass for the rest of the day.

Around 50 percent of the cows' diet was from direct grazed pasture, 35 percent concentrates and the remaining 15 percent hay or silage. The cows produced well using this system, averaging over 600kg of milk solids (MS)/cow/year.



A 'waste not' hay feeder similar to the ones the Gardiners were using prior to changing to concrete troughs.

This system required around 2,800 megalitres (ML) each year, of which the Gardiners own about 40 percent of this water requirement, relying on the temporary water market and carry-over water for the rest of their water needs.

The Gardiners were successful at and enjoyed running this farming system. They were good at managing the risks in this system by doing things such as carrying over water and hay between each season and using grain contracts. Carrying over a large amount of water into the drought year of 2018-19 meant that they kept most of the perennial ryegrass going over the summer of 2018-19.

The problem

By the start of the 2019-20 season, the Gardiners had only been able to carry 300ML of water into the season and it was looking likely that water allocations would be around 60 percent. Temporary water prices were already over \$500/ML.

Due to a reasonable winter in most of Victoria, hay prices had eased compared to the extreme prices of 2018-19 and the Gardiners were able to purchase reasonable quality hay for \$260/tonne delivered. The price difference between well-made canola hay and vetch hay was around \$50/tonne, leading them to purchase canola hay.

It was a concern to the Gardiners and their nutritionist that if the canola hay was fed unprocessed in hay rings, the cows would waste a lot and intake would be limited due to the time and effort to eat the stalky feed. The canola hay feed tested at 10.3 MJ Metabolisable Energy (ME), 21.5 % Crude Protein (CP) and 28.7% Neutral Detergent Fibre (NDF).

The Gardiners had some hard decisions to make about how they would farm in the 2019-20 season. Mark had calculated that the water price would need to come back to around \$350/ML to justify irrigating the perennial ryegrass over summer compared to purchasing hay.

The feed area and hay feeders at the time only had the capacity to accommodate around 300 cows with no pasture in the system. It was also estimated that a

reduction in wastage of around 20 percent could be made from converting from hay feeders to concrete troughs.

Given their reluctance to purchase extra machinery and feeding infrastructure, and change to a more intensive style of farming, the Gardiners carefully looked at a range of options. Due to the very high water prices, high milk price and high feed costs in 2019-20, as well as the price range of different hay types, the option of purchasing a mixer wagon and concrete troughs came out well in front in the budgets.

The Gardiners decided to invest in the mixer wagon and concrete troughs, believing that the 2019-20 season is unlikely to be a one-off and that the system will be valuable in similar years down the track. They plan on running a perennial pasture-based system again when water prices make it economical.

The solution

During the spring of 2019, the Gardiners purchased;

- A 27m³ NDE mixer wagon for \$132,000
 - The mixer wagon has twin vertical augers, a slide door on one side and an extra-large conveyor belt on the other side to enable the feeding of hay-dominant rations into 'waste not' hay feeders.
- A second hand (25-year-old) 185hp tractor to run the mixer wagon for \$35,000
- 300m of 1.2-metre-wide concrete troughs that the cows could access from both sides (0.7 metre per cow), costing \$55,000

The troughs were placed on the ground (no rock underneath) in two sacrifice paddocks, allowing the Gardiners to run two herds.

- Additional water troughs were installed in the sacrifice paddocks, costing around \$15,000.
- Additional rock was added to gateways and high traffic areas, costing around \$10,000.
- An auger was set up from the silos to feed into the mixer



The Gardiners new mixer wagon under the auger.



The Gardiners new mixer wagon under the auger.

The 3,500 tonnes of large square purchased hay was stacked seven-high in the sacrifice paddocks with hay caps on top (costing around \$7,500) to provide shade for the cows. These stacks of hay were fenced off. Sprinklers in the dairy yard were also used when required to assist with cooling.



The Gardiners new troughs are nearly ready for a new mix to go into them.



The Gardiners hay stacked 7 high with hay caps on top providing the cows with shade. The Gardiners cows in one of the two sacrifice paddocks that include the additional water troughs, concrete feed troughs and hay for shade.

The Gardiners also purchased a telehandler, but they had already planned on purchasing this prior to changing the system due to the large amount of hay (around 1350 tonnes) fed each year.

The Duncan seeder was upgraded, due to sowing around 300ha this year compared to the normal 100ha, costing around \$20,000.



The Gardiners cows in one of the two sacrifice paddocks that include the additional water troughs, concrete feed troughs and hay for shade.

During October 2019, the whole farm was progressively dried off and the two herds were moved into the two sacrifice paddocks full time. These paddocks were harrowed each day.

The diet being fed to the herd changed over time as different feed types ran out or became available. The following was the diet being fed to the herd on the 1st February 2020:

- 8kg wheat (50% fed in the mix whilst the other 50% was fed in the dairy)
- 3.65kg canola meal (50% fed in the mix while the other 50% was fed in the dairy)
- 1.7kg lucerne hay (home grown)
- 4.5kg canola hay
- 2kg grass silage (home grown)
- 85g urea
- Minerals
- Added water to get mix to 48% moisture

The results

Many things changed at once on the Gardiners farm – from pasture making up around 50 percent of the diet to none of the diet, swapping vetch hay for canola hay, confining cows, introducing a mixer wagon and feeding in troughs – it is difficult to know which change caused which result. They were milking an additional 50 cows compared to last year. Seasonal conditions also influence results. For example, the 2019/20 summer was not as hot as the 2018/19 summer.

There are three key things that appear to have improved as result of the changes. These are;

- Milk production has increased by 6% per cow (litres have stayed about the same, but milk solids have increased by around 6%) to an extra 34kg MS per cow
- Reduced feed wastage of the hay by around 20%
- Reduced the average cost of the hay by around \$20/tonne from switching from vetch to canola
 - 1,500t canola hay @ \$285t and 2,000t of cereal hay @ \$240t = average price of \$259t
 - 1,500t vetch hay @ \$330t and 2,000t of cereal hay @ \$240t = average price of \$279t

The following is a list of estimated extra costs due to running the mixer wagon:

- 3 extra hours of work each day
 - 4 hours mixing, 2 hours scarifying but less time driving and irrigating
- An extra 153 litres of fuel each day
- An estimated extra \$20,000/year in repairs and maintenance costs (e.g. tractor servicing costs and replacing worn out or broken parts)
- Depreciation
 - The mixer wagon will be worth half its purchase price in 5 years
 - The tractor (old already) will be worth half its purchase price in 10 years
 - The other infrastructure, such as the troughs, will be worth half the purchase price in 10 years
- Interest on all purchases at 4% per annum

The following table is a breakdown of the costs and income of the Gardiners chosen approach (the introduction of the mixer wagon and concrete troughs) in comparison with the alternative option (feed out of vetch

in hay rings). This considers that the Gardiners would have dried off the pastures regardless due to the high price of water.

It is impossible to know if the increase in milk production is due to the mixing of feeds or if some of it is due to not grazing and/or better summer conditions and/or change in fodder quality compared to last year.

The feed wastage savings are also an estimation as no comparison/calculation could be done. The feed cost savings (price per tonne) are actual.

The Gardiners had the cows confined and off pasture for approximately 180 days. For the remaining 185 days, the cows will predominantly graze pastures and will not require as much fodder fed. Although the mixer wagon and troughs may be used to a lesser extent during the grazing period, it is not included in the analysis based on the fact that the Gardiners would not have purchased the mixer wagon and troughs for this purpose.

Hence, this partial budget is only for the 180 days without pasture and focuses only on what has changed. It is by no means an indication of the whole farm's profitability.

Table 1 Comparison of costs and income before and after the Gardiner's investment in a mixer wagon and troughs

900 cows fedlot for 180 days	Before	After
Income/Savings		
Milk		
KG MS per cow per day	\$2.03	\$2.15
Milk price \$/KgMS (indicative milk price not actual)	\$7.20	\$7.20
Milk income per cow	\$14.62	\$15.49
Feed		
Feed wastage saved (Kg DM)	\$0	\$1.64
Fodder cost per cow per day (price and wastage factored in)	\$3.83	\$2.96
Total income/savings per cow per day		\$1.75
Whole farm income/savings per year		\$283,141
Extra cost		
Mixer wagon interest (4%)		\$5,280
Mixer wagon Depreciation (half value after 5 years)		\$13,200
Tractor Interest (4%)		\$1,400
Tractor Depreciation (half value after 10 years)		\$1,750
Interest on extra infrastructure (4%)		\$3,400
Depreciation on other infrastructure (half value after 10 years)		\$4,250
Extra Fuel (\$153 per day)		\$27,540
Extra Labour (3 hours x \$33 hour per day)		\$17,820
R&M		\$20,000
Total Extra Costs		\$94,640
Annual extra profit due to the change		\$188,501
Income over additional cost per cow per day		\$1.16

It is important to note that this is the highest milk price this farm has ever received and some of the highest feed prices ever paid. If the milk and feed prices were not as high, the results would not have come out so far in favour of the change. Using the average milk and feed prices for the Gardiners farm over the last six years, the annual extra profit for 2019–20 calculates out at \$133,513. As can be seen by the results, the purchase costs of the mixer wagon, new tractor, troughs and other expenses (total cost of \$255,000) will be paid back in under two years.

Other benefits

Whilst it is difficult to calculate an economic benefit, introducing the mixer wagon and the concrete troughs has had other benefits that have not been calculated. Some examples are:

- More flexibility and wider range of feed types can be used.
- Allowed for alternative feed sources, such as urea, to be used to reduce the overall diet cost without reducing milk production.
- Positive animal health benefits such as lower cell count, improved milk fat test and healthier looking cows.
- More flexibility in managing each season. The wagon and troughs allow the Gardiners to choose the best feed scenario in accordance to water, feed and milk prices along with seasonal conditions.
- Milk production has been more consistent; doesn't fluctuate as much day to day as it did on pasture.

Some of the drawbacks

As with any change to a dairy farm system, not every aspect will be positive. Some of the drawbacks the Gardiners have found are:

- The need to have the mixes fed out while the cows are being milked, and very little time flexibility with this. This means somebody must be there making the mixes in the morning (5am) prior to milking.
 - The mix can only be partly made up the night before because not all the hay can fit in the mixer wagon without being wet down. It is not good (particularly in summer) to have hay soaking in water all night.
- Very exposed if the mixer wagon broke down.
- Effectively using a mixer wagon is a new skill for staff to learn and it is very costly if things go wrong due to user error.

Key learnings

Some of the key things the Gardiners have learnt are:

- A good nutritionist is especially important to getting the best out of this system
- Feed test all fodder
- There is less flexibility when feeds are mixed and fed out, making the timing of when tasks are done particularly important
- Need to clean water troughs out regularly
- Need to have a plan in place for how to manage wet conditions. This is the biggest risk for this new system.
- Having non-irrigated existing perennial pasture paddocks to put the cows on in the autumn worked well when it was too wet to keep the cows in the designated sacrifice feed areas or on newly sown pastures. The Gardiners consider it important to delay starting up some of the pastures in the autumn so that there are dry areas to put the cows on if it becomes wet before the new pastures are established.
- The wider troughs have worked well with the majority of hay mixed being fed in them. No cows have been stuck in the troughs.

FOR FURTHER INFORMATION

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