Dairy Directions — Analysing Farm Systems for the Future

Providing robust analysis of the impact of on-farm changes and innovation on the profitability of dairy farm systems

Impacts of variable water availability – options for your dairy business
A case study from the Macalister Irrigation District

Background

Perennial pasture-based dairy systems in the Macalister Irrigation District (MID) are reliant on irrigation water to optimise production. Uncertainty in regards to the availability of irrigation water, fluctuating milk prices and changing operating conditions mean that dairy farm businesses are under pressure to maintain profitability. A dairy case study farm in the MID was used to examine the impact of changing water availability, and to investigate some potential future options the business could adopt to maintain or increase profit.

The case study farm was initially analysed under long term average conditions and prices. It was assumed that in 9 out of 10 years the farmer would receive enough water to grow the desired amount of feed. It was also assumed that a drought would occur on average 1 year in 10 and it would occur randomly within a 10-year period.

Before any changes were made (base farm) and under typical prices, the case study farm was efficient and profitable. If the business continued to perform at it's current level, it would be able to repay it's debt within 8 years. However, if there was more than one drought during the 10-year period, the debt repayment would take longer than 10 years. Although there was no need to make dramatic changes to the farm system, there were a number of options that could be considered if conditions changed in the future. Four alternative futures were analysed; two of these were associated with changes in water availability, while the remaining two options explore intensifying the farm system and expanding the business.

Specifically, the four alternative scenarios investigated were:

1. Purchase more supplementary feed, if the availability of high reliability water share (HRWS) was reduced.
2. Sell some HRWS and purchase temporary water each year to reduce debt. The herd size and pasture consumption were maintained.
3. Increase pasture consumption on the home farm to 16 t DM/ha by increasing cow numbers.
4. Purchase land and increase cow numbers to maintain a similar stocking rate as the base farm.

Details of the base farm and alternative options examined are given in Table 1. Discounted net cash flow budgets over a 10-year period were used to evaluate the different options.

Table 1: Key details of the base farm system and alternative options examined (a negative value indicates the sale of the asset)

	Base farm	Option 1	Option 2	Option 3	Option 4
Milking area (ha)	65	65	65	65	90
Outblock Ha)	42	42	42	42	42
Total farm area (ha)	107	107	107	107	132
Cow numbers	262	262	262	314	366
Pasture consumed on milking area (t DM/ha)	13.3	13.3	13.3	16.0	13.1
Pasture consumed on outblock (t DM/ha)	6.8	4.5	6.8	6.8	6.8
Stocking rate	4.0	4.0	4.0	4.8	4.1
High Reliability Water Share (HRWS) (ML)	377	325	182	377	520
Irrigation water used - milking area (ML/ha)	6	6	6	6	6
Irrigation water used - outblock (ML/ha)	1.2	0	1.2	1.2	1.2
Herd costs ($'000)	59	59	59	71	83
Shed costs ($'000)	14	14	14	17	20
Purchased feed (% of total feed required)	27	34	25	33	34
Cows purchased ($'000)	-	-	-	62	120
Land purchased ($'000)	-	-	-	-	375
Additional tracks ($'000)	-	-	-	-	25

Cash (annual net cash flow), profit (nominal internal rate of return) and wealth (nominal owner's capital) were the measures used to assess the performance of the business. The average results for the base farm and each option are presented in Table 2. When analysing the performance of the base farm and alternative options, each year of the 10-year budget was also run with different prices, costs and pasture yields to reflect the variability that farmers experience. This was done 10,000 times to generate 10,000, ten year runs.

Table 2: Average financial and economic performance over 10 years of the base farm and the alternative options

	Base farm	*Option 1*	*Option 2*	*Option 3*	*Option 4*
Average annual net cash flow (steady state; $'000)	110	73	95	71	139
Average nominal internal rate of return (%)	7.3	6.1	7.9	5.7	7.6
Average nominal owner's capital ($'000,000)	3.96	3.57	4.81	3.41	3.94

A way to look at the relative performance and riskiness of each option is to use box plots. The variability in nominal internal rate of return (IRR) is shown in Figure 1, as an example. Each box contains 50% of the output data.

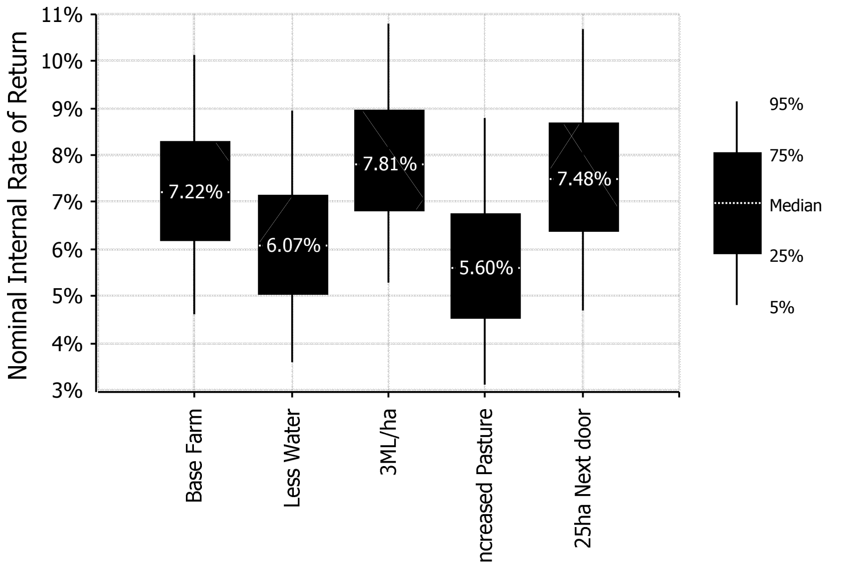

Figure 1 Box plots of nominal internal rate of return for the options analysed.

How did each option perform?

Option 1 – Purchase feed if water availability is reduced

This option was analysed to examine an alternative future with reduced water availability. It was assumed that 34% of feed requirements would need to be purchased compared to 27% for the base farm system. This option was less profitable than the base farm, and average annual net cash flow and wealth also declined when compared with the base farm (Table 2). To maintain profitability in the medium to long-term when there is a reduction in total water availability, the farm manager would need to consider additional, changes to the operating system apart from just purchasing additional feed.

Option 2 – Sell some HRWS and purchase temporary water each year

This option involved selling 130 ML of HRWS for $2,200/ML to reduce debt and opportunistically purchasing temporary water each year, costing on average $12,000/year at $90/ML over the 10 years. This option was more exposed to changes in water price and availability, but exposure to interest rate variability was reduced. This option resulted in a slightly lower average annual net cash flow, but higher profit (nominal IRR increased from 7.3% to 7.9%) and increased wealth (the average nominal owner's end capital in year 10 increased) compared to the base farm (Table 2). The variability (standard deviation) in these measures was similar for this option and the base farm, indicating that this option could be a slightly more profitable system than the base farm, at a similar level of risk.

Option 3 – Increased pasture consumption by increasing cow numbers

This alternative option looked at intensifying the farm system by increasing pasture consumption. This was achieved by extra fertiliser applications and increased pasture renovation at a cost of $10,000/year, and purchasing an additional 52 cows (Table 1). This option did not seem to perform as well as the base farm; the average annual net cash flow, wealth and profit all decreased (Table 2). This system is reliant on pasture as a relatively cheap source of feed, and the costs of increasing pasture consumption to 16 t DM/ha appear to be higher than the benefits obtained from it. In addition, data from the Victorian Dairy Industry Farm Monitor survey suggest that few farms can consistently achieve very high levels of pasture consumption. For farms in the MID that participated in the survey, the average perennial pasture consumption between 2007/08 and 2011/12, was 11 t DM/ha, with the range between 6 and 16 t DM/ha.

Option 4 – Purchase land and increase cow numbers

This option involved purchasing 25 ha of neighbouring land and using it as additional milking area. To maintain a similar stocking rate to the base farm an additional 104 cows were purchased. It was assumed that the investment was made entirely by borrowed capital with a total cost of $795,000 for the land, cows, water and infrastructure upgrades. This option resulted in a similar average nominal owner's end capital in year 10 when compared with the base farm (Table 2). However, this option also has the potential to achieve a higher annual net cash flow and profit compared with the base farm, with the nominal IRR of the whole business increasing slightly from 7.3% to 7.6% (Table 2). The nominal IRR on extra capital invested was 8.7%. The results indicate this may not be a good option if the investment was made entirely from borrowed capital. Factors such as purchasing capital and infrastructure at a cheaper price, increased pasture consumption on the milking area and receiving a milk price incentive for increased production may make this option more attractive.

Conclusion

In the face of continuing competition for resources and a rise in real costs of key inputs (e.g. labour, capital, purchased feeds) with a stable or declining real price for milk fat and protein, this study analysed two options for a farm in the MID under changed water availability. Options to intensify or expand the farm business were also examined. Although the base farm was performing well, the alternatives analysed provide some scope for the business to lift productivity and offset the impacts of a future cost-price squeeze.

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