Investing in improved irrigation scheduling to increase pasture growth in northern Tasmania

KEY MESSAGES

- Improved irrigation scheduling was implemented on a centre pivot that irrigated a 141ha area of pasture for dairy production at Meander in Tasmania.
- Improved irrigation scheduling provided benefits with pasture growth rates being approximately 20 kg DM/ha/day higher on the case study farm than the nearby farms (this was estimated to produce an additional 3.6 t DM/ha over the 180 day period).
- Investing in improved irrigation scheduling was a very profitable option for this site, even if an extra 0.5 t DM/ha of pasture is consumed.
- This centre pivot covers a large area which enables benefits to be realised over a large area from a relatively small capital investment. An investment in improved irrigation scheduling may not be as profitable for a site with a smaller irrigated area.

ABOUT THE RESEARCH

As part of the ***Smarter Irrigation for Profit Phase 2*** (SIP2) project, James Hills and David McLaren of Tasmanian Institute of Agriculture (TIA) set up soil moisture monitoring equipment on a Focus Farm near Meander in northern Tasmania and helped implement improved irrigation scheduling practices on a centre pivot that irrigated a 141ha area of perennial ryegrass pasture for dairy production. Pasture growth rates on the case study farm were compared with several nearby farms that had not adopted the improved scheduling technology and practices.

ANALYSIS OF FARM LEVEL COSTS AND BENEFITS

The estimated benefits and costs of incorporating improved irrigation scheduling into the 141 ha pivot were analysed. The analysis applied discounted cashflows over 10 years.

Capital Expenditure/Setup Costs. A cost of $6,500 was assumed to purchase and install 2 soil moisture probes.

Amount of extra pasture consumed. The pasture growth rates were measured with a rising plate meter, and this indicated that there was an extra 20 kg DM/ha/day for 180 days on the Focus Farm when compared with several nearby farms. This was attributed to implementing the improved scheduling. This suggests an additional 3.6 t DM/ha/year could be consumed. However, not all of this additional pasture may be utilised, and it is possible that other differences in management practices may have also had an impact on this. In this analysis we tested a range of additional amounts of pasture consumed (0.45, 0.9, 1.8 and 3.6 t dry matter per ha) and we estimated the 'break-even' amount required that would result in improved scheduling being an attractive investment.

Value of extra pasture consumed. A value of $250/t dry matter for the additional pasture was used to represent a long-term typical value for supplementary feed of similar quality (assuming all the extra pasture could be consumed via grazing and no extra harvesting costs were incurred. A value of $125/t

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dry matter were also used to test the sensitivity and is likely to be a better reflection of the value if the extra pasture needed to be conserved and fed back.

Value of extra irrigation water. It was assumed that the total amount of water being applied by the pivot increased by 1.25 ML/ha/year (about 30%) to optimise start-up time and irrigation frequency. A value of $70/ML was assumed for the additional irrigation water (this included pumping costs). A value of twice this amount was also analysed.

Other changes in operating costs. It was assumed that there were extra labour costs of $500 per year to collate and interpret data. A software subscription of $1,000 per year was assumed.

Investing in improved irrigation scheduling for this site would provide very attractive returns if an extra 0.5 t DM/ha of pasture is consumed

The results indicate that the investment in improved irrigation scheduling provides attractive returns if an extra 0.42 t DM/ha of pasture is consumed, with and Internal Rate of Return (IRR) of 15% and 7 years to break-even (Table 1). The pasture growth rate measurements indicated that the extra pasture consumed was substantially higher than this, making the investment in improved scheduling very profitable. If the extra pasture consumed is below 0.40 t DM/ha, then the investment becomes very unattractive as the extra irrigation water costs outweigh the benefits from the extra pasture.

Table 1. Summary of results. Discounted cashflows of benefits from VRI compared to the baseline scenario.

Extra pasture consumed (t DM/ha) (Extra Pasture valued at $250/t DM)	**0.45**	**0.9**	**1.8**	**3.6**
Internal Rate of Return (nominal)	48%	Over 100%	Over 100%	Over 100%
Years to pay back (after interest)	3	2 or less	2 or less	2 or less

The results are sensitive to the value of the extra pasture consumed (Table 2). If 0.85 t DM/ha of extra pasture was consumed, then it appears improved irrigation scheduling would still be an attractive investment (IRR 20%) for this site if the value of the extra pasture was $125/t DM. This value for the extra pasture is likely to be a better estimate if the extra pasture needed to be conserved and fed back as was sometimes the case for this site.

Table 2. Sensitivity to the value of extra pasture. Discounted cashflows of benefits from VRI compared to the baseline scenario.

Extra pasture consumed (t DM/ha) (Extra pasture valued at $125/t DM)	**0.45**	**0.9**	**1.8**	**3.6**
Internal Rate of Return (nominal)	Highly negative	48%	Over 100%	Over 100%
Years to pay back (after interest)	10 or more	3	2 or less	2 or less

If the extra irrigation water was twice the value that was initially assumed ($140/ML rather than $70/ML), then the investment in improved scheduling would require about 1.6 t DM/ha of extra pasture consumed at a value of $125/t DM (Table 3) to be an attractive investment. This value for irrigation water would be more relevant in other irrigation regions.

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Table 3. Sensitivity to the amount of irrigation water and power saved. Discounted cashflows of benefits from VRI compared to the baseline scenario.

Extra pasture consumed (t DM/ha) (Half the water and power savings and extra pasture valued at $125/t DM)	**0.45**	**0.9**	**1.8**	**3.6**
Internal Rate of Return (nominal)	14%	25%	Over 100%	Over 100%
Years to pay back (after interest)	7	5	2 or less	2 or less

Concluding remarks

It appears likely that investing in improved irrigation scheduling was a very profitable option for this site. This centre pivot covers a large area which enables benefits to be realised over a large area from a relatively small capital investment. An investment in improved irrigation scheduling may not be as profitable for a site with a smaller irrigated area.

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