



Cost benefits of investing in a new mainline and a sprinkler pack for a centre pivot in southern NSW.

KEY MESSAGES

- A proposal to invest in an upgraded mainline and a sprinkler pack was analysed for a centre pivot that irrigated a 25ha area of pasture for dairy production near Bega on the NSW south coast.
- Investing in the mainline upgrade and sprinkler pack is predicted to be a very attractive option for this site if an additional 2 t DM/ha of pasture is consumed across the 25ha pivot. However, it appears that an increase in pasture consumption of this magnitude would be optimistic.
- This centre pivot covers a relatively small area. Investment in options to improve efficiency with lower capital expenditure may be worthwhile. For example, if the capital expenditure was just on the sprinkler pack, an additional 0.17 t DM/ha of pasture consumed would make this an attractive investment, which appears likely.

ABOUT THE RESEARCH

The major objective of this project was to identify key irrigation system modifications and practices that could be efficiently and effectively adopted by dairy farmers to achieve improvements in energy and water usage and increase pasture consumption per ML of irrigation applied. This report is focussed on a site near Bega where a 25ha area of kikuyu/annual ryegrass pasture for dairy production was irrigated with a centre pivot.

An audit of the pivot found that there was potential to improve distribution uniformity and irrigation efficiency with the incorporation of a larger mainline and a new sprinkler pack for the centre pivot. It is possible that Variable Rate Irrigation (VRI) could improve irrigation efficiency but, given the centre pivot is 20 years old (and covers a relatively small area) the high capital cost of VRI is unlikely to provide a profitable return. Hence, it was considered sensible to focus on lower capital cost options and improvements that would also be beneficial if the pivot was replaced, such as an upgraded mainline.

ANALYSIS OF FARM LEVEL COSTS AND BENEFITS

The estimated benefits and costs of the incorporation of a larger mainline and a new sprinkler pack for the 25 ha centre pivot were analysed. The analysis applied discounted cashflows over 10 years.

Capital Expenditure/Setup Costs. A cost of \$110,000 for the incorporation of a larger mainline and \$7,000 for a new sprinkler pack fitted was assumed. It was assumed that the mainline upgrade would have a useful life of at least 20 years (and the sprinkler pack 10 years) and be beneficial even if the current pivot was replaced.

Amount of extra pasture consumed. The pasture growth rates were measured with a rising plate meter and the difference between the more productive and less productive areas indicated that there was potential to produce an extra 2 t DM/ha/year over 12.5 ha of the 25 ha area as a result of incorporating a larger mainline and a new sprinkler pack to improve distribution uniformity. This equates to an additional 1 t DM/ha/year over the whole area. However, it is possible that more than





half of the area may have some benefit and the benefit may vary between years. Hence, in this analysis we tested a range of additional amounts of pasture consumed (0.5, 1.0, 1.5 and 2.0 t dry matter per ha) to estimate the ‘break-even’ amount required that would result in these upgrades 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 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 irrigation water saved. It was assumed that the total amount of water being applied by the pivot remained the same, it was just distributed more evenly.

Value of energy saved. It was assumed that the total amount of energy required for pumping was reduced (it was estimated that this would equate to a reduction of \$1,000/year in power costs). Savings of twice this amount were also analysed.

Other changes in operating costs. It was assumed that there was a saving in repairs and maintenance costs of \$1,000/year with less waterlogging of areas that were previously over-watered and the wheel tracks staying drier.

Investing in the mainline upgrade and sprinkler pack for this site would provide attractive returns if an extra 2 t DM/ha of pasture is consumed but, this appears optimistic.

The results indicate that the investment in mainline upgrade and sprinkler pack provides attractive returns if an extra 2 t DM/ha of pasture is consumed, with an Internal Rate of Return (IRR) of 15% and 8 years to break-even (Table 1). However, the pasture growth rate measurements indicate that the extra pasture consumed is likely to be closer to 1 t DM/ha which results in an IRR of 6%, making this upgrade a relatively unattractive investment. The analysis indicates that the capital expenditure would need to be approximately half what was assumed to get an IRR of 15% if the extra pasture consumed is 1 t DM/ha.

If the capital expenditure was just the \$7,000 on the sprinkler pack, and there was no upgrade of the mainline, an additional 0.165 t DM/ha of pasture consumed would make this an attractive investment with an IRR of 15% and 5 years to break-even.

The mainline upgrade may have additional benefits to the farm business by enabling areas adjacent to the centre pivot that are currently not irrigated to be developed for irrigation. This possibility was not investigated in this analysis.

Table 1. Summary of results. Discounted cashflows of benefits from upgraded mainline and sprinkler pack compared to the baseline scenario.

Extra pasture consumed (t DM/ha) (Extra Pasture valued at \$250/t DM)	0.5	1.0	1.5	2.0
Internal Rate of Return (nominal)	2%	6%	11%	15%
Years to pay back (after interest)	10 or more	10 or more	10 or more	8



The results are sensitive to the value of the extra pasture consumed (Table 2). If the value of the extra pasture was \$125/t DM, the investment in mainline upgrade and sprinkler pack does not provide an attractive return even if an extra 2 t DM/ha of pasture is consumed, with an IRR of 6% and 10 or more years to break-even (Table 2).

If the value of the extra pasture was \$375/t DM, the investment in mainline upgrade and sprinkler pack does provide an attractive return if an extra 1.5 t DM/ha of pasture is consumed, with an IRR of 18% and 7 years to break-even. This value is likely to be a reasonable estimate for a drought period but, is unlikely to remain at this level for the life of the investment.

Table 2. Sensitivity to the value of extra pasture. Discounted cashflows of benefits from upgraded mainline and sprinkler pack compared to the baseline scenario.

Extra pasture consumed (t DM/ha) (Extra pasture valued at \$125/t DM)	0.5	1.0	1.5	2.0
Internal Rate of Return (nominal)	0%	2%	4%	6%
Years to pay back (after interest)	10 or more	10 or more	10 or more	10 or more

If the power savings were twice what was initially assumed (\$2,000/year rather than \$1,000/year), then the investment in a mainline upgrade and sprinkler pack would improve slightly (Table 3).

Table 3. Sensitivity to the amount of power saved. Discounted cashflows of benefits from upgraded mainline and sprinkler pack compared to the baseline scenario.

Extra pasture consumed (t DM/ha) (Twice the power savings and extra pasture valued at \$250/t DM)	0.5	1.0	1.5	2.0
Internal Rate of Return (nominal)	4%	8%	12%	16%
Years to pay back (after interest)	10 or more	10 or more	10 or more	8

Concluding remarks

It does not appear likely that investing in the mainline upgrade and sprinkler pack will be a very attractive option for this site unless an additional 2 t DM/ha of pasture is consumed across the 25ha pivot. This centre pivot does not cover a very large area and lower capital cost options may be worth considering. If the capital expenditure was just on the sprinkler pack, and there was no upgrade of the mainline, an additional 0.17 t DM/ha of pasture consumed would make this an attractive investment. An increase of this magnitude appears likely.

There may be additional benefits to the farm business from the mainline upgrade that were not investigated in this analysis.

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