FarmWater

Fact Sheet

Comparing Total Costs of Irrigation Systems in Victoria

March 2015

Currently, there are four main choices of irrigation system in Northern Victoria gravity irrigation areas:

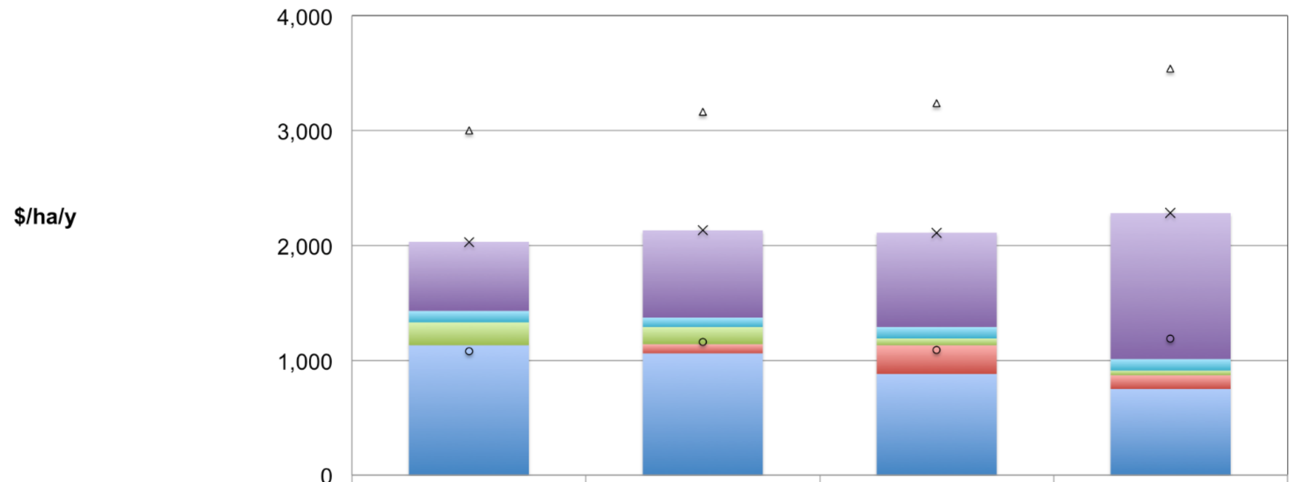
- **Gravity Surface Irrigation**
- **Pipe and Riser Surface Irrigation**
- **Centre Pivot Spray Irrigation**
- **Drip Irrigation**

This fact sheet analyses and compares the lifetime financial costs associated with setting up and operating these different systems. The comparison highlights that while the type of system is important, other factors such as proper design, maintenance and management were more important drivers affecting total costs.

Comparison of Costs – Standard Systems

Below is an analysis of projects that have already been completed under the Farm Water Program. This analysis may guide or assist others in determining the costs associated with developing efficient irrigation systems. Key findings showed that:

- **The total cost of irrigation was roughly the same ($2,100/ha/year) for all four systems if used every year.**
- **More than 80% of the cost of irrigation was attributable to ownership (capital) and water costs.**
- **Pumped systems had higher ownership (capital) costs, however, water savings due to improved water use efficiency and labour efficiency offset these extra costs (but only if irrigated every year).**



	Surface irrigation (gravity channel)	Pipe and riser (pumped)	Centre Pivot (pumped)	Drip (pumped)
Ownership costs	600	760	820	1,270
Repairs, maintenance & motorbike	100	80	100	100
Labour	200	150	60	40
Power	0	80	250	120
Water	1,130	1,060	880	750
× Total	2,030	2,130	2,110	2,280
○ Total optimistic (low estimate)	1,080	1,160	1,090	1,190
△ Total pessimistic (high estimate)	3,000	3,160	3,240	3,540

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Comparing Total Costs of Irrigation Systems in Victoria (cont.)

Factors Affecting Cost Analysis (Assumptions Used in Study)

Various factors can influence the actual cost of irrigation development on a particular farm. Every situation will be different but to simplify comparison, the analysis considered:

- **Pumping Technology and Pipe Design:** Pump type and pipeline size (diameter and length) can affect pump efficiency and friction losses. Beware of the trade off between undersized components to reduce capital costs and subsequent higher operating costs. This analysis assumed irrigation systems installed to current recommended practice.
- **Productive Life:** Mechanical and specialised components (pumps, motors, centre pivots, drip lines) had an assumed life of 15 years; while civil works (pipelines and earthworks) were given a life of 25 years. This was used to calculate the annual depreciation component of ownership costs.
- **Interest:** The same terms were applied to all systems (ie. an annual interest rate on borrowings at 6% was included in the ownership costs). The upfront capital cost assumed for each system was: $6,000/ha for gravity channel surface irrigation, $7,500/ha for pumped pipe and riser, $6,500/ha for centre pivot and $10,000/ha for drip irrigation.
- **Irrigation Efficiency:** This analysis assumed that drip and spray irrigation achieve target crop yields with less water. (There may also be yield differences between irrigation systems that have not been included).
- **Maintenance and Management:** Poorly designed, installed and maintained systems will cost more to run that ones that are operated according to industry standards.
- **Water Delivery:** The analysis assumed water was supplied to the property by channel. Extra costs would be incurred if the water needed to be lifted from a river or pumped a long distance.
- **Crop Type:** The analysis assumed irrigation every year (ie. if the system is not being used every year, the variable costs such as power, water and labour are not incurred in the non-irrigation years. Therefore, a system with lower ownership costs will be more attractive in these circumstances.).
- **Water Cost:** The analysis assumed water costs of $125/ML/year, based on $45 delivery charges plus $80 for the market price of water. Market variability will have an impact on water costs.
- **Labour:** A cost of $25 per hour for labour was assumed.
- **Power:** Electricity to drive pumps was assumed at a cost of 25 cents per kW/hour.
- **Production Lost During Redevelopment:** It was assumed that works were successfully scheduled and completed to avoid any production losses.

Data Sensitivity

The optimistic and pessimistic ranges shown in the diagram overleaf reflect the results of a sensitivity analysis on the various inputs. Discussions with farmers and an examination of the data from various case studies confirmed enormous ranges. For example:

- High costs associated with centre pivots that got bogged and the need to then be replaced after ten years;
- Major overhauls to replace sprinklers, tyres and track maintenance;
- Wide ranges in power costs (eg. some being very low due to the use of off peak tariffs).

The main factors that influenced operating costs, capital costs, and system life were design, maintenance and management. Therefore, optimistic and pessimistic scenarios were developed to explore these ranges in costs:

- The optimistic scenario was based on operating costs being 50% of the assumed base case, capital costs being 33% lower and an additional five years life therefore gained from the system.
- The pessimistic scenario assumed the base case operating costs increased to 150% of the assumed base case, capital costs were 33% higher and five years reduced life occurred.

The sensitivity analysis showed all systems examined had large ranges between optimistic and pessimistic scenarios. These ranges were wider ($+/- 1,000/ha/y) than the differences in costs between efficient systems ($250/ha/y). This therefore indicated design, maintenance and management were more important drivers of total costs than the differences between the types of efficient systems.

Conclusion

It is worth investing time to ensure the design of the system matches your needs so that costs are no higher than necessary.