

Irrigation: one of the keys to reaching yield potential



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Sugarcane grows fastest under conditions of adequate moisture, sunlight and temperatures over 24°C. Growth measurements of over 40 mm per day have been recorded. In the absence of growth restraints such as weeds, pests, gaps or compaction, the plant grows in direct proportion to the amount of water available up to its yield potential.

The maximum amount of water the crop can use – and therefore its yield potential – is determined by the annual evaporation rate and the crop water-use factors. As the moisture is removed from the soil by the growing crop, growth rates decline rapidly in response to the moisture stress.

For each 100 mm of soil water used by the crop, approximately 10 tonnes per hectare of cane is produced.

Using the annual evaporation rate and the crop water-use factors, the total crop water use can be calculated (see **Table 1**). When the total rainfall and the effective rainfall – that is, the rainfall which can be used by the crop and is not lost to deep drainage or runoff – are also known, the irrigation requirement for each district can be calculated.

The irrigation requirement varies between districts with some areas not requiring irrigation at all, and others such as the Burdekin region requiring full irrigation.



Table 1 (below): Irrigation requirements in sugar regions (from Kingston *et al.* 2000).

Region	Annual crop water use (mm)	Rainfall (mm)	Effective rainfall (mm)	Irrigation requirement (mm)	Level of irrigation
Innisfail	1310	3562	1205	100	Nil
Burdekin	1520	1058	600	920	Full
Mackay	1490	1676	870	620	Supplementary
Bundaberg	1360	1106	854	500	Supplementary
Grafton	990	975	782	200	Nil



In the absence of irrigation, cane yields are limited to the water provided by the effective rainfall. **Table 2** shows the estimated crop yields (using the APSIM model) which could be produced from the rainfed situation and compares this yield to the potential yield achieved from full irrigation. The increases in yield which can be achieved through full irrigation range from 60 to 123 t/ha.

Location	Rainfed (t/ha)	Irrigated yield (t/ha)	Increase from irrigation (t/ha)
Bundaberg	62	130	68
Childers	60	120	60
Mackay	84	144	60
Mareeba	29	152	123
Proserpine	73	154	81
Sarina	84	144	60

Table 2 (right): Estimated crop yield (365-day crop) under rainfed and unlimited irrigation conditions.

Benefits from irrigation

In many districts, irrigation can have a large and positive impact on cane yields. If district yield potentials are to be met, irrigation is essential.

So, does irrigation pay?

The rising cost of electricity for pumping, and high water costs, have some growers wondering whether irrigation is still a profitable operation.

The answer to this question will depend on an individual's farm operational costs, and the following information may help to make this decision.

The cost of irrigation

Water costs

Water charges are highly variable throughout the industry. In some regions, growers have access to low-cost water from bores or unregulated streams whereas, in other regions, growers who rely on irrigation schemes can pay between \$50 and \$120 per ML.

Pumping costs

Some growers are able to operate irrigation systems directly from the irrigation outlet with no pumping cost. A recent survey of electricity usage found that a typical low-pressure system such as a centre pivot had a pumping cost of \$55/ML, while a high-pressure system such as a water winch had a pumping cost of \$90 per ML.

Income growth from irrigation

The income produced as a result of irrigation can be measured by the cane yield response to applied water. Typically, cane yields are increased by six to 10 tonnes of cane for each ML of water applied. If cane is priced at \$40/t and the harvesting cost is \$10/t, then an extra \$30 of income can be generated for each additional tonne of cane grown.

A few scenarios

	Furrow direct from outlet: no pumping	Low-pressure centre pivot	High-pressure water winch
Income/ha			
Extra cane grown per ML	6 tonnes	10 tonnes	8 tonnes
Extra income per ML	\$180	\$300	\$240
Less costs			
Water cost	\$60	\$90	\$90
Pumping cost	\$0	\$55	\$90
= Profit/ha from irrigating	\$120	\$155	\$60

