



Variable Rate Irrigation and VARIwise in centre pivot dairy production

Applied case study

Property	Tasmanian Institute of Agriculture Dairy Research Facility
Production details	Milk 340 cows on 130 ha pasture of which 65 hectares is irrigated pasture
Area developed with SIP2 research	25 ha
Irrigation system	Centre pivot with capacity of 8.5 mm/day
Pasture	Perennial ryegrass
Water source	Groundwater and storage
Soil type	Red ferrosol
Average rainfall	1040 mm

What SIP2 innovation was applied?

As part of Smarter Irrigation for Profit Phase 2 (SIP2) the Tasmanian Institute of Agriculture (TIA) Dairy Research Facility (TDRF) and University of Southern Queensland (USQ) trialed variable rate irrigation (VRI) with VARIwise autonomous control technology under a 25 ha centre pivot.



Standard VRI technology applies variable irrigation rates based off soil structure and water holding capabilities determined through soil and terrain mapping. This data is collected manually and often only at initial setup. In comparison, VARIwise was developed to automatically link in with sensors including soil characteristics, dairy pasture characteristics, and climate to provide a more accurate and near real time update of crop water requirements.

What were the benefits?

Increased pasture production from greater matching of irrigation to crop water requirements.

Standard VRI allows more accurate irrigation application and scheduling based on the soil and terrain mapping, which has been shown to increase pasture production by 0.5 to 1 t/DM/ha. By using a more dynamic mapping process that includes near real time updates of soil, climate, and pasture growth, VARIwise has been shown to generate additional benefits of up to 1 t/DM/ha compared to standard VRI.

The TIA Livestock Production Centre Leader James Hills stressed that field variability will play a key role in the benefits realised from VRI technology. “If your field has a lot of variation in elevation or soil type, then the irrigation water requirements could vary significantly” said James, “VRI allows you to meet that variation, so you should get higher pasture production out of VRI compared to flat rate irrigation, and higher again with VARIwise due to the greater alignment between water requirements throughout the season”.

Reduced labour requirement

In addition to the automated mapping, the VARIwise technology incorporates an autonomous component. This allows it to communicate to pumps to turn the system on and off as required. This has the potential to take away any form of decision making and labour relating to irrigation scheduling.



Reduced water use

Compared to flat rate irrigation, standard VRI technology has been able to reduce water use by between 20 to 30 percent. This is due to both better irrigation scheduling, and also avoided watering on non-productive areas: “VRI turns off as it goes over the laneways and other non-productive areas, so you are not watering those areas that don’t need it”, said Bradley Millhouse, TDRF farm manager.

James said the trials have shown that VARIwise further enhances the in-field irrigation efficiency through the near real time data updates on soil moisture and pasture growth. “In the TDRF trials the VARIwise system improved the water use efficiency for the season by up to 5% to 10% compared to the standard VRI technology”. If irrigation water is limited on the property, this water saved can be used to irrigate a larger area. Peter Raedts, Research Fellow at TIA Livestock Production Centre, said that “in the case of the TDRF, a 10% water saving for the 25 ha pivot results in an additional 2.5 ha under irrigation, which can generate up to 12.5 dry matter extra per year”.



Reduced energy use

Through reduced water use VRI technology supports lower energy use. This can be further enhanced by replacing pumps and motors with ones better matched to variable rate irrigation such as variable speed drive (VSD).

What were the challenges?

The TDRF system uses section control with each solenoid controlling four sprinklers. While this has a lower cost than individual sprinkler control, it can result in less accuracy depending on the field dynamics: “In some areas the four sprinkler sections were a little too big for our setup”, said Brad, “we try not to water laneways but that means we would lose a couple of metres each side”.

What are your recommendations for growers considering VRI technology

In addition to understanding field variability, James highlighted operational flexibility as a key factor when considering VRI technology generally: “If you have a big pivot with different management requirements under the pivot, then VRI is probably worth it. The biggest issue we saw is that if you stop irrigating for some reason, such as to cut silage in a section under the pivot, then you are straight away behind with your irrigation. Then it is very hard to catch up again. Having the VRI means you can just turn off that section but keep irrigating the areas that need it”.

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