National Science Challenges

OUR LAND AND WATER

Toitū te Whenua, Toiora te Wai

FACTSHEET

Science-based advice for
Using variable rate irrigation to mitigate nutrient losses

Science-based advice

At a farm scale

- Variable rate irrigation (VRI) technology can decrease farm leaching losses and nutrient concentrations in groundwater and surface waterways. In this study, nitrogen (N) and phosphorus (P) at the downstream site under VRI were about 80–85% less than that lost under uniform rate irrigation (URI).
- Nutrient applications also need to be matched to crop requirements and soil type.

At a broader scale

- Wider adoption of VRI technology could maintain or decrease farm leaching losses and nutrient concentrations in receiving waterbodies compared to areas with widespread URI or flood irrigation. The reduction in nutrient losses and water use may allow for additional conversion from dryland to irrigated systems, if more profitable.
- In future, if more precise application of irrigation water and nutrients over space and time is achieved, even greater gains in nutrient loss reduction could be possible.

Questions and answers

How was the figure of 80-85% less N and P downstream arrived at?

A six-year study was conducted on a dairy farm in Central Otago – the first-ever study to compare both N and P losses from URI and VRI on an intensively grazed system. Uniform rate irrigation was used for three years, and then VRI for three years. Under VRI, concentrations of N and P downstream from the irrigated site were 80-85% less than under URI.

How does VRI reduce nutrient leaching losses?

Variable rate irrigation accounts for different soil infiltration rates and soil water holding capacities across a farm, so can reduce drainage compared to URI or the application of excessive irrigation as an insurance policy against soil moisture deficits.

Why does this matter?

Variable rate irrigation (VRI), where the application rate of irrigation water across an area changes depending on soil type and other factors, can also decrease leaching losses of nitrogen (N) and phosphorus (P).

Irrigating grazed dairy pastures can promote N and P losses via leaching, which can reduce nutrient use efficiency and profit, and impact waterways.

To help mitigate losses, much focus has been on decreasing the amount and availability of these two nutrients, with less attention given to their movement after application, and the part irrigation might play.

Nitrogen losses are already regulated across New Zealand, while P losses are already regulated in many regions, and are likely to be regulated across New Zealand by 2026.

Who's this factsheet for?

This factsheet is for dairy farmers and irrigation scheme leaders.

What's this advice based on?

The information below is sourced from an Our Land and Water research paper:

Does variable rate irrigation decrease nutrient leaching losses from grazed dairy farming?

doi: 10.1111/sum.12363

Image: Dave Allen/NIWA