

Reducing nitrogen fertiliser while maintaining dairy farm productivity

utas.edu.au/tia | 2026



Project overview

Project: Dairy HIGH2

Funding source: Dairy Australia

Lead organisation: Tasmanian Institute of Agriculture (TIA)

Research team: James Hills, Pieter Raedts, Zac Beechey-Gradwell, Richard Rawnsley, Ben Noble, Andrew Marshall, Jacob Lightman

Project duration: August 2023 – June 2026

The challenge

Productive pastures are the foundation of profitable dairy farming in Tasmania. Over the past decade, the dairy industry has expanded significantly through the development of irrigated land, allowing farmers to grow more pasture and support higher milk production.

However, this intensification has also increased reliance on synthetic nitrogen fertiliser, which is costly and subject to price shocks, and can contribute to environmental concerns.

As a result, farmers and industry are increasingly interested in finding ways to reduce nitrogen fertiliser use without compromising pasture growth or milk production.

One promising approach is to make greater use of legumes such as white clover.

Legumes can naturally supply nitrogen to pastures through biological nitrogen fixation, reducing the need for fertiliser. They can also improve feed quality, increase pasture intake by cows, and support milk production.

More diverse pasture mixes that include additional legumes and forage herbs have also been suggested as a way to improve pasture resilience and productivity.

What did we investigate?

This study aimed to determine:

- How much nitrogen fertiliser can be reduced while maintaining pasture production.
- What changes to pasture composition may be needed to support productive dairy systems with lower nitrogen inputs.

KEY POINTS

- The trial set an ambitious target to halve the amount of synthetic nitrogen fertiliser used on dairy farms without reducing pasture or milk production.
- Farmlets, aka 'mini farms', were established at TIA's Dairy Research Facility to test theories under real farm conditions – an approach not happening anywhere else in Australia.
- The trial found that high milk production can be maintained while using low to moderate levels of synthetic nitrogen fertiliser.
- High pasture and cow productivity is largely due to white clover, which contributes significantly through biological nitrogen fixation.



Image caption: Mr Pieter Raedts and Dr Zac Beechey-Gradwell at the TIA Dairy Research Facility.



Our response

Researchers established four irrigated farmlet systems (mini farms) at the TIA Dairy Research Facility in Elliott, north-west Tasmania. The farmlets were managed over three consecutive lactation seasons from 2023 – 2026 to test research theories under real farm conditions.

The farmlets differed in the amount of synthetic nitrogen fertiliser applied and the types of pasture species grown.

- **Farmlet 1:** 80% perennial ryegrass and 20% white clover, with 300kg of nitrogen per hectare
- **Farmlet 2:** 80% perennial ryegrass and 20% white clover, with 150kg of nitrogen per hectare
- **Farmlet 3:** 40% perennial ryegrass, 30% white clover, 30% plantain, with 150kg of nitrogen per hectare
- **Farmlet 4:** 40% mixed grasses, 30% mixed legumes, 30% mixed herbs, with little to no nitrogen application

Practical outcomes

White clover contributed substantial amounts of biologically fixed nitrogen across all farmlets, supplying more than 250kg of nitrogen per hectare during the first year of the study.

Pasture production remained high across all farmlets. In the first year, all farmlets produced around 21 tonnes of dry matter per hectare, which is double the industry average. In the second year, the farmlet receiving half the nitrogen fertiliser (F2) produced almost the same amount of pasture as the farmlet receiving the conventional amount of nitrogen fertiliser (F1).

Milk production was also impressive. Over the three-year study, the farmlets receiving low to moderate nitrogen fertiliser inputs exceeded industry benchmarks by more than 1,000kg milk solids (milk fat and protein) per hectare, demonstrating an opportunity to lift milk productivity.

Importantly, this higher productivity was achieved while reducing total nitrogen inputs, with farmlets 2 and 3 receiving approximately 25 per cent below industry averages.

Industry impact

The results demonstrate that under fully irrigated conditions, high levels of pasture and milk production can be maintained with substantially lower nitrogen fertiliser inputs than are commonly used.

A key reason for this success was the strong and consistent contribution of white clover, which supplied large amounts of biologically fixed nitrogen to the pasture system.

These findings suggest there is considerable opportunity for Tasmanian dairy farms to reduce reliance on synthetic nitrogen fertiliser while maintaining productive and profitable farming systems.

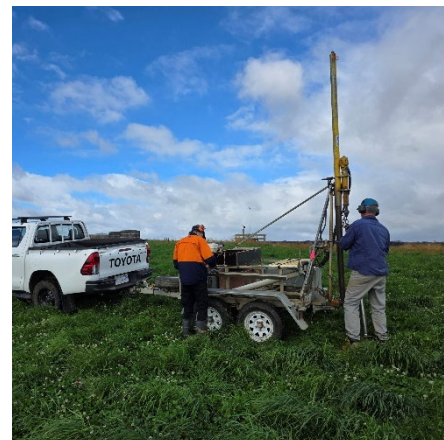


Image caption: (top) Deep core soil sampling in the farmlet paddocks. (bottom) Collecting milk samples in the TIA Research Dairy.

Engaging with industry

Preliminary results and observations have been shared with stakeholders throughout the trial, including a digital newsletter, report, and video update shared monthly.

These legacy resources can be accessed on the [TIA website](#).

For more information, please contact Dr James Hills, Centre Leader for Livestock Production at TIA: James.Hills@utas.edu.au +61 3 6430 493

DISCLAIMER: While the Tasmanian Institute of Agriculture (TIA) takes reasonable steps to ensure that the information on its fact sheets is correct, it provides no warranty or guarantee that information is accurate, complete or up-to-date. TIA will not be liable for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on the information contained in this publication. No person should act on the basis of the contents of this publication without first obtaining specific, independent, professional advice. TIA and contributors to this Fact Sheet may identify products by proprietary or trade names to help readers identify particular types of products. We do not endorse or recommend the products of any manufacturer referred to. Other products may perform as well or better than the products of the manufacturer referred to.

Scan the QR code or [visit our website](#) to learn more about this project.

