

Nitrate leaching from winter forage crops and SDH farm systems

Background

Traditionally, non-lactating in-calf dairy cows have been wintered off pasture on brassica crops. For this reason, autumn- and winter-grazed fodder beet (FB) crops are key to the FB farmlets at the Southern Dairy Hub (SDH), while kale is the winter feed in the other 2 farmlets. To increase knowledge of the environmental impacts of these grazed forage crops, N leaching losses were measured in selected treatments during 2018, 2019 and 2020 to provide

- Quantitative N leaching data for the crops, soils, and climate of SDH.
- N leaching comparisons between:
 - autumn-grazed v lifted FB,
 - winter-grazed kale v winter-grazed FB, and
 - selected pastures on the milking platform.

Average N leaching losses for the 3 years of measurements are presented in Figure 12. N leaching under the winter-grazed fodder beet crops was on average only 50% of that under the winter-grazed kale crops, while the autumn harvested FB leached a similar amount to the winter grazed kale.

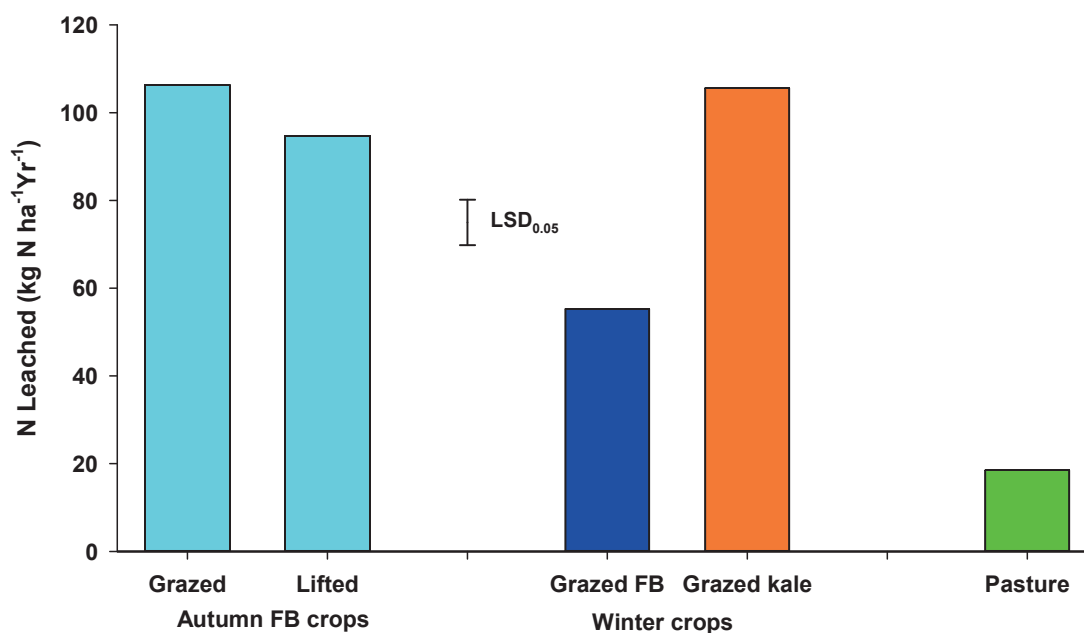


Figure 12: Average annual N leaching losses (2018, 2019 and 2020) from autumn-grazed or -lifted FB, and winter-grazed FB or kale treatments. Average N loss from 3 pasture paddocks (Standard farmlet) is also shown (in green). The LSD bar represents a significant difference between the forage crop treatments at a 95% confidence level.

Likely N losses per cow wintered were calculated using the yields of the FB and kale treatments, cow daily feed allocations and adjusting the areas required for each crop. Using FB as a winter grazing option can reduce nitrate leaching per cow wintered by up to 60% (Table 1).

Table 1. N leaching losses from winter-grazed crops (average of 3 years of data).

	Kale	Fodder beet
N leached kg per ha per year	106	55
N leached kg per cow wintered	5.6	2.0

Using losses calculated by Overseer for the pasture areas of the milking platform combined with the measured N losses from the winter crop areas, we have estimated the total N losses from each of the 4 farmlets. These results, presented in Figure 13, indicate that the change in fertiliser N inputs resulted in about 22% less N leached. Similarly changing from kale to fodder beet as the winter crop lowered N leaching losses by about 16%. The lower impact FB (LI FB) treatment leached 34% less than the standard kale farmlet.

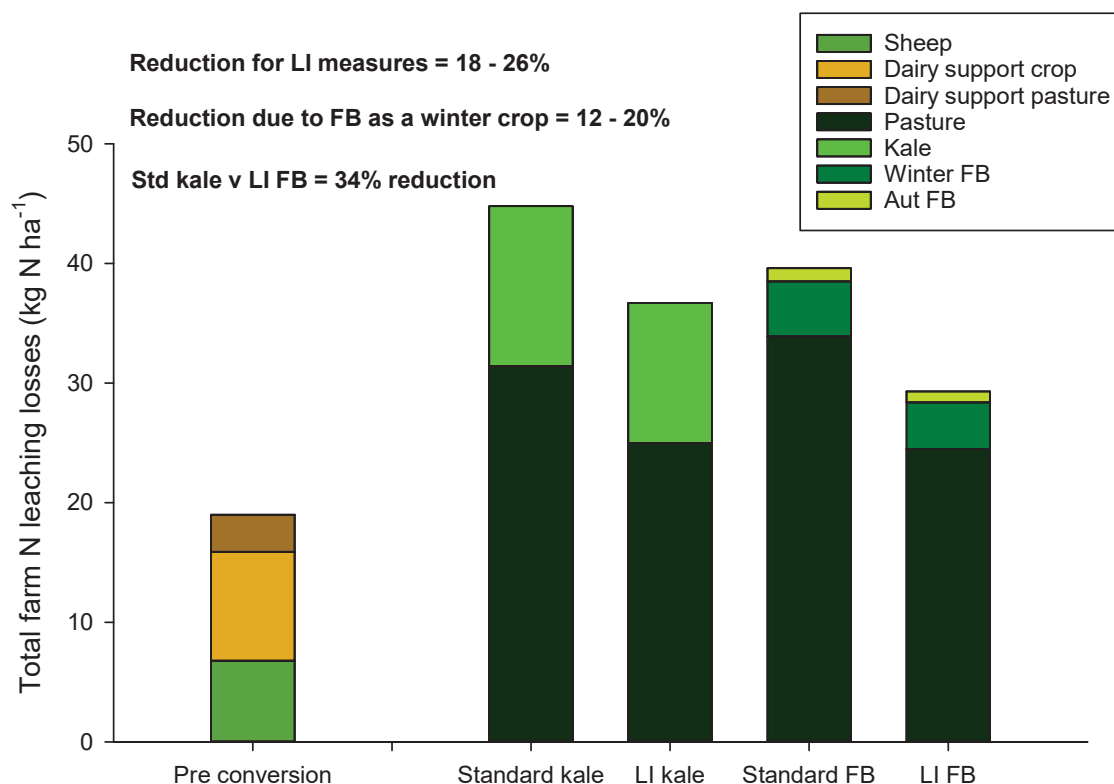


Figure 13: Comparison of the calculated and measured N losses pre conversion and from the four farmlets. Note that the low impact (LI) treatments indicate lower N inputs.

Key messages

- If lifting fodder beet in autumn to feed elsewhere or grazing in paddock, aim to replant the paddock as soon as possible to reduce N loss from drainage during the winter period
- Fodder beet offers potential to decrease winter nitrate leaching losses, despite the increase in stocking density required with the higher dry matter yield.
- Measured losses of N from the pasture paddocks were relatively low, and similar to Overseer predicted losses.

Smith LC and Monaghan RM. 2020. Nitrogen leaching losses from fodder beet and kale crops grazed by dairy cows in southern Southland. *Journal of New Zealand Grassland* 82: 61-71