

How could plants help us to reduce nitrogen losses from dairy farms?

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New Zealand dairy systems are typically intensively grazed forage-based systems where cattle graze outdoors year-round. Perennial ryegrass-white clover mixtures are commonly used in these systems. During grazing, the urine which is deposited by dairy cows onto the paddock results in an input of nitrogen (N) into the soil-plant system greater than what the plants can use. This N which is not taken up by the plants is often lost from the soil in the drainage water. This leaching of N is a significant environmental concern in these systems because it can cause a decline in the quality of both ground and surface waters.

The risk of N leaching is greatest during the cool seasons (late autumn to early spring). This is because rainfall is often high at these times of year and perennial ryegrass and white clover do not grow very fast at cool temperatures, so demand for water and nitrogen by the plants is low. One mitigation approach is to increase the uptake of N by forage plants, particularly during these cooler seasons. Plants with higher winter activity or larger root systems have the potential to reduce N leaching compared with typical perennial ryegrass-white clover systems. This study uses a series of field lysimeter experiments to measure N loss to water, plant N uptake and the fate of ¹⁵N for a selection of alternative forages treated with ¹⁵N labelled-cow urine. The results from this study will help determine whether alternative forages could be used by New Zealand dairy farmers to reduce their nitrogen losses and thereby reduce their negative impact on the environment.