

Questions and answers

What beneficial effects of using plantain will OverseerFM include?

Plantain varieties have been identified as having positive effects on production and reducing nitrate leaching risk. These include increases in milk production, diuretic effects on the animals and the effects of bioactive compounds on soil processes.

OverseerFM reflects the current knowledge of the effects of Ceres Tonic's plant composition on urine nitrogen excretion, as found in extensive research with this variety: a lower apportioning of the excreted nitrogen to urine and a lower nitrogen load per urine patch due to a greater urine volume per animal per day.

Any effects relating to greater milk production would be reflected by user input of milk volume.

At present, OverseerFM does not reflect the potential effects of plantain's bioactive compounds on soil processes. Further research is planned to better understand these effects on nitrogen processes in the soil, such as nitrification. Results from this research will inform potential further updates of OverseerFM. Additionally, this research will provide a framework to assess the chemical profiles of other plant varieties to verify that they possess the attributes that result in N leaching reductions.

How do I know my plantain is beneficial?

OverseerFM has been updated to include the diuretic response in animals as a result of consuming plantain. When plantain is entered as a part of a pasture mix in OverseerFM the model will derive the proportion of the diet plantain makes up for the enterprise and apply the response.

Most New Zealand research on plantain uses the cultivars 'Ceres Tonic' (Forages for Reduced Nitrate Leaching) and AgriTonic (Greener Pastures). These are a relatively winter-active, prostrate, large- but narrow-leaved plantain type (*Plantago lanceolata*), with a coarse root structure¹. Further characteristics of this type observed in various trials, relevant to the effects on nitrogen excretion in urine and therefore nitrate leaching risk, are its lower dry matter content, higher non-structural carbohydrate/nitrogen ratio and lower proportions of total nitrogen that are soluble and degradable compared with perennial ryegrass².

1. Stewart AV (1996) Plantain (*Plantago lanceolata*) – a potential pasture species. *Proceedings of the New Zealand Grassland Association* 58: 77-86.
2. Minnée E, Kuhn-Sherlock B, Pinxterhuis I and Chapman D (2019) Meta-analyses comparing the nutritional composition of perennial ryegrass (*Lolium perenne*) and plantain (*Plantago lanceolata*) pastures. *Journal of New Zealand Grasslands* 81: 117-123.

Research partners are currently seeking funding to enable a framework to be developed to assess the chemical profiles of other plant varieties to verify that they possess the attributes that result in N leaching reductions.

Overseer does not verify any product claims. Users will need to verify any product claims independently until such time as the industry has appropriate product labelling.

Why does the maximum effect of plantain on the excreta and urine patch modelling stop at 60% of the diet?

Based on the finding from FRNL, the effects on urine load are evidenced for plantain pasture mixes up to a maximum of 60% of the diet. Any plantain diet above 60% are assumed to have the same effect as 60%.

Why don't you include the bioactive effects of plantain on soils?

The FRNL research did not include sufficient investigation of these effects to enable modelling in OverseerFM. Further research is planned to better understand these effects on nitrogen processes in the soil, such as nitrification^{3,4,5,6,7}. Results from this research will inform potential further updates of OverseerFM.

3. Carlton AJ, Cameron KC, Di HJ, Edwards GR and Clough TJ (2019) Nitrate leaching losses are lower from ryegrass/white clover forages containing plantain than from ryegrass/white clover forages under different irrigation. *New Zealand Journal of Agricultural Research* 62: 150-172.
4. Carlton AJ, Cameron KC, Di HJ, Edwards GR and Clough TJ (2019) Nitrate leaching losses are lower from ryegrass/white clover forages containing plantain than from ryegrass/white clover forages under different irrigation. *New Zealand Journal of Agricultural Research* 62: 150-172.
5. Welten BG, Ledgard SF, Judge AA, Sprosen MS, McGowan AW, Dexter MM (2019) Efficacy of different temperate pasture species to reduce nitrogen leaching from cattle urine applied in different seasons: A soil lysimeter study. *Soil Use and Management* 35: 653-663.
6. Judson HG, Fraser PM, Peterson ME, Edwards GE (2018) Specific genotypes of plantain (*Plantago lanceolata*) vary in their impact on sheep urine volume and nitrification in the urine patch. *Journal of New Zealand Grasslands* 80: 125-128.
7. Judson HG, Fraser PM, Peterson ME (2019) Nitrification inhibition by urine from cattle consuming *Plantago lanceolata*. *Journal of New Zealand Grasslands* 81: 111-116.

Plantain roots grow to deeper than 60cm; will this be included?

OverseerFM models and reports the nitrate leaching through the soil at 60cm depth. It does not model or report on the fate of leached Nitrate below 60cm, which might include uptake by deeper rooted plants. OverseerFM does include the growth of plant roots below 60cm, but only as part of the plant growth model, and not as part of the nitrogen leaching calculations. Work is planned in our longer-term programme to investigate the impact of uptake of N from plants below 60cm and this will likely include plantain.

Has the modelling been peer reviewed?

The research findings from the FRNL programme are published in various peer review journals which you can review in [FRNL's New Knowledge register](#).

The approach to implement the research findings in OverseerFM has been reviewed by the FRNL scientists involved in the research on plantain. Details are listed in the [Sensitivity Testing Report](#).