

RPF4 Project Report 2020/21 Q4

Measuring real time nitrate leaching from a Hawkes Bay onion field 25/06/2021

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Summary of scope

The primary objective of this project was to prove that successful real time '*in situ*' nitrate measuring was possible using a nitrate sensor and that nitrate losses were relative to both climatic and management events.

The project has achieved this primary objective (measuring real time nitrate leaching losses to drainage water) and has shown examples of grower/crop management 'cause and effect' using the live sensor data.

There was a strong linear relationship between nitrate sensor readings and laboratory analysis of the grab samples, giving confidence that the sensor can be calibrated to give an accurate measure of nitrate-nitrogen concentrations in real time. This provides growers with a real time indication of N leaching from their fields when drainage volume is also able to be measured.

This research has demonstrated links between farmer management practices, such as fertiliser application and/or irrigation, and nitrate-nitrogen concentration in the drainage water. It has also demonstrated links between uncontrollable climatic events (rainfall) and nitrogen losses to water.

Nutrient budgeting (including nitrogen) and soil moisture monitoring suggest good agricultural practices (GAPs) were followed during the growing of the onion crop, however modelling through OverseerFM implies some changes/modifications in some agricultural practices *could* reduce nitrate-nitrogen losses to water by up to 50%. A good example of this is the use of a winter catch crop to 'soak up' excess nitrogen that remains in the soil after the onion crop. A winter catch crop was not utilised the previous year.

The availability of real-time measured data provides a means to validate any *possible* improvements to good agricultural practices suggested by modelling through Overseer. However, this research needs to continue for the entire period over which Overseer models N loss (12 months) to more accurately comment about Overseer scenario findings versus real time measured data.

Outcomes of the Project

Modified agricultural practices to reduce nitrate nitrogen losses are already being implemented within this block, based on the trial results and modelling completed to date (i.e., a winter catch crop of oats has been planted). Live data plus grab samples are being used to prove the crop's ability to soak up surplus nitrogen and reduce nitrate losses.

The project has created a lot of discussion, both within and outside of the large growing organisation that partnered with the project (the grower). The grower partner is being seen as a leader in the local horticultural sector, and positive change in management practices based on these trial results are already starting to occur.

Nitrogen losses are being monitored and are currently in line with Overseer predictions of what reductions in losses should occur with the use of a winter catch crop. However as previously mentioned, it is still too early to accurately comment on OverseerFM modelled findings versus actual measured data as a full 12-month cycle hasn't yet been completed.

Presentations have been made to Zespri Agronomists and Extension Officers (Photos 1 & 2), Iwi of the Kohupātiki Marae (Photo 3) and local horticultural Growers (Photos 4 & 5). Interest that has been generated from those presentations have created follow up discussions around industry specific trial opportunities (Kiwifruit) plus opportunities for linkages into larger external projects are being explored. (i.e., Sustainable vegetable Production SFFF).



Photo 1. Zespri Nutrient Forum Presentation on live sensing and N loss



Photo 2. NZIPIM member Jamie Thompson presenting at Zespri Nutrient Forum workshop on live sensing and N loss



Photo 3. Kohupātiki Marae presentation (including high school students from Taradale High)



Photo 4. Presenting 'measuring nitrate loss in real time' to growers at the Horticultural Field Days



Photo 5. Engaged growers listening to sensing technology at the Horticultural Field Days

A draft paper has been written for submitting to the Farmed Landscapes Research Centre (FLRC) for potential presentation at the annual FLRC conference at Massey University in 2022. This paper does however require a full 12-month of data to more accurately comment and report on the modelled Overseer scenario analysis versus the real time, measured data.

A grower 'Tech Note' has been written and distributed during workshop presentations. A copy of this tech note is being used for extension (grower education) and tech transfer and is available for public education.

This tech note will be updated, along with the paper for FLRC once a full 12-month cycle has been completed.

Summary and comments

The project outlook looks very positive with both industry and grower interest being high. This is due to the ability to show live data and trends (on computer and/or mobile app), based on both climatic events and management activities.

This real time data gives growers some trust in the real nitrate loss numbers and can be used to compare against modelled data where there seems to be a lot of mistrust in the reported numbers. Growers can see the almost instant results of management decisions and weather events in real time and if comparable to modelled Overseer results, will give them more confidence in OverseerFM over time.

This trial has been a great example of a 'shovel ready' project that is able to move quickly and show near instant results, creating conversation and positive change in management practices.

It is hoped that this research programme can be extended for a further 6 months to monitor the outcomes of the modified agricultural practices such as the use of a catch crops (in real time) and any other changes to grower management practices, such as irrigation amounts and/or nutrient applications.