Rootzone reality: network of fluxmeters measuring nutrient losses under cropping rotations

Presented by Matt Norris
Nutrient losses in New Zealand

Some key changes over the past few years:

Regulatory policies
Access to markets

Greater requirement for growers to demonstrate:

That their production systems are sustainable
That they are taking proactive steps to mitigate nutrient losses from their systems

Use of tools:

Predict whole farm outcomes
Set associated policies

Measured Data
Provide growers and regional authorities with robust measurements of N and P leaching losses from cropping farms across sites and seasons

We need data!
» As a platform for discussion
» To determine whether GMP’s are having the desired impact
» To inform models and policy

Overview:
» Trial design and experimental sites
» Measurements
» Results from Year 1: Focus on N losses
Measuring N losses: the tension fluxmeter

What is a tension fluxmeter?
- PVC pipe that intercepts drainage (stores ~14 L)
- Filter zone to reduce sediment transfer
- Passive wick
- Drainage pumped to surface through plastic tubes

Top of fluxmeter is at a depth of 1.0 m

Drainage validated against a soil water balance
The fluxmeter network
key measurements

Drainage
» Volumes
» Inorganic N (NO₃, NH₄)
» Phosphorus (DRP, total P)

Crop biomass
» Dry matter
» N and P export

Soil fertility
» Range of N, P and C measures
Measured drainage from Aug 14 – Sept 15
Measured N losses from Aug 14 – Sept 15

- **Nitrate-N**
- **Ammonium-N**
- **NR** No result
Measured N losses from Site 5
Measured N losses from Site 5

Rainfall (mm)

Drainage (mm)

N concentration (mg/L)

Cumulative N loss (kg/ha)

250% wetter than long term average

Rainfall
Drainage

Nitrate-N
Ammonium-N
Cumulative N loss
Measured N losses from Site 5
Measured N losses from Site 5

- Rainfall (mm)
- Drainage (mm)
- Nitrate-N
- Ammonium-N
- Cumulative N loss

36 kg N/ha
Measured N losses from Site 5

- Rainfall (mm)
- Drainage (mm)
- N concentration (mg/L)
- Cumulative N loss (kg/ha)

Data points:
- Fallow: 36 kg N/ha
- Maize: 152 kg N/ha
- 450 mm irrigation

Graph shows rainfall, drainage, and nitrogen concentration over time.
In Year 1:
» Captured drainage ranged from 0 to 611 mm
» N losses ranged from 0 to 226 kg N/ha

Winter and spring losses dominate
» Rainfall is a key driver
» In general irrigation is not resulting in significant drainage

Need to consider the long term patterns
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