

Nitrate-nitrogen leaching in horticulture

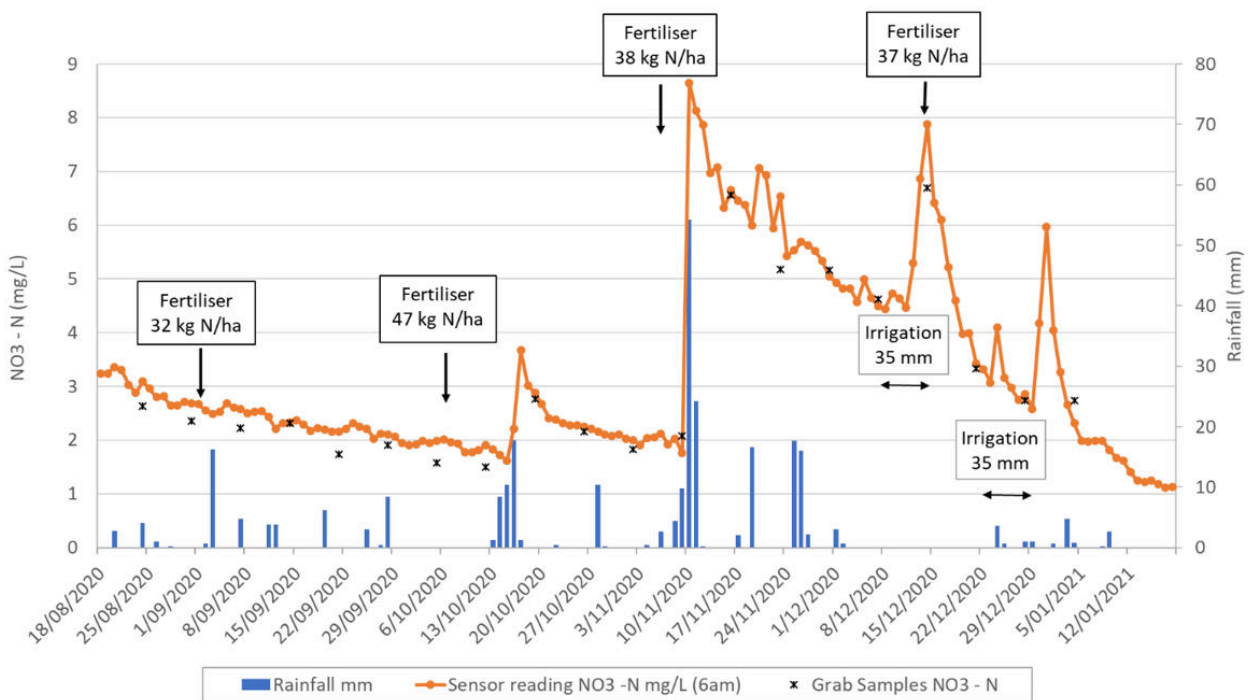
Why is reducing nitrogen (N) loss important?

Reducing leaching of nitrate-N from the soil is important as it represents both an economic loss to the grower and a threat to the environment through ground and surface water contamination.

How does Nitrate-N loss occur?

Nitrate leaching occurs when there is nitrate-N in the soil – which is released from the breakdown of soil organic matter, crop residues, or applied N fertiliser in the soil – and when drainage occurs following rainfall or irrigation (Figure 1). Drainage, and therefore nitrate-N leaching, can occur at any time of the year. However, leaching risk can be more significant between late autumn and early spring when soil moisture levels are closer to field capacity and rainfall frequency greater.

Figure 1. Spikes in Nitrate-N concentration in drainage water after N fertiliser applications and rainfall or irrigation events.



What can be done to help reduce nitrate-N leaching?

The extent of Nitrate-N leaching that occurs is due to a combination of on-farm management practices and weather events that cause drainage. Because growers have no control over the weather, it is important to consider management decisions/practices and the implications of these practices when combined with rainfall events resulting in drainage.

1. Cultivation

- a. Minimise time between harvest and establishment of the next crop so there is only a short fallow period. Avoid winter fallow periods when mineral N levels are high.
- b. Minimise cultivation depth and frequency and use direct or minimum tillage where possible.

2. Catch or cover crops

- a. Plant a winter catch or cover crop to help utilise residual nitrate N from the soil.

3. Fertiliser N applications

- a. Soil sample each block before planting to know current nutrient status and to monitor trends over time.
- b. Calculate individual crop N requirements by doing a nutrient budget (inputs vs outputs).
- c. Split N applications to best match plant N requirements with soil N supply, i.e., do not put all N fertiliser on at planting when plant uptake requirements are low.
- d. Aim to have minimal residual N levels at the conclusion of each crop cycle.
- e. Use tools such as 'Nitrate Quick test strips' to better understand real time changes in Nitrate-N levels in the soil.
- f. Apply as little N as possible when soil temperatures are low and drainage risk is high (late autumn, winter and early spring).

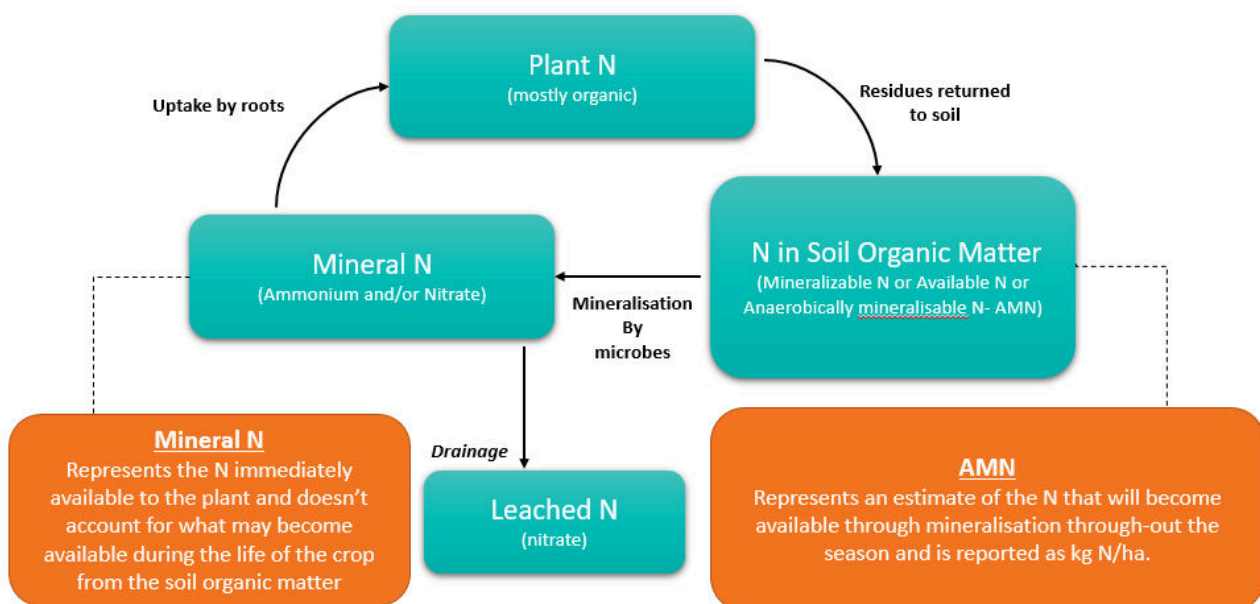
4. Irrigation

- a. Monitor soil moisture deficits so irrigation depths (mm) can be optimised without creating out of season drainage events.
- b. Avoid excess irrigation after N applications.

5. Monitor weather forecasts

- a. Applying N fertilisers before rainfall or irrigation is recommended best practice with 10mm within 8 hours required to wash N into the soil and to avoid losses to the atmosphere. Larger rainfall events may create drainage, so knowing soil moisture deficits and expected rainfall (mm) can better inform growers on the appropriateness of applying N prior to a rainfall event.
- b. Incorporate N fertilisers into the soil when possible and consider using urease-treated (coated) fertilisers.

Figure 2. The principles of N loss in cropping systems



Summary

- Monitor soil moisture levels to minimise out-of-season drainage events through excess irrigation.
- Do not create surplus nitrate-N levels in the soil by excessive applications of nitrogen, especially prior to rainfall or irrigation events that may result in drainage.
- Know the N status of your soils and crop N requirements, to better match supply and demand.