

# Soil Nitrogen Dynamics

## Research Summary



### Overview:

A field trial carried out at Te Ahikawariki - Vegetable Centre of Excellence (VICE) investigated nitrogen availability patterns following fertiliser application in Pukekohe vegetable production systems and validated rapid field-testing methods against laboratory analysis. The project examined soil samples across 52 days following two Calcium Ammonium Nitrate (CAN) applications under contrasting weather conditions to address critical knowledge gaps in fertiliser release timing and on-farm nitrate monitoring technology.

### Methodology:

#### Trial Design and Treatments

- The trial was conducted within a 24 m × 30 m block, split into bedded and ridge-furrow systems, with an unfertilised control area.

#### Fertiliser treatment

- CAN was applied twice (28 November and 11 December 2025) at 300 kg/ha via side-dressing.

#### Sample collection

- Samples taken at 0-15cm and 15-30cm depths with 6 cores per sample
- Baseline soil sampling occurred on 18 November 2025, followed by repeated sampling every 3-4 days

#### Analysis

- Nitrate was measured the same day using a CaCl extractant and quick test methods (Horiba LAQUA twin meter and Supelco® quick Nitrat-Tests).
- Samples were then sent to Hill Labs for comprehensive soil testing including KCl extraction and mineral N testing.

#### Data Handling

- Field and lab results were adjusted for soil moisture, depth, and bulk density to calculate kg NO<sub>3</sub>-N/ha.

### Key Findings

- Nitrate availability was driven primarily by fertiliser timing and rainfall
- Peak Nitrate levels occurred 10-14 days after fertiliser application under Pukekohe conditions
- Dynamic environmental conditions masked depth and cultivation effects
- Quick nitrate tests showed strong correlation with laboratory analysis but had concentration-dependent bias; lab analysis remains essential for accuracy
- High variability and site-season limits restrict broader inference of results

Soil nitrate dynamics varied greatly with environmental conditions, highlighting the need for growers to consider weather and timing when making nitrogen-management decisions.

