

Plantain Potency and Practice Programme

Key Results and

Messages

6-3-24

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Funding partners

Ministry for Primary Industries
Manatū Ahu Matua



DairyNZ



PGG Wrightson Seeds

Delivery partners

agresearch
āta mātai, mātai whetū

AGRICOM
Pastures for Profit

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Plantain Potency and Practice Programme

Providing confidence in a low cost, high impact mitigation for nitrate leaching

Efficacy



- Benefit at scale
- *How* plantain works
- Range of soils/climates

Safety and Integrity



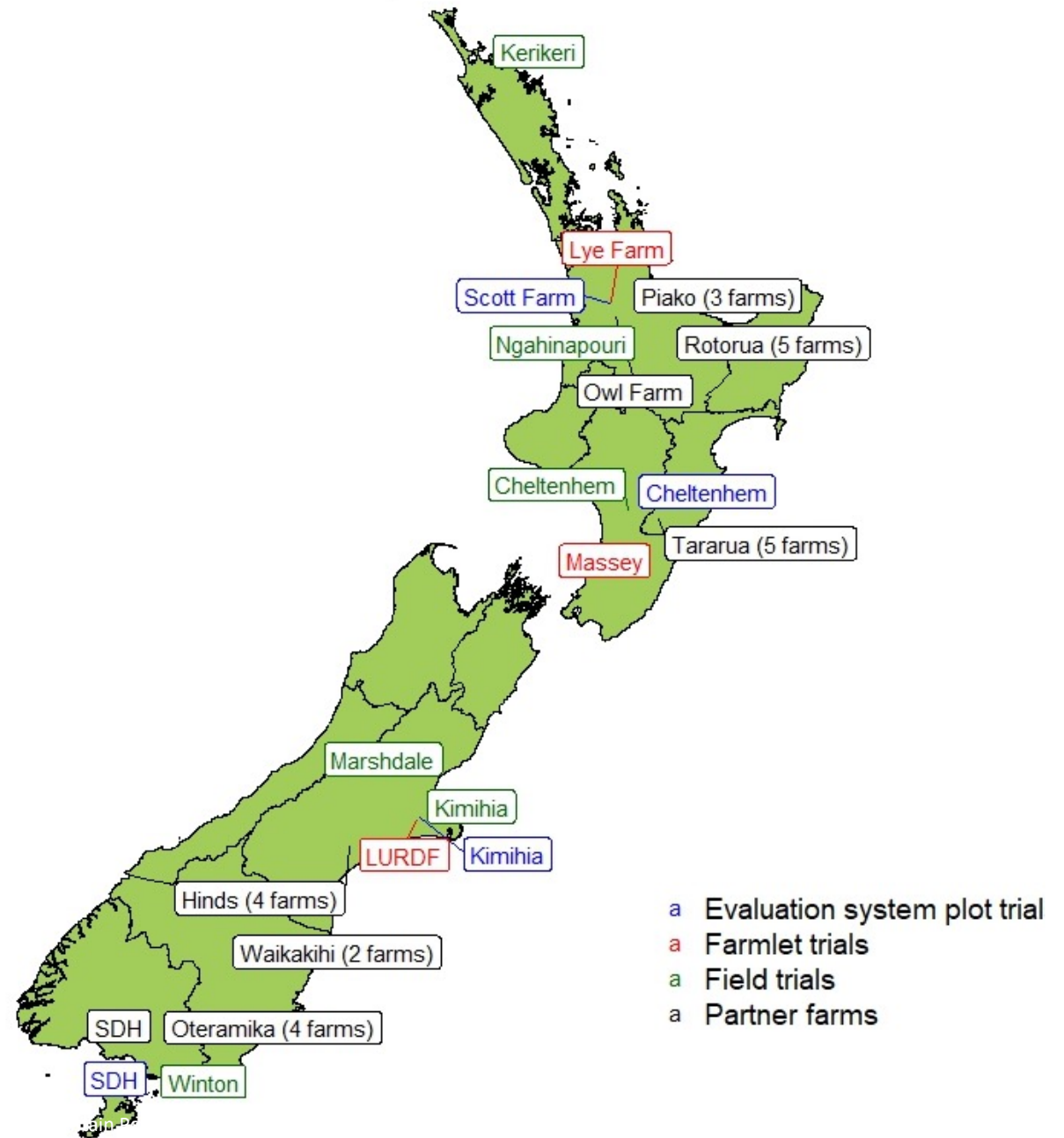
- Risk/benefits to milk, meat, animal health/welfare

Adoption and Impact

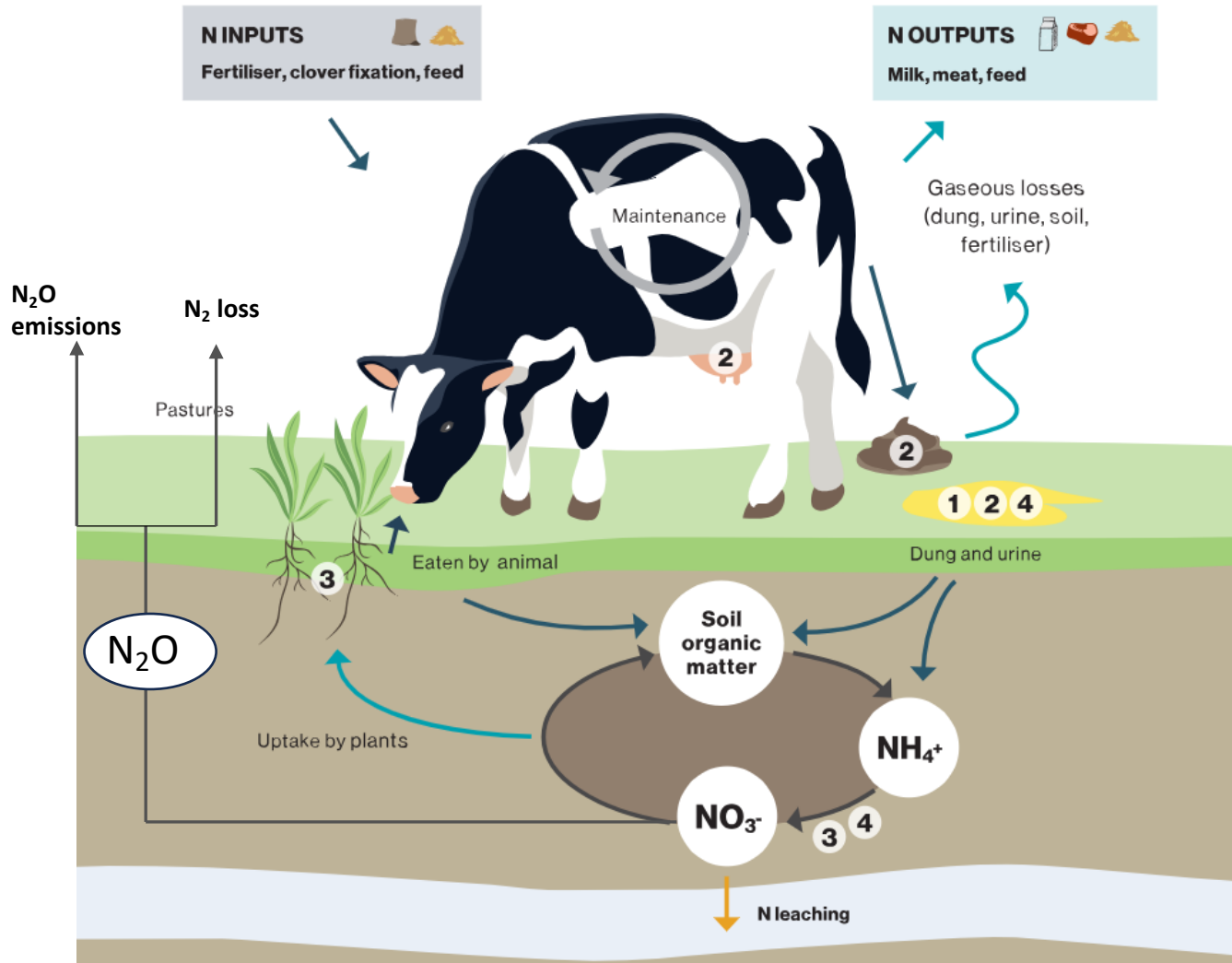


- Management for persistence
- Tools for regulation
- Partner farms, modelling
- Cultivar evaluation

Location of research and partner farms



How Ecotain plantain works



1. Dilution effect: Higher urination frequency & volume (lower DM%)

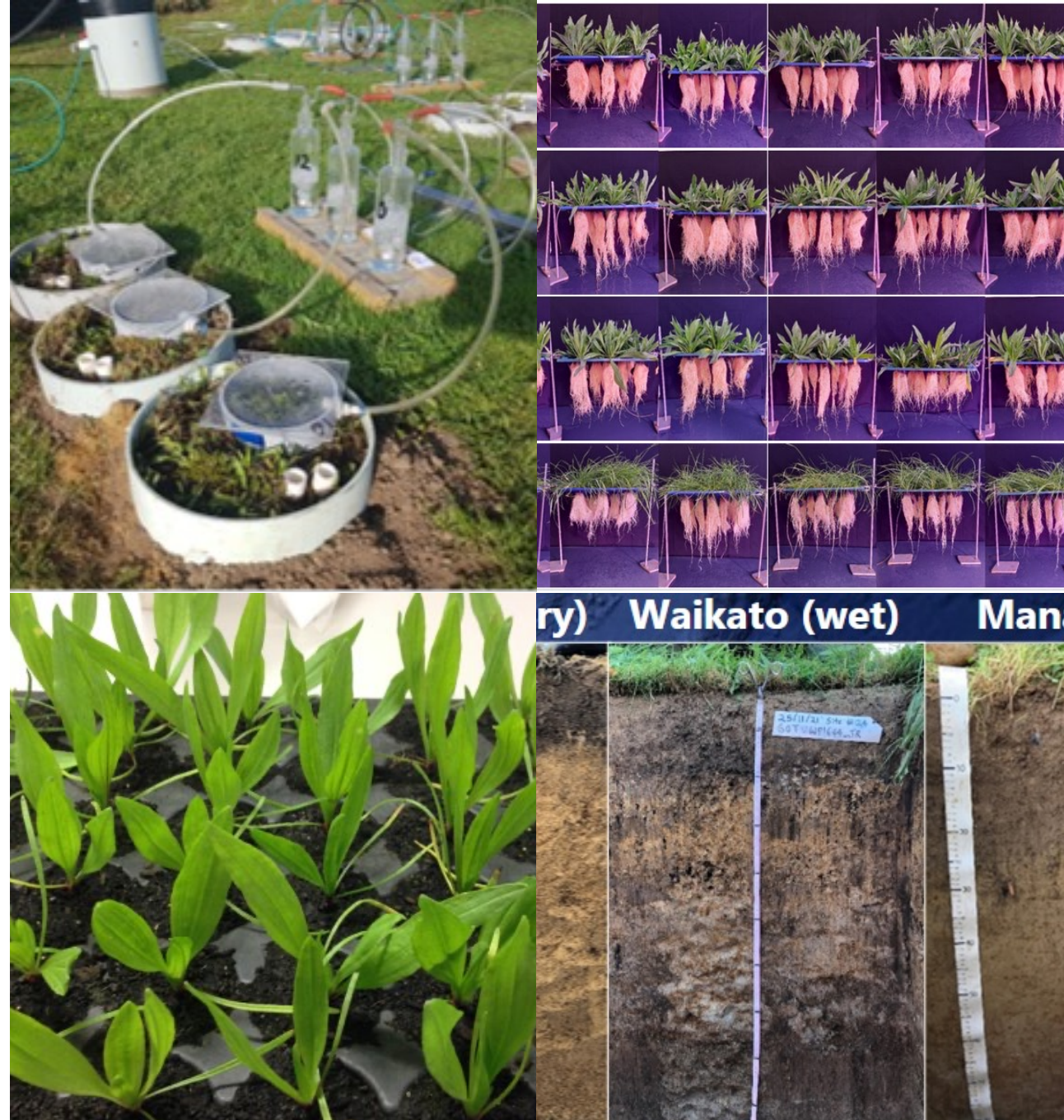


2. Partitioning effect: More N partitioned to dung and milk vs. urine

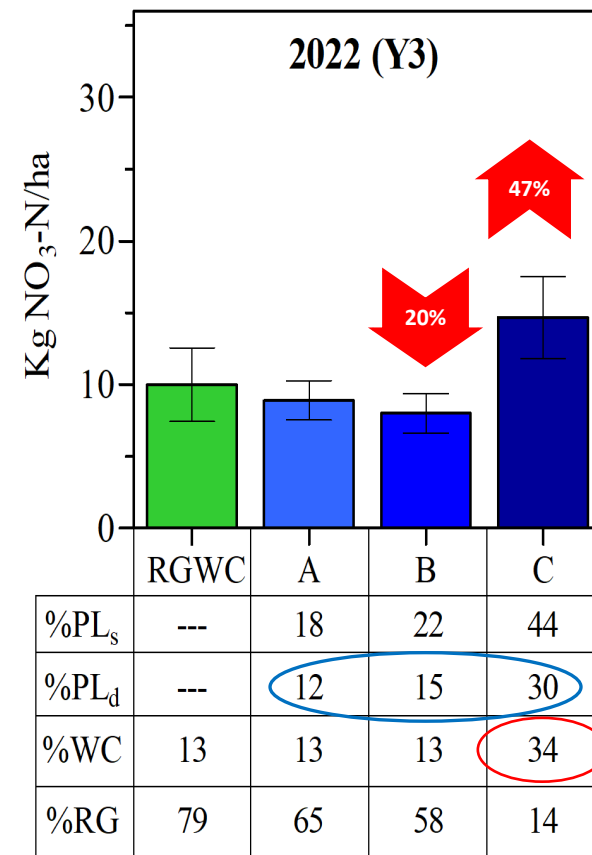
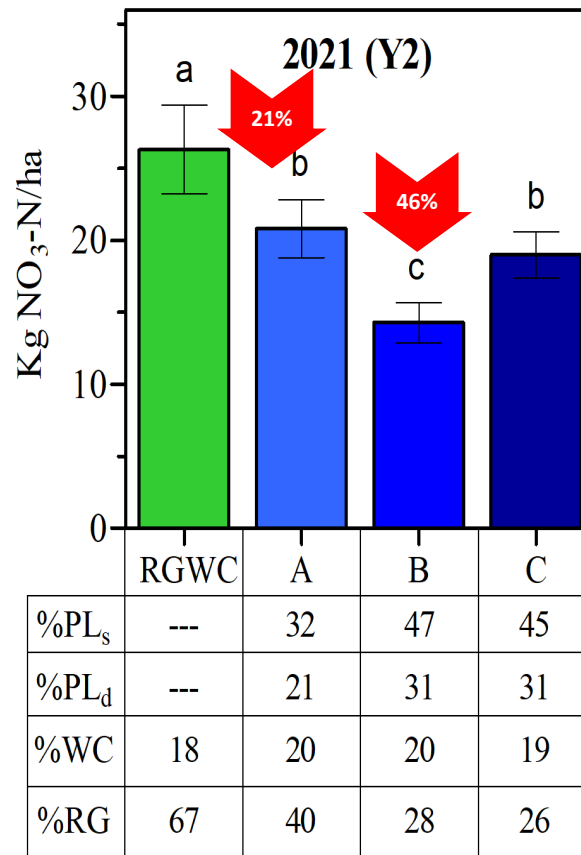
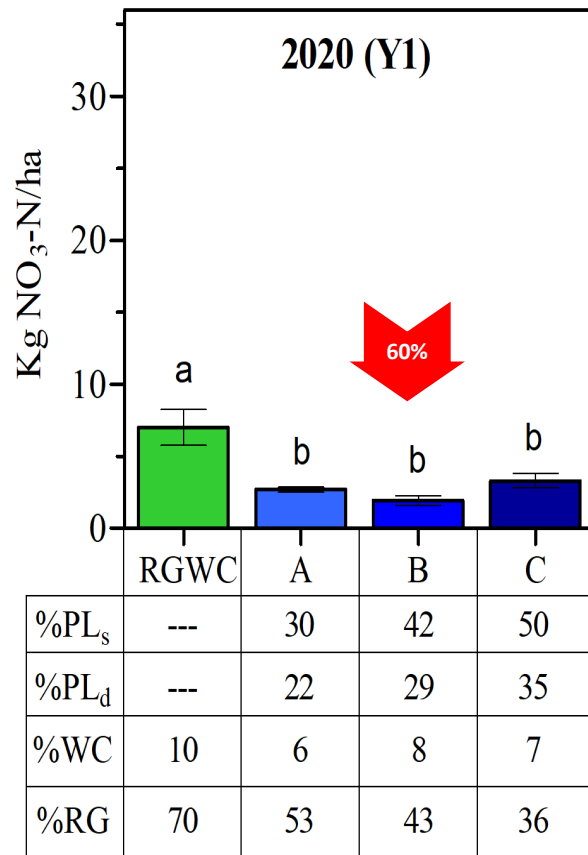
3. Soil mechanisms
Biological Nitrification Inhibition and/or decreased drainage

Quest to understanding how plantain works

- Aim: Model the full effect of plantain; develop a plant test for effectiveness of cultivars
- Hydroponic experiments (5 cultivars)
- Pot experiments (3 soils)
- Lysimeter experiments (2 soils)
- Field trials (7 soil/climate combinations)



Nitrate leaching at Massey

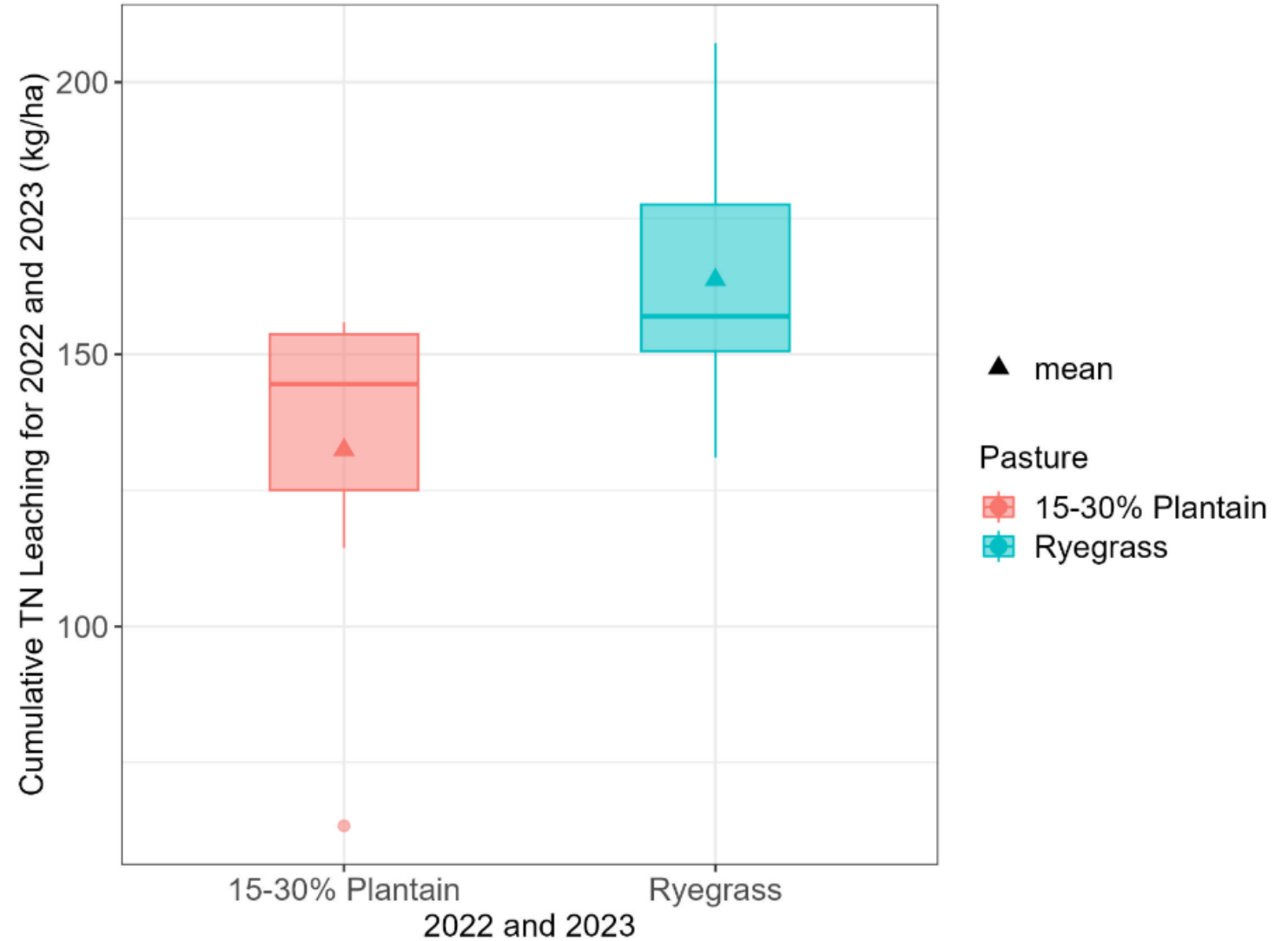


20-60% reduction in N leaching from 20-50% plantain in the pasture

Nitrate leaching at Lincoln

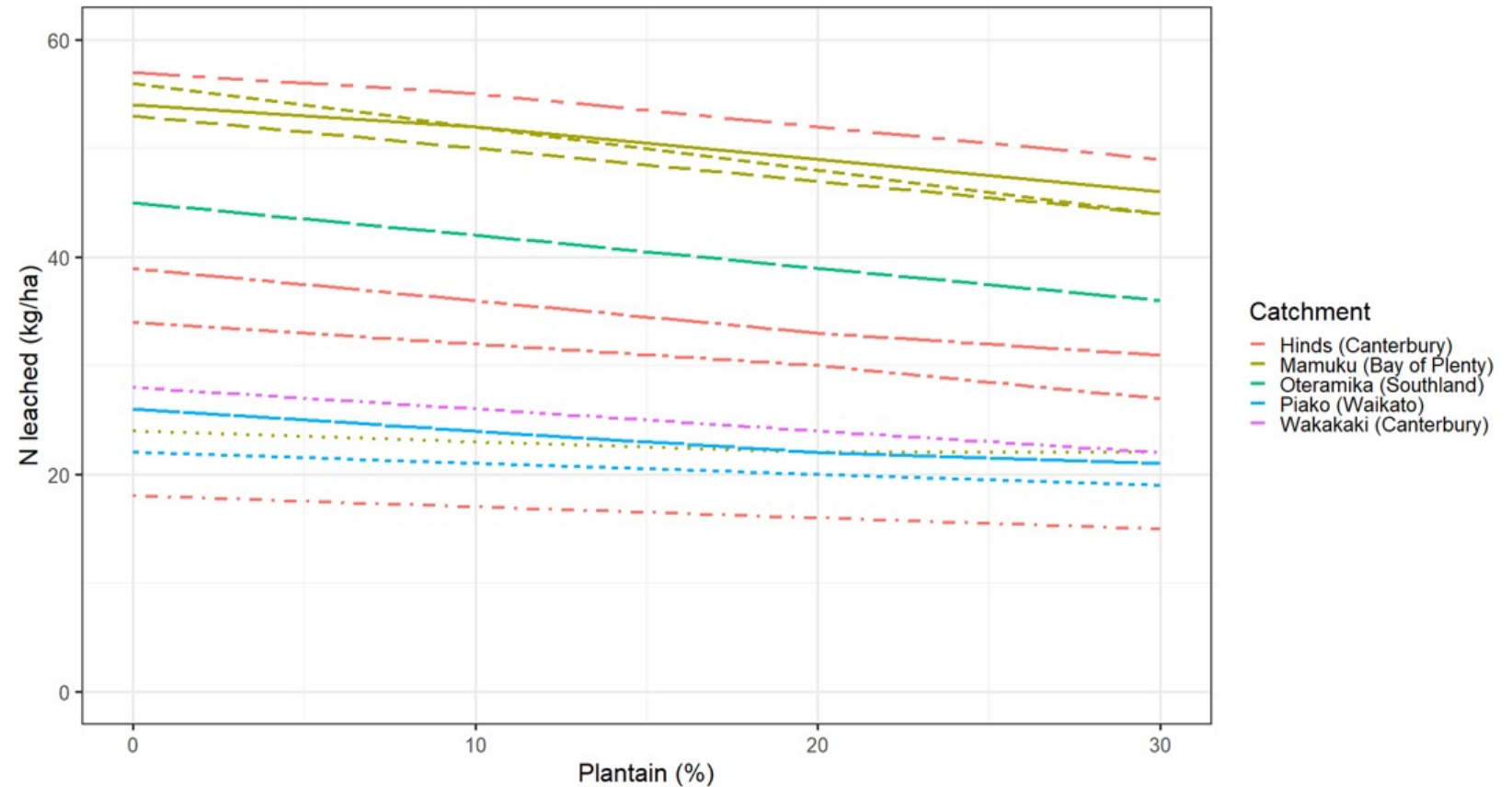
*20% reduction in N leaching –
around 20% average plantain*

Two years of data $P = 0.048$



Plantain in Overseer

- 12 partner farms, 5 catchments
- Urinary N effect only
- Avg. 6% (3-8%) reduction in N leaching for every 10% plantain
- Further reduction expected due to soil mechanisms
- Aim to reflect in Overseer by 2027



Economic case studies

Holdem, Rotorua, 59 kg N down to 41 kg N leaching (-31%)

	30% Plantain +	Fewer cows	Stand-off pad & 30ha trees	Plantain broadcast 2 kg/ha every year \$26/kg
Stocking rate	-7%	-31%	-5%	
Operating profit	-4%	-10%	-17%	

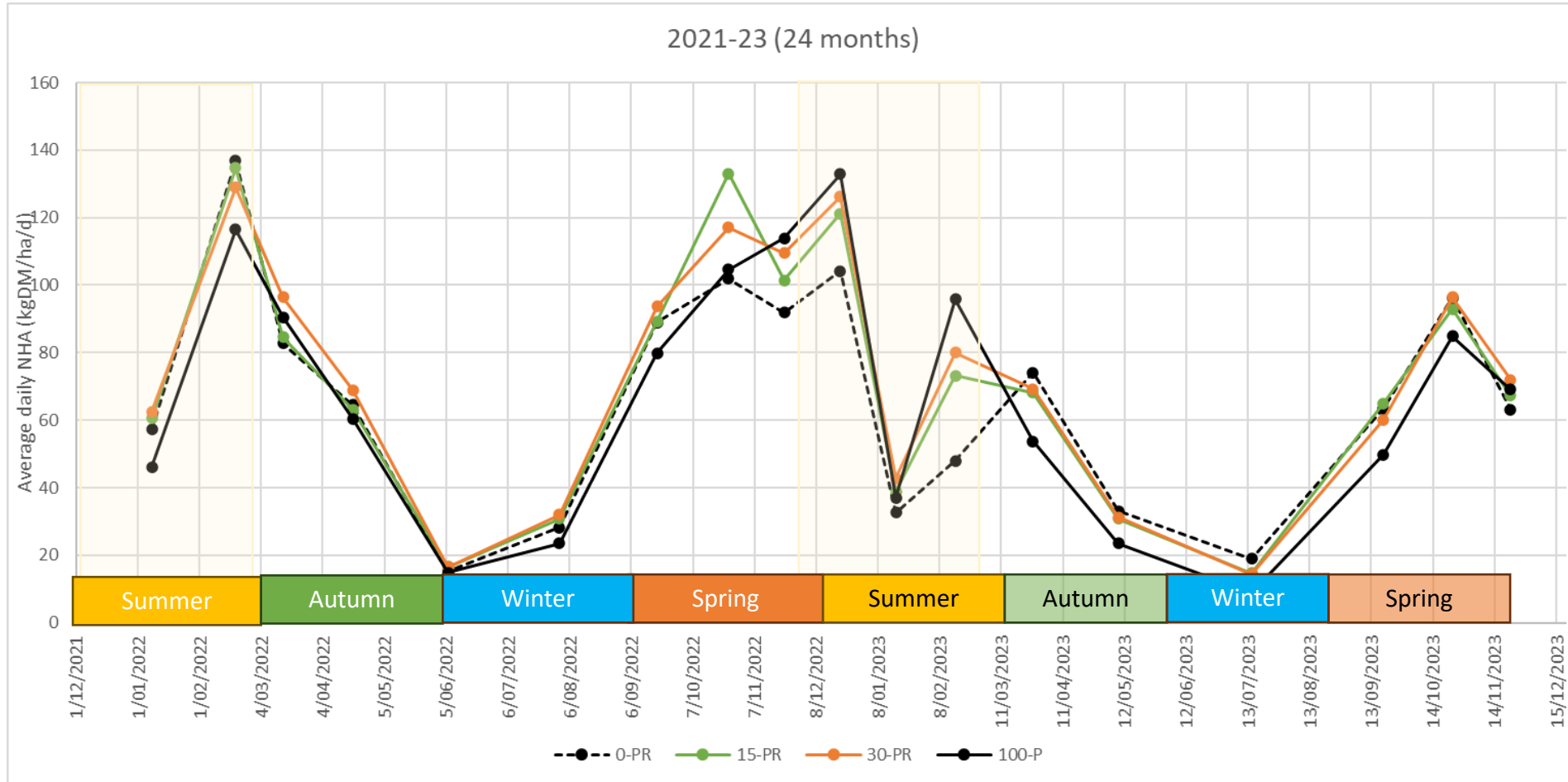
Raemac, Southland, 45 kg N down to 36 kg N loss (-20%)

	30% Plantain	Fewer cows	No crops	Plantain included in seed mix and broadcast 4 kg/ha/yr
Stocking rate	-	-24%	-	
Operating profit	-2%	-37%	-11%	

Early, Mid-Canterbury, 57 kg N down to 48 kg N loss (-16%)

	30% Plantain	Fewer cows	No barley crop	Plantain included in seed mix 3kg/ha and broadcast 3 kg/ha
Stocking rate	-	-20%	-	
Operating profit	-1%	-16%	-1%	

Pasture production - Edendale

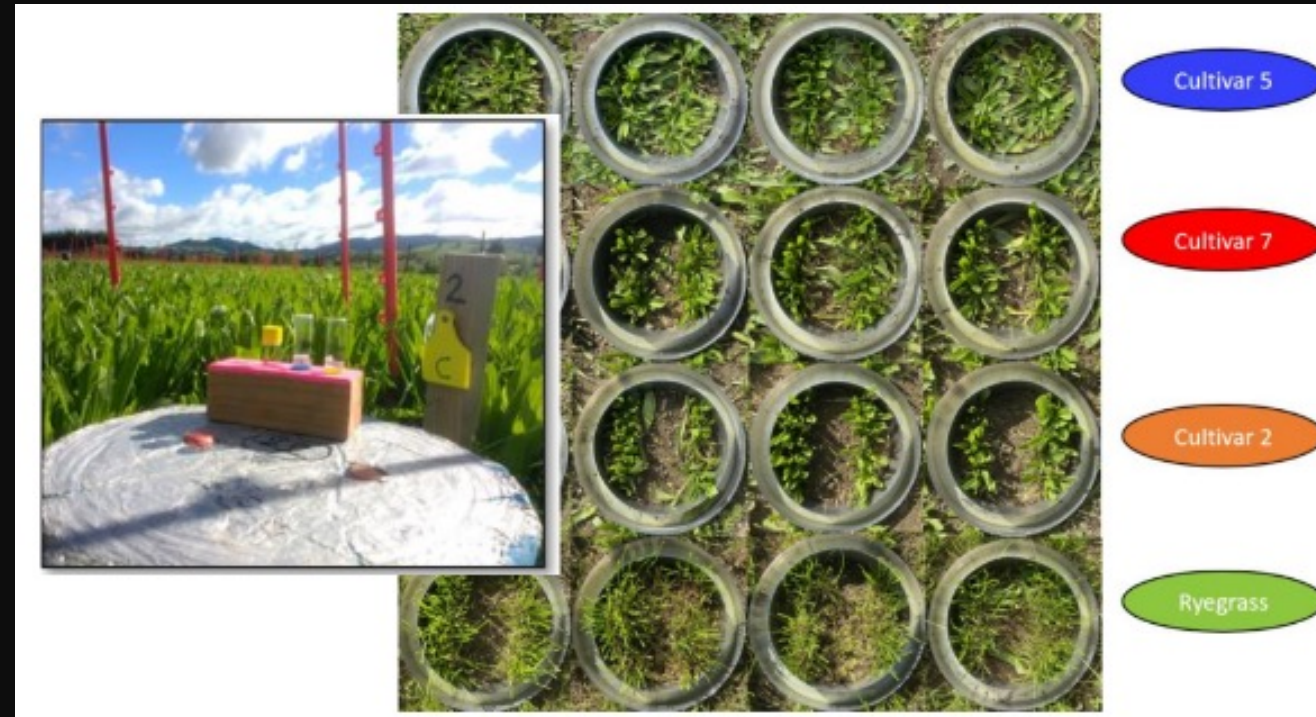


Summer dry environment:
Irrigation:
Feed quality:
Milk production:

Benefit from summer/autumn growth
Usually no change
No change
No significant change in farmlot trials

Nitrous oxide emissions (Supported by NZAGRC)

- All trials compared to Perennial Ryegrass/White Clover
- Dunedin:
 - Linear trend reduced N₂O with increased plantain - plantain urine and ryegrass urine.
 - 53% reduction from 30% plantain.
- Massey: 39% reduction from 30% plantain
- Cultivar evaluation (preliminary data)
 - 3 cultivars compared to PRG
 - Urine from ryegrass used on plantain
 - Southern Dairy Hub (dry autumn):
 - 39, 57 and 63% reduction
 - Waikato (wet autumn):
 - 12, 15 and 3% reduction



Plantain establishment

- Plantain swards reach peak abundance at 12-18 months and then decline (life around 3 years)
- Important not to sow too deep <1cm
- Spring or Autumn – before too cold
- Control weeds prior to sowing
- Dictate (Bentazone) now on label for control of weeds in plantain mixed swards



New pasture: 3-4 kg/ha Ecotain with 8-20 kg/ha ryegrass + 5 kg/ha clover



Broadcast: 2-5 kg/ha with or without fertiliser. Prillcote for good spread x 2 rate.



Pure crop: 12 kg/ha Ecotain (optional ~5 kg/ha clover)



Under-sow into existing pasture at 2-5 kg/ha

Grazing management

- Manage grazing rotations the same as perennial ryegrass/white clover
- Overgrazing reduces persistence, especially in wet soils
- Low palatability can result from long rotations (>25 days) or high residuals, especially in autumn
- Graze new pastures at 6-leaf stage
- Avoid seedhead production to extend the life of the plant




Plantain Visual Assessment Guide

www.dairynz.co.nz/plantain


- Recognised by regional councils
- Walk across paddock diagonally, estimate % plantain
- Weighted average of plantain % by area for each block – enter into Overseer.

What 5% - 30% plantain could look like




5%

What 40% - 90% plantain could look like




40%



Plantain quiz - test yourself

Now you've got your eye in, test yourself using the images below. Each test image is followed by the same image showing the correct %.



Plantain Cultivar Evaluation

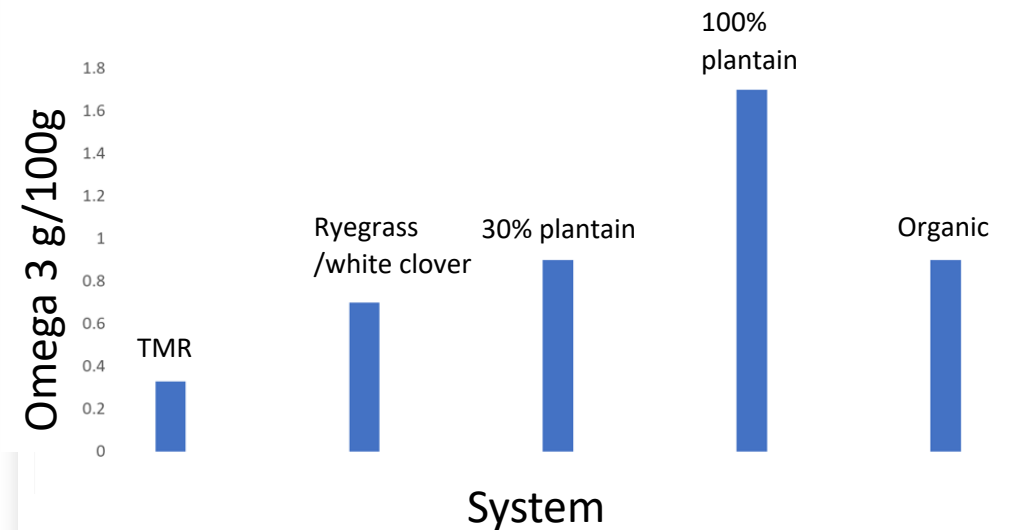
- Independent system for evaluating effectiveness of plantain cultivars for reducing nitrate leaching
- Currently only Agritonic (marketed as Ecotain) classed as effective
- Plot trials in 4 regions – 9 cultivars, ryegrass, 10 breeding lines. Assess nutritional drivers of animal effects and plant secondary compounds.
- Cow metabolism stall trial
- Soil/plant research = plant-based test
- Preliminary analysis shows up to 12% difference in leaching between cultivars (animal effects only)



Milk from plantain-fed cows



- No risk to human health
- No impact on milk composition (fat, protein etc.)
- No impact on products (milk, cheese, cream etc)
- Higher Omega 3



Plantain and animal health

- Initial data - plantain has lower facial eczema spores than ryegrass
- Observed lower ryegrass staggers where wildtype endophyte present.
- Caution with varying plantain intake during calving – potential metabolic risk.
- No consistent issues with grazing plantain among partner farmers.
- Animals may drink less water with plantain – caution with inline dispensers.

