

# Recent policy developments and practical responses to lessen the impacts of grazing livestock on water quality in NZ

**agresearch**  
*āta mātai, mātai whetū*

**Dr Ross Monaghan**  
**Soil Scientist, Ethical Agriculture Group**

AgResearch Invermay, Mosgiel

# Outline

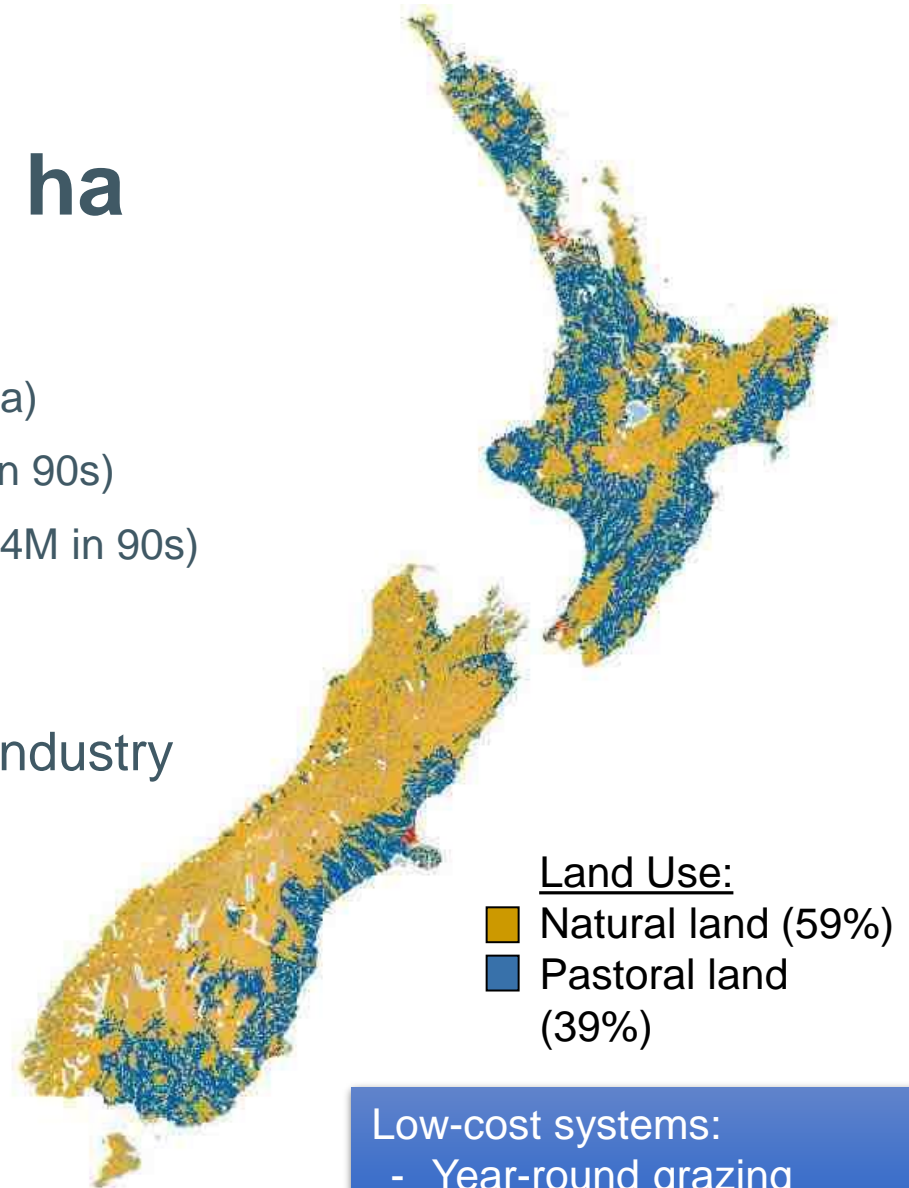
1. Issues and challenges
2. Policy developments
3. Practical responses
4. Research needs

# New Zealand – 27 M ha

## Populations:

- 5 million people (on 1% of land area)
- 27 million sheep (down from 60M in 90s)
- 6.5 million dairy cattle (up from 3.4M in 90s)
- 4 million beef cattle

Agriculture is most important NZ industry  
Predominantly pastoral livestock

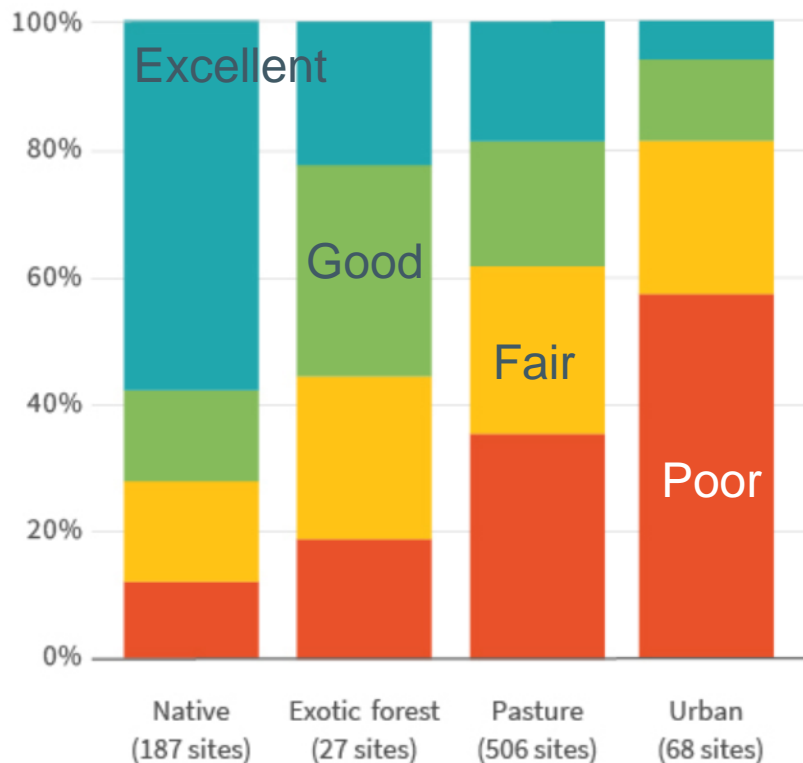


## Low-cost systems:

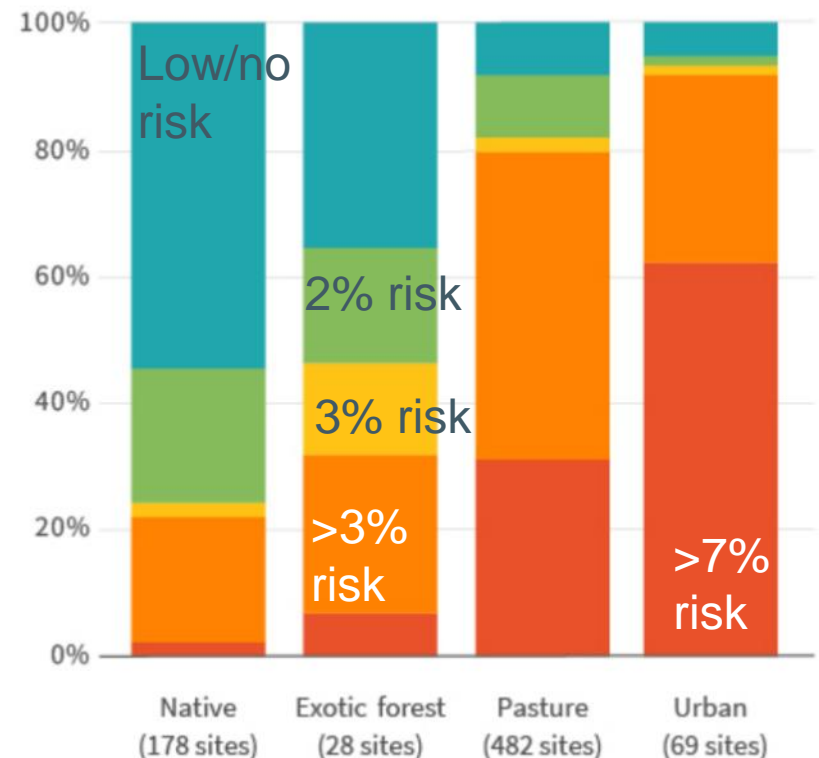
- Year-round grazing
- Clover-based pastures

# Water quality state National snapshot

Macroinvertebrate Community Index

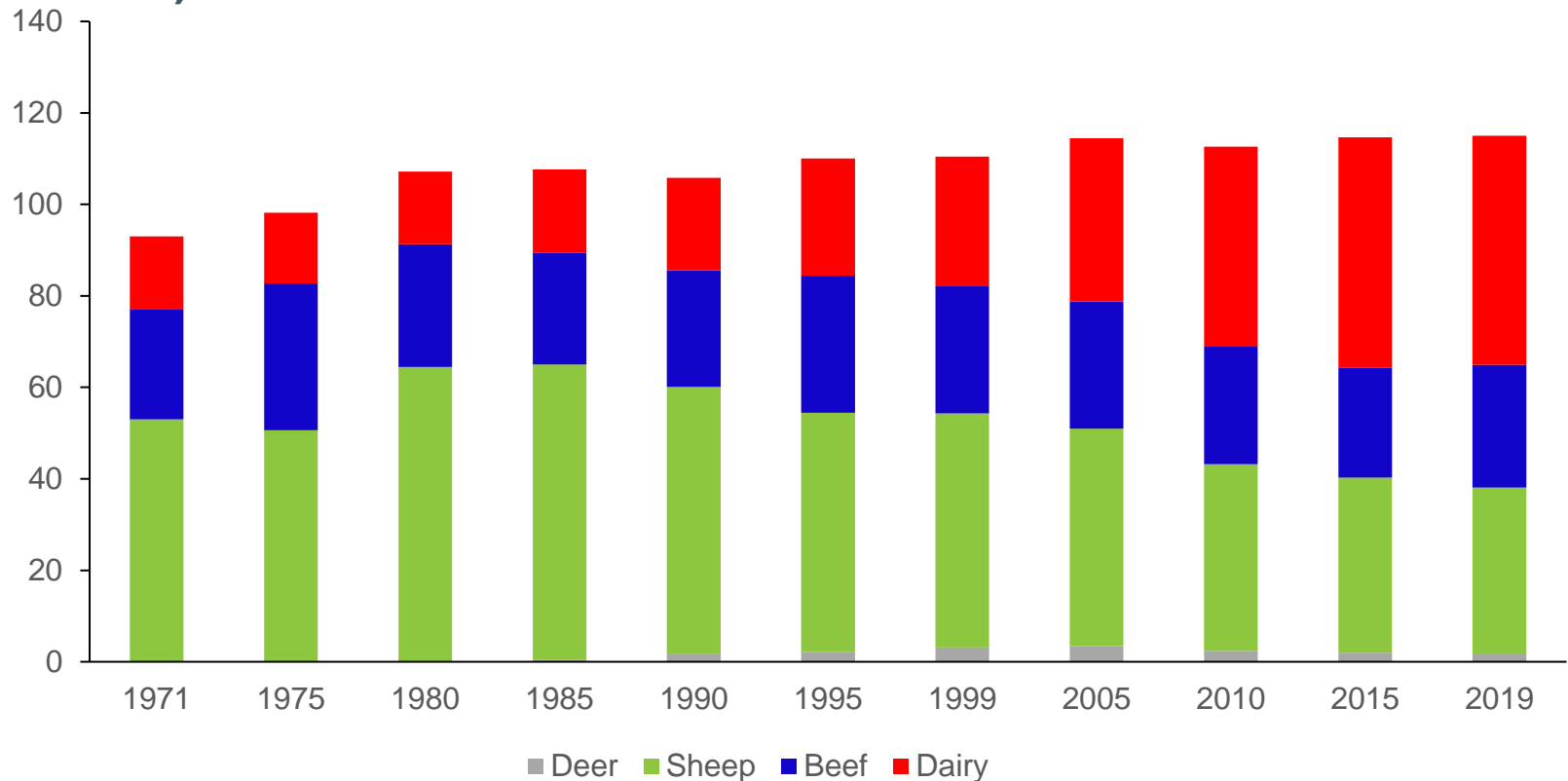


*E. coli*



# Animal stock unit equivalents (SUEs) 1971 – 2019

(millions)



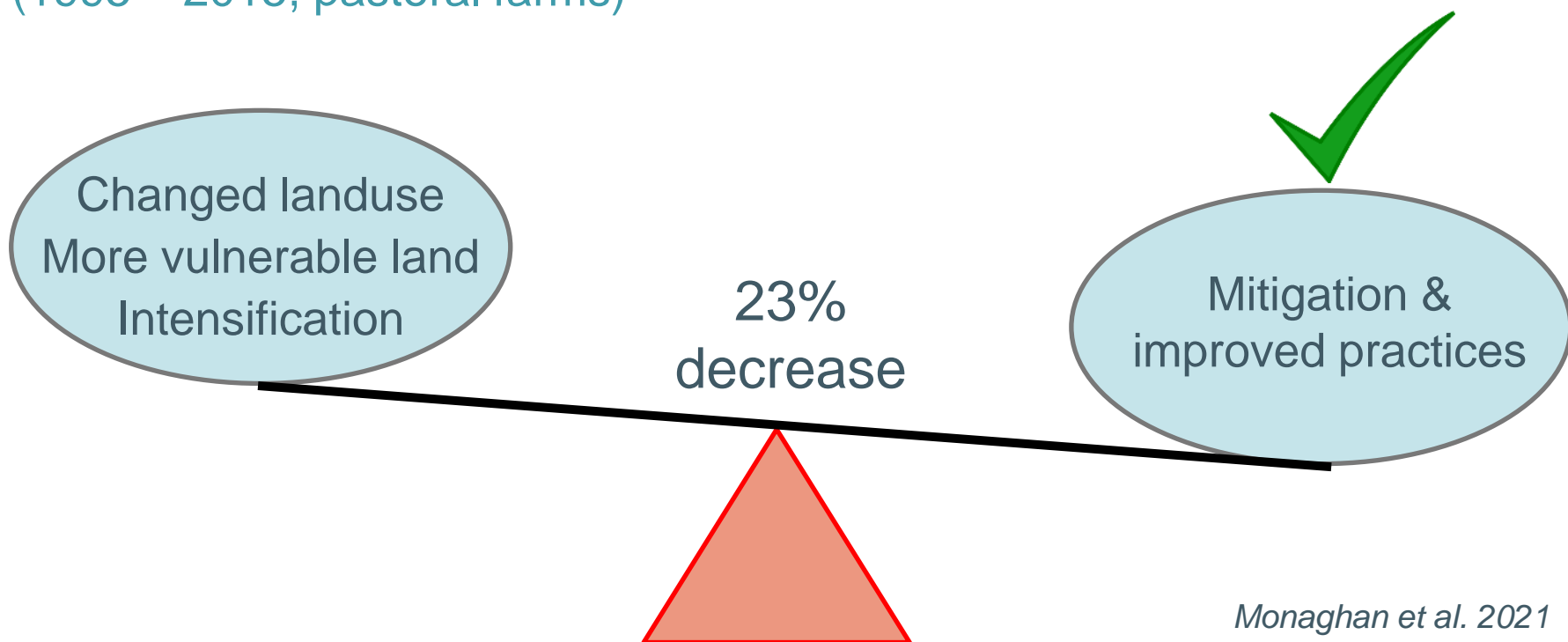
Source (head counts): StatisticsNZ, [www.stats.govt.nz](http://www.stats.govt.nz)  
1 SUE consuming ~ 6000 MJ ME per year



# Implications for water quality

## Assessments of farm scale P losses

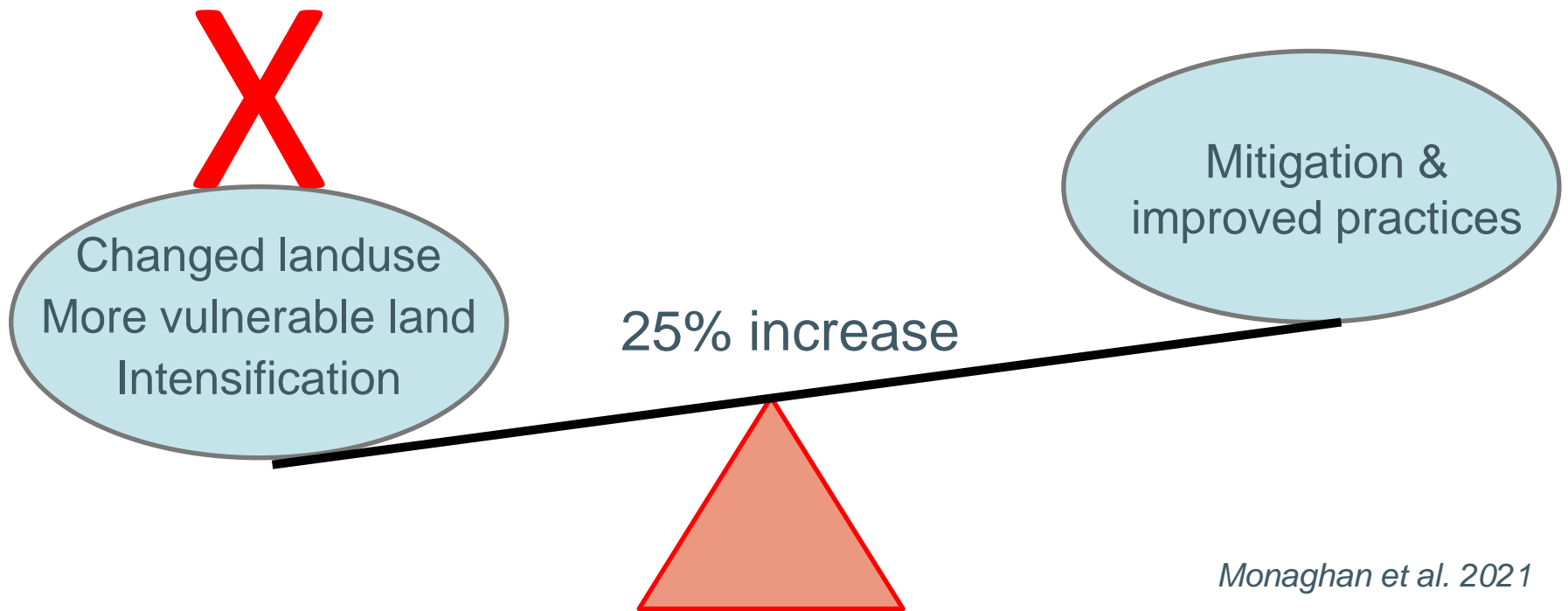
(1995 – 2015, pastoral farms)



# Implications for water quality

## Assessments of farm scale N losses

(1995 – 2015, pastoral farms)



*Monaghan et al. 2021*

## 2. Policy developments



# National Policy Statement for fresh water management

Directing **regional** councils to set limits for fresh water in their regional plans to

- “..**safeguard fresh water**’s life supporting capacity, ecosystem processes, and indigenous species
- manage freshwater bodies so **people’s health** is safeguarded
- maintain or **improve the overall quality** of fresh water within a region..”

## The Zero Carbon Bill

New Zealand is on the path to a low emission, climate resilient future; the Government aims to reduce our emissions to net zero by 2050.

- The Government is committed to New Zealand becoming a world leader in climate change action
- It plans to introduce a new Zero Carbon Bill that will set a new emissions reduction target by 2050
- It also plans to establish an independent Climate Change Commission.

Tuesday, 23 October 2018 10:12

## Farmers under the microscope

Written by Peter Burke

font size 🔍 🔍 | Print | Email

Farming has been under the microscope this month with three heavyweight Government reports — on water quality, climate change and *Mycoplasma bovis* — all appearing in just three days.

Federated Farmers vice-president Andrew Hoggard quipped that his response to these challenges was to



id Parker.

## Interim Climate Change Committee Announced

Tuesday, 17 April 2018, 2:14 pm

Press Release: **New Zealand Government**

Hon JAMES SHAW  
Minister for Climate Change

## The government announces \$118 million grant to help plant one billion trees by 2028

30/11/2018


Holly Garran

Twitter Facebook Share Like 3



Shane Jones

Forestry Minister



## Essential Freshwater

Healthy Water, Fairly Allocated

**THE DESIGN SCHOOL**  
PALMERSTON NORTH • WAIKARE  
graphic design • fashion design

You have talent  
Now get a career

[www.designschool.ac.nz](http://www.designschool.ac.nz)

More From Newshub



## What does this (likely) mean?

- Farm Plans mandatory (starting with “at risk” catchments)
- No more than 190 kg synthetic N/ha per year
- Interim controls on intensification
- Stock exclusion from waterways & wetlands
- More stringent rules for animal wintering – limits on areal extent, slope, pugging depth, re-grassing dates
- Tighter controls on stock holding areas (feed, standoff and loafing pads; wintering structures)
- For many farms: managing in-stream nutrient concentrations (perhaps to < 2.4 mg DIN/L)



INDEPENDENT VOICE OF THE SOUTH

Telephone: (03) 477-4760

New Zealand's first daily newspaper, Est. 1861

# Otago Daily Times

SATURDAY & SUNDAY  
July 17-18, 2011

SPORT • 32

**SATURDAY & SUNDAY,**  
July 17-18, 2021

BUSINESS • 16

## Exciting challenges in the South

REGIONS • 17

## Landfill gets consent

SPORT • 32

**Last  
chance  
to impress**

## AT HOME ON THE RANGE

BUGS AND LEBRON

**'Enough is enough'**

**■ STAFF REPORTERS**

The country came to town and they did the town know about it. Huge crowds swarmed into towns and cities across the South yesterday, united in their support of rural New Zealand.

From Oamaru to Invercargill, convoys of tractors, farm vehicles, trucks and vans joined thousands further north taking part in the Hōse of a Protest event, organised by Groundswell New Zealand, protesting against what the rural sector says are unworkable government regulations.

In Dunedin, the first truck, driven by Jamie Marshall, rolled into the Octagon just after noon, to much cheering from the lunchtime city crowd, and the last vehicle went through about 3.30pm.

Mr Marshall, husband of a protest's Dunedin organiser Gill Marshall, was thrilled to see the large turnout in support of the protest. People were starting to realise that, without farmers, they would be "pretty hungry", he said.

Jim Macdonald, who drove his tractor in from his Clarks Junction farm, said the huge turnout was what he had hoped for but did not expect.

He praised Groundswell National founders Laurie Paterson and Bryce McKenzie for doing a "hell of a job".

time and business  
affected.  
"Everyone's getting so  
rules, you can't keep up."  
Despite the many con-  
nobody was listening, and  
like the Government had  
muffs" on, he said.  
Invermay direc-

Former Inverness  
Jock Allison, who spoke  
protest's finale in N  
described it as a "map  
protest" — the South the



Not your usual ... A convoy of tractors heads along Princes St in  
as part of Groundswell NZ's Howl of a Protest event  
PHOTO: STEPHEN JAGLIEP

A large crowd of people is gathered for a protest. In the background, a sign is visible that reads "WWT REGULATED UNDER THE 1961 ACT". The crowd is diverse in age and appearance, and many are looking towards the front of the gathering. The photo is credited to "PHOTO: GORDON D'YRRE".

West Otago, and Mr Paterson Waskela, delivered Grouwell's "Enough is enough" message.

### Groundswell's concerns

- ▶ Unworkable freshwater regulations.
- ▶ Proposed Significant Natural Areas policy penalising conservation-minded landowners.
- ▶ Over-the-top, one-size-fits-all state control.
- ▶ No respect for people, their privacy and property information.
- ▶ Overseas corporates buying up New Zealand farmland to offset emissions.
- ▶ Taxes on essential work vehicles.
- ▶ Out-of-control costs crippling small business.
- ▶ Unconcentrated mental strain on people.

Standing tall to support grandad



Dressed in her pink gumboots and overalls, 6-year-old Ari Wallace — one of the youngest participants in the Groundswell NZ protest — was wielding a sign in support of third-generation Taieri farmer Peter Cashmere.

"I love Poppa too," commented a passer-by as Ari and her twin brother Luke patiently awaited the arrival of their grandfather, Dunedin's Octagon. Luke was holding a banner reading "Give Farmers A Go".

The twins' grandmother, Marise Cushman, said her husband was taking part in the protest because he needed to look after his term.

The more restrictions in front of them, the more they were able to produce, she said.

Mr Cashmere hopes the children, including

another set of twins, have the opportunity to continue the farming tradition if they want to. **REPORT: I**

PHOTO: CHRISTINE

Invercargill organiser Bruce Robertson estimated at least 500 people attended there, and 140 sites, 55 tractors, five helicopters and one fixed-wing plane turned out in Te Anau.

(Continued Page 3)

PHOTOS • Page 1  
STAYING ON MESSAGE • Page 2

VIDEOS: [www.odt.co.nz/](http://www.odt.co.nz/)

Continued Page 3

NATIONAL PROTEST • Page 3  
PHOTOS • Page 1  
STAYING ON MESSAGE • Page 7

▶ VIDEOS: [www.odt.co.nz/](http://www.odt.co.nz/)

## 3. Practical responses

### a. Better pastures/management

- Reductions in purchased N
- Diverse pastures
  - Plantain
  - More winter active
  - Deeper rooting?

# Plantain

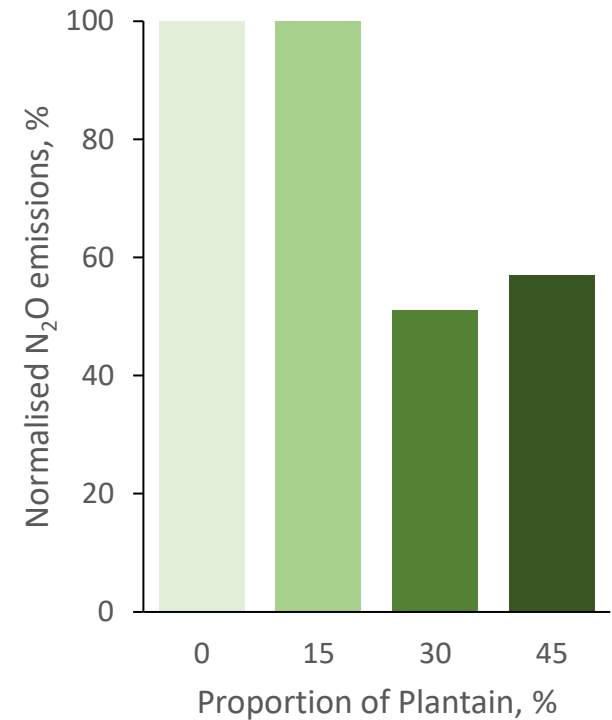
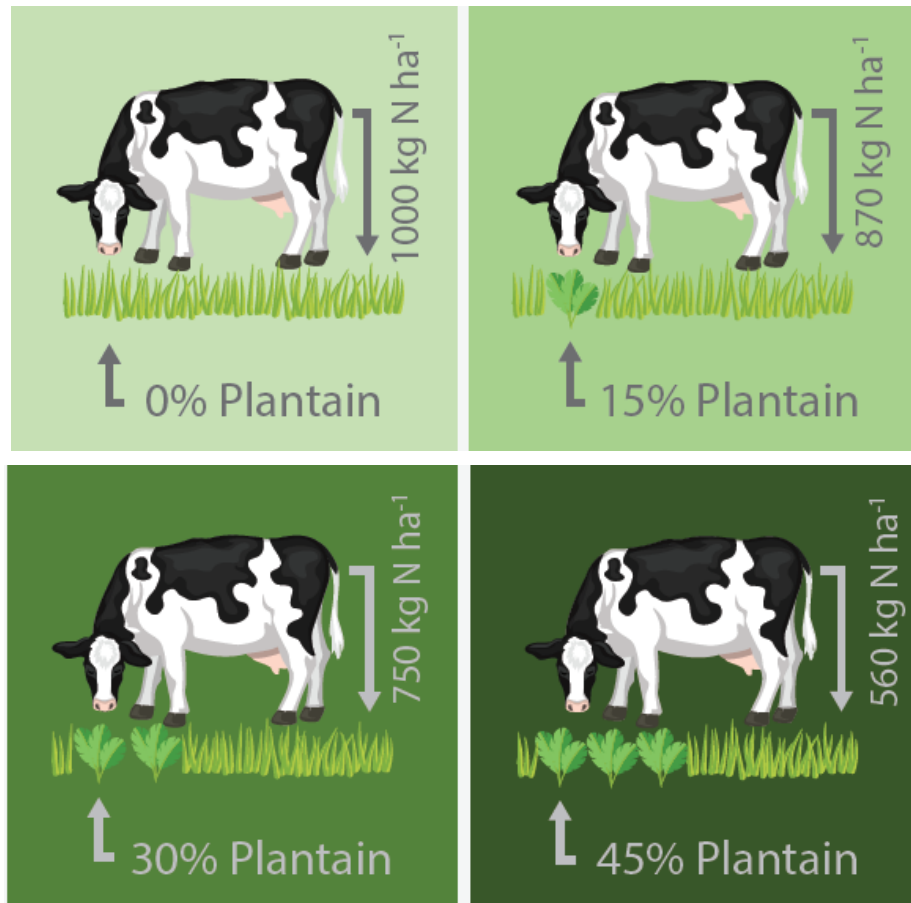
## From weed to wonder plant?

- Commercially available
- Positive attributes
  - Less and diluted urine N
  - Slows nitrification
- Targeted at N leaching reduction
  - c. 10 – 30% reductions?
- ~ 30% plantain in pasture/diets will be required



*Woods et al. 2018*  
*Carlton et al 2019*  
*Minnee et al. 2020*

# Plantain co-benefit: Reducing N<sub>2</sub>O emissions



Simon et al. 2019



## 3. Practical responses

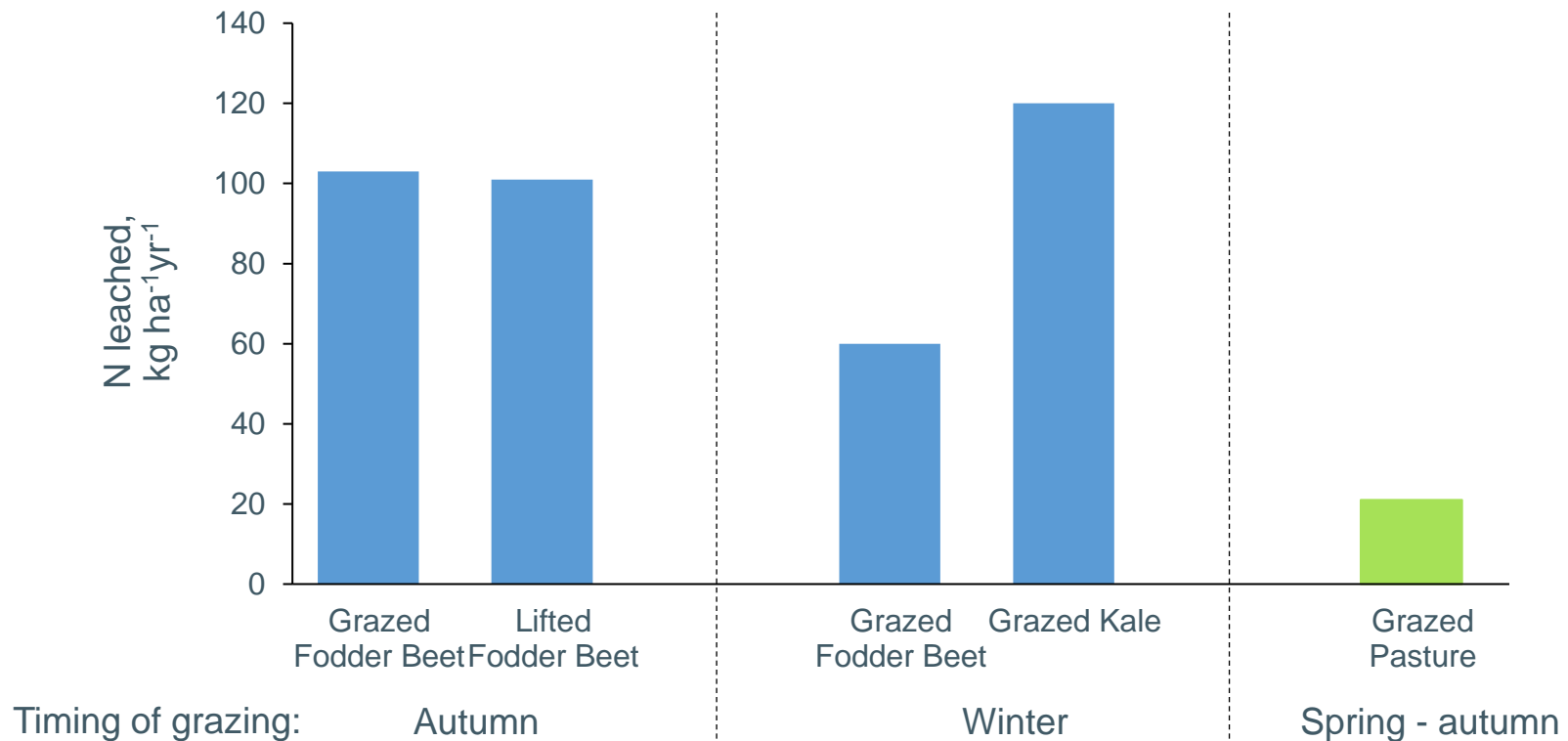
### b. Forage cropping systems

- Less autumn & winter forage crop grazing



# N losses to water

## Crops v pasture – southern NZ



## 3. Practical responses

### b. Improved forage cropping systems

- Less autumn & winter forage crop grazing
- Less bare or damaged soil
  - Catch crops following winter crops
  - Reduced tillage intensity



*B Malcolm, P Carey and others*

## 3. Practical responses

### b. Improved forage cropping systems

- Less autumn & winter forage crop grazing
- Less bare or damaged soil
  - Catch crops following winter crops
  - Reduced tillage intensity
  - Provision of ground cover





## 3. Practical responses

### b. Improved forage cropping systems

- Less autumn & winter forage crop grazing
- Less bare or damaged soil
  - Catch crops following winter crops
  - Reduced tillage intensity
  - Provision of ground cover
- Off-paddock infrastructure?



## 3. Practical responses

### c. Alternative land uses?

- Trees...
- Fruit crops – avocado, kiwifruit, etc.
- Specialty seeds – carrot, radish, etc.
- Hemp
- Small ruminant milking

# Emerging industries

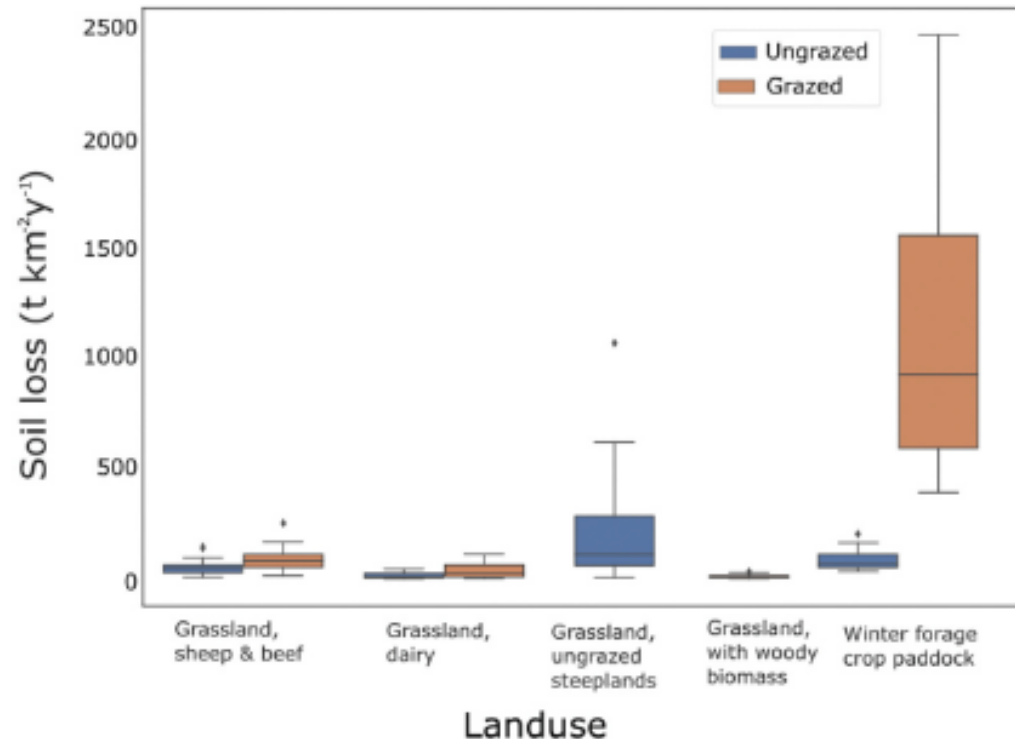
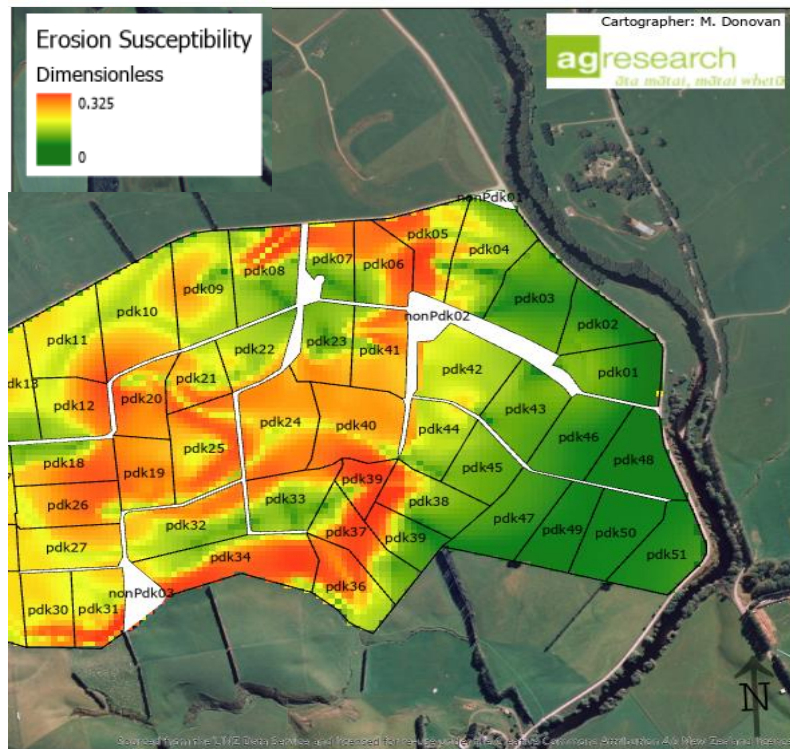




# 3. Practical responses

## d. Managing vulnerable landscapes

Minimize overlap between intensive grazing and vulnerable land  
Important for sediment control at farm and catchment scale



# Managing and modelling soil loss risk

Inherent properties	Management factors
Rainfall erosivity	Crop yield
Slope angle	Stock Type
Slope length	Tillage method
Soil erodibility	Grazing history
	Grazing density
	Residual Cover



Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: <http://www.elsevier.com/locate/jenvman>



## Research article

Impacts of grazing on ground cover, soil physical properties and soil loss via surface erosion: A novel geospatial modelling approach

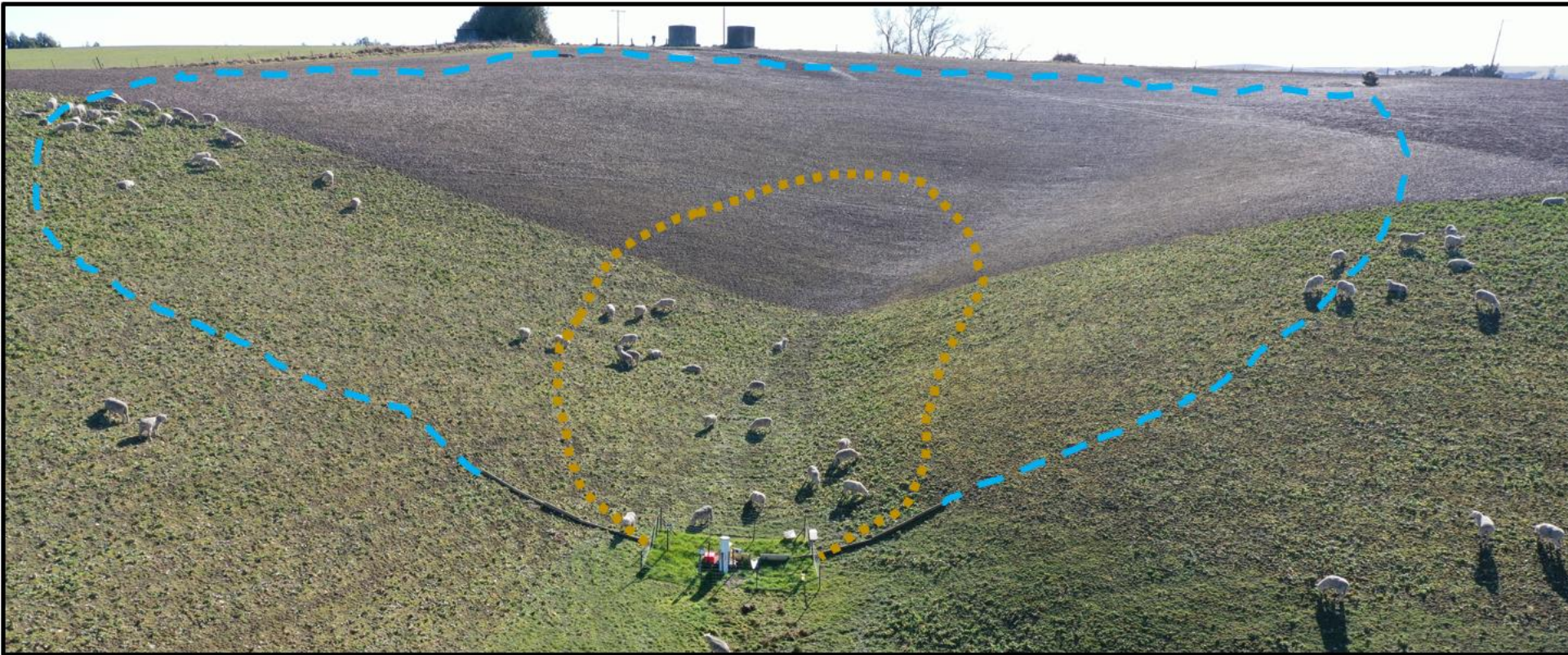
Mitchell Donovan<sup>\*</sup>, Ross Monaghan

AgResearch Limited Invermay Agricultural Centre Puddle Alley, Private Bag 50014, Mosgiel, 9053, New Zealand





# Tactical grazing to protect Critical Source Areas (CSAs)





# Tactical grazing to protect Critical Source Areas (CSAs)



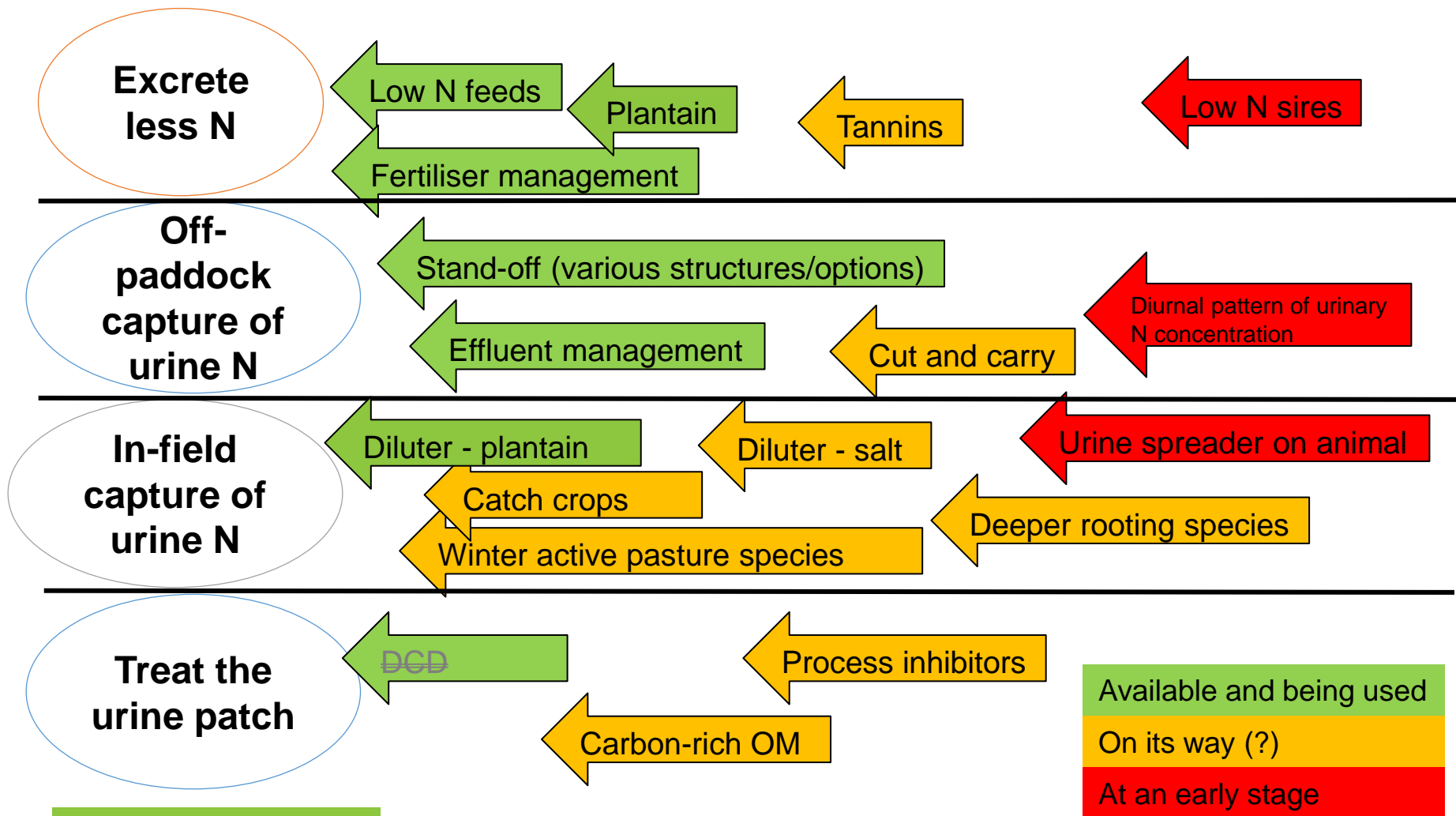
## 4. Research needs

- Plantain
  - Catch crops
- } effectiveness at farm scale, other attributes?
- Improved geospatial modelling to guide policy & practise
  - More efficient recycling of urinary N

# Reducing the N problem = targeting the urine patch



# Pipeline: some options for urinary N





# More affordable standoff options?



## Final remarks

- It's a tough time to be a NZ farmer...
- Implementing what we know now will be important
- Some design inefficiencies still to be overcome
  - N surplus in urine patch
  - grazed winter forage crop systems
  - transport of faecal microbes in surface runoff
- Better matching of Land Use to Land Suitability is also required