SPRING AHEAD

Plan now for a successful season

bci

ACTON FARMERS
Irrigation Cooperative Limited

(October 2023)

DairyNZ beef+lamb new zealand bnz agresearch FAR mrb macfarlane rural business ENVIRO COLLECTIVE

SPRING AHEAD

Plan now for a successful season

LOCATION: 815 Back Track, Highbank
DATE: 4TH October 2023

SPRING PLANNING

10:15AM	ARRIVAL AND MORNING TEA	
10:30AM	Introduction, Health and Safety and BCI Scheme Update	Nick Daniels (BCI) and Jeremy Casey (Back track Dairies)
10:40AM	Spring Irrigation System Checks	Will Wright (Enviro Collective)
10:55AM	Planning for Profit	Mark Everest (MRB)
11:20AM	Tools to Optimise N Fertiliser for Forage Crops	Abie Horrocks (Foundation for Arable Research)
11:40AM	Bale Grazing Trial Update	Ross Monaghan (AgResearch)
	LUNCH	
	WINTER PLANNING	
12:30PM	Introduction and Recap	Eva Harris (Enviro Collective)
12:35PM	Preparing for Next Winter	Justin Kitto (DairyNZ) and Tom Orchiston (Beef+Lamb)
12:50PM	Prepare your Winter Grazing Management Plan	Break out session to prepare your own winter grazing management plan for this coming season.
1:20PM	Wintering Diverse Pasture Post-Grazing Update	Jeremy Casey (Back Track Dairies)

HEALTH AND SAFETY

- Watch out for Heavy Machinery
- Uneven surface out in paddock
- Watch out for animals and electric fences
- Dehydration or sunstroke if hot, water and sunscreen is available

SPRING PLANNING

Thinking ahead for a smooth season

BCI SCHEME UPDATE

Our Purpose

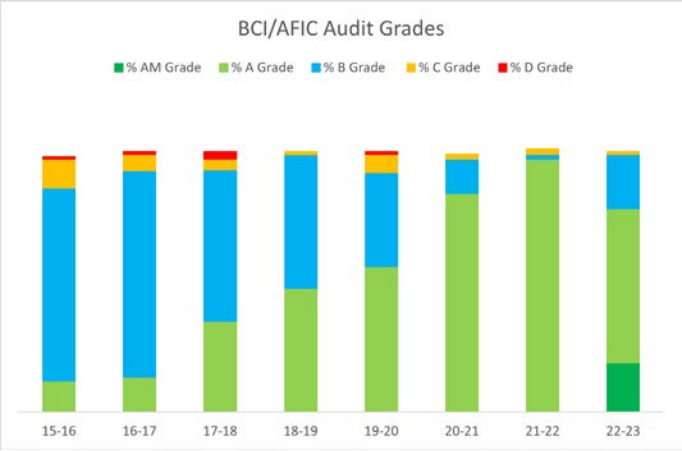
- Community
- Food
- People
- Intergenerational Infrastructure
- Environmental Commitment

Key Environmental Priorities - 2023

1. Comply with our water take and discharge consents
2. Promote continuous improvement
3. Supporting Shareholders to work towards Advanced Mitigation

2023 Audit Update

- 19% Advanced Mitigation
- 21% "B" Grades
- Most "B" grades due to lack of bucket testing
- Changes in auditor guidelines mean you need to be able to demonstrate all systems are performing at the expected standard



ADVANCED MITIGATION FOR WINTER GRAZING CROPS

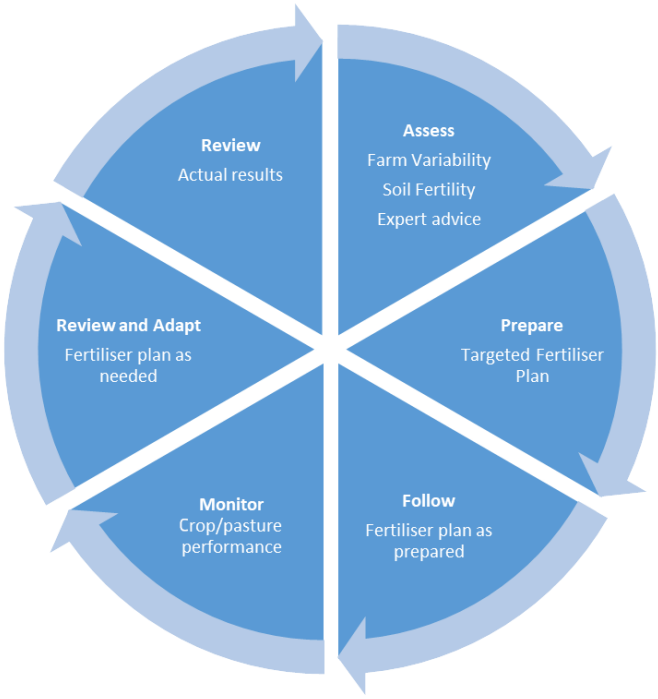
Advanced Mitigation requires you to identify where you can reduce your farm's nitrogen surplus and take action to do so. Intensive Winter Grazing (IWG) is a key risk for nitrogen loss to groundwater on your property.

For winter grazing crops, nitrogen can be lost to groundwater when:

1. More nitrogen is available (e.g. from fertiliser or mineralisation) for the plant than needed for growing
2. Animal urine and dung inputs during grazing
3. Limited or no plant growth immediately after grazing
4. Cultivation methods after grazing
5. Soil damage slowing growth of crop sown after grazing
6. Excess irrigation draining nitrogen stored in the soil

Optimising fertiliser inputs, managing irrigation to avoid drainage, minimising soil damage by stock and getting a new crop in as soon as possible after grazing are therefore key to reducing nitrogen losses from intensive winter grazing and achieving Advanced Mitigation.

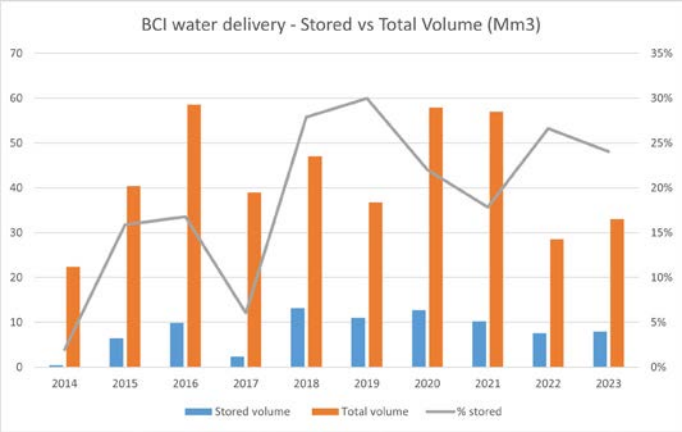
Figure 1: Annual Cycle for Advanced Mitigation Fertiliser Management.



BCI STORED WATER UPDATE

BCI stored water – how important is it?

- Stored water use varies by year
- Stored water use is unrelated to 'wet' vs 'dry' years (is not directly related to rainfall on plains).
- Stored water use averages 19% of total water use (range 6-30%)
- However – stored water ensures water can be delivered at critical times



Stored water – when do we use it?

Number of days of stored water / month and season

Key Points

- Most stored water days have occurred in Dec, Jan and Feb (80%)
- However, large variability between months and years
- Not uncommon to have more than 10 stored water days in a month

Table 1: The number of stored water days in each month over the past ten years

	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	Average/month
OCT	2	-	-	-	15	-	-	4	1	-	2
NOV		-	-	2	-	3	-	8	8	-	2
DEC		-	17	3	-	19	-	11	-	-	6
JAN	13	14	2	25	6	6	-	7	8	-	8
FEB	14	-	11	4	16	1	3	6	18	3	8
MAR		-	2	-	5	-	6	8	4	1	3
APR		-	-	-	-	-	-	-	-	-	-
Total	29	14	32	34	42	29	9	44	38	4	27

SPRING IRRIGATION SYSTEM CHECKS

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With a dry season predicted, maintaining your irrigation system is as important as ever to minimise the risk of mid-season breakdowns and avoid blocked nozzles reducing your yields.

Key checks to complete now include:

- Dry Walk" – check against nozzle chart, tyre pressure and wheel ruts
- "Wet Walk" – check for leaks, water pressure, eyeball each nozzle
- Clean sand trap
- Complete a bucket test
- Make sure moving bits are greased
- Check pivot alignment and that the guns switch on and off when they're meant to
- Use IrrigationNZ Pre-Season checklist for each irrigator

The El Nino weather pattern can mean more frequent and stronger north-westerly winds, increasing the risk of damage to your irrigator. Make sure you have a plan in place to Park, Point and Anchor your irrigators when high winds are predicted.

• PARK • POINT • ANCHOR

For further information:

IrrigationNZ/FMG:
Guide to Managing Irrigation in High Winds
https://www.irrigationnz.co.nz/Attachment?Action=Download&Attachment_id=395
IrrigationNZ Pre-Season Checklists:
https://www.irrigationnz.co.nz/PracticalResources/GMP/BucketTest
Enviro Collective Guide to Irrigation System Calibration and Maintenance
https://www.bciwater.co.nz/wp-content/uploads/2022/11/Guide-to-Irrigation-Calibration-Oct-22.pdf

PLANNING FOR PROFIT

Mark Everest
Farm Consultant
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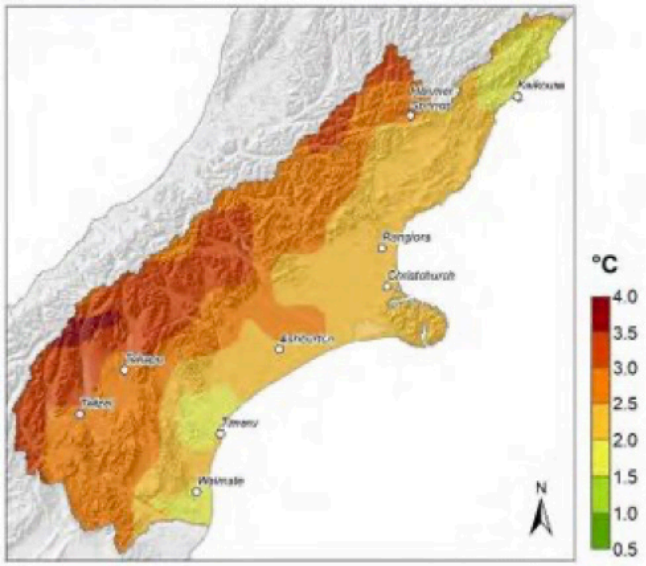
Key Points

- The principles now are no different to any other year.
- There's no money in maintaining an animal – it has to grow to make $.
- Most crop expenses are already spent before water restrictions are on.
- Short water pasture, sell stock and focus on crops.
- Continue watering 10-15 days after drought break.
- Going forward, its likely considering maturity and water demands of crops will become more pertinent to ensure everything is finished.

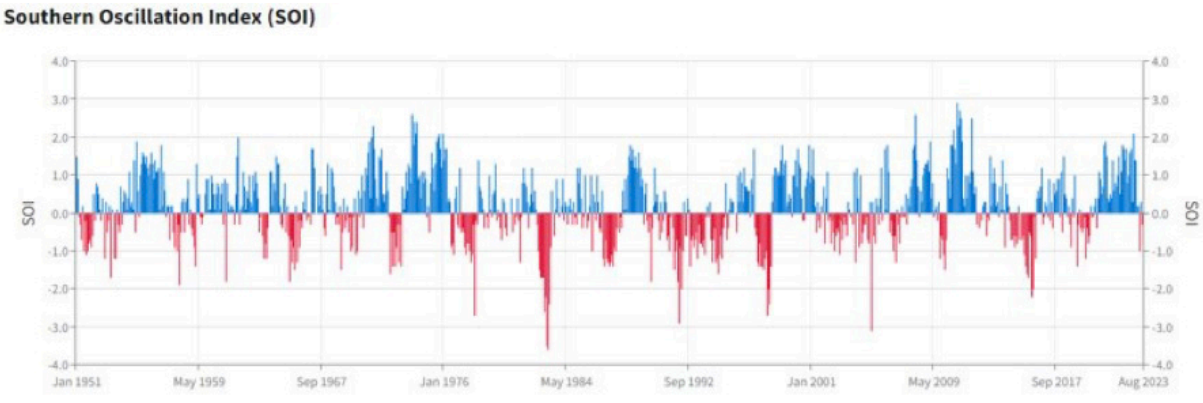
Short and Long Term Climate Projections:

Long Term Outlook:

- NIWA forecasting 50-100mm increased PET for Canterbury by 2040
- That's 50-100mm more irrigation needed
- Lower annual river flows
- More total annual river volume
- More rain in episodic events



Annual Mean Temperature
- projected change



Cost of Water

Storage 18c/m3 ($1.80/mm/ha)

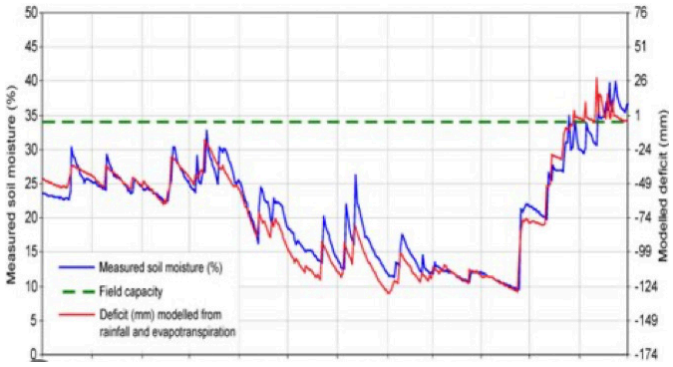
On Farm

- Pump electricity (marginal) @ $0.26/mm/ha
- Irrigator electricity – nominal
- Diesel for tractors (if applicable) @ $0.70/mm/ha

Total Range $1.80 – $2.76/mm/ha

Principles of Water

- Not a response to irrigation, plants respond to the presence or absence of a soil moisture deficit



Water Responses – Pasture

Pasture harvested 6.5t dryland, 13.0t irrigated

- 270-320mm/ha efficiently used for a 6.5tDM pasture gain
- 20-25kgDM/mm water applied ($0.09-$0.15/kgDM, incl. fert)

Pasture – Dairy

- Does not matter – use whatever is needed.
- At $6.00 milk price Nett Margin $0.50/kgDM
  - Grain = 51c/kgDM ($480/t)
  - PKE = 46c/kgDM ($360/t)
  - Baleage = 58c/kgDM ($250/t in paddock)

Pasture – Non Dairy

- Summer Trade lambs: $0.10-$0.15c/kgDM
- Dairy Grazing: $0.22-$0.28/kgDM
- Weaner Deer: $0.25-$0.30/kgDM
- Beef Finishing: $0.19-$0.25/kgDM

Water Responses – Pastures

Stored Water Cost: $0.09-$0.15/kgDM

Short-water the lot or fully-water part? (Pastures)

- Already reached stress point
- Looking like another 6 weeks of 50% restrictions

Consider

- Once you hit PWP, a large number of ryegrass plants will die
- Oversowing cost of dead/thinned pastures
- Having some of the farm growing like normal can be good for mental health

Results

- Nothing in it
- Likely to be more expensive in the long run to short water everything as will require more regrassing.

Water Responses – Forage and Feed Crops

Stored Water Cost: $1.80 – $2.76/mm/ha

Agronomy

Think about when the money is spent.

Water Responses

- Fodder Beet +11t 16mm/t @ $300 ($18.75/mm)
- Brassica +6t 29mm/t @ $300 ($10.30/mm)
- Forage Oats +2t 50mm/t @ $300 ($6.00/mm)
- Maize Silage +17t 22mm/t @ $280 ($12.70/mm)

Water Responses – Grain and Seed Crops

Stored Water Cost: $1.80 – $2.76/mm/ha

Agronomy

- As for forage and feed, most of the money is spent by the time the water runs out....
- A stressed crop is more susceptible to disease and insect pressure.
- Contractual quality obligations

Water Responses

- Grains +4t 62mm/t @ $450/t ($7.25/mm)
- Grass Seed +0.8t 320mm/t @ $1800/t ($5.60/mm)
- Legume Vegetables +5t 44mm/t @ $380/t (8.60/mm)
- Root Vegetables +26t 12mm/t @ $300/t ($25.00/mm)
- Specialist Seeds +40% $20-$65/mm

Summary

Stored Water Cost: $0.18 – $0.28/m3

Margin /m3 water	
Grains	$0.73
Grass Seeds	$0.56
Legume Vegetables	$0.86
Root Vegetables	$3.30
Specialist Seeds	$4.25
Fodder Beet	$1.88
Brassica	$1.03
Forage Oats	$0.60
Maize Silage	$1.27

Margin /m3 water	
Milking Cows	$1.13
Summer Trade Lambs	$0.28
Dairy Grazing	$0.56
Deer Finishing	$0.62
Beef Finishing	$0.10

GOOD PRACTICE WINTER GRAZING SERIES

Part 1: Preparing for Winter
What you need to do to prepare for winter
Part 2: Wintering Success
Managing winter grazing and preparing for spring
Part 3: Planning for Winter
Plan now to maximise options next winter

AIM

Promote Good Winter Grazing Practices by bringing together science, regulations and other farmers to share practical ideas.

TOOLS TO OPTIMISE N FERTILISER FOR FORAGE CROPS

Abie Horrocks, Research Leader Environment
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Key Points

- Accounting for Mineral N and Potential Mineralisable N (PMN) can save you money
- FAR's new Soil Nitrogen Supply Calculator can turn lab results into a fertiliser plan
- Poor soil quality and pugging can reduce yields
- Catch crops after winter grazing can remediate soil compaction and N leaching

FAR N Calculator

Brassica crops have large nutrient requirements, e.g.~300 kg N/ha. There are substantial savings to be made by making informed nitrogen fertiliser decisions, both with direct fertiliser costs and animal health.

FAR compared a good management practice (GMP) cereal treatment (recommended nitrogen fertiliser rate minus soil available nitrogen over the growing season) with a standard (Std) treatment (recommended nitrogen fertiliser rate). We found yields were not compromised by reducing the fertiliser rate and savings were made in fertiliser spend and emissions (Table 1.)

Irrigated wheat	2021/22 GMP v Std	2022/23 GMP v Std
N applied	75 kg N/ha less	112 kg N/ha less
Fert cost	$216/ha less	$340/ha less
Emissions	0.36 t CO2-e/ ha less	0.54 t CO2-e/ha less

Table 1. Good management practise and standard practice nitrogen (N) fertiliser management across two seasons.

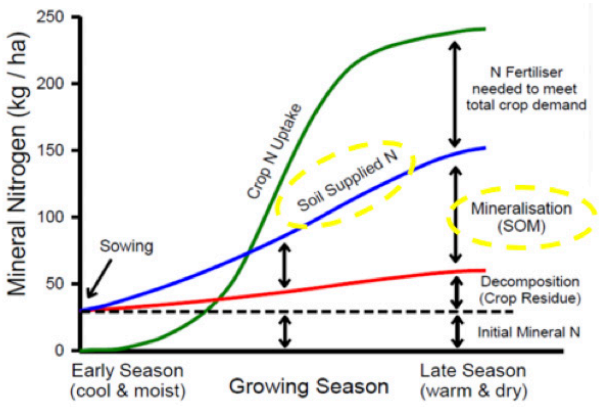


Figure 1. Mineral nitrogen (kg/ha) supply and demand over a growing season.

The best way to get bang for your buck is to soil test for mineral N and mineralisable N (Figure 1) and factor the results into fertiliser decision making.

Available N Tests

Mineral N test: How much plant-available nitrogen (nitrate and ammonium) your plants have access to right now (e.g. at the time of sampling). Can be completed yourself with a Quick-N test or lab test.

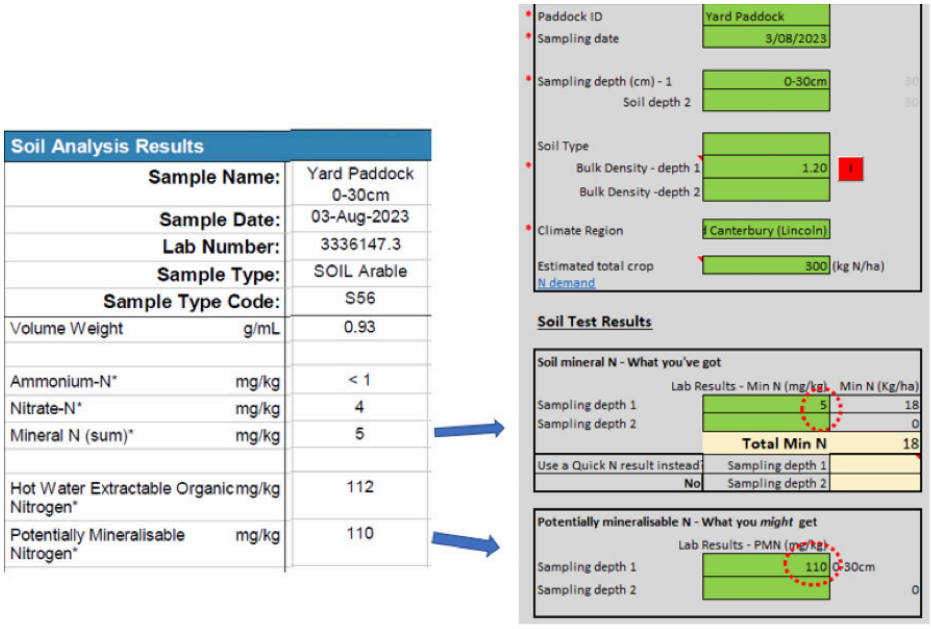
Potentially Mineralisable N (PMN) test:
N that will become available over the growing season.

Fertiliser N (kg N) = Crop N requirement (kg N) –Soil mineral N (kg N) – PMN (kg N)

PMN tests:

- Can be included with your regular basic soil testing (mineral N, pH, P, K etc.)
- Can be done at any time of year
- Don't need to be done every year
- Should only be measured in the top 0-15 cm, or 0-30 cm of soil

Once you've got your soil test results back you can plug into FAR's new Soil Nitrogen Supply Calculator which will factor in regional climate factors to convert potentially mineralisable N lab result into realistic release rates. FAR N Supply Calculator uses soil N supply to calculate how much fertiliser N (kg/ha) should be applied to reach your expected yields (based on an estimate of total N required to reach those yields). The example in Figure 2 (overpage) is based on an expected 12 t/ha wheat crop.



Soil Analysis Results		
Sample Name:		Yard Paddock 0-30cm
Sample Date:		03-Aug-2023
Lab Number:		3336147.3
Sample Type:		SOIL Arable
Sample Type Code:		S56
Volume Weight	g/mL	0.93
Ammonium-N*	mg/kg	< 1
Nitrate-N*	mg/kg	4
Mineral N (sum)*	mg/kg	5
Hot Water Extractable Organic Nitrogen*	mg/kg	112
Potentially Mineralisable Nitrogen*	mg/kg	110

What you've got	Soil mineral N available	18 kg N/ha
What you *might* get	Total estimated N mineralised in growing season	55 kg N/ha
	Total estimated soil N supply over growing season	**73 kg N/ha**
What the crop needs		300 kg N/ha
Difference between crop need and estimated soil N supply		227 kg N/ha
"Confidence" factor (How much of the potential soil N supply estimate to inclu		100 %
Revised fertiliser N requirement		227 kg N/ha
N fertiliser saving		73 kg N/ha

Figure 2. Example of how to put laboratory results into FARs N calculator.

Improving Soil Quality After Grazing

After winter grazing soil management is important. Soil can be compacted after winter grazing due to high stock density when the ground is wet. Poor soil quality is not only linked to poor environmental outcomes, it also reduces yield.

Work in Southland by Beare and Tregurtha (2004) showed yields were affected by soil quality and for every 10% reduction in aggregate stability there was an 8% reduction in wheat crop yield. Based on average autumn wheat yields of 11.6 t/ha from the 2022 Cereal Performance trials in Southland, an 8% yield loss would equate to 0.9 t/ha, or $500 a hectare loss in income (wheat price $540 a tonne).

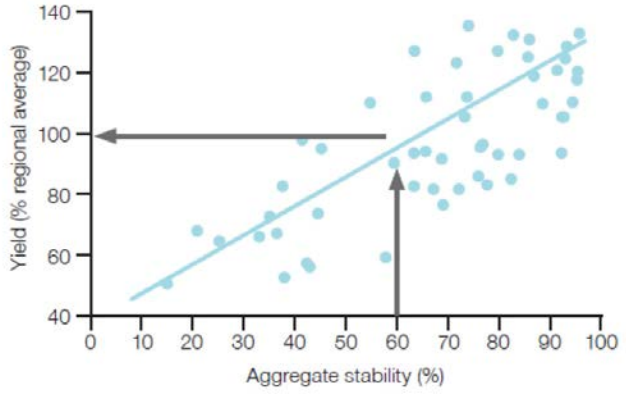
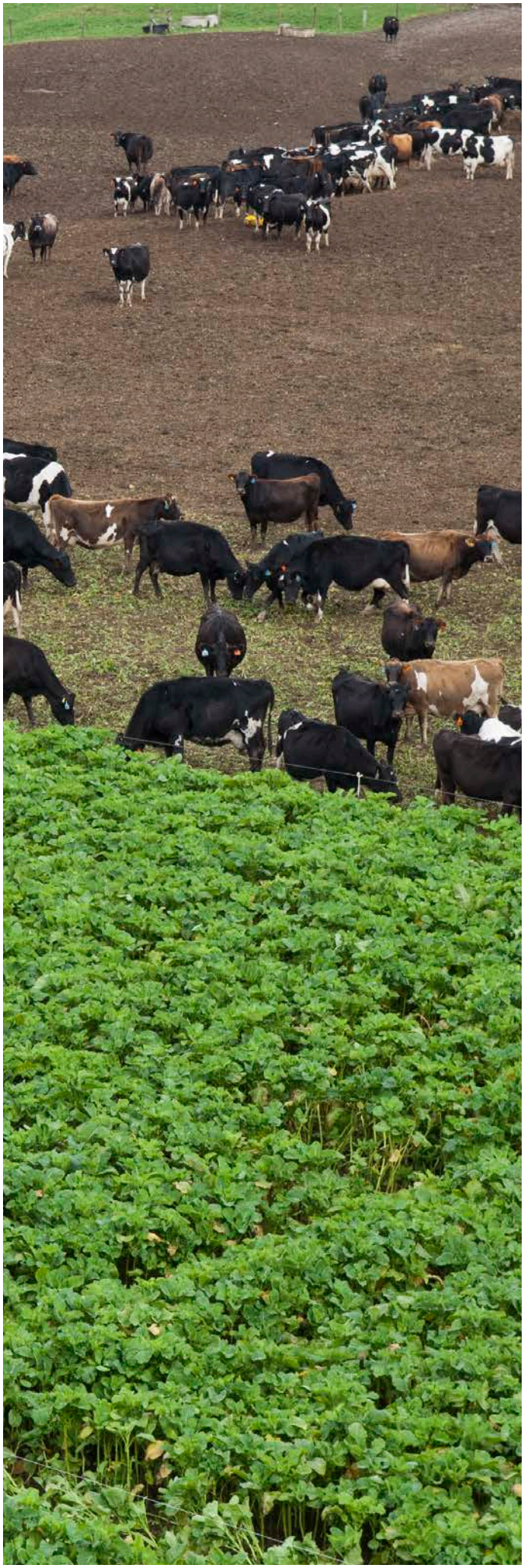


Figure 3. Relationship between soil quality indictor (aggregate stability%) and relative crop yields, 2004, Southland. Grey arrows show averages for the region

One of the most effective ways to remediate compaction is to actively encourage below returns of organic matter with living roots (compaction remediation with roots can occur quickly), such as with catch crops. Catch crops do more than just take up nitrogen that otherwise may be leached, they can also help remediate compaction. Where a compacted winger grazed paddock in Southland was left fallow after a grazing event the soil remained compacted. In the same paddock, when the soil was cultivated after grazing and sown in an oat cover/catch crop, the organic matter returns from the roots resulted in visual improvements in soil quality after 7-8 weeks. (Figure 4).

Figure 4. Compaction of a soil left fallow after winter grazing (below top)

vs an oat cover crop was sown (below).
Photos supplied by Plant and Food Research.



BALE GRAZING TRIAL UPDATE

Ross Monaghan
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What is bale grazing? Bale grazing uses established pasture and a grid of pre-placed hay bales to winter cows.

A winter bale grazing system is being compared to a winter-grazed kale crop at a site in northern Southland to see if it provides benefits for soil and water quality, and cow welfare. The project has almost completed its third year of measurements and some preliminary messages have emerged.

Soil conditions are better than observed for kale-grazed plots, as evidenced by scores for soil roughness, pug depth, infiltration rate and Visual Soil Assessment.

How fast does pasture recover? Pasture recovery following winter grazing is reasonably rapid.

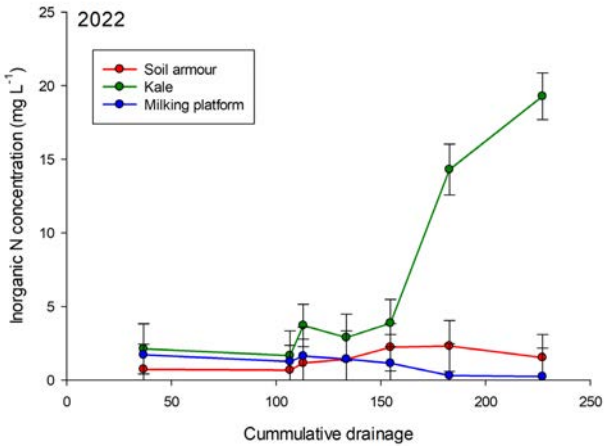
Immediately after grazing
17 June

4 weeks after grazing
41% bare soil

10 weeks after grazing

Less than 10% bare ground

What about nitrate leaching? Nitrate leaching losses (2022) are lower, on both a per hectare and per cow wintered basis.



N leaching loss is approximately one quarter that estimated for kale treatment (per cow wintered).

Do the cows like it? Cow comfort is greater for bale grazing cows (2022 monitoring).

Bale grazed cows:

- Spent more time lying and in postures indicative of greater thermal comfort
- Spent more time ruminating
- Were warmer (skin temperature) and cleaner

Suggested Design Criteria
Grazing pressure of 16 m2/cow/day
For 100 cow mobs: feed 0.5 ha (3,000 – 4,000 kg DM/ha covers) in 3-day breaks with 15 large round hay bales. A well-drained soil helps

PREPARING FOR NEXT WINTER

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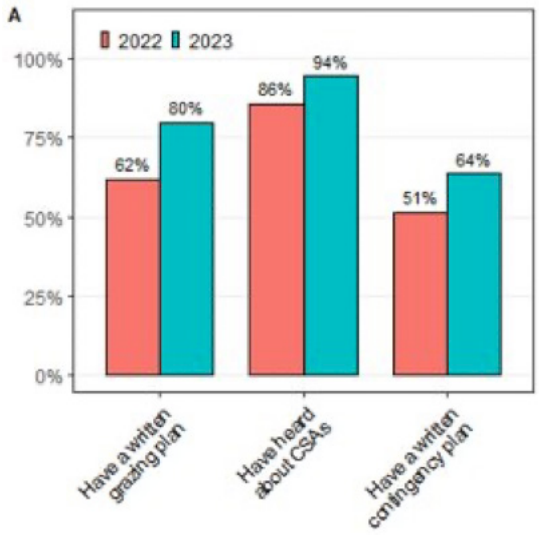
Key Points

- How did things go last winter? Are there areas you would like to improve on or make easier for your staff?
- Paddock selection – are there additional risks to be managed? Are there any weed or pest issues? Is shelter available?
- How to feed out, access to reticulated water in the selected paddock?
- Does your grazing layout make it easier or harder to back-fence?
- Cultivation methods/direction of drilling – less disturbed soil is more resilient to pugging when grazed
- Break out areas/wet weather plan – does the owner of the animals want to do anything differently?
- Fertiliser requirements

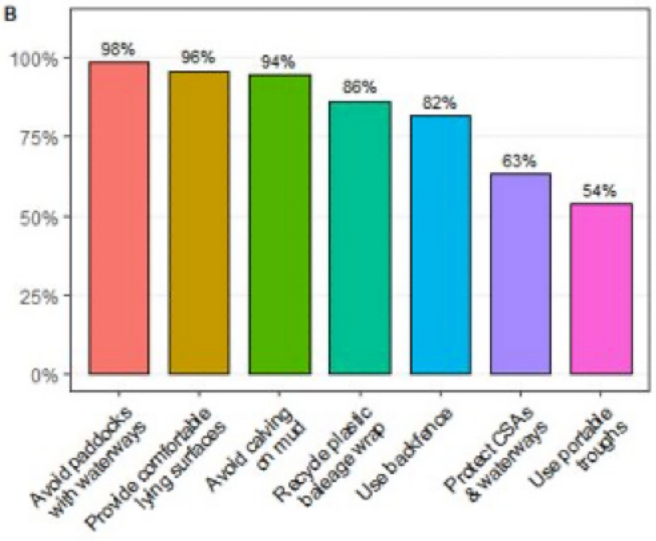
Winter Grazing Management Plan

- Can front-foot issues
- Can be a chance for graziers and owners of the animals to get on same page
- Requirement of winter grazing consents

Figure 1. A) Proportion of 2022 and 2023 respondents with written winter grazing plans, who have heard about critical source areas (CSAs), and have written contingency plans for wet weather or adverse events in,



and, B) proportion of 2023 respondents implementing each good winter management practice, in national surveys of New Zealand dairy farmers on winter management.



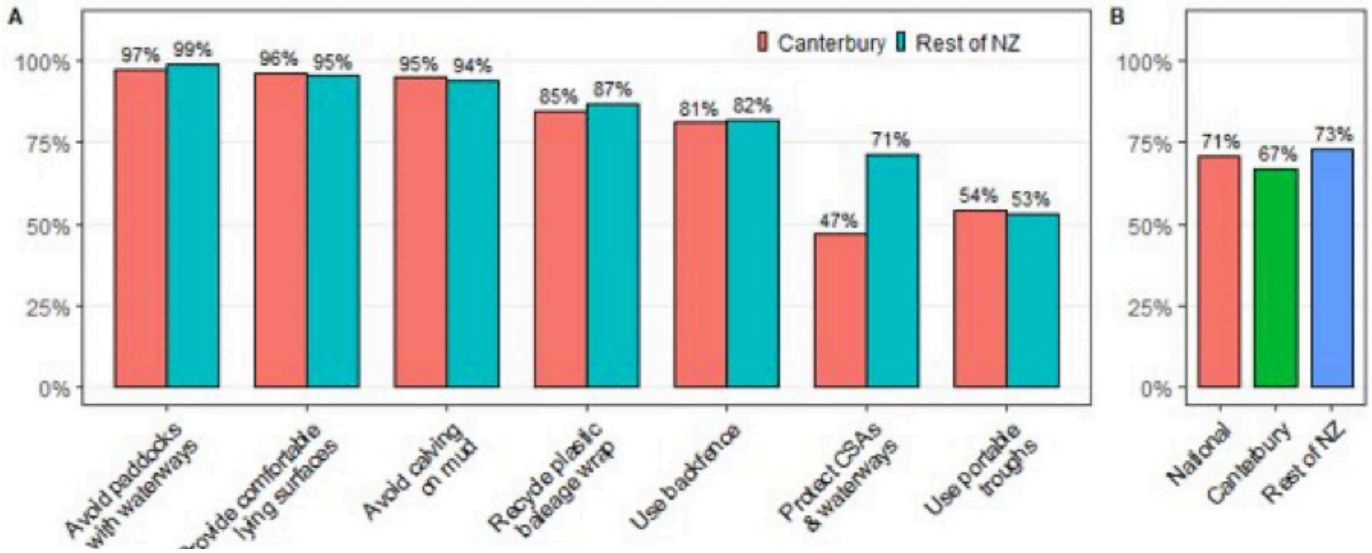


Figure 2. A) Proportion of 2023 respondents implementing each good winter management practice in Canterbury and other regions, and B) the proportion of respondents implementing at least five good management practices, in a national survey of New Zealand dairy farmers on winter management in 2023.

RISK ASSESSMENT

Factor	Low	Medium	High
Slope risk	0-5°	5-10°	>10°
Soil risk	Well-drained, structurally resilient soil	Artificially-drained soil	Soil is poorly-drained and/or vulnerable to compaction
Waterways/drains	Paddock distant to streams and drains	Paddock has an extensive nework of artificial subsurface drainage	Paddock is directly adjacent to stream or wetland
Critical Source Areas	No CSAs present	A few CSAs present that are easily fenced off and left ungrazed	Many CSAs, occupying >5° of paddock areea
Shelter available	Yes	Very little	No
Flood risk	Never floods	Very occasional surface flooding, limited areal extent	Flooding is known to occur over a large % of paddock
Paddock history (soil fertility and weed and pest issues)	Good fertility and no weed and pest problems	Fertility OR weed/pest issues	Fertility AND weed/pest issues
Years out of pasture	First year in forage crop	Second year in forage crop	Third+ year in forage croop
Tillage method	No till	Minimum tillage	Conventional (full) cultivation
Ease of management for staff	Multiple access points and easy access to reticulated water		One access point and no reticulated water

WINTERING DIVERSE PASTURES PROJECT

Jeremy Casey and Kim Solly farm Back Track Dairies, which has been trialling a biological pasture system for nearly 10 years. They have been grazing their animals on kale on the neighbouring Middleton property during this time. Jeremy and Kim have leased the 5 ha block to try diverse pasture-based wintering, integrating bale grazing techniques where appropriate.

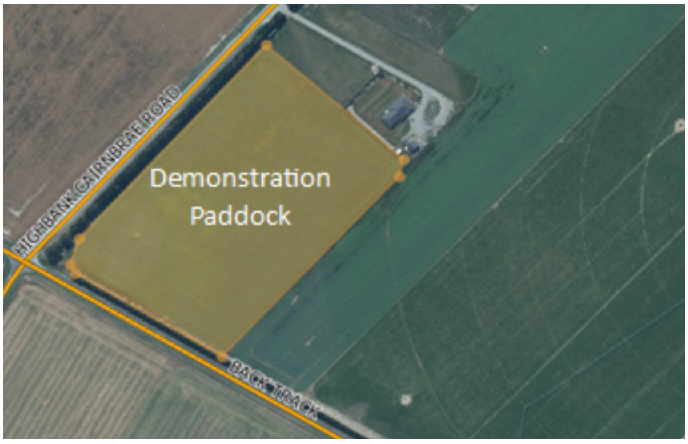
The project aims to share Jeremy and Kim's experience, including capturing the inputs needed, basic fertility and soil data, comparing outcomes with the neighbouring kale paddocks and animal observations.

Back Track Dairies Key Farming Objectives

- **Happy, content, well-fed cows**
- **Improve soil productivity and health**
- **Reduce inputs**
- **Maintain profitability**

16th December 2022

DEMO PADDOCK OVERVIEW



Area	5ha
Farm System	Winter grazing
Irrigation	Dryland past four years
Soil	Templateton 9a.1
Crop rotation	Kale-Fallow-Kale, grazed by light stock
Yield	4 T DM/ha for past 2 years

Up to 14 T DM/ha kale grown historically with irrigation and higher inputs, however currently showing signs of club root and needed a break from brassicas.

30th August 2023

PASTURE WINTERING PROJECT TO DATE

Key objectives of this project:

1. Ensure a similar amount of feed is available to the animals over the winter
2. Build organic matter and soil biology
3. Have contented animals

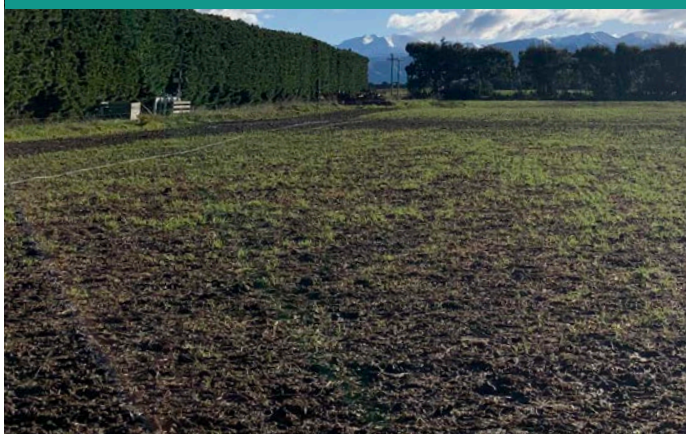
Inputs were already low for the block and aim to keep it that way, using what's needed as applicable.

Summary to Date

Sowing Dates	16 December 2022 (annual mix) 30 August 2023 (10 kg/ha perennial mix)
Annual Seed Mix	Italian ryegrass, triticale, red and white clover, caucasian clover, persian clover, chicory, plantain
Perennial Seed Mix	27% Hustle ryegrass 27% AberGreen ryegrass 27% Base ryegrass 8% Rossi red clover 8% Fiona white clover 4% AberLasting white clover
Fertiliser	30 kg N/ha SustaiN (January, March) 30 kg N/ha, 14 kg S/ha Ammo (August) 25 kg N/ha Sustain (October)
Spray	3 l/ha Dynamo (January)
Yield	2.2 T/ha baled (January) 3.6 T/ha grazed
Grazing	61 light carry overs from 1st June Estimate BSC average ~ 4.0
Soil Tests	November and June
Points of Note	Rust formed on triticale in March

Day 1 Grazing

2 Weeks post grazing



4-6 weeks post grazing / Dry Break

4-6 weeks post grazing / Wet Break

10 weeks post grazing

THANK YOU

Special thanks to Jeremy and Kim for letting us share their experience with pasture-based winter grazing and for Greg Middleton for letting them experiment on his land:

- Racheal Bryant and Lincoln University
- Leyland Feed Services
- May Brothers (cultivation and drilling)
- Molloy Ag (spraying)
- Phillip Wareing (Fertiliser spreading)
- Ballance Agri-Nutrients (fertiliser sampling and advice)
- Golden Bay Dolomite
- Jackson Holmes (silage contracting)
- Cates Seeds (agronomy advice)

CONTACT US

If you have any questions about Winter Grazing, please feel free to contact the Environmental Team.

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This handout was prepared by Enviro Collective on behalf of Barrhill-Chertsey Irrigation and Acton Farmers Irrigation Limited with support from MRB, DairyNZ, FAR, AgResearch and Beef+Lamb.