Farming with a 190 N cap

North Otago Sustainable Land Management workshop

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The AgriBusiness Group

12 July 2021

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Topics

- Background
  - N-cap policy
  - Your N use & regional N use
  - Relationship between N use & profit
- Strategies to reduce N use
  - Transition period & impact
  - Practical tips
  - Findings of P21 trial
  - Farmer example
- Group discussion
  - What are farmers doing now – planning
  - Farmer tips – what works, what doesn't
- Q&A & next steps

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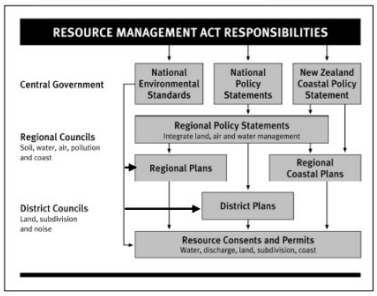
Freshwater regulations

- National Policy Statement for Freshwater Management (NPS-FM 2020) was set by Central Government
- A national bottom line
- Gives effect to regional policy



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N cap regulation & what it means

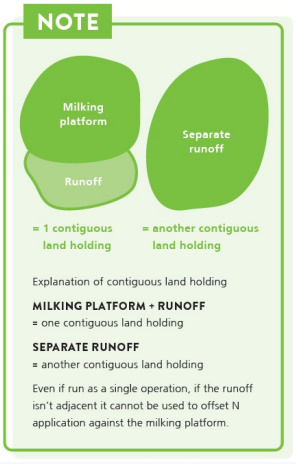
Application of **synthetic N** fertiliser to land in pastoral land use **capped at 190kgN/ha/year** from 1 July 2021.

There are two 190kgN limits:

- Average of all land used for grazing (includes annual forage crops). You can put >190kgN/ha/year on forage crops **only** if offset by applying lower amounts on pasture.
- Absolute limit to each hectare of pasture (not used to grow annual forage crops).

The nitrogen cap applies to a '**contiguous land holding**'. This is 'one or more parcels of land within a farm'.

Dairy farms – **report N use to regional councils** by 31 July 2022



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N cap regulation & what it means

What the regulations say	What it means	What can I do?
Pastoral land use in a contiguous landholding	Pasture & annual forage crop grazed in-situ	Know the rules & what crops are included
190 kgN/ha (synthetic N) limit from 1 July 2021 to be permitted activity	Average across pastoral land use (i.e. grazed land), &	>190kg can be applied to forage crops, only if this is "offset" by applying less to pasture
	Maximum to every hectare of pasture excl. forage crops	Know how much applied last year
If above cap	1. Reduce to 190	Next part of workshop
	2. Non-complying consent	1-hour free regional council advice (ECAN)
Report to regional councils (dairy farmers) – due 31 July 2022	Land area, rate, date, type, receipts for N purchased	Set up a recording system for now

Source: DairyNZ (recent SIDE presentation)

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Consent for >190 kgN/ha

Two options are available:

1. Requires you to submit an N reduction plan, showing how you will reduce your application to <190kg N/ ha/yr **by July 1, 2023 (2 years)**.
2. Application shows that there will be no increase in N to water compared to if 190kg N/ha/yr was applied (and GMP will apply). This will be granted for a **maximum term of 5 years**.

Important to note:

- Both options will require input from a qualified and experienced consultant.
- Both consents are **non-complying activities** – you will have to show the adverse effects are minor, and the consent application comes under more scrutiny ($$).
- You have until 31 December 2021 to apply (check with your regional council).

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N-cap regulation – the unknowns

Regional Councils & Government are still working on the implementation details

MFE have a working group, with aim to develop practical guidance (been delayed)

Still waiting on clarity on:

- Details of recording required?
- How is this going to be monitored
- Non-complying consenting option

Central Government will review the N cap in 2023, and requirements may change (e.g. regional limits?)

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Key messages

1. Understand the rules
2. Know how much synthetic N fertiliser was applied last season
3. Aim to operate below the N-cap and if you cannot do this, apply for a resource consent
4. Have a good system in place for recording
5. Report to your regional council next year: how will become clearer

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Your Nitrogen Use & Plan

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Farmer N use – 20/21 season

Nitrogen (N) Use SEASON 2020/2021

Kg N applied /ha effective=	Kg N/ha
Kg N applied effluent area=	Kg N/ha
Kg N applied non-effluent area=	Kg N/ha
Rate N/ha per application	

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Kg/ha												

When applied? e.g. behind the cows? Once a month? Twice a month? Once/twice a week?	
Type of Fertiliser (liquid/granular, coated Urea)	
Any variable application between paddocks/areas of the farm or within paddocks?	
Effluent Management:	
Any other relevant comments:	

0 100 200 300 kgN/ha/yr

Where did you sit last season?

How many of your fertiliser plans (e.g. from fertiliser company) include monthly N applications?

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Common scenario

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Nitrogen follows the cows

Month	Rate & product	Total N applied
Mid-August	100 kg/ha Ammo 31	**= 30 kgN/ha**
Mid-September to Mid-May (240 days)	50 kg/ha urea per app = 23 kgN/ha Average 23-day grazing round = 10.4 applications	23 kgN/app *10.4 app/yr **= 240 kgN/ha**
Total N use		**270 kg N/ha/yr**

It is not unusual for farmers to be surprised by their annual N use, if they haven't planned or monitored

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190 kgN/ha scenario

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Month	Rate & product	Total N applied
Mid-August	70 kg/ha Ammo 31	**= 21 kgN/ha**
Mid-September to end April (227 days)	Left with 169 kgN/ha = 0.74 kg/day (over 227 days) Average 23-day grazing round = 9.9 applications =17 kgN/app = 37 kg urea / app	17 kgN/app * 9.9 app/yr **= 168.5 kg N/ha**
Total N use		**189.5 kgN/ha/yr**

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190 kgN/ha scenario

Proposed Nitrogen (N) Use Season 2021/22

Kg N applied /ha effective=	Kg N/ha
Kg N applied effluent area=	Kg N/ha
Kg N applied non-effluent area=	Kg N/ha
Rate N/ha per application	

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Kg/ha												

When applied? e.g. behind the cows? Once a month? Twice a month? Once/twice a week?	
Type of Fertiliser (liquid/granular, coated Urea)	
Any variable application between paddocks/areas of the farm or within paddocks?	
Effluent Management:	
Any other relevant comments:	

How many of you have a monthly N fert plan for next season?

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How to do a monthly N fertiliser plan

- Continue to follow cows, using lower rate
  - Most efficient way to ensure N is utilised within grazing round, and N concentrations pasture not too high
- Monthly N applications:
  - Do one round N for the month (relative to a 3-week round)
  - Consider potential losses of applications outside optimal range
- Apply monthly applications to ½ farm:
  - E.g. on the 5th of the month and the balance of the farm 15 days later (on the 20th of the month).

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Regional N Use

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What do you think the average N fertiliser use (kg/ha/yr) was over the past 12 years for Canterbury dairy farms (DairyBase data)?

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Canterbury DairyBase survey
Average N loss over past 12 years

= 226 kgN/ha/yr

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Canterbury / North Otago N use

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Average kgN/ha/yr (2019:20):

- 255 kg, top 25% using >300 kg (dairy farmers in mid-Canterbury irrigation scheme)
- 235 kg, many clients >300 kg (established Canterbury consultancy firm)
- 218 kg, DairyNZ partner farms (Selwyn & Hinds), only 2 (of 38) farms under 190 kgN
- 163 kg, Otago dairy farms (217) with Overseer accounts. Top 25% were above 227 kgN (highest 380)
- 15 kg, Otago mixed drystock / arable farms (77) with Overseer accounts.
- 5 kg, Otago sheep, beef & deer farms (37) with Overseer accounts.

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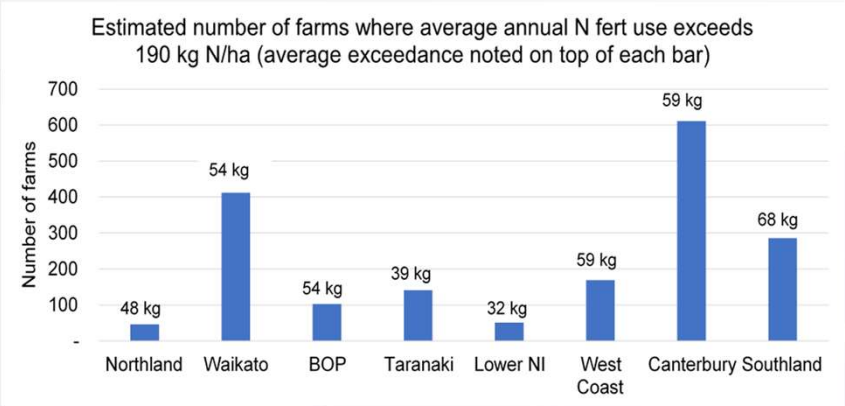
Regional data (19/20)



Source: DairyNZ DairyBase data

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Historic use (last 12 years)

How do you think average N fert per hectare has changed on Canterbury dairy farms in the past 12 years?

- Increased
- Decreased
- Stayed the same

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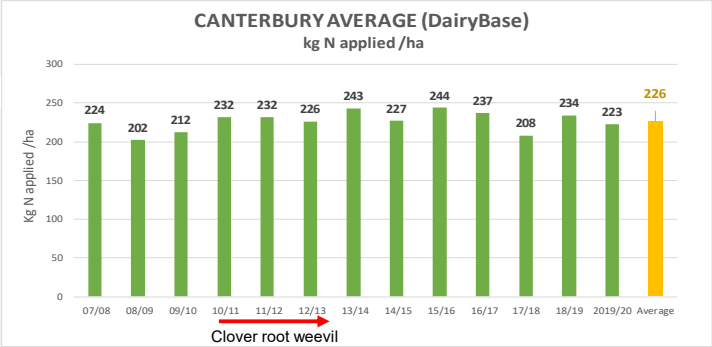
Historic use (last 12 years)



Source: Dairybase, Canterbury farms

- Average N use – 226 kgN/ha/yr
- Annual ranges – 202 ($5.20 payout 08-09) to 244 kgN/ha/yr
- No trend – regulation, new conversions, clover root weevil, MS $, droughts

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N use & profit

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N fertiliser use & profit

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N applied (kg N/ha)
↓
Pasture Grown (kg DM/ha)
↓
Pasture Harvested (kg DM/ha)
↓
Milk Production (kg MS/ha)
↓
Profit ($/ha)

Response rate
(kg DM/kg N applied)

% Pasture Utilisation

Feed Conversion Efficiency
(Pastures +Supplements)
Kg LW/ha & kg MS/kg LW

Farm Income – Expenses
(depends on MS $, cost N, overall expenses)

Lower N fert is likely to reduce pasture growth, however how pasture is managed and utilised can minimise the impact on MS & $

For the same amount N fert, there are several factors that will influence amount pasture grown / harvested.

Source: DairyNZ presentation at SIDE conference

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kgN applied & operating profit – an opportunity

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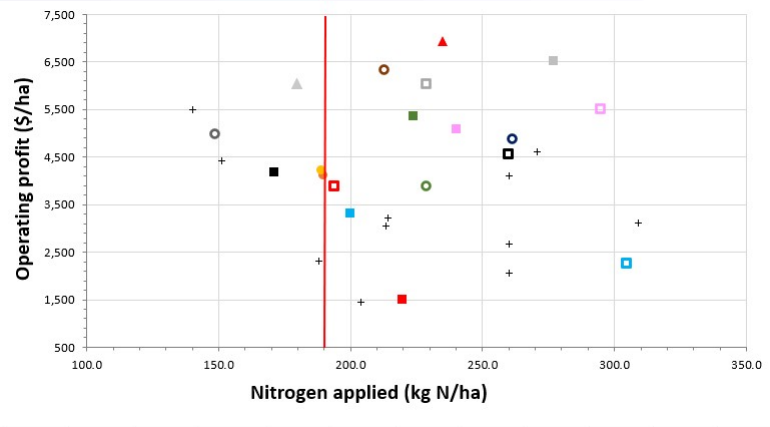

Source: Dairybase 19-20, Canterbury farms

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Transitioning to lower N: Impact on pasture growth

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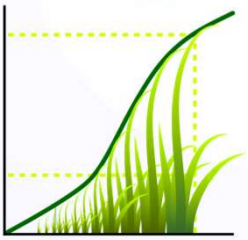
Impact of N cap on a farm



At an individual farm level, this will depend on:

- Current amount of N applied (size of reduction)
- Current use efficiency
- Transition period

Working alongside farmers have observed:

- Many reduced N fert with little impact on pasture harvested (and profit) by improving N use efficiency
- Some made good farm systems decisions and re-adjusted feed supply & demand in a way with little impact on profit
- Others made a few mistakes e.g., reduction too quickly, took N fert out at wrong time = pasture deficit filled with expensive supplements

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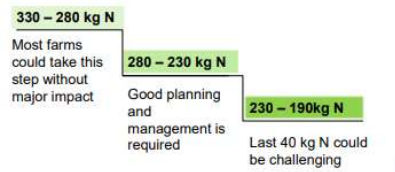
Transitioning to lower N use – how easy is it?

Not the beginning of an apocalypse:

- Reducing to 220 kgN for most is relatively easy
- For many this will bring a review of all farm inputs / costs



Not all smooth-sailing either:

- Regulation in effect now
- Systems are psychological as well as biological (successful transition takes time)
- Some are using >300 kgN
- During development phase, 190 kgN is limiting
- Changes required at farm system level

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Strategies to reduce N use

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1. Planning & monitoring

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Review your 2020/2021 strategy and results, & identify potential areas to improve N efficiency

Create a monthly N fert plan for next season

Have a robust monitoring plan – how did it go last year (N budgeted & N Applied)

HawkEye®

Precision Farming

My Ballance

ravensdown

FARMIQ®

MINDA®

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2. Address other issues that may be limiting pasture (clover) growth

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Soil testing (from monitor paddocks > every paddock > every ha). Late winter/spring. No other nutrients limiting growth.

Herbage testing – macro & micro-nutrients in clover only & historic N in mixed herbage samples


Wednesday, 14 October 2020

Serious savings from whole-farm soil testing

Share:

Whole-farm soil testing saves Taranaki farmer Hayden Lawrence about $15,000 on fertiliser each year.

Published under Research and Innovation, The Express

"For us to whole-farm soil test 50 paddocks costs $2,500. We had been spending about $40,000 a year but that's down to about $13,000 a year.

When we started, Dr Ants Roberts (Ravensdown's Chief Scientific Officer) came down and did up a plan, which we still use. We have seven fertiliser mixes and one of those is no application."

Adding what is needed when is needed

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3. Pasture monitoring & management

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Pasture monitoring to identify surplus/deficits

Eat the grass you grow & grow the grass you eat

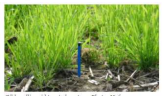
Increase round length.

Use optimal grazing rounds (2.5 - 3 leaf stage) for yield advantage and max response

GA in spring and/or autumn with N to boost growth

A-O-Dair Pasture Meter

A rising plate meter measuring height



Gibberellic acid treated pasture. Photo: Nufarm

Gibberellic acid untreated pasture. Photo: Nufarm

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Pasture walks & “feeding the wedge”

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Weekly pasture walks

- Record history for predictive feed wedge (Year on Year)

Key considerations

- Is N required to fill a **genuine** future feed deficit?
- Pasture height needs to be above 3.5cm (~1500 kgDM/ha) to respond to N
- Seasonal response rates to N
- Seasonal response time to N – does grazing round give enough opportunity for growth?

A rising plate meter measuring height

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Eat the grass you grow……

There is about a 12:1 response kgDM:kgN

- Using 400kgN should grow 18.3t
- Using 200kgN should grown 15.9t
- Using 0kgN should grown 13.5t

Why grow 18.3t when you only eat 14t?

- Topping is 200-500kgDM wastage
- Increases in nitrogen leaching from more fertiliser

Is all potential growth being consumed?

- Missed opportunity for growth on 18-day round (uptake 20-24 days)
- If 60 days on 24-day round (vs 18-days) = 0.8 grazings reduction.
  At 30kgN = 24kgN saved

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& grow the grass you can eat

N is the cheapest form of feed but its not cheap!

- Urea ($799/t, $1.74/kgN) @ 12:1 = 14c/kgDM.
- But if you aren't eating it?

Budget the feed

- Maintain as close as possible a 2100-2300 cover
- If you need the feed, use the N
- If you produce too much feed and have to top…
- Broad acre application of high rates?
- Suggested savings up to 600kgDM/ha supplements (or 50kgN less)

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Response rates

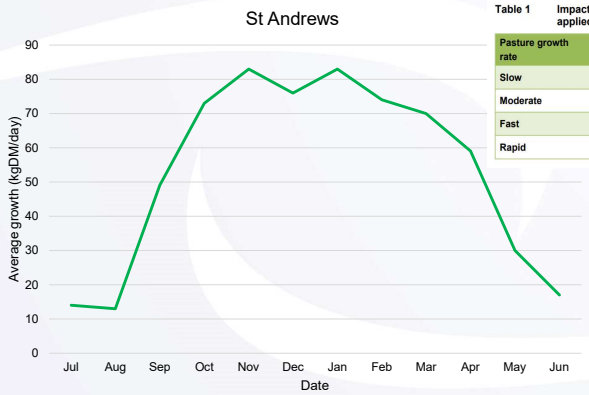

Table 1 Impact of pasture growth rate on response rates to N fertiliser (N applied at optimum rates)

Pasture growth rate	Pasture growth (kg DM/ha/day	Response (kg DM/ kg N)	Time for full response (weeks)
Slow	10	5	10 - 14
Moderate	20 – 40	10	6 – 8
Fast	50 -70	15	5 - 6
Rapid	80	20	3 – 4

Let the N do its job

Source: DairyNZ, data from a farm from 2014-16

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4. Tactical use

Right Rate

Right Place

Right Time

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Right rate

- Maximum 25 – 40 kgN/ha/app
- More in early spring (genuine feed deficit)
- 190 kgN / 240 growing days = 0.8 kg N/ha/day of grazing round
- Can mix with other nutrients (K and S)
  - Costs increase
  - However, advantage of applying other nutrients in small amounts where risk of loss from root zone

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Right place

- Lower use on high fertility areas (front paddocks, around troughs)
- Variable rate & precision tracking
- Lower use on areas with well-established clover plants (30% pasture early summer), as less likely to respond N
- Lower use on effluent blocks
  - Take account of N applied as eff
  - Content N eff is variable – test
  - Effluent block size - Is effluent area consistently getting effluent ? – may only need N fert in early spring and maybe autumn
  - Target times eff N is sufficient

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Right place - Taking account of N applied as effluent

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Effluent report

The report shows rates and target areas for farm liquid effluent only, assuming it is all applied to pastoral blocks. It excludes any farm solid effl areas may need to be increased.

CURRENT AREA RECEIVING LIQUID EFFLUENT	
Total area including crops	19 ha
Pastoral area receiving liquid	19 ha
% of farm pastoral area	13%
Average liquid effluent	286 kg N/ha/yr
Average fertiliser	291 kg N/ha/yr
Average other	14 kg N/ha/yr

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Right time

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- Do not apply fertiliser at low soil temperatures
- Reduce / don't apply late autumn, when pasture response low & sufficient covers
- Reduce / don't apply at high temperatures (Jan-Feb), when clover content & soil mineral N is high (N not limiting). Take herbage samples
- Only use when required - Skip paddocks out when pasture growth high & silage making not needed (weekly farm walk & feed wedge)

A rising plate meter measuring height

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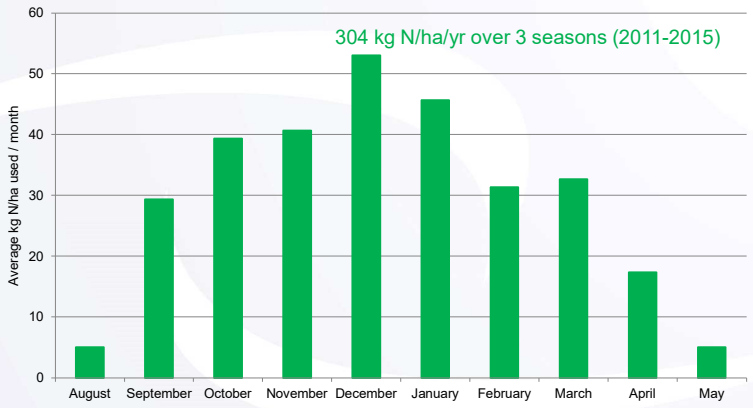
Pastoral 21 trial – timing N



High input – High efficiency system
Source: Chapman et al.

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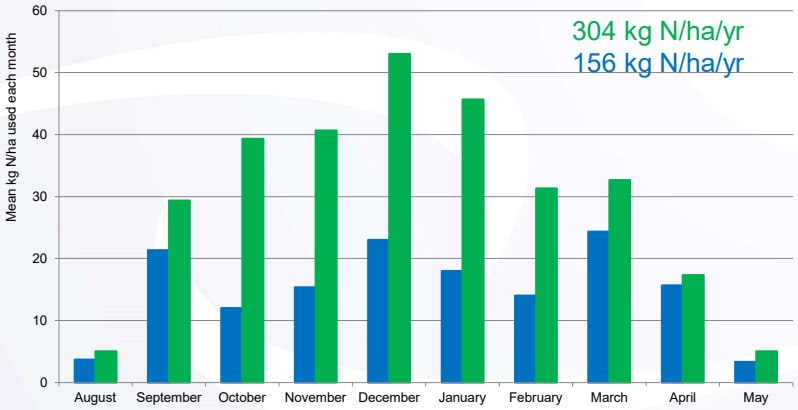
Pastoral 21 trial – timing N



Blue – lower input-high efficiency (50% N fert, 75% supplement)
Source: Chapman et al.

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Pastoral 21 trial – summary of key changes

- **Changing the frequency & amount of N applied** (85% contribution to reduction)
  - 1.7 less grazings/yr > average 4-day increase rotation
  - Longer rounds > increase in leaf stage (by 0.3 leaves/grazing), estimated to increase pasture production by 1.1 tDM/ha/yr. Higher % tetraploids helpful
  - 2.4 less app/yr & an average of 8 kgN/app less;
- **Reducing N fertiliser to effluent** (15% contribution)
- This 'buffered' the impact of the significant reduction in N:
  - Net reduction of 0.4 tDM/ha
  - Estimated net reduction of 1.5 tDM/ha, if grazing round was not changed

Source: Chapman et al

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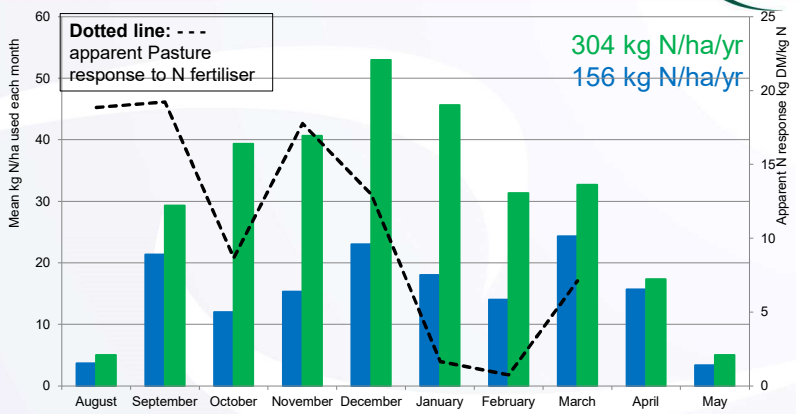
Pastoral 21 trial – timing N



Source: Chapman et al.

Summer: low response due to high soil temperatures & soil mineralisation, strong clover content (30% total pasture) meaning N fixed from atmosphere– N unlikely to be the limiting factor

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Is applying less N in Jan/Feb right for your farm?

Depends on:

- Good clover content in pastures
- All other nutrients (including trace elements) essential for plants are not limiting growth (confirmed by soil and herbage testing)
- It has been at least eight years since the farm has been converted to dairy (and likely to have good levels of soil organic matter)
- You have other sources of N to support pasture growth (e.g., effluent)
- Your weekly farm walk is not predicting a feed deficit requiring N fertiliser

Summer growing conditions can be variable (even on irrigated farms) therefore a successful N use strategy requires close monitoring and agile decision making to respond to changes in growing conditions. Talk to your trusted advisor before deciding on altering summer N for your farm.

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Ways to reduce N over Jan/Feb

- Reducing N application rates to 15-20 kg N/month
  - Ammo type fertilisers to lower rate & maintain spreading accuracy
- Skipping one or two applications over the whole farm
- Skipping one or two applications over some areas of the farm:
  - Areas with high clover content,
  - Stock camping areas
  - Effluent areas

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What about December N?

DO NOT SKIP

- In early summer, ryegrass is well through reproductive phase (heading)
- Heading promotes tillering, helps transition to vegetation stage & maintain quality
- **Applying N in early summer during this phase sets plant up**

By Jan / Feb ryegrass has passed this phase and N is only required if growth deficit

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5. Clover – the 'free' N

- Clover N fixation = 'free' N
- Reducing N fertiliser will support clover content
- Introduce in pasture mix. Ensure appropriate sowing rate (D:12 kg, T:16kg)
- Soil fertility for clover (pH, P, K, S, Mo)
- Adequate grazing management for clover (manage residuals to avoid shading)

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5. Clover – the 'free' N

Free N

- 25-50 kgN fixed / tDM clover

More N is a death spiral

- 0kgN = 16% clover
- 200kgN = 12-15% Clover
- 300kgN = 3% Clover
- 400kg N = 3% clover

Over 300kg, the clover population drops, then you need more N

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Other tools

- Liquid N
  - But LU research shows similar yield and pasture quality to spreading

- N-Boost (Donaghys)
  - Spray app with N
  - 2x pasture response to N.

- Ecotain
  - 20% less leaching (30% pasture) = less N fertiliser loss

- Coated urea
  - Urea un-watered 48 hours = 25% loss; 8 hours = 12% loss
  - Say 200kg N used, if can save even 9% from loss = 18kgN
  - Cost = additional $50/t (7% more) than urea

- Gibberellic Acid – early spring / autumn, within 5 days after grazing

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Mick O'Connor – Terrace Farm

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Take home messages

1. Understand the rules and how they apply to your farm
2. Review your strategy for the 2020/21 season including how much was applied, where and when.
3. Create a plan to meet the 190 kg N/ha cap
4. Have good systems in place for recording and monitoring
5. Seek good and independent advice based on science and evidence

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Industry resources are very valuable!

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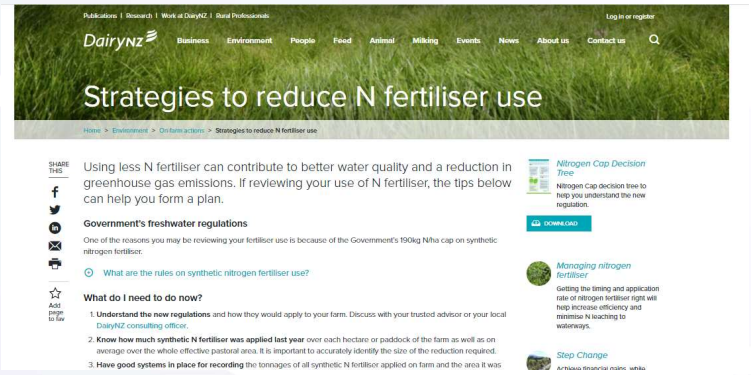

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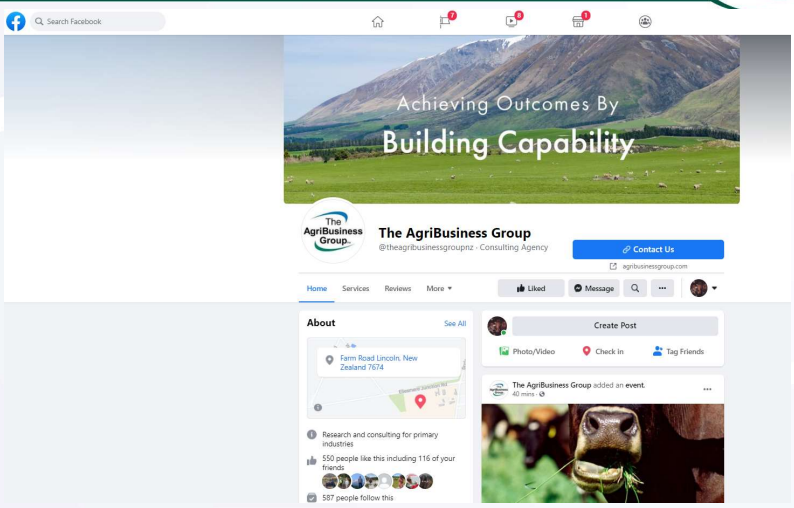

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