Land Use Opportunities: Waimakariri catchment

Craig Depree
Simon Harris
Steve Thomas
Bruce Smallfield
Pierre Beukes
Robyn Dynes

Workshop #4 – Oct 2022

Our research – 'the big picture'

Land Use Opportunities
Whitiwhiti Ora

National SCIENCE Challenges | OUR LAND AND WATER | Toitū te Whenua, Toiora te Wai

- *Developing a holistic decision-making framework for evaluating land use opportunities*
- *help land stewards assess diverse land use opportunities and make decisions with confidence that both the whenua and its people will prosper*

Good alignment with Theme 1: **Waimakariri LANDCARE TRUST**

- *achieving a sustainable & resilient farming business for future generations*
- *opportunity/risk assessment that considers financial, people & environment*
- *understanding what a robust change process involves*

Plant & Food Research — Rangahau Ahumāra Kai | agresearch — āta mātai, mātai whetū | landwaterpeople | LWP | Dairynz

To date…

- 3 workshops (Mar 2021, Jul 2021, Feb 2022)
  - List of land use opportunities of interest to catchment
- 4 case study farms – (baseline data)
  - 2x dairy, arable and hill country S&B
  - List of preferred land use options for each case study

- preliminary assessment of options / methodology
- initial modelling (baseline profit vs environmental limits)
- water / ecosystem health survey (40+ sites)
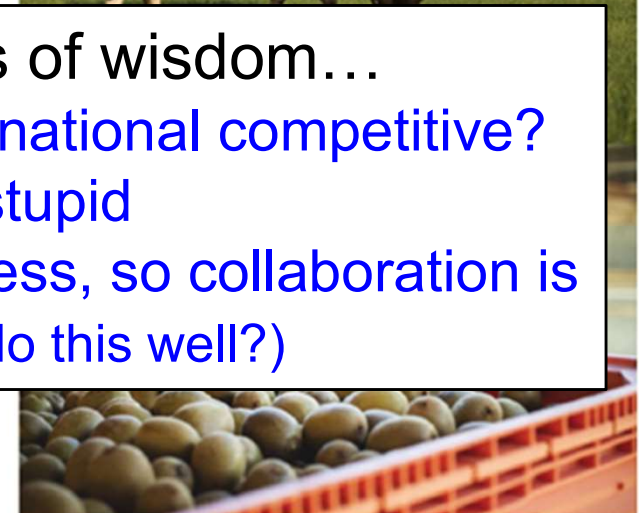
Feb 2022 Workshop #3 (Mark Cox, Craigmore)

Thoughts on Future Crops in Canterbury

- Apples ✓
- Grapes
- Hops ✓
- Sheep Milking ✓
- Alternative Milks/Protein
- Solar Farming ✓
- Berries

✓ = identified as alternate land use for Waimakariri

Mark's summary / words of wisdom…
- is the new product international competitive?
- be determined but not stupid
- scale helps market access, so collaboration is often a key (Kiwis don't do this well?)
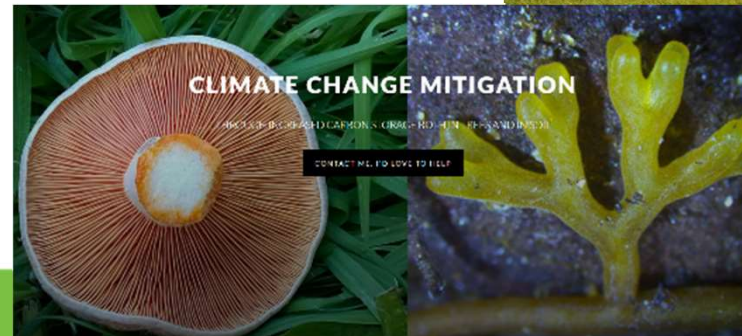
Land use opportunities (workshop #3)

	Taggart	Larundel	Alkington	Grange
Current land use	arable	dairy	dairy	dry stock
N-leaching (kgN/ha/y)	43	62	40	9 (17)
'Future' land use OPTIONS				
Farmer pick	**Vegetable options (process)**	Permanent tree crop (apples)	Future dairy	**Carbon** / tourism
Expert pick	Perennial tree crop (hops)	Future dairy	Perennial tree crop (hops)	Permanent tree crop (?)
Group #1	Leasing for organics	Vegetable flower options	**Energy farming (solar / *agrivoltaics*)**	Sheep milking
Group #2	Kanuka oil / bees / honey / pollination	Sheep milking		**Carbon farming**

- in developing these and other land use options….
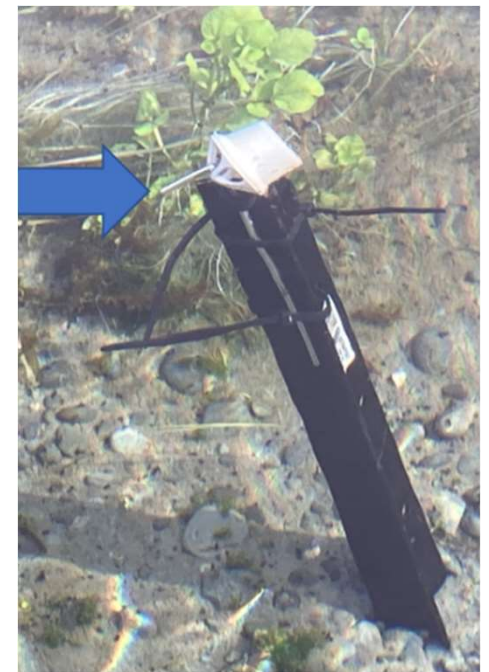- good opportunity to hear from some experts…

Our Speakers…

- Phil Orme (Orme & Associates)
  - Trees on farm

- Chris Winefield (Lincoln University)
  - Hops

- Cam Henderson (Farmer/Nuffield Scholar)
  - Solar farming

- Alexis Guerin (Mycotree)
  - Edible fungi

CLIMATE CHANGE MITIGATION

Plant & Food Research
Rangahau Ahumāra Kai

agresearch
āta mātai, mātai whetū

landwaterpeople | LWP

Dairynz

But first – a quick word on ecosystem health monitoring in the Waimakariri using eDNA

- **eDNA = environmental DNA**
- new method for assessing stream ecosystem health
- Detects
  - aquatic insects/plants, fish, terrestrial plants, mammals, birds, microorganisms
- data gives an overall 'ecological health' score

Environmental DNA (eDNA)

- https://www.wilderlab.co.nz/explore **(41 sites)**

Environmental DNA: Cam River

- https://www.wilderlab.co.nz/explore

- 'zoom in' on map to select site
- e.g., Cam River upstream of Bramleys Rd

Cam River at Bramleys Rd

Environmental DNA: Cam River
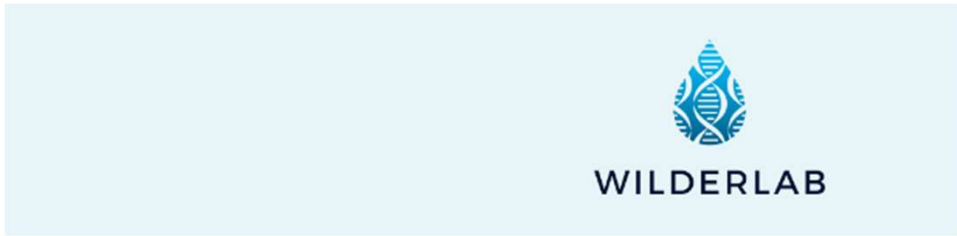
- https://www.wilderlab.co.nz/explore

WILDERLAB

eDNA Sample Report

Sample Information   Additional Information

Sample number: 402325
Collected by: Lee Burbery
Collected on: 2022-05-12
Reference: Cam River u/s Bramleys Road
Environment type: River/Stream
Co-ordinates: -43.343350, 172.636950
Time deployed: 23 h
Filter: 1.2 µm x 30 mm cellulose acetate
Assay type: Comprehensive

pictures of species identified at site

Featured Species   Sequence Information   Wheel of Life   Ecological Health

Environmental DNA: Cam River

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WILDERLAB

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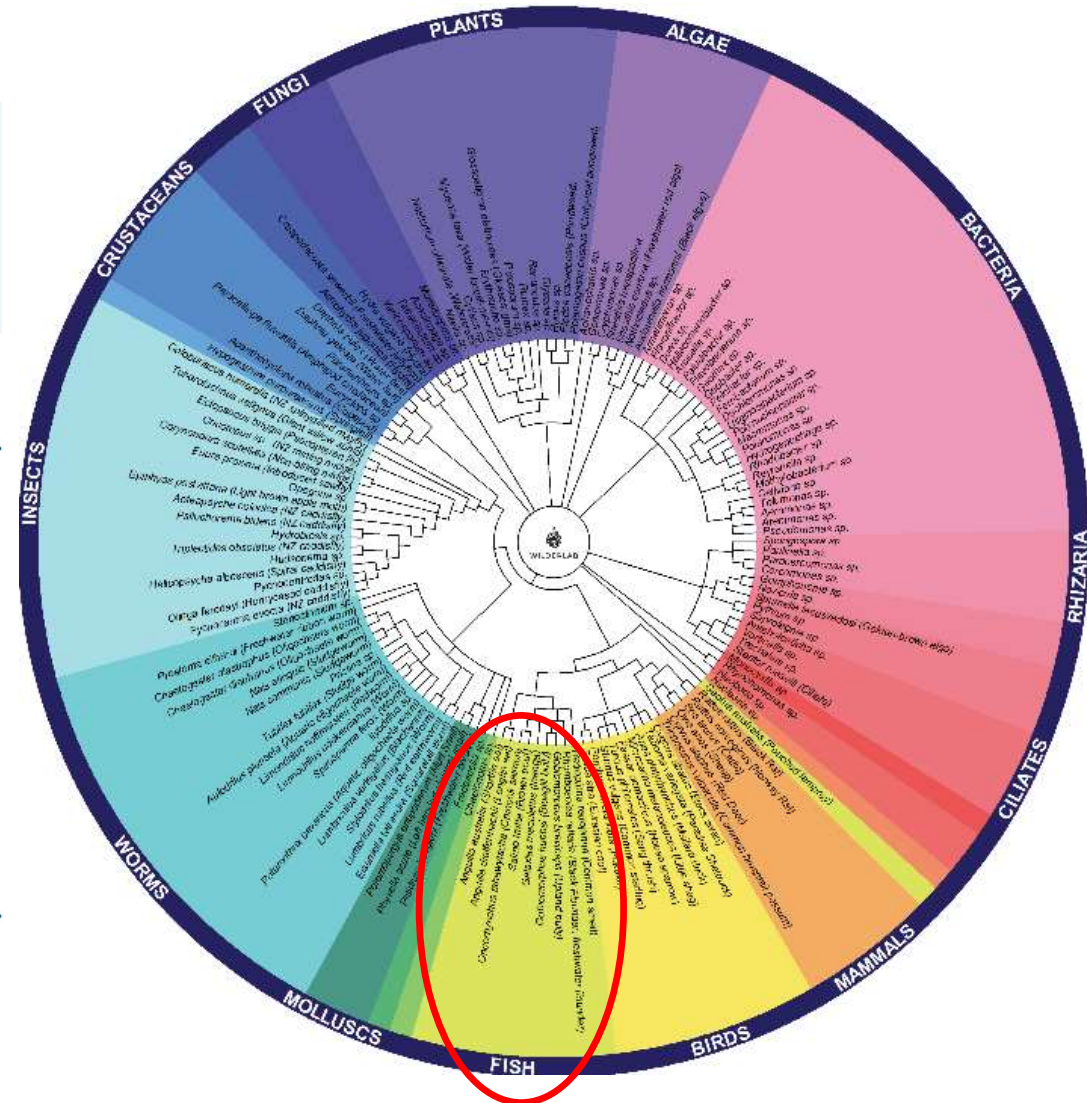Filter: 1.2 µm x 30 mm cellulose acetate
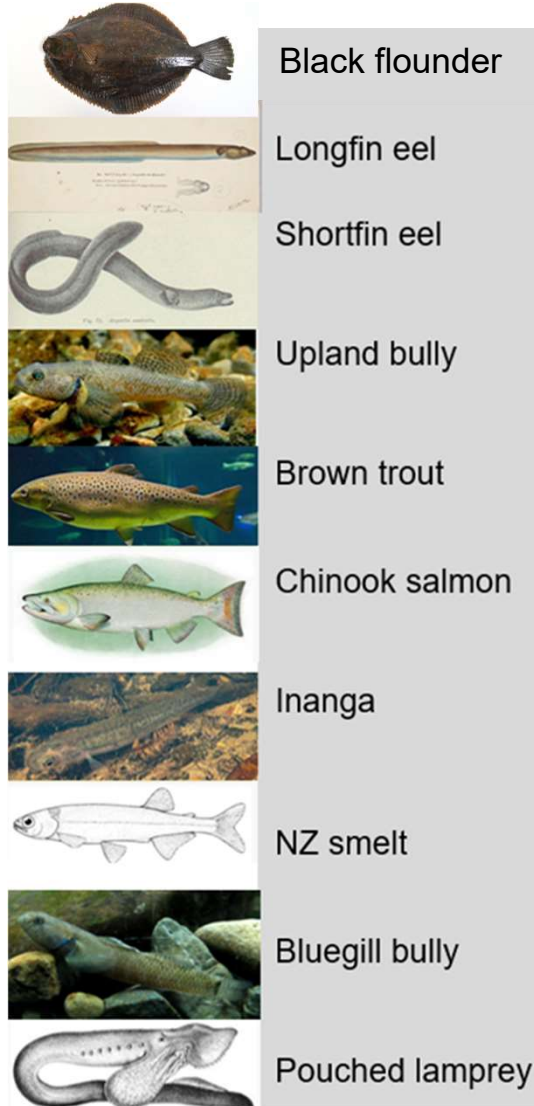Assay type: Comprehensive

Featured Species   Sequence Information   Wheel of Life   Ecological Health

"wheel of life" for that site

Environmental DNA: Cam River

- https://www.wilderlab.co.nz/explore

Black flounder
Longfin eel
Shortfin eel
Upland bully
Brown trout
Chinook salmon
Inanga
NZ smelt
Bluegill bully
Pouched lamprey

"fish species"

Environmental DNA: Cam River

- https://www.wilderlab.co.nz/explore
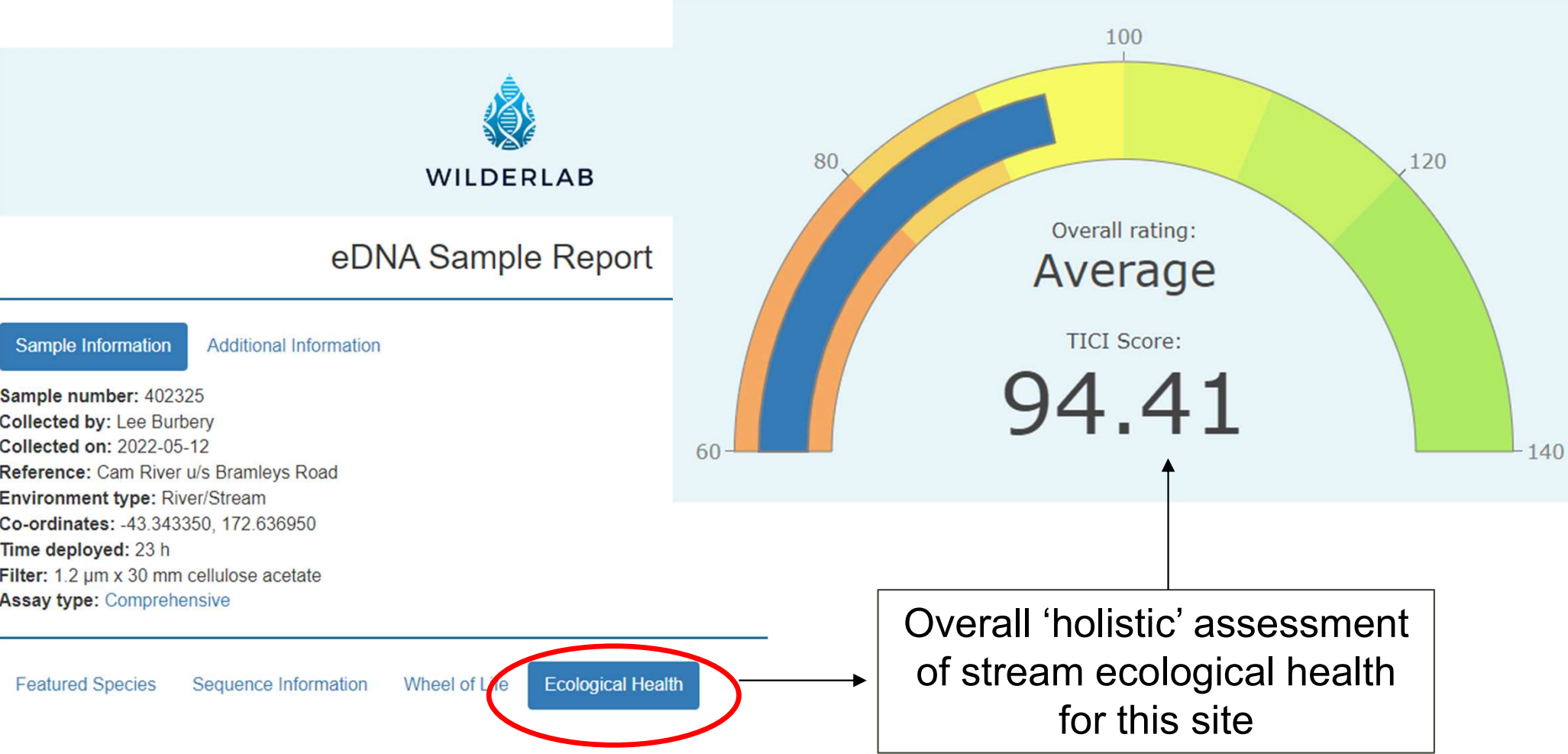
Environmental DNA: Overall

- https://www.wilderlab.co.nz/explore

- **of 41 samples**

- 2 = "excellent"
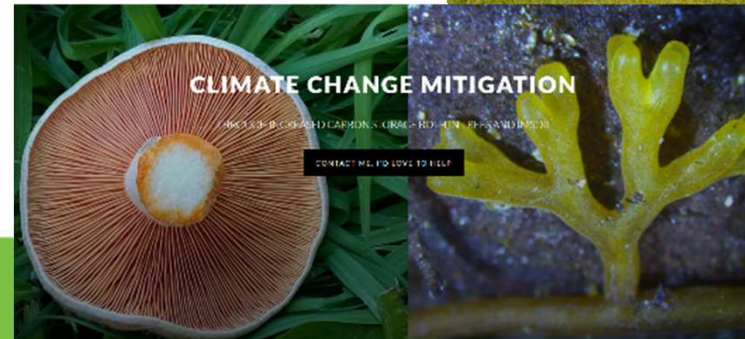- 4 = "good"
- 30 = "average"
- 5 = "poor"
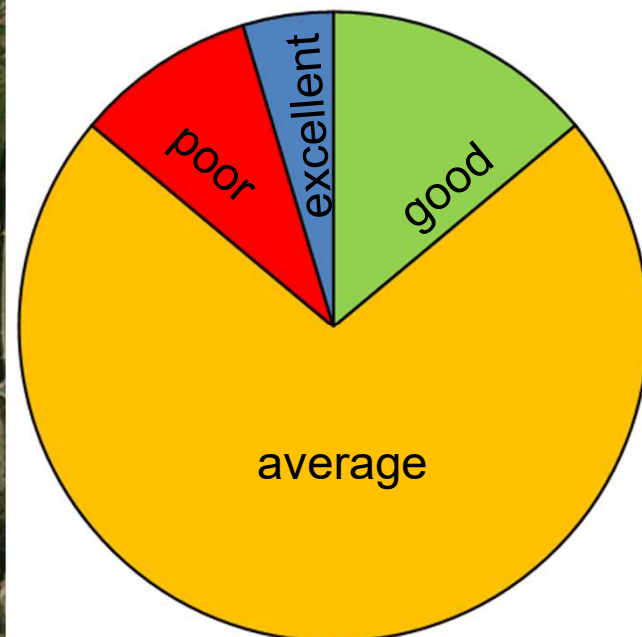
Back to the Speakers…

- **Phil Orme** (Orme & Associates)
  - Trees on farm
- **Chris Winefield** (Lincoln University)
  - Hops
- **Cam Henderson** (Farmer/Nuffield Sch
  - Solar farming
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Refer to individual presentations provided

Afternoon session:

- National-scale work (wider WWO program)
- Waimakariri catchment – 4x case study farms
  - Recap on where we are at
  - Preliminary results for 'baseline' state for dairy farms under environmental limits
- Group 'workshopping' to get farmer input into land-use scenarios for the case study farms
- Summary and next steps

Whitiwhiti Ora national-scale work

- Production

- Economics

- Environmental losses

https://wwo.landcareresearch.co.nz/dataset

Land Use Opportunities
Whitiwhiti Ora

Datasets   Terms of Use   Privacy   Search

🏠 / **Datasets**

▼ Industry ▼

Animal 2

Arable/Vegetable 7

Fruit 8

Indigenous plants 1

Tree Crops 7

Other 1

▼ Land Use ▶

🔍

19 datasets found

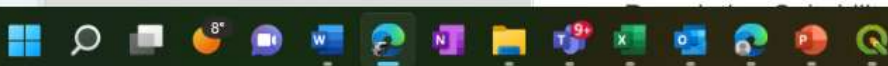Order by | Name Ascending ∨

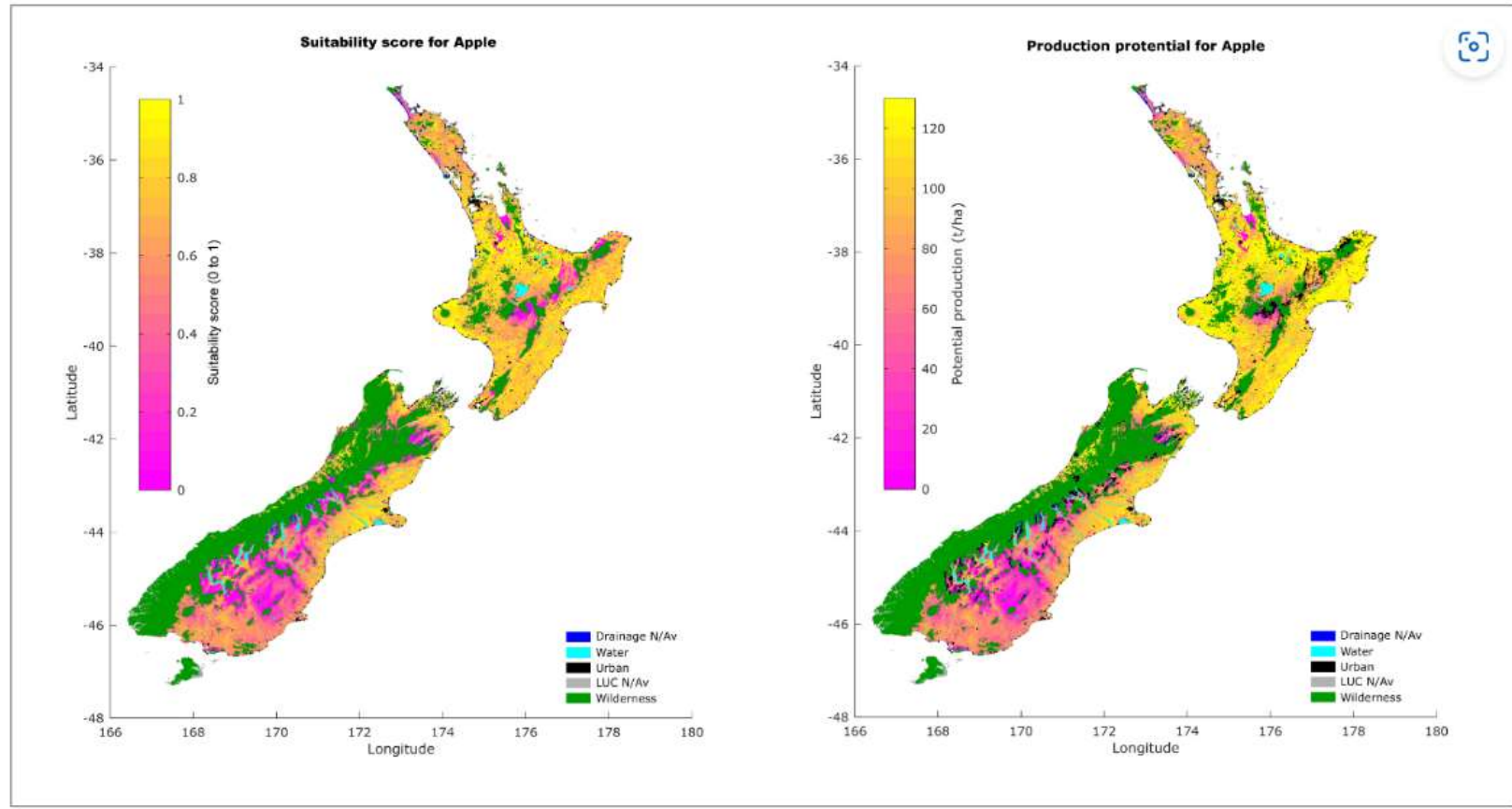### Annual potential evapotranspiration deficit under pasture (to mid and end of ...

Description Annual potential evapotranspiration deficit (PED) is the sum of daily PED under pasture over a year (STARTING JULY). The six-model ensemble mean of annual-mean...

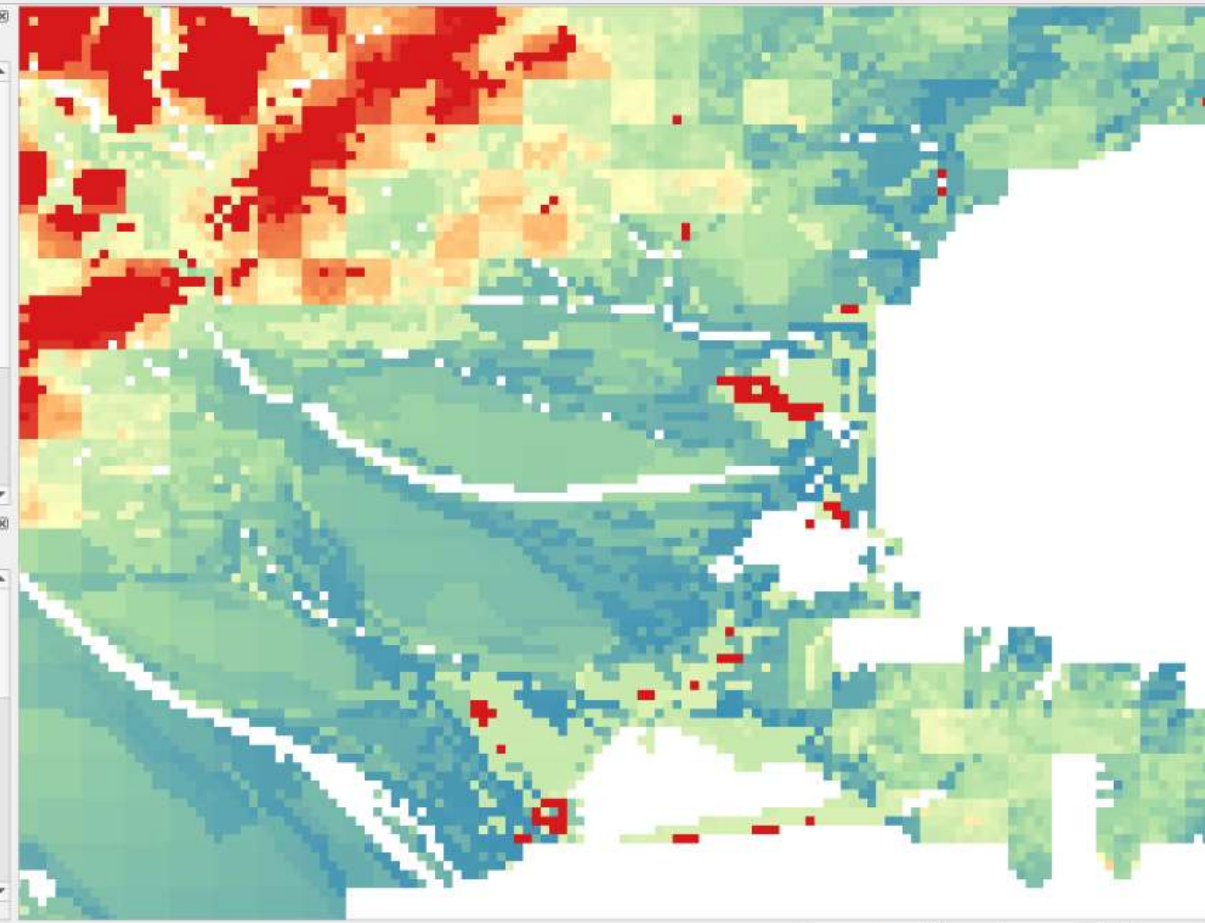TIF   PNG

Apple - crop suitability and yield maps

Plant & Food Research   agresearch   LWP   Dairynz

Preview Image

Suitability score for Apple

Production protential for Apple

Legend (both maps):
- Drainage N/Av
- Water
- Urban
- LUC N/Av
- Wilderness

Land use opportunities (workshop #3)

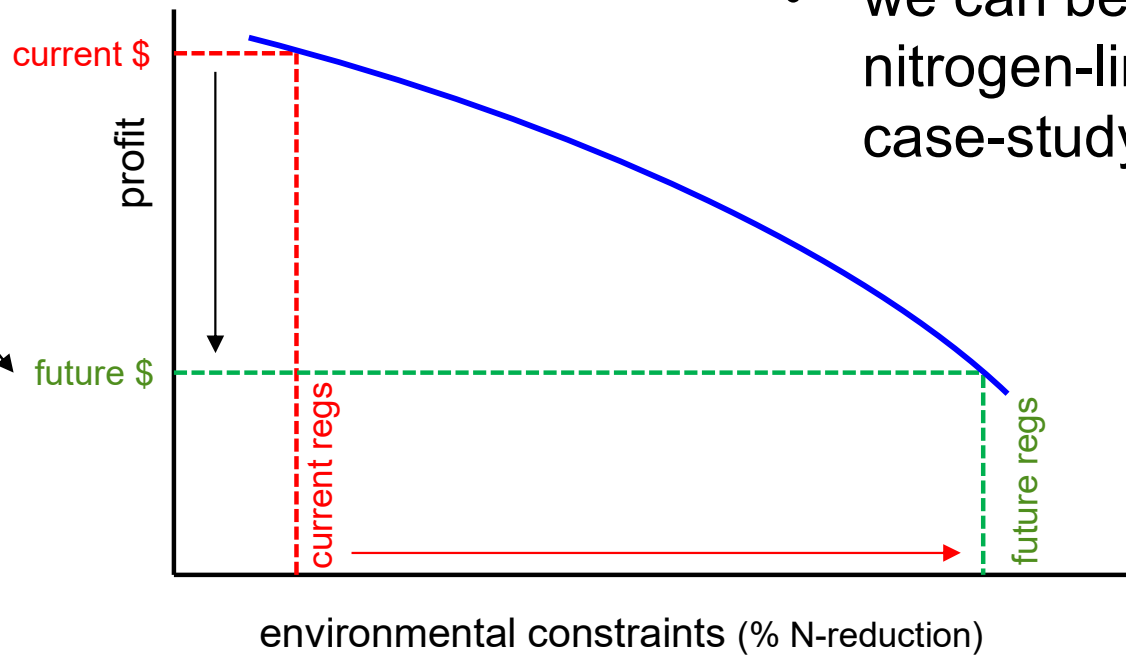|	Taggart	Larundel	Alkington	Grange
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- for each case study farm – we are looking for input regarding:
  - the *what, where and how much* for each land-use option
  - N-reduction % for '*baseline profit*' that consider *environmental limits*
    - Why is this important ?

'Baselines' & environmental limits

Waimakariri Trust goals / visions…

- *Our farming practices balance profitability & <u>environmental responsibility</u>…*
- *opportunity/risk assessment that considers financial, people & <u>environment</u>*

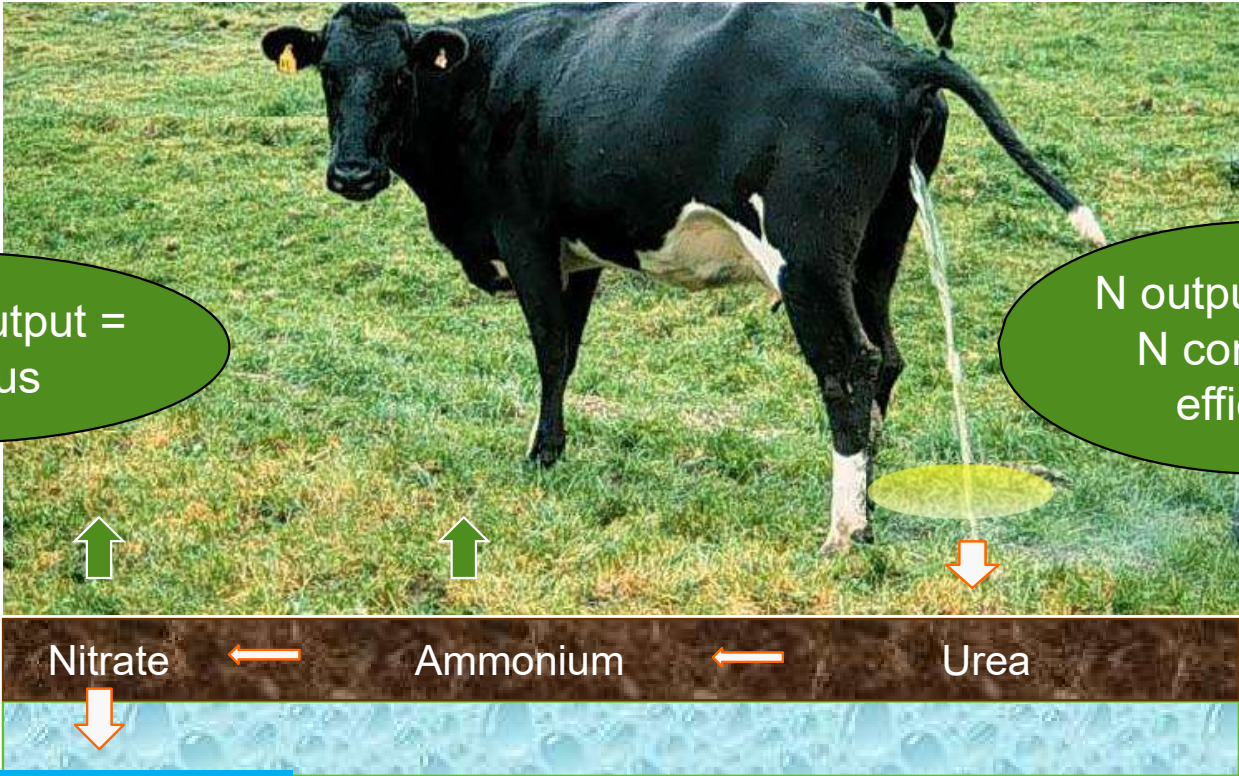assessment of alternate land use depends on the 'baseline' used

- we can best model the impact of nitrogen-limits on profit for dairy case-study farms (Pierre)

current $

profit

future $

current regs

future regs

current land use

environmental constraints (% N-reduction)

The nitrogen cycle

Inputs:
N fertiliser
Supplements
N fixation

Outputs:
milk, meat, crop

N input – output = N surplus

N output / input = N conversion efficiency

Nitrate ← Ammonium ← Urea

N leaching

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Proposed mitigations

N mitigations
– Stacked on top of each other, with each added mitigation having an additive effect on N-removal (relative to the baseline state)

Barn system with cut and carry

+

Reduced inputs, reduce stocking rate

+

Autumn/winter standoff

+

nitrification inhibitors

+

Remove/reduce cropping

+

Reduced urinary N autumn

+

Italian & plantain

+

N use efficiency

+
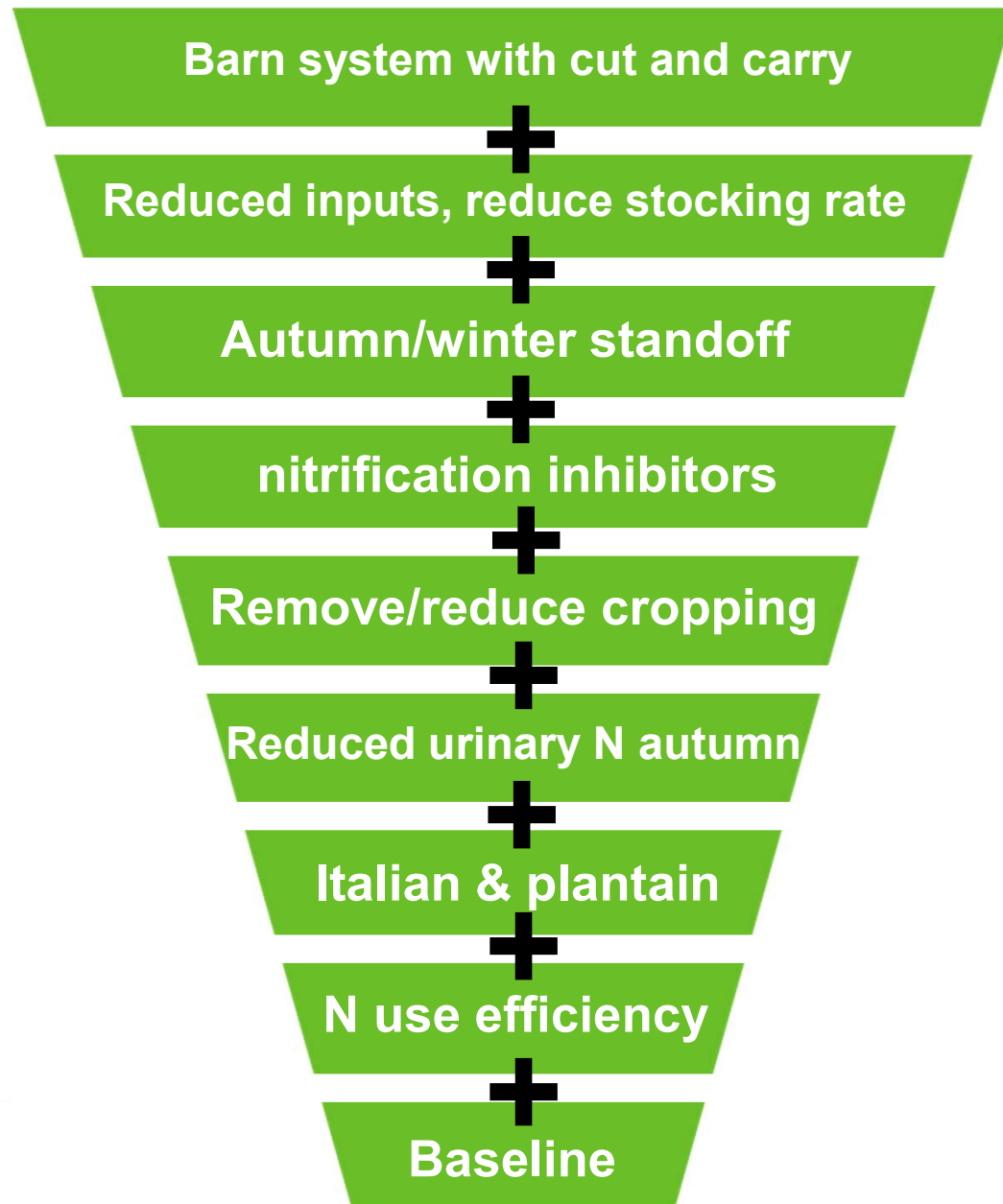
Baseline

Alkington

Milking platform area: 183 ha
Effective area: 177 ha
N fertiliser on pasture: 190 kg/ha
Peak cows: 613
Stocking rate: 3.4 cows/ha
Production: 530 kg MS/cow; 1800 kg MS/ha
Milk price: $9.30/kg MS

Farm Map

Milking platform only

	Baseline 2021-22
N loss kg/ha	43
Total N loss kg	7,918
P loss kg/ha	1.8
Total P loss kg	320
Methane kg CO2-e/ha (Overseer)	12,150
Total GHG kg CO2-e/ha (Farmax)	13,120
Operating profit $/ha	9,967

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Alkington: Marginal abatement curve (MAC)

- reduction in baseline profit as N-loss requirements increase

Profit change with N loss change

Strategy	N loss change %	Profit change %
Baseline	0	0
NUE	-12	+1
Italian and Plantain	-18	+1
Early calving and dry off	-22	-3
No crop	-30	-7
Autumn standoff	-38	-16
BNI	-41	-18
100kg N/ha and SR 3.3	-46	-21
85kg N/ha and SR 3.1	-47	-31
Barn with cut and carry	-81	-47

Larundel

Milking platform area: 370 ha
Support land: 220 ha
N fertiliser on pasture: 235 kg/ha
Peak cows: 1425
Stocking rate: 3.7 cows/ha
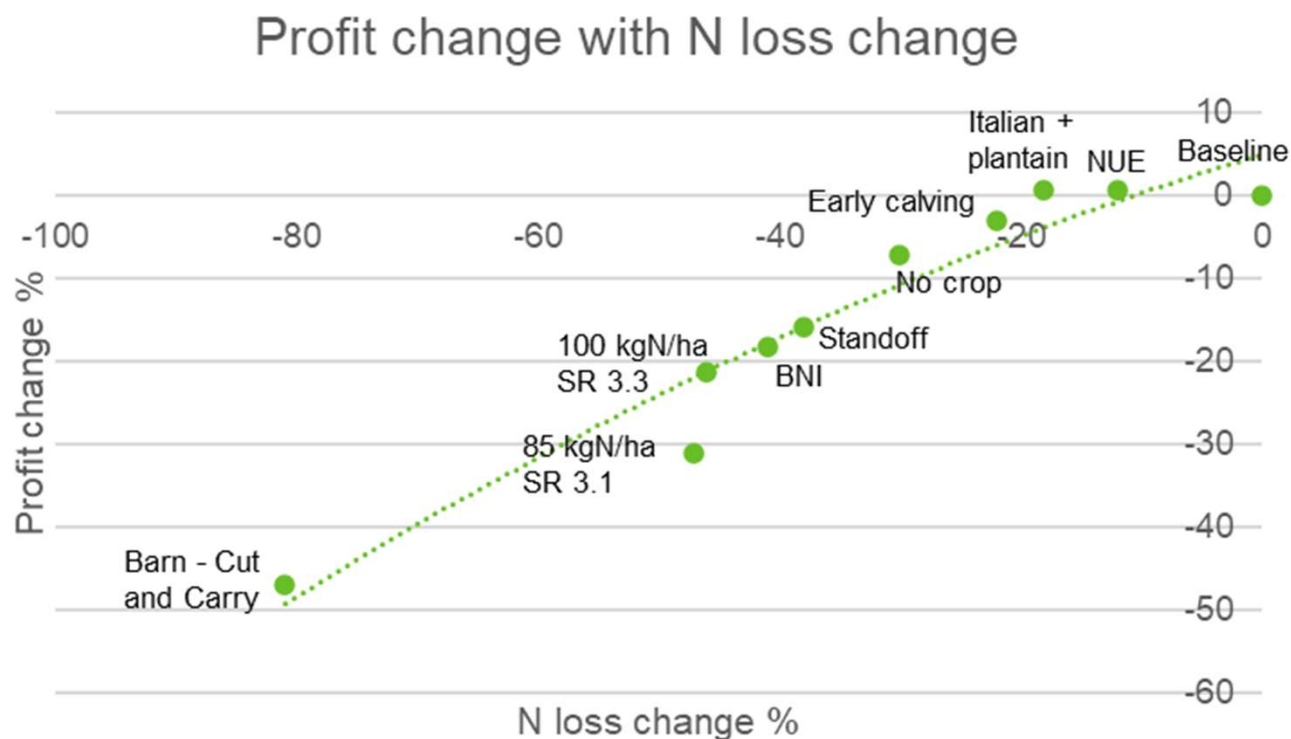Production: 460 kg MS/cow;
1700 kg MS/ha
Milk price: $9.30/kg MS

All hectares counted

	Baseline 2021-22
N loss kg/ha	45
Total N loss kg	27,106
P loss kg/ha	0.9
Methane kg CO2-e/ha (Overseer)	9,438
Total GHG kg CO2-e/ha (Farmax)	11,956
Operating profit $/ha	4,395

Larundel: Marginal abatement curve (MAC)

- reduction in baseline profit as N-loss requirements increase

Profit change with N loss change
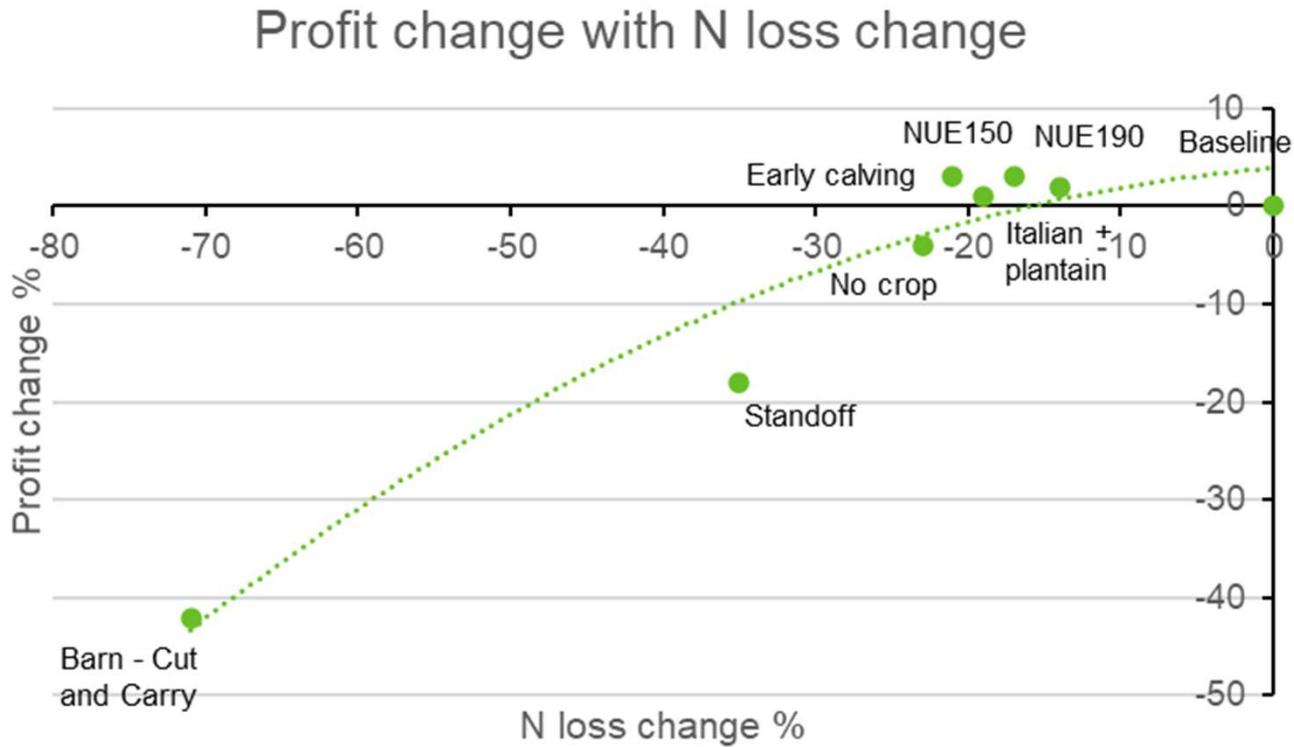
Strategy	N loss change %	Profit change %
Baseline	0	0
NUE190	-14	+2
NUE150	-17	+3
Italian and Plantain	-19	+1
Early calving and dry off	-21	+3
No crop	-23	-4
Autumn/winter standoff	-35	-18
Barn with cut and carry	-71	-42

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