

AIMING FOR ADVANCED MITIGATION ARABLE

ACTON FARMERS
Irrigation Cooperative Limited



Keen to find out about
Advanced Mitigation on a
cropping farm?

Andrew Scott and Ross Hewson of Lynscott
and Hewson Farms open up their gate to
show you how and why they use Advanced
Mitigation to reduce inputs and improve
profitability.

15th DECEMBER
9.45am - 1pm

**721 Chertsey Road,
Chertsey**



AIMING FOR ADVANCED MITIGATION (ARBALE)

LOCATION: Penlyn Farm, 721 Chertsey Road, Chertsey
DATE: 15 December 2022, 9:45am-1pm

AGENDA

9:45AM	MORNING TEA	
10:00AM	INTRODUCTION, H&S	Nick Daniels, BCI Andrew Scott, Lynscott Farm
10:15AM	WHAT IS ADVANCED MITIGATION	Mark Everest, MRB Will Wright, Enviro Collective
10:35AM	ADVANCED IRRIGATION	Andrew Scott, Lynscott Farm Tom Yeatman, Vantage AG
11:10AM	ADVANCED FERTILISER MANAGEMENT	Andrew Scott, Lynscott Farm Chris Smith, FAR Julie Lasham, Agronomy Solutions
11:45M	ADVANCED CROP N UPTAKE	Andrew Scott, Lynscott Farm Shane Butler, PGG Wrightson Seeds
12:15PM	WRAP UP AND DISCUSSION	Will Wright, Enviro Collective
12:30PM	BBQ LUNCH	



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

KEY FARMING OBJECTIVES

Both Hewson Farms and Lynscott Farms have similar business objectives, which include:

- 1. Keep it simple
- 2. Maximise return on capital

“Best practice is what we try to do and it doesn’t stand still”

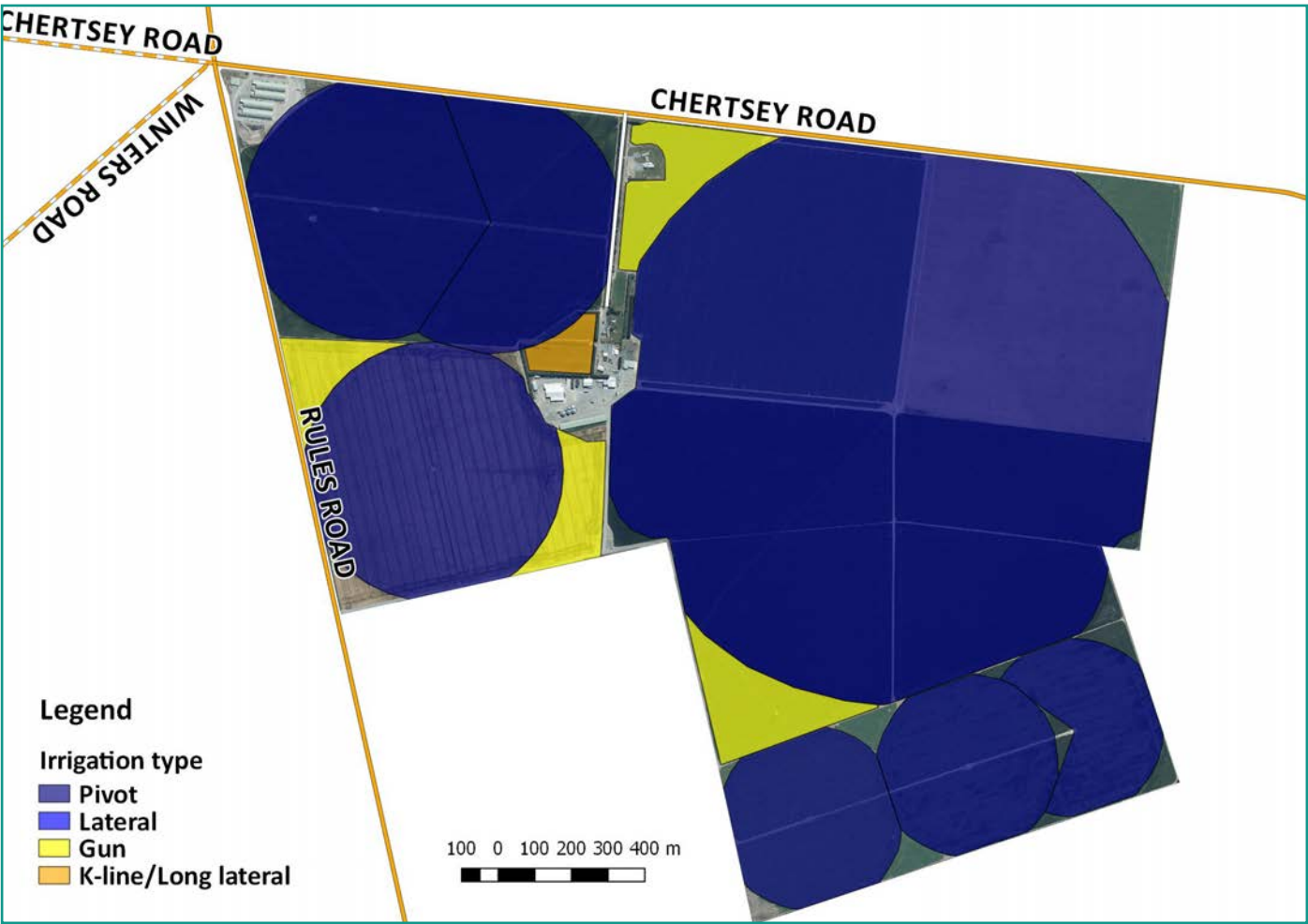
Early adoption of technology has been key to delivering economic and environmental goals for their businesses, with most of the tools discussed in this document used for more than 8 years on these properties

PENLYN FARM OVERVIEW

Penlyn Farm was purchased by the Hewson family in 1999 as a dryland sheep, cattle and cropping farm. Irrigation was added in 2000 and shifted to a more intensively cropped system with sheep. Crops include potatoes, onions, cereals, grass and clover seed, and other small seeds.

Area	388ha, operated within Hewson Farms enterprise
Farm System	Mixed cropping with sheep
Irrigation	Groundwater, 334 ha pivot, 15.6ha gun
Soil	Lismore, PAW = 86mm
Operator	Owned by Ross and Rochelle Hewson, Farm Manager Andrew Scott

Variance in crop yields aligned with the historic paddock layout, which created an interest in precision fertiliser to optimise the yields and improve consistency of product quality.

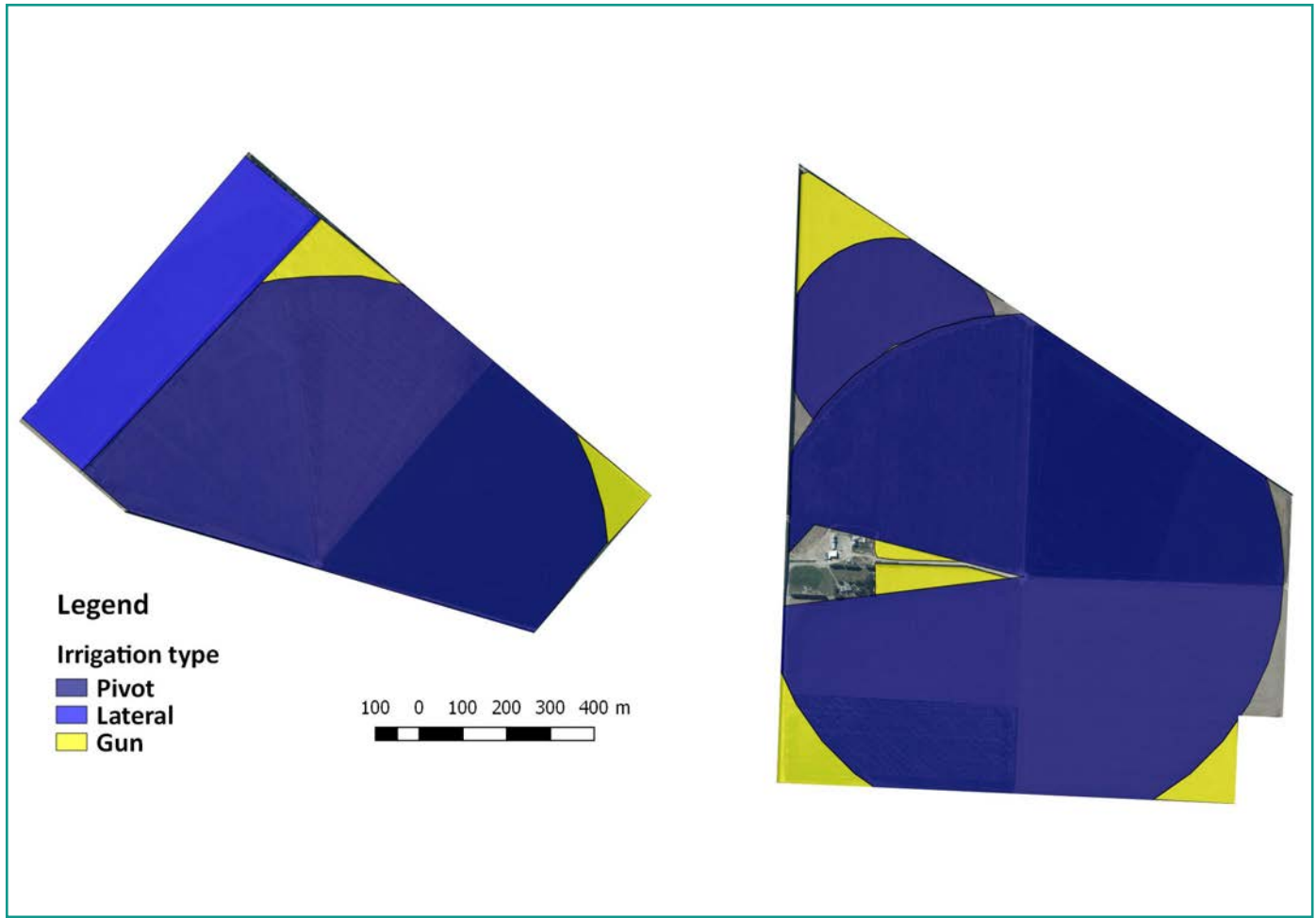


LYNSCOTT FARM OVERVIEW

Andrew Scott and Liz Waugh operate Lynscott Farm, a 201 ha arable and vegetable production farm located in Mitcham, Mid Canterbury. Andrew purchased his first block, Lynnfield Farm (121ha), as a dryland arable and finishing property in 2005. Irrigation was added to the farm shortly afterwards. In 2010 a further 80ha partly irrigated block was added with the purchase of the Mitcham Block. Both properties receive a mixture of BCI and well water.

Andrew is also the Farm Manager of Hewson Farms and utilises many of the same technologies and data platforms for his own business.

Area	201ha over 2 properties
Farm System	Mixed cropping with sheep
Irrigation	BCI water, 180 ha pivot, 12.4ha gun
Soil	Templeton, PAW = 102mm
Operator	Owned and operated by Andrew Scott and Liz Waugh





WHAT IS ADVANCED MITIGATION?

Advanced Mitigation (AM) is a new standard to demonstrate environmental management above and beyond “Good Management Practice”.

Key principals of Advanced Mitigation are:

- 1. Cost benefit or neutral to average Mid-Canterbury Farmer
- 2. Reduce nitrogen leaching on a typical Mid-Canterbury farm

Advanced Mitigation is defined in BCI’s Ashburton Zone resource consent CRC211511. The 5 AM targets promote advanced irrigation and N surplus management as well as reduce contaminants from point sources. The outcomes were developed in consultation with other irrigation schemes, industry experts and farmers.

WHY ADVANCED MITIGATION?

- Improve profitability on farm
- Enables farm system flexibility
- Supports real improvements in water quality outcomes

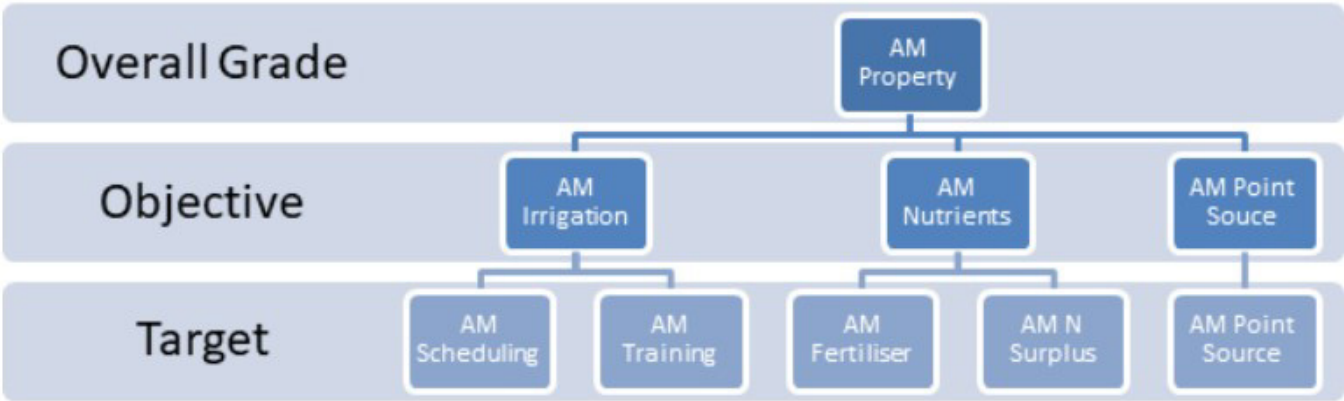
ADVANCED MITIGATION: IRRIGATION

Advanced Mitigation Irrigation Target 1:
To minimise water use and drainage during times of high nitrogen loss risk, irrigation water is applied so that the timing and depth target crop requirement and optimizes capture of rainfall to minimise drainage.

Key Outcomes of Advanced Mitigation Irrigation Target 1

Irrigation systems are designed and operated to target crop demand and maximise capture of rainfall.

- A. Efficient System**
95% of irrigated area on the property utilises a system that can achieve 80% efficiency.
- B. Differential Irrigation**
Irrigation systems are able to vary application by irrigation management zone on 95% of irrigated area on the property.
- C. Strategic Irrigation Scheduling**
Optimise capture of rainfall through strategic management of irrigation through the shoulders of the irrigation season.
- D. Accuracy of Tools**
irrigation system and scheduling tools are calibrated and maintained to optimise accuracy.



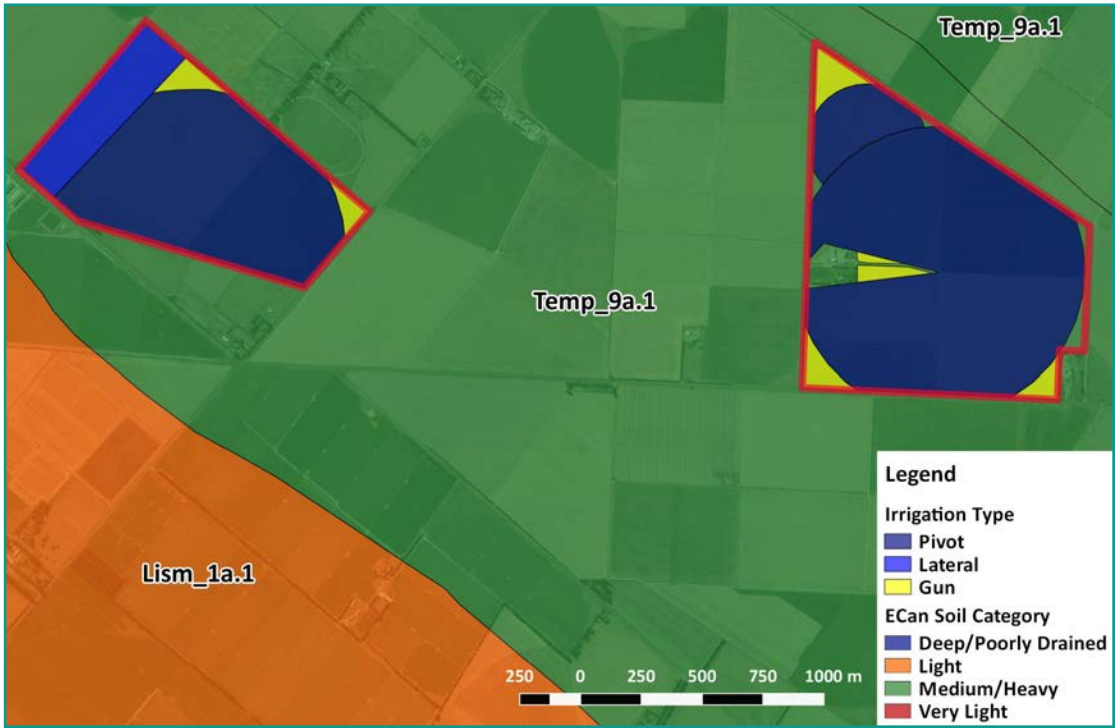


Figure 1: Lynscott Irrigation Systems by Soil Type

LYNSCOTT IRRIGATION ADVANCED MITIGATION EXAMPLE

Lynscott Farm use soil moisture sensors to optimise the use of water in order to reduce the cost of BCI water, reduce pumping costs from wells and reduce wear and tear on irrigation equipment.

Quality and shelf life of some crops can also be severely impacted if too much or little water is applied, therefore accurate water application to meet crop demand is a high priority.

Efficient System

Soils: Templeton 9a.1, PAW = 102 mm. Maximum application depth to achieve 80% efficiency for property = 63 mm (RAW/0.8).

Total irrigated area: 192.9 ha, 5 mm/day system capacity

Total Pivot Area: 163.7 ha (85%), average 20-25 mm/application

Total Lateral Area: 17.2 ha (9%), average 20-25 mm/application

Gun: 12.4 ha (6%), average 40-45 mm/application

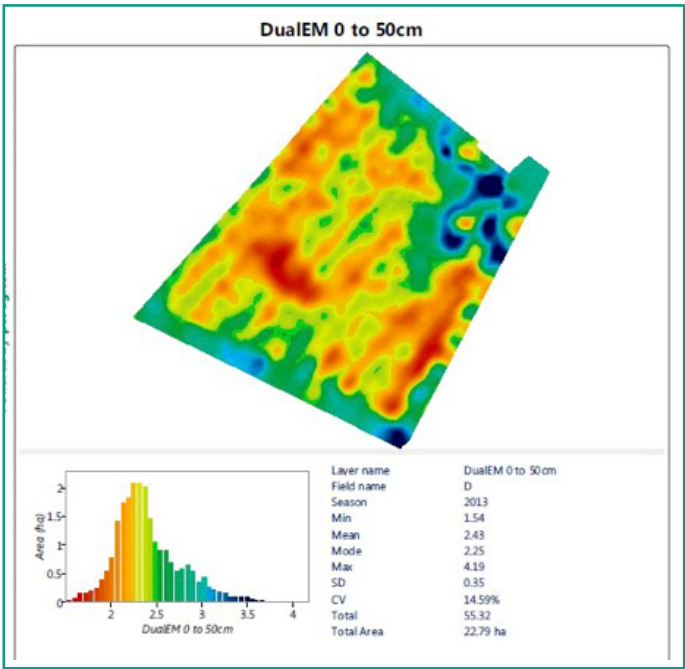
Therefore, 100% of the Lynscott irrigated area is able to achieve the 80% design efficiency specifications.

Differential Irrigation

- Lynscott paddock layout aligns with Irrigation Management Zones
- EM mapping completed, demonstrates limited variability in soils



Figure 2: Lynscott Paddock Layout (above) and EM Mapping (below)



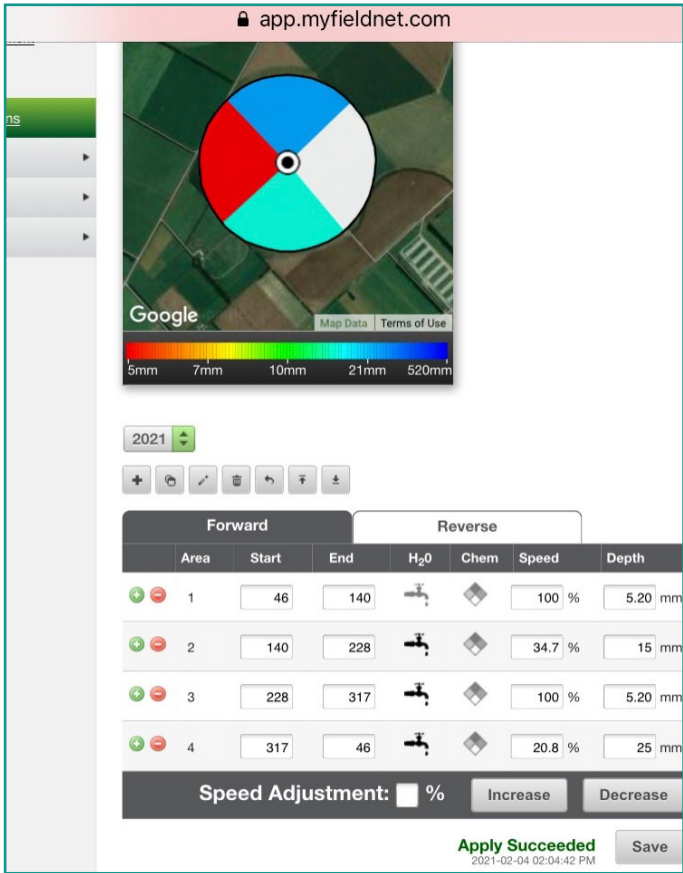


Figure 3: Example of Sector Control Set Up in FieldNet



Figure 4: Aquacheck Probe

- Sector control allows pivots to vary application depths by crop type
- Three aquacheck probes used to assess soil moisture for potatoes, wheat and grass seed
- Irrigation can be managed remotely by FieldNet

Strategic Irrigation Scheduling

- Lower irrigation triggers used during fringes of the season
- Drainage measured below root zone

Accuracy of Tools:

Aquacheck probes calibrated annually.

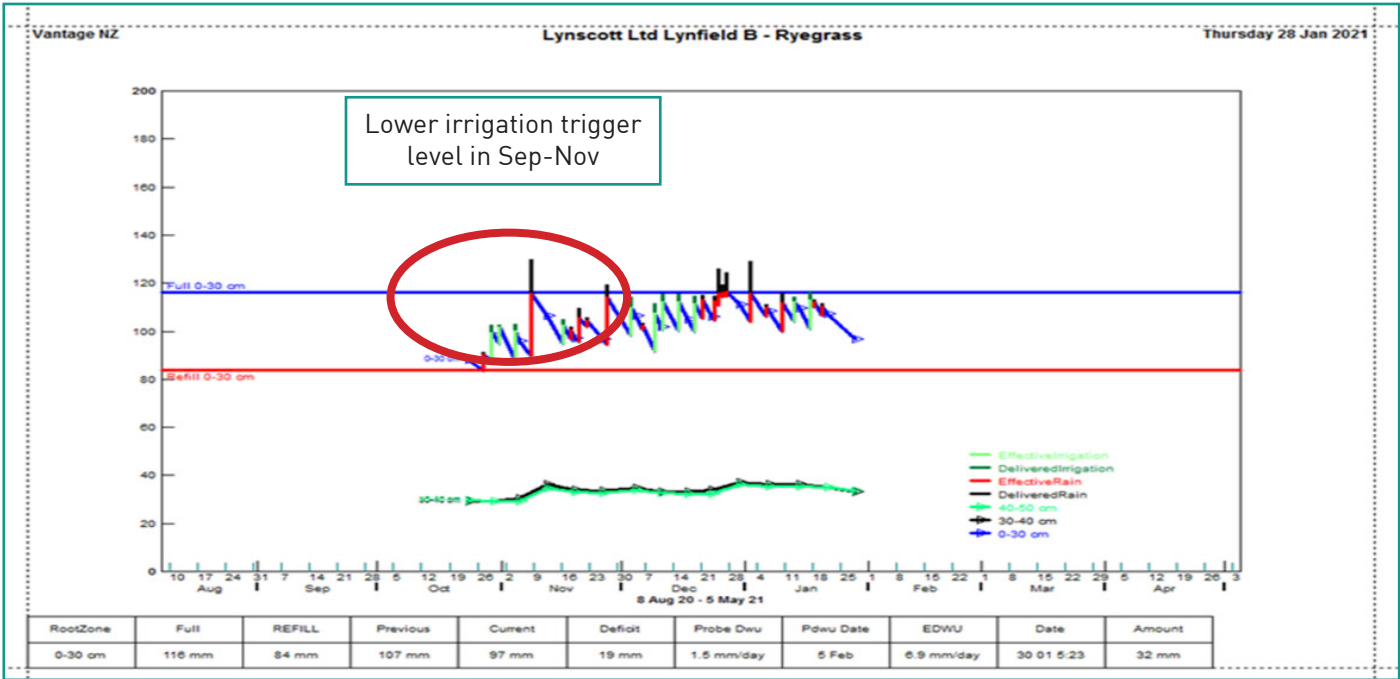
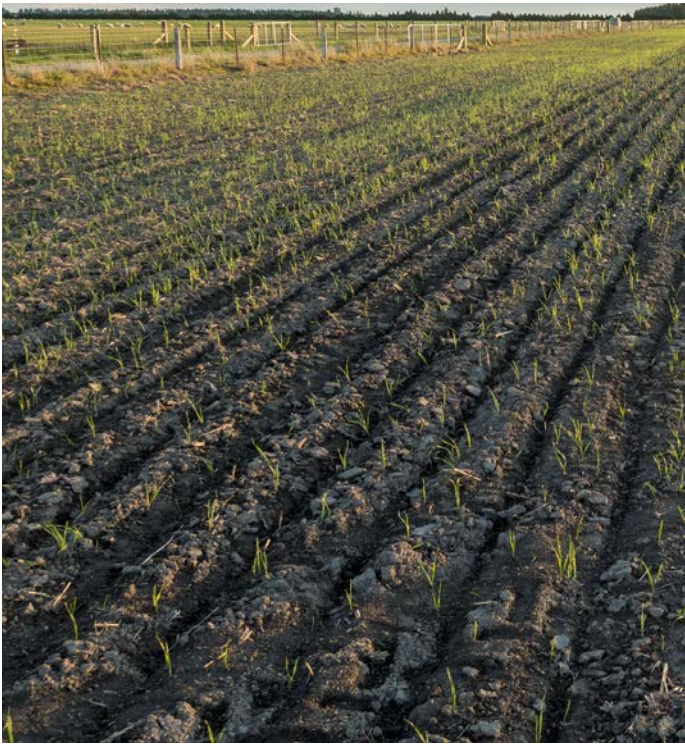


Figure 5: Seasonal Overview of Soil Moisture Monitoring showing lower irrigation triggers at the start of the season

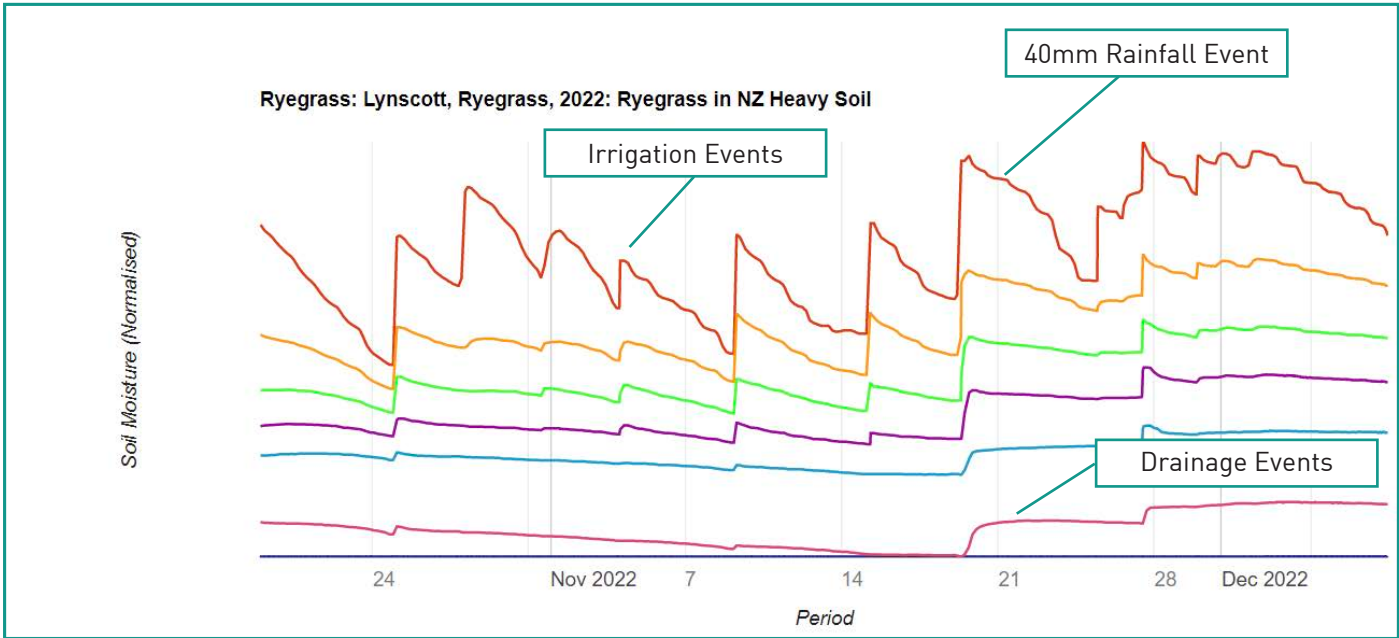


Figure 6: Soil Moisture Sensor Data demonstrating irrigation managed to avoid drainage and maximise capture of rainfall

ADVANCED MITIGATION IRRIGATION TARGET 2:

The Irrigation manager(s) understands the relationship between the irrigation system, soil and climate in order to achieve the irrigation management requirement (a).

Key Outcomes of Advanced Mitigation Irrigation Target 2

The shareholder should ensure that all irrigation managers are sufficiently knowledgeable in their irrigation systems and supporting tools.

A. Training

Irrigation managers are trained to understand the property's irrigation system and its limitations.

B. Understanding

Irrigation managers can articulate reasons for steps taken to minimise the risk of drainage by irrigation management zone.

Specific training can be useful, however is strongly linked to being able to explain and achieve the outcomes of Irrigation AM target 1

ADVANCED MITIGATION: NUTRIENT MANAGEMENT

Advanced Mitigation Nutrient Target 1:

To lower soil nitrogen surplus from higher risk land use activities and to reduce leaching of nitrogen, fertiliser is applied based on the variability of soil and crop health throughout the season both within paddocks and between paddocks.

Key Outcomes of Advanced Nutrient Target 1

N surplus is reduced by targeting fertiliser applications to address variability both between and within paddocks.

A. Base Soil Fertility

Soils have sufficient base fertility to optimise plant yield.

B. Identification of Variability

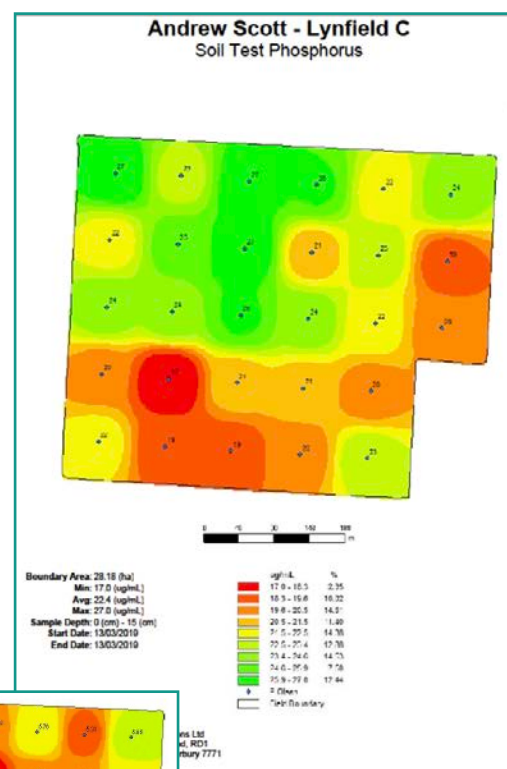
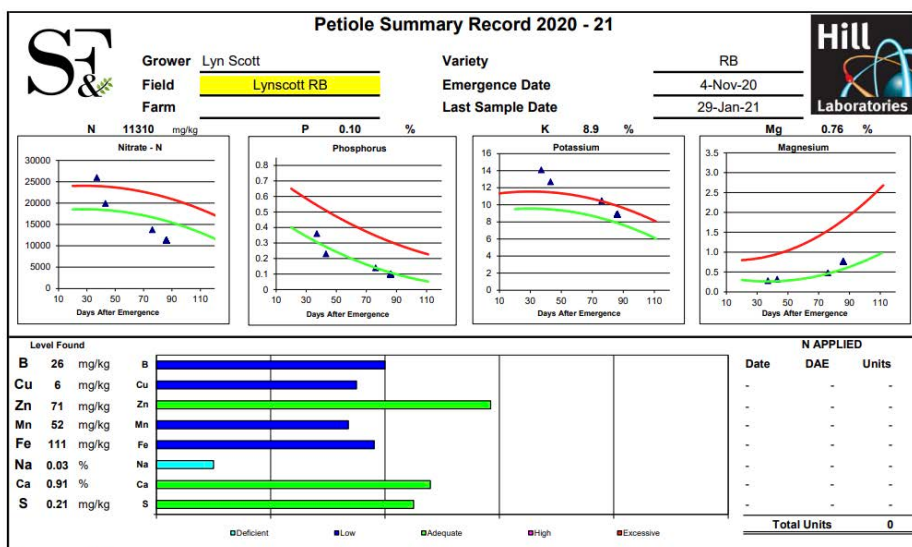
Property has identified and addressed sources of variability on their land.

C. Targeted Application

Fertiliser applications are targeted to meet the need of a plant, both within and between paddocks.

D. Adaptive Management

Plant growth and performance is monitored, with fertiliser plans adapted in response to realised growth throughout the season.



LYNSCOTT /PENLYN FERTILISER MANAGEMENT ADVANCED MITIGATION EXAMPLE

Both Penlyn and Lynscott Farms have implemented major changes in land use and paddock layout since they were purchased, which has resulted in noticeable differences in yield performance. A programme of grid sampling and targeted fertiliser treatments was first implemented in 2016 to address these issues and improve yield and quality consistency across a paddock.

Base Soil Fertility

- Grid sampling (Lynscott and Penlyn) after potatoes, annual tests on other paddocks
- Deep N testing and Potential Mineralizable N prior to sowing crops
- Fertiliser plan targeted to ensure optimal base fertility.
- Herbage tests completed if needed

Identification of Variability

- Variability in yield performance for both Lynscott and Penlyn farms linked to paddock history
- Dryland areas on Penlyn have lower yield potential most years as typical rainfall ~ 680 mm/yr
- Grid sampling used to identify areas of paddock with lower performance
- Soil sampling, yield mapping, satellite and drone monitoring of crop progress

Targeted Application

- Variable fertiliser prescriptions, adjusted to optimise N response, balance pH

Adaptive management

- Crop growth monitored using satellite imagery
- Adjust fertiliser plan according to season

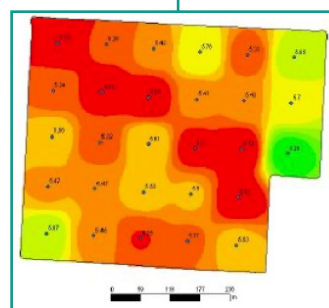


Figure 8: Satellite imagery used to monitor crop performance over the season

ADVANCED MITIGATION: N SURPLUS REDUCTION

To improve N fertiliser utilisation, reduce soil nitrogen surplus and lower the risk of nitrogen leaching and increase nitrogen uptake from the soil by optimising pasture and crop growth.

Key Outcomes of Advanced Mitigation Nutrient Target 2

The shareholder should seek to assure themselves that all suitable tools are implemented to improve plant uptake of nitrogen and reduce N surplus from livestock grazing and intensive winter grazing..

A. Risk Assessment

Risk assessment completed to understand and quantify N brought into and removed from the system, how it is stored in the soil and when and how it is likely to be lost to the environment.

B. Pasture or Crop N Uptake Optimised

Pasture and crop is managed to optimise uptake of N from the soil.

C. Applicable N Loss Mitigations

Tools and techniques to minimise nitrogen surplus are implemented.

LYNSCOTT /PENLYN N SURPLUS REDUCTION EXAMPLE

Fertiliser inputs are a significant expense for Lynscott and Penlyn Farms and every kg of N lost to the environment is seen as an expense to the business and erodes their bottom line.

Pasture or Crop N Uptake Optimised: Addressed when Nutrient Target 1 is met for this property.

Applicable N Loss Mitigations: Benchmarking data is available for Lynscott and Penlyn farms to demonstrate continuous improvement and reductions in N surplus from their operations.

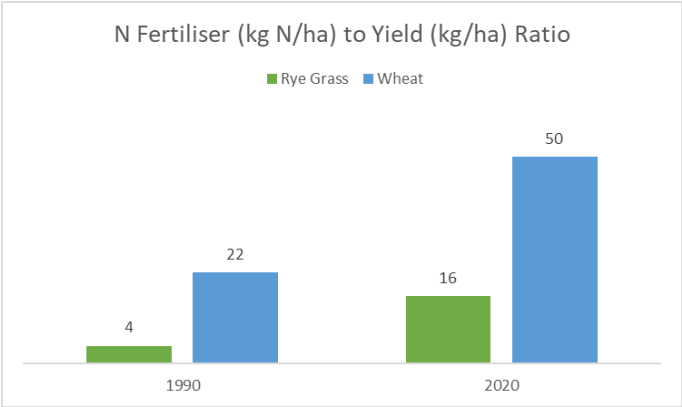


Figure 10: Ratio of N fertiliser Use and Yield between 1990 and 2020 demonstrates significant improvement over time

Risk Assessment – What activities or processes drive N loss from the property?

Key Risks	When	Key Mitigation(s)
High mineral N in soil following legumes	Conventional cultivation after harvest mineralises N, at risk of loss if drainage event occurs over winter	Account for fixed N in soil for following crop High N uptake crop to follow Minimum fallow
High mineral N in soil following high N input crops	Conventional cultivation after harvest mineralises N, at risk of loss if drainage event occurs over winter	N testing before and following crop Tailor fertiliser to crop demand to optimise uptake Minimum fallow High N uptake crop to follow
N input from urine from intensive winter grazing of sheep	Winter months	N input from animals taken into consideration for fertiliser plan of following crop High N uptake crop to follow winter grazing
Nitrates in soil mobilised with drainage	Irrigation season	Irrigation managed to avoid drainage, where possible

For Lynscott and Penlyn Farms, N loss risks are managed when Advanced Mitigation Irrigation and Fertiliser targets are achieved.

ADVANCED MITIGATION: POINT SOURCES

Point source discharges from critical source area such as farm silage, ofal pits, rubbish dumps, animal holding areas, soakholes, fuel and agrichemical storage, consumable waste and well head security are managed to prevent as much as practicable contaminants from entering ground or surface waters.

Key Outcomes of Point Source

Point sources are managed to prevent discharges of contaminants into surface or ground water.

A. Waste Management

Waste production is minimised or managed to reduce need to dispose of ofal, rubbish or other consumable waste on-farm.

B. Farm Silage, and Animal Holding Areas

Run-off from farm silage and animal holding areas is managed to avoid contamination to surface or groundwater.

C. Fuel and Agrichemical Storage

Fertiliser applications are targeted to meet the need of a plant, both within and between paddocks.

D. Soakholes

Soakholes are located and managed to minimise drainage of unclean water.

E. Well Head Security

All wells on the property are secure and complies with regulatory requirements



EXAMPLES OF ADVANCED MITIGATION POINT SOURCE MANAGEMENT

Waste Management

- Meets industry/milk supplier waste management requirements
- Waste management service utilised
- Ofal waste is composted or removed from property

Farm Silage, and Animal Holding Areas

- Waste from calf shed is captured and spread
- Other animal holding areas are suitably lined and waste captured and spread to land

Fuel and Agrichemical Storage

- Fuel tanks, liquid fertiliser and/or other chemicals are banded or stored to capture spills

Soakholes

- Avoid them in highly contaminated areas
- Fence them off during high risk activities, such as intensive winter grazing
- Investigate and implement options to treat run-off prior to drainage in soakhole

Well Head Security

- Recent inspection from suitably qualified professional
- All wells (including domestic) meet PA requirements, including:

Item	Description	LWRP §5.103 part
1	Bore registered with Ecan?	5
2	Is the bore capped / Secure	4a
3	Does the bore have a robust collar → 20cm above ground	
4	Is there a concrete pad least 0.3 m radius and 0.1 m thickness	4c
5	Proximity to contaminated land	6

Figure 11: Example of planting around a soakhole to capture sediment and nutrient run-off from paddock

THANK YOU!

Big thank you to our hosts, Andrew Scott and the Hewson Family (Ross, Rochelle, Joel and Sarah) for opening up their gates and sharing their experience with us all.



ROSS



ROCHELLE



JOEL



SARAH



ANDREW

OUR EVENT SPONSORS:



This handout was prepared by Enviro Collective on behalf of Barrhill Chertsey Irrigation and Acton Farmers Irrigation Co-operative.