Farming Businesses

Greenvale Pastures Ltd
- 200 ha intensive cropping

Three Springs Dairies Ltd
- 330 ha high output dairying

Agri Optics New Zealand Ltd
- Precision Agriculture company

Mackenzie Research Group Ltd
- Farming technology
Nuffield Scholarship

“Understanding our Carbon Footprint in Farming Systems”

- Grain Drying - China
- 80-a-side parallel shed - USA
Global Farmer Roundtable

World Food Prize – Des Moines, Iowa
Precision Agriculture from Innovation to Field in Water Efficiency - the Sustainable Use of Irrigation Water.
The best way to predict the future is to create it

Abraham Lincoln
Profit Mapping

Net Profit ($/ha)
- Minimum to 0.00
- 0.00 to 1500.00
- 1500.00 to 3000.00
- 3000.00 to 4500.00
- 4500.00 to 6000.00
- 6000.00 to 7500.00
- 7500.00 to Maximum

It's hard to be Green when you're in the Red
Water and its Use in Agriculture

- Globally, water quality is deteriorating
- 1 in 6 people are water stressed (UN), not having direct access to drinking water
- Estimated that Agriculture uses 70% world’s fresh water
- Irrigation has always been vital to crop and food production
- Irrigated farm land uses 2% of the world’s rainfall
- Only 17% of crop land is irrigated but it produces 40% of the world’s food.
- Colorado study showed 89% of farmers used history or the look of the crop for irrigation scheduling
- WUE: Rice consumes 39% of the world’s irrigation water
  - In India its 3500 l/kg, in China hybrids use 1750 l/kg
- GM might reduce water use by 30-40%

Water allocation, use and quality all need to be addressed
Things we need to know about Irrigation

- Our farm soil types and WHC
- Incorporate rainfall into our irrigation schedules
- The $ return for every mm applied
- The cost per mm applied under various systems
- The water use efficiency of different crops
- About instantaneous water application and its effects
- Infiltration rates of our soils.
From the Ground Up

Farming starts with the soil

- Know your soil type
- Know your water-holding capacity (whc)
- Know your soil’s potential
- Understand your farm’s variability

Sustainability needs to be built in - not bolted on
Electromagnetic (EM) Mapping

- Different pattern to S-Map
- GIS site specific detail
- Accurate to individual farm
- Makes targeted management easier
- Useful going forward for informing Overseer inputs
EM Surveying for Irrigation Management

- Neutron probes placed in different soil zones to enable fine tuning of management
- 127mm of AWC variation so need differential management

<table>
<thead>
<tr>
<th>Zone</th>
<th>Site Area</th>
<th>Full Point (mm)</th>
<th>Stress Point (mm)</th>
<th>Zone Area</th>
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EM Surveying for Irrigation Management

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<tr>
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<th>2011/12 Wheat Yield (t/ha)</th>
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- Sites 1, 4 and 5 had highest yields in 2012
- Anticipated that sites 2 and 3 would have highest yield due to heaviest soils
- Over-watering occurred causing a yield penalty

Average loss of yield from Zones 2 and 3 = 3.79t/ha

or $1064/ha when compared to Zone 4

VARIABLE RATE IRRIGATION WAS INSTALLED IN 2012 TO ELIMINATE THIS PROBLEM!!
Irrigation Management

- We’ve come a long way with technology, hardware and science. We use variable rate irrigation (VRI).
- Get an accurate understanding of the spatial variability of soils. We use data from EM Survey.
- Understand the water holding capacity of each soil type to be irrigated.
- Situate soil moisture probes by zone and water holding capacity.
Variable Rate Irrigation

Extremes in efficiency
AquaCheck Soil Moisture probes

• Greenvale Pastures soil moisture status over several zones using VRI to control moisture level in each zone individually.
  • Aiming for the flattest line possible
  • On Greenvale 35 individually managed zones
Science on the Farm

Measure / Model / Manage

- Measuring leaching in a real situation
- Accurate figures needed for NZ regulatory schemes
- Need to show what we are doing to the wider public
- Urban - Rural Connection

It's all about being engaged
Science on the Farm

Lysimeter data
Weekly feed by email
Irrigation Management

- Understand individual crops requirements
- Irrigate to appropriate levels to capture all rainfall events while avoiding drainage to eliminate any environmental impact.
- Incorporate accurate weather forecasting into irrigation scheduling. We use FarmMet
- Management available at your fingertips from anywhere in the world

Outstanding Farmers still need to be outstanding in their fields
Variable Rate Effluent

EM Map

AquaCheck soil moisture Probes

Classic 60cm probe

Sub-surface 60cm probe
• Site-specific application of nitrogen

• Up to 30% reduction of applied nitrogen without production loss.

• Reduces $\text{N}_2\text{O}$ & $\text{NO}_3$ emissions.
Nutrient Budgets & Overseer®

Overseer Nutrient Budget

• Includes all nutrients e.g. fertiliser, effluent,

• Helps reduce fertiliser inputs

• Help access profitability

• Increased understanding of models for future use

Trimble Juno for GPS location

http://www.overseer.org.nz
## The Value of EM Mapping in Overseer

### Estimated N Leached / Ha

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<table>
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<tr>
<th>% OF AREA</th>
<th>VV</th>
<th>FV</th>
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<td><strong>62</strong></td>
<td><strong>146</strong></td>
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Big Data in the Cloud
Getting Connected

We’re a Connected Farm

- 3G connection - farm office and machinery
- WiFi connection - farm office and irrigators, soil moisture probes
- 3G connection - Irrigators, software server and cellphones
- 3G connection - wells and irrigation auditor
- GPS on all irrigators, combine and tractors - all with autosteer

Rural Connectivity is a huge issue for NZ development
Keeping Connected

Three Pillars of Sustainability:

- Farmers
- Industries
- Rural communities
- Urban communities
- Lobby groups
- Central & Local Government

It’s all about working together
Exciting times for Agriculture - What tools to choose?
Exciting times for Agriculture

Good sustainable farming practices and profitable farming practices go hand in hand