Overseer the story of a New Zealand decision support tool supporting sustainable farming practice

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Aotearoa – New Zealand
26.8M hectares
Mountains cover over half the south island area

FARMING

Area of farming land 2016

14.0	million hectares, of which:		
7.7	in grassland	1.6	in plantations
2.3	in tussock or danthonia	2.3	in other land or holdings

Farm holdings 2016

In 2016, there were 55,473 holdings, irrespective of size or location, with an average area of 252 hectares. Approximately, 93% of commercial sheep and beef farms are owner-operated.

Source: Source: Beef + Lamb New Zealand Economic Service, Sheep & Beef Farm Survey, Statistics New Zealand, 2016 Agricultural Production Survey

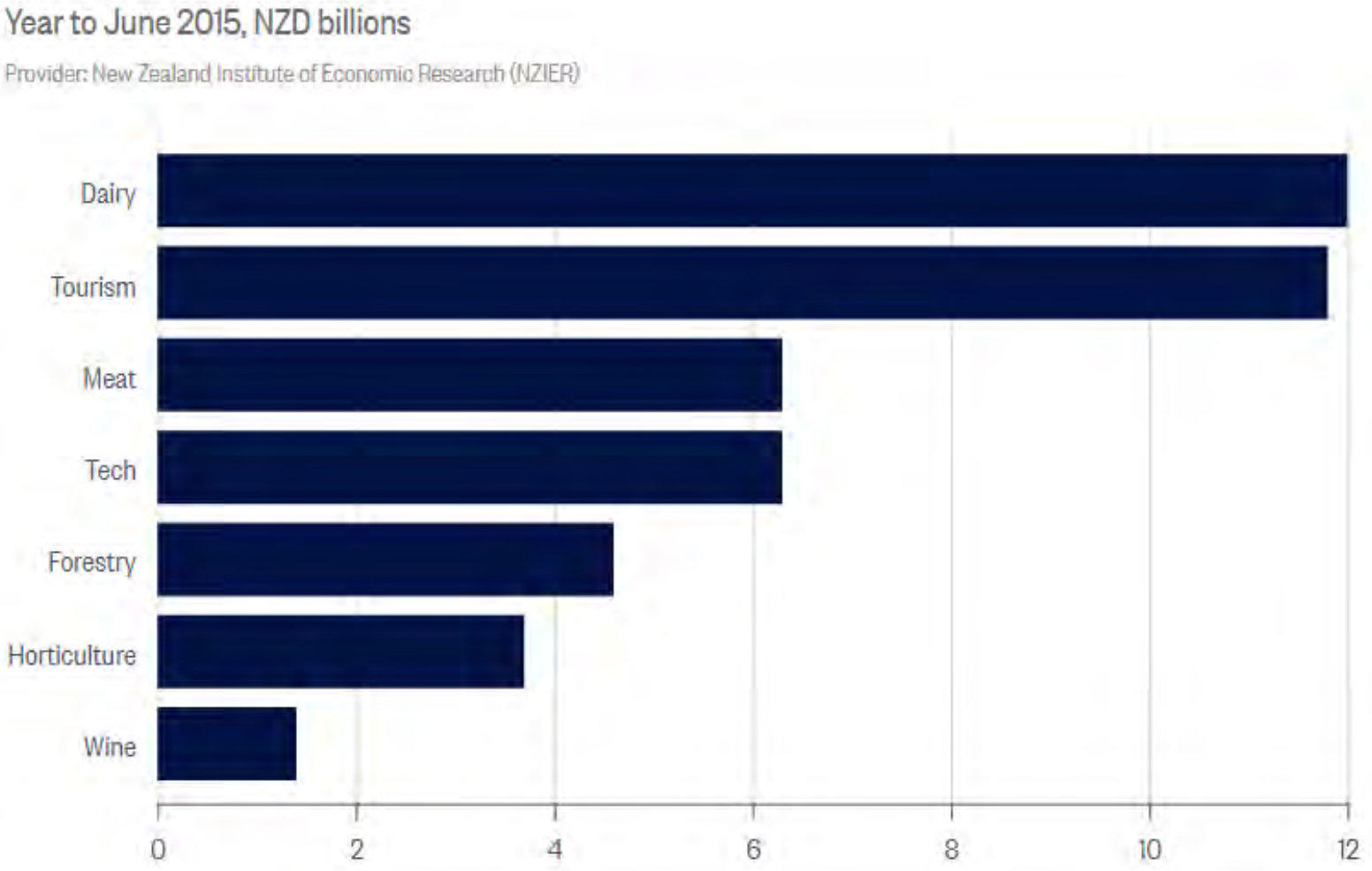
Farms by farm type 2012

	NUMBER OF FARMS[1]	AGRICULTURAL AREA (000 HA)
Sheep & Beef Farming	25,113	9,328
Dairying	12,150	2,415
Cropping	3,297	284
Deer Farming	1,128	287
Pig Farming	225	11
Poultry	135	3
Total	42,048	12,327
Other (including forestry)	16,020	2,067
TOTAL ALL FARM TYPES	58,068	14,394

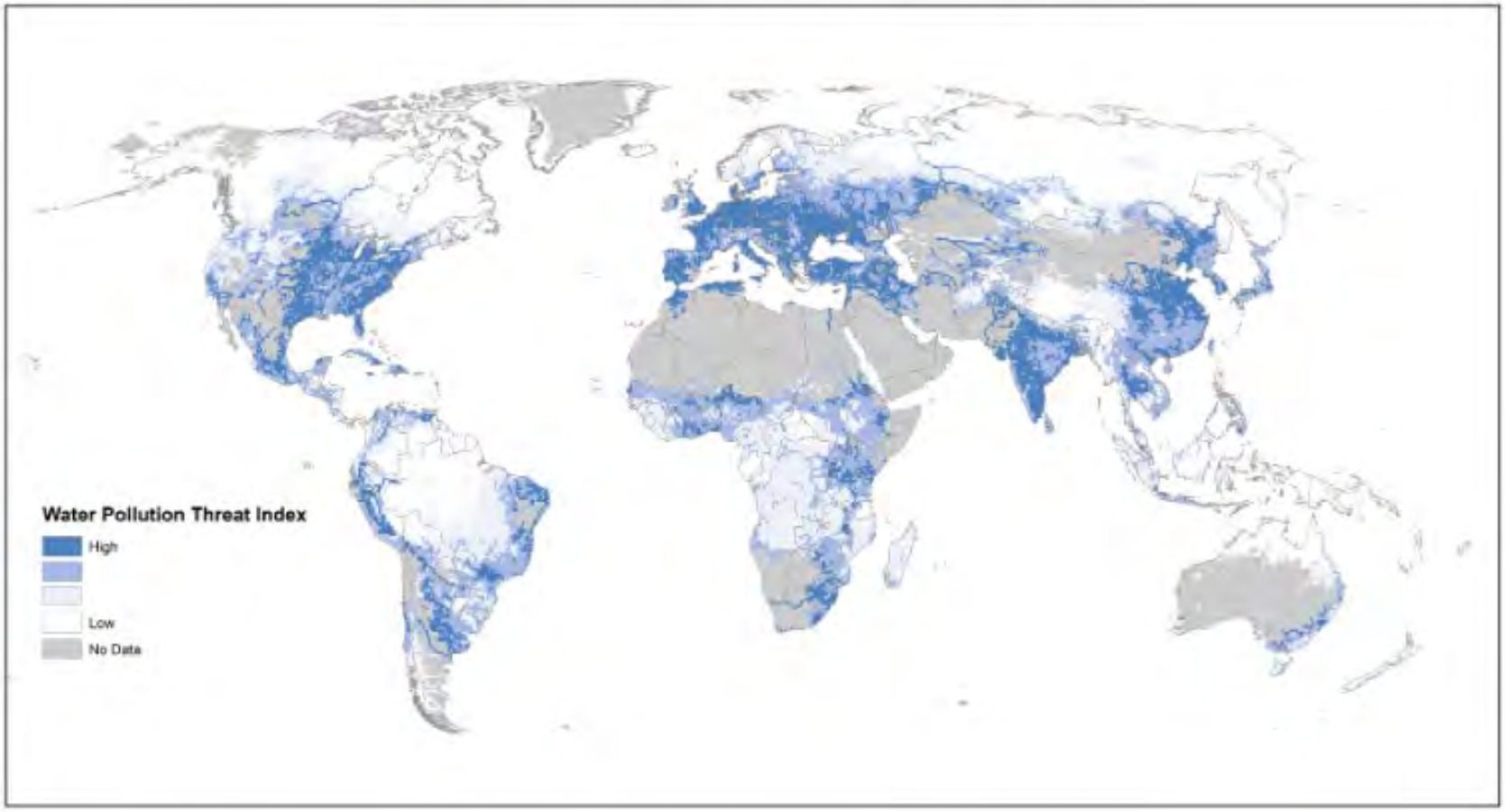
1 Includes non-commercial smallholding farms.

Source: Statistics New Zealand, 2012 Agricultural Census

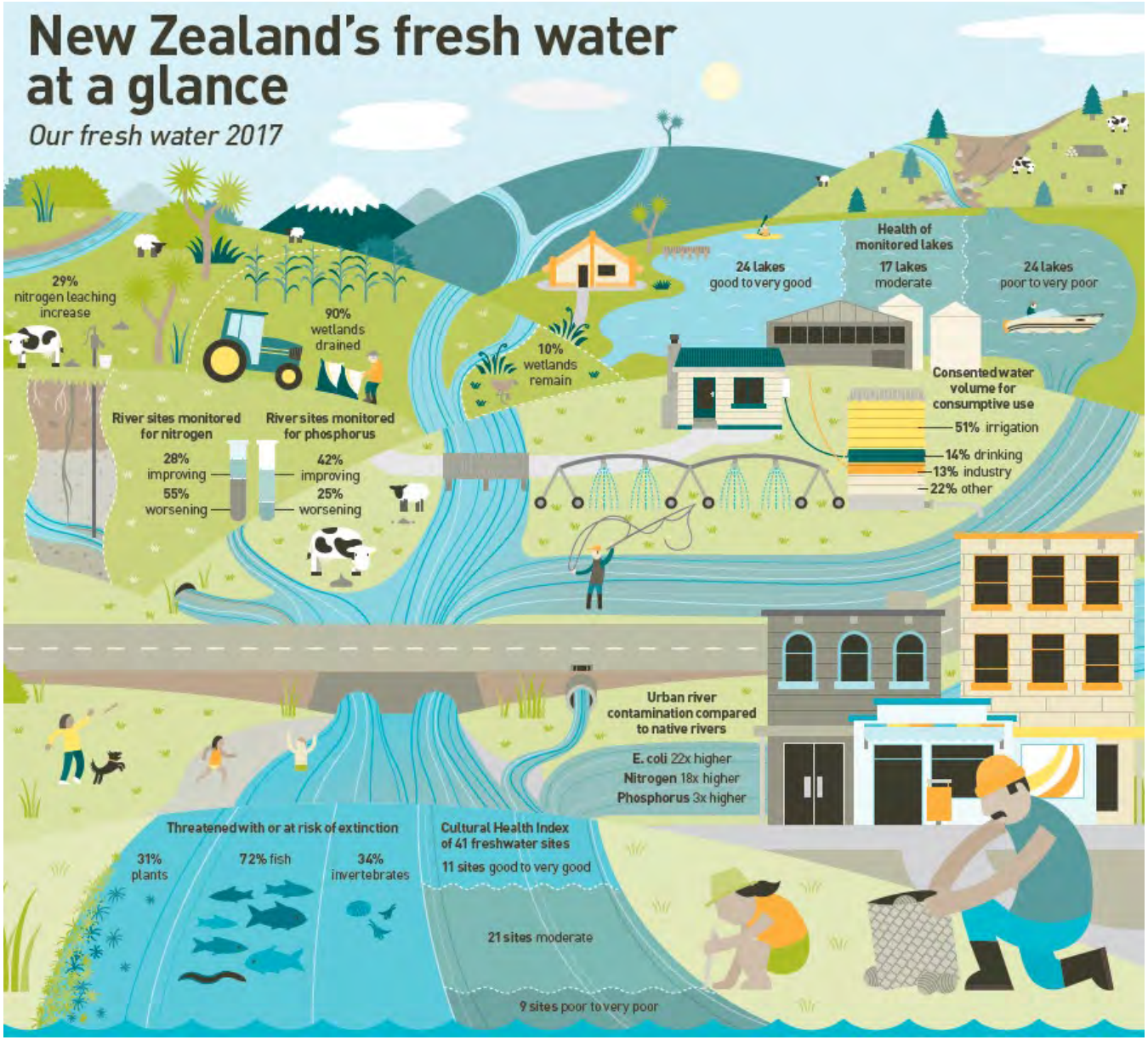
NZ Exports


Year to June 2015, NZD billions
Provider: New Zealand Institute of Economic Research (NZIER)
Dairy
Tourism
Meat
Tech
Forestry
Horticulture
Wine
0
2
4
6
8
10
12

Global distribution of water pollution hazard, 2000



Note: Map includes the effects of nutrient and pesticide loading, mercury deposition, salinisation, acidification, and sediment and organic loading.
Source: Sadoff et al. (2015); based on data from Vörösmarty et al. (2010).



Hydro and geothermal power make up 80% of electricity in NZ

Tourism $15.9 billion, or 6.1% of GDP

Agriculture $10.6 billion, or 5% of GDP

The reliable supply of good **water** is an important economic advantage for **New Zealand**, but its quality and availability is declining


Ethical consumers
Trades and market access
Animal welfare
Alternative protein
People & capability
Climate Change
sustainability
Biosecurity
Water quality
Productivity
Health & Safety
Compliance costs
Evidence based decision-making

Environmental Regulation in Aotearoa New Zealand

Water quality management

Putting responsibility for compliance on losses not controlling input

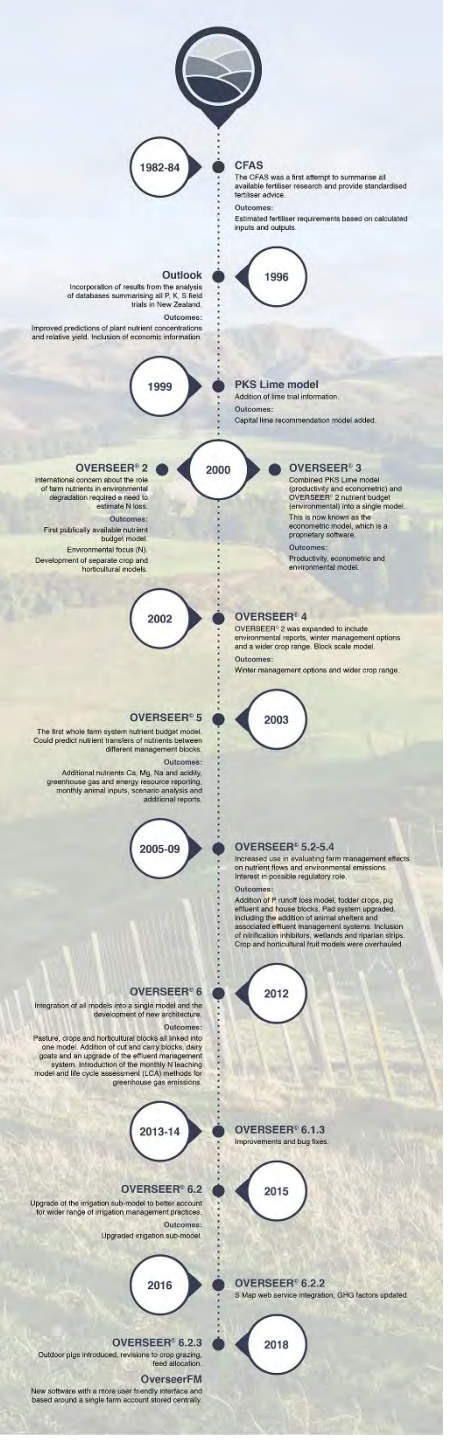
- Stimulates innovation (for long-term prosperity of industry)
- Allows tailored approaches in different environments

Determining diffuse nutrient loses from a farm is hard

- Especially when your trying to capture the impact of different management practices.
- Level of specificity – where do you draw the line?

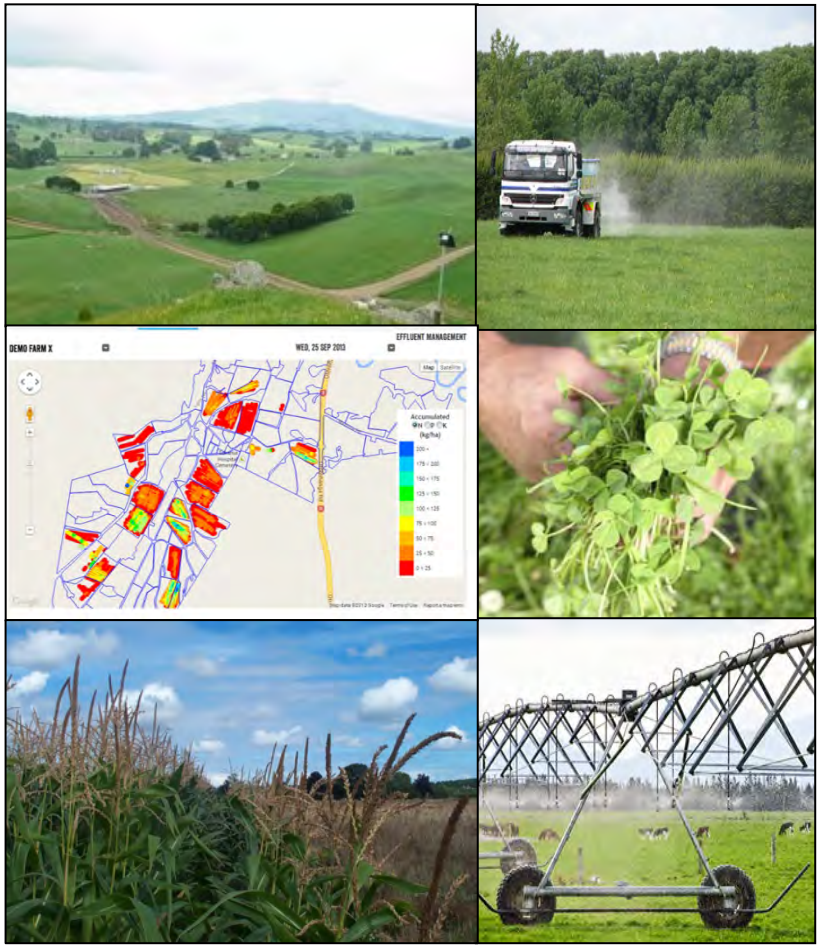
Overseer nutrient model

- **Developed by AgResearch over 20 years**
  - Initially block scale – expanded to farm scale to consider nutrient transfers within the farm.
  - Includes budgets for 7 farm nutrients and models GHG emissions
  - Modelling approach - assess the impact of different management practices to inform farm nutrient management planning
    - Uses a long-term climate profile to enable relative change assessment between management practices.
    - Uses only data easily available to farmer (or adviser) or defaults
  - Based on limited calibration data from NZ field trials



Overseer analyses farm practices

- Captures most farm types and practices in New Zealand
- How efficiently nutrients are used (budget)
- Levels of nutrients needed to maintain soil fertility to existing production levels
- Expected nutrient (N & P) and greenhouse gas losses into the environment
- Likely impacts of changes in management practices or farm systems/land use.



Advantages - why use Overseer to control diffuse N-loss?

- It provides assessment of individual farms
- Government ownership stake and established industry use
- It enables aggregated analysis to set limits
- It supports tailored rules to meet environmental needs directly
- It helps farmers meet the rules by identifying the impact of different possible approaches to drive sustainable change

Early challenges in using Overseer

1. Rules were set that couldn't deal with changing numbers as the model evolved
2. High costs of auditing farm analyses to ensure no one is "gaming" the system
3. Conflict over prioritising model development – concern over different sectors being "favoured" at the expense of others
4. A poor software approach created a fragmented ecosystem making it difficult to monitor change

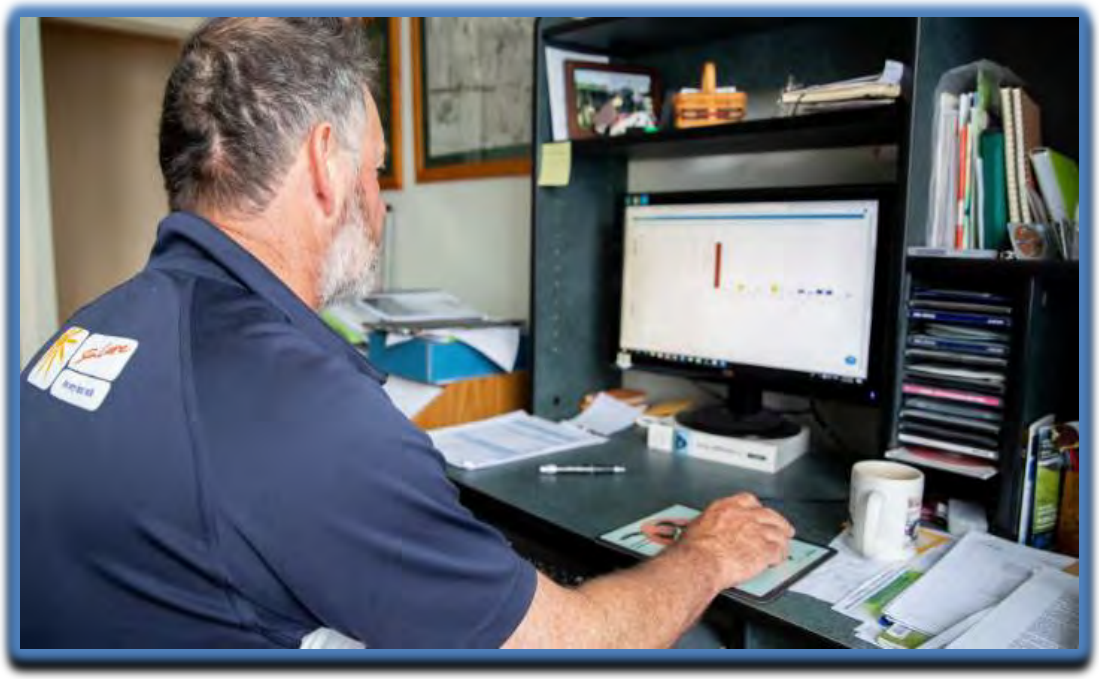
Leading to loss of confidence in the model.

Overseer entity formed

- ✓ Corporate Governance approach with non-profit constitution
- ✓ Direct engagement with regulators and farmers

Business Plan

New decision support software that supports compliance



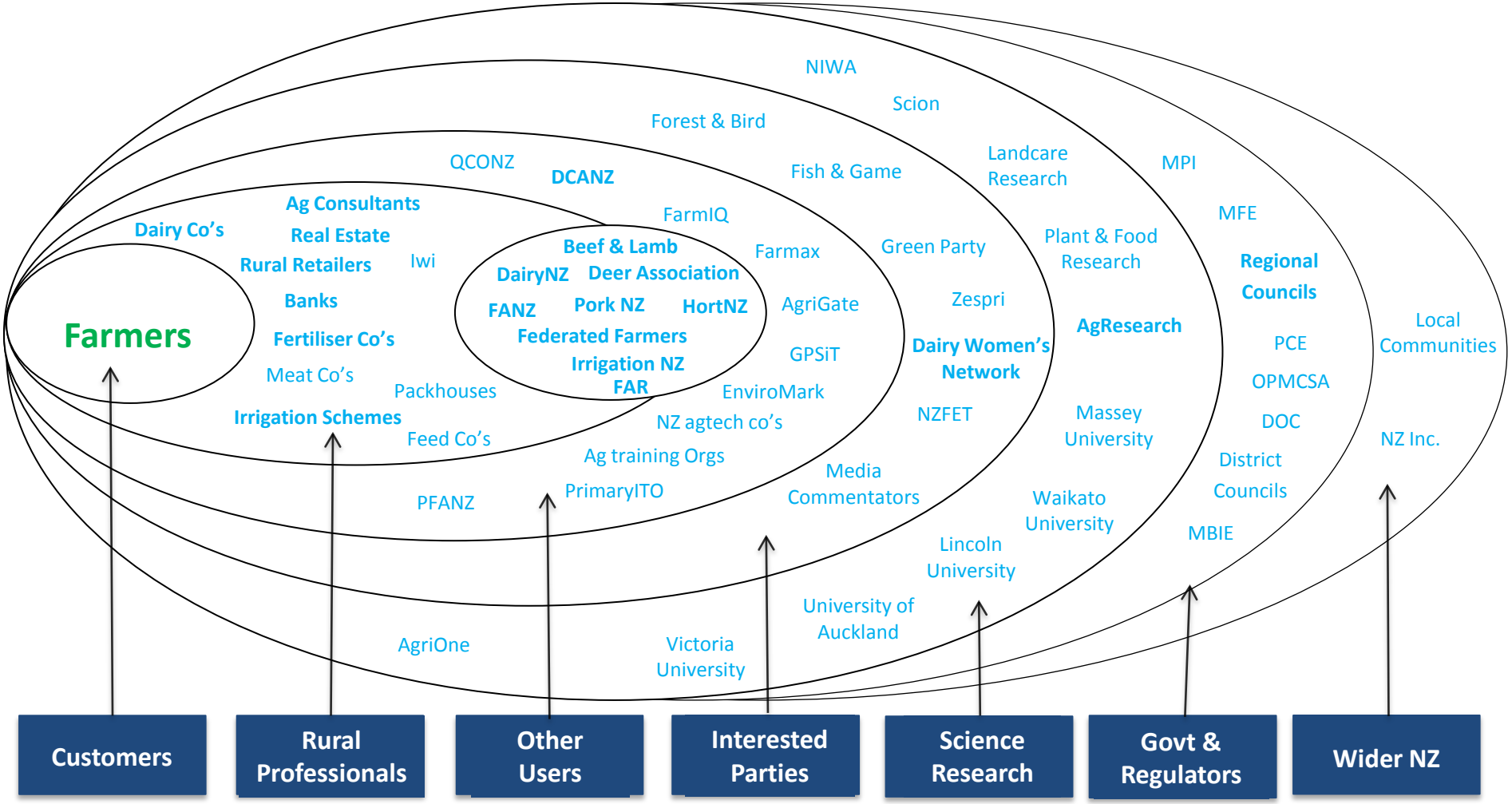
New focus – farmer as the user

- Increasing regulation and a need to change – but HOW?
- **Complete overhaul of the software and services to support farmer use**

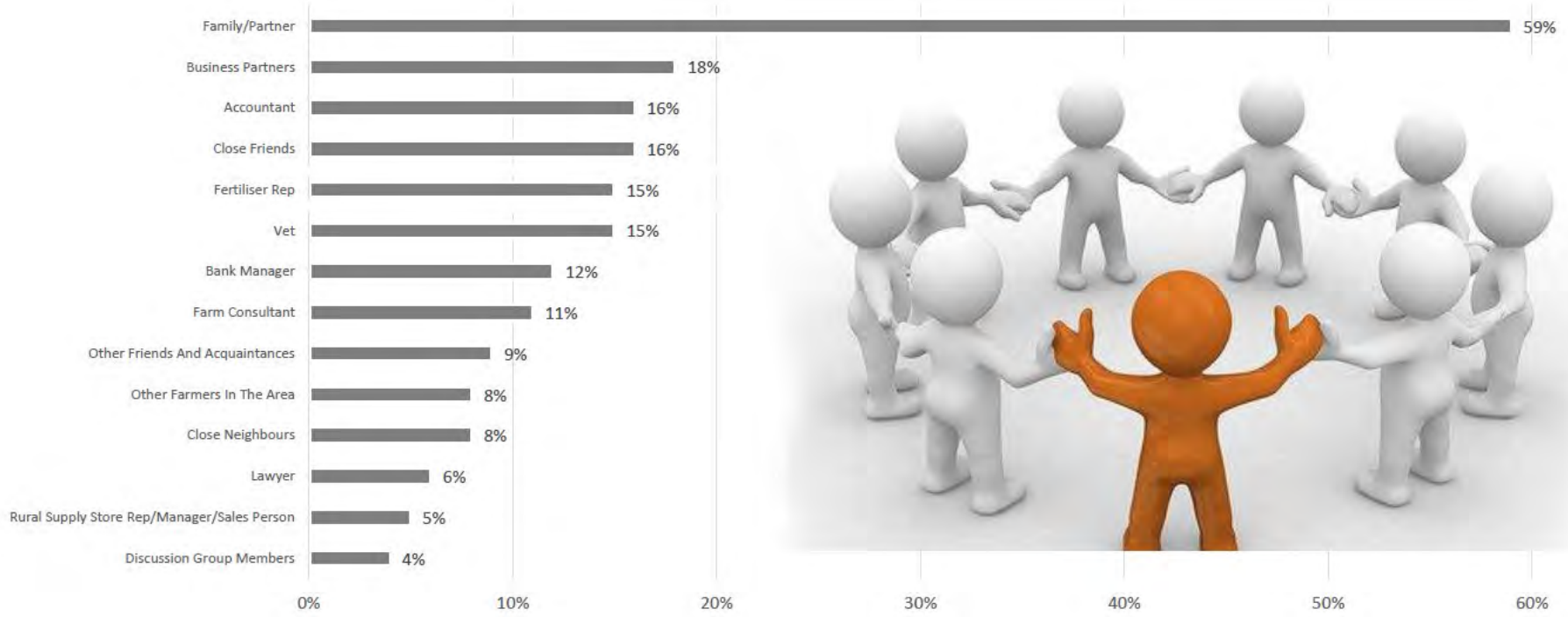
Approach

- ✓ Focus on supporting Farmers to engage with nutrient budgeting
- ✓ Direct engagement with regulators to improve use in regulation
- ✓ Develop software to maximize the insights derived by the modelling (e.g. benchmarking)
- ✓ Develop partnerships with certification programs – value add opportunities for products

Overseer's Customers & Stakeholders



Farmers inner circle – the influencers



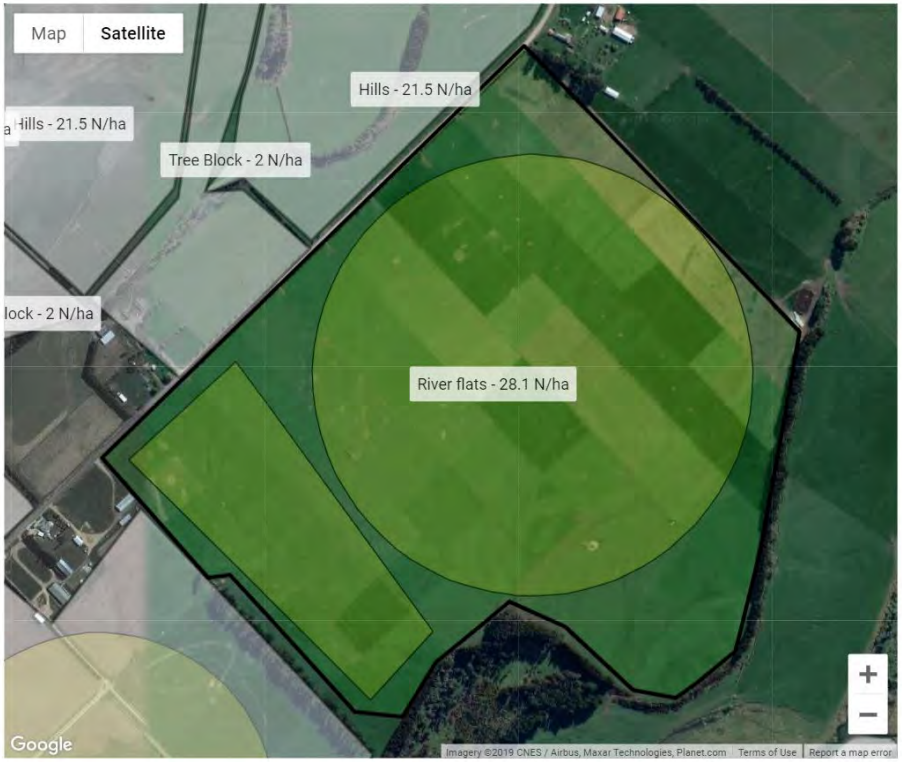
Source: Rural Marketing Conference 2018

OverseerFM – presents the farm as its understood by the farmer

BLOCKS | CLIMATE | SOIL | DRAINAGE | PASTURE/CROPS | ANIMALS | STRUCTURES/EFFLUENT | SUPPLEMENTS | FERTILISER | IRRIGATION | GHG | OVERVIEW

Overview | Farm Details | Block Details | Compare Blocks | Animal Reports | GHG | Comments (1)

View block details by clicking on the block on the map or selecting a block from the list. You can print this page by selecting print under the browser menu. For PDF, change the destination to PDF.



SELECT A BLOCK

River flats

N loss: 2143 N loss/ha: 28.1 P loss: 96 P loss/ha: 1.2

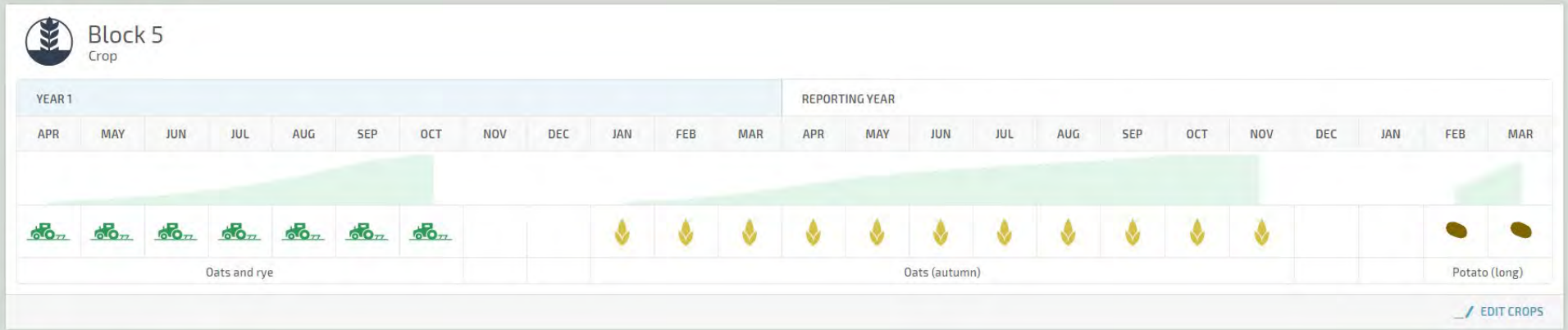
TYPE	AREA	RAINFALL	TEMP	PET
Pasture	76.3 ha	1124 mm/yr	10.4 C	780 mm/yr

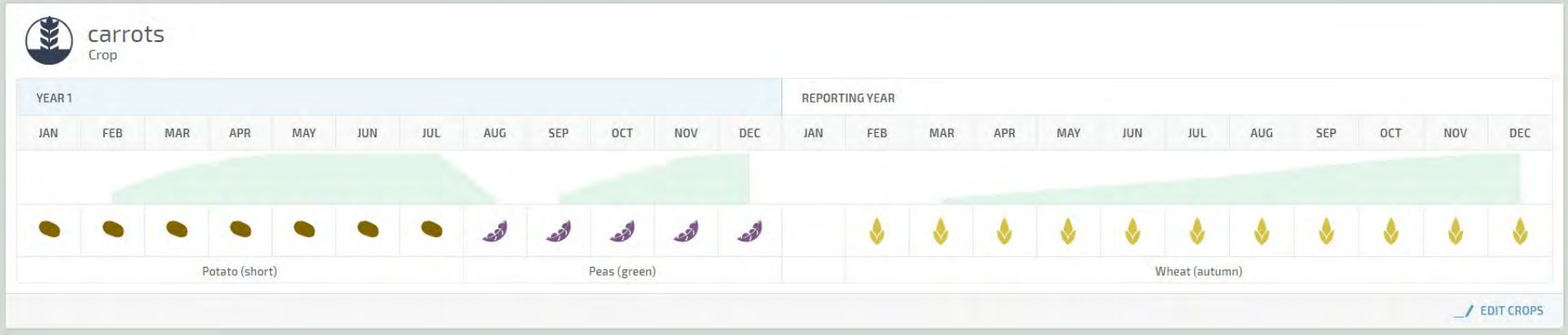
PASTURE GROWTH	UTILISATION	INTAKE
11710 kg DM/ha/yr	70 %	8197 kg DM/ha/yr

4.19 rsu | 4.23 rsu | 6.26 rsu | Ryegrass/white clover

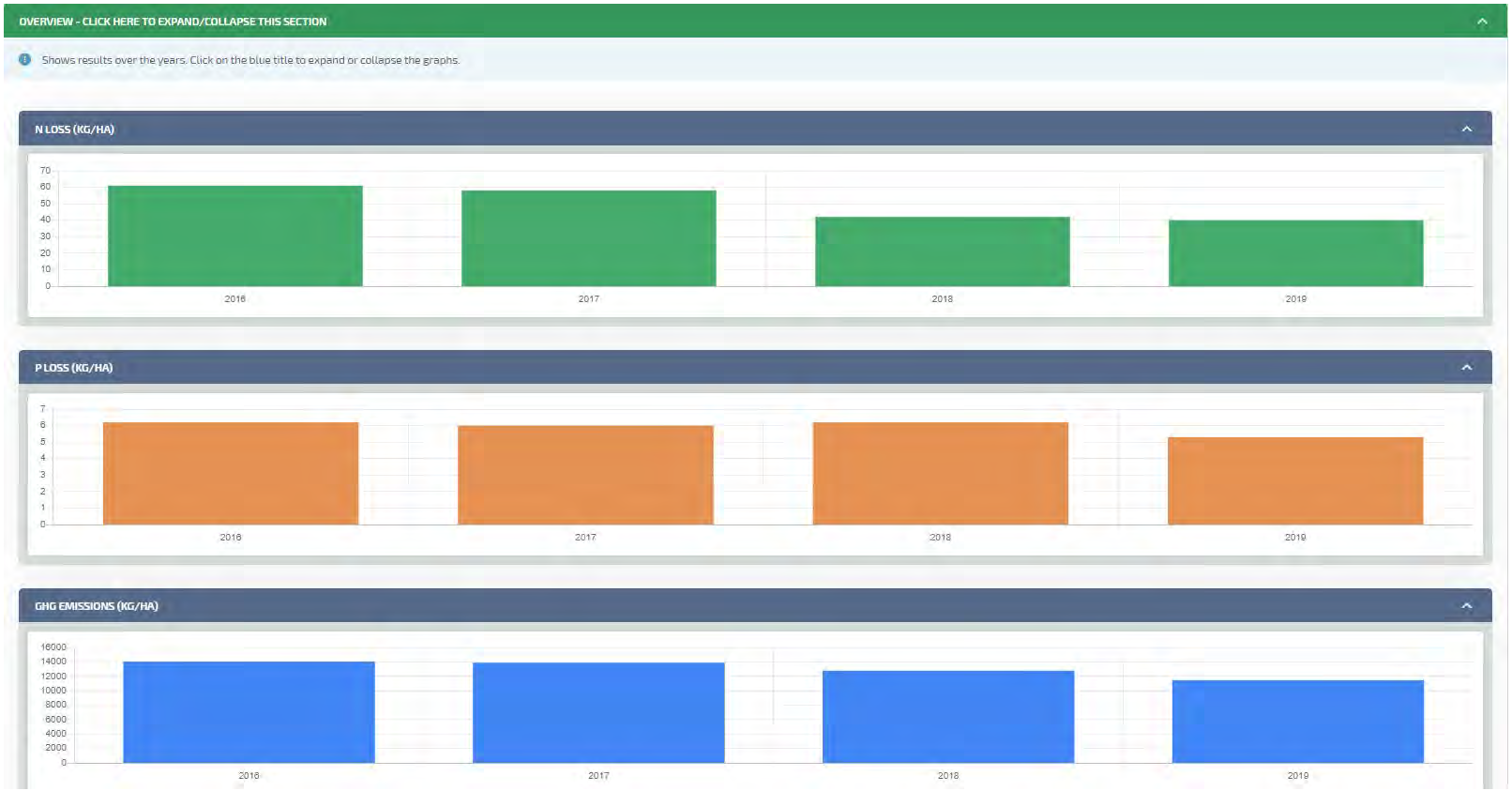
APPLICATIONS (KG/HA)	N	P	K	S	CA	MG	NA	LIME
Maintenance	0	13	17	2	29	13	0	126
Fertiliser applied	126	18	18	38	46	6		0.9
Irrigation	4.39		2.84	4.39	15.93	3.78	16.48	

Is this a good description of my farm?





How am I doing - trends over time – N, P, GHG?



Year ending 2018 | CREATED 31 Jul, 2018, 4:29PM | MODIFIED 30 Jan, 2019, 2:09PM | VISIBILITY Farm | v6.3.2: N/ha: 42 P/ha: 6.2 GHG/ha: 12775

SYNCED | 1 ATTENTION | PUBLISHED V6.3.1: | N/HA: 41 | GHG/HA: 12935 | SHOW PUBLICATIONS | AUDIT LOG | COMMENTS (0) | PUBLISH | COPY

Year ending 2017 | CREATED 31 Jul, 2018, 4:13PM | MODIFIED 10 Jan, 2019, 3:09PM | VISIBILITY Farm | v6.3.2: N/ha: 58 P/ha: 6 GHG/ha: 13885

SYNCED | 2 ATTENTION | PUBLISHED V6.3.1: | N/HA: 57 | GHG/HA: 14345 | SHOW PUBLICATIONS | AUDIT LOG | COMMENTS (0) | PUBLISH | COPY

Where are my hotspots?

Arable Holdings 1
Timaru, New Zealand

Year ending 2015 N: 2331 N/ha: 13 P: 21 P/ha: 0.1 GHG/ha: 7459 v6.3.1

BLOCKS | CLIMATE | SOIL | DRAINAGE | PASTURE/CROPS | ANIMALS | STRUCTURES/EFFLUENT | SUPPLEMENTS | FERTILISER | IRRIGATION | GHG | OVERVIEW

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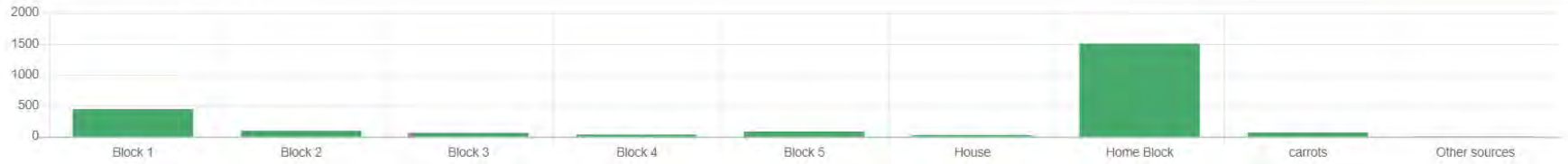
N LOSS FROM ROOT ZONE PER HECTARE (KG/HA)

TOTAL N LOSS FROM ROOT ZONE (KG)



LOSS FROM ROOT ZONE	BLOCKS (KG/YR)	OTHER SOURCES (KG/YR)	TOTAL FARM (KG/YR)	REMOVED BY WETLANDS (KG/YR)	FARM (KG/YR)
Nitrogen	2,323	8	2,331	0	2,331
Phosphorous	8	13			21

How does it look across the year?

RESULTS BY SOIL AND IRRIGATION - BLOCK 1

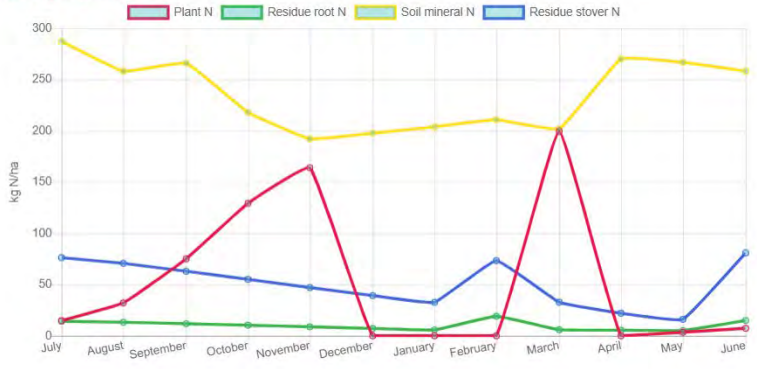
				NITROGEN				PHOSPHOROUS		P LOSS CATEGORIES			
SOIL	IRRIGATOR	PERCENTAGE	AREA	TOTAL LOST	LOST	DRAINAGE	SURPLUS	ADDED	TOTAL LOST	LOST	SOIL	FERTILISER	EFFLUENT
Temp_4a.1	Pivot 1	36%	5.1 ha	234 kg	46 kg/ha	35.9 ppm	-62 kg/ha	146 kg/ha	0 kg	0 kg/ha	N/A	N/A	N/A
	No irrigation	15%	2.1 ha	77 kg	37 kg/ha	37.6 ppm	-63 kg/ha	146 kg/ha	0 kg	0 kg/ha	N/A	N/A	N/A
Temp_3a.1	Pivot 1	21%	3.0 ha	138 kg	46 kg/ha	35.9 ppm	-62 kg/ha	146 kg/ha	0 kg	0 kg/ha	N/A	N/A	N/A
	No irrigation	9%	1.3 ha	48 kg	37 kg/ha	37.5 ppm	-63 kg/ha	146 kg/ha	0 kg	0 kg/ha	N/A	N/A	N/A
Temp_2a.1	Pivot 1	14%	2.0 ha	91 kg	45 kg/ha	36.4 ppm	-62 kg/ha	146 kg/ha	0 kg	0 kg/ha	N/A	N/A	N/A
	No irrigation	5%	0.7 ha	26 kg	37 kg/ha	37.9 ppm	-63 kg/ha	146 kg/ha	0 kg	0 kg/ha	N/A	N/A	N/A

			TO 60CM						TO 150CM			
SOIL	IRRIGATOR	PERCENTAGE	DRAINAGE	RUNOFF	FIELD CAPACITY	WILTING POINT	SATURATION	PAW	FIELD CAPACITY	WILTING POINT	SATURATION	PAW
Temp_4a.1	Pivot 1	36%	128 mm	0 mm	192 mm	90 mm	255 mm	102 mm	318 mm	117 mm	534 mm	201 mm
	No irrigation	15%	98 mm	0 mm	192 mm	90 mm	255 mm	102 mm	318 mm	117 mm	534 mm	201 mm
Temp_3a.1	Pivot 1	21%	128 mm	0 mm	189 mm	87 mm	258 mm	102 mm	396 mm	150 mm	645 mm	246 mm
	No irrigation	9%	98 mm	0 mm	189 mm	87 mm	258 mm	102 mm	396 mm	150 mm	645 mm	246 mm
Temp_2a.1	Pivot 1	14%	125 mm	0 mm	195 mm	93 mm	258 mm	102 mm	294 mm	129 mm	456 mm	165 mm
	No irrigation	5%	97 mm	0 mm	195 mm	93 mm	258 mm	102 mm	294 mm	129 mm	456 mm	165 mm

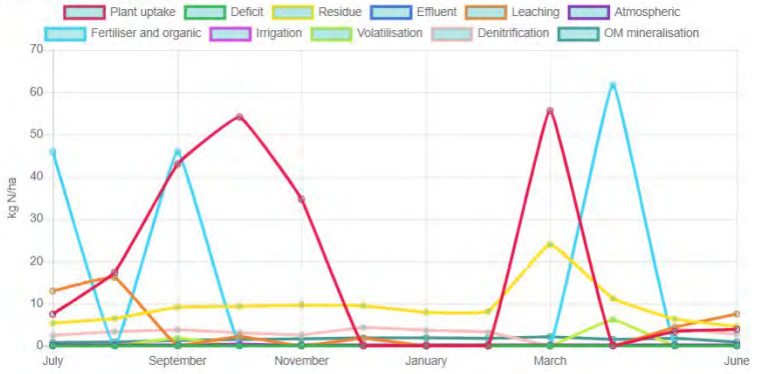
N POOL GRAPHS - BLOCK 1 (BACKGROUND ONLY)

These are the N pool and change in N pool graphs for the background model. You can click on each of the labels (eg. Plant uptake label) to add or remove it from the graph.

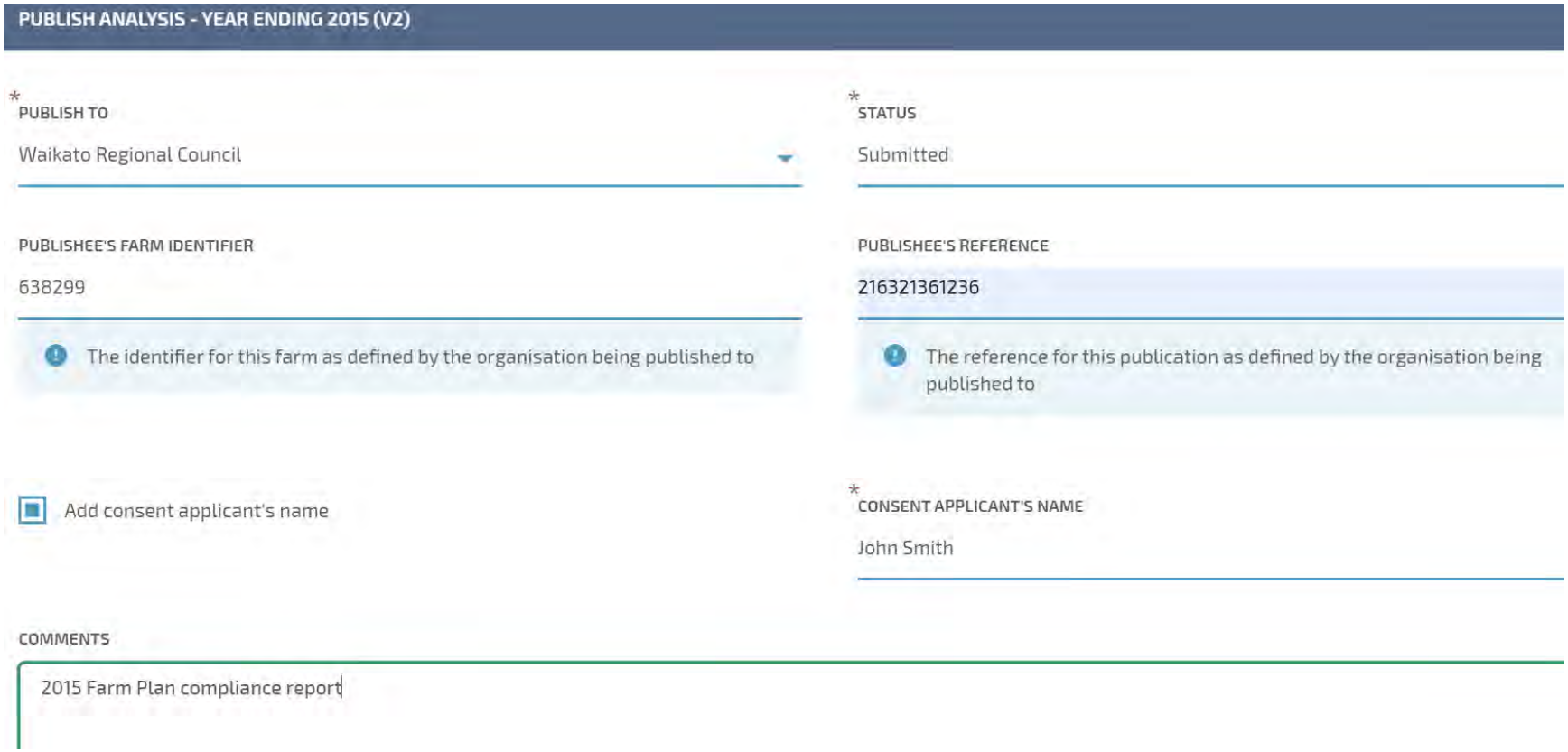
Nitrogen pools



Change in nitrogen pools

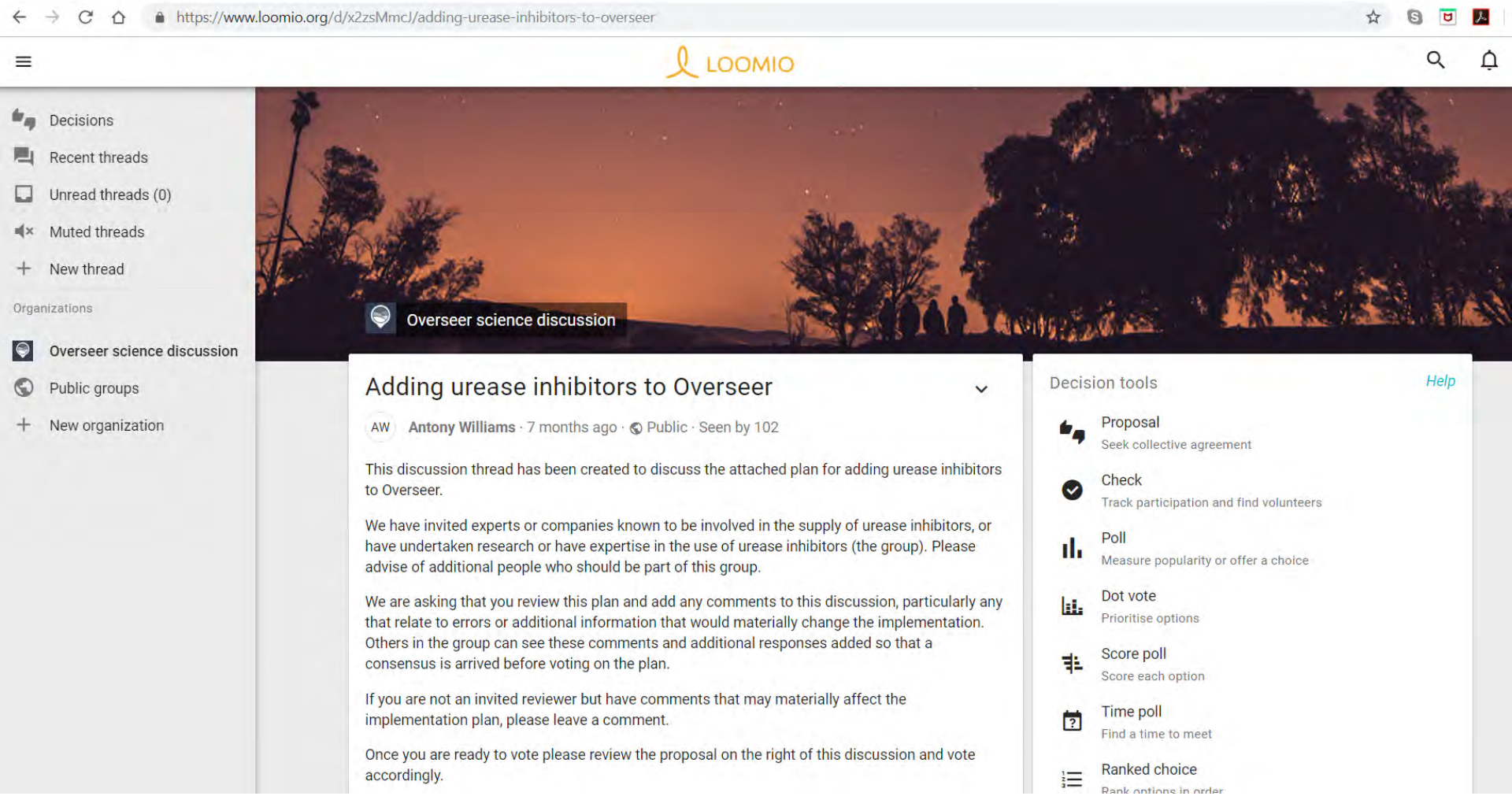


Supporting compliance reporting



Our Rural Professional workshops

Collaborative model development




Overseer
Enabling farms to be environmentally and economically sustainable