The Context And Practice Of Nutrient Mitigation On Rotorua Dairy Farms

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Outline

- Lake Rotorua water quality
- Sustainable Farming Fund project
  - Field trial results
  - N loss trends
  - Mitigation costs
  - Engagement
- Conclusions

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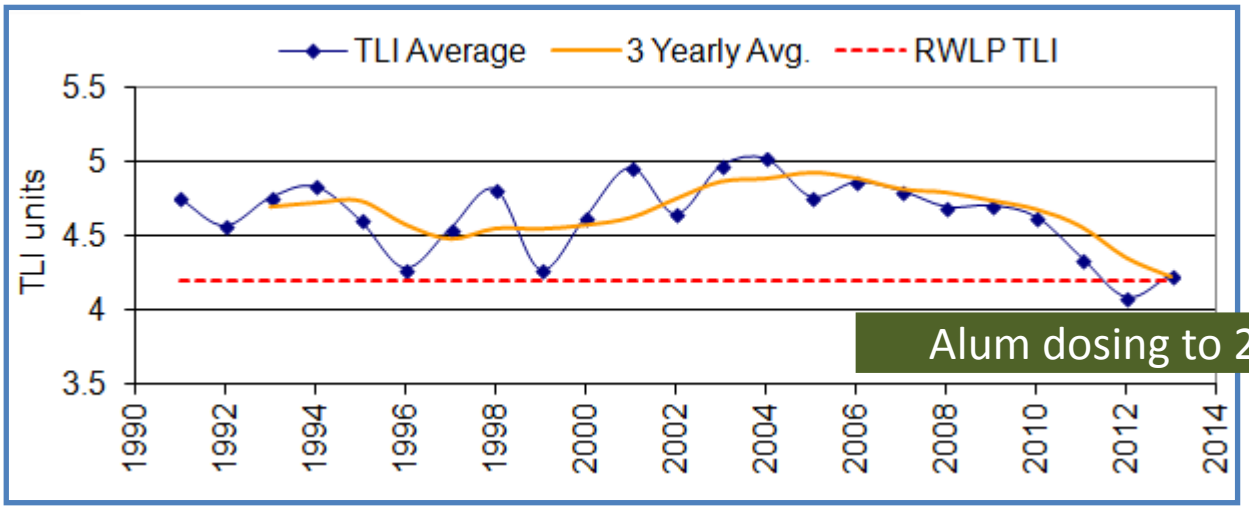
Lake Rotorua water quality



Alum dosing to 2019 ?

- Sustainable N load = 435 tN/yr
- Reduce farm N loss by half
  - New rules with Nitrogen Discharge Allowances, 140 tN
  - $40m fund, 100 tN
  - Gorse project, 30 tN

SFF project: Meeting nutrient loss targets on Rotorua dairy farms, 2012-2015

SFF project work programme

Farm system trial

1. Nil-N fert
2. Plus-N, 140-160 kgN/ha

6 x 2 paddocks, each 25 suction cup samplers, regular leachate and pasture sampling

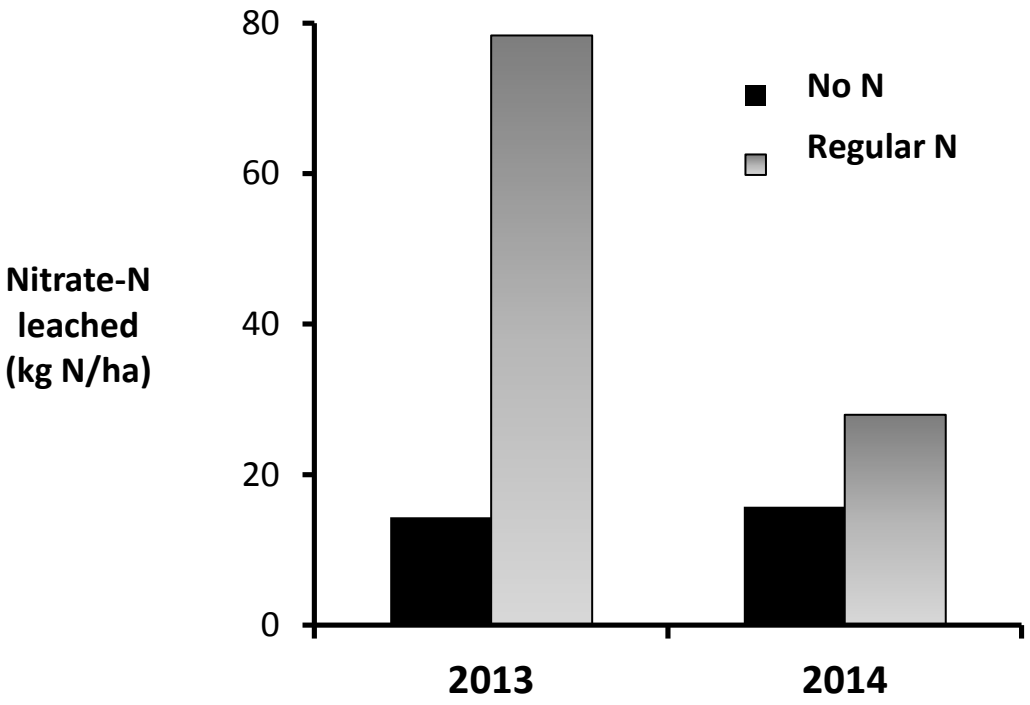
Pasture plot trial with 3 N fertiliser rates

1. Nil-N
2. Strategic-N, 30-40 kg N/ha in August and April
3. Current-N, 160 kgN/yr

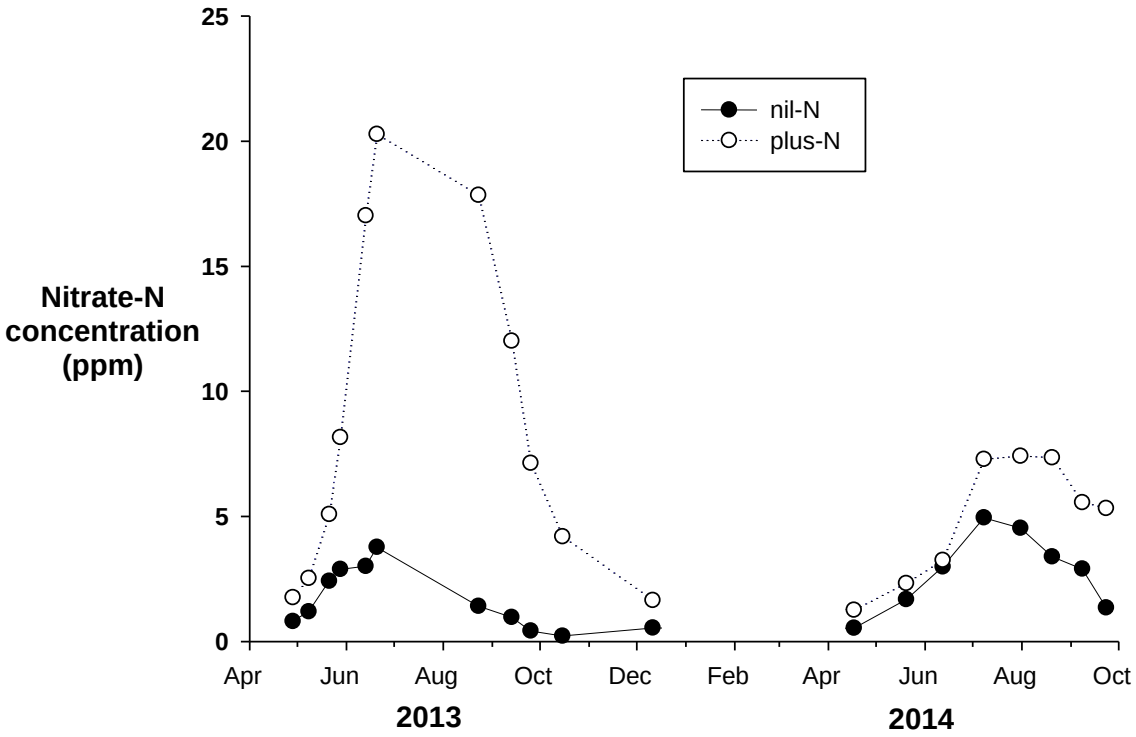
Modelling in Overseer and Farmax

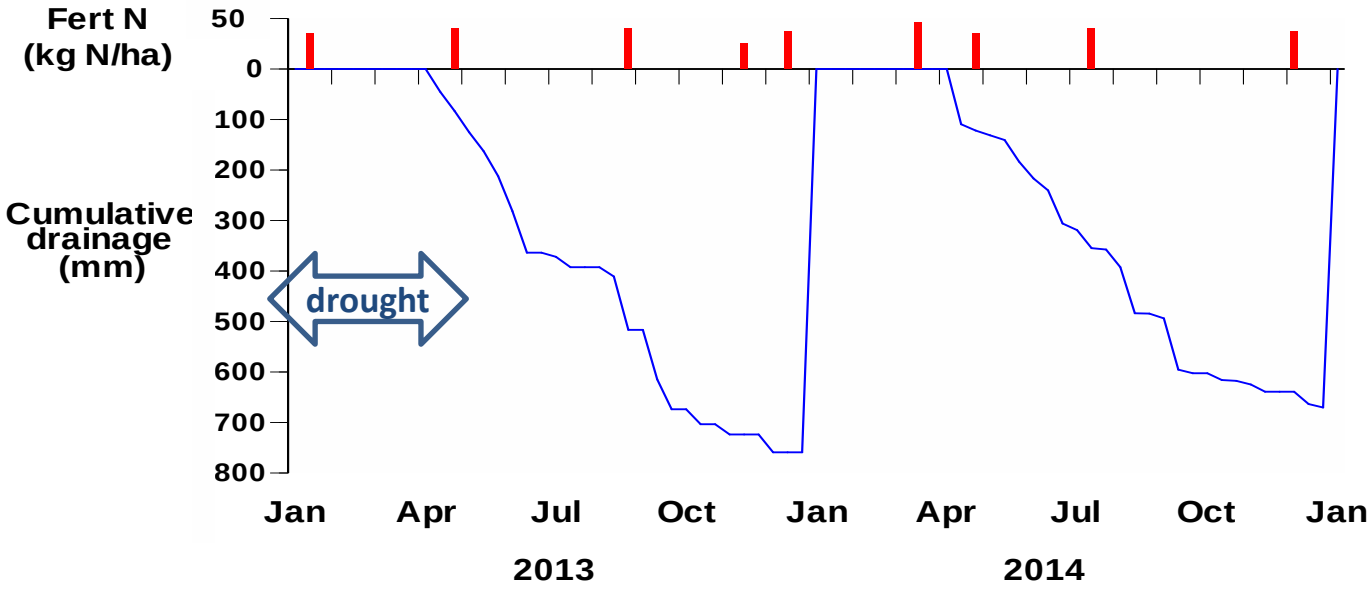
Engagement…

Farm system trial results

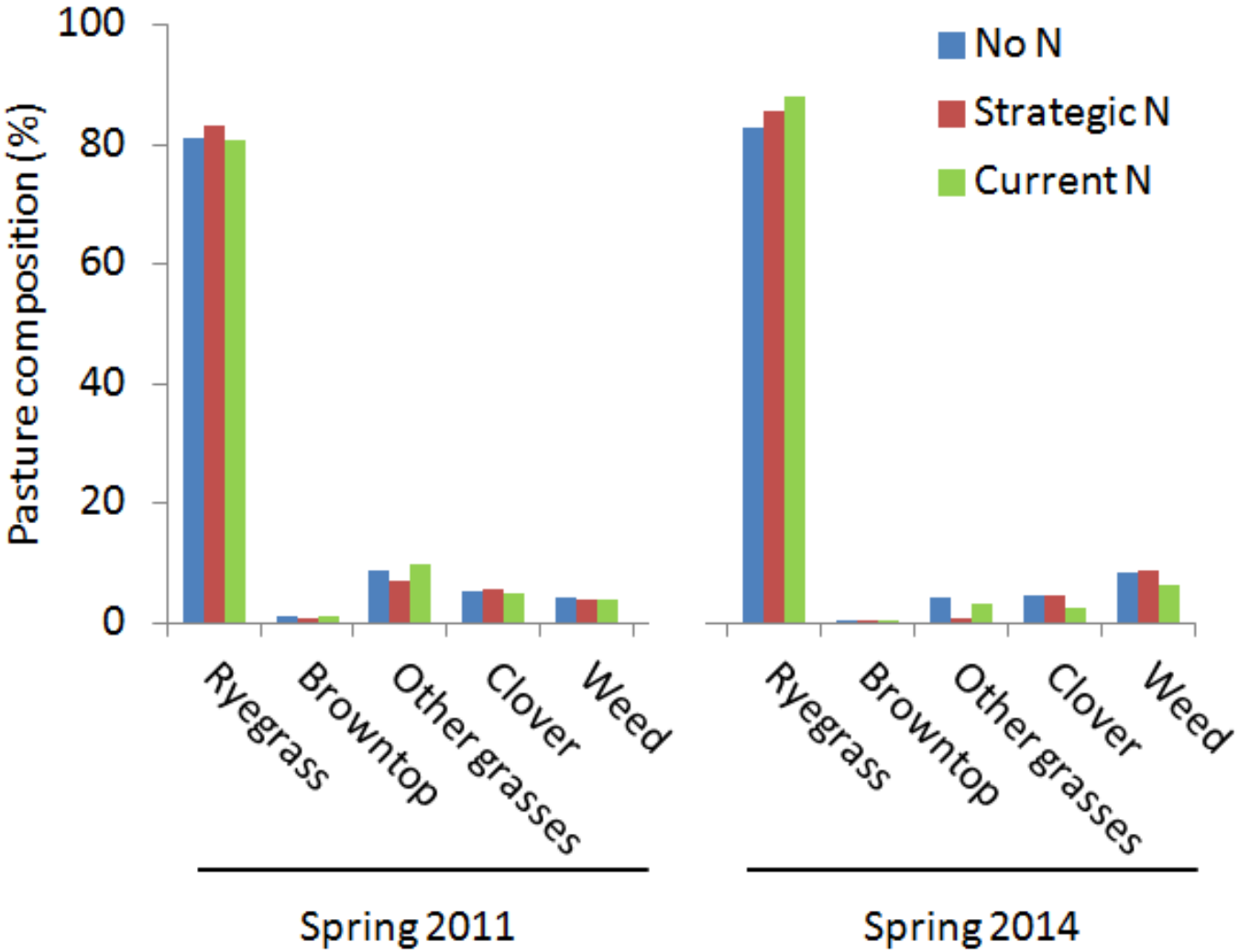


	Year 1 (2012/2013)		Year 2 (2013/2014)	
	nil N	current N	nil N	current N
Estimated pasture production (t DM/ha/year)	6.6*	7.7*	12.6	14.7
Percent response to N fertiliser (%)		16		17
Additional DM (kg/ha/year)		1080		2100
Annual fertiliser N applied (kg N/ha/year)		163		142
Pasture N response (kg DM/kg N)		**6.6**		**14.8**


Nitrate-N concentration (ppm)
25
20
15
10
5
0
nil-N
plus-N
Apr
Jun
Aug
Oct
Dec
Feb
Apr
Jun
Aug
Oct
2013
2014


Fert N (kg N/ha)
50
0
Cumulative drainage (mm)
100
200
300
400
500
600
700
800
drought
Jan
Apr
Jul
Oct
Jan
Apr
Jul
Oct
Jan
2013
2014

Plot trial results



Modelling “nil N” dairy, production

	Status quo N fertiliser	Nil N fertiliser and maintain production	Nil N fertiliser and reduce production
Stocking rate (cows/ha)	**2.97**	**2.97**	**2.66**
Fertiliser N use (kg N/ha)	**178**	**0**	**0**
PKE (tonnes DM/ha)	1.1	1.1	1.0
Maize (tonnes DM/ha)	0.0	2.1	0.4
Grass silage (tonnes DM/ha)	0.2	0.2	0.2
Cows wintered-off 8 weeks	83%	83%	82%
Crop (ha)	3%	3%	3%
Regrassing (ha)	3%	3%	3%
Silage cut (ha)	21%	21%	21%
Production (kg MS/ha)	**1057**	**1057**	**943**
/cow	356	356	355

Modelling “nil N” dairy, profit as EBIT

	Status quo N fertiliser	Nil N fertiliser and maintain production	Nil N fertiliser and reduce production
Income/ha, $5.75/kgMS + cattle sales	**$6,303**	**$6,303**	**$5,622**
Farm working expenses	**$4,062**	**$4,444**	**$3,597**
$/kg MS	$3.84	$4.20	$3.81
Operating surplus	**$2,241**	**$1,859**	**$2,026**
less depreciation	$149	$149	$149
Operating profit (EBIT)/ha	**$2,093**	**$1,711**	**$1,877**
N leaching (kgN/ha/yr)	**74**	**45**	**43**
EBIT/kg N leached	$28	$38	$44
N conversion efficiency	25%	39%	37%
Reduction Vs status quo		40%	43%

Wider Rotorua dairy farm N loss trends

- Compare 2001-2004 with “current”, Overseer 6.1.3
- 13 dairy farms, 60% of catchment dairy total

	2001-2004	2012-13	
Total area (ha)	2734	2612	down 4%
Total cows	7300	7300	
Total kg MS	2,100,000	2,700,000	up 27%
Kg MS/cow	287	365	**up 27%**
Total N loss (tonnes)	204	180	**down 12%**
N leached, kgN/ha/yr	75	69	**down 8%**

- N fert 142 →117 kgN/ha/yr
- Crop 6% → 4%, more maize/PKE
- Effective area down 4%

Farmer engagement

- Participation at four SFF field days
  - 8-31 farmers, 28-60 in total
- Challenge to engage given N policy uncertainty
  - Clean, P-limited lake → farmers query N focus

Farmer messages

- Concern at pasture quality under nil N fert
- Willing to investigate N and P mitigation
- Assess whole farm systems and $ impacts
- Local trials important

Conclusions

- Interesting nil N field trial results so far
  - Additional DairyNZ & BOPRC funding to Dec 2015
  - OVERSEER calibration / validation
- Major N mitigation impacts profit and production
  - Improved N use efficiency since 2004 - the “easy” gains
- Farmer engagement is not easy
  - Farmers want to know individual N limits
  - **New N rules due soon!**

Acknowledgements

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