



Profitability. Sustainability. Competitiveness.

Soils for Resilient Dairy Farming Systems

David Chapman

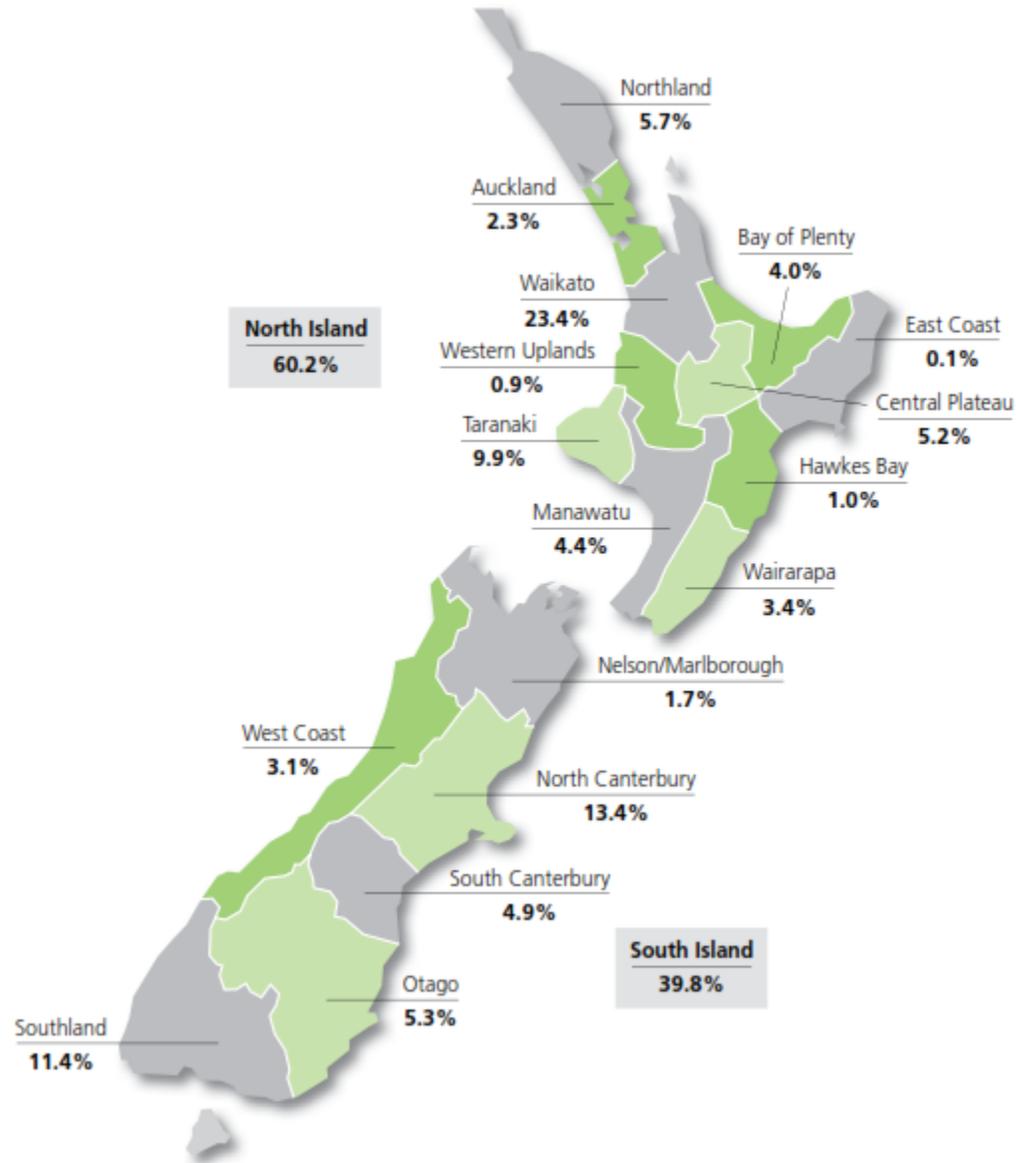
Celebrating Soils in The Hub, 27th November 2015



Land use

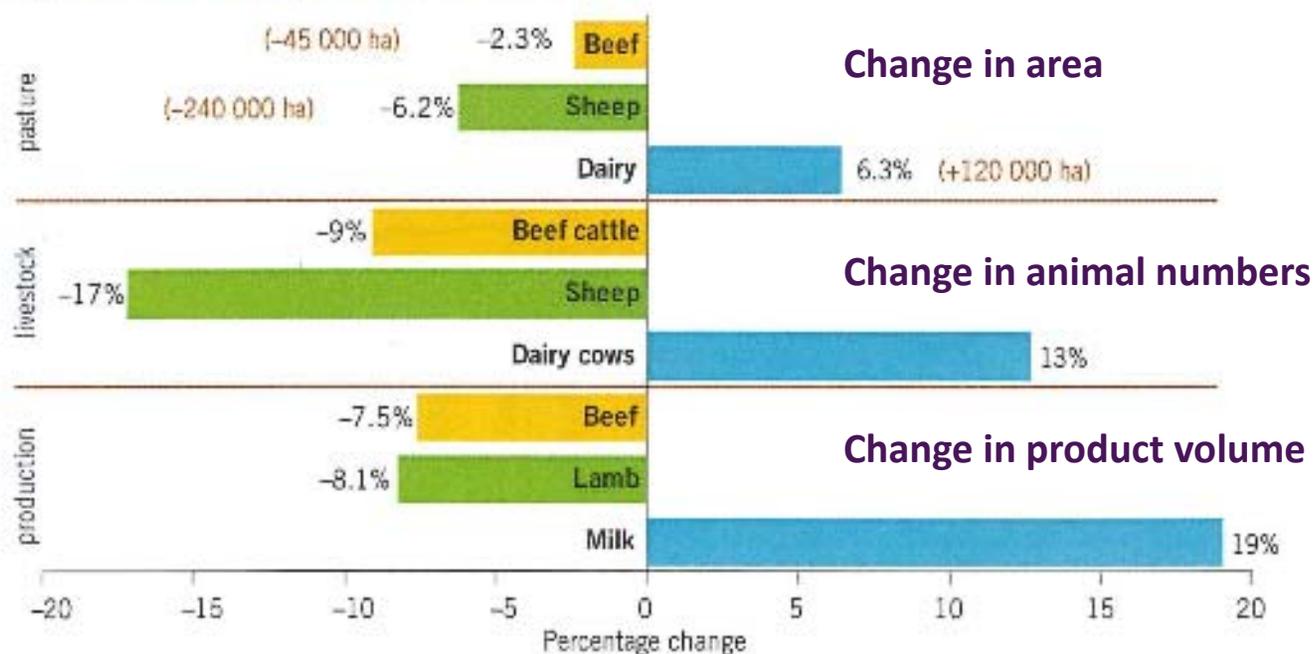
- ~ 1.75 m hectares of dairy 'milking platform' area nationally
- plus ~ 0.5 m ha dairy support land (replacement animals, dry cows, forage production)
- ~ 20% of total area in pasture in NZ, or ~ 8% of NZ total land area

Graph 3.1: Regional distribution of dairy cows in 2014/15



Changes in land use: pastoral sector 2002-2009

Figure 18: Summary of pastoral production trends.



Source: Pastoral input trends in New Zealand: A snapshot. MPI June 2012.



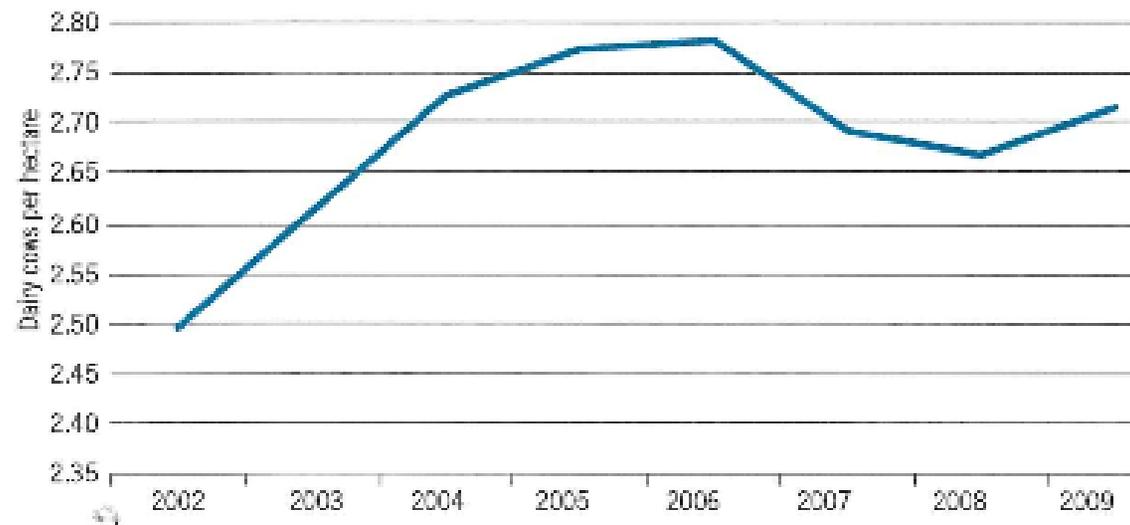
“ “The dairy industry has lost the plot. All they do now is buy in feed through N fertiliser and palm kernel and put on more and more cows. Nobody bothers with pasture any more” “

Loosely paraphrasing any number of commentators
(because I didn't have time to go and find a real quote!)



Changes in dairy farm system inputs: Stocking rate

Figure 10: Total dairy cows per hectare. SOURCES: ANIMALS – APS, LAND – MPI ESTIMATE (SEE APPENDIX)

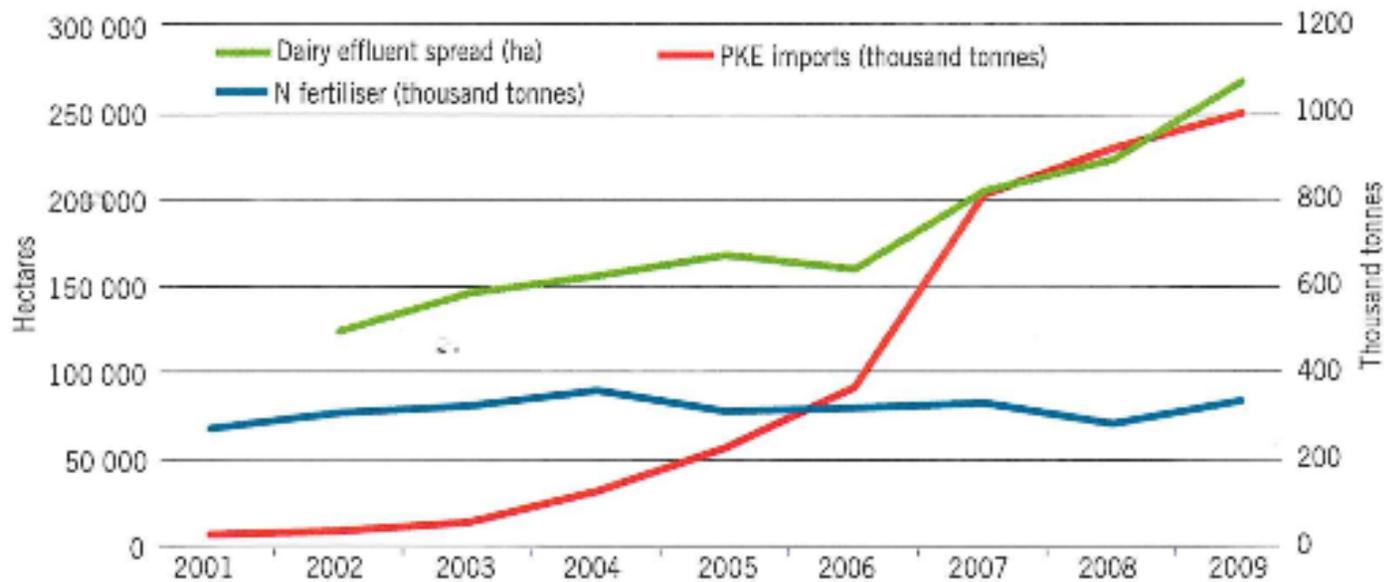


Source: Pastoral input trends in New Zealand: A snapshot. MPI June 2012.



Changes in dairy farm system inputs: Fertiliser, feed and effluent

Figure 25: Nitrogen inputs on dairy farms. SOURCES: PKE – WORLD TRADE ATLAS STATISTICS NZ, FERTILISER – FERT RESEARCH, EFFLUENT – APS



Source: Pastoral input trends in New Zealand: A snapshot. MPI June 2012.



Feed source contributions to total milk production

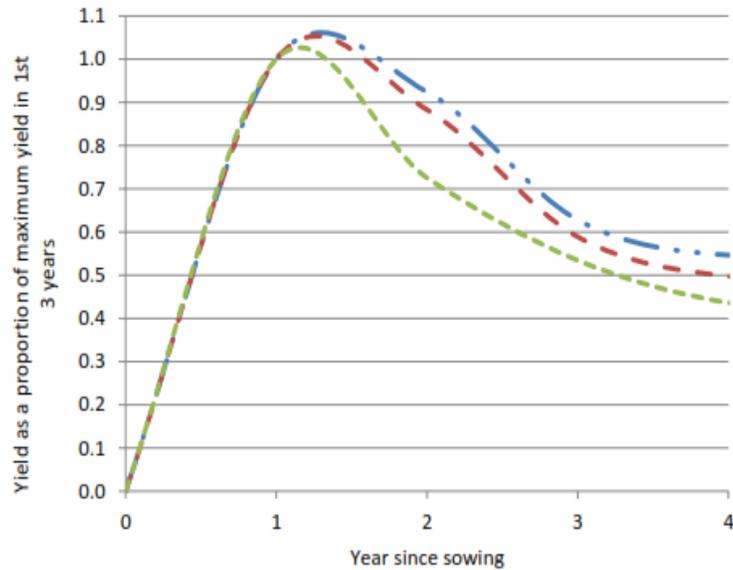
- N fertiliser: ~ 9.7%
 - based on weighted national mean 150 kg N fert/ha, 8:1 utilisation response and 12 kg DM per kg MS
- PKE: ~ 8.2%
 - based on mean 360 kg/cow (~1.8 m tonnes total used annually)
- Other supplements: ~ 7% (guess!)
- Total = ~ 25%
- Rest comes from the natural **SOIL**-pasture system, including nutrient recycling



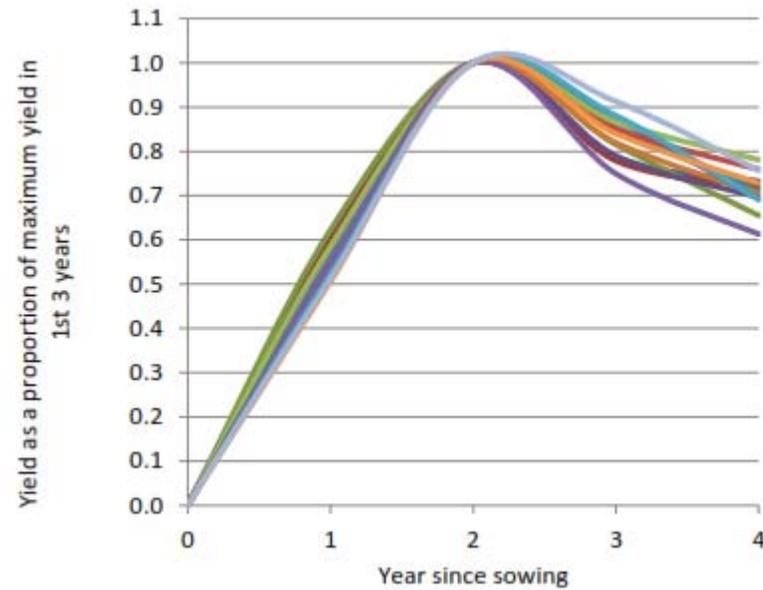
Resilience and compliance

- More pasture harvest
 - Correlates directly to profit
- Less use of imported supplements
 - Expensive
 - Ramifications beyond NZ (PKE)
- Less N fertiliser
 - Regional water management plans
 - More N coming in = more N in emissions

Back to pasture for a moment: Why do we see this?



Waikato example



Canterbury example

And what's going on here?

	Shoot DW	Root DW	Root/shoot ratio
	g/plant	g/plant	
Bealey ex field	1.11	0.64	0.63
Bealey ex seed	1.96	1.55	0.81
One50 ex seed	2.25	1.87	0.86
P value	<0.001	<0.001	<0.001
LSD _{0.05}	0.28	0.16	0.06

← Elite survivors from dairy pastures . 5 years old





Apparent fungal colonisation in root systems



Bealey grown from the field plants



Bealey grown from seed

Acknowledgement: Jim Crush, AgResearch, and PGP/DNZ funding





Saprophytic root fungi in the soil?

- Are we overlooking a serious problem here?
- What is colonising root systems, and where are the colonisers coming from?
- Skipp & Christensen 1989 – identified species of fungi
- Sarathchandra et al (2006) – more labile C in soil (e.g. from dairy effluent) = increased pathogenicity of fungal strains
- What can we do about it anyway?



Closing comments

- Yes, let's celebrate soils!!
- They support most of our milk production
- And must continue to do so in the future
- They control many of our critical environmental emission rates
- Do they hold answers to our concerns about pasture persistence?