



Ministry of Agriculture and Forestry
Te Manatū Ahuwhenua, Ngāherehere



21 October 2015

Dryland Pastures

Professor Derrick Moot

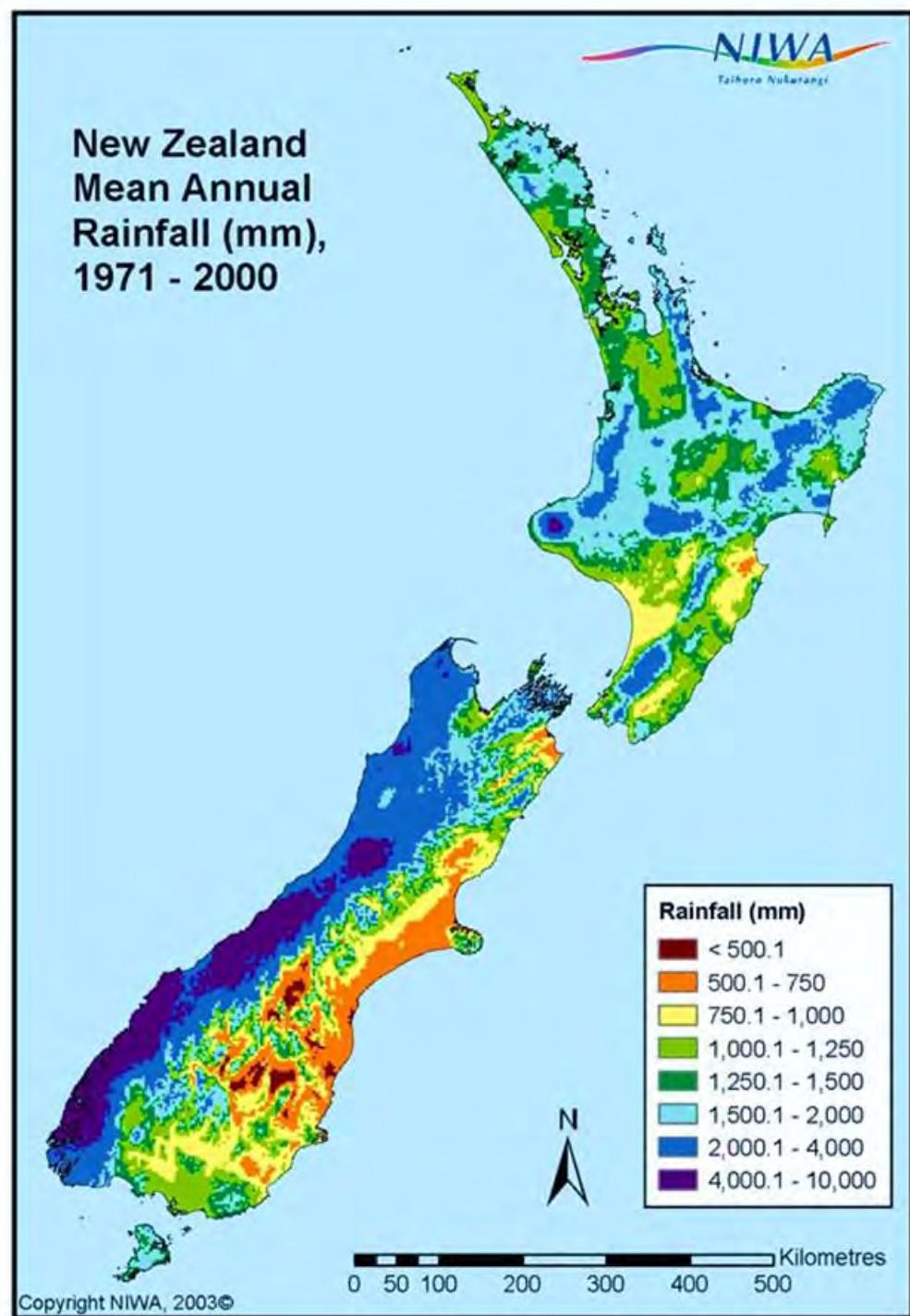


New Zealand's specialist land-based university



This work by [Derrick Moot & the Dryland Pastures Research Team](#) is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](#).

**Strong rainfall gradient
West ⇒ East**



What is sustainable farming?

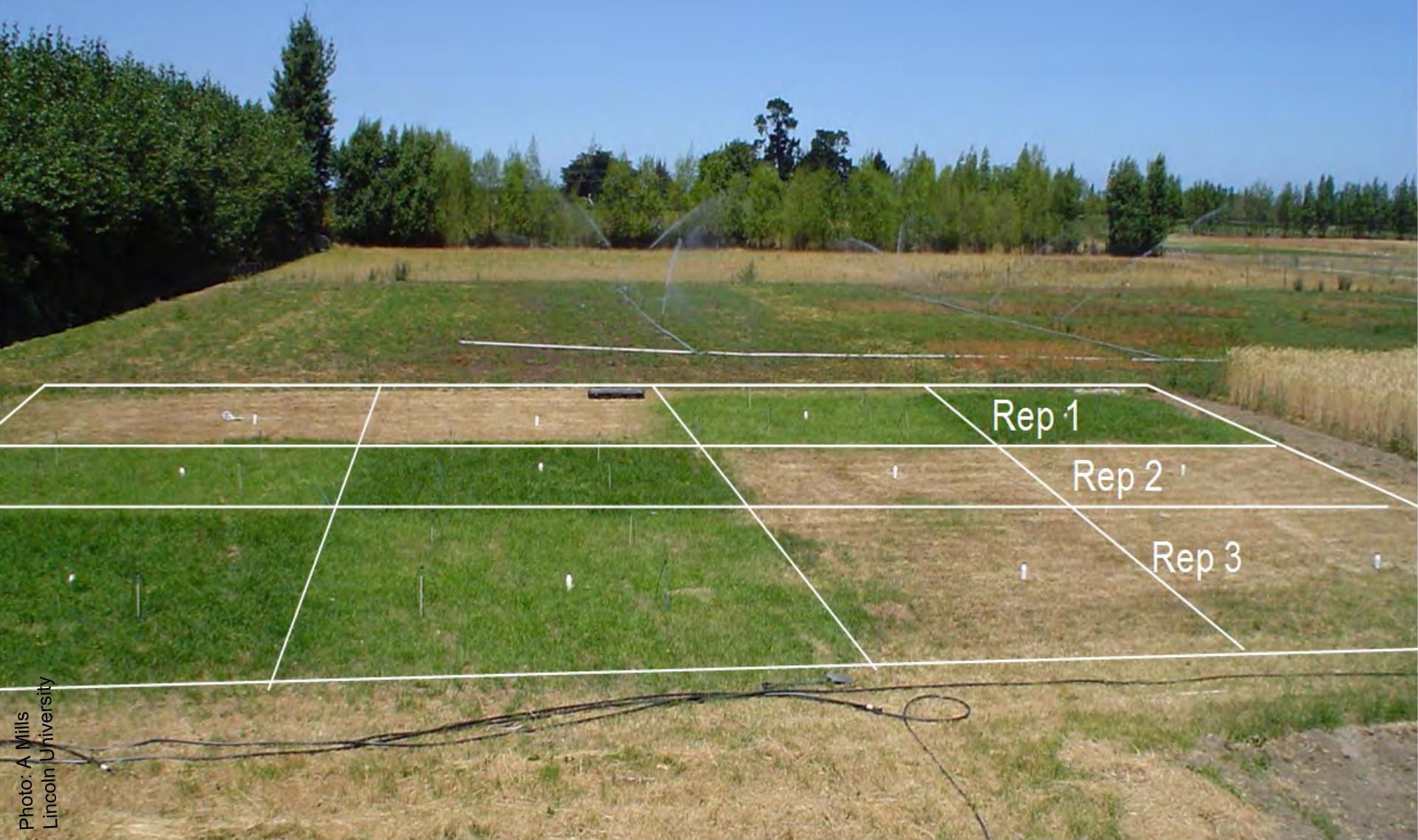


A Farm practice that achieves;

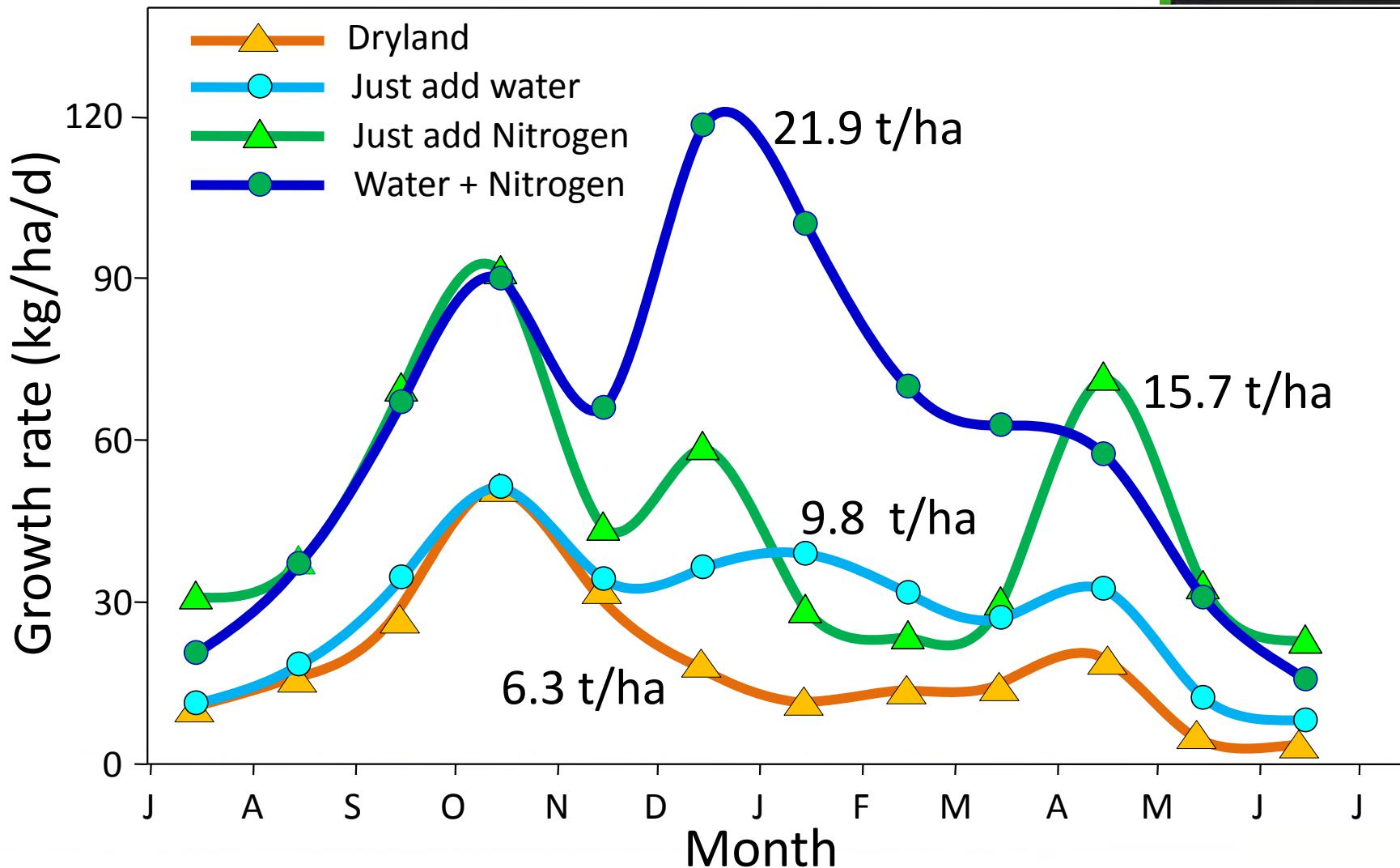
- **Production** – a desired goal e.g. MS/ha
- Risk – **reduces the risk** of not achieving the production goal e.g. maize silage
- **Economic** – medium term profitability
- Environment – **sustainable** for soil, water, air and other resources e.g. erosion
- Social – **socially acceptable** – “dirty dairying”

New Zealand's specialist land-based university

Experiment site – Quantify growth



Growth rates (2 year means)

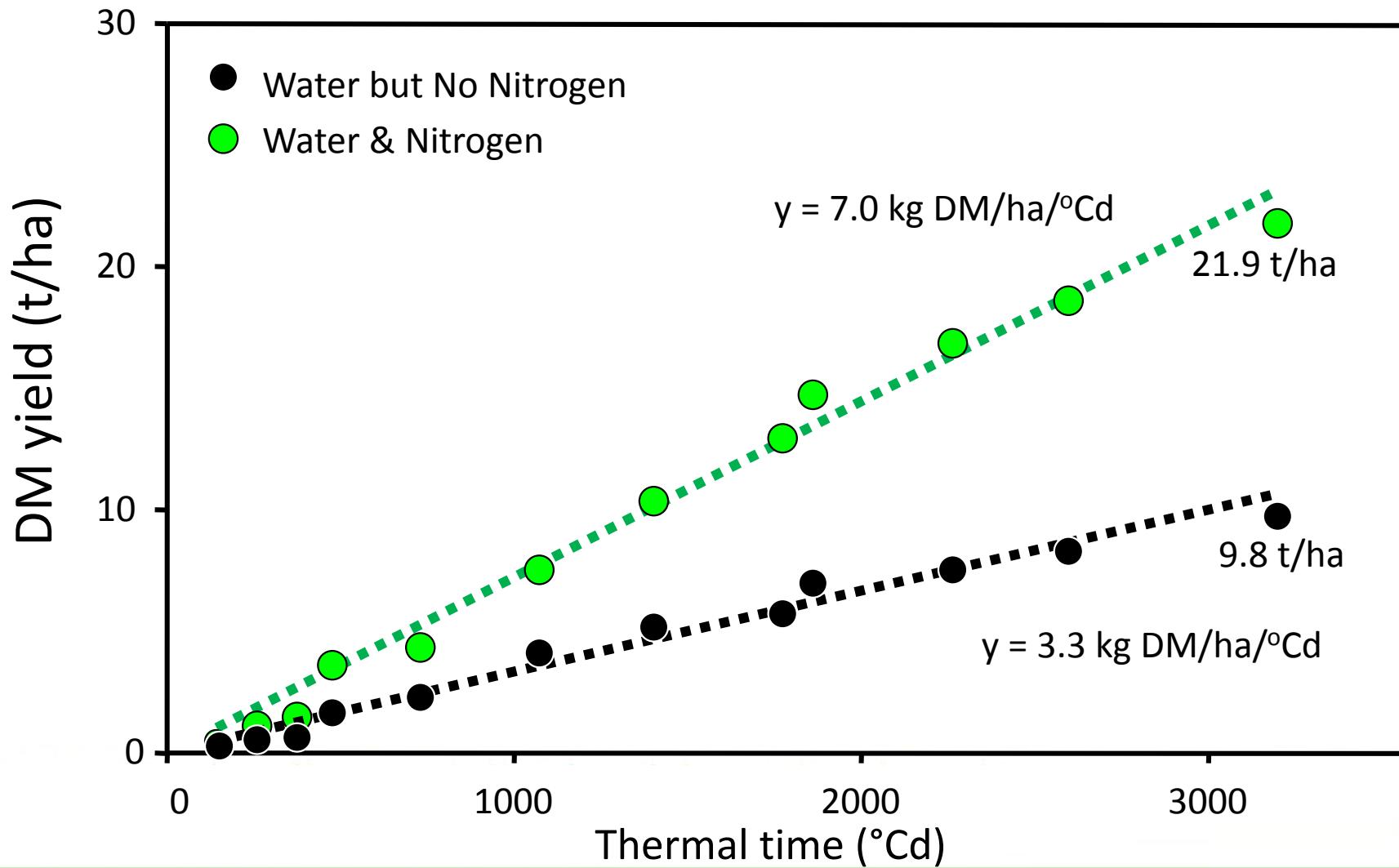


Winter

⇒ temperature response



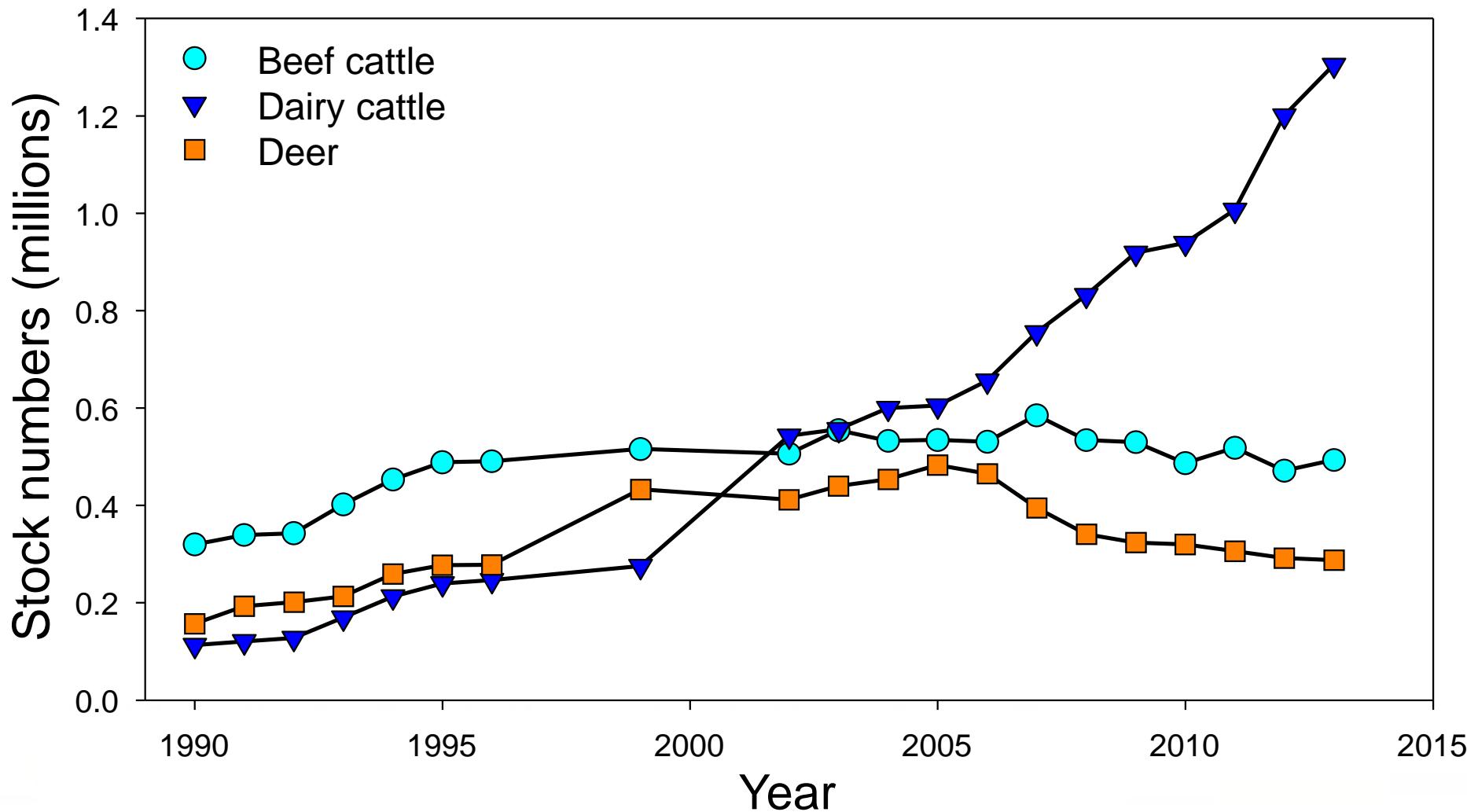
Where do we get our N?



Water and nitrogen = ryegrass (230,000 ha irrigated dairy)

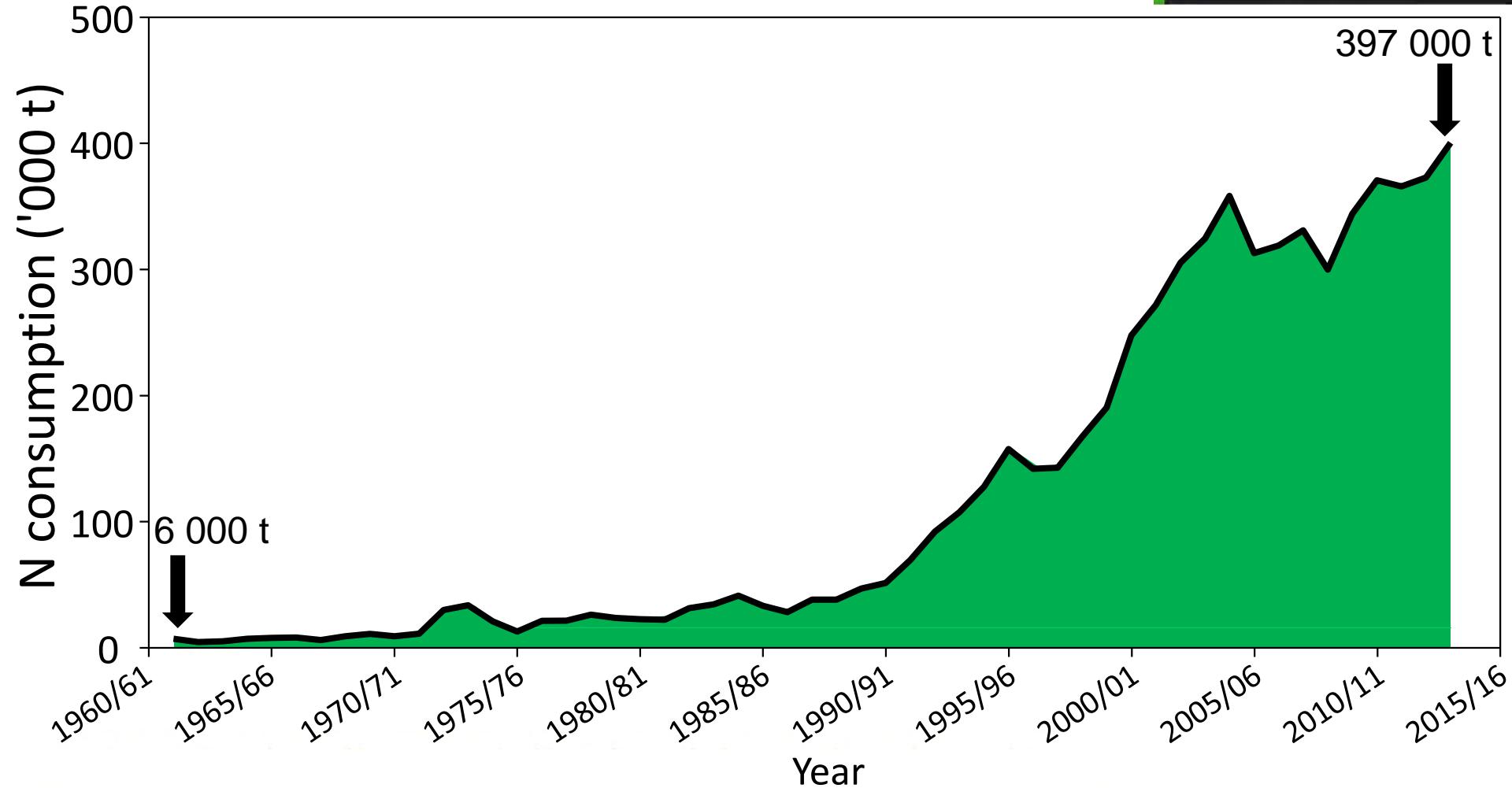


Deer & cattle numbers in Canterbury

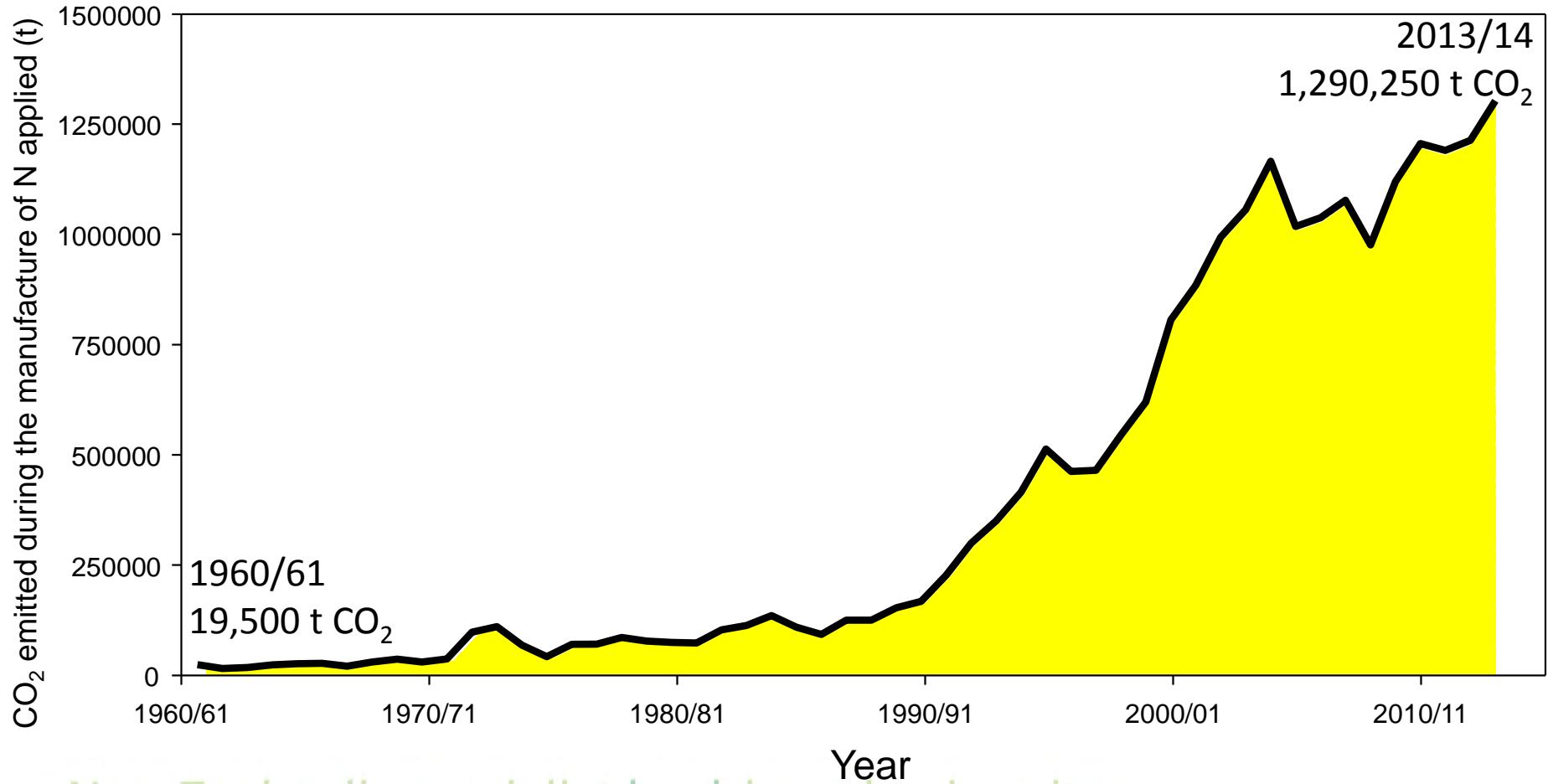


Fertiliser N use in NZ

- Nationally sustainable?



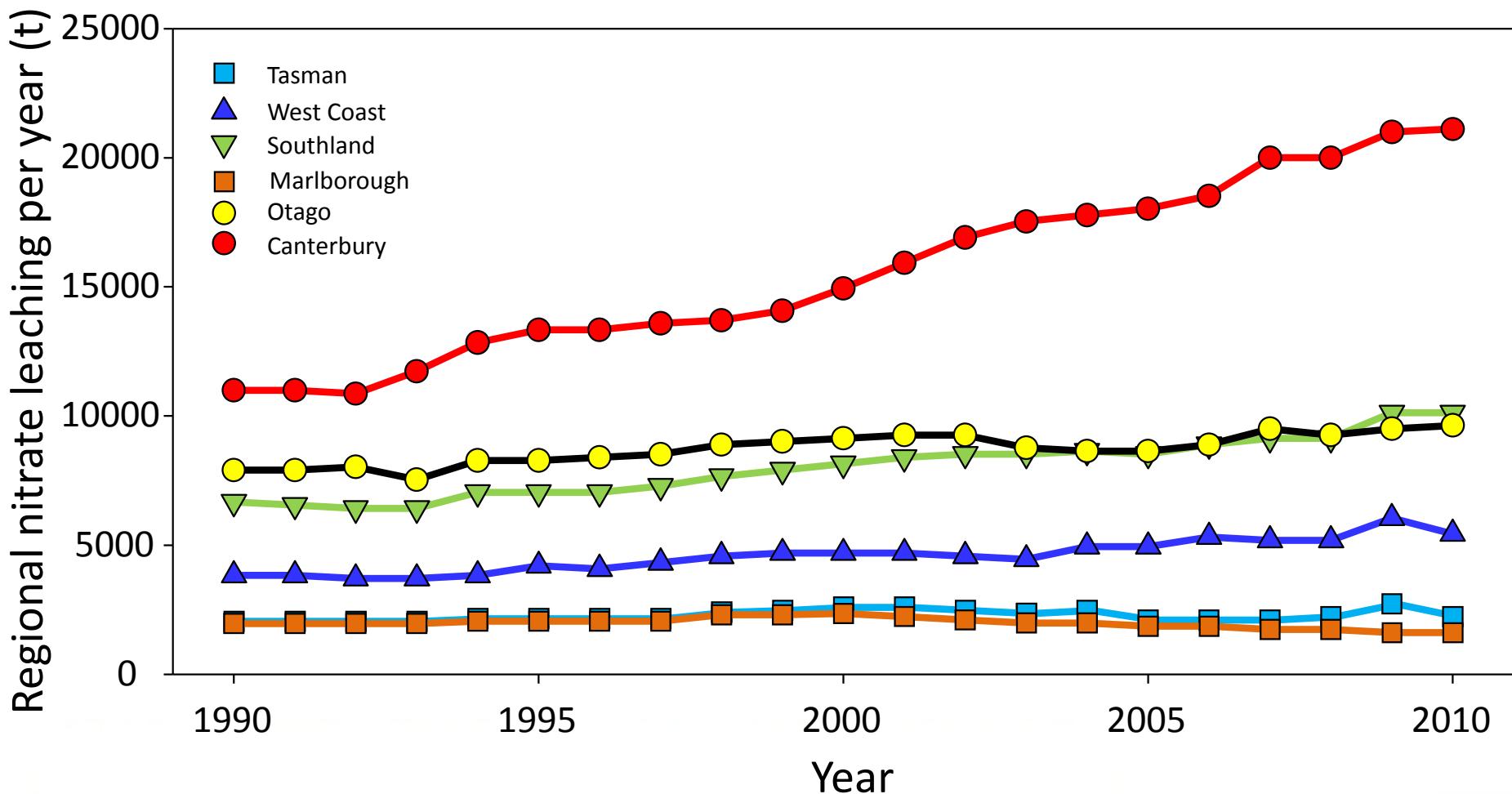
CO_2 emitted in production of our N - Globally sustainable?



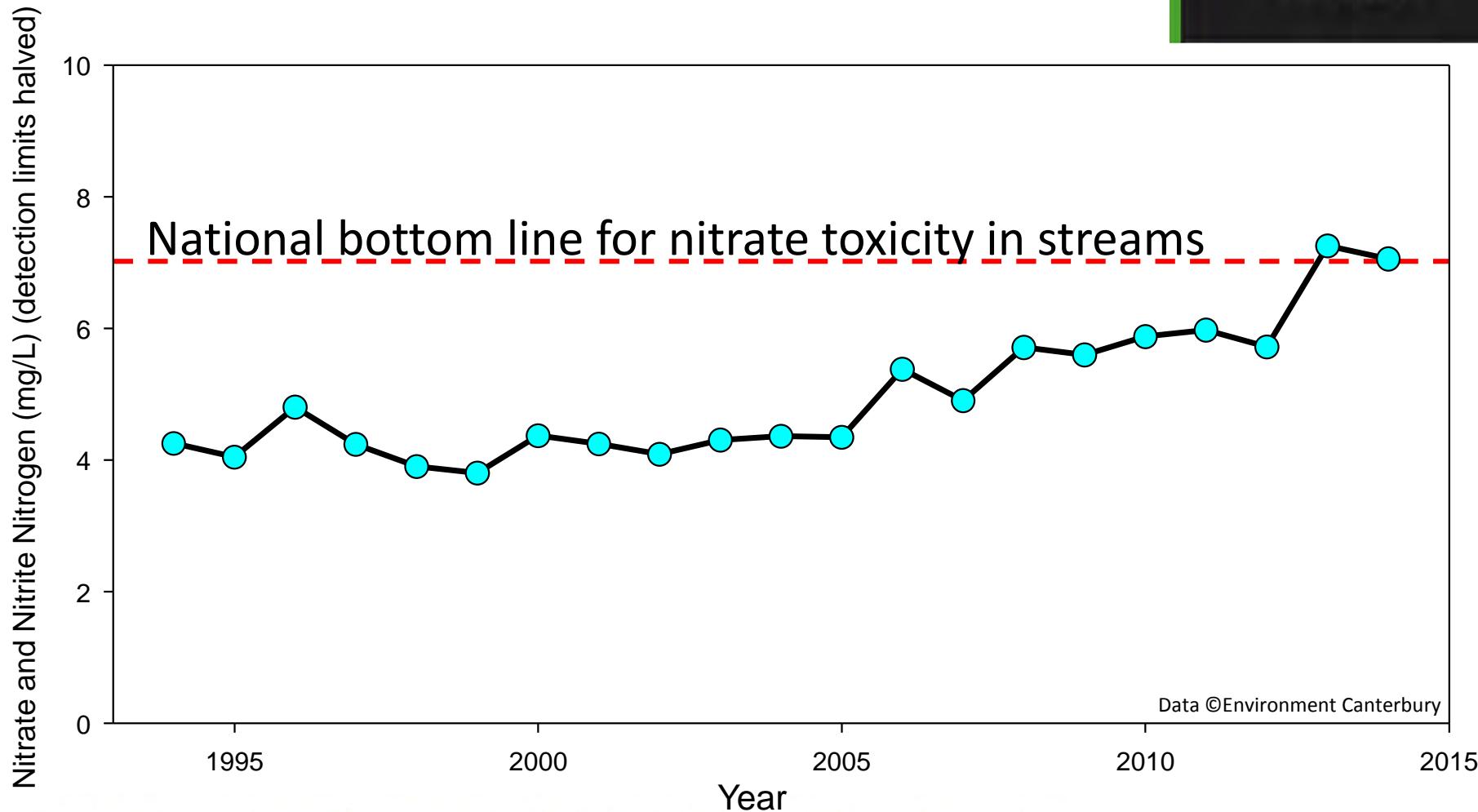
New Zealand's specialist land-based university

Regional annual nitrate losses

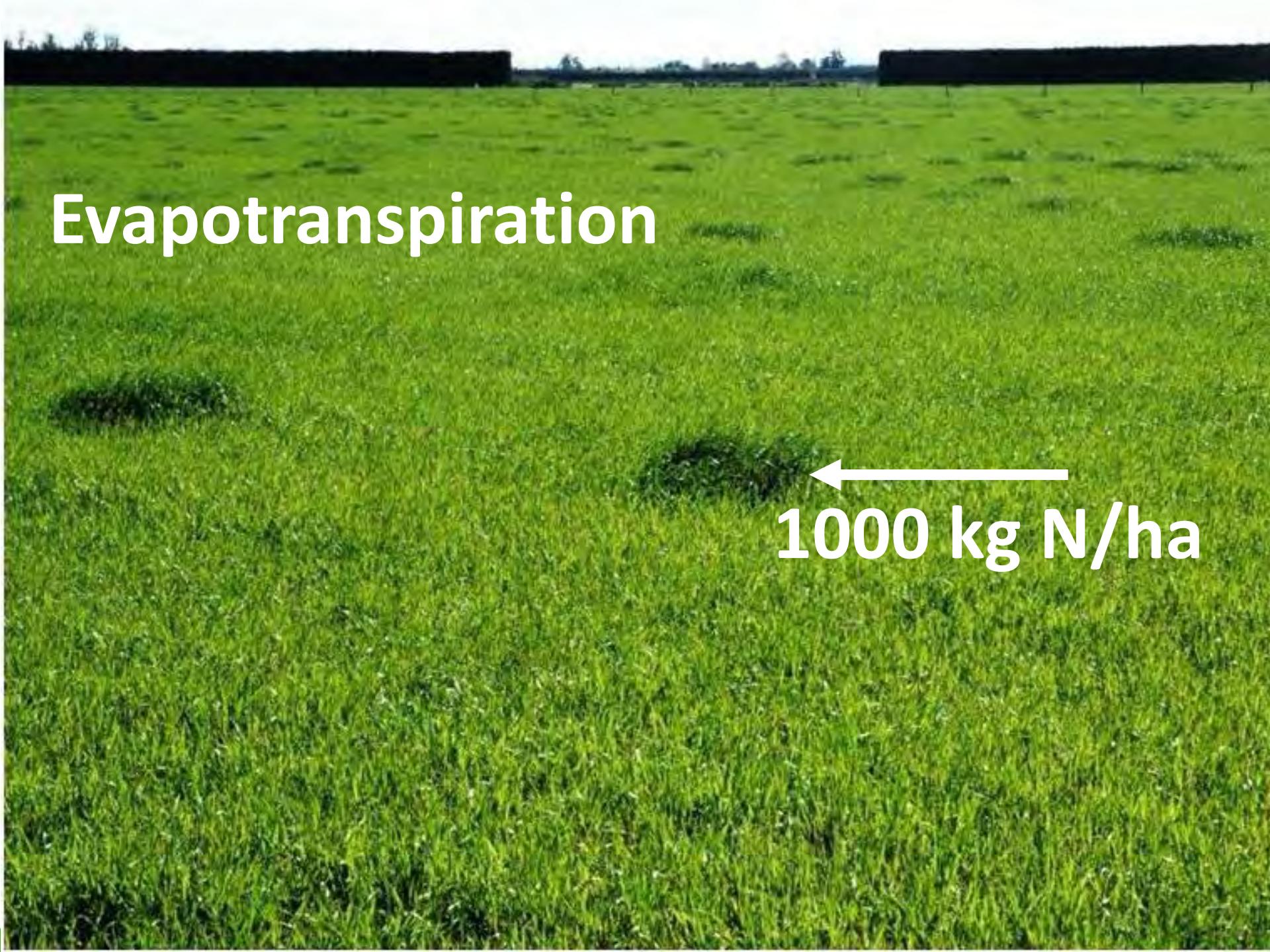
- Sustainable regionally?



Mean annual nitrate levels in Harts Creek - Sustainable locally?



New Zealand's specialist land-based university

A wide-angle photograph of a vast, green grassy field. The grass is a vibrant shade of green, indicating healthy vegetation. In the distance, a dark, low wall or fence line runs across the horizon. The sky above is a clear, pale blue with no visible clouds.

Evapotranspiration

1000 kg N/ha

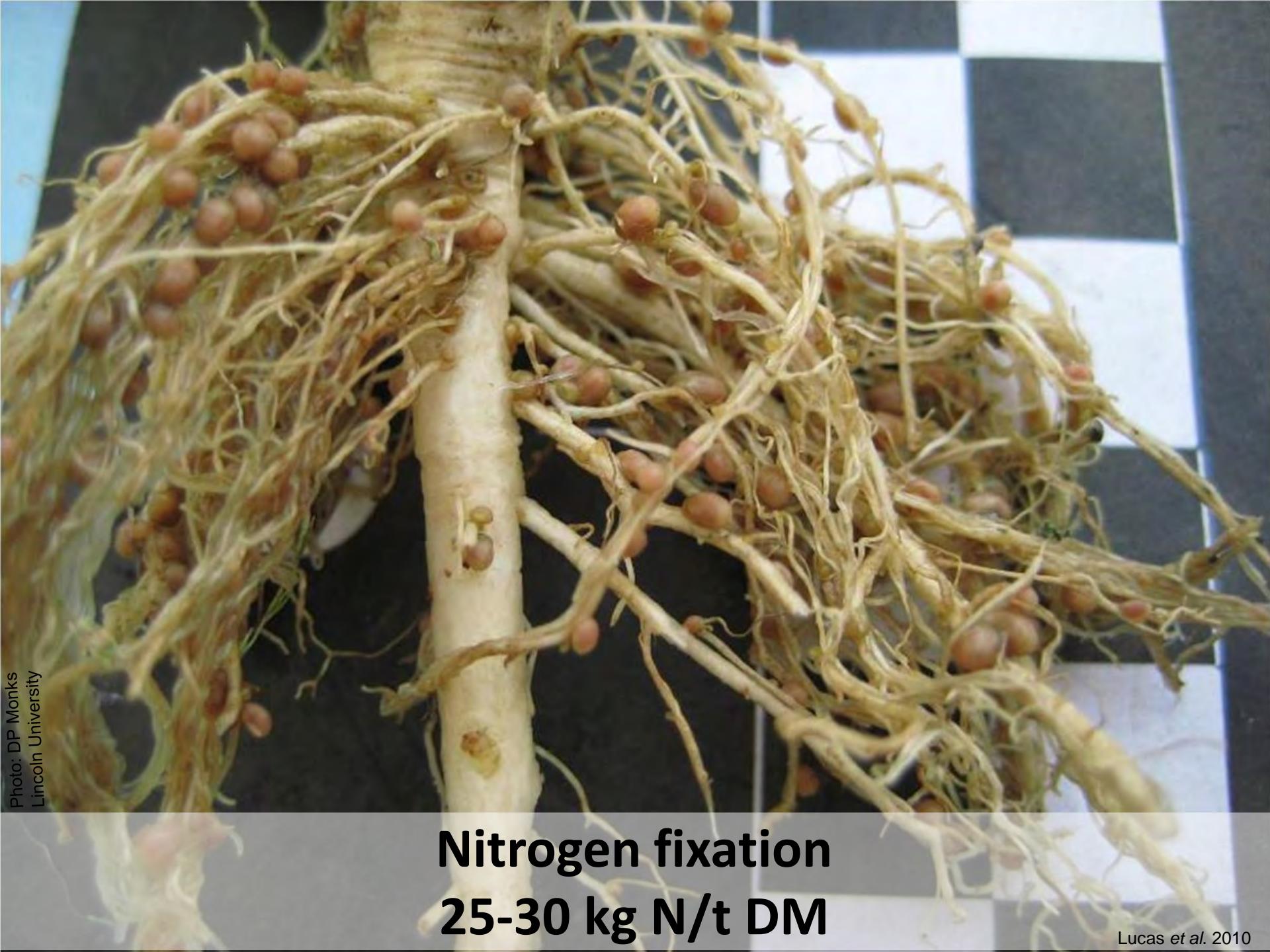
Future dryland pastures



- Limited water supply
- N to make plants grow!
- Meet animal demand (lactation)
- Minimize impact on air, soil, water
- Productive and profitable
- Socially acceptable

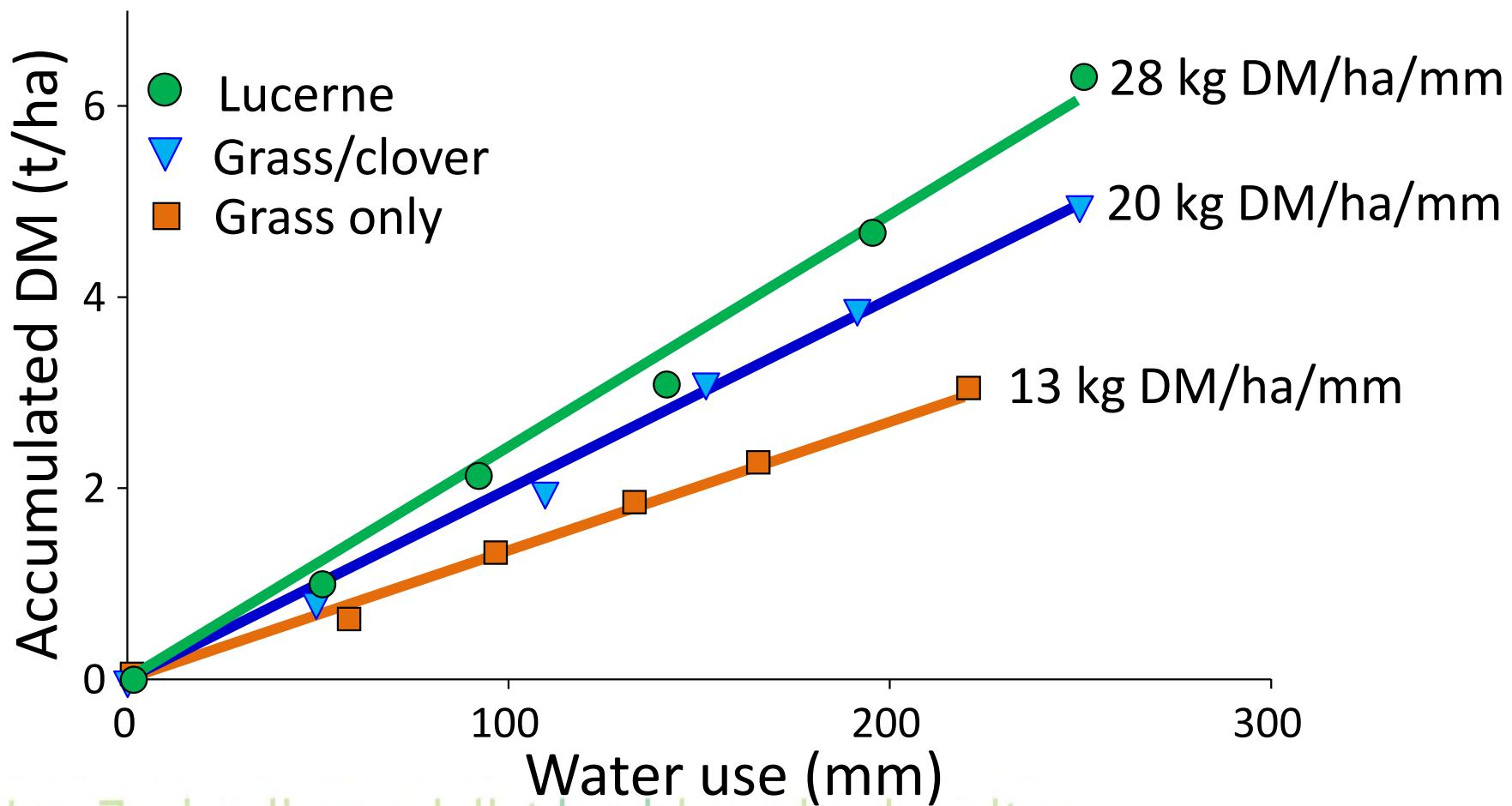
Legume dominant

New Zealand's specialist land-based university

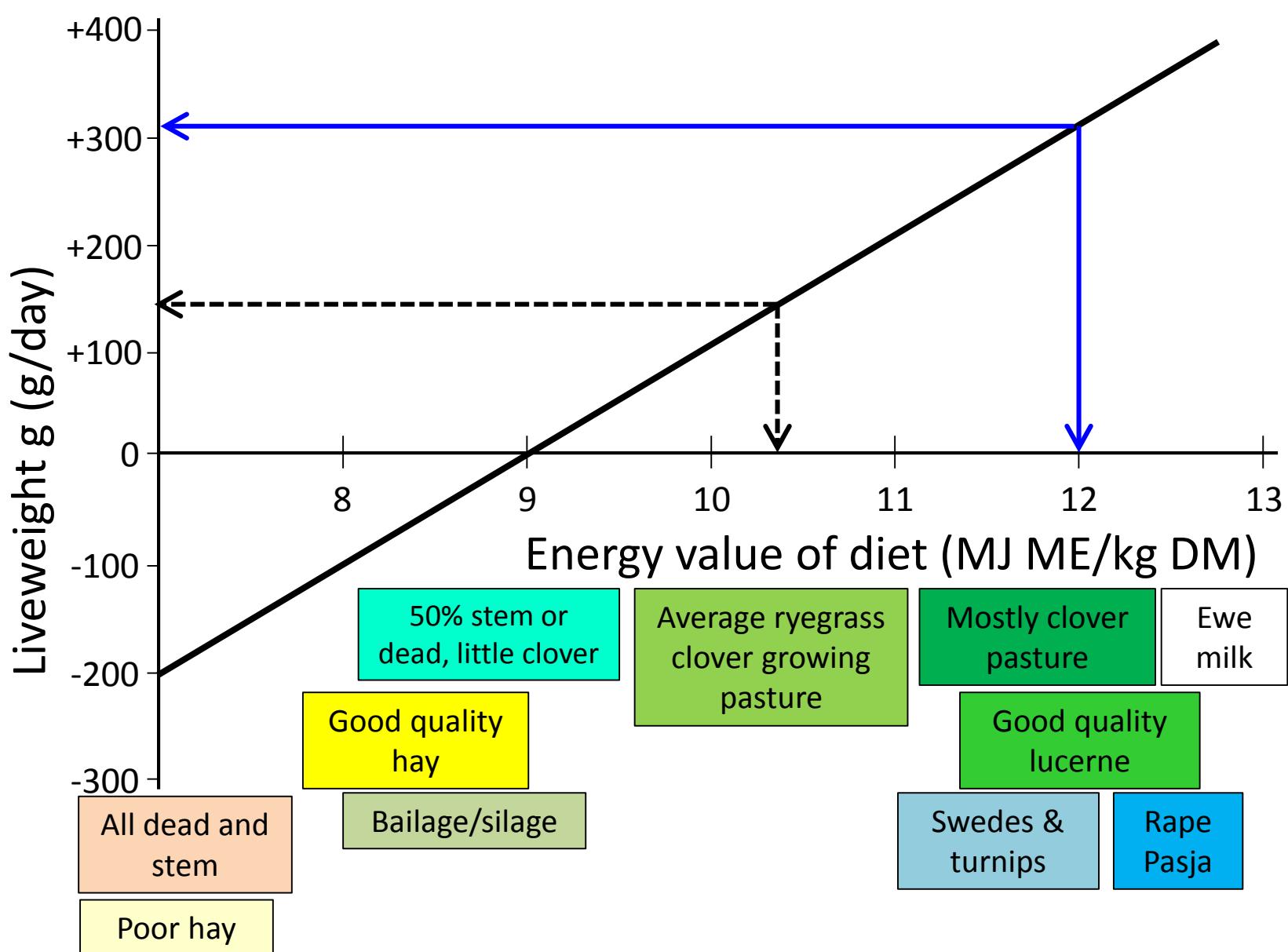


Nitrogen fixation
25-30 kg N/t DM

Spring WUE



New Zealand's specialist land-based university



Sheep prefer 70% legume, 30% grass



Photo: Jo Grigg
Tempello 'Marlborough'



High feeding value pastures have;

- high legume content
- high leaf content
- low stem content
- young herbage age

Case study – Bonavaree farm, Marlborough

Over grazed – high erosion risk

Dryland Lucerne conversion



New Zealand's specialist land-based university



Maximize reliable spring growth – high priority stock



'Bonavaree' production change over 10 years

	2002	2012	Change
Land area (ha)	1100	1800	 64%
Sheep numbers	3724	4158	 12%
Lambing (%)	117	145	 24%
Lamb weights (kg)	13.3	19	 43%
Lamb sold (kg)	38324	74460	 94%
Wool (kg)	18317	20869	 14%
Sheep:cattle	70:30	50:50	
Gross trading profit (ha)	\$317	\$792	 149%

New Zealand's specialist land-based university



06/10/2015



Resilient drought-proofed landscape



SI Farmer of the Year 2010



“With better income we can focus on the environment and preserve it for generations to come”

Doug Avery



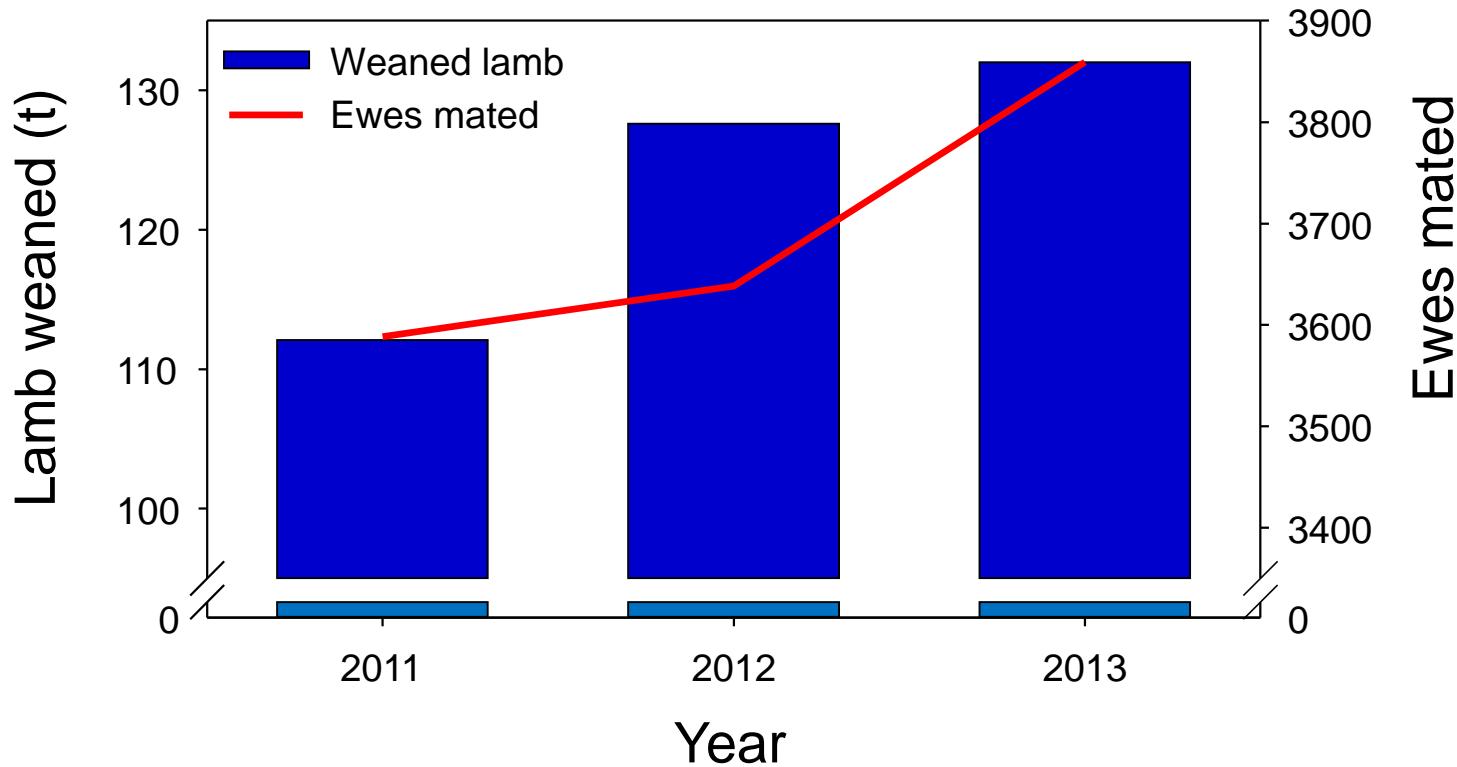
New Zealand's specialist land-based university



Photo: Bog Roy Station

New Zealand's specialist land-based university

Lamb weaned and Ewes mated



11% increase in lamb weaned per ewe mated (2011 vs. 2012/2013)
31.2 vs 34.6 kg weaned per ewe mated

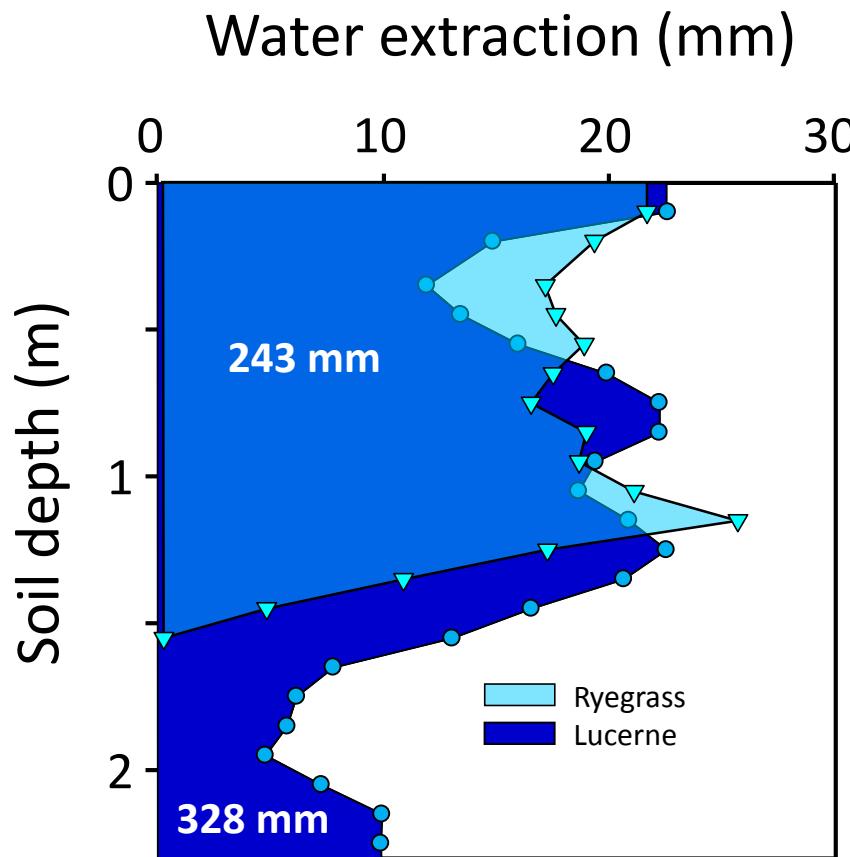
Landscape farming

Photo: Bog Roy Station



New Zealand's specialist land-based university

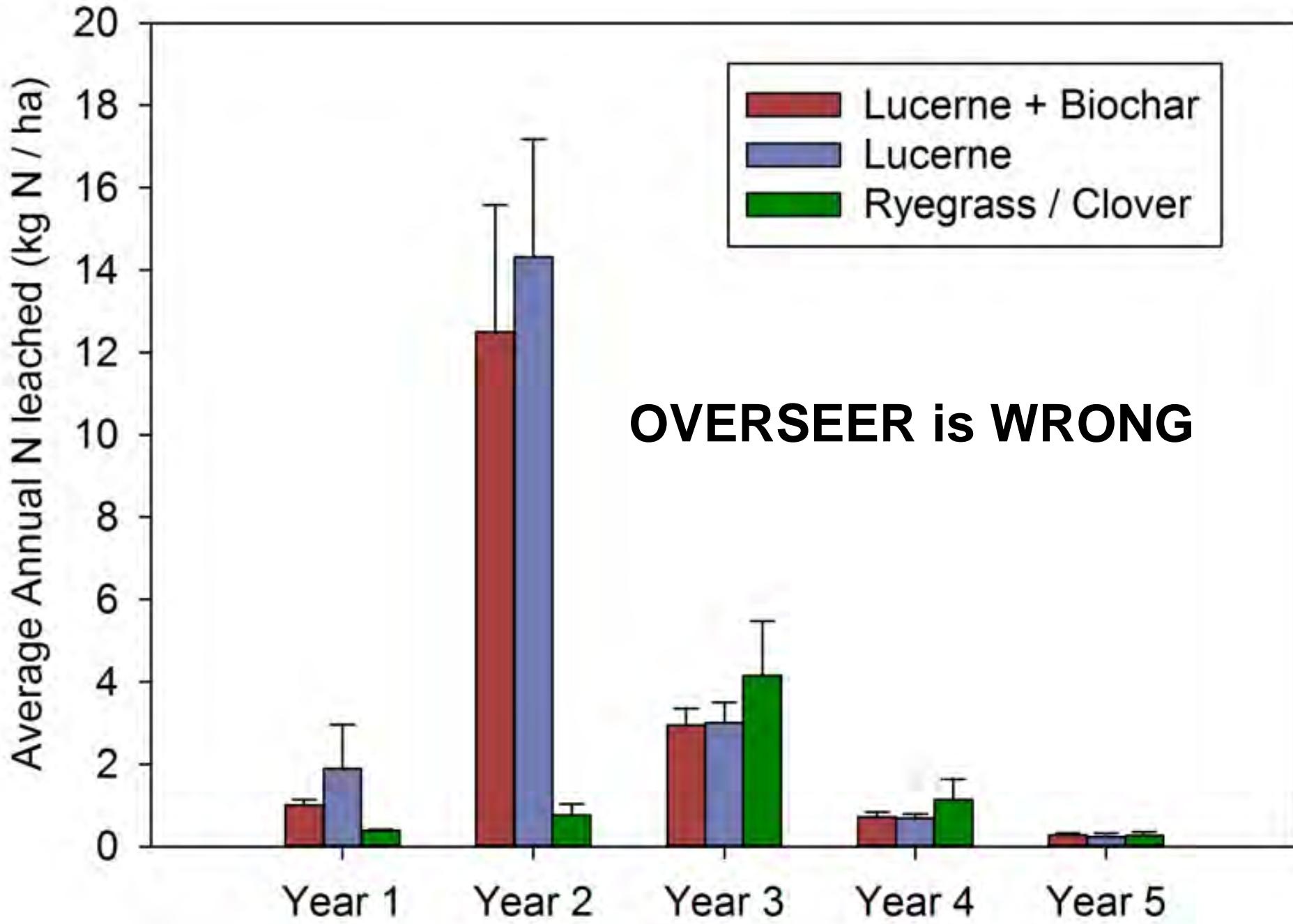
Soil water extraction: Species



Lucerne dries the bucket to reduce the risk of drainage

OVERSEER IS WRONG

New Zealand's specialist land-based university



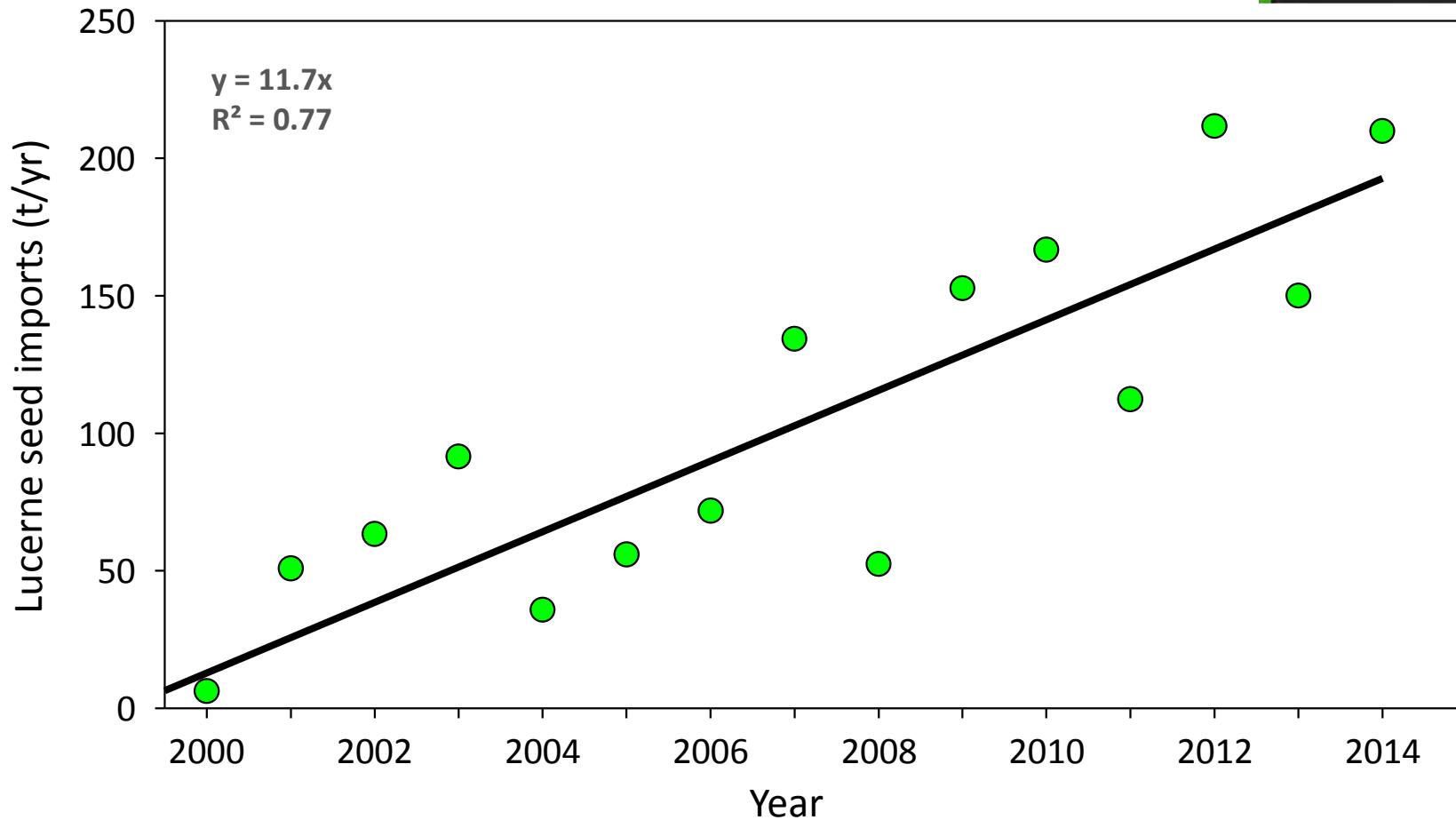
The background of the slide is a photograph of a rural landscape. In the foreground, there's a field of green grass. Beyond it, the land slopes upwards towards a range of mountains. The mountains are dark and silhouetted against a bright blue sky with a few wispy white clouds.

**Over 200,000 ha sown
700+ txt alerts**

“28-35% Rate of return on investment”

New Zealand's specialist land-based university

Lucerne seed imports in NZ



New Zealand's specialist land-based university



Sub. clover dominant pasture 8 Oct 2015

Bulls grazing sub. dominant pasture

8 Oct 2015





Pasture	Ewe	Lamb
Cocksfoot/Sub	63	350
Cocksfoot/Sub/Balansa	114	366
Ryegrass/Sub	187	338
Ryegrass/Sub/Balansa	160	353

First stock entered pastures 20/8 & all grazing animals weighed on 25/9/15

Ashley Dene P21 Phase II
Ewes & lambs grazing Plot 8 on 5 Oct 2015

Ashley Dene

9 Jan 2015



LEGUMES AT MEADOWBANK

We're in clover

Will Grigg

Website: www.lincoln.ac.nz/dryland

Field Day handouts and presentations page (20 June 2013)





- Lucerne/prairie grass/plantain mix in late January 2013.
- Sown October 2012 and first grazed late March 2013.
- 16 ha split into five paddocks and water troughs installed.

Lucerne, prairie and plantain October 2012.

Twin ewes and lambs at 12 ewes /ha and 1 steer/ha.



Grazing after shutting up for sub clover seeding.





Close up of germinating clover seedlings on 1 May

WHAT'S HAPPENED TO PRODUCTION AT MEADOWBANK?



- Similar stock numbers, better fed.
- Ewe efficiency **increased 40%** since 2005

	2005	2012	Change
Ewe Lambing%	121%	142%	↑ 21%
Hogget Lambing%	60%	81%	↑ 21%
Weaning weight	28 kg/hd	34 kg/hd	↑ 21%
Return	\$730/ha	\$2640/ha	↑ \$1910/ha (>260%)

New Zealand's specialist land-based university

Sustainable dryland farming?



- **Production** – 40-100% incr. LWG/ha
- **Risk** – beat the drought
- **Economic** – 30% IRR
- **Environment** – efficient water and N fert., lowered CO₂ emissions, ecosystem services, dry profile
- **Social** – “green” dryland, fire breaks, employment, landscape farming

New Zealand's specialist land-based university

Transforming dryland regions



S - profitable, resilient, legume based

W - new skills, no political will

O - 3-4M ha, east coast NZ

T - Overseer, FEPs, regulators

New Zealand's specialist land-based university



Dryland Pastures
Research

[Learn more about Lincoln's research on dryland pastures.](#)



Research Projects
[Find out more about some of the dryland pasture research projects.](#)



Scientific Publications
[View the latest scientific publications.](#)



Field Day Handouts and Presentations
[View field day handouts and conference presentations.](#)



Postgraduate Students
[View our current and previous postgraduate students.](#)



Interns and Visitors
[Meet some of our interns and visitors who have worked with us with visiting with the Dryland Pastures team.](#)



Frequently Asked Questions
[Check our list of frequently asked questions, broken down into categories for you.](#)



Contact Us
[Please contact us if you have any questions.](#)



Blog
[View our blog here.](#)

[Website](#)
Handouts & presentations

FAQs

[Direct link to Blog](#)

www.lincoln.ac.nz/dryland

Dryland future



- Plant growth and resource use efficiency.
- Legume systems to meet economic production demands across diverse soil, climate, topography.
- Technology transfer and implementation to enhance environmental and production outcomes.

New Zealand's specialist land-based university

References

- Anderson, D.; Anderson, L.; Moot, D.J.; Ogle, G.I. 2014. Integrating lucerne (*Medicago sativa* L.) into a high country merino system. *Proceedings of the New Zealand Grassland Association* 76: 29-34.
- Department of Statistics. 2015. Agricultural Production Survey variables (various years). Accessed: (various dates). Online: <http://www.stats.govt.nz>
- Dymond, J.R.; Ausseil, A.G.E.; Parfitt, R.L.; Herzig, A.; McDowell, R.W. 2013. Nitrate and phosphorus leaching in New Zealand: a national perspective. *New Zealand Journal of Agricultural Research* 56: 49-59.
- Lucas, R.J.; Smith, M.C.; Jarvis, P.; Mills, A.; Moot, D.J. 2010. Nitrogen fixation by subterranean and white clovers in dryland cocksfoot pastures. *Proceedings of the New Zealand Grassland Association* 72: 141-146.
- Mills, A.; Moot, D.J.; McKenzie, B.A. 2006. Cocksfoot pasture production in relation to environmental variables. *Proceedings of the New Zealand Grassland Association* 68: 89-94.
- Mills, A.; Moot, D.J.; Jamieson, P.D. 2009. Quantifying the effect of nitrogen on productivity of cocksfoot (*Dactylis glomerata* L.) pastures. *European Journal of Agronomy* 30: 63-69.
- Moot, D.J.; Avery, D. 2013. Sustainable intensification of livestock grazing systems in low rainfall regions of New Zealand. p. O3.O3 (4 pgs). In: Gliller, K.; van Ittersum, M. (Eds.). *First International Conference on Global Food Security*. 29 September - 2 October 2013. Elsevier Ltd, Noordwijkerhout, The Netherlands. p O3.O3 (4 pgs).
- Moot, D.J.; Brown, H.E.; Pollock, K.; Mills, A. 2008. Yield and water use of temperate pastures in summer dry environments. *Proceedings of the New Zealand Grassland Association* 70: 51-57.
- Moot, D.J.; Mills, A.; Pollock, K.M. 2010. Natural resources for Canterbury agriculture. *Proceedings of the New Zealand Grassland Association* 72: IX-XVII.
- NIWA 2013. Climate Explorer – National Median Annual Rainfall Map. Accessed: 1/10/2010 2010. <http://climate-explorer.niwa.co.nz>.
- Saunders, C.; Barber, A.; Taylor, G. 2006. Food Miles - Comparative energy/emissions. Performance of New Zealand's agriculture industry. Research Report No. 285. Lincoln University Agribusiness & Economics Research Unit (AERU), Lincoln University. 105 pp. Accessed: 14/9/2009.
http://www.lincoln.ac.nz/story_images/2328_RR285_s13389.pdf
- Stevens, D.R. 1999. Ewe nutrition: decisions to be made with scanning information *Proceedings of the New Zealand Society of Animal Production* 59: 93-94.

Acknowledgements for data/graphs:

- Environment Canterbury (ECAN) for Harts Creek data (data ©ECAN) & MPI for lucerne seed import data
- New Zealand Fertiliser Association for the nitrogen fertiliser data
- Malcolm McLeod for the N leaching graph

New Zealand's specialist land-based university