Drummond 23 March 2018

Lucerne



Professor Derrick Moot

New Zealand's specialist land-based university

Lincoln University
Te Whare Wānaka o Aoraki
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Website

Handouts & presentations

FAQs

Direct link to Blog

www.lincoln.ac.nz/dryland

Facebook: @DrylandPasturesResearch

Experiment site

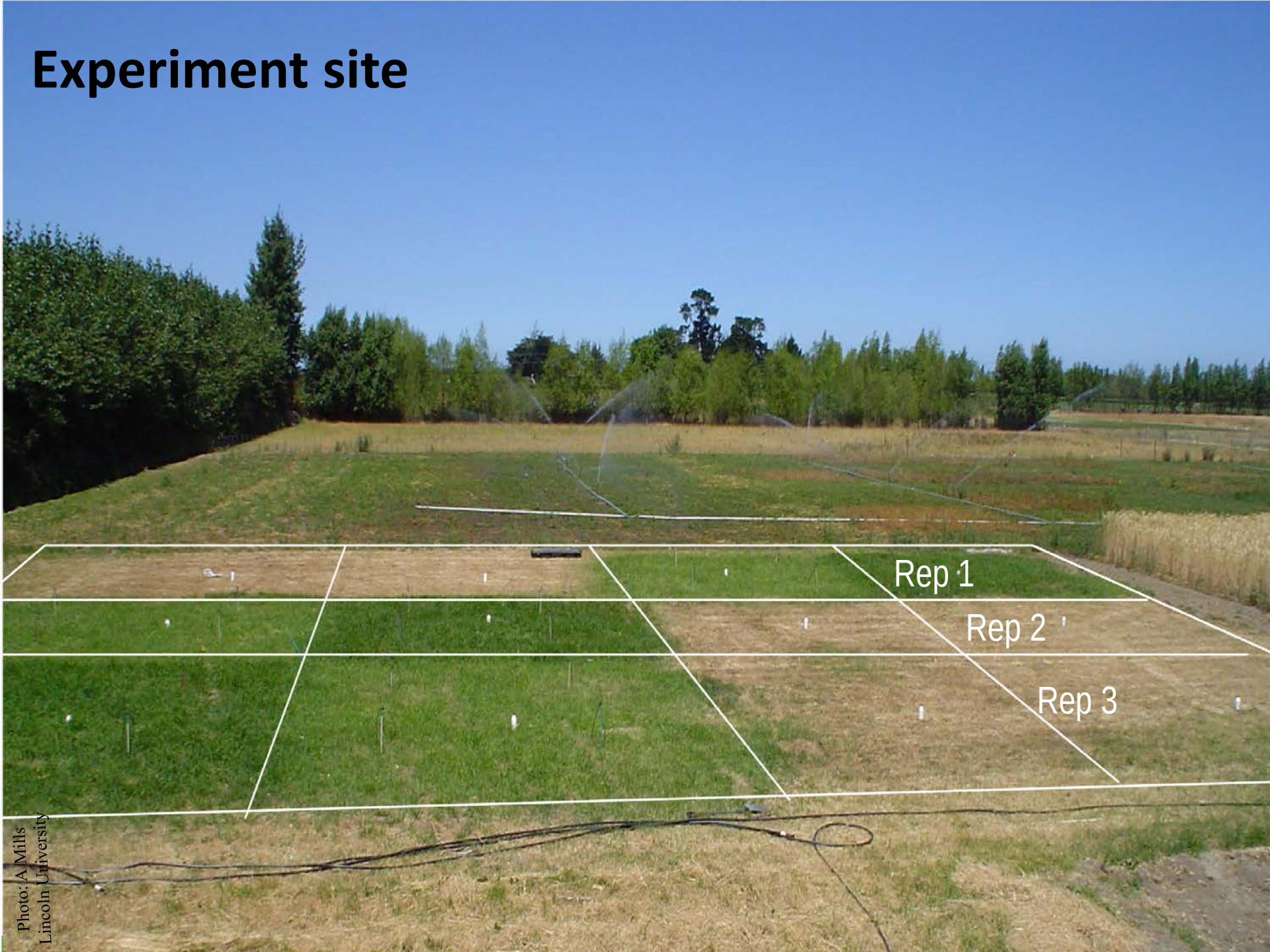
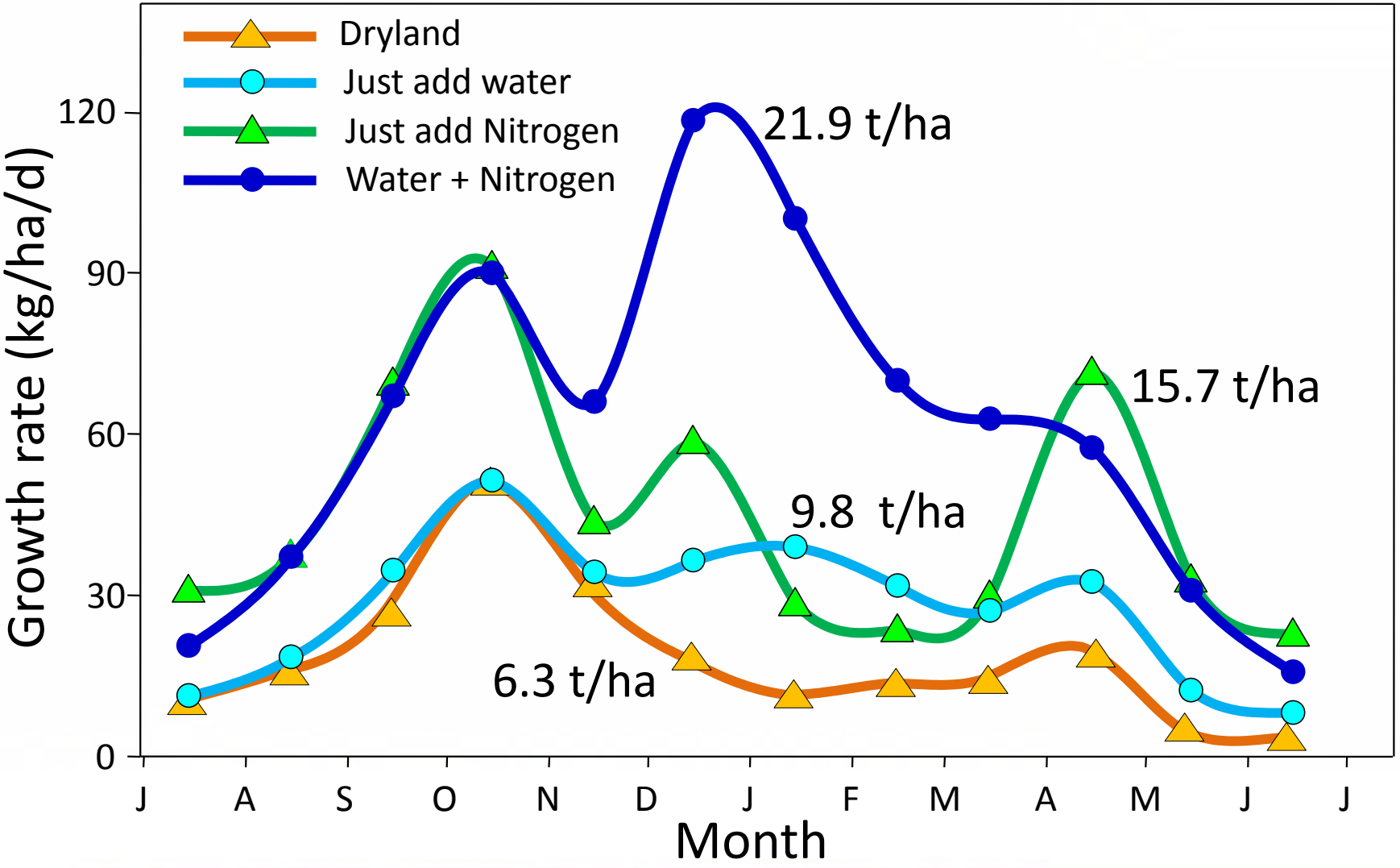


Photo: A Mills
Lincoln University

Growth rates (2 year means)



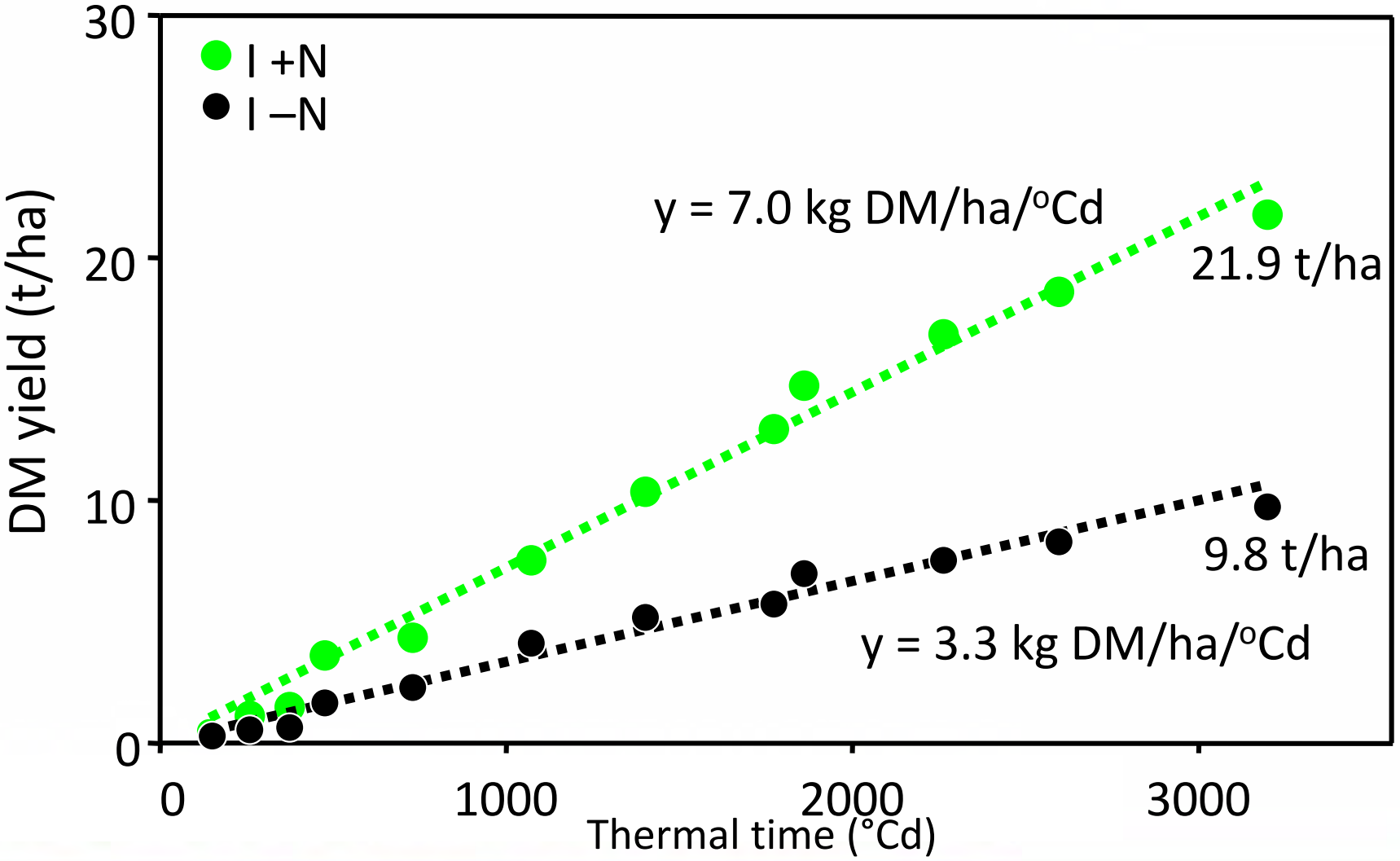
Mills *et al*. 2006, 2009

Winter

⇒ temperature response

Photo: KM Pollock
Lincoln University

The Nitrogen gap

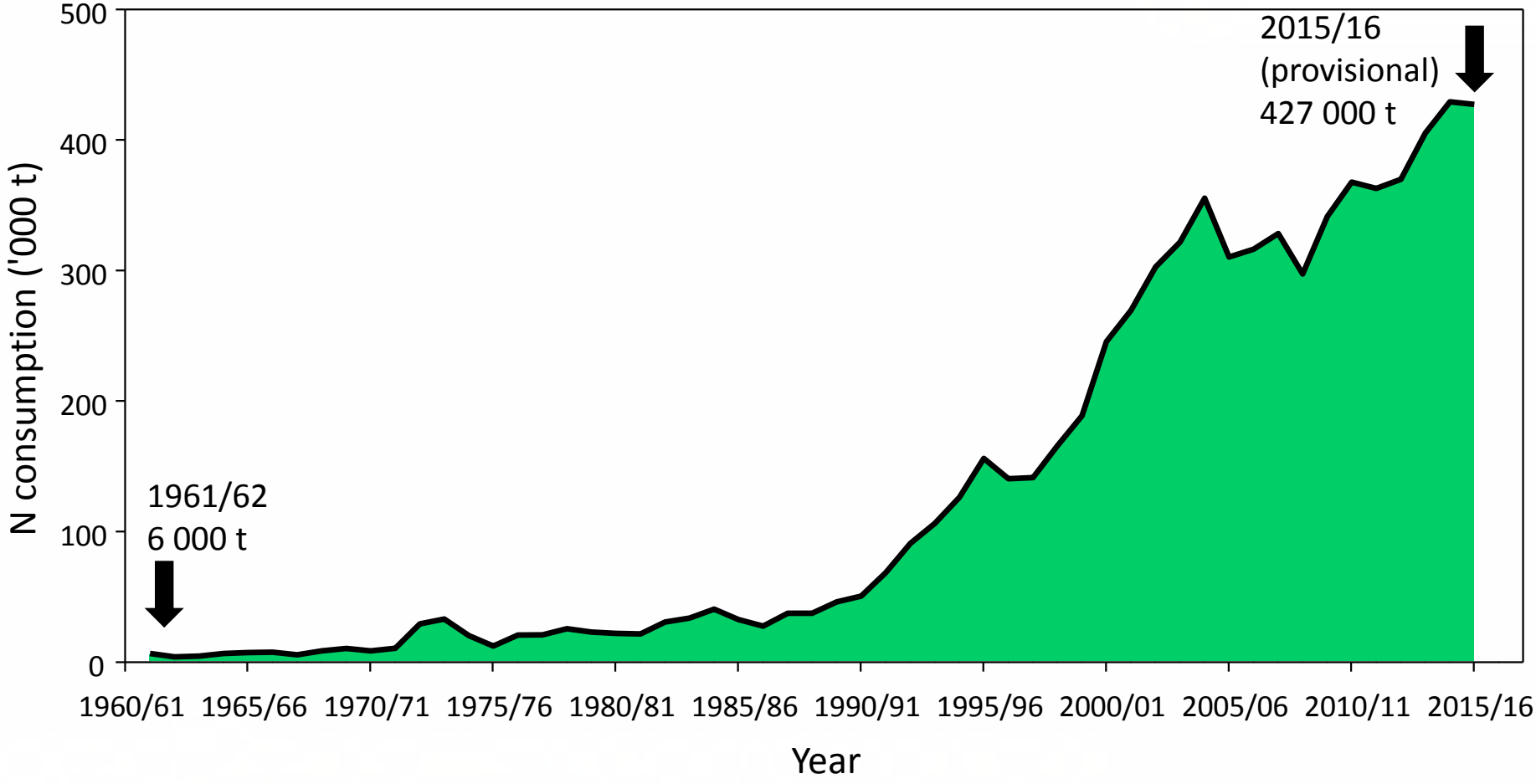


Mills *et al*. 2006; 2009

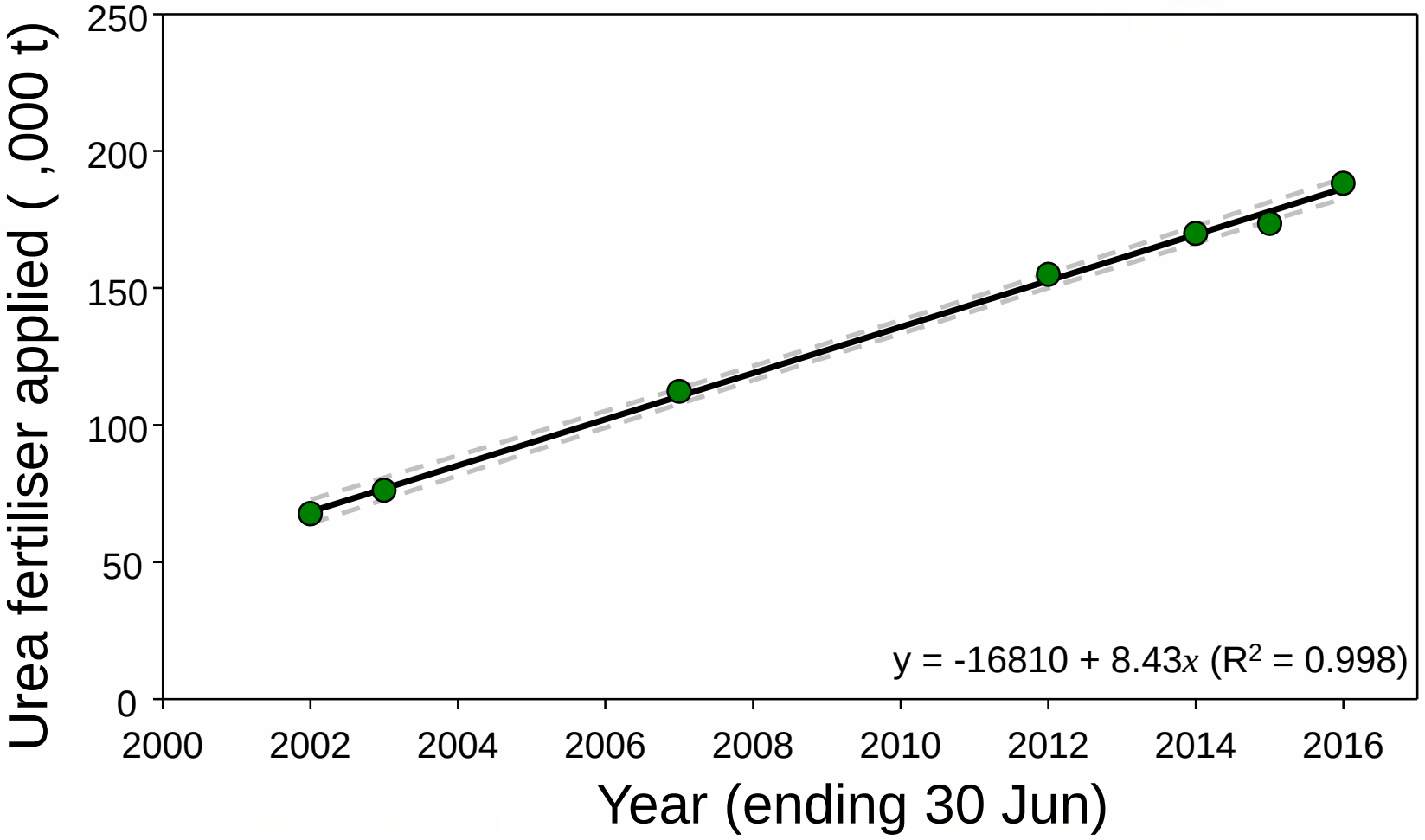
Water and nitrogen = ryegrass (230,000 ha irrigated dairy)

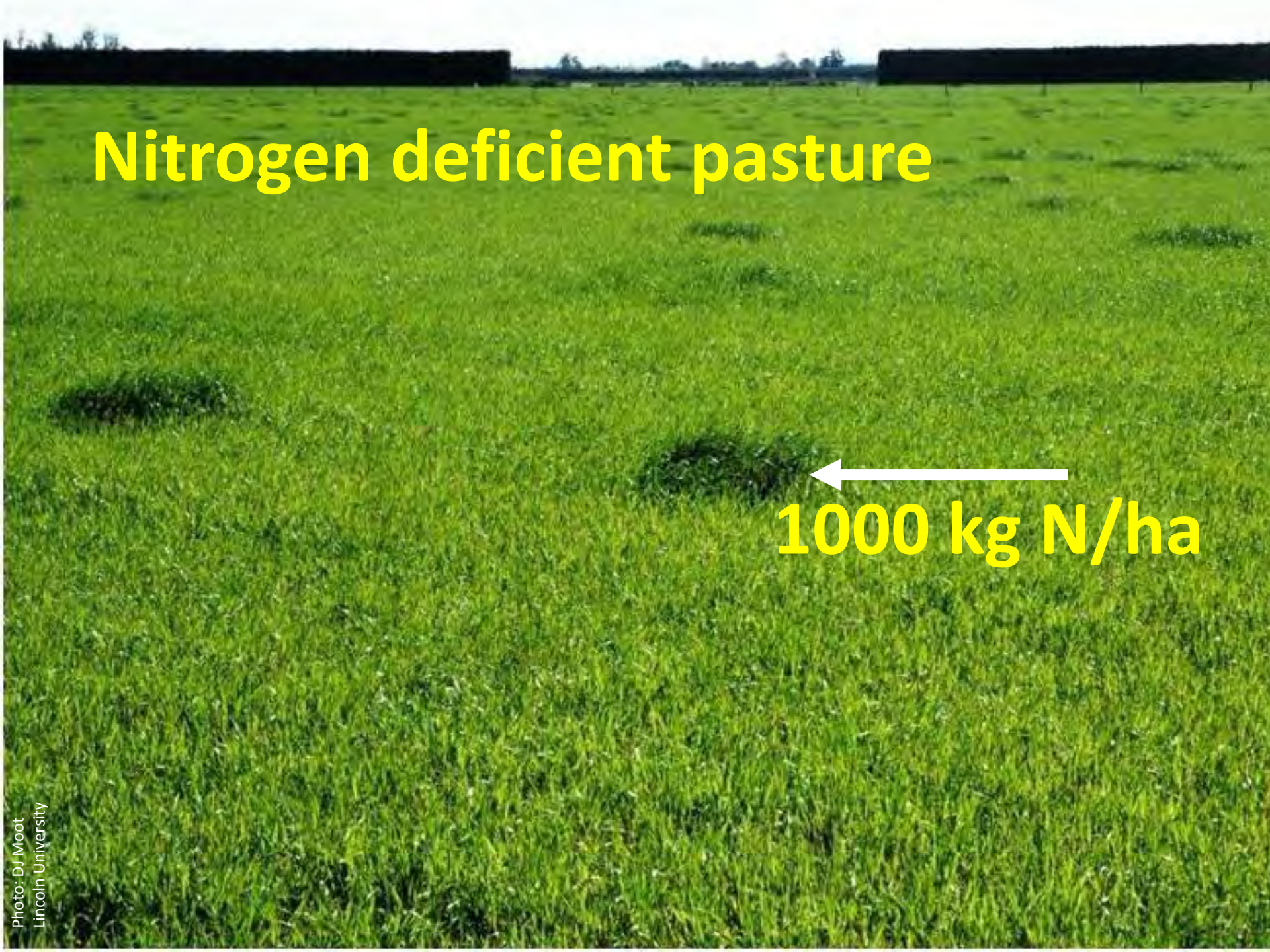
Photo: Dr WR Scott
Lincoln University

Nitrogen applied in NZ

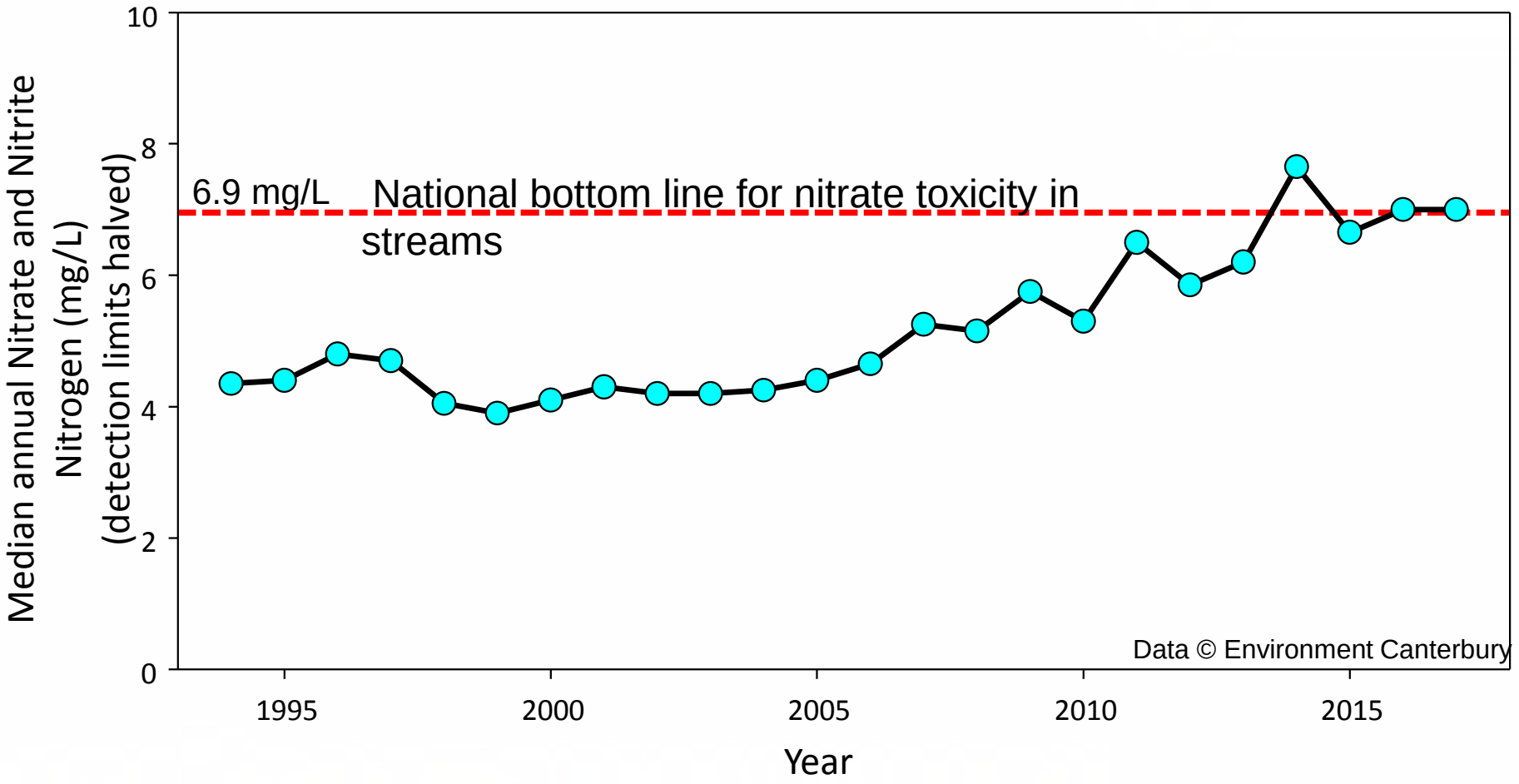


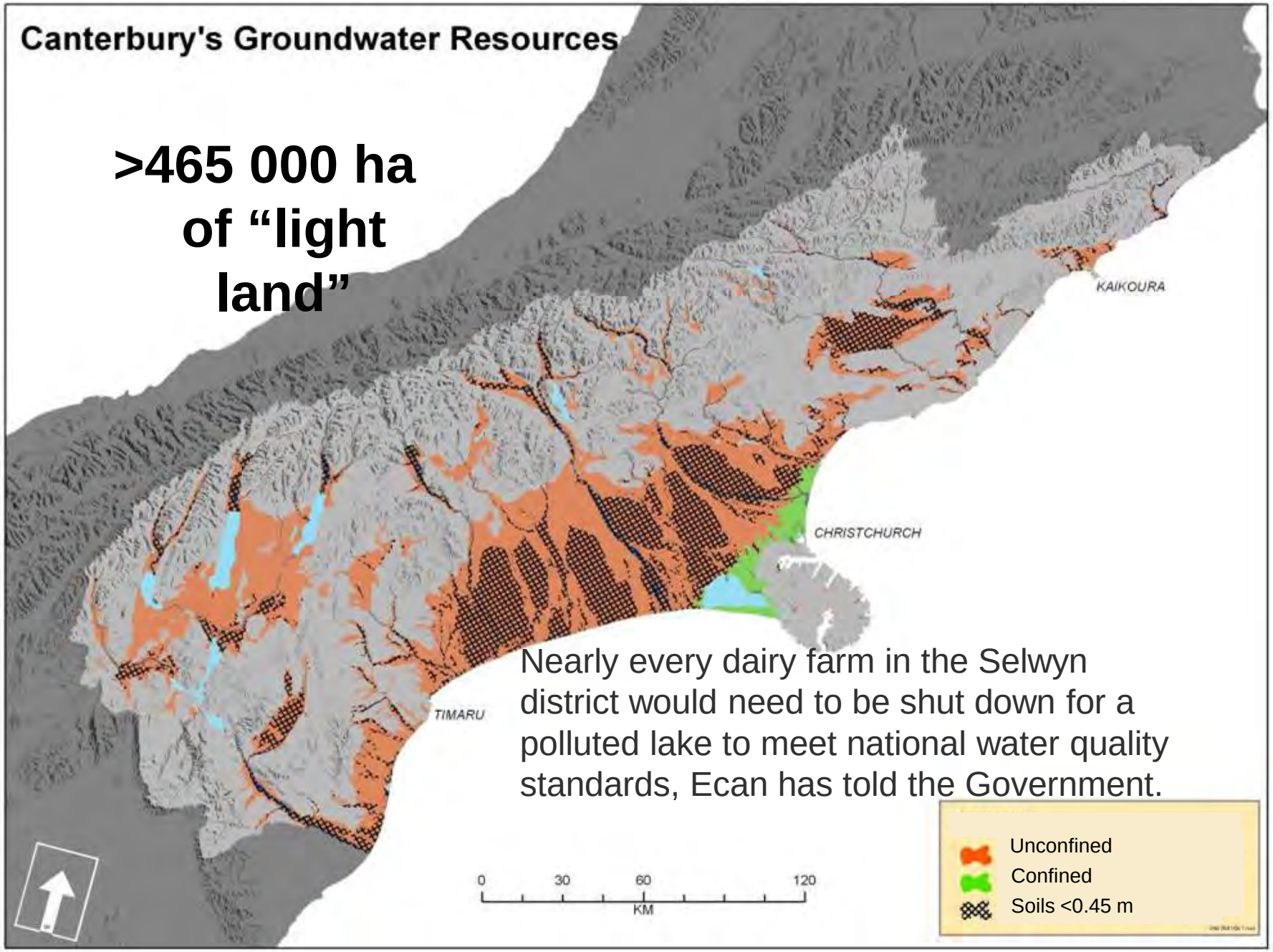
Urea use in Canterbury




Nitrogen deficient pasture
1000 kg N/ha
Photo: DJ Moot
Lincoln University

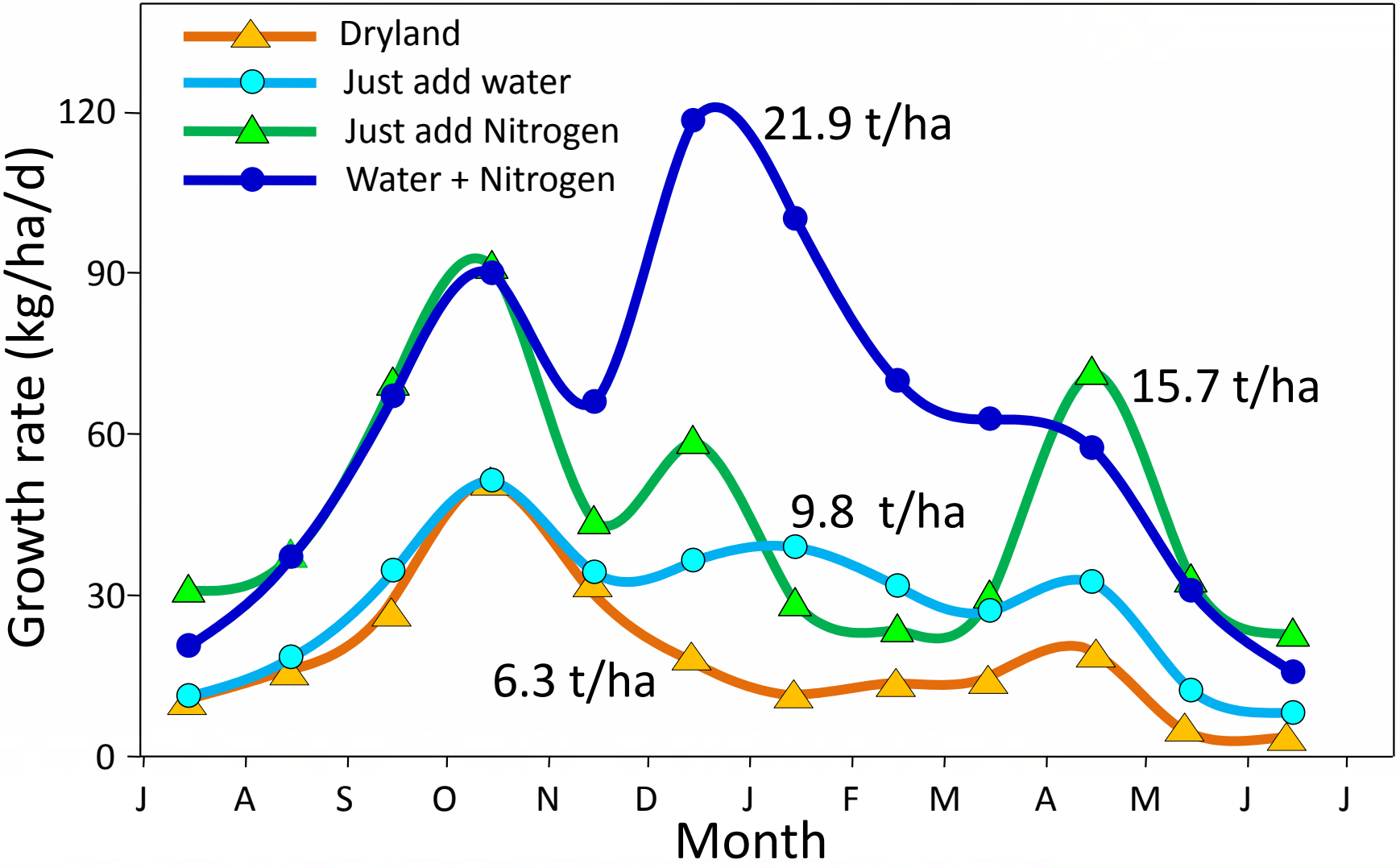
Nitrate + Nitrite measured at Harts Creek, Canterbury





Source: Ken Taylor ECan

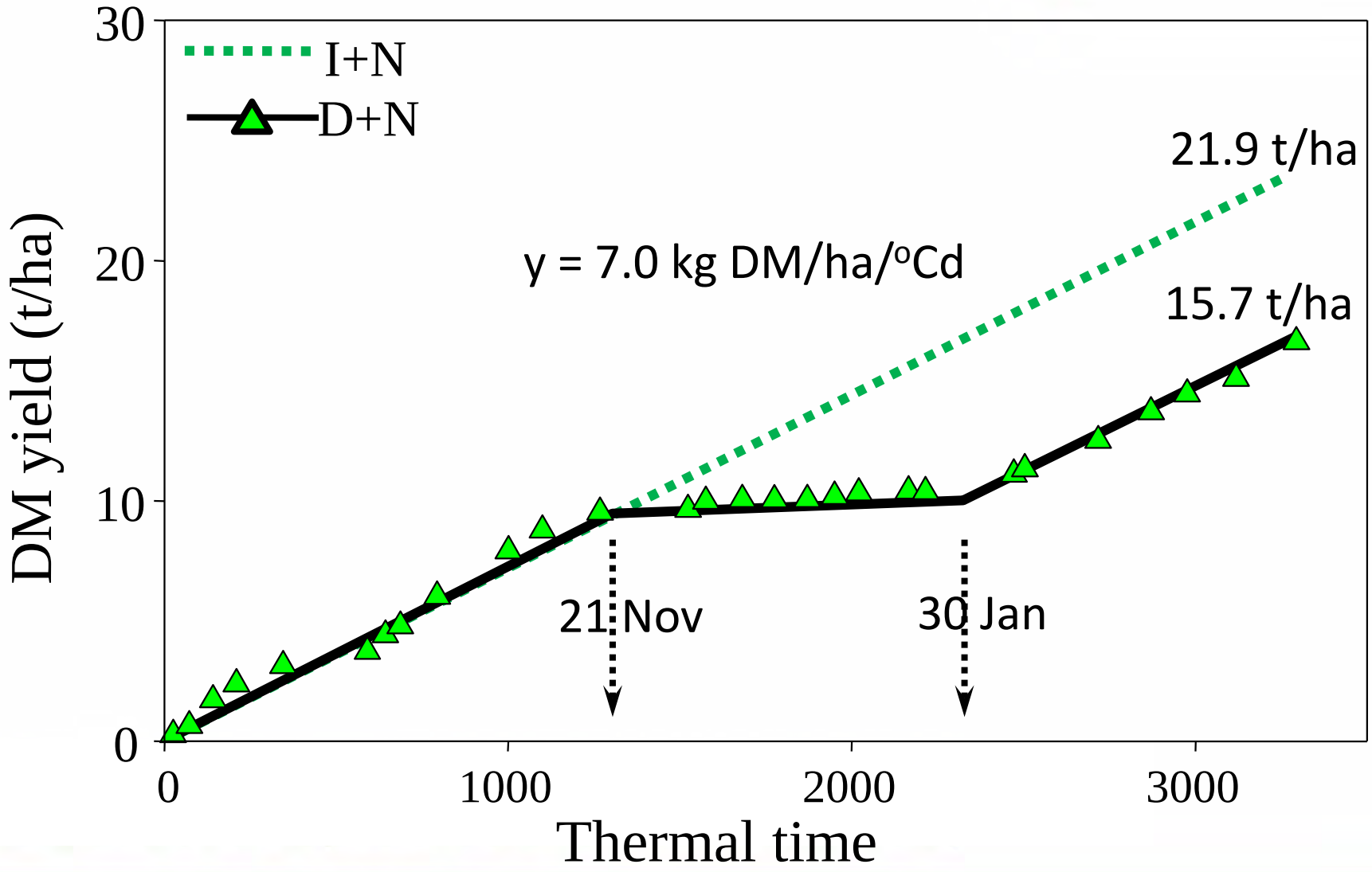
Growth rates (2 year means)



Mills *et al*. 2006, 2009

Summer ⇒ moisture response

Water stress effect on yield



Mills *et al.* 2006

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

Nitrogen fixation
25-30 kg N/t DM

Photo: DP Monks
Lincoln University

Lucas *et al*. 2010

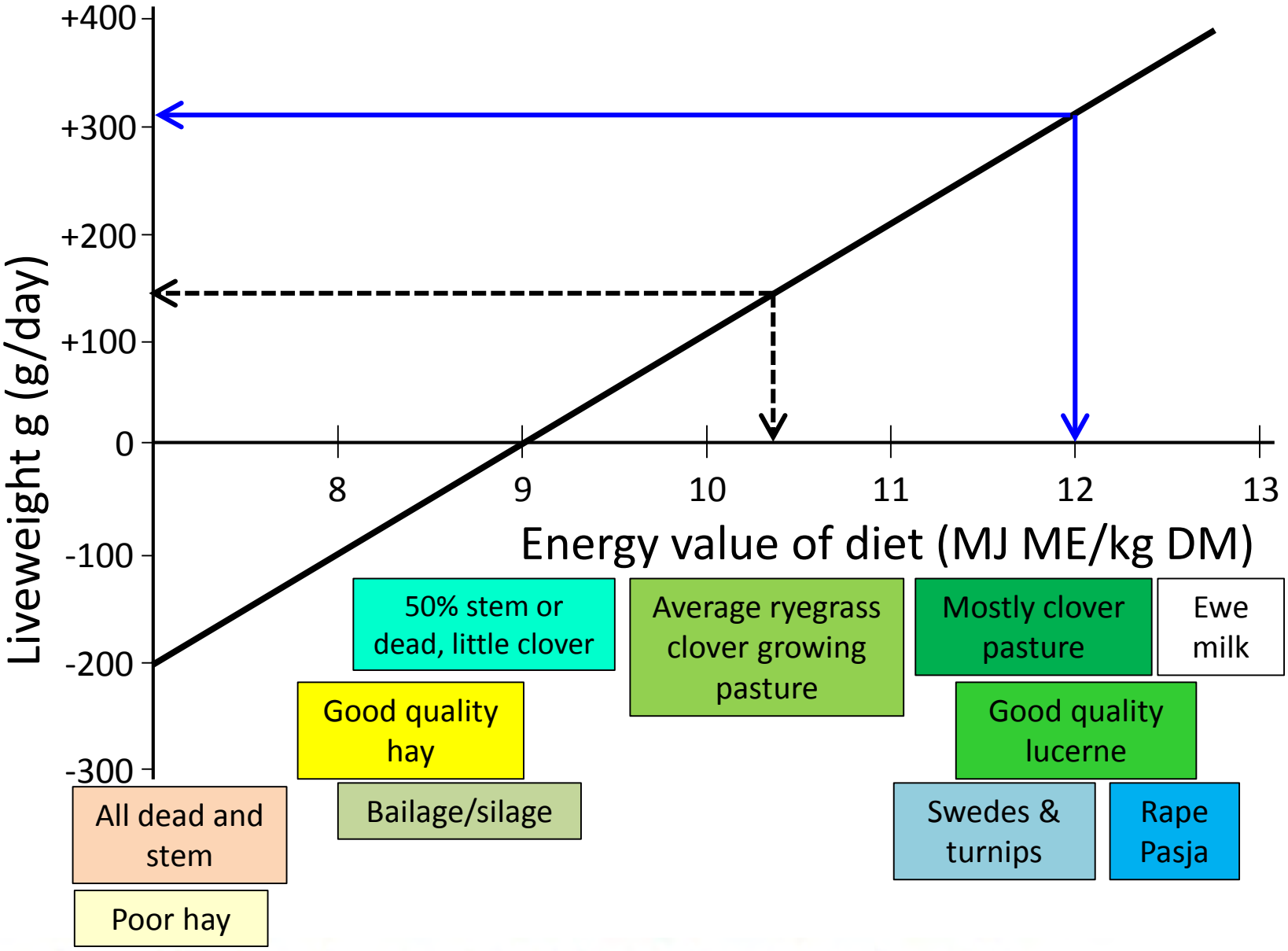
High feeding value pastures have;

- high legume content

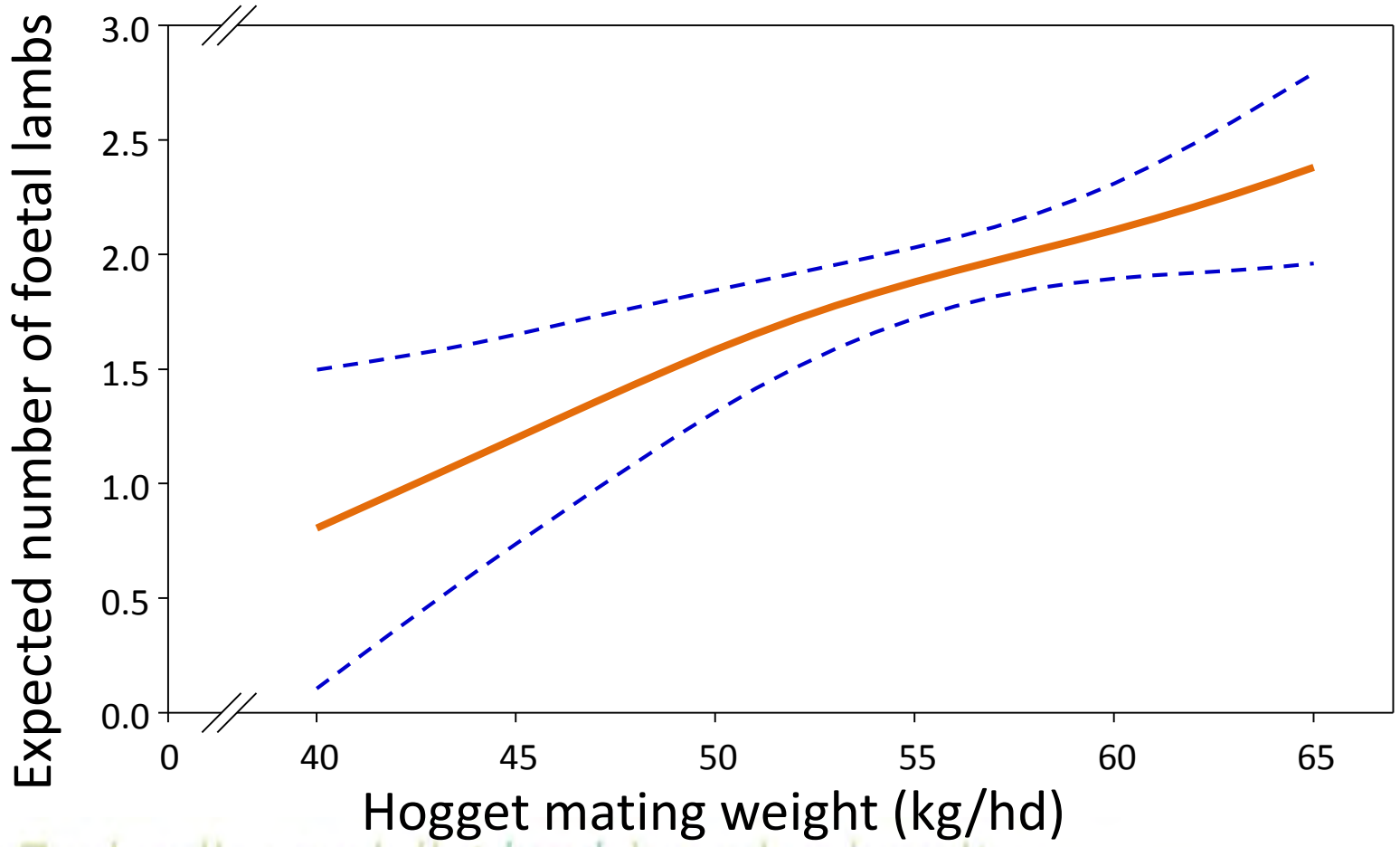
- high leaf content

- low stem content

- young herbage age

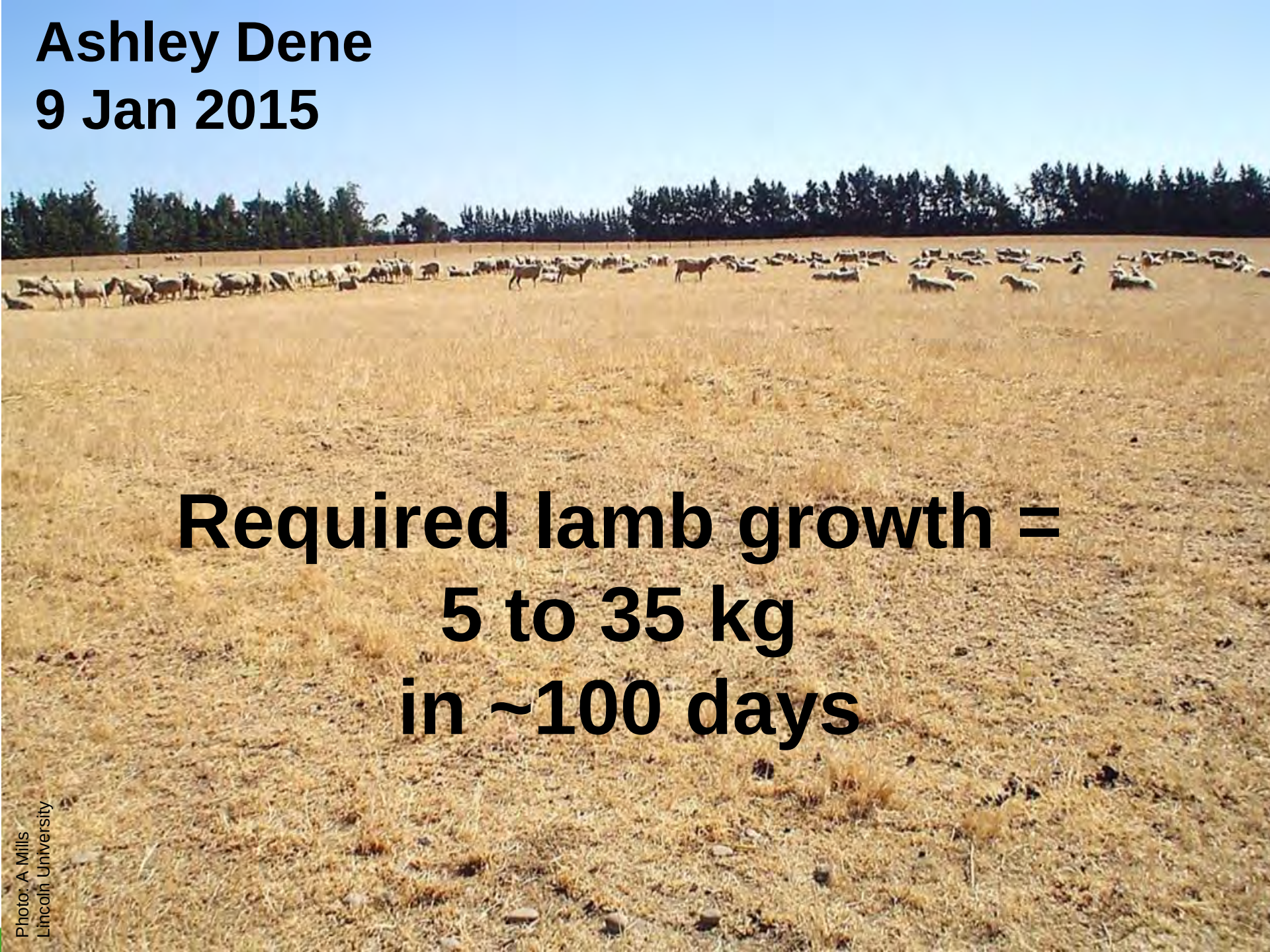


Foetal lambs vs. mating weight



Sheep prefer 70% legume, 30% grass

Photo: Jo Grigg
'Tempello' Marlborough


Ashley Dene
9 Jan 2015
Required lamb growth =
5 to 35 kg
in ~100 days
Photo: A Mills
Lincoln University

Lucerne Objectives

- Describe key establishment issues.
- Describe management to maximise production, quality and persistence.
- Answer any question

Establishment

Soils - deepest free draining soils
- pH 6.0
- RG/Wc fertility

Sowing - 8-10 kg/ha
- 10-25 mm
- peat inoculated 8-10 kg/ha
- ***spring*** *or* ***autumn*** *???*
- cultivated/direct drilled (DAP)

Photo: David Hollander
Lincoln University

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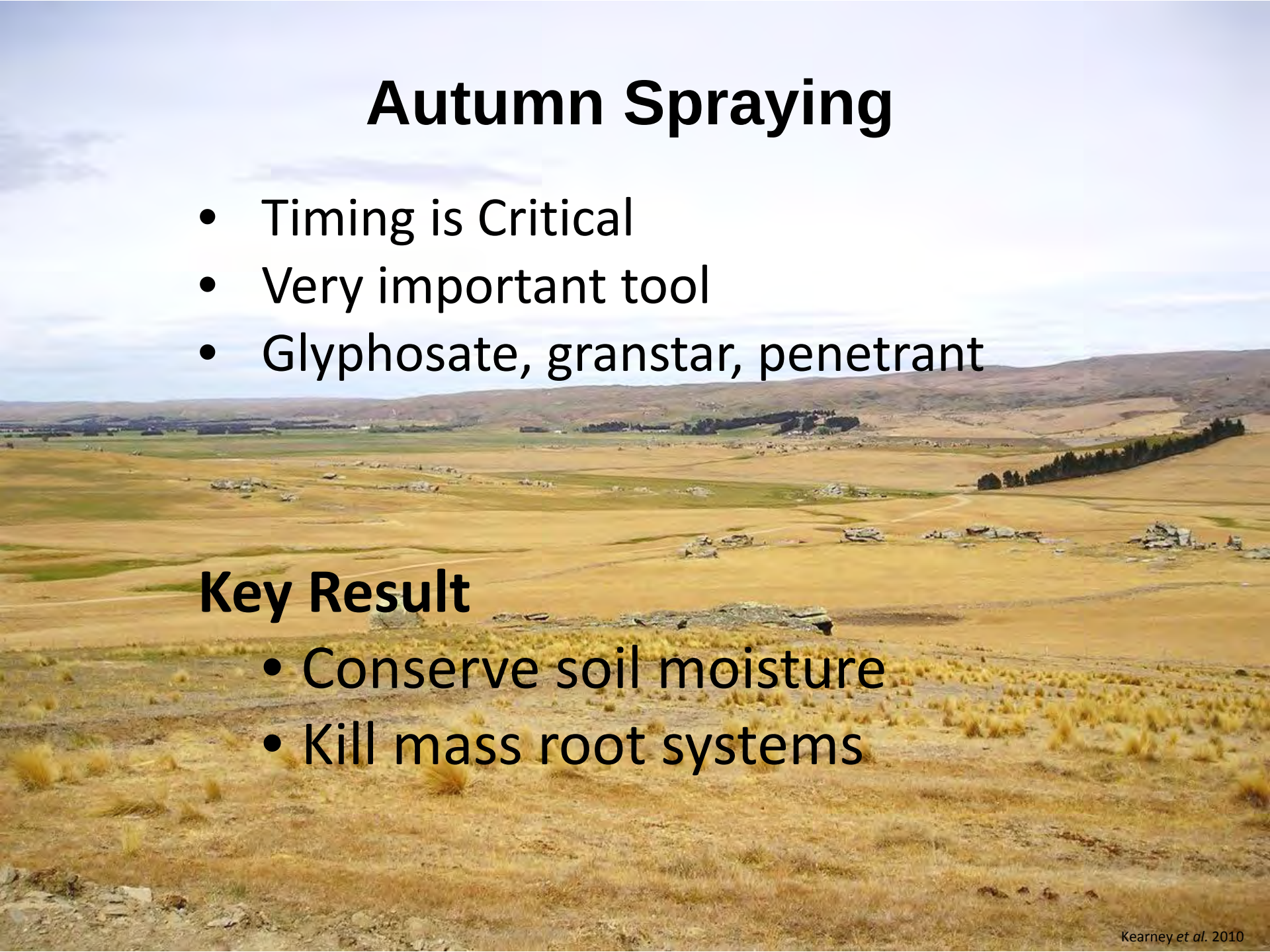
Lucerne root
~8 months after sowing
> 1.5 m length

Autumn Spraying

- Timing is Critical
- Very important tool
- Glyphosate, granstar, penetrant

Key Result

- Conserve soil moisture
- Kill mass root systems



Kearney *et al*. 2010

2nd Spray – Spring

Glyphosate, insecticide, penetrant

Result from Autumn spray, photo taken 1 November 2010

Kearney *et al.* 2010

Drilling seed with fertiliser
Direct drilling = seed + fertiliser

Kearney *et al.* 2010

Sowing rate and date

Established 2007 LU – Templeton silt loam

Coated 'Grasslands Kaituna' lucerne.

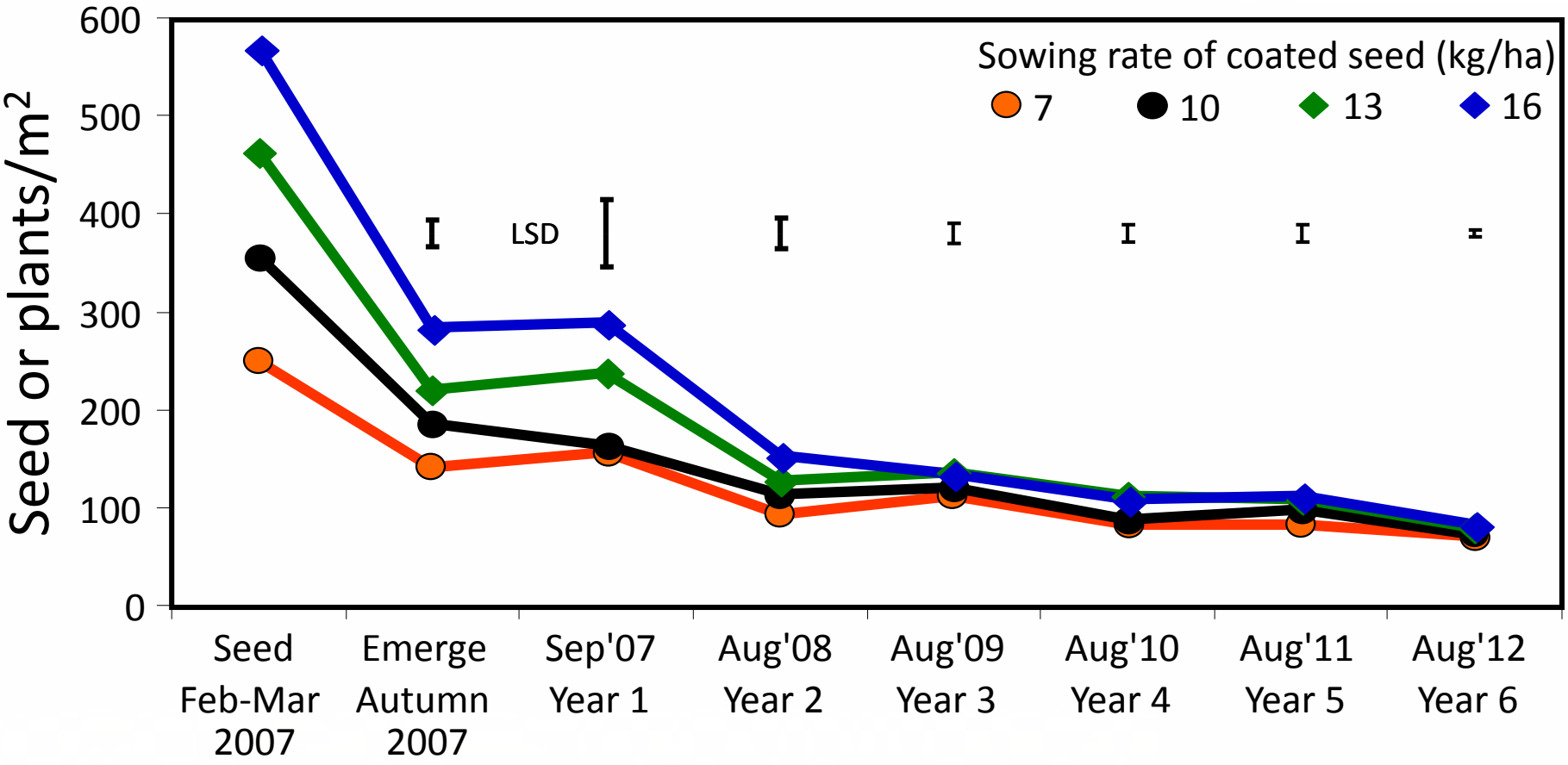
Four sowing dates

- 21 February,
- 2 March,
- 16 March and
- 30 March

Four sowing rates

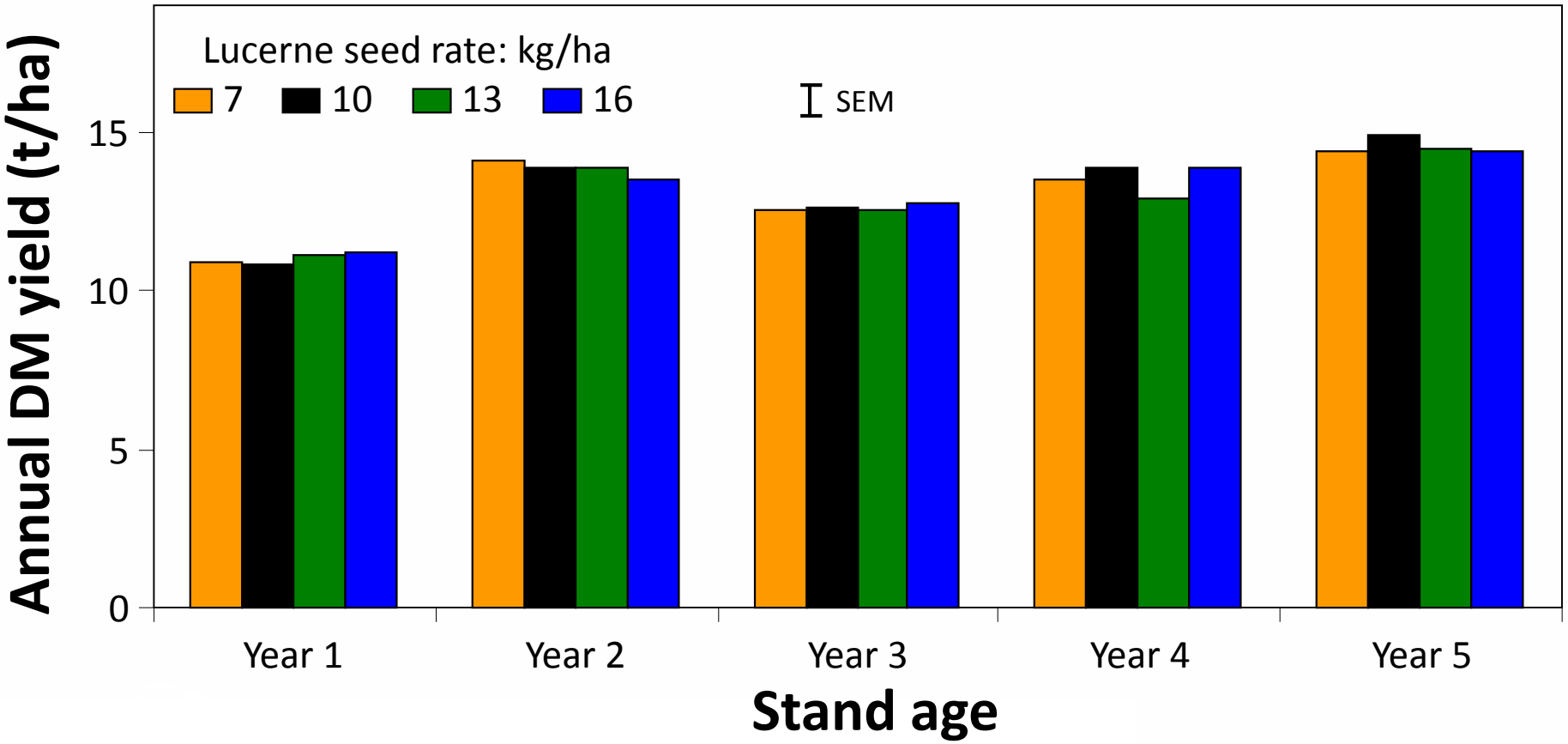
- Equivalent to bare seed @ 7, 10, 13 and 16 kg/ha

Sown seed & plant population over time



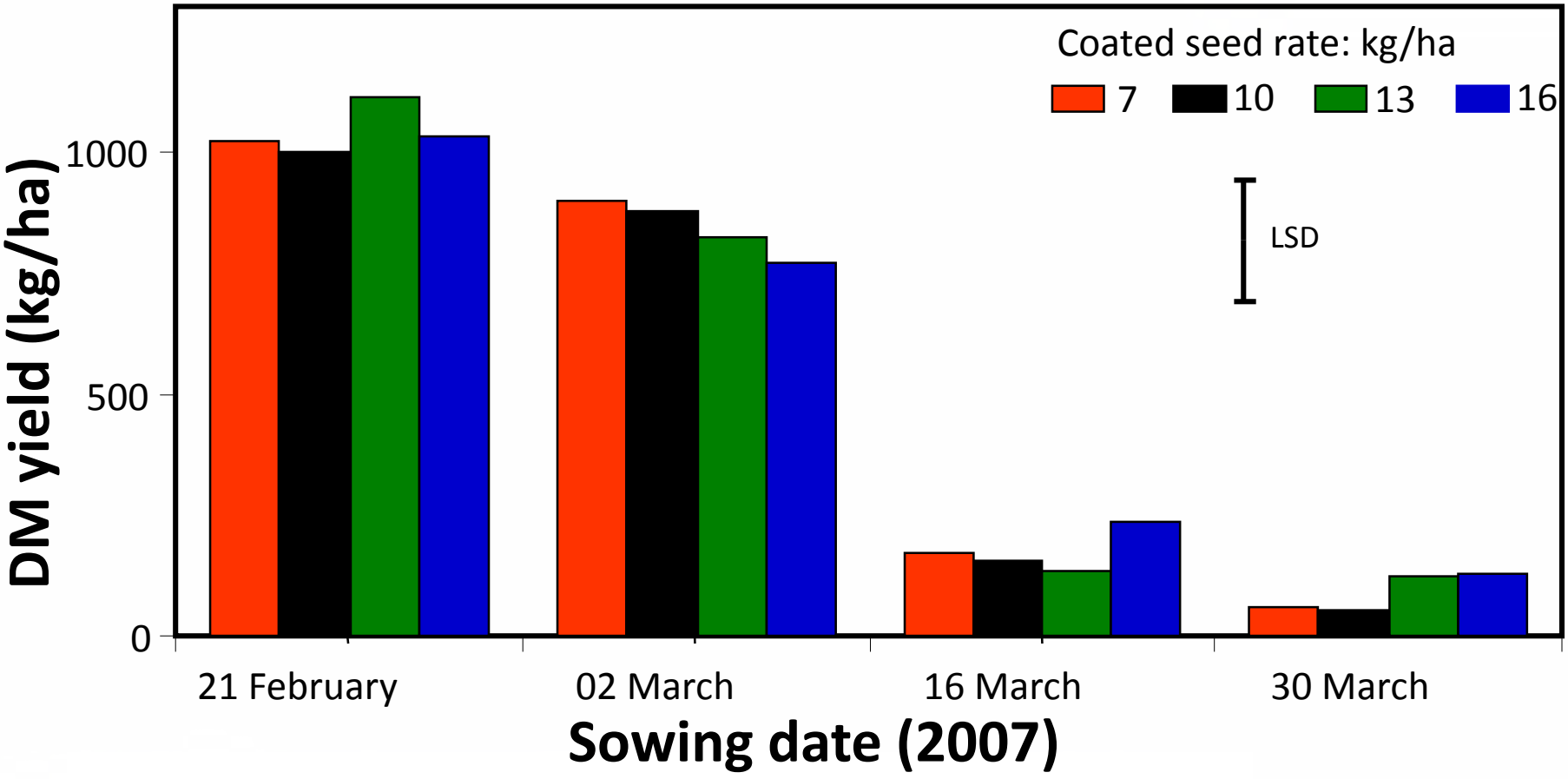
Moot *et al*. 2012

Annual yield in relation to sowing rate



Moot *et al*. 2012

Seedling lucerne yield to early June



Moot *et al*. 2012

Weeds present @ 09 October 2007 (Year 1)

Sown 21 Feb 2007 **Sown 30 Mar 2007**

Weed control

- Ensure adequate control of perennial weeds before sowing lucerne.
- Triflurilan pre sowing – note dry conditions.
- Spinnaker and 2,4 DB post emergence - or graze at 15 cm if weeds are an issues.
- Fathen only lasts one year.
- Minimal winter weed control in Year 0.

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Taproot mass

Establishment

- Pre sowing – fertility and weed control pre sowing
- Firm seed bed for accurate seed depth (1 cm)
- Spring sow – October
- First crop cut – December
- Graze earlier if weedy - then flowering
- Start rotational grazing in January 15-30 cm
- Don’t need 10% flowering

- Be patient!

Growth:

is dry matter accumulation as a result of light interception and photosynthesis

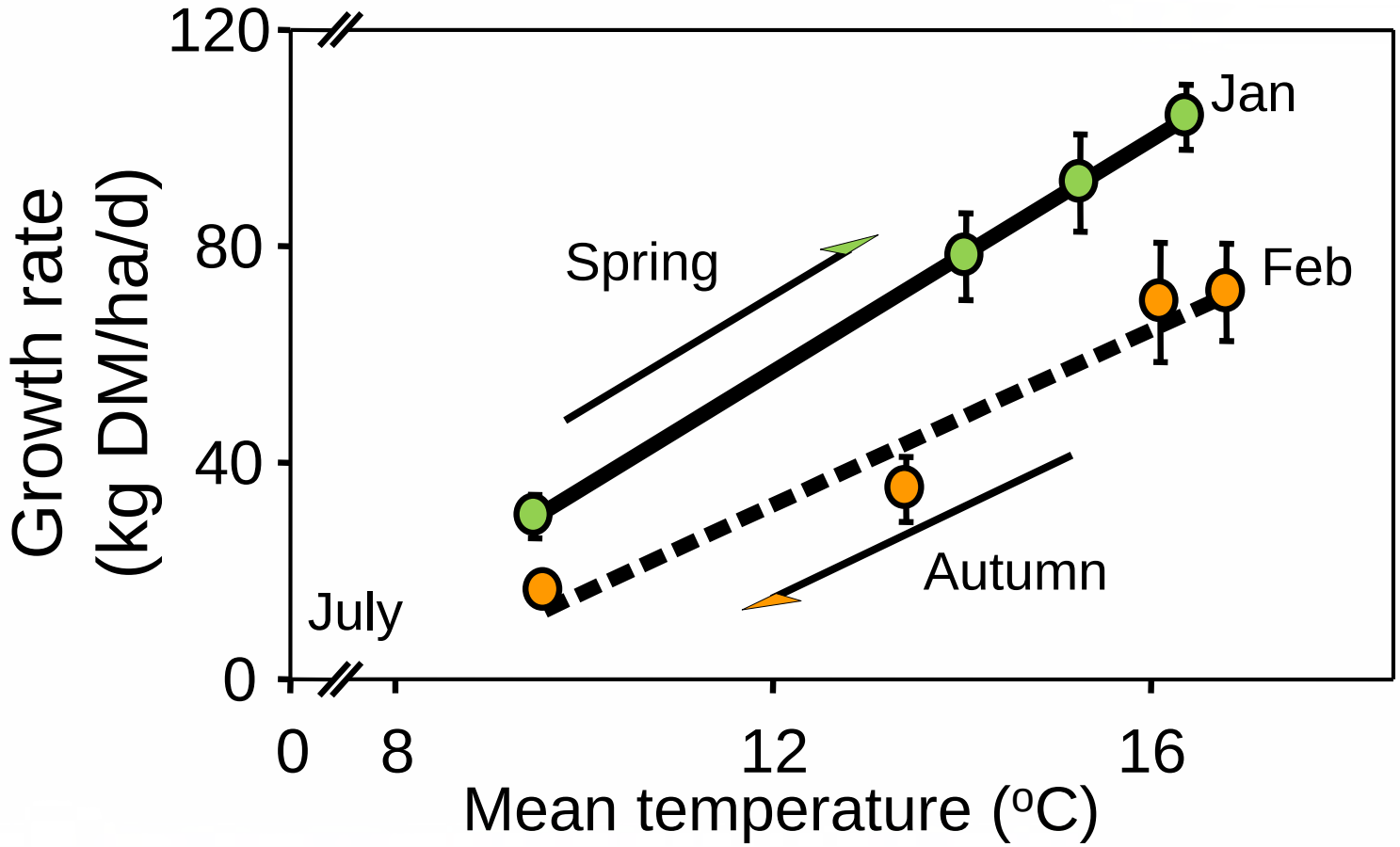
Development:

is the ‘age’ or maturity of the regrowth crop
e.g. leaf appearance, flowering

Growth and development are both influenced by environmental signals

The canopy:
the energy capture device

Vegetative growth



Moot *et al.* 2003

Experiment 2 flexible grazing

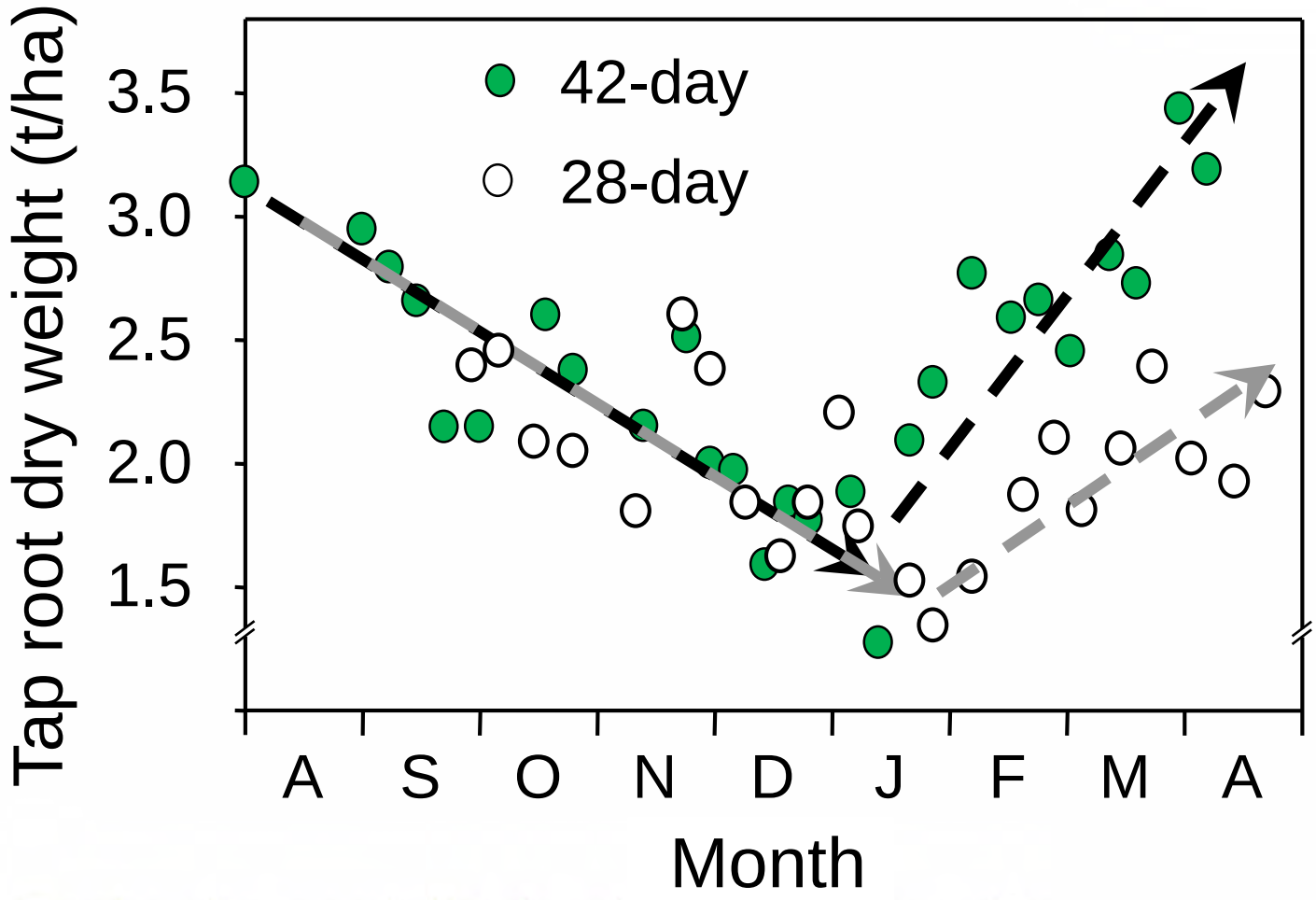
38 days resting

4 days grazing

25 days resting

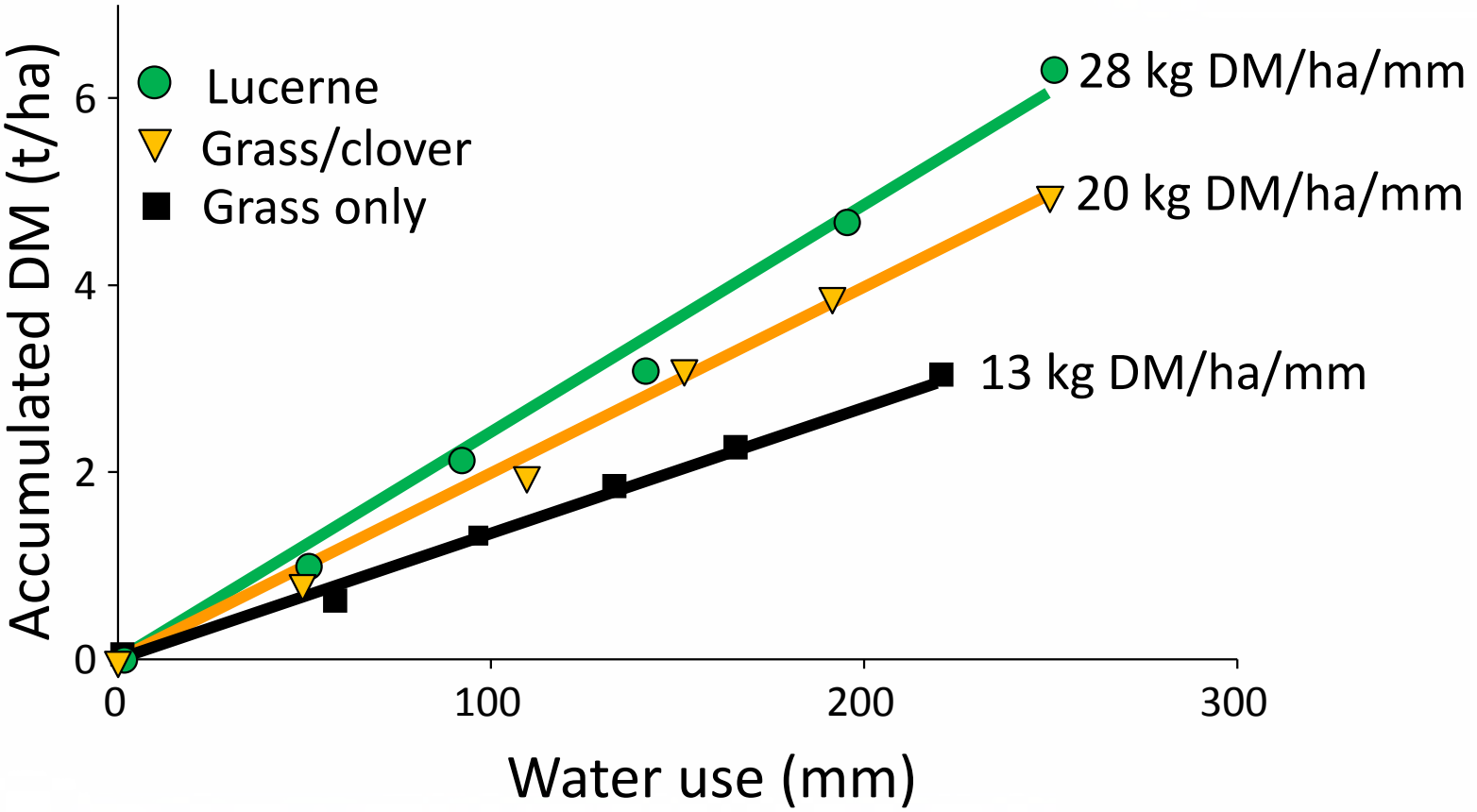
3 days grazing

Partitioning to roots



Moot *et al*. 2003

Spring WUE



Moot *et al*. 2008

Seasonal grazing management

Spring

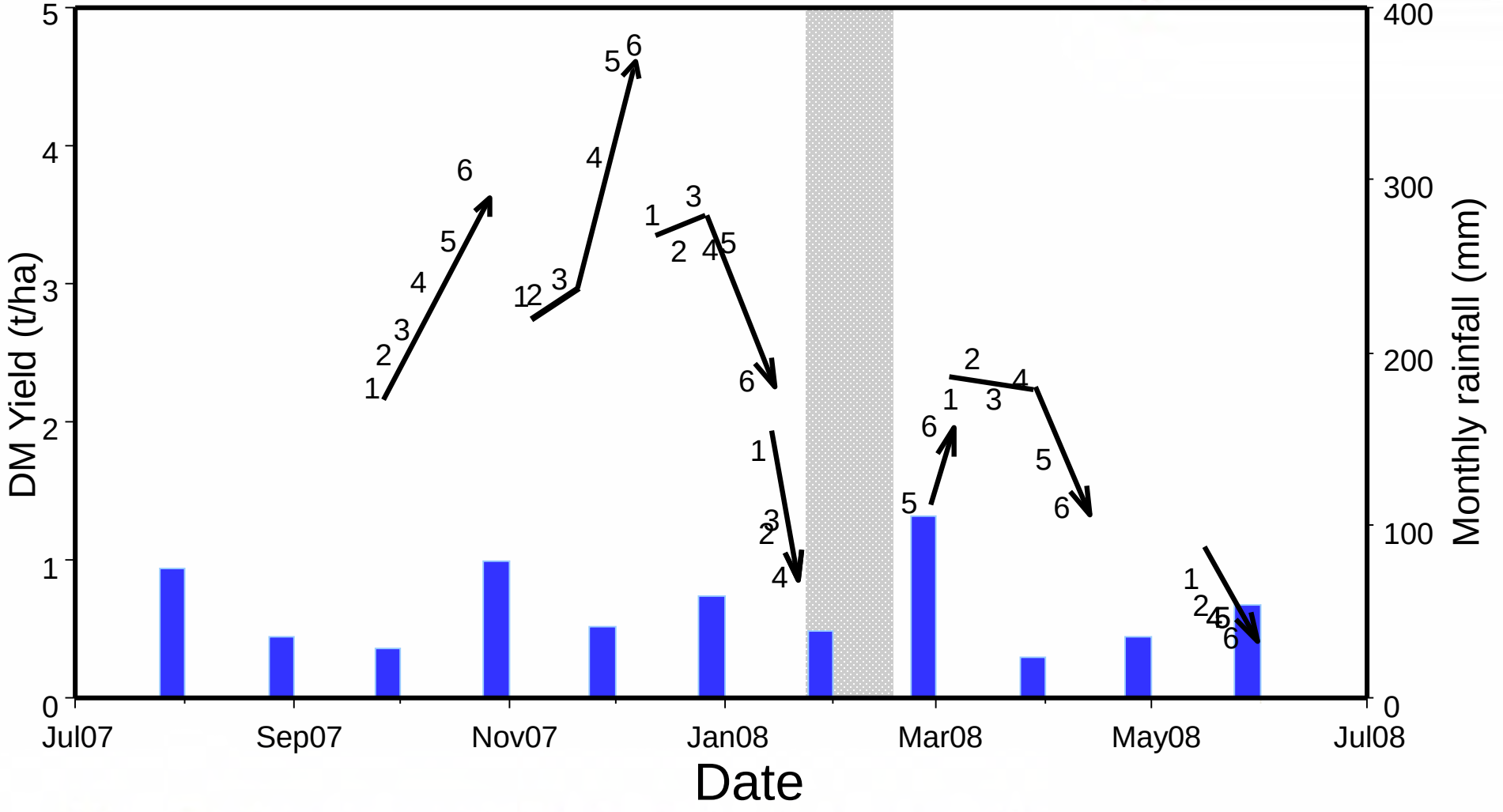
- 1st rotation aided by root reserves to produce high quality vegetative forage.

- can graze before flowers appear (~1500 kg DM/ha) ideally ewes and lambs but

Growing point at the top of the plant

Rotation 1 Pre-graze
Plot 1 (21/9/07)
2.3 t DM/ha
20-25 cm tall

MaxClover – 38-42 day rotation



5th September 2011 – Cave, South Canterbury

Photo: DJ Mobi
Lincoln University

Photo: HE Brown
Lincoln University


12 Sep 2001
cm
18
16
14
12
10
8
6
4
2
0
Photo: HE Brown
Lincoln University

Photo: HE Brown
Lincoln University

Photo: 'Bonavaree, Marlborough

Spring grazing

Seasonal grazing management

Spring/summer (Nov-Jan)

- Priority is stock production (lamb/beef/deer)
- Graze 6-8 weeks solely on lucerne
- 5-6 paddock rotation stocked with one class of stock (7-10 days on)
- Allowance 2.5-4 kg DM/hd/d – increase later in season

High numbers for 7-10 days

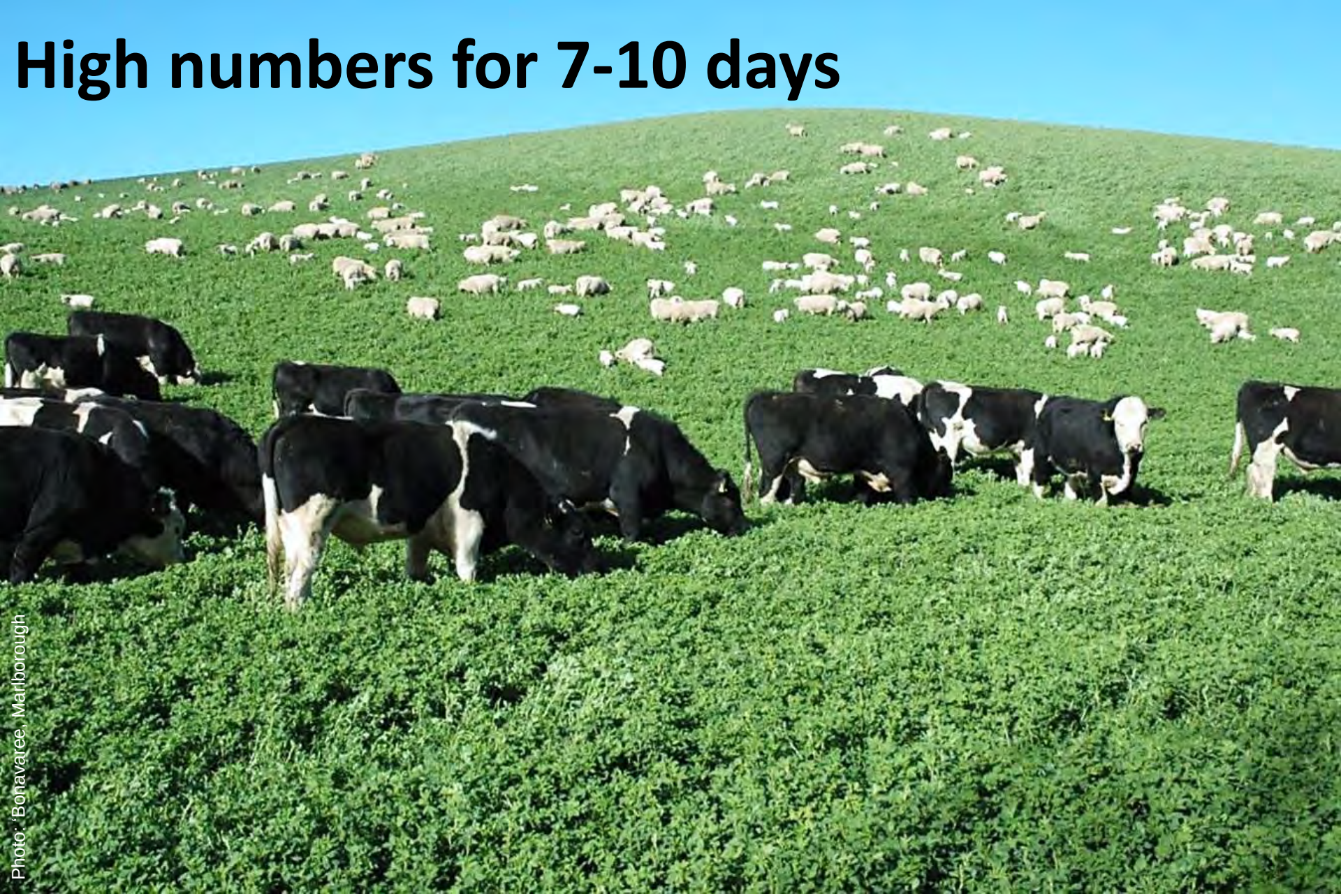


Photo: Bonavaree, Marlborough

Fibre and salt

Photo: Doug Avery, 'Bonavaree', Marlborough 6/10/2015

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Pre graze mow

Seasonal grazing management

Early autumn (Feb-April)

- terminal drought ⇒ graze standing herbage
- allow 50% flowering
- long rotation (42 days) somewhere between Jan and end of May.

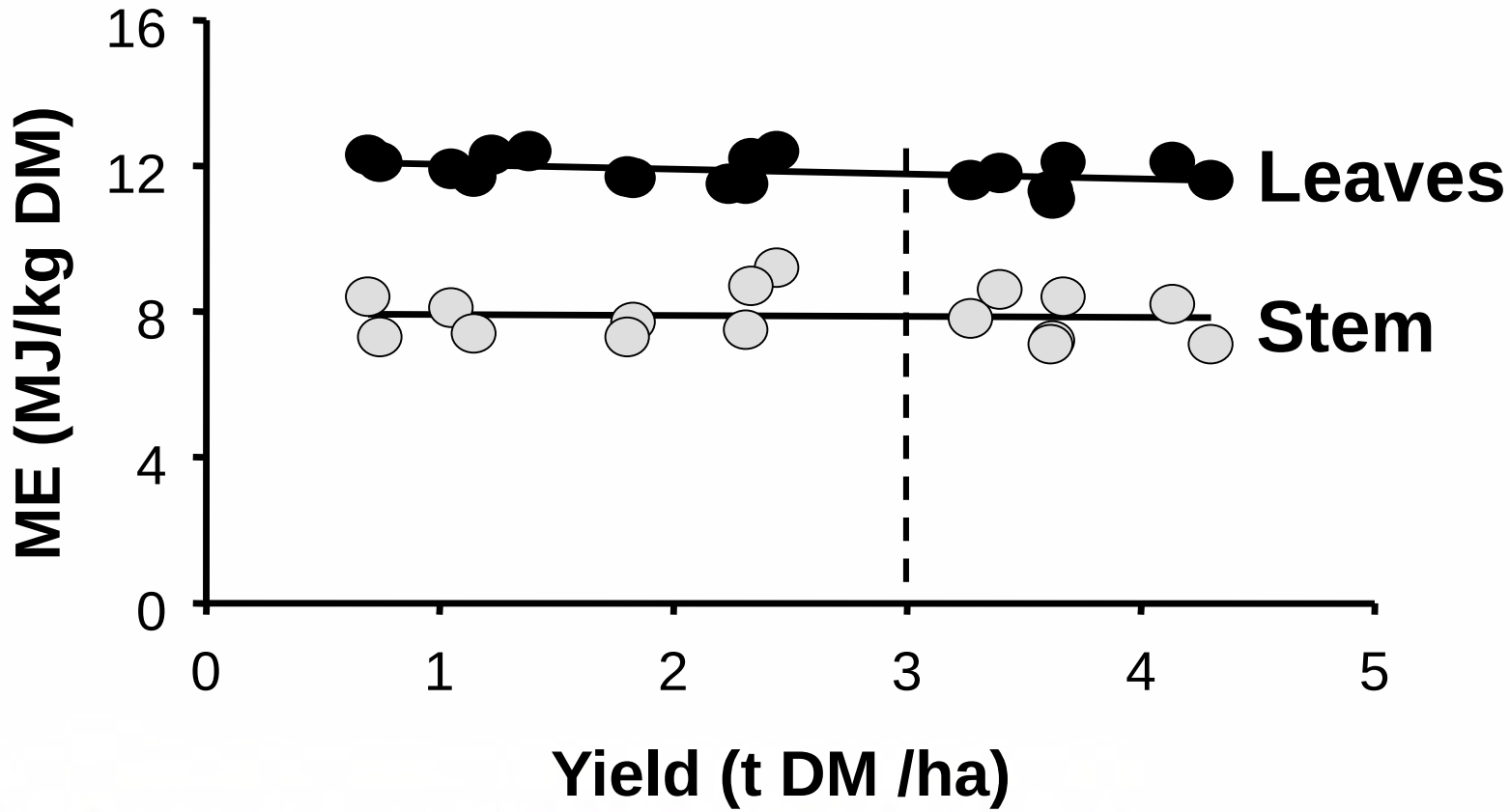
⇒ build-up root reserves for spring growth and increase stand persistence

Autumn = flowering plants

Photo: 'M' Smith
Lincoln University

Rotation 4 Pre-graze
Plot 6 (28/2/08)
2.0 t DM/ha produced in 51 d

Metabolisable energy of lucerne



Brown & Moot 2004

Fertilizer

- Higher requirement from cutting than grazing
  - 2% K = 20 kg/ha/t DM removed

- 50% K super = 80 kg/ha/t DM removed

Or

- KCL = 40kg/ha/t DM removed + P and S from super

Photo: DJ Moot
Lincoln University

Animal health

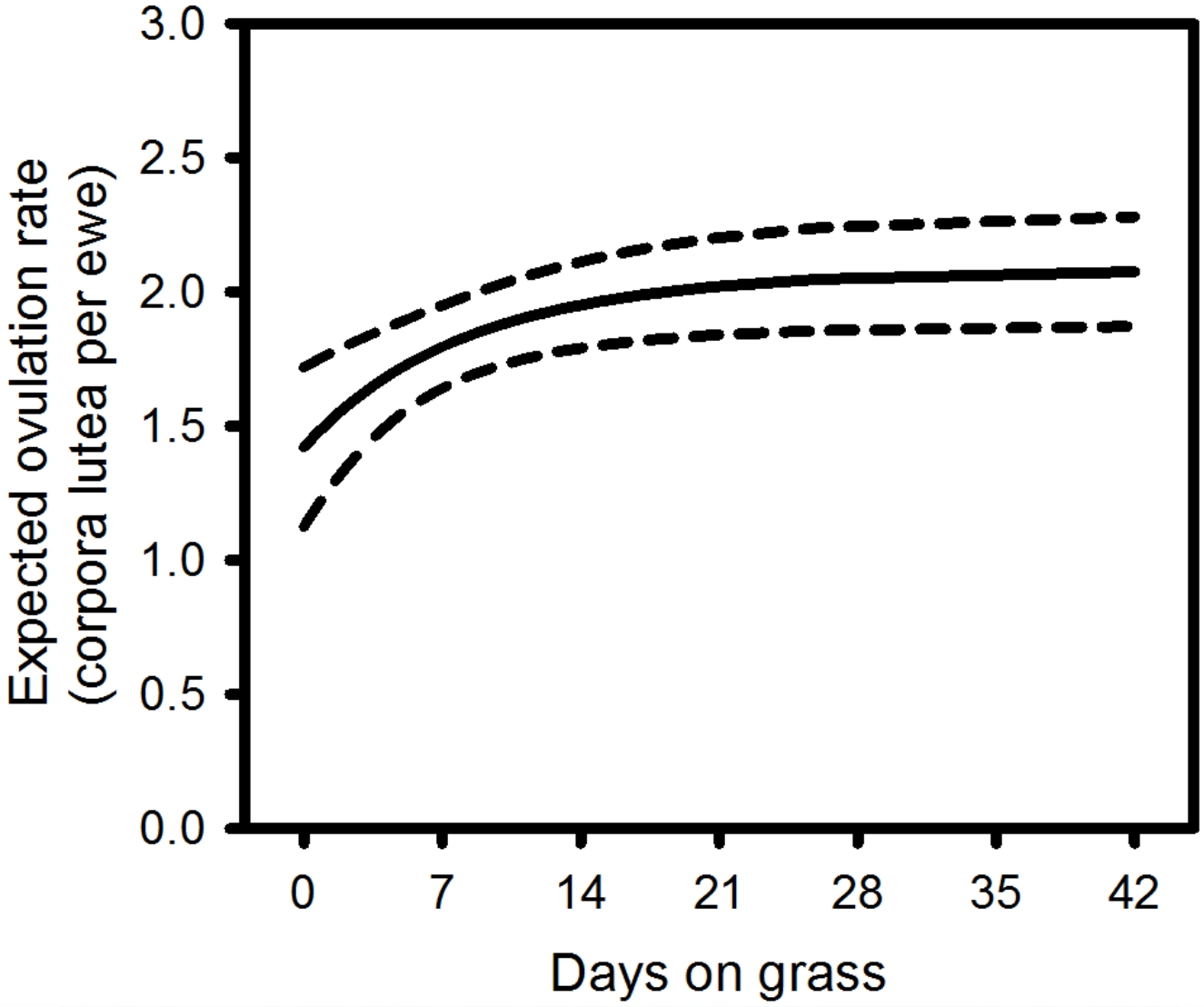
- **Clostridial bacteria:** vaccinate
- **Cobalt:** vitamin B12 injection
- **Worm haven:** Camping on small area – river edge?
- **Avoid flushing if:** leaf spots or dull weather

When is coumestrol high?

- Ranges from 0 to 600 mg/kg.
- **>25 mg/kg** sufficient to reduce ewe ovulation rate.
- Produced in response to fungal pathogens.

Fields *et al*. 2017

Two weeks off lucerne was sufficient for recovery.



Fields *et al*. 2017

Animal health

- **Redgut:** problem on high quality feeds – fibre
- **Bloat:** cattle more than sheep – capsules
- **Na def.** (0.03%): salt licks/fence-line weeds/pasture
- Require 0.11% Na - sheep/beef/dairy

Conclusions

- Start spring grazing at 15- 20 cm
- Quality maximized at 30 cm
- Leaf and soft stem are highest quality
- Ignore residual
- Drop out paddocks if recovery is rapid
- Allow a period of extended growth in autumn
- Wet autumn - use grass
- Weed control essential in wet seasons

References

Brown, H. E. and Moot, D. J. 2004. Quality and quantity of chicory, lucerne and red clover production under irrigation. *Proceedings of the New Zealand Grassland Association*, **66**, 257-264.

Fields, R.L., Moot, D.J., Barrell, G. 2017. Identifying oestrogenic lucerne crops and pre-mating ewe management. Extension Report. 4 pp. Online: http://www.lincoln. ac.nz/PageFiles/28807/2017-Coumestrol-Extension-Report.pdf

Kearney, J. K., Moot, D. J. and Pollock, K. M. 2010. Dryland lucerne production in Central Otago. *Proceedings of the New Zealand Grassland Association*, **72**, 121-126.

Kerr, P., 2010. 400 plus - a guide to improved lamb growth. New Zealand Sheep Council in association with WoolPro and Meat New Zealand.

Lucas, R.J., Smith, M.C., Jarvis, P., Mills, A. and 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. and Jamieson, P.D., 2009. Quantifying the effect of nitrogen of productivity of cocksfoot (*Dactylis glomerata* L.) pastures. European Journal of Agronomy, 30: 63-69.

Mills, A., Moot, D.J. and McKenzie, B.A., 2006. Cocksfoot pasture production in relation to environmental variables. Proceedings of the New Zealand Grassland Association, 68: 89-94.

Moot, D. J., Brown, H. E., Pollock, K. and 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., Brown, H. E., Teixeira, E. I. and Pollock, K. M. 2003. Crop growth and development affect seasonal priorities for lucerne management. *In:* D. J. Moot (ed). Legumes for Dryland Pastures Proceedings of a New Zealand Grassland Association Inc Symposium held at Lincoln University, 18-19 November, 2003, 201-208.

Moot, D. J., Pollock, K. M. and Lewis, B. 2012. Plant population, yield and water use of lucerne sown in autumn at four sowing rates. *Proceedings of the New Zealand Grassland Association*, **74**, 97-102.

Moot, D. J. and Smith, M. 2011. Practical Lucerne Management Guide. 9 pp. Online: http://www.lincoln.ac.nz/Documents/Dryland-Pasture-Research/presentations/Lucerne-management-guide-Col.pdf.

Sim, R. E. 2014. Water extraction and use of seedling and established dryland lucerne crops. PhD thesis, Lincoln University, Lincoln, Canterbury. 264 pp.