Sheparton, Victoria
28th July 2014

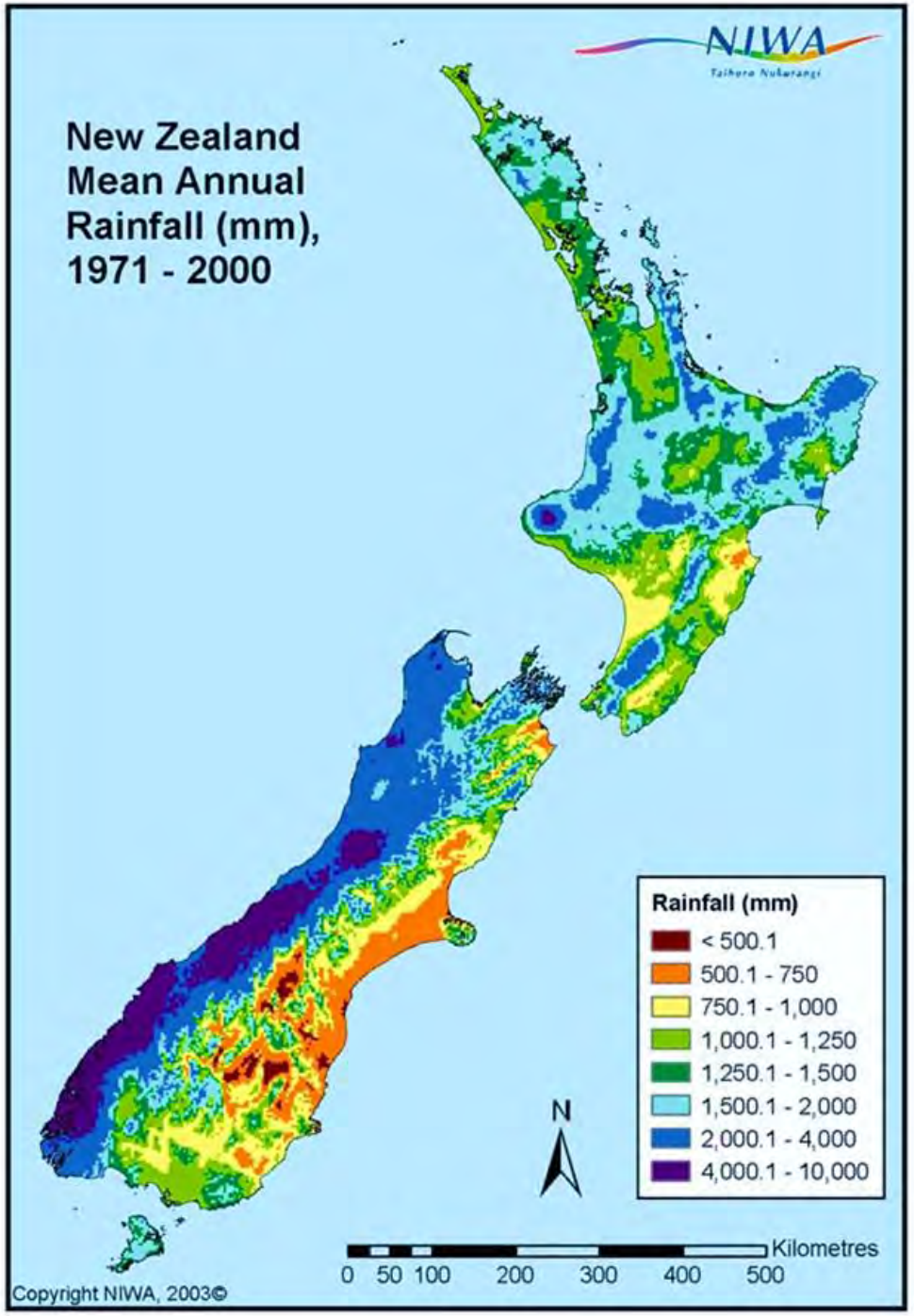
Lincoln University
Te Whare Wānaka o Aoraki
CHRISTCHURCH·NEW ZEALAND

Lucerne
Agronomy

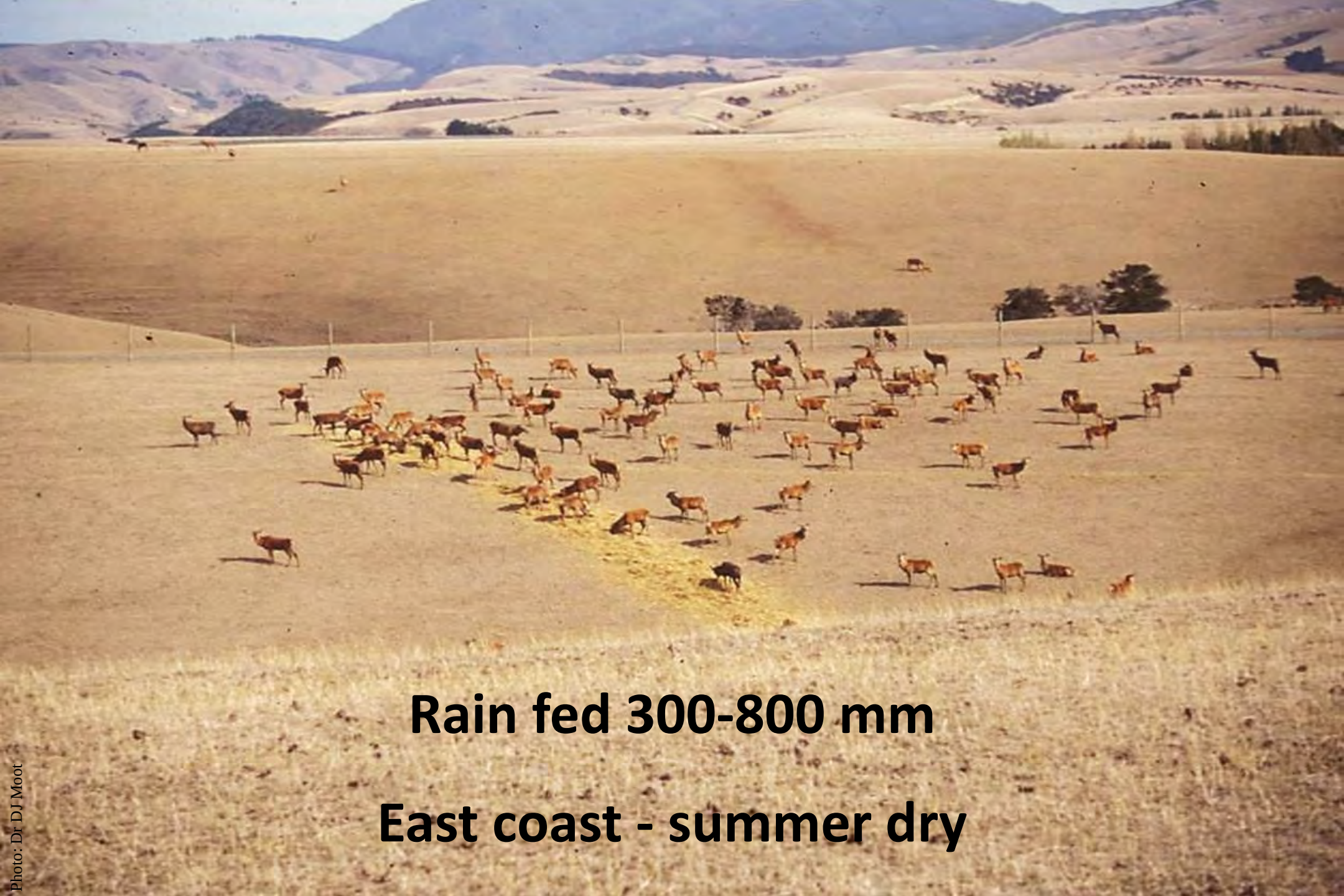
Dr Derrick Moot
Professor of Plant Science

New Zealand's specialist land-based university

Strong rainfall gradient
West ⇒ East



Source: NIWA 2013


Rain fed 300-800 mm
East coast - summer dry
Photo: Dr DJ Moot

Objectives

- Outline the role of lucerne in New Zealand farming systems
- Describe management to maximise production, quality and persistence
- Quantify perennial ryegrass growth in relation to nitrogen and water
- www.lincoln.ac.nz/dryland

Growth vs. Development

Growth:

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

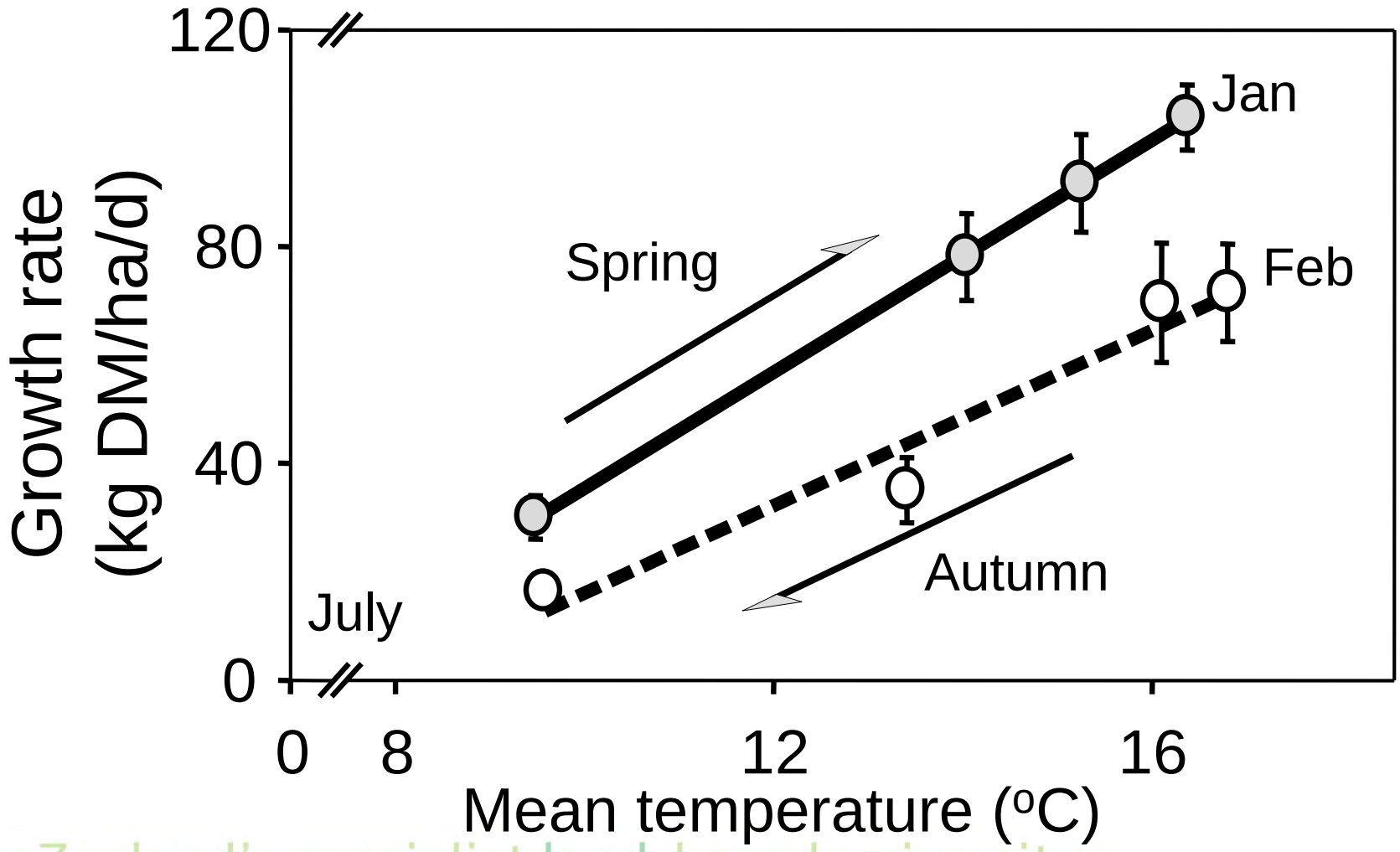
Development:

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



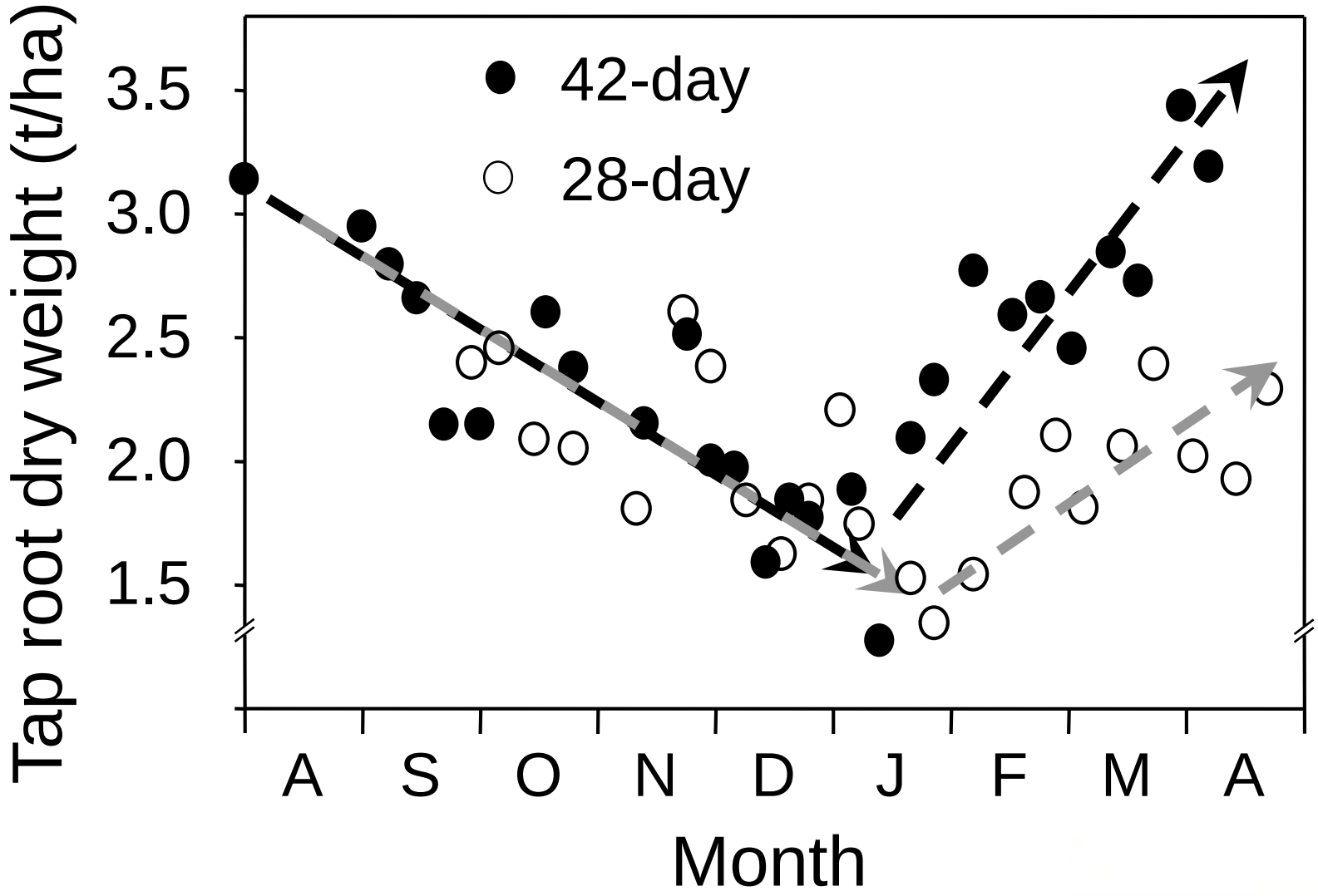
Source: Moot *et al*. 2003

Experiment 2 flexible grazing

Photo: Dr El Teixeira

What's going on down there?

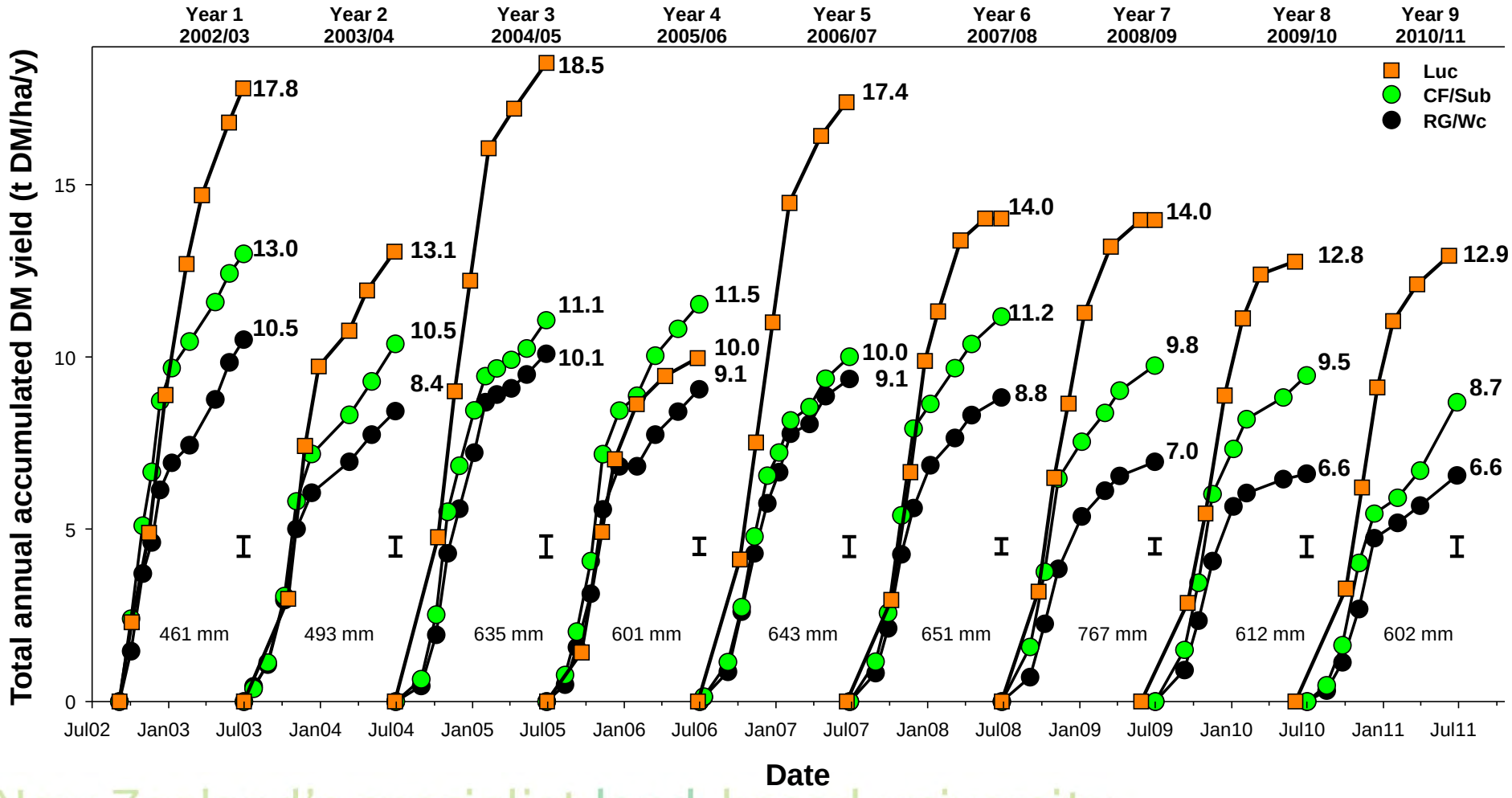
Partitioning to roots



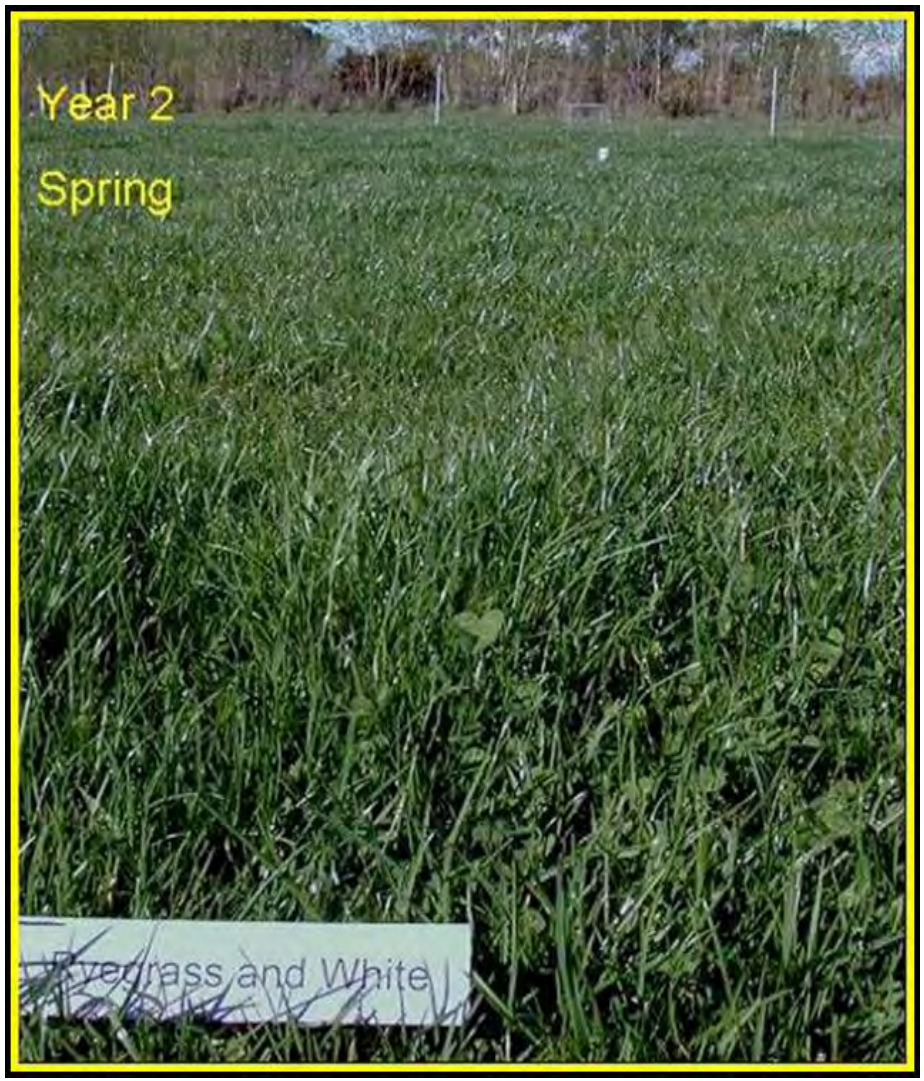
Source: Moot *et al*. 2003

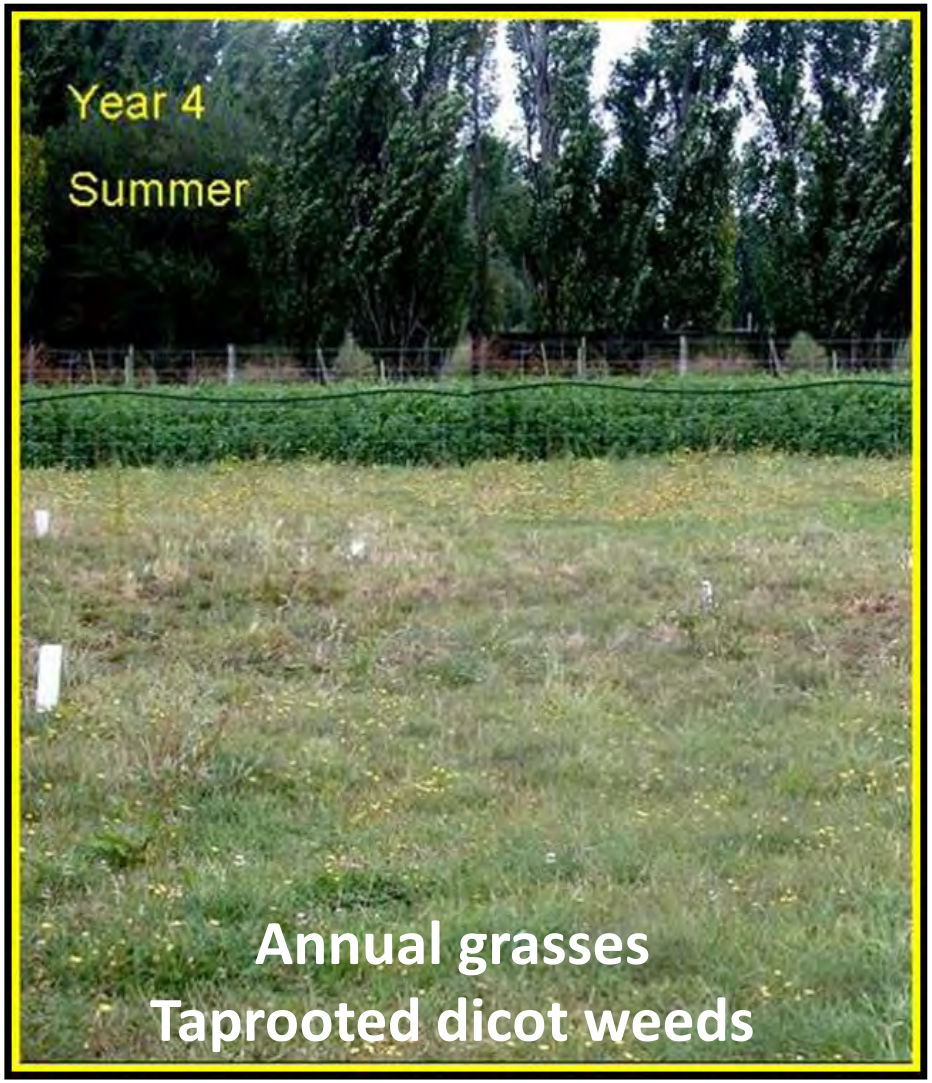
Grazing Expt. - ‘MaxClover’

MaxClover Total DM yields



Source: Moot 2012



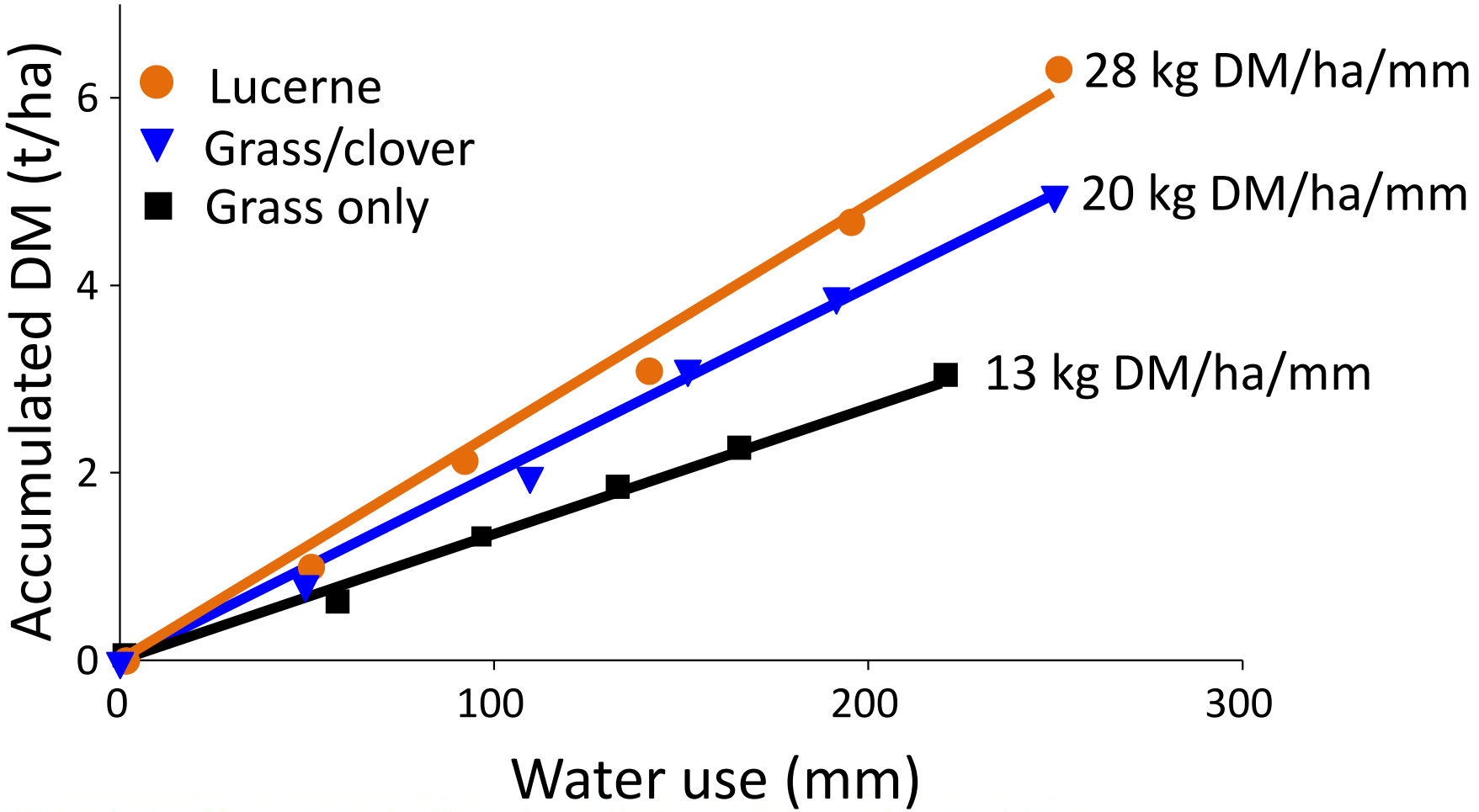


Unsown species <5% in Year 1 …….>45% in Year 6

RG/Wc pastures

Mills et al. 2010; 2014

Spring WUE



Source: Moot *et al.* 2008

SERVANT LEADER

Extension – solution to every problem

Seasonal grazing management

Spring

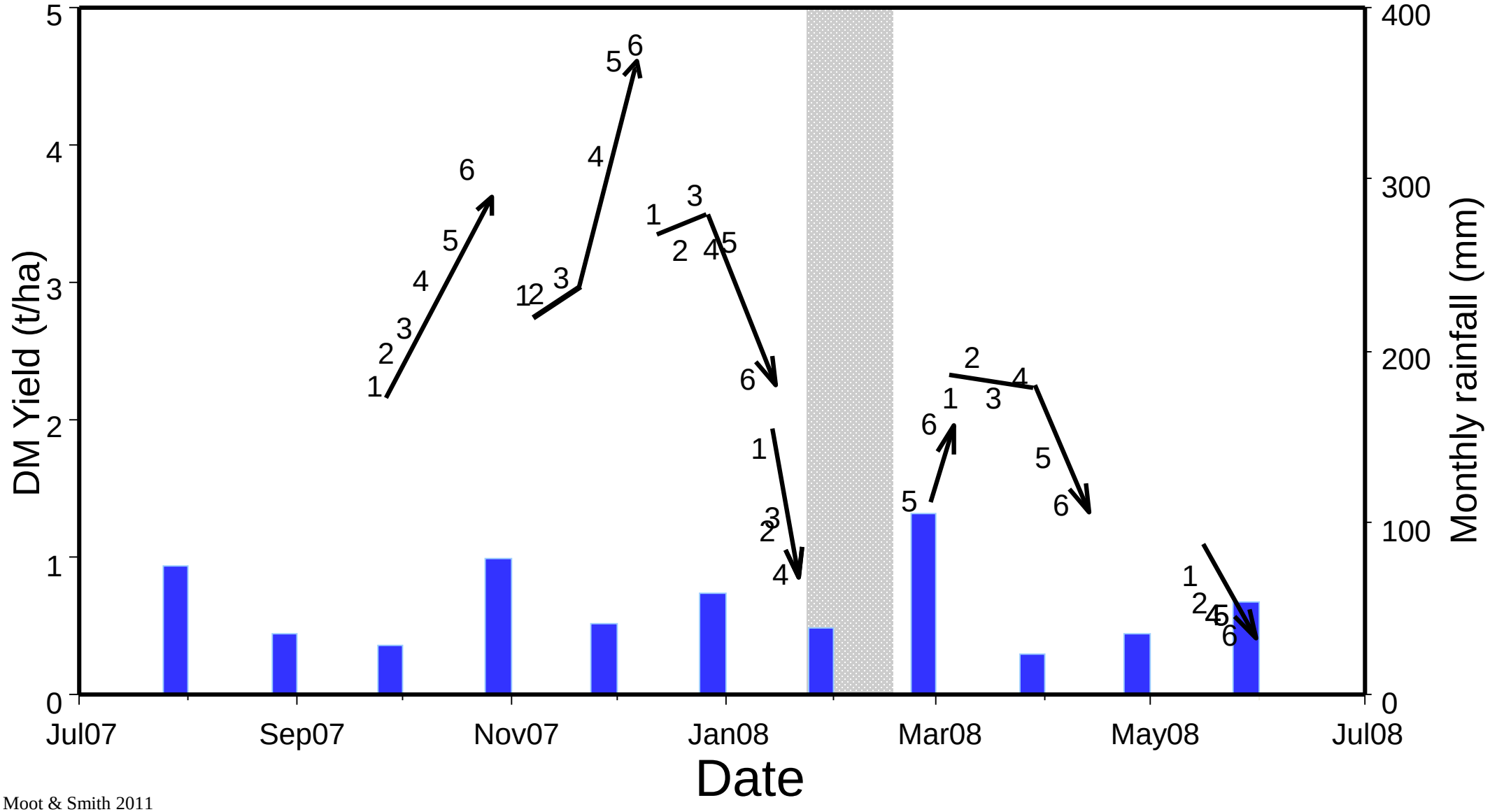
- 1st rotation aided by root reserves to produce high quality vegetative forage.

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

<u>Growing point at the top of the plant</u>

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

MaxClover – 38-42 day rotation



Moot & Smith 2011
Practical Lucerne Management Guide

Rotation 2 Pre-graze
Plot 1 (2/11/07, 38 d)
2.9 t DM/ha
35-40 cm tall

5th September 2011 – Cave Sth Canterbury

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Stocking rates in New Zealand

- Spring 14 ewes plus twins/ha
- Summer 70 lambs/ha
- Ideally 7-14 days maximum on any one paddock
- Less intensive systems – don’t open the canopy

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


Bonavaree Marlborough
14 ewes + twins/ha

High numbers for 7-10 days

'Bonavaree' Marlborough

Fibre and salt

Maximize reliable spring growth – high priority stock

'Bonavaree' Marlborough

Seasonal grazing management

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Early autumn (Feb-April)

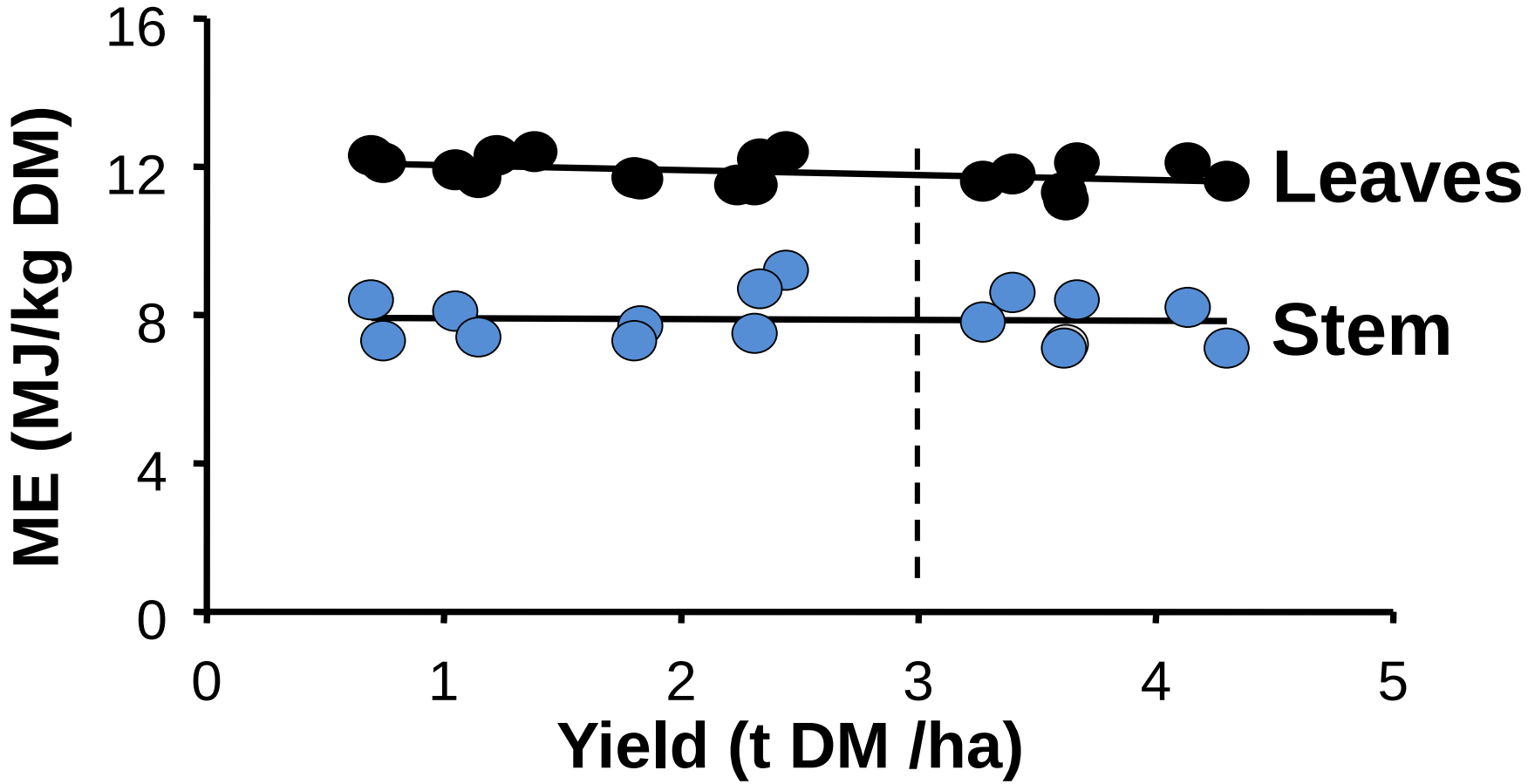
- terminal drought ⇒ graze standing herbage
- allow 50% flowering
- long rotation (42 days) somewhere between Jan and end of May.

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

Autumn = flowering plants
But don't flush on this!

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

Metabolisable energy of lucerne



Source: Brown & Moot 2004

Animal health

- **Clostridial bacteria:** vaccinate
- **Cobalt:** vitamin B12 injection
- **Worm haven:** Camping on small area – river edge?
- **Avoid flushing if:** leaf spots or flowering lucerne
  - new regrowth or tops only are O.K.

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

Establishment

Soils
- deepest free draining soils
- $pH_{(H_2O)}$ 6.0 (….or 5.2 in CaCl)
- RG/Wc fertility

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

Lucerne root

~8 months after sowing

> 1.5 m length

Photo: D. Hollander
Lincoln University

Autumn Spraying

Timing is Critical

Most important tool

Glyphosate, granstar, penetrant

Key Results

Conserve soil moisture

Kill mass root systems

Source: Kearney *et al.* 2010

Drilling seed with fertiliser
Direct drilling = seed + fertiliser

Sowing rate and date

Established 2007 LU – Templeton silt loam

Coated 'Grasslands Kaituna' lucerne.

Four sowing dates

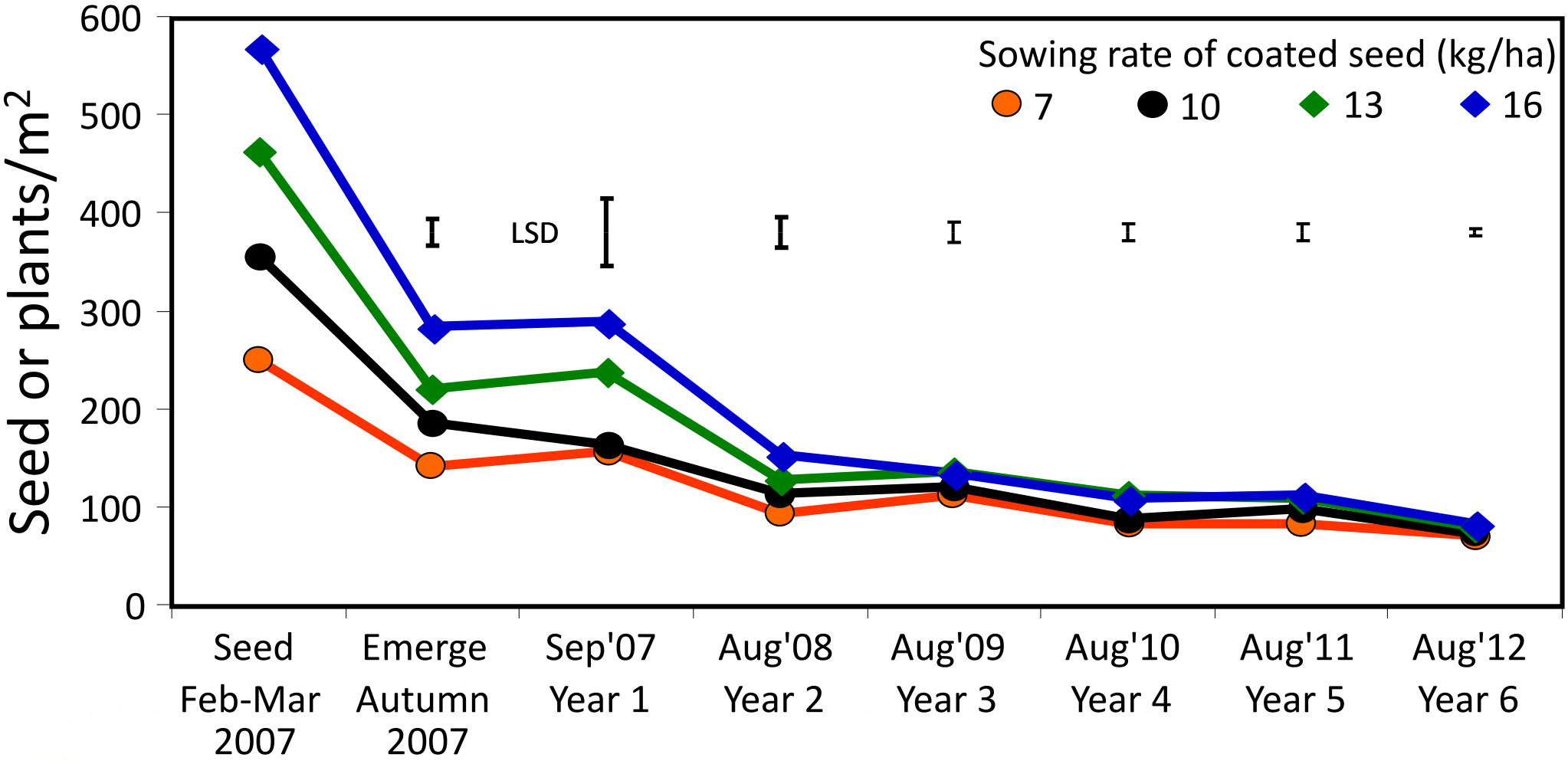
- **21 February,**
- **2 March,**
- **16 March and**
- **30 March**

Four sowing rates

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

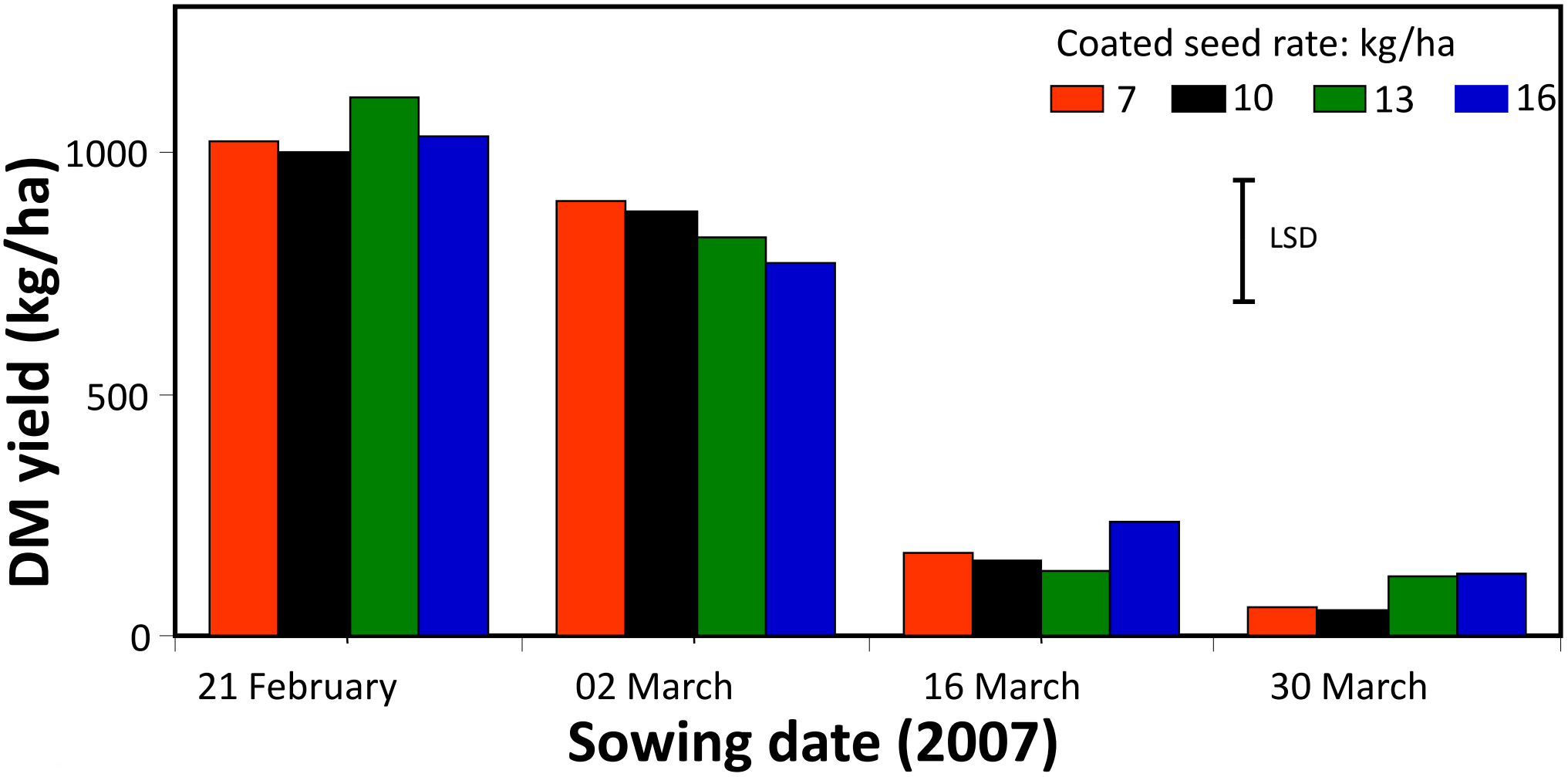
Source: Moot *et al*. 2012

Sown seed & plant population over time



Source: Moot *et al*. 2012

Seedling lucerne yield to early June

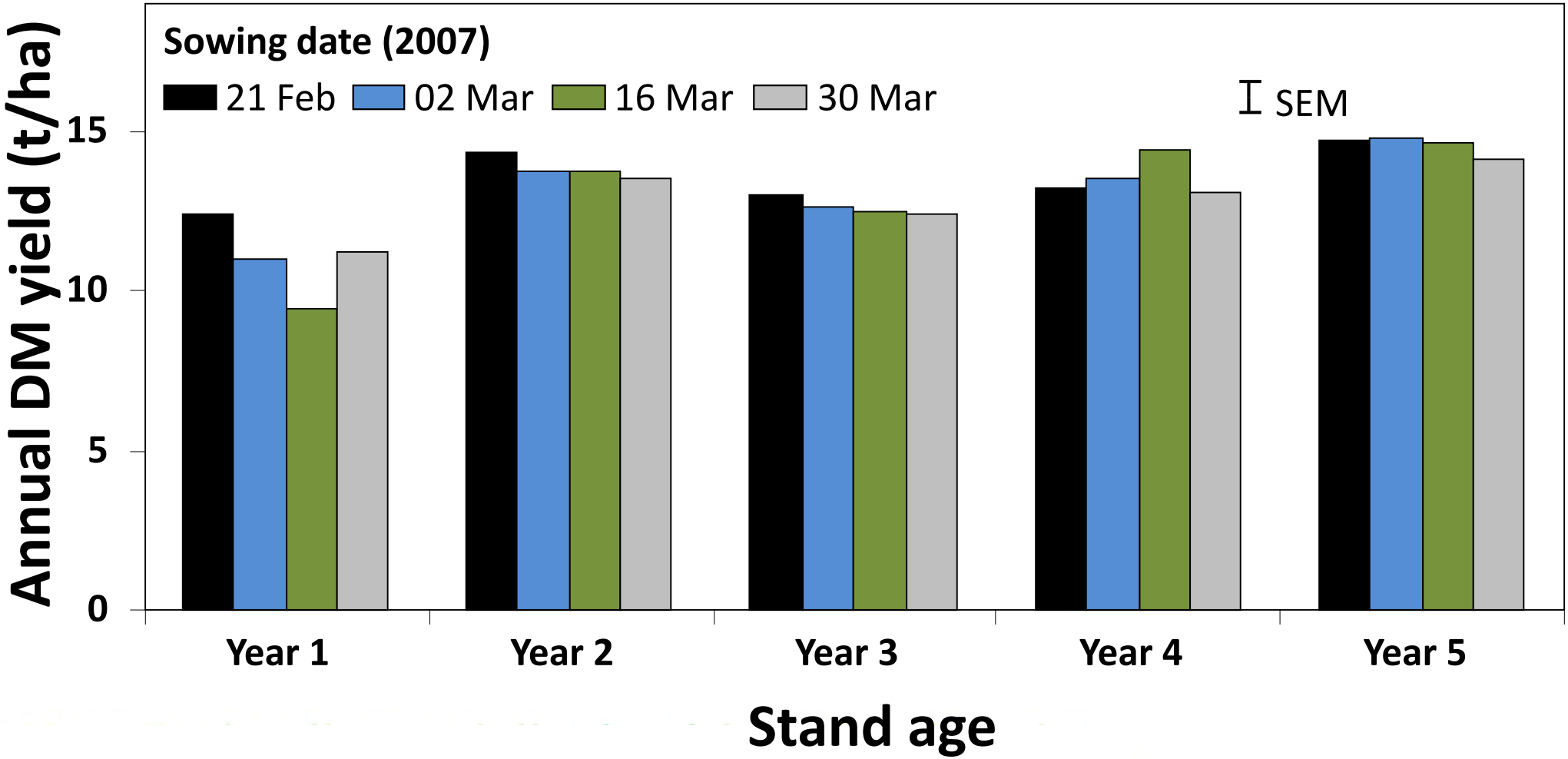


Source: Moot *et al.* 2012

Weeds present @ 09 October 2007 (Year 1)

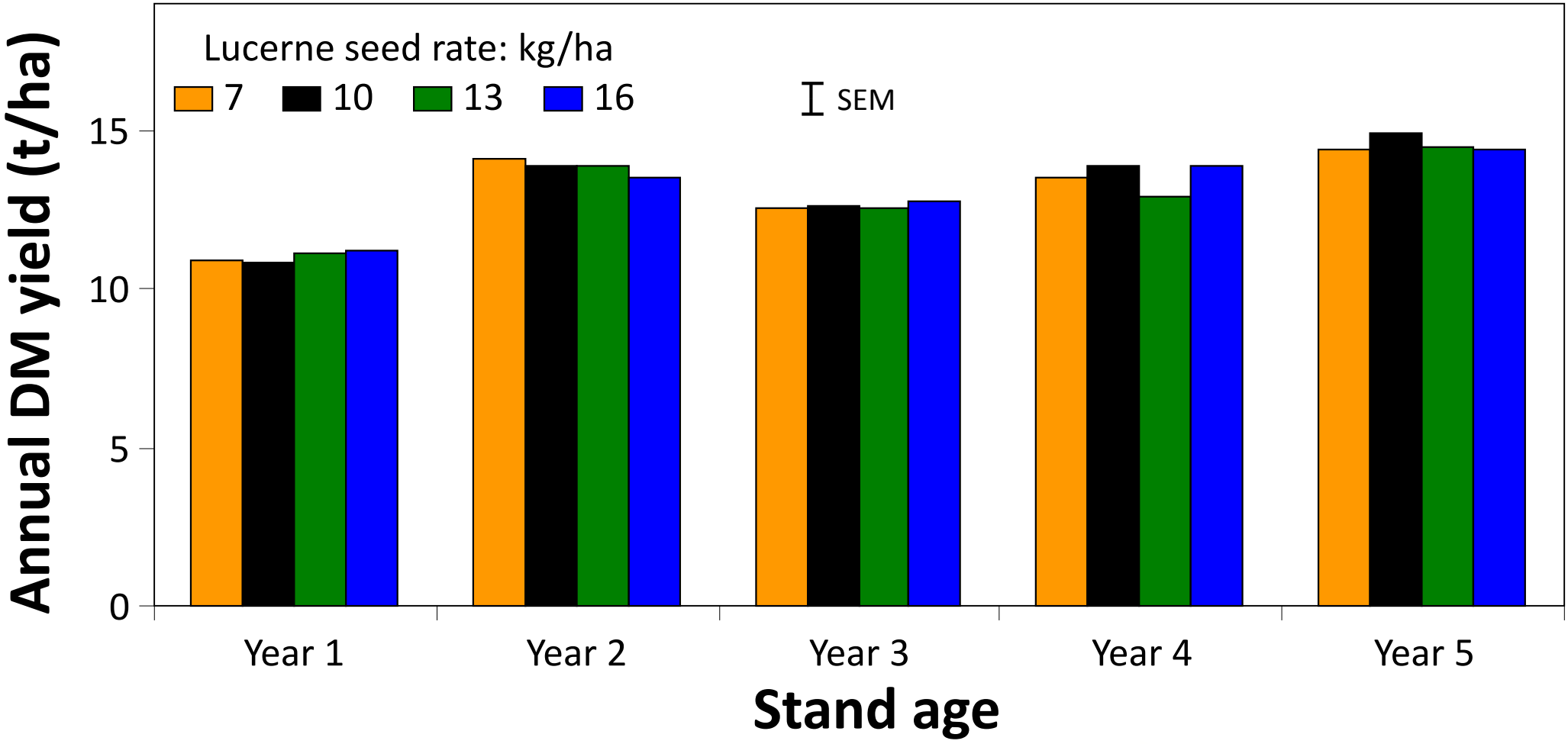
Sown 21 Feb 2007 **Sown 30 Mar 2007**

Annual yield in relation to sowing date



Source: Moot *et al*. 2012

Annual yield in relation to sowing rate



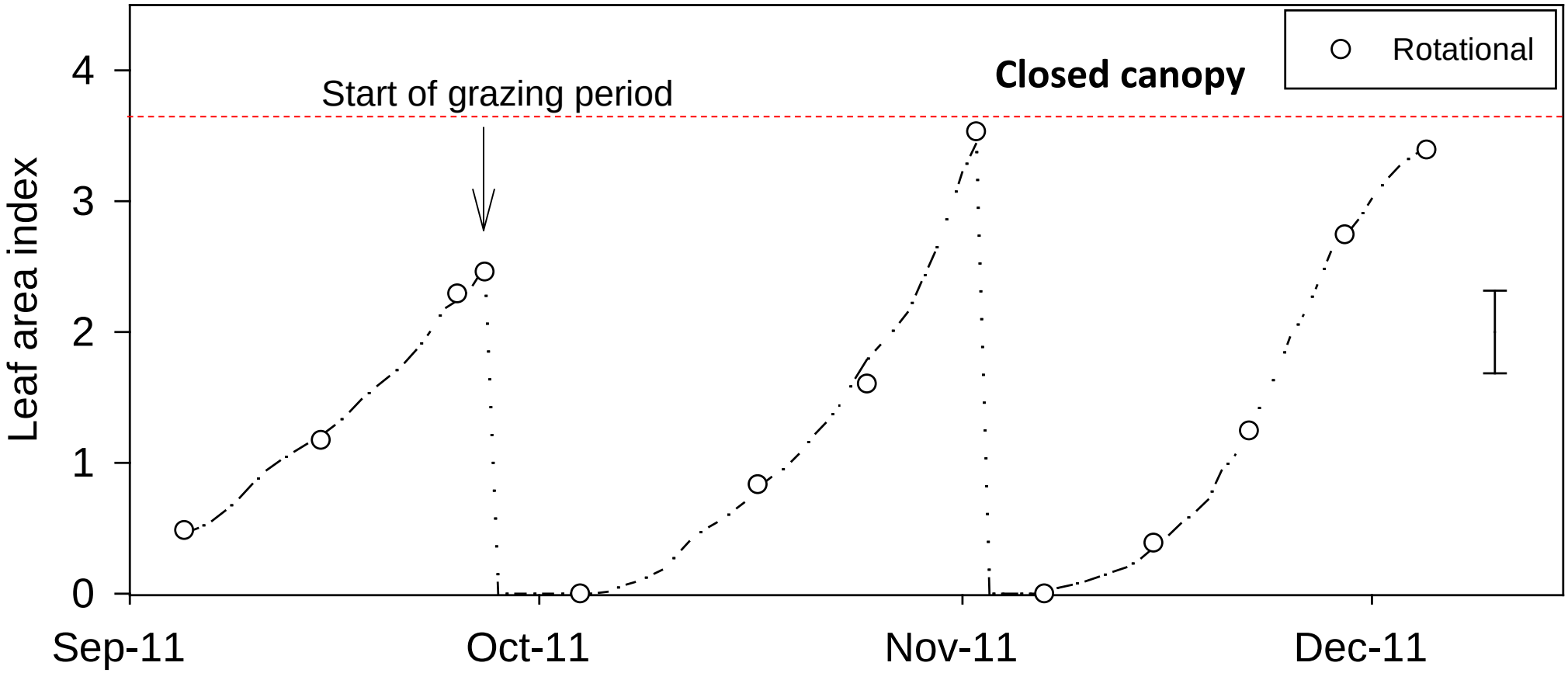
Source: Moot *et al*. 2012

Irrigation

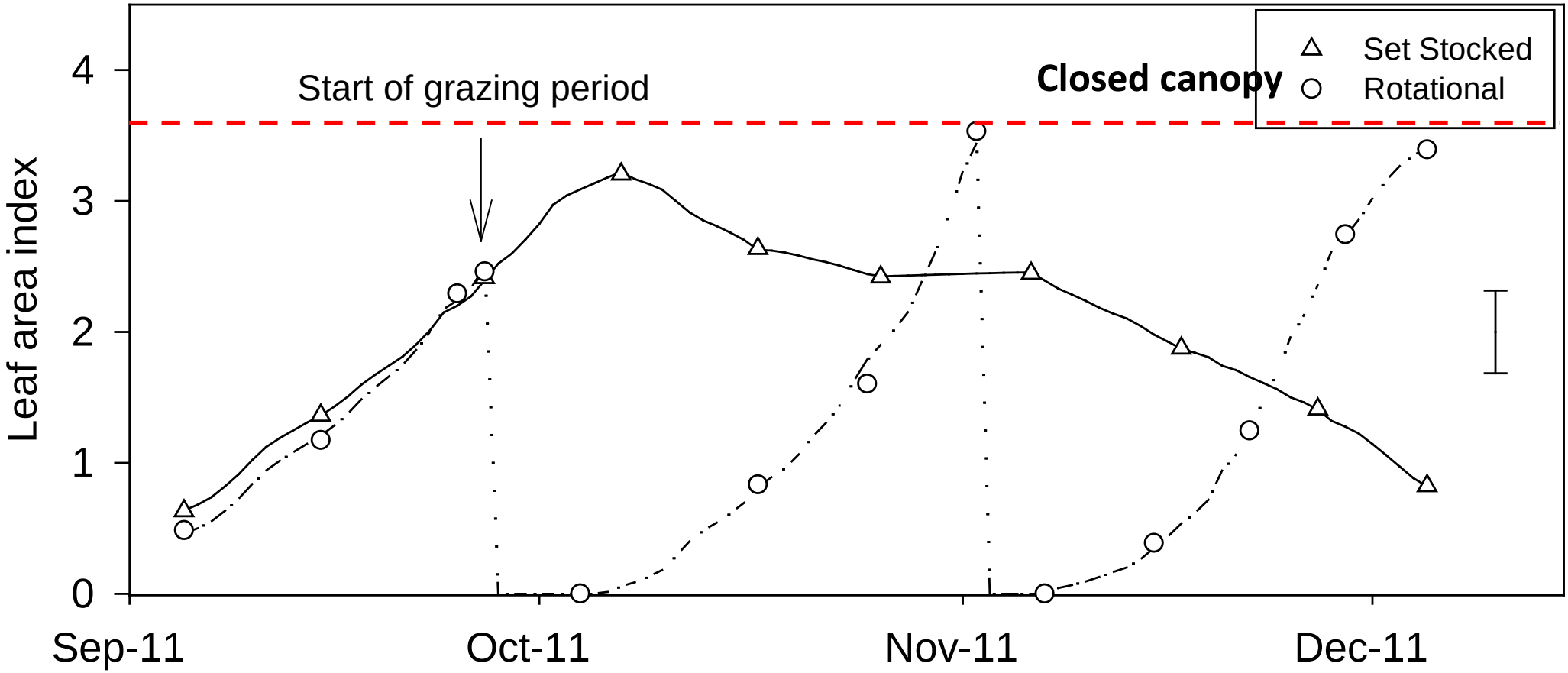
- Before sowing to encourage root growth
- When the canopy is closed to reduce soil evaporation and weed growth
- Large amounts (50 mm) infrequently rather than small (15 mm) amounts frequently
- Fallow – dry soil vs wet soil

Lambs set stocked

Crop canopy


Leaf area index
0
1
2
3
4
Sep-11
Oct-11
Nov-11
Dec-11
Start of grazing period
Closed canopy
Rotational

Crop canopy


Start of grazing period
Closed canopy
Set Stocked
Rotational
Leaf area index
0
1
2
3
4
Sep-11
Oct-11
Nov-11
Dec-11

Water Use

Grazing treatment	Transpiration	E_S	Total WU
Set stocked	297 $_a$	77 $_b$	374
Semi-set stocked	282 $_a$	76 $_b$	358
Rotational	231 $_b$	128 $_a$	359
P	<0.05	<0.05	ns
SEM	10.6	8.0	

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

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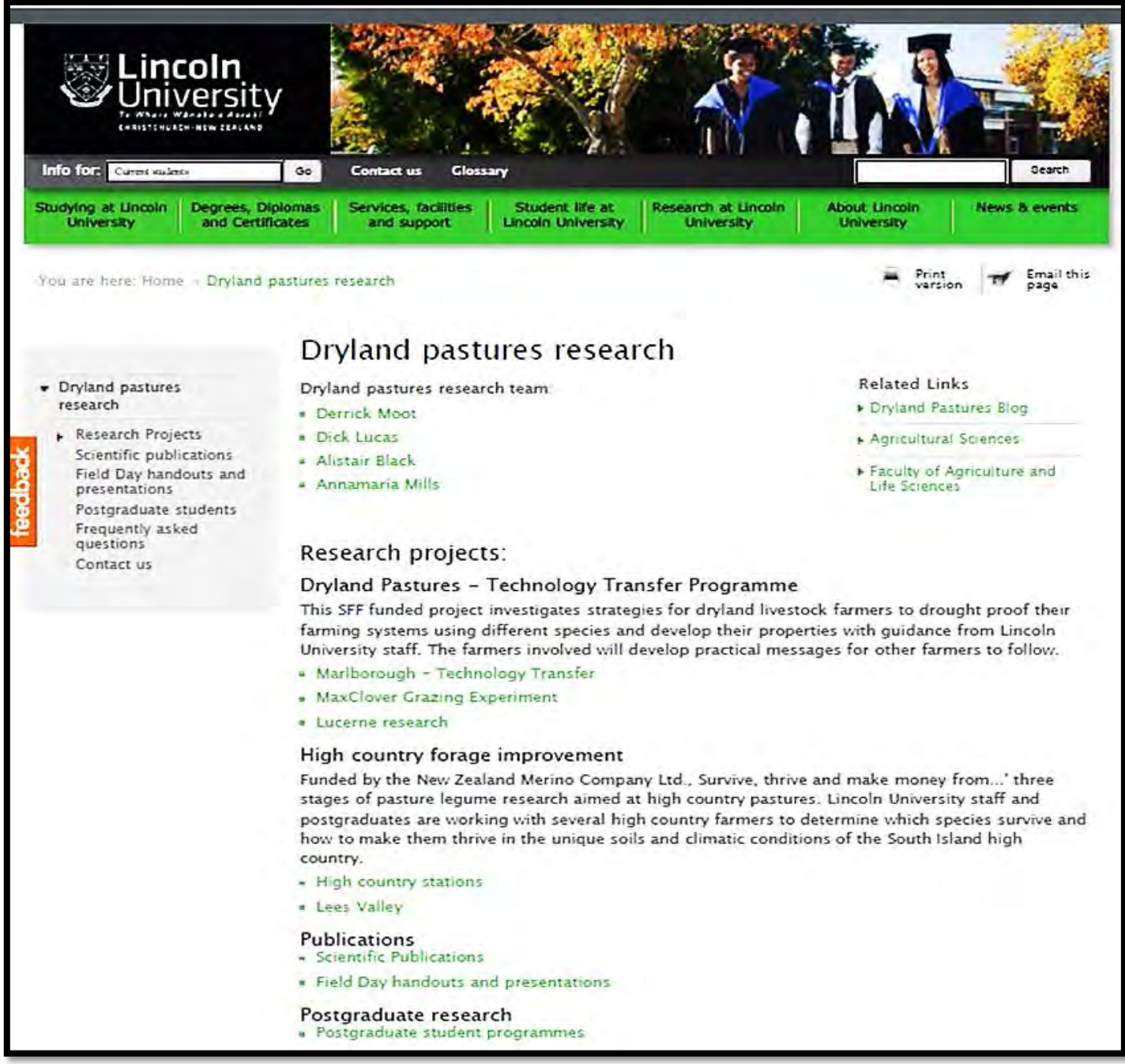
The website…

Info on:

- Current projects
- Field day presentations
- Scientific publications
- FAQs
- Postgraduate study



www.lincoln.ac.nz/dryland

Conclusions

- Lucerne growth rate is seasonal based on storage and remobilization of reserves
- Lucerne can be grazed or cut and carried based on yield – not time of flowering
- Replace nutrients removed through cut and carry (K)
- Minimize soil evaporation by timing of irrigation

References

Website: www.lincoln.ac.nz/dryland

Dryland pastures blog: http://www.lincoln.ac.nz/conversation/drylandpastures/

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