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Kimihia, 12 August 2015

Lucerne Agronomy

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New Zealand's specialist land-based university

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Dry matter yield and botanical composition of the 'MaxClover' grazing experiment at Lincoln University, Canterbury, New Zealand

PHOTO DIARY - 2002/03 to 2010/11

Prepared by: DJ Moot; A Mills; RJ Lucas; KM Pollock; M Smith
Lincoln University Dryland Pastures Research Team

Funded by:
beef+lamb new zealand

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http://www.lincoln.ac.nz/Lincoln-Home/Research/Current-Research/Dryland-Pastures-Research/Research-Projects/MaxClover-Grazing-Experiment/

The ‘MaxClover’ Grazing experiment in paddock H19 at Lincoln University

Yield and composition of six dryland pastures over nine growth seasons

- Lucerne produced more DM than all grass based pastures in most years.
- Tap-root enabled access to water from lower soil layers but it also more efficiently than the grass - especially in spring.
- CF/Sub clover was the highest yielding pastures in Years 6-9.
- Yields of all pastures declined over time.

Mills *et al*. 2014a

Figure 1. Total annual accumulated dry matter production

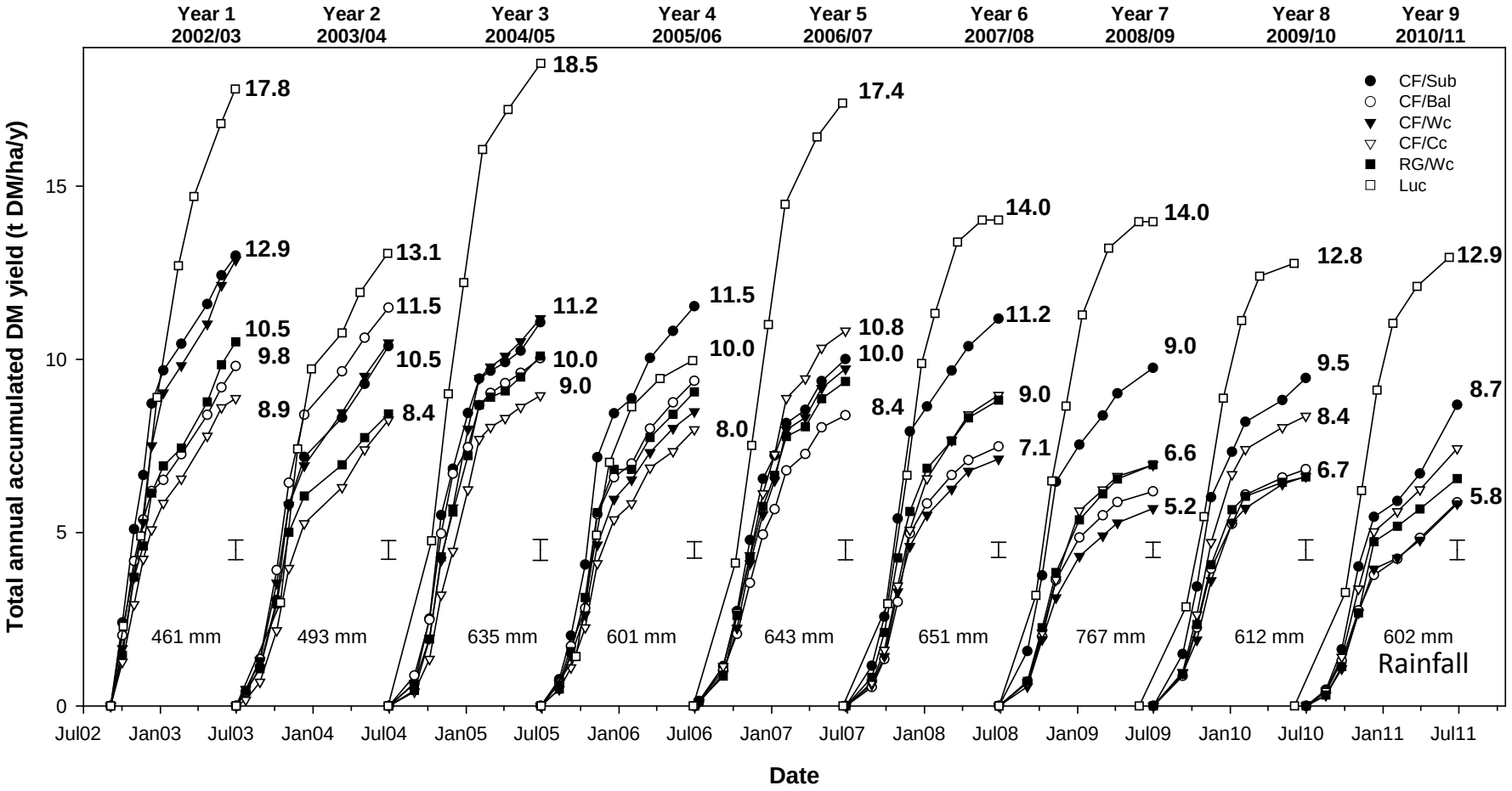
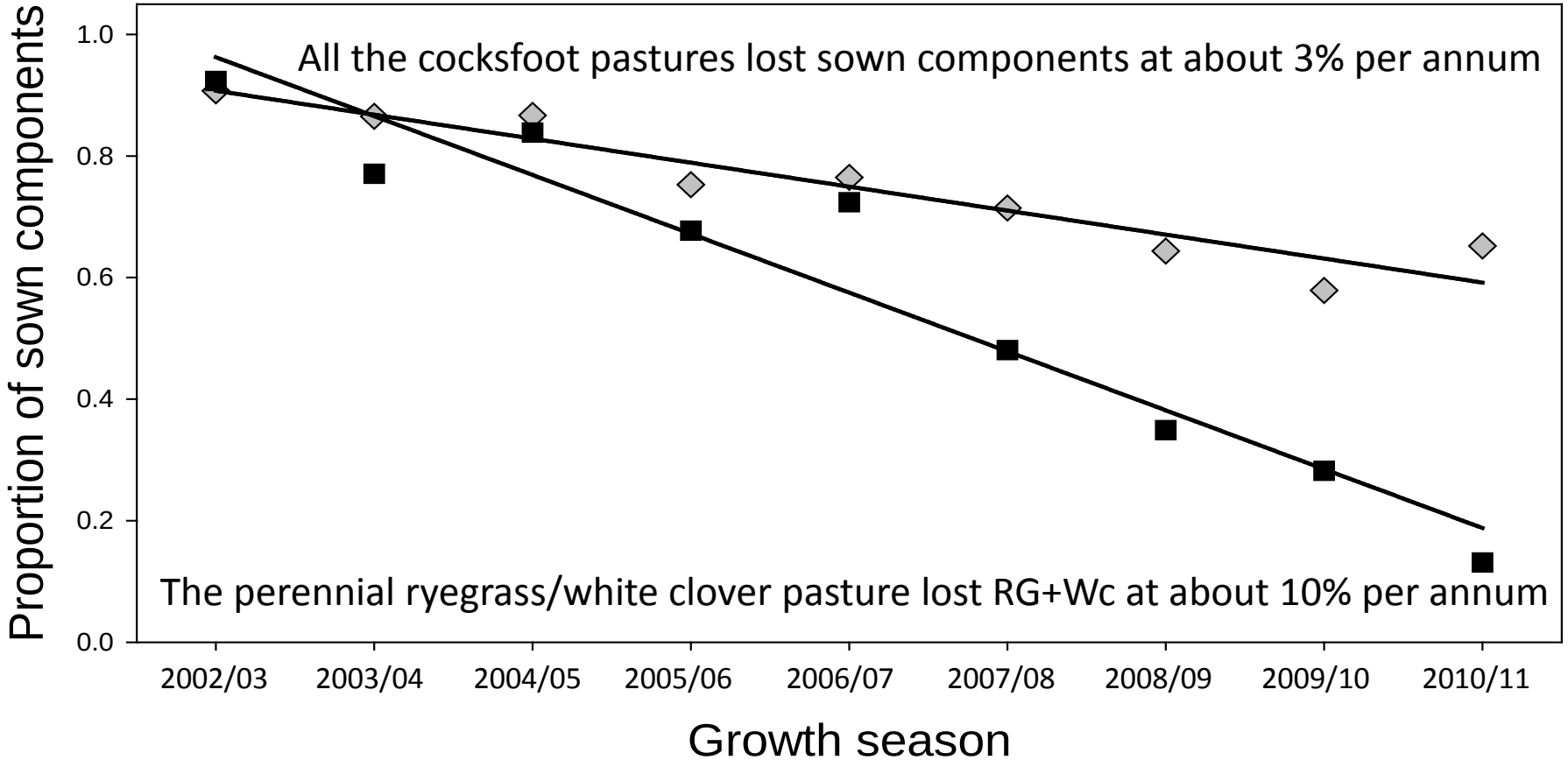
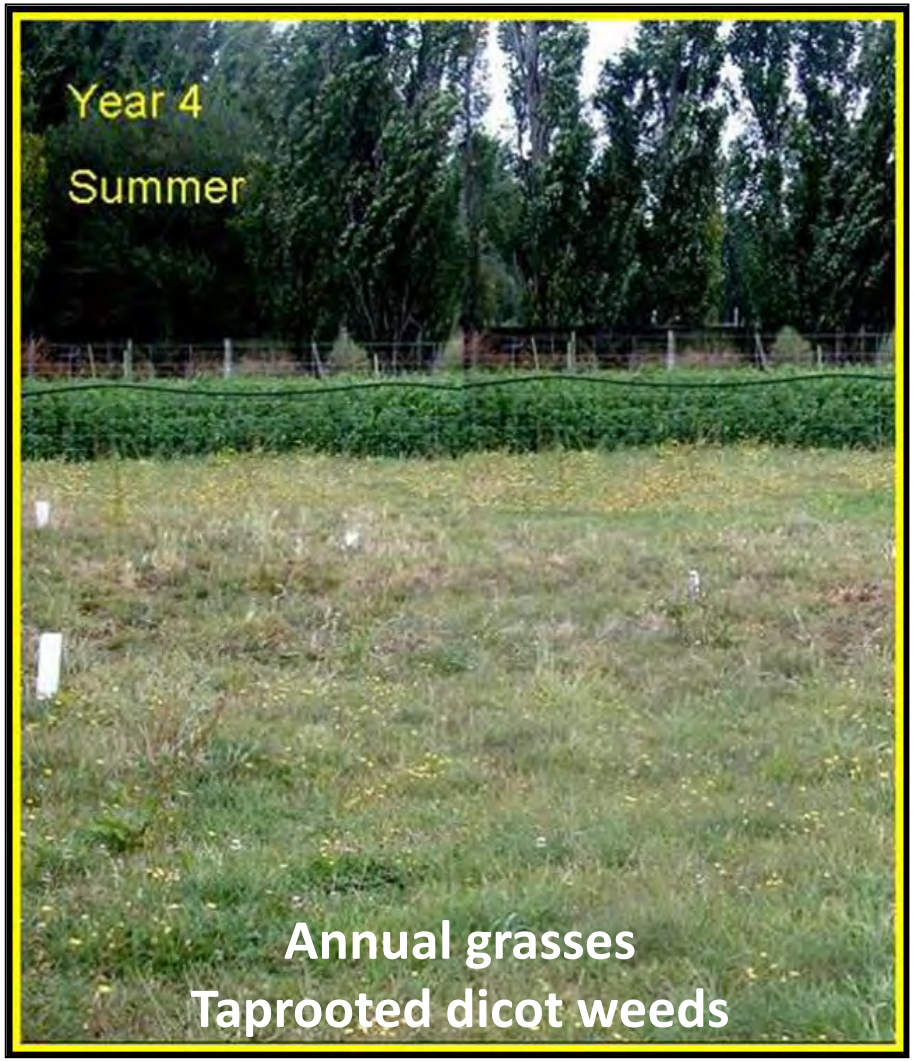


Figure 2. Change in the proportion of originally sown pasture components (grass + clover) over time

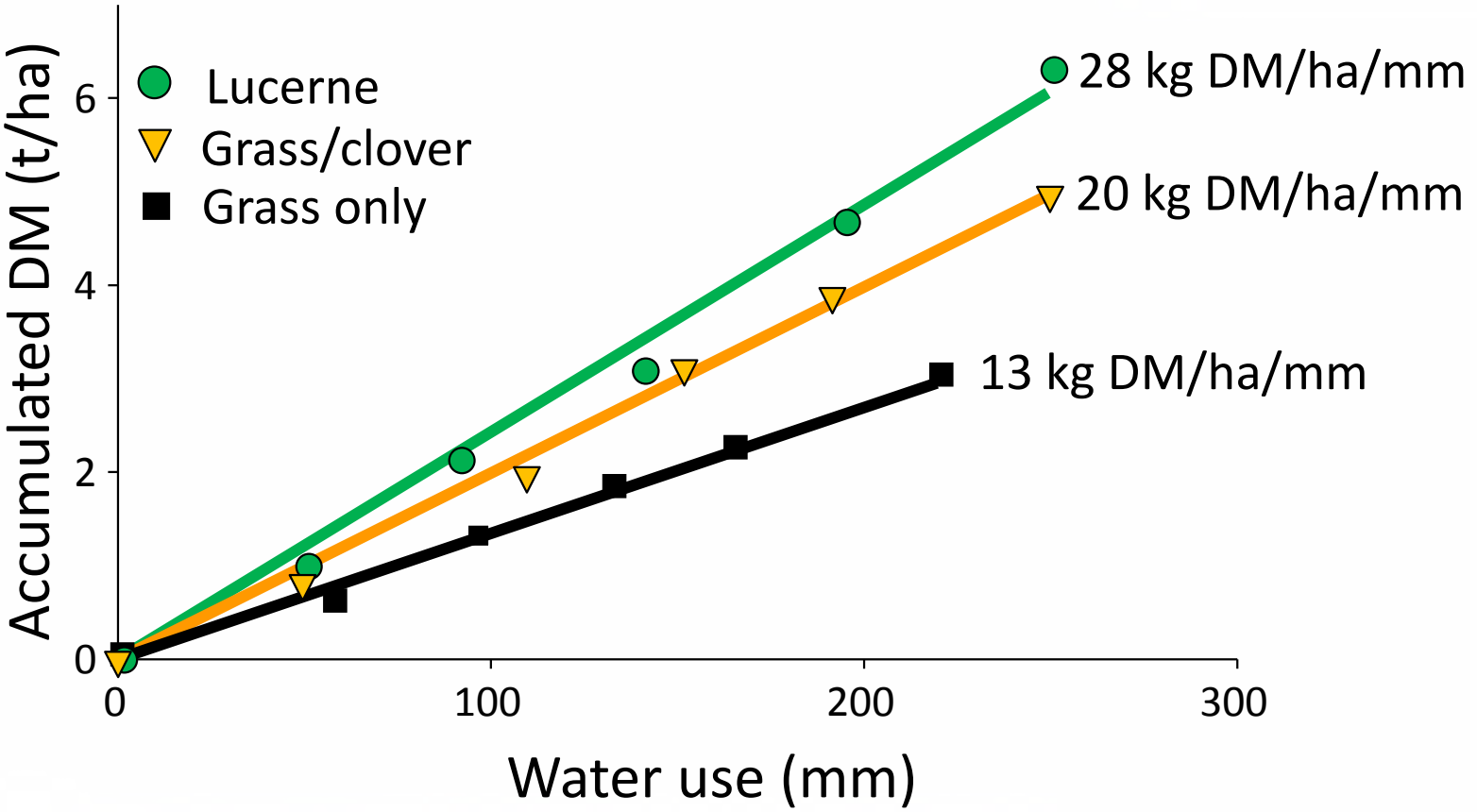




Unsown species <5% in Year 1 …….>45% in Year 6

RG/Wc pastures

Spring WUE



Moot *et al*. 2008

Lucerne Objectives

- Describe management to maximise production, quality and persistence.
- Describe key establishment issues.
- Examples of lucerne on farm.

Growth:

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

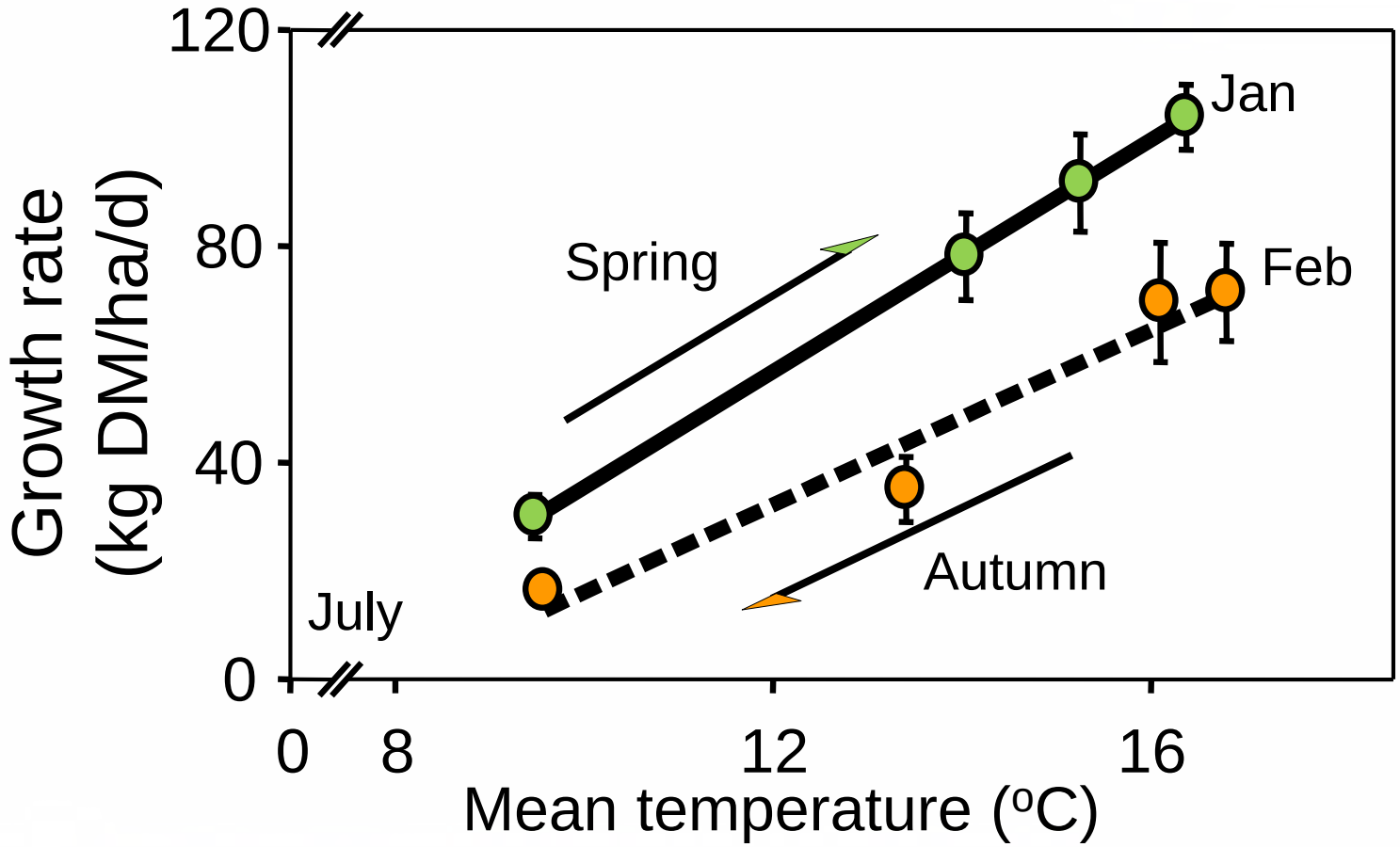
Development:

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

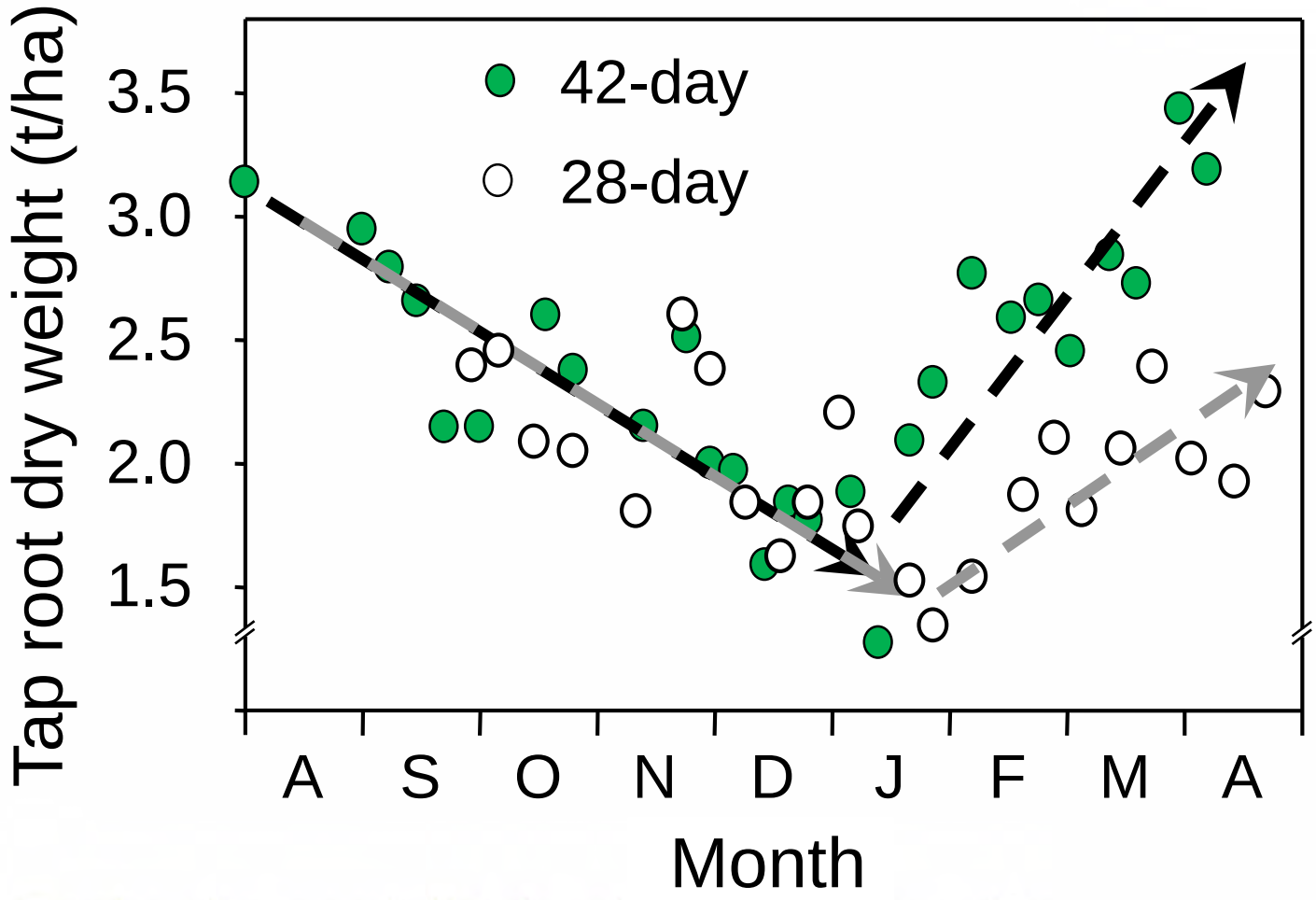
4 days grazing

25 days resting

3 days grazing

What's going on down there?

Partitioning to roots



Moot *et al*. 2003

Seasonal grazing management

Spring

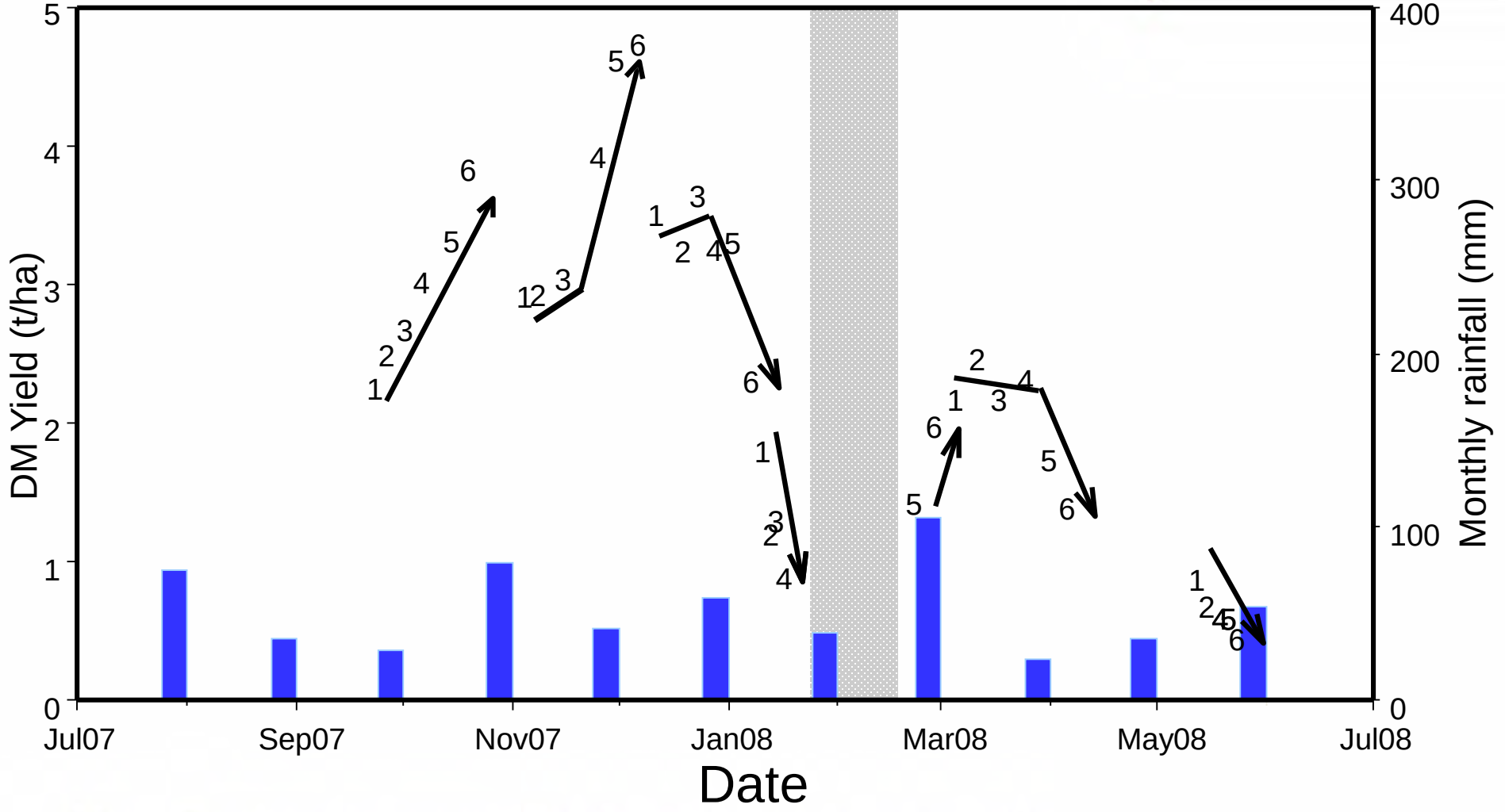
- 1st rotation aided by root reserves to produce high quality vegetative forage.

- 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



Moot & Smith 2011

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

5th September 2011 – Cave, South 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

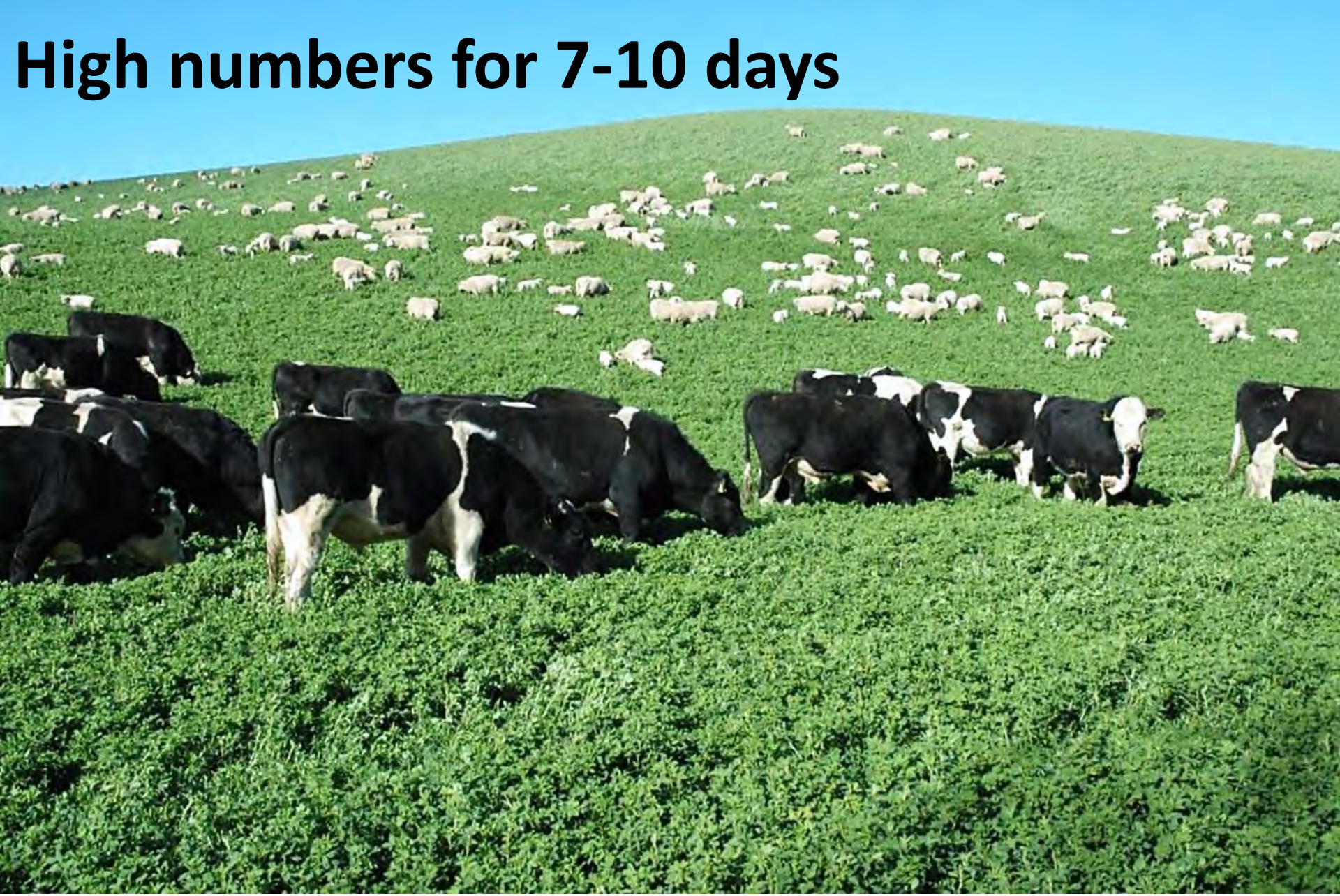
Seasonal grazing management

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


14 ewes + twins/ha

High numbers for 7-10 days




Fibre and salt

Maximize reliable spring growth – high priority stock

Seasonal grazing management

Early autumn (Feb-April)

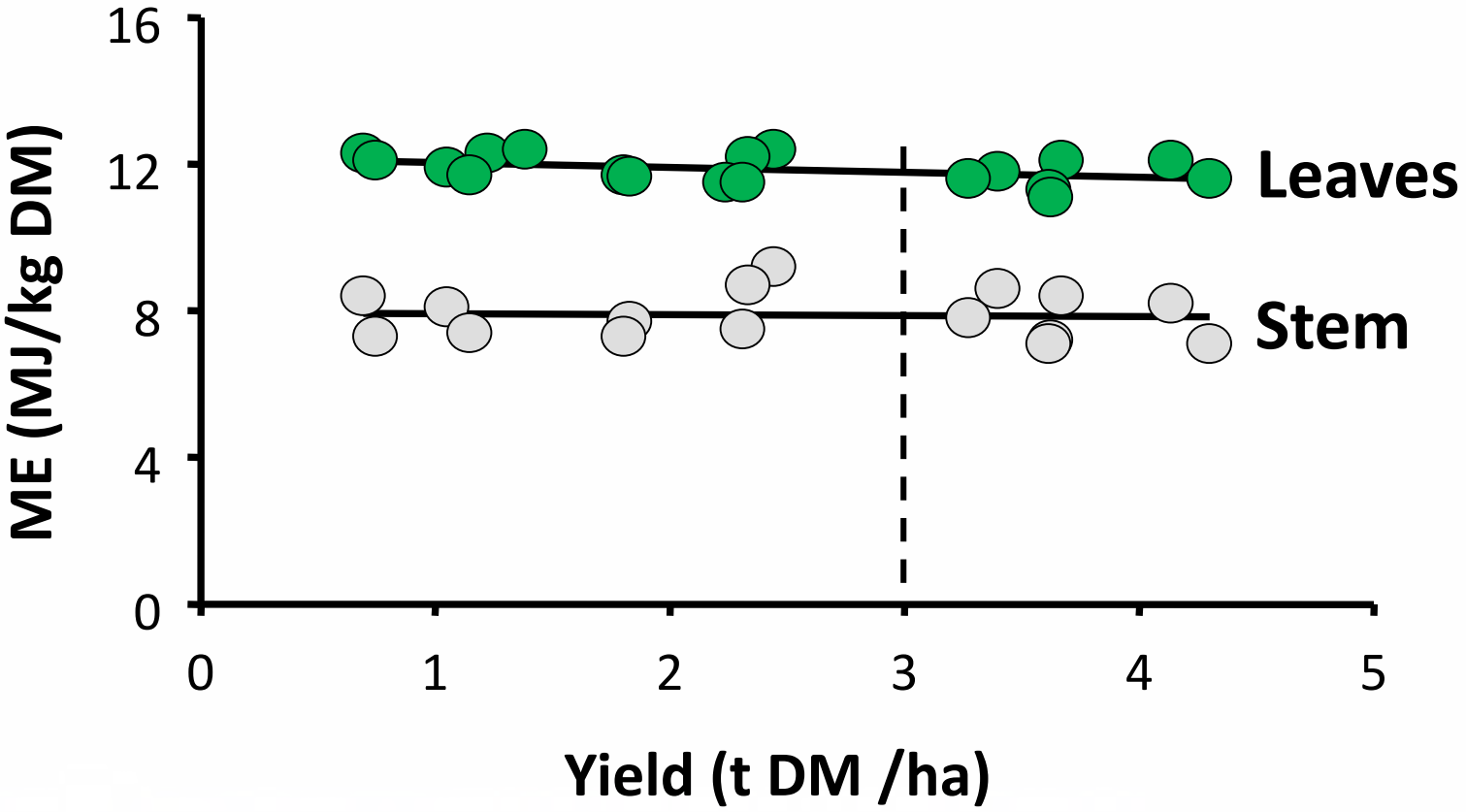
- terminal drought ⇒ graze standing herbage
- allow 50% flowering
- long rotation (42 days) somewhere between Jan and end of May.

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

Autumn = flowering plants
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



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 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)

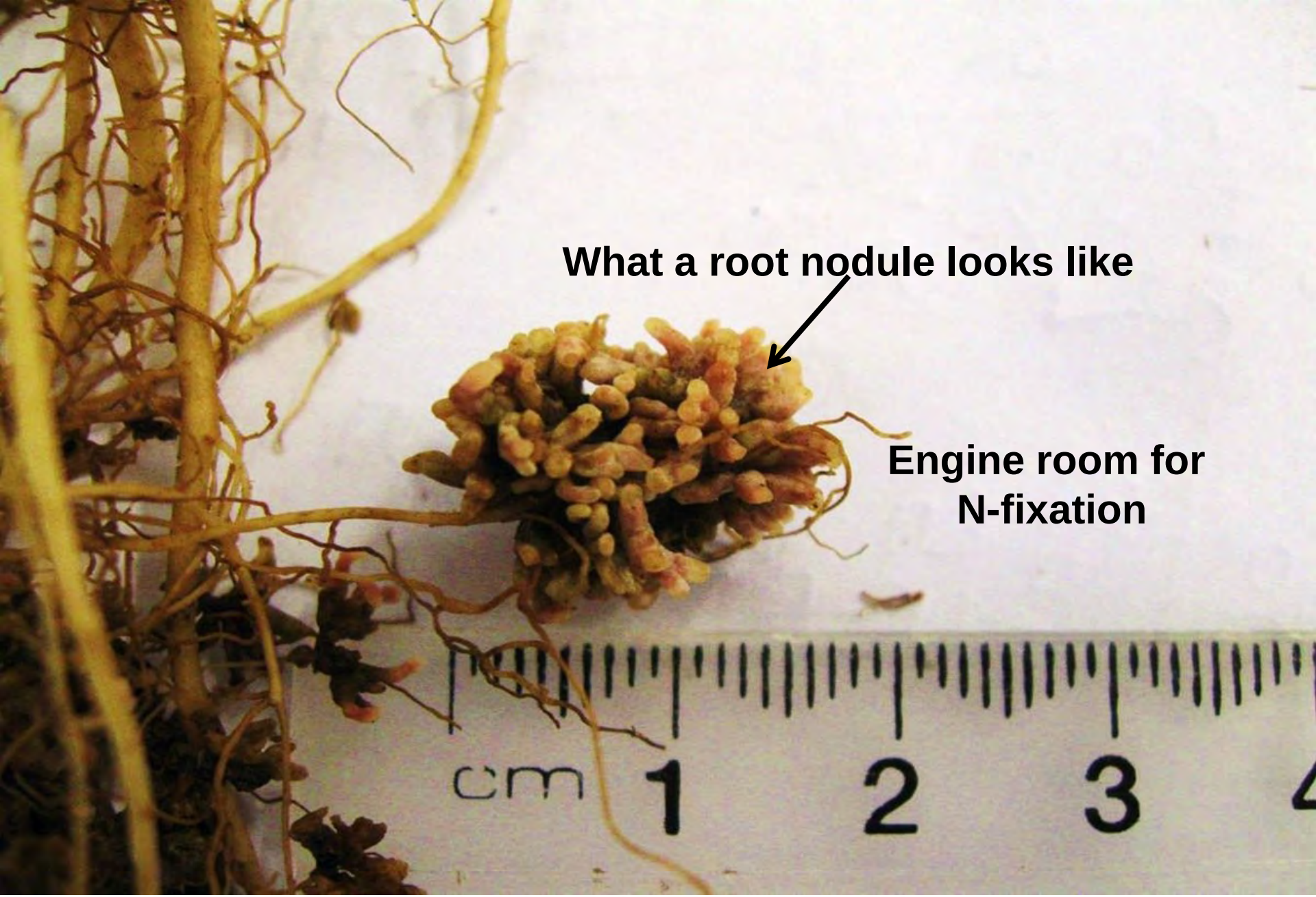

What a root nodule looks like
Engine room for
N-fixation
cm
1
2
3

Photo: David Hollander
Lincoln University

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Lucerne root
~8 months after sowing
> 1.5 m length

Autumn Spraying

Timing is Critical

Most important tool

Glyphosate, granstar, penetrant

<u>Key Results</u>

Conserve soil moisture

Kill mass root systems

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

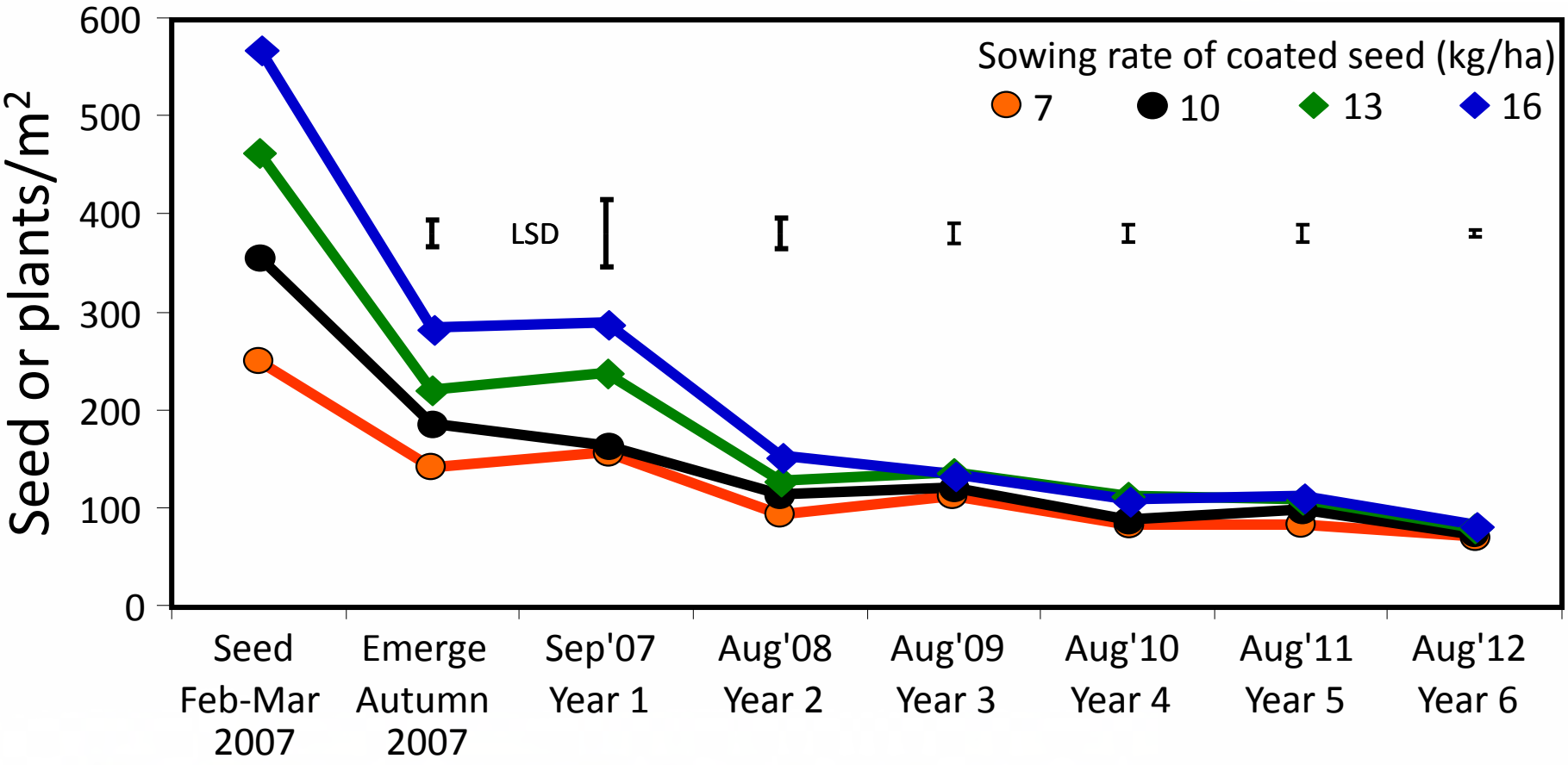
- 21 February,
- 2 March,
- 16 March and
- 30 March

Four sowing rates

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

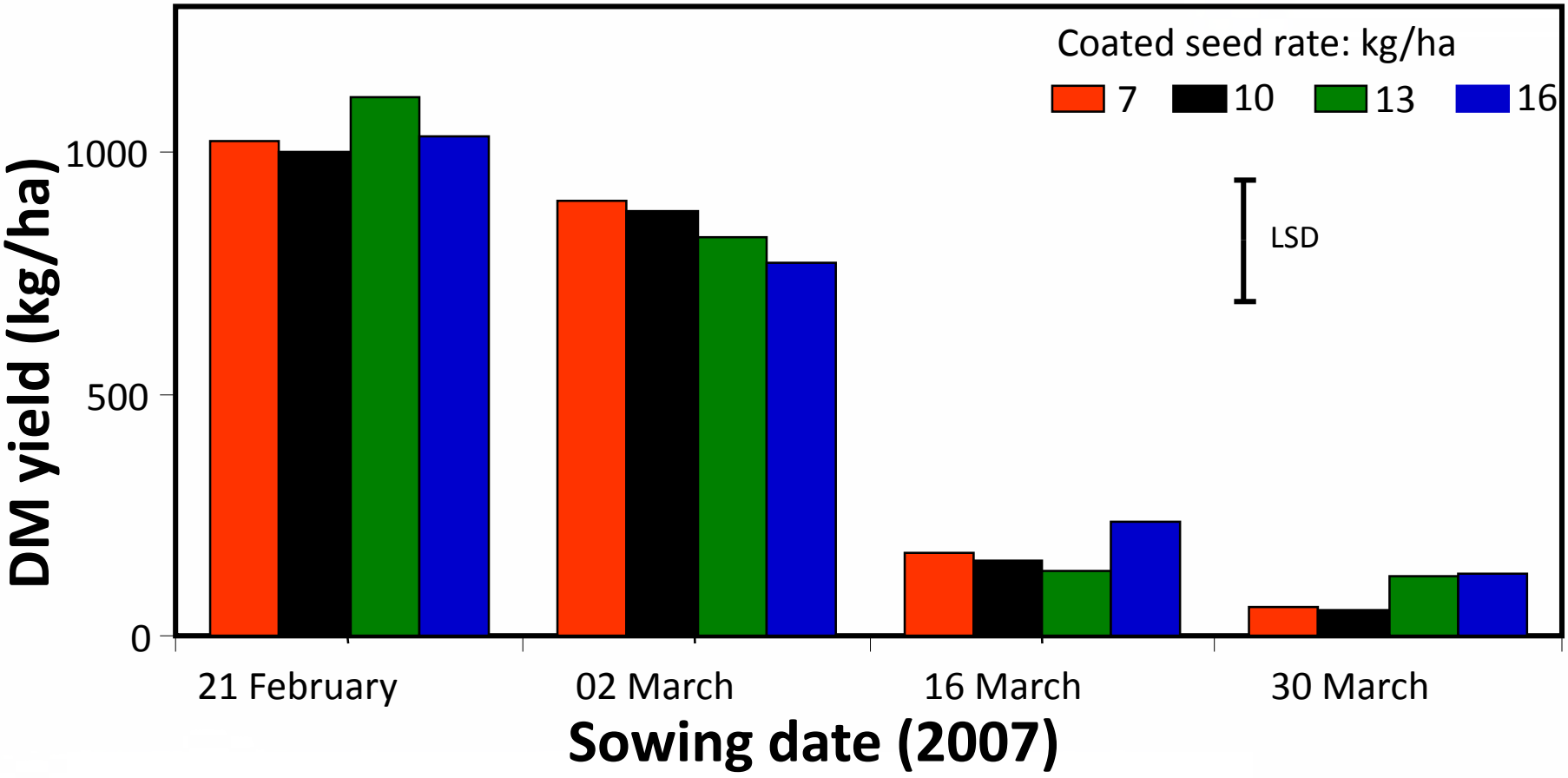
Moot *et al*. 2012

Sown seed & plant population over time



Moot *et al*. 2012

Seedling lucerne yield to early June

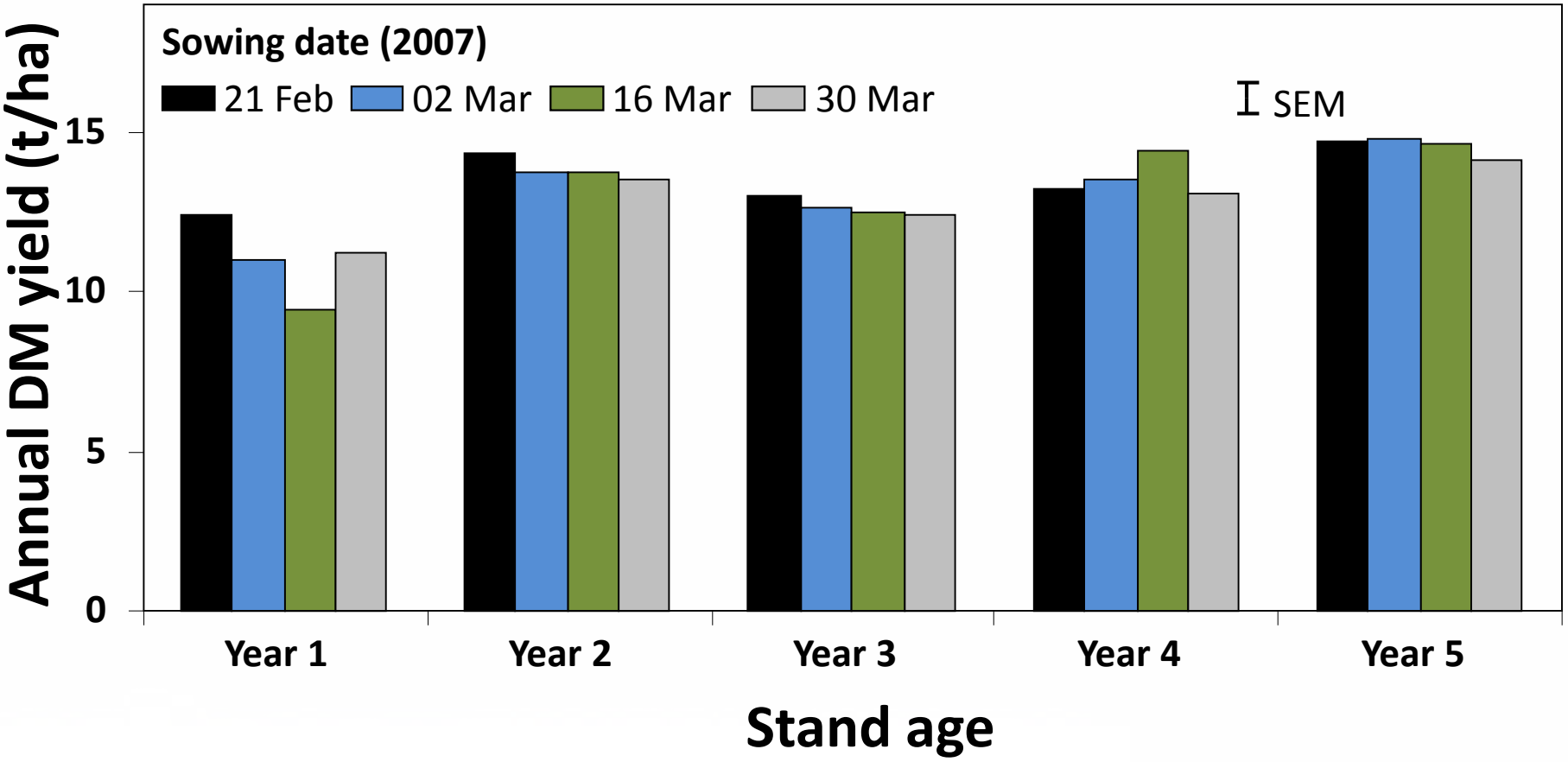


Moot *et al*. 2012

Weeds present @ 09 October 2007 (Year 1)

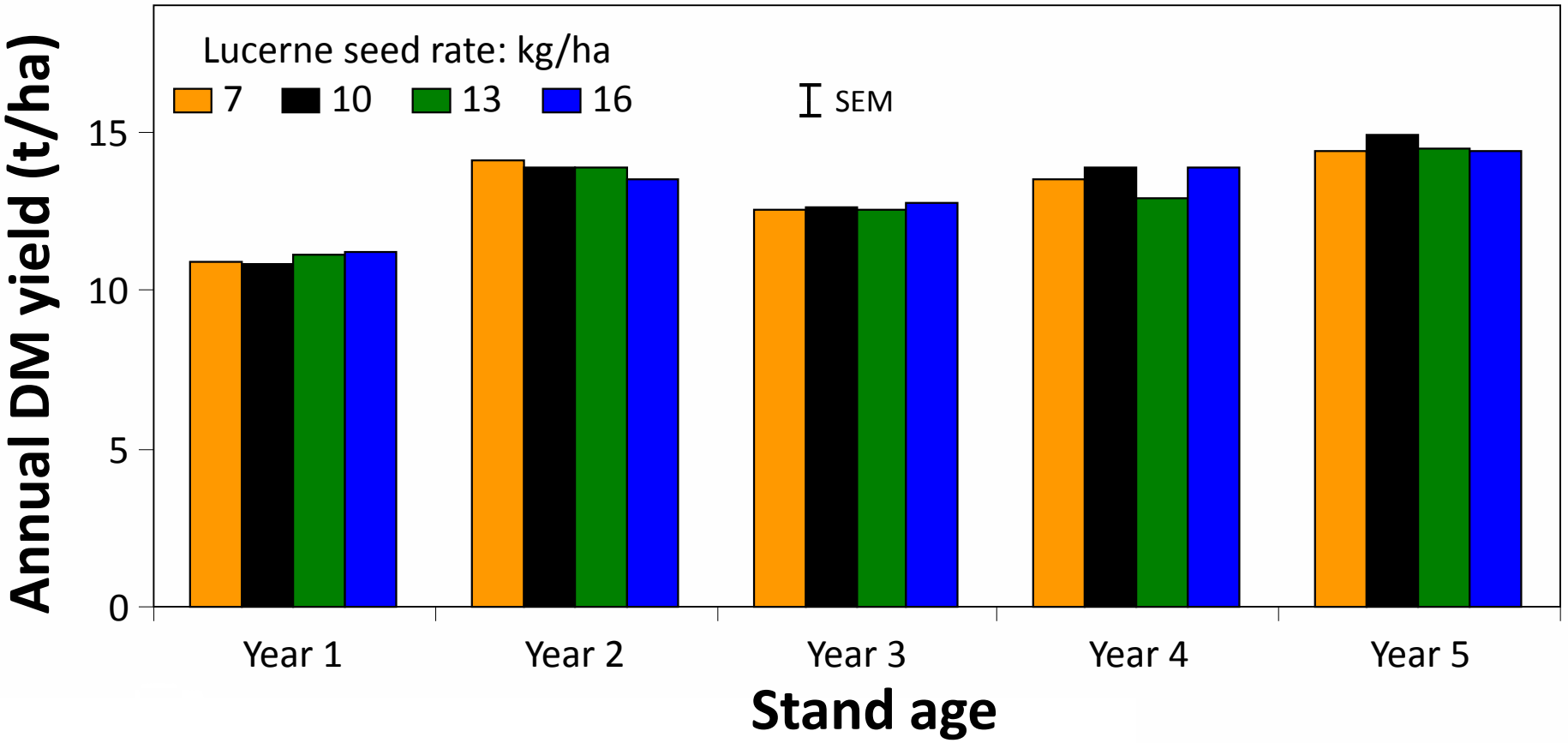
Sown 21 Feb 2007 **Sown 30 Mar 2007**

Annual yield in relation to sowing date



Moot *et al*. 2012

Annual yield in relation to sowing rate



Moot *et al*. 2012

Sown: February October

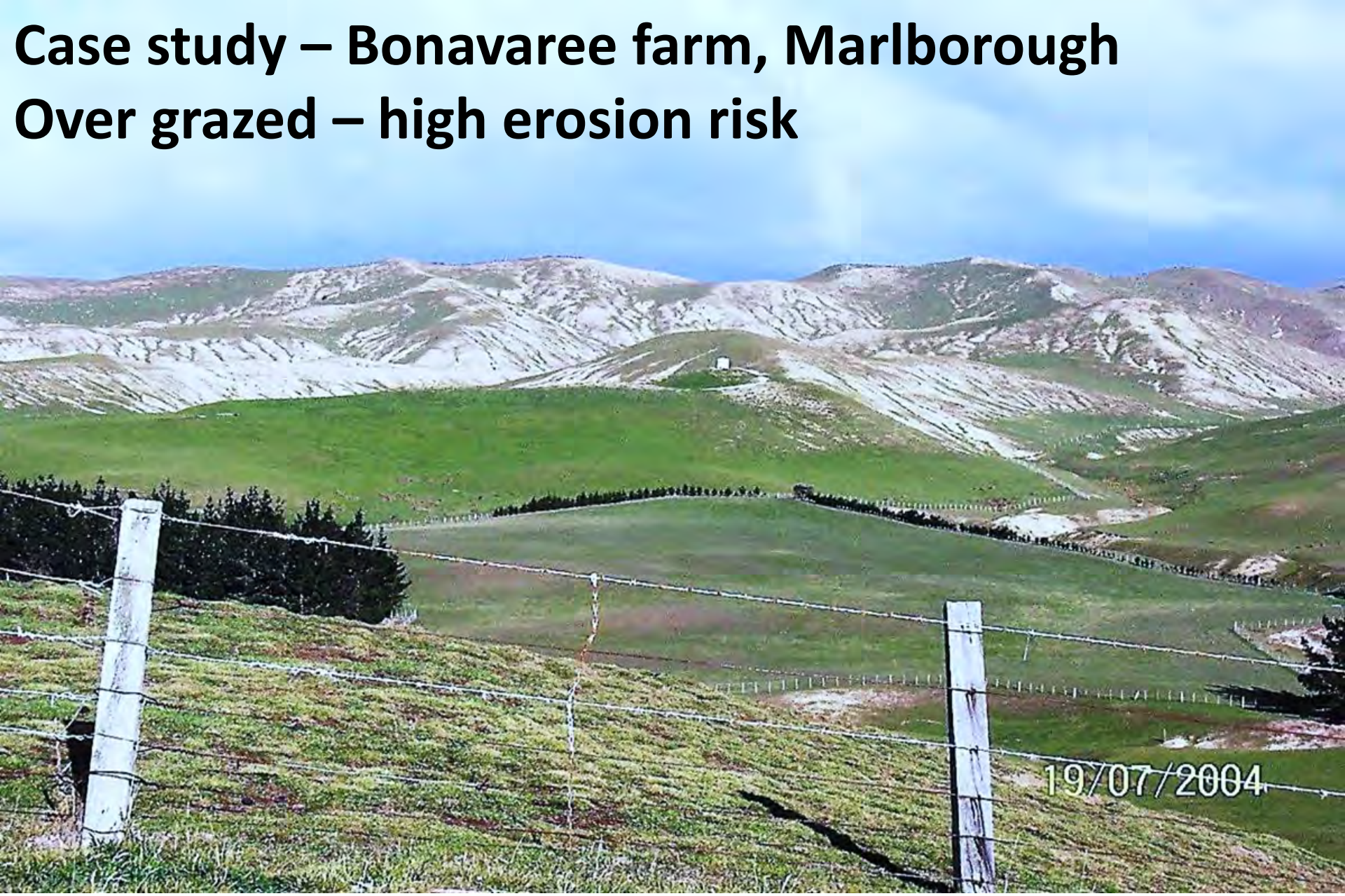
Sampled: June

Taproot mass

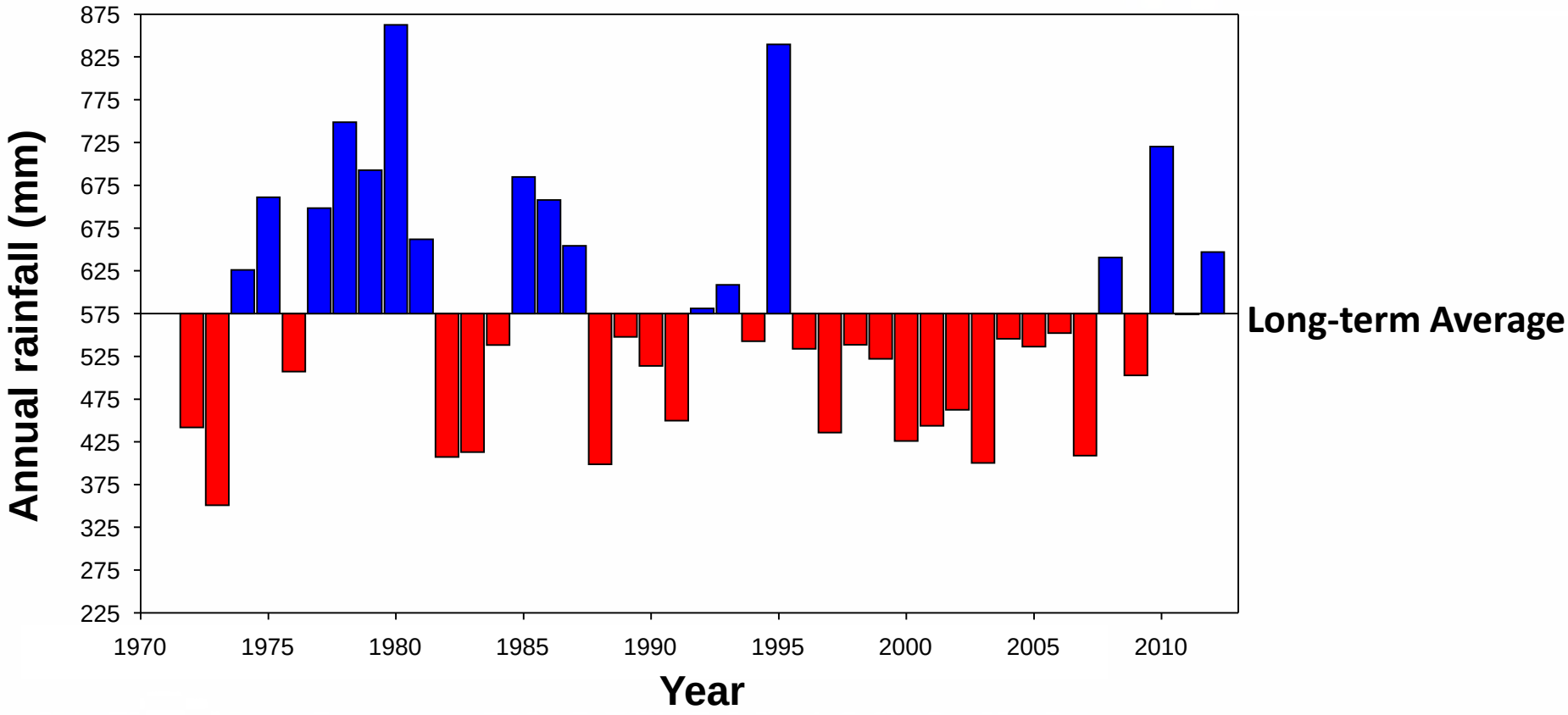
Conclusions from establishment

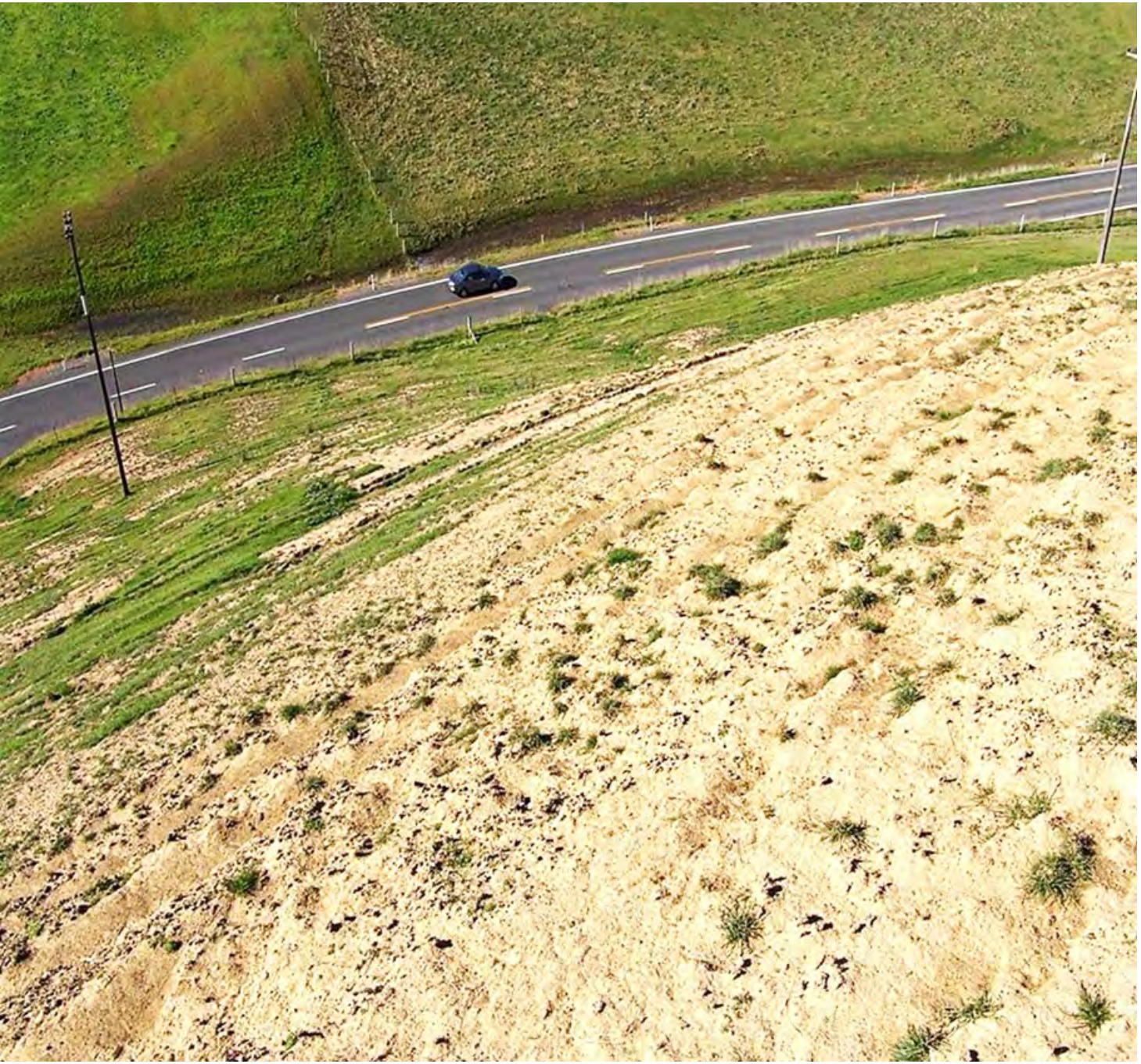
- Spring sow - October
- Yield in year one is lower due to partitioning
- Plant population self thins over time
- Sow on deep soils

Case study – Bonavaree farm, Marlborough
Over grazed – high erosion risk



Annual rainfall at ‘Bonavaree’





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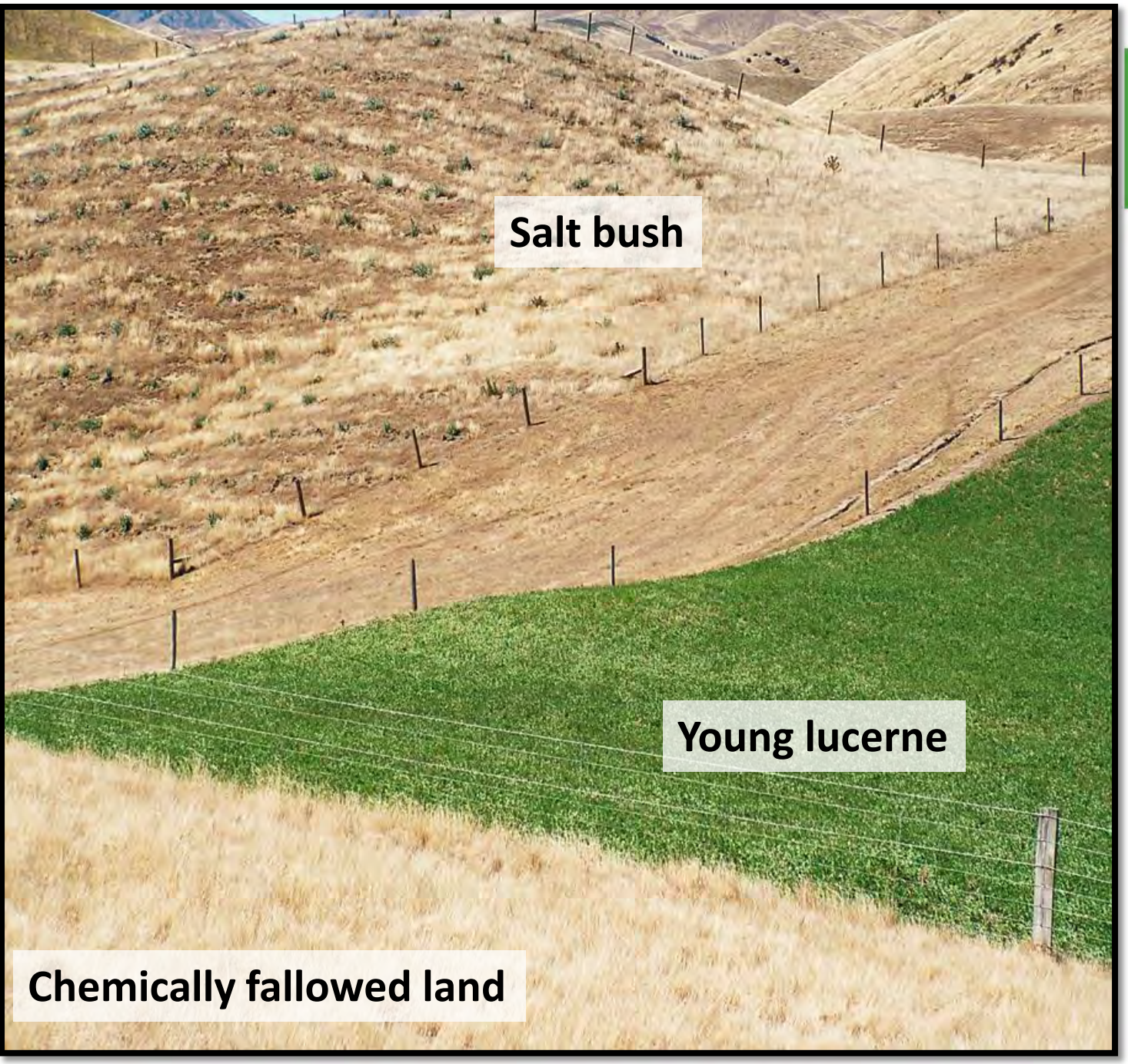

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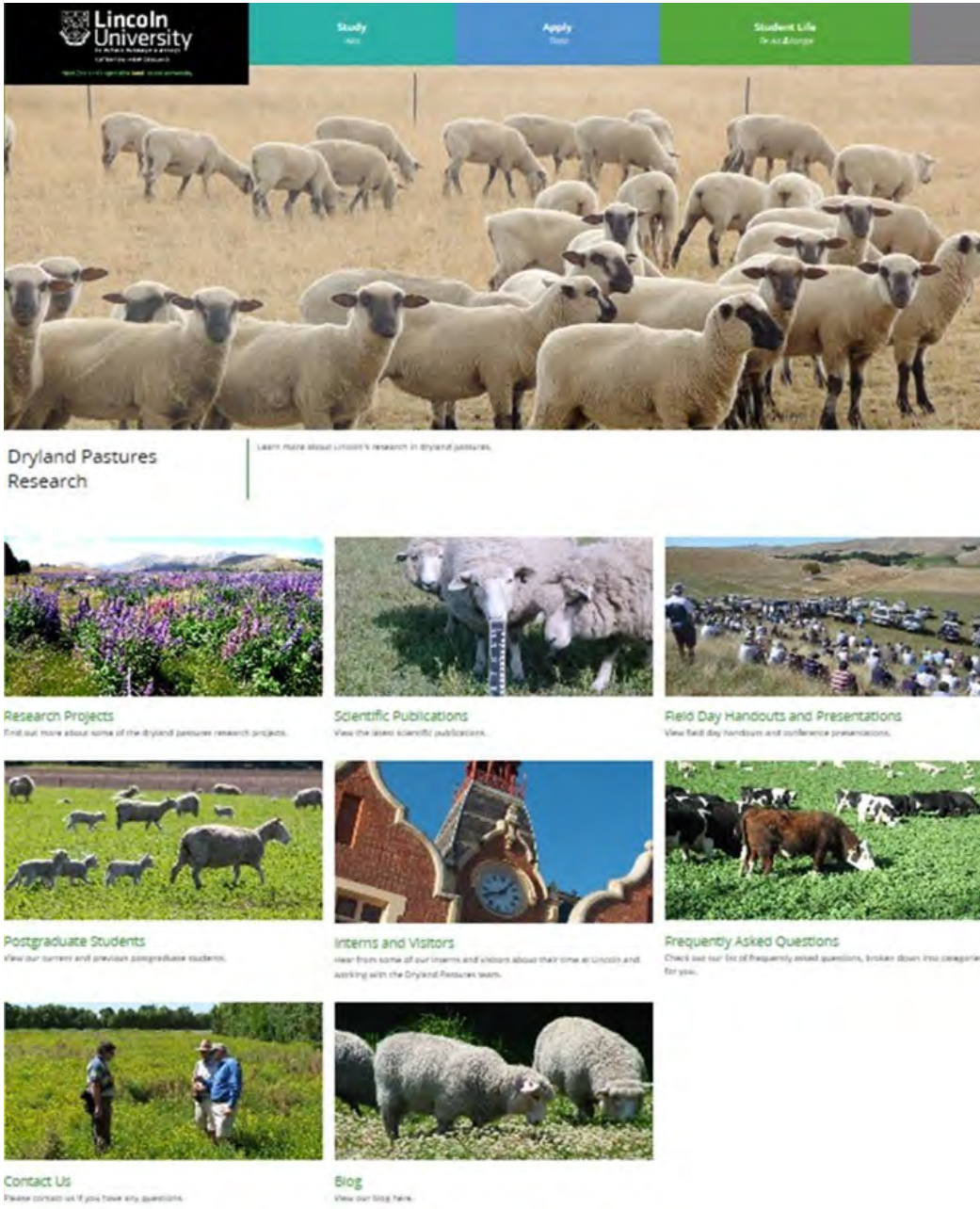
‘Bonavaree’ production change over 10 years

	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%

The website…

Info on:

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



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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

Set stocking lucerne in early spring – the stuff you need to know

Posted on 31/10/2014 by Anna Mills

Posted on behalf of Prof. Derrick Moot

This grazing management is based on new research out of Lincoln University. It is recommended **ONLY** for farmers with a large proportion (**>40%**) of their properties in lucerne who require greater areas to lamb on in early spring and who already follow the optimum rotational grazing management system advocated by Prof. Moot and Lincoln University's Dryland Pastures Research Team.

After 15 years telling people never to set stock on lucerne Prof. Moot has mellowed (…slightly). The rules for set stocking lucerne outlined below must be followed. Failure of farmers/managers to follow these guidelines may result in killing your lucerne stand within 2 years. Deviations from the guidelines are at your own risk.

Planning for spring set stocking happens in early autumn

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- Set stocking lucerne in early spring – the stuff you need to know
- Upcoming Dryland Pastures Seminar – Marlborough 28 August
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https://blogs.lincoln.ac.nz/dryland/

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References

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