

Coleraine, Victoria
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**Lincoln
University**
Te Whare Wānaka o Aoraki
CHRISTCHURCH • NEW ZEALAND



LUCERNE

Agronomy and grazing

Dr Derrick Moot
Professor of Plant Science

New Zealand's specialist land-based university



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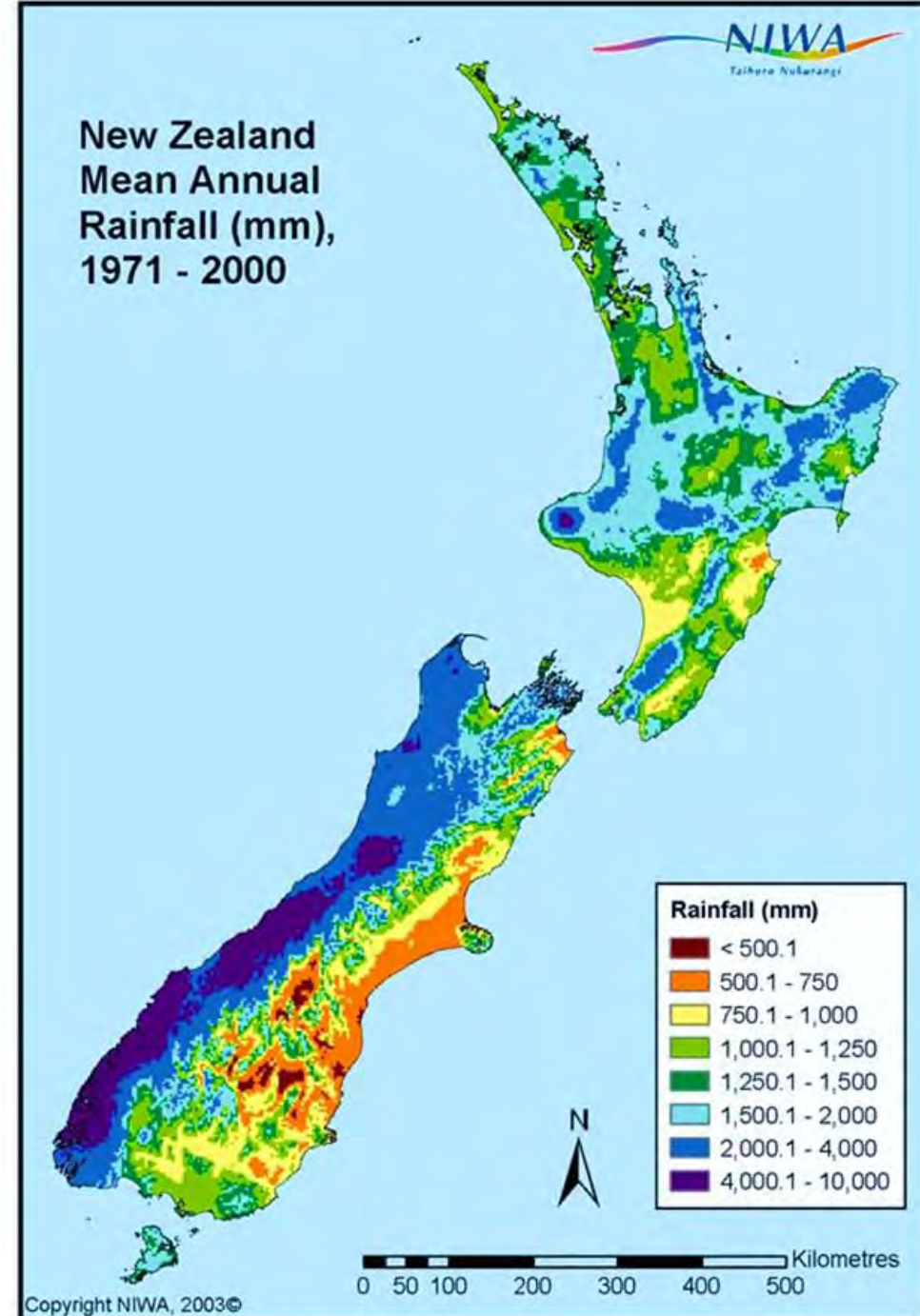
Objectives

- Outline the role of lucerne in New Zealand farming systems
- Describe management to maximise production, quality and persistence
- Reference “Legumes for Dryland Pastures” Grassland Research and Practice Series No. 11. 2003. pg’s 201-208.
(http://www.grassland.org.nz/publications/nzgrassland_publication_1654.pdf)
- www.lincoln.ac.nz/dryland

Why lucerne in NZ?

High quality, deep tap-rooted, perennial legume suited to grazing and/or conservation for stock finishing on free-draining drought prone soils

**Strong rainfall gradient
West ⇒ East**





Rain fed 300-800 mm

East coast - summer dry

Why not?

a) Farmer questions?

- Which dryland species?
- Lucerne – cut and carry in spring
- Pests in the 80's

Resistance to Pests and Diseases

| Cultivar | Dormancy | BGA | PA | SAA | BW | SN | PRR | VW | LD |
|---------------------|----------|-----|----|-----|----|----|-----|----|----|
| Grasslands Kaituna | I | R | R | R | R | R | R | - | MR |
| Grasslands Otaio | I | R | R | R | R | R | R | - | S |
| Grasslands Torlesse | D | HR | R | R | R | - | R | - | MR |
| P54Q53 | D | MR | MR | MR | HR | HR | HR | - | - |
| P54V09 | D | - | HR | R | HR | HR | HR | HR | - |
| Runner | D | - | - | - | R | - | S | - | - |
| Wairau | SD | S | S | S | S | S | S | S | S |
| WL 325HQ | I | R | R | R | R | MR | R | - | - |

BGA = Blue-green aphid

BW = Bacterial Wilt

VW = Verticillium wilt

PA = Pea aphid

SN = Stem nematode

LD = Leaf diseases

SAA = Spotted alfalfa aphid

PRR = Phytophthora root rot

D = Dormant

SD = Semi-dormant

HR = 50%+ resistant

MR = 16-30%

R = Resistant = (31-50%)

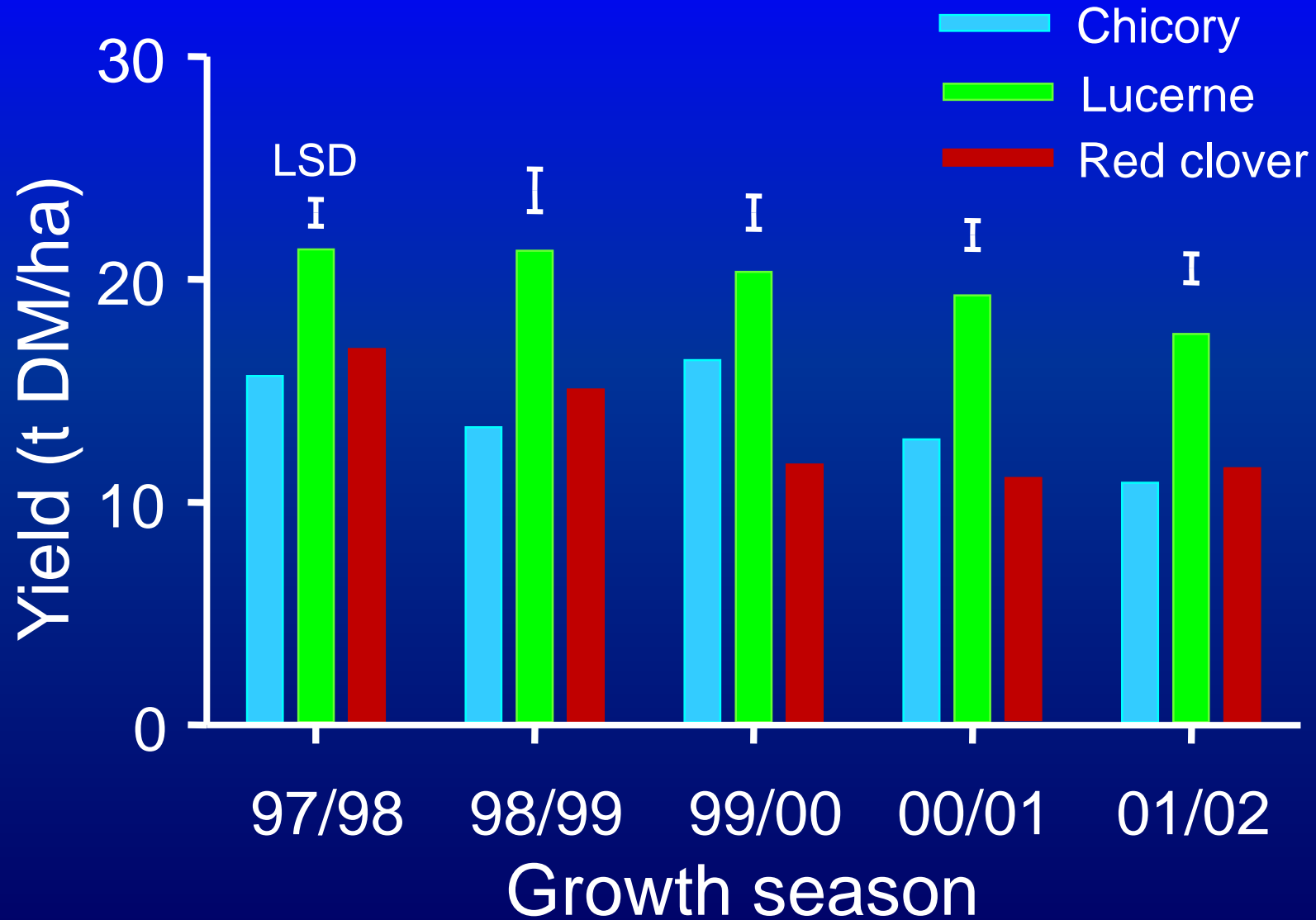
S = Susceptible

Experiment 1 – drought tolerant species

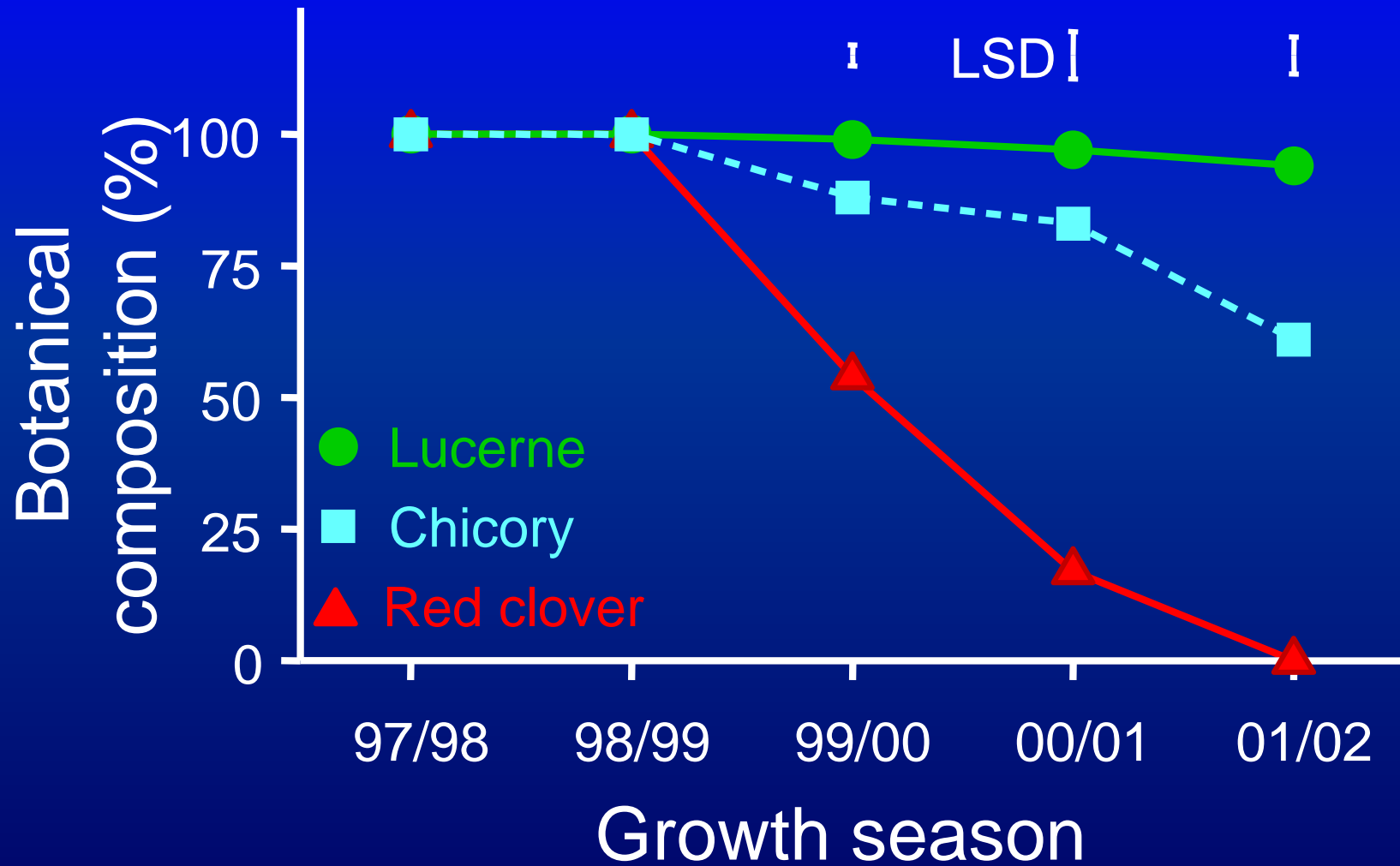


- 65 – 437 mm irrigation
- 7-10 day measurement interval
- 6 years

Annual dry matter yields



Persistence



Growth:

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

Development:

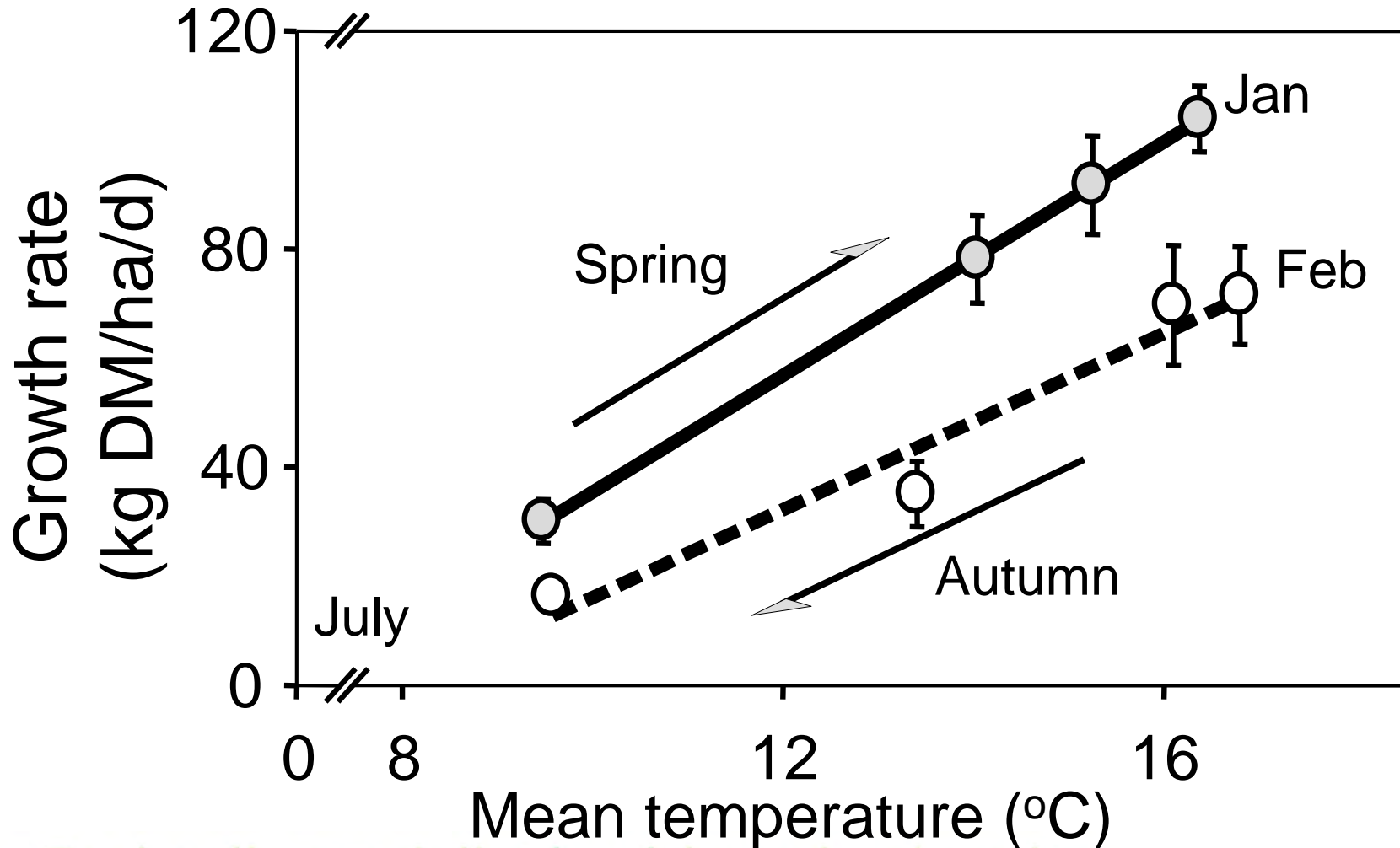
is the ‘age’ or maturity of the regrowth crop
e.g. leaf appearance, flowering

Growth and development are both influenced
by environmental signals

The canopy: the energy capture device



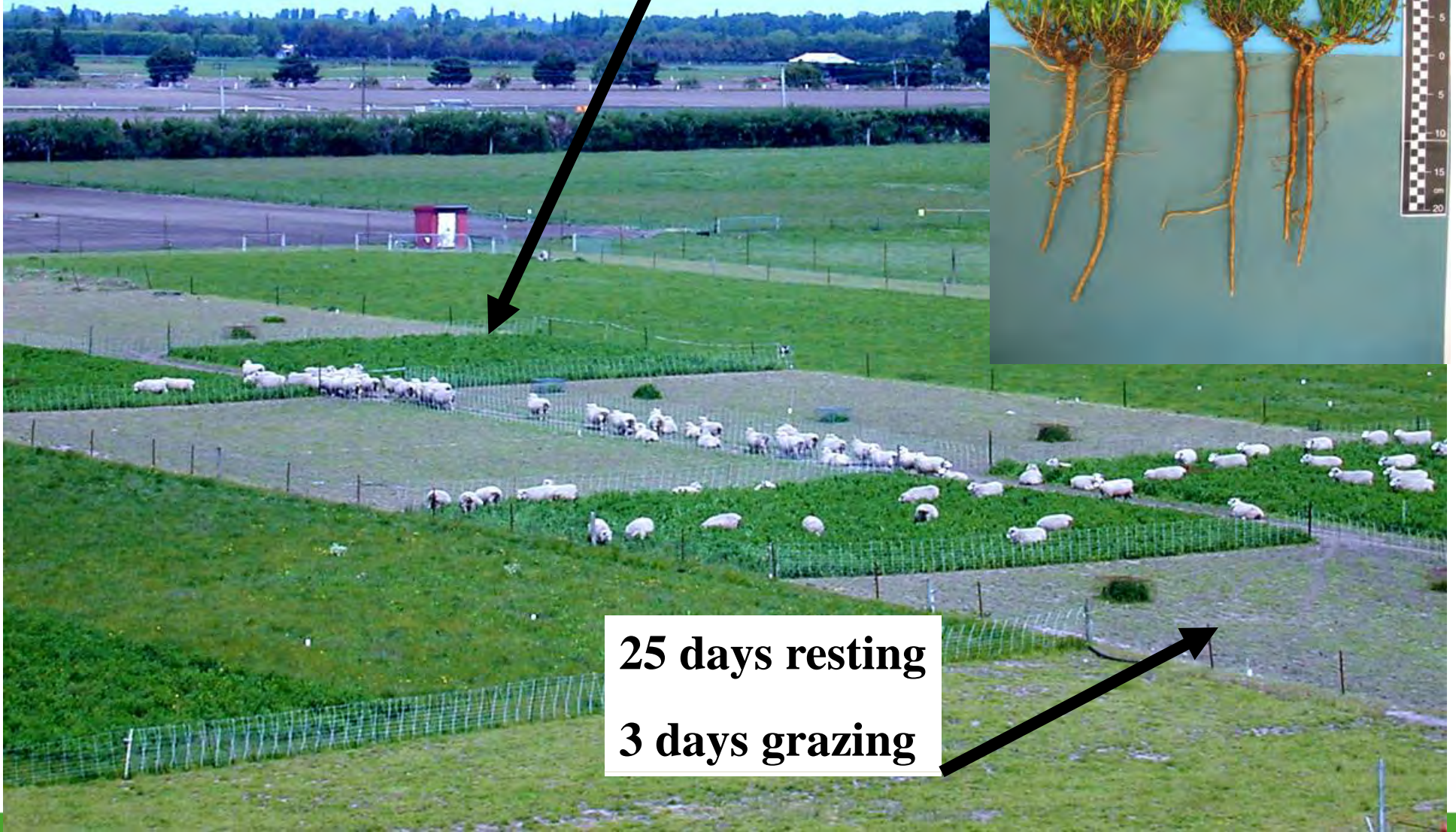
Vegetative growth



Experiment 2 flexible grazing

38 days resting

4 days grazing



25 days resting

3 days grazing

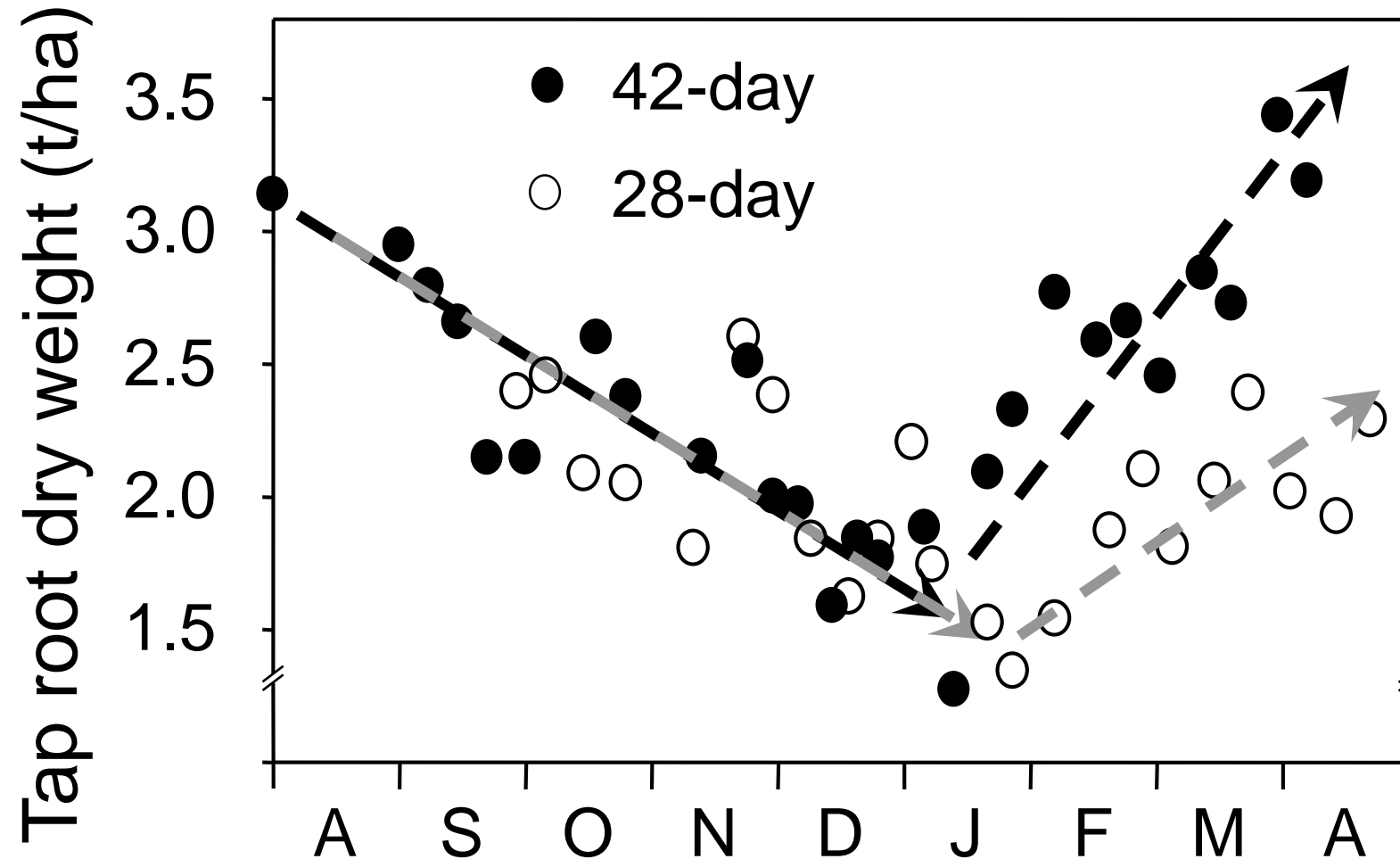




What's going on down there?



Partitioning to roots

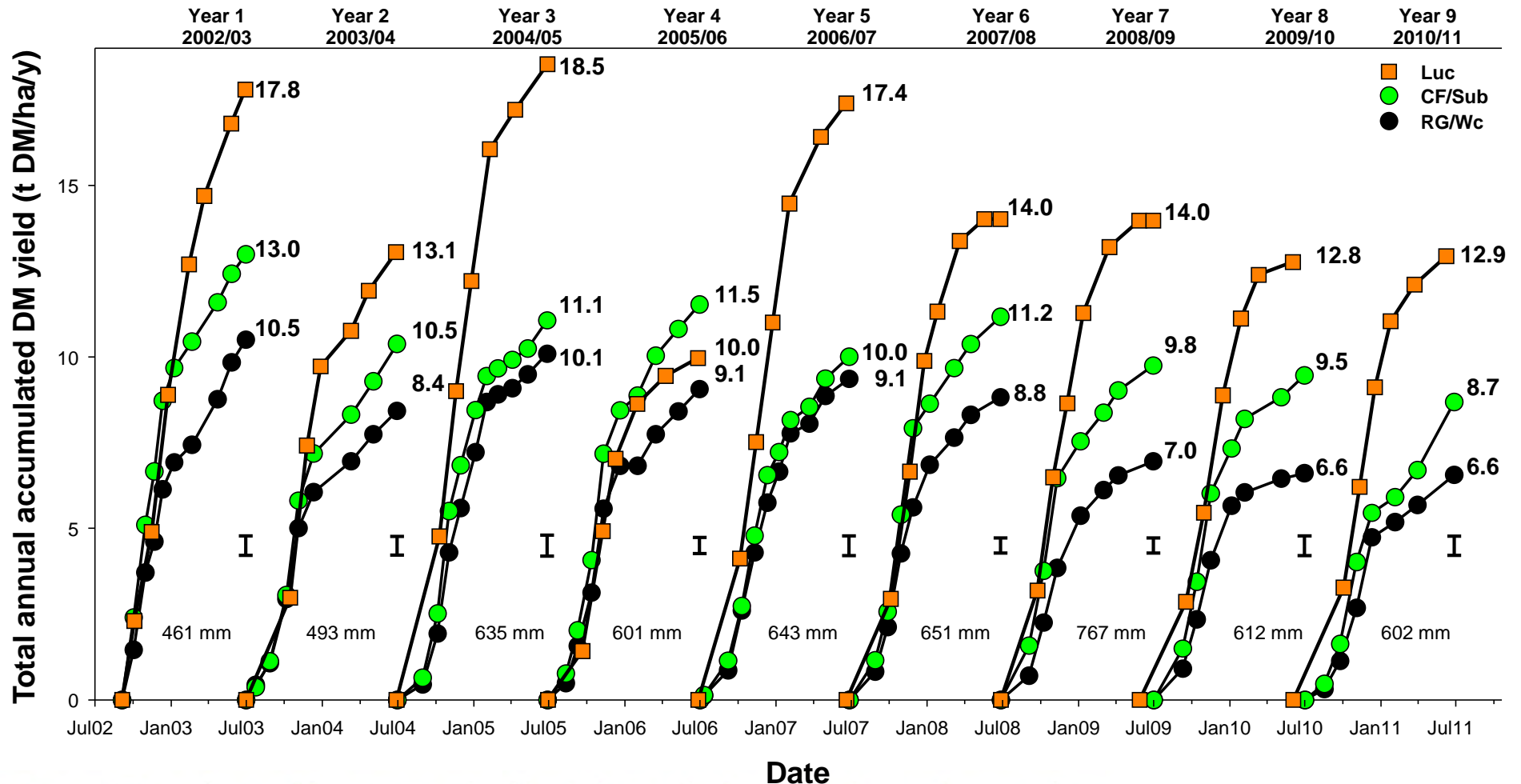




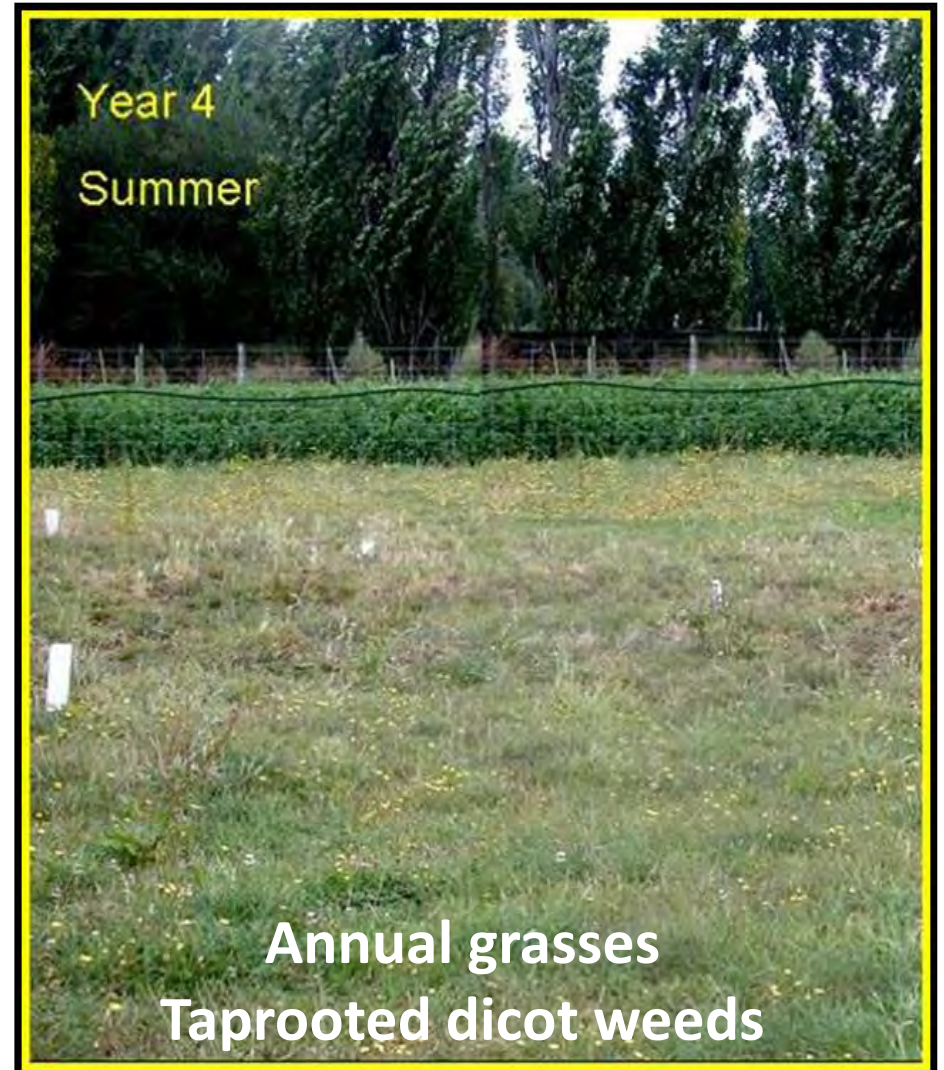
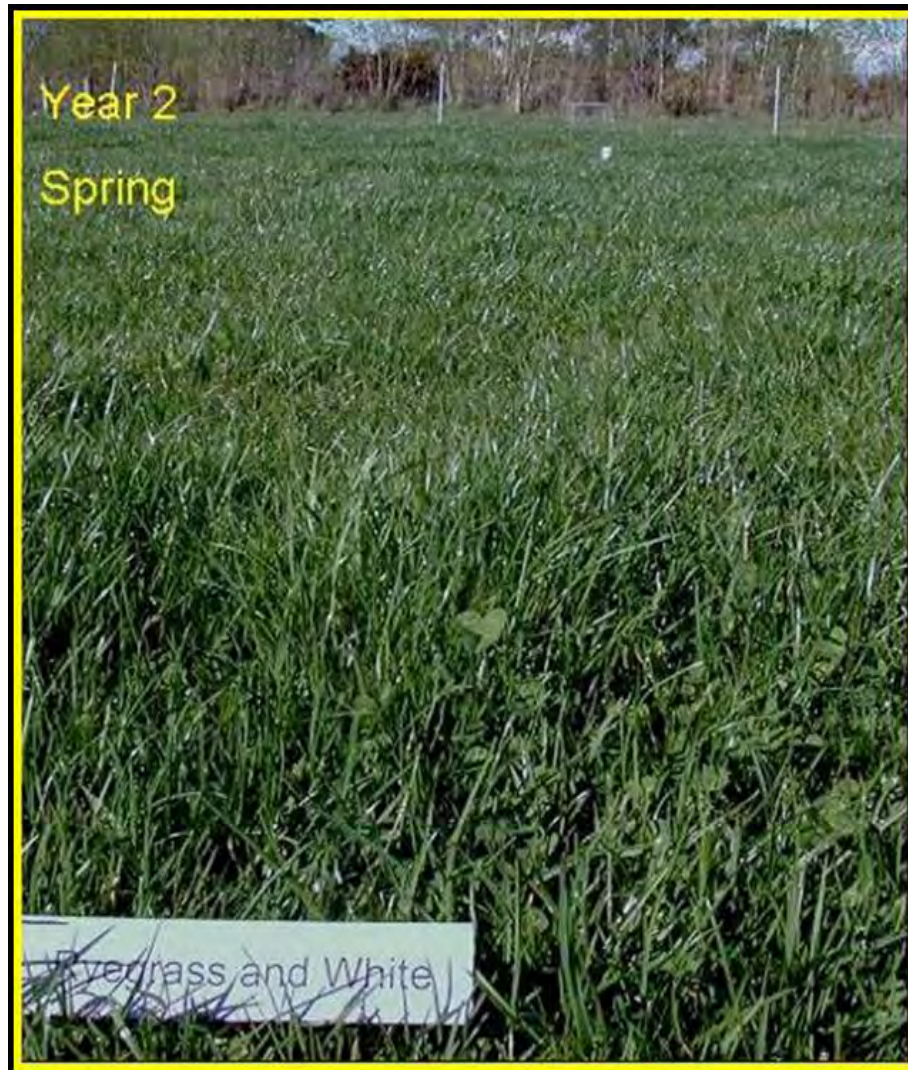
RG/Wc
Lucerne
CF/Sub
CF/Balansa
CF/Cc
CF/Wc

Grazing Expt. - 'MaxClover'

MaxClover Total DM yields

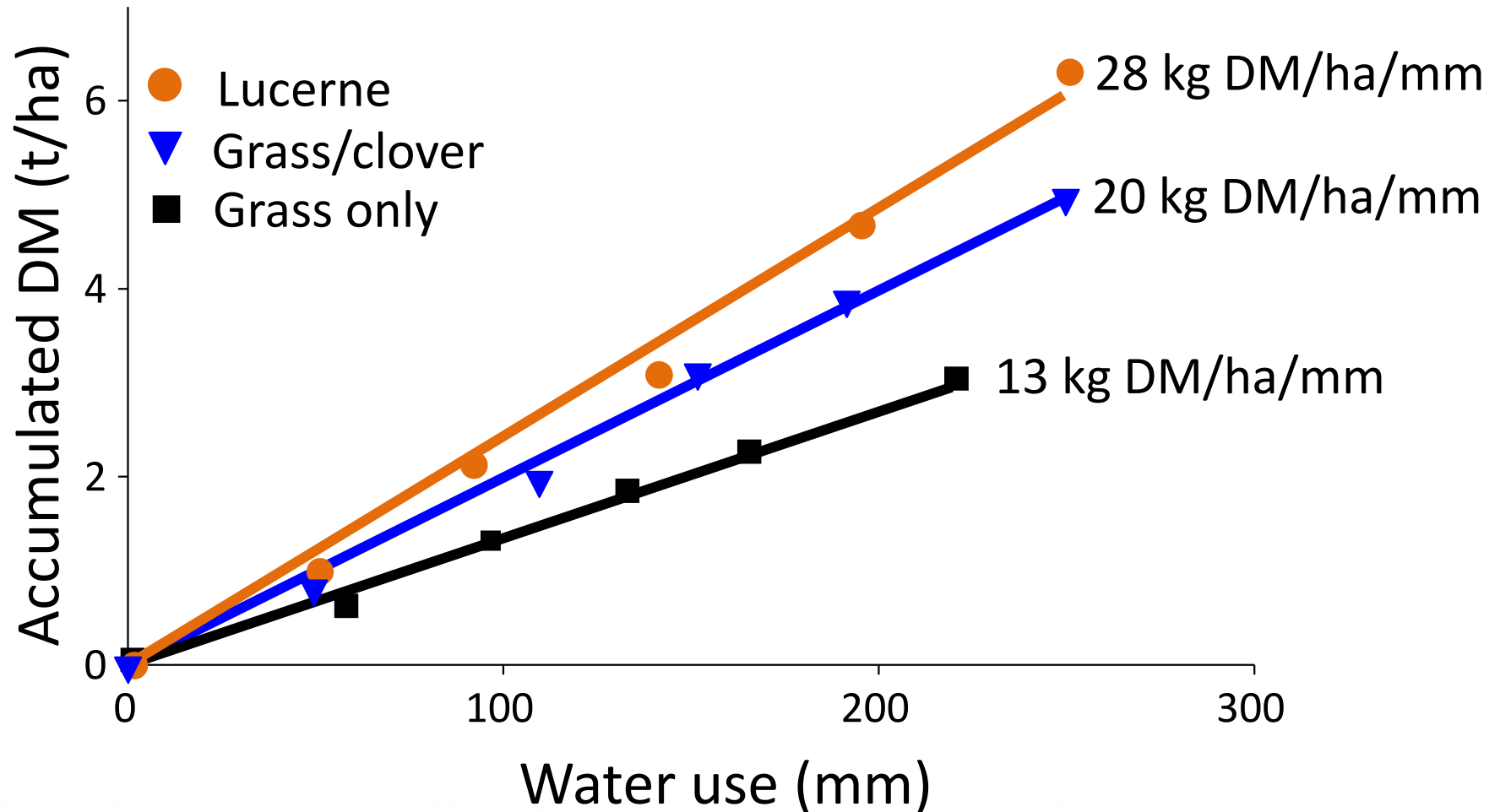


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Unsown species <5% in Year 1>45% in Year 6
RG/Wc pastures

Spring WUE




Seasonal grazing management

Spring

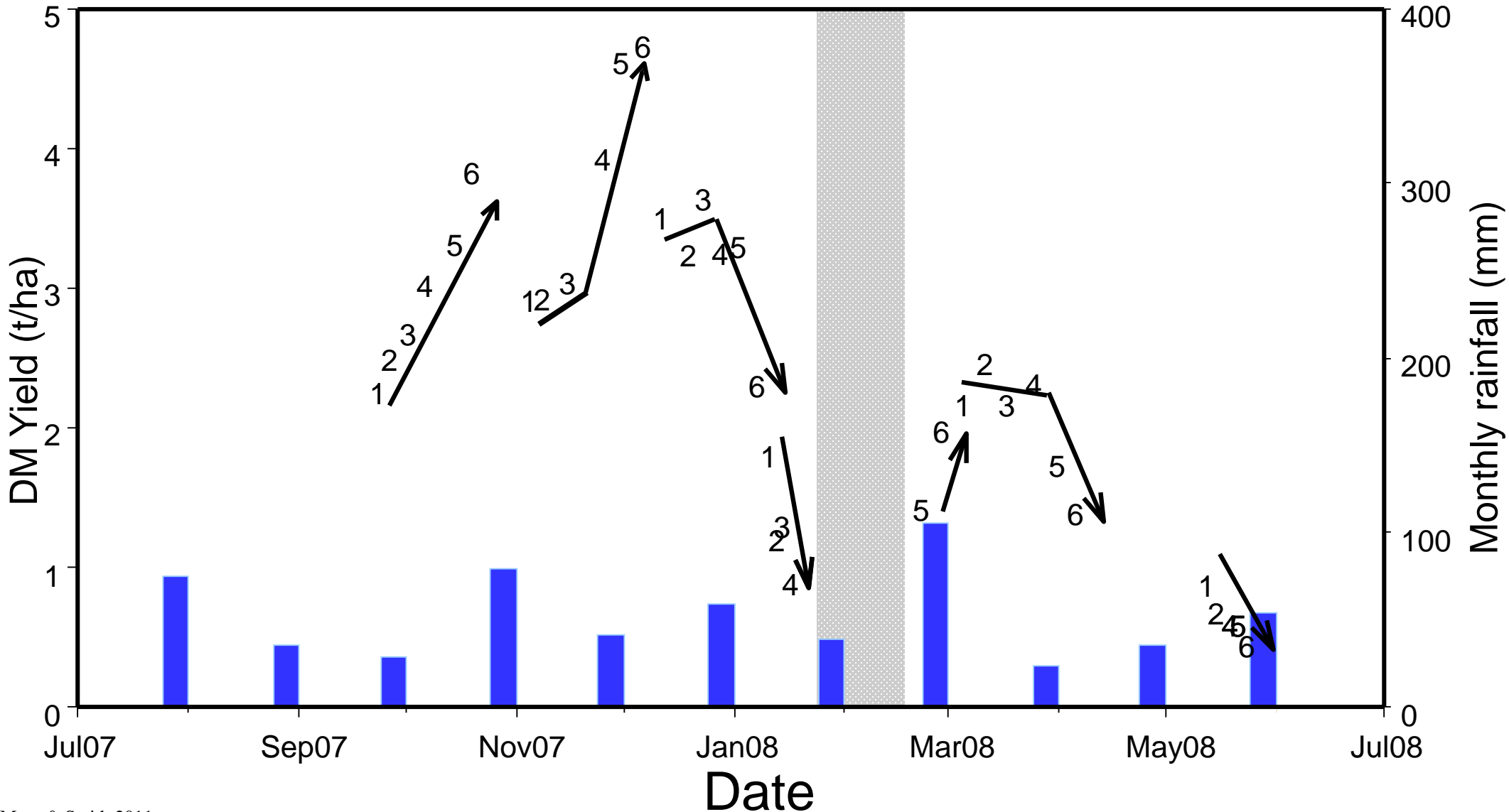
- 1st rotation aided by root reserves to produce high quality vegetative forage.
- can graze before flowers appear (~1500 kg DM/ha) ideally ewes and lambs but

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



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

Plot: 31
Date: 2/11/07
Pre-graze





5th September 2011 – Cave Sth Canterbury





Growing point

Photo: A Black

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

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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





11/09/2009
Fibre and salt

Maximize reliable spring growth – high priority stock



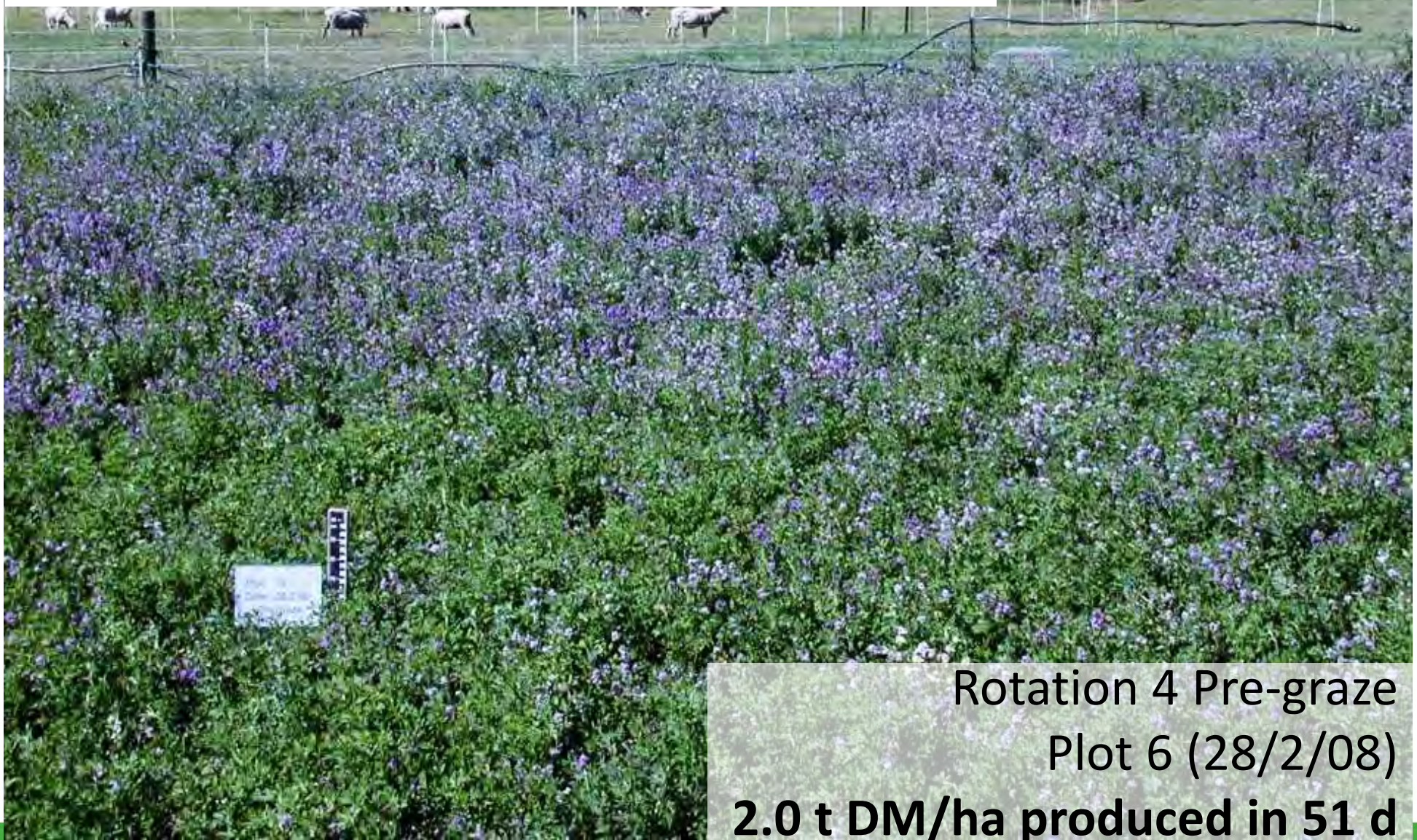
Seasonal grazing management

Early autumn (Feb-April)

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

**\Rightarrow 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

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

Lucerne establishment

Weed control – pre sowing

Sowing method – cultivation or direct drill e.g. Post spring fallow in low (<600 mm) environments

Management – hard graze at 15 cm if weedy

Flowering – 50% of stems with an open flower and then graze or cut.

Lucerne root
~8 months after sowing
> 1.5 m length





Where to plant

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Landscape farming

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Establishment

- Soils**
- deepest free draining soils
 - pH 6.0 (in H₂O)
 - RG/Wc fertility

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

Autumn Spraying

Timing is Critical

Most important tool

Glyphosate, granstar, penetrant

Key Results

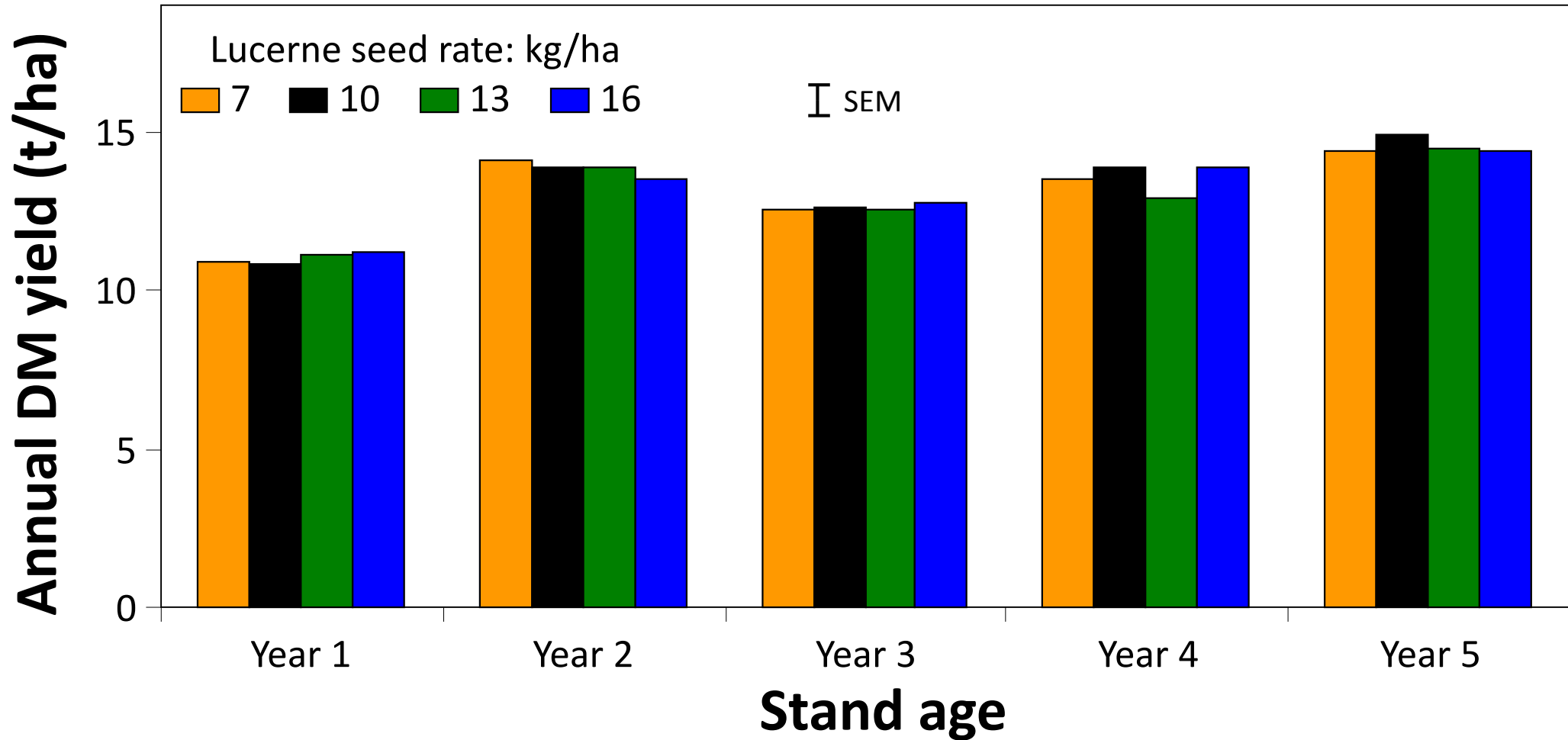
Conserve soil moisture

Kill mass root systems

Drilling seed with fertiliser
Direct drilling = seed + fertiliser



Annual yield in relation to sowing rate



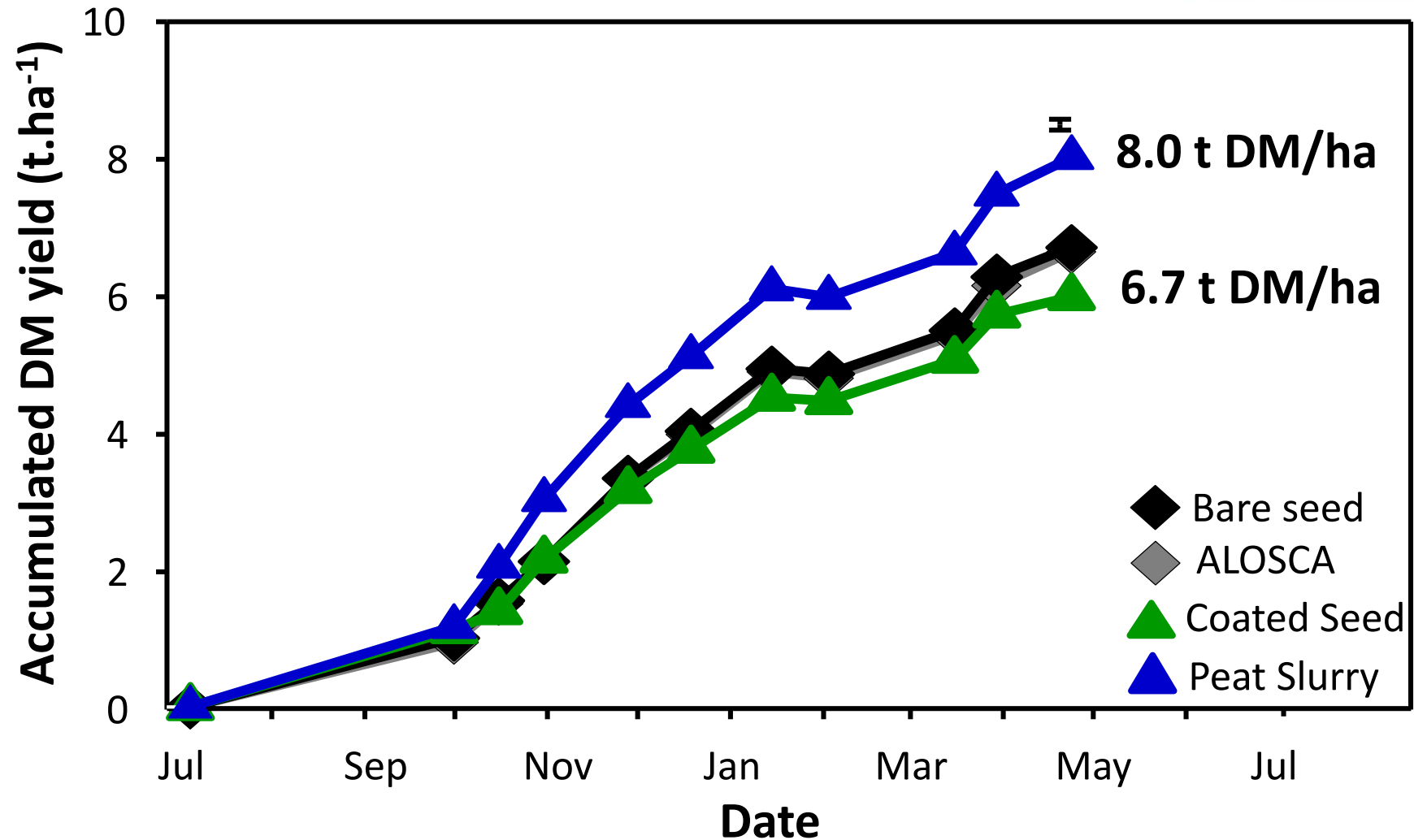
Sown: February ~ October

Taproot mass



Sampled: June

Effect of seed treatment on yield in Year 1



A close-up photograph of a plant root system, likely from a legume, showing a network of roots. The roots are light brown to tan in color. A prominent feature is a cluster of dark, reddish-brown, nodular structures (root nodules) attached to a root. The background is a plain, light-colored surface. A semi-transparent white rectangular box is overlaid on the upper portion of the image, containing the text "Which rhizobia are in here?".

Which rhizobia are in here?

Aluminium issues



Lime and Fertiliser Application

Lime 3-5 ton/ha
Fertiliser 250-500kg/ha



Transformational change & Resilience to climate change



Over 60,000 ha sown and doubling of lucerne seed sales over 10 years



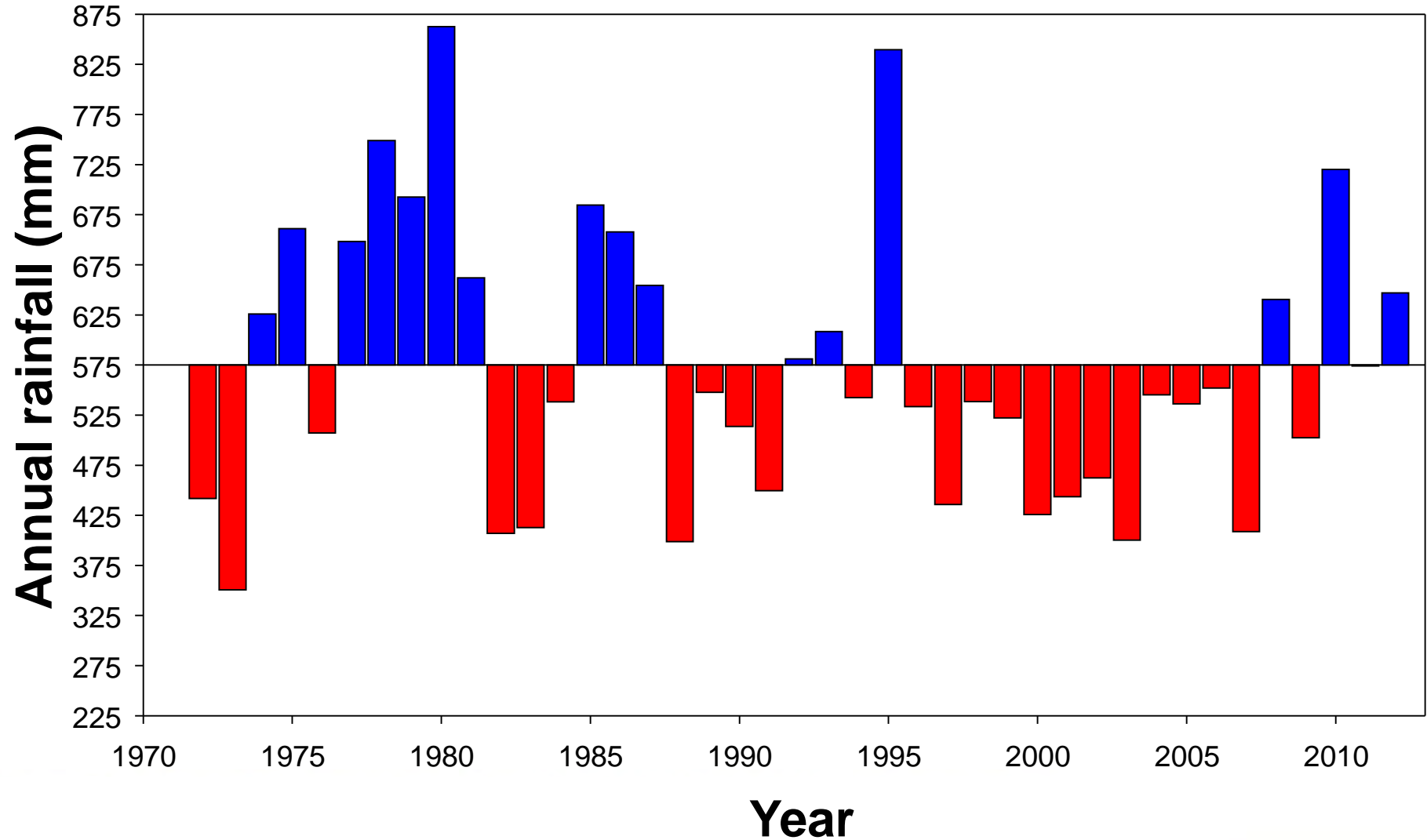
“35% Rate of return on investment”

Case study – Bonavaree farm

Over grazed – high erosion risk



Annual rainfall at 'Bonavaree'







Salt bush

Young lucerne

Chemically fallowed land

'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) | \$US267 | \$US665 | ↑ 149% |



***“With better income we can focus on the environment and preserve it for generations to come”
(Doug Avery)***



Resilient drought-proofed landscape



SI Farmer of the Year 2010

Close up of a prairie grass and lucerne mixture



'Bonavaree' Marlborough
July 2010

Lucerne + cocksfoot



The website...

Info on:

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

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Dryland pastures research

Dryland pastures research team:

- [Derrick Moot](#)
- [Dick Lucas](#)
- [Alistair Black](#)
- [Annamaria Mills](#)

Research projects:

Dryland Pastures – Technology Transfer Programme

This SFF funded project investigates strategies for dryland livestock farmers to drought proof their farming systems using different species and develop their properties with guidance from Lincoln University staff. The farmers involved will develop practical messages for other farmers to follow.

- [Marlborough – Technology Transfer](#)
- [MaxClover Grazing Experiment](#)
- [Lucerne research](#)

High country forage improvement

Funded by the New Zealand Merino Company Ltd., 'Survive, thrive and make money from...' three stages of pasture legume research aimed at high country pastures. Lincoln University staff and postgraduates are working with several high country farmers to determine which species survive and how to make them thrive in the unique soils and climatic conditions of the South Island high country.

- [High country stations](#)
- [Lees Valley](#)

Publications

- [Scientific Publications](#)
- [Field Day handouts and presentations](#)

Postgraduate research

- [Postgraduate student programmes](#)

Related Links

- [Dryland Pastures Blog](#)
- [Agricultural Sciences](#)
- [Faculty of Agriculture and Life Sciences](#)

feedback

www.lincoln.ac.nz/dryland

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Masters: Kirsopp, D. Black, Power, Gillespie, Tonmukayakul, Khumalo, Morris

Honours students: Dunne, Lewis, Kearney, Inch, Sim, Brown, Murray-Cate

Wigley, Stocker, Tapp, Kearns, Lewis, Neal, Crutchley, Coutts, Neal,



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