Lucerne:
From research to farmer adoption

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Canterbury
New Zealand

Photo: DJ Moot
Lincoln University

Lincoln University

Canterbury
New Zealand

Photo: WR Scott
Lincoln University

East coast dry land

Rain fed 300-700mm

Photo: DJ Moot
Lincoln University

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By 2030 - Drier:
Drought – increased duration and frequency
Annual and tap rooted dryland pasture species?
Photo: DJ Moot
Lincoln University

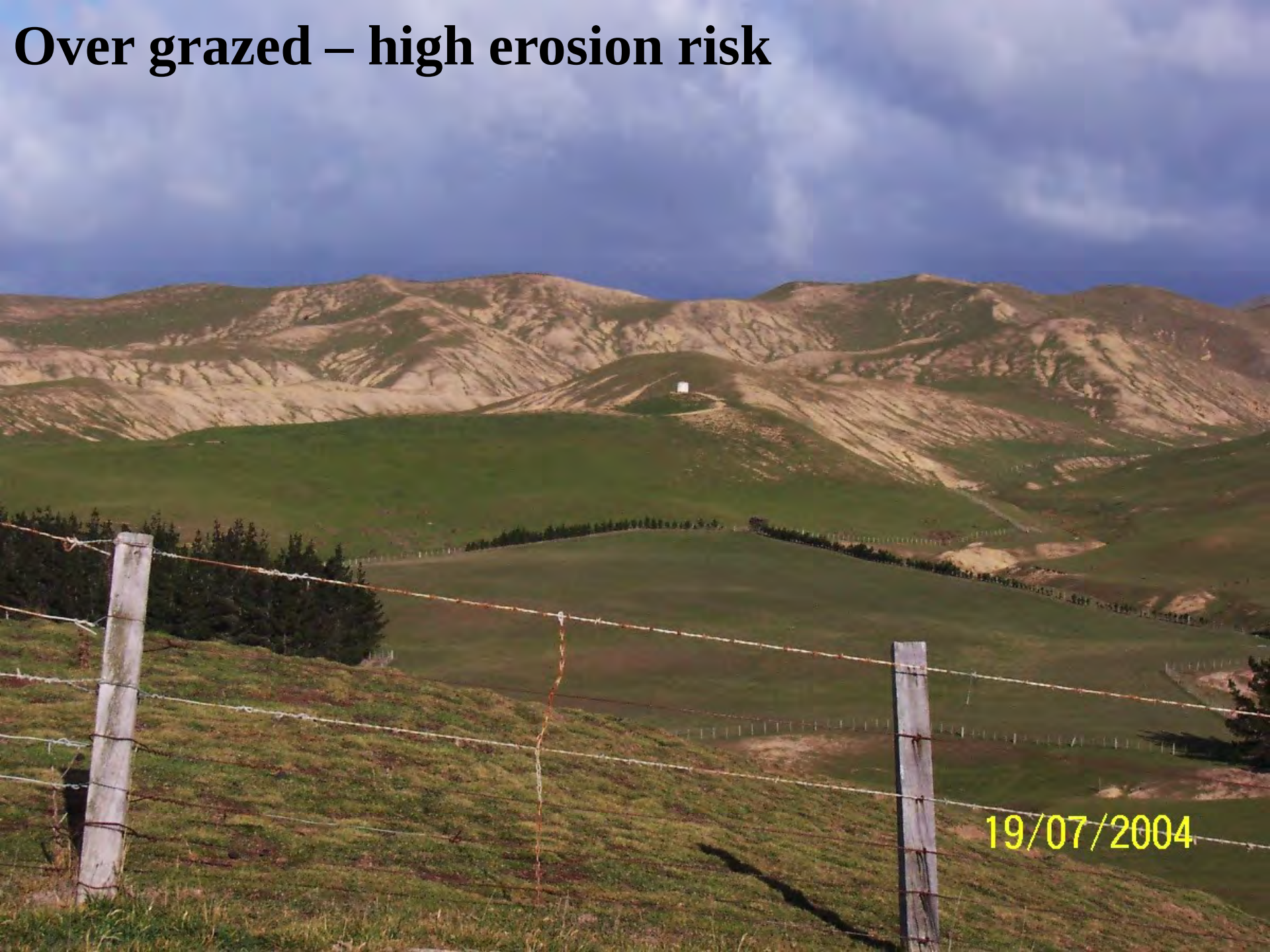
Transformational change
&
Adaptation to climate change

Kearney *et al*. 2010

Hills Creek Station – 60,000 ha by one company

Kearney *et al*. 2010

Over grazed – high erosion risk



iverse drought-proofed landscape

Lucerne Research

1) Farmer survey (1998 – 1 Masters)

2) Directed Experiments (1998- present: 4 PhD, 2 Masters, 11 Honours students)

3) Science and Modeling – (2000 – present) (40 international journal, 70 conference)

4) Extension and adoption- (1998 - present)

1) Lucerne issues

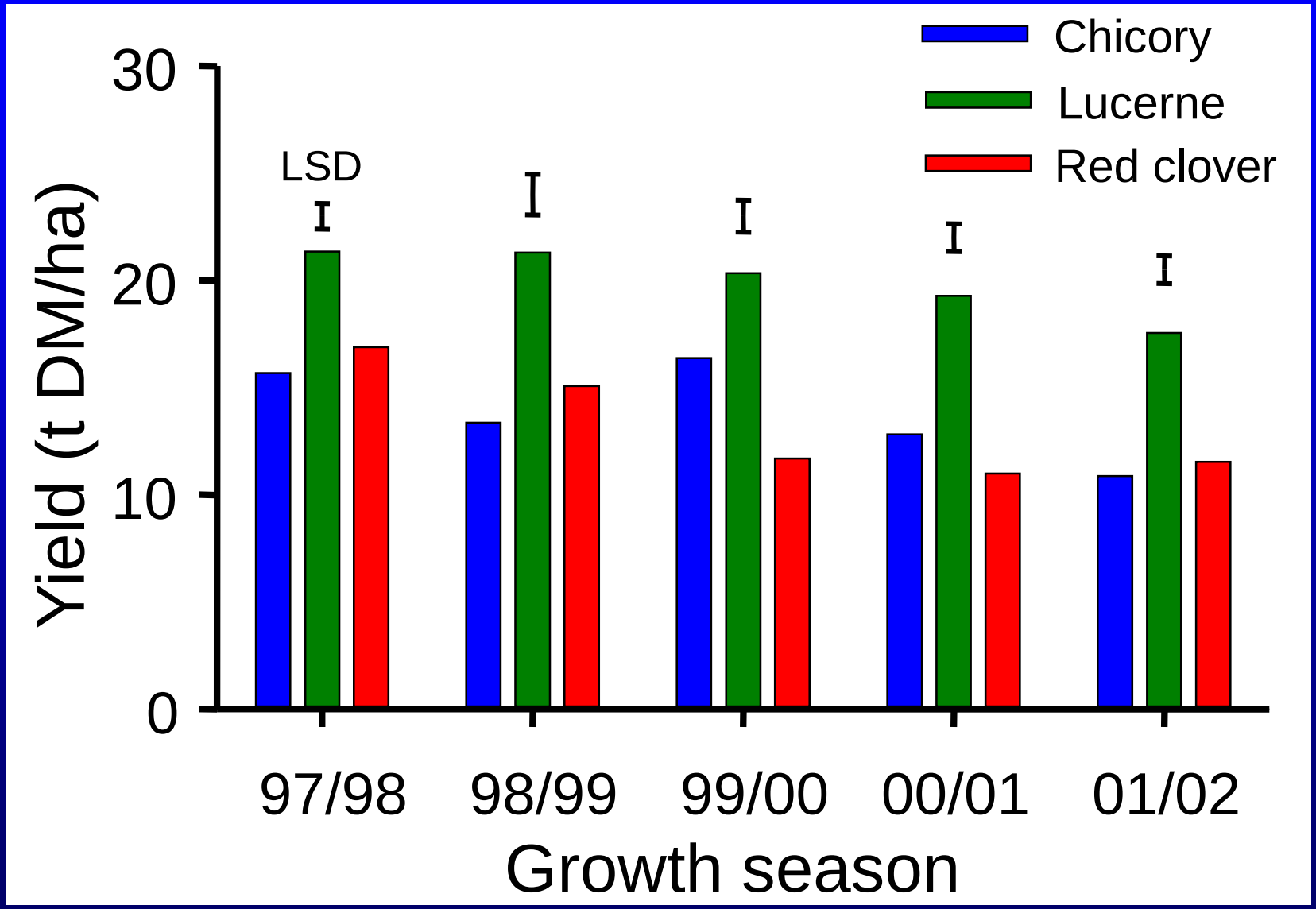
A) Pests and diseases – 1980s

- Largely overcome by new cultivars from NZ and Nth America

B) Which deep-rooted species e.g. chicory, lucerne, red clover ?

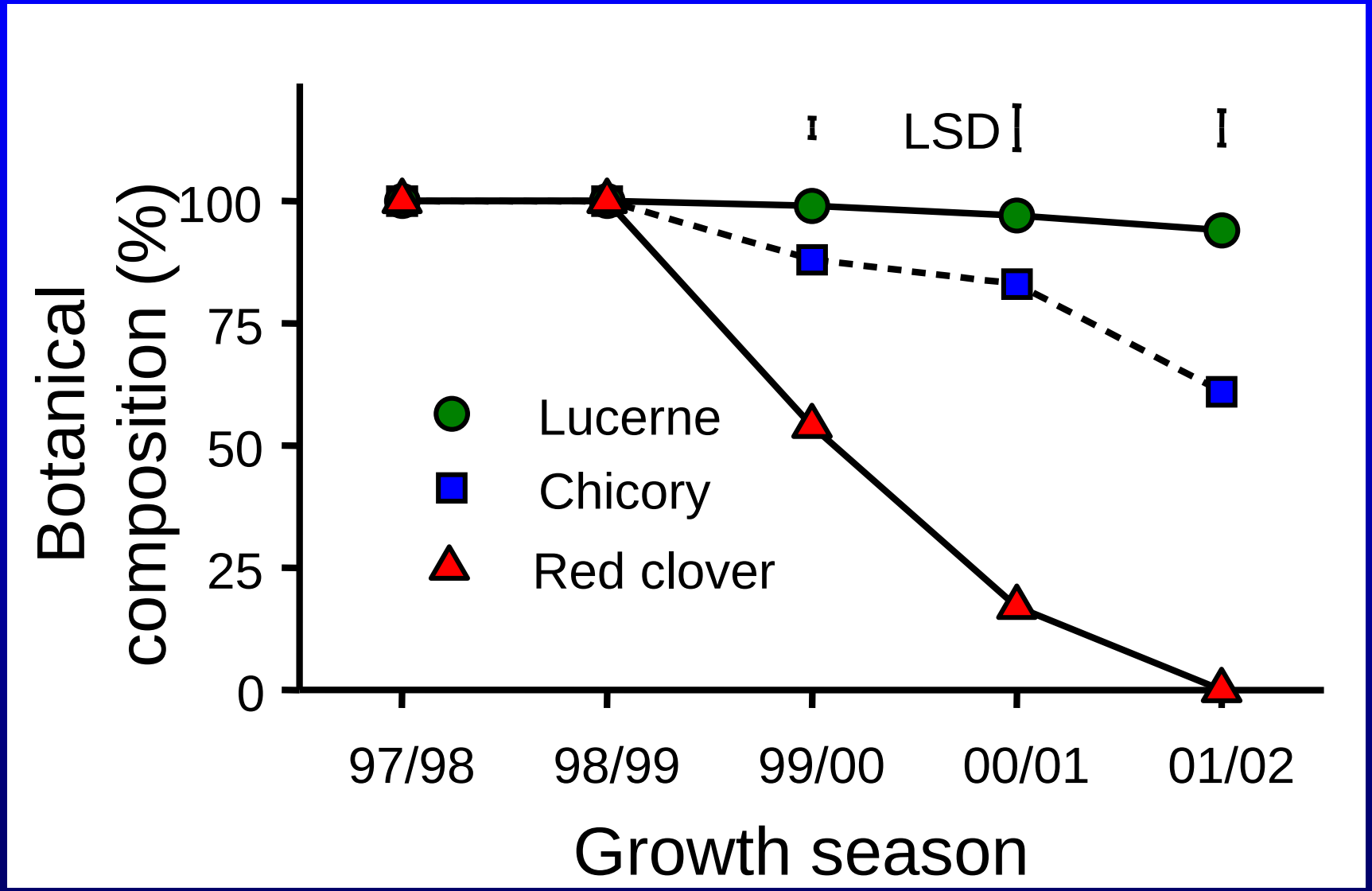
2) Experiment 1 – drought tolerant species

Annual dry matter yields



Brown *et al*. 2005

Persistence



Brown & Moot 2004

1) Lucerne issues (cont'd)

c) Lambing time

- Average 23% higher but 3-weeks later
- Ewes and lambs on lucerne pre-weaning?
- 10% flowering – basal bud formation

Experiment 2

38 days resting

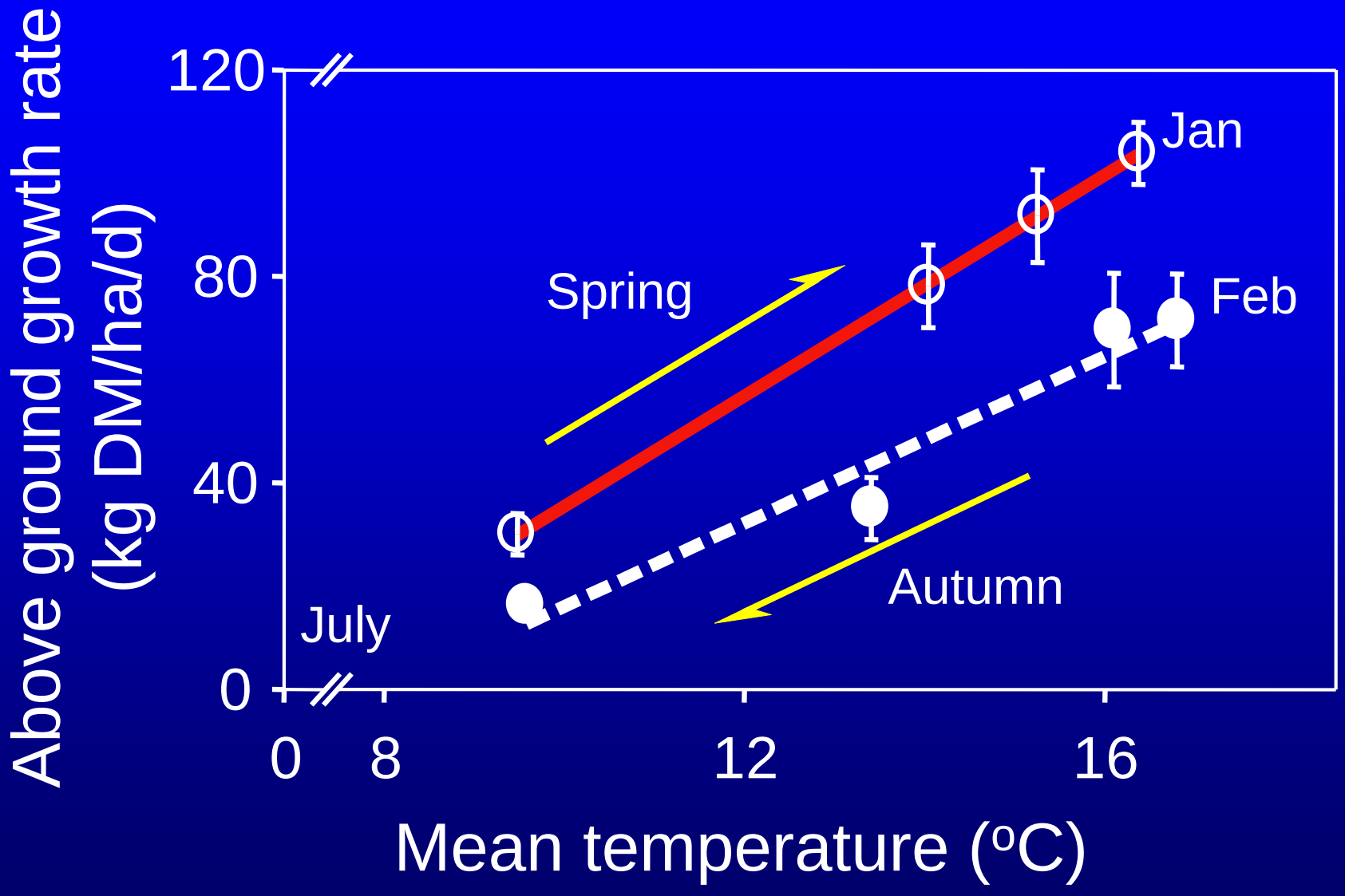
4 days grazing

25 days resting

3 days grazing

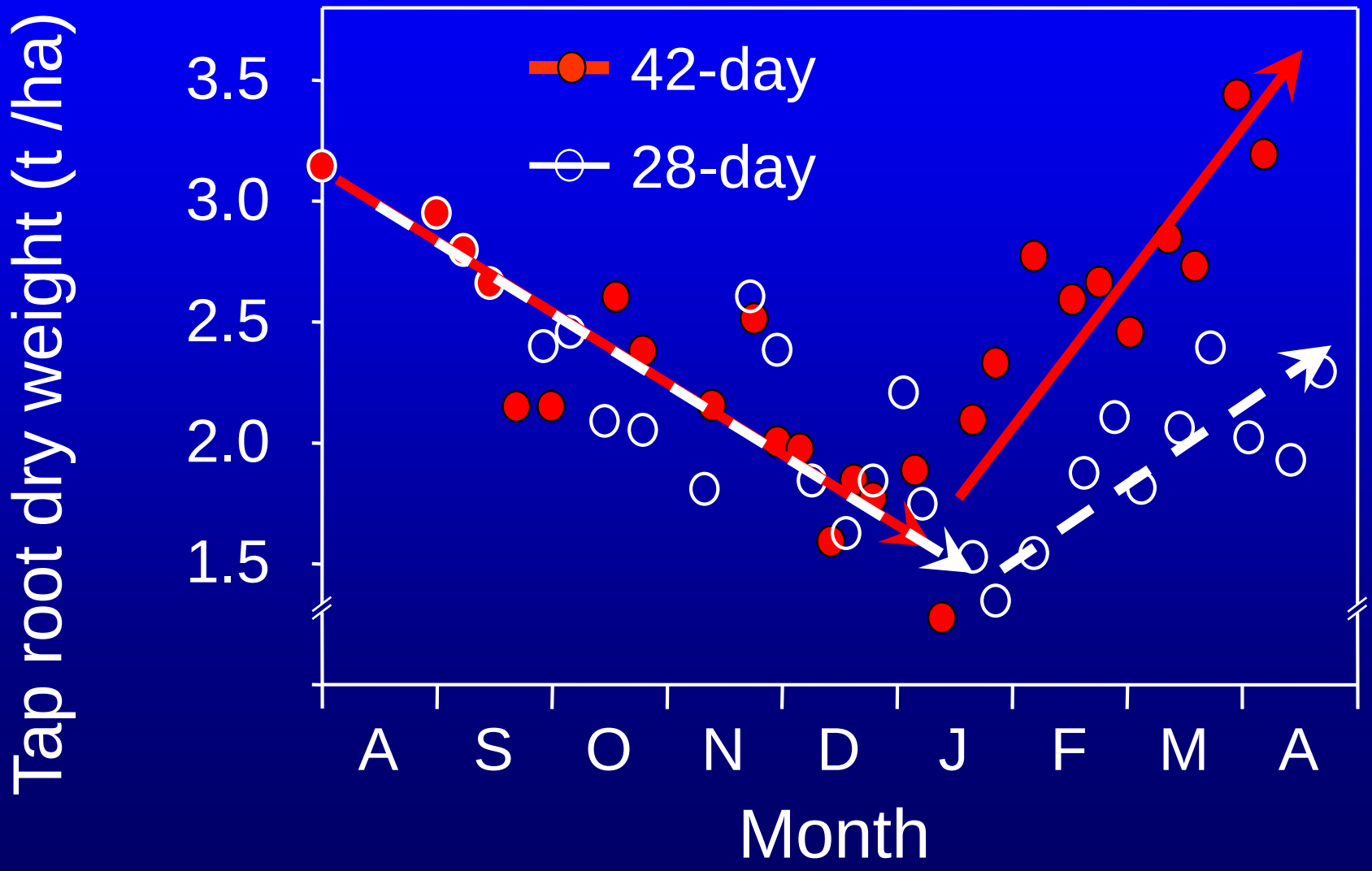
Photo: Edmar Teixeira
Lincoln University

Vegetative growth



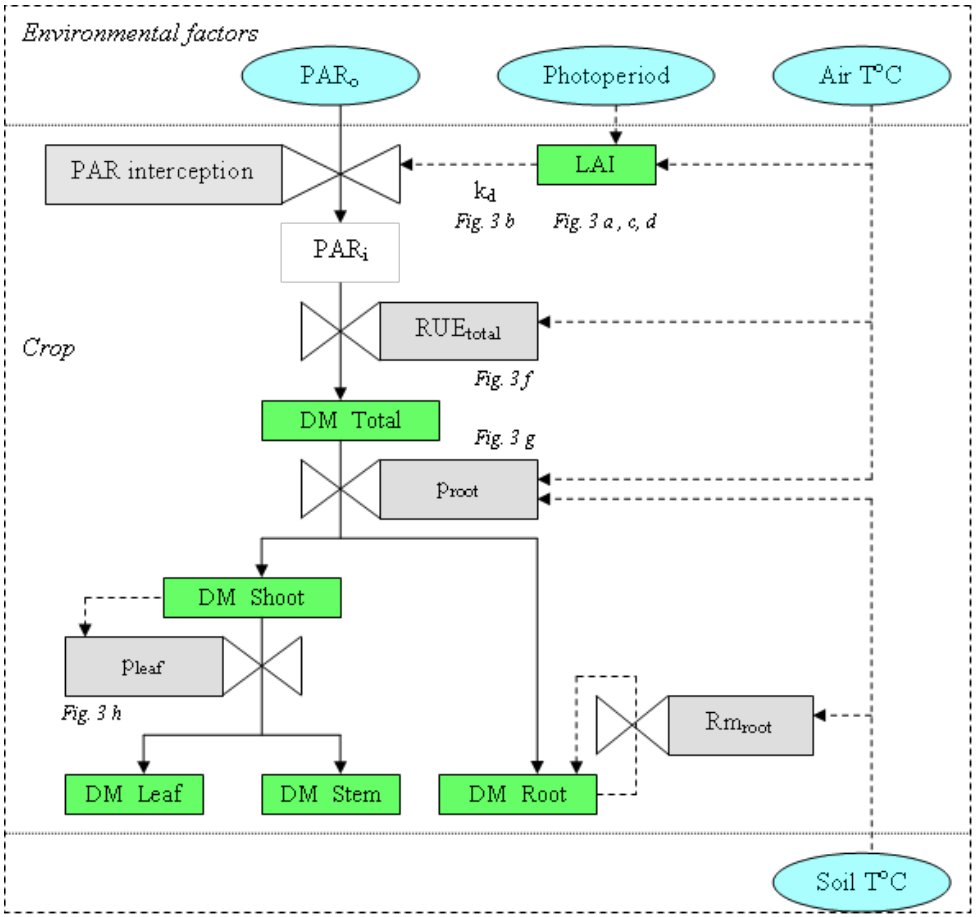
Moot *et al*. 2003

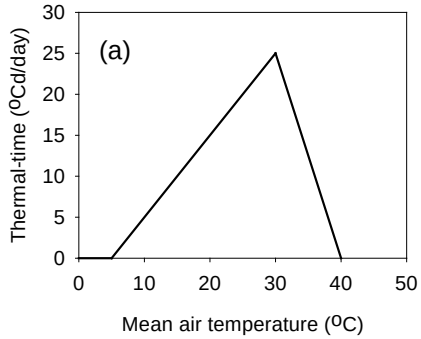
Partitioning to roots

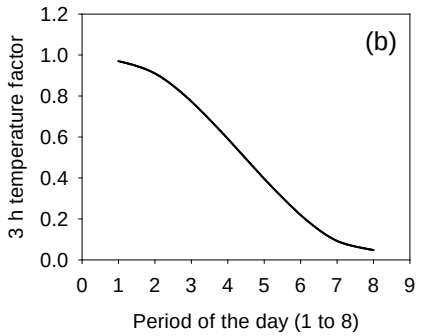


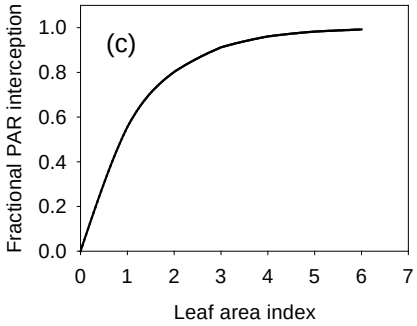
Moot *et al*. 2003

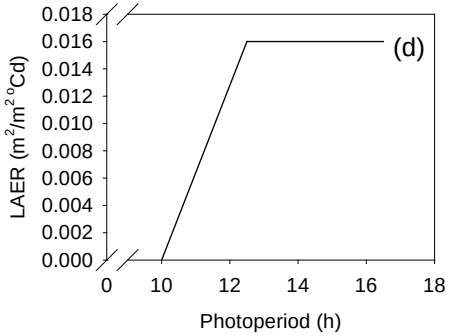
3) Modelling

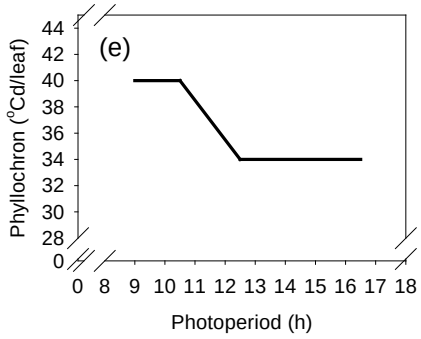


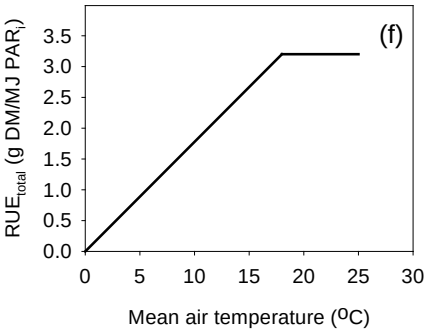


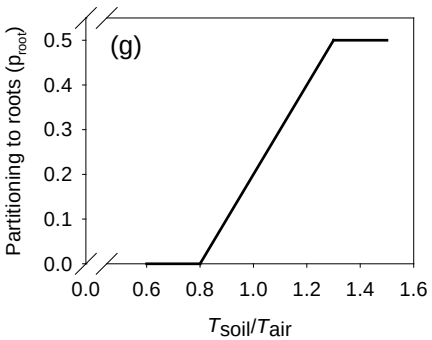


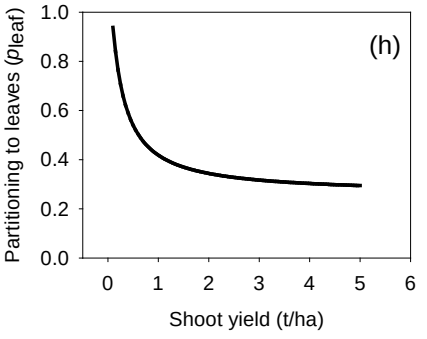






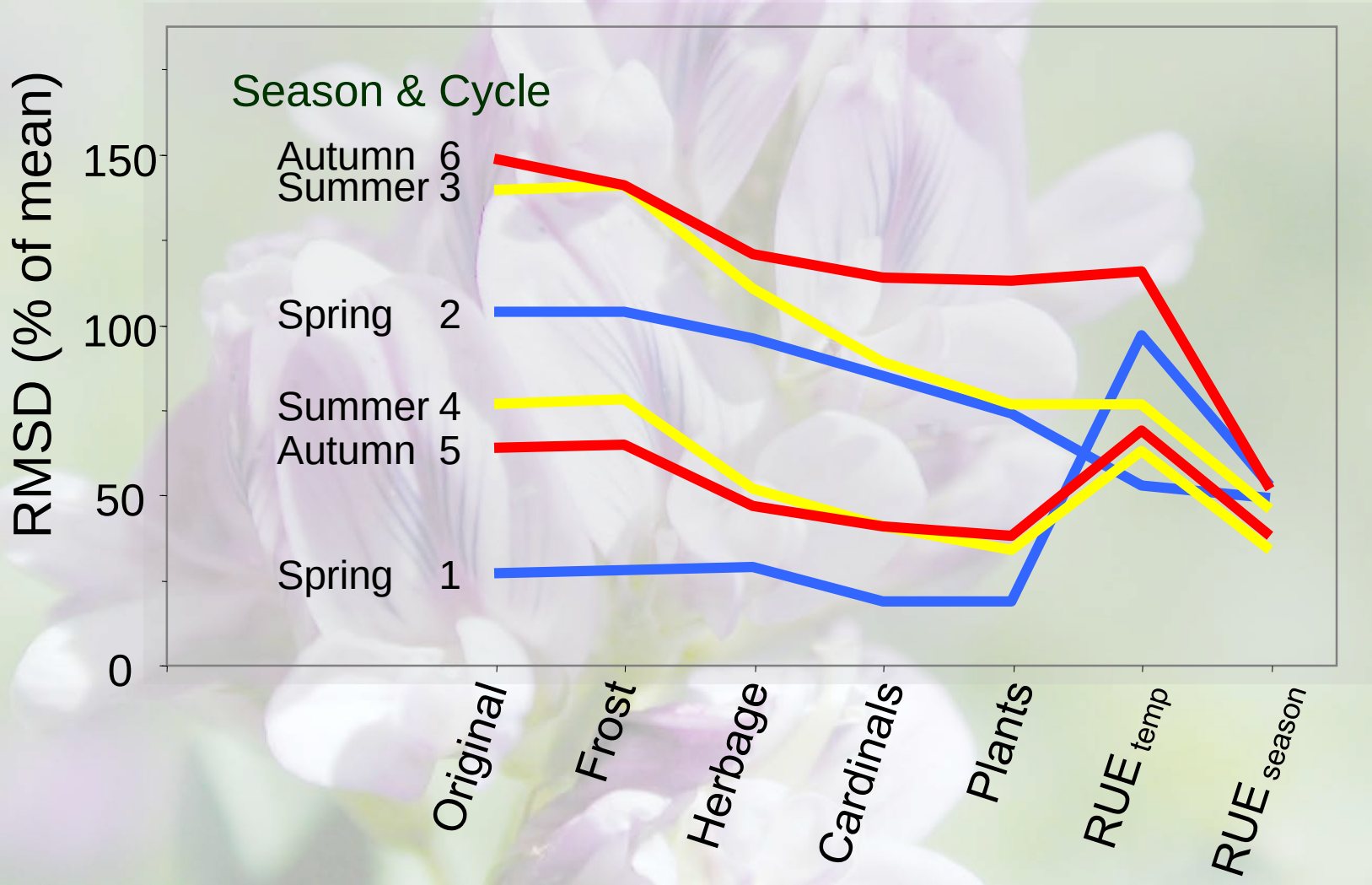






Teixeira *et al*. 2009

RMSD: → RUE seasonal



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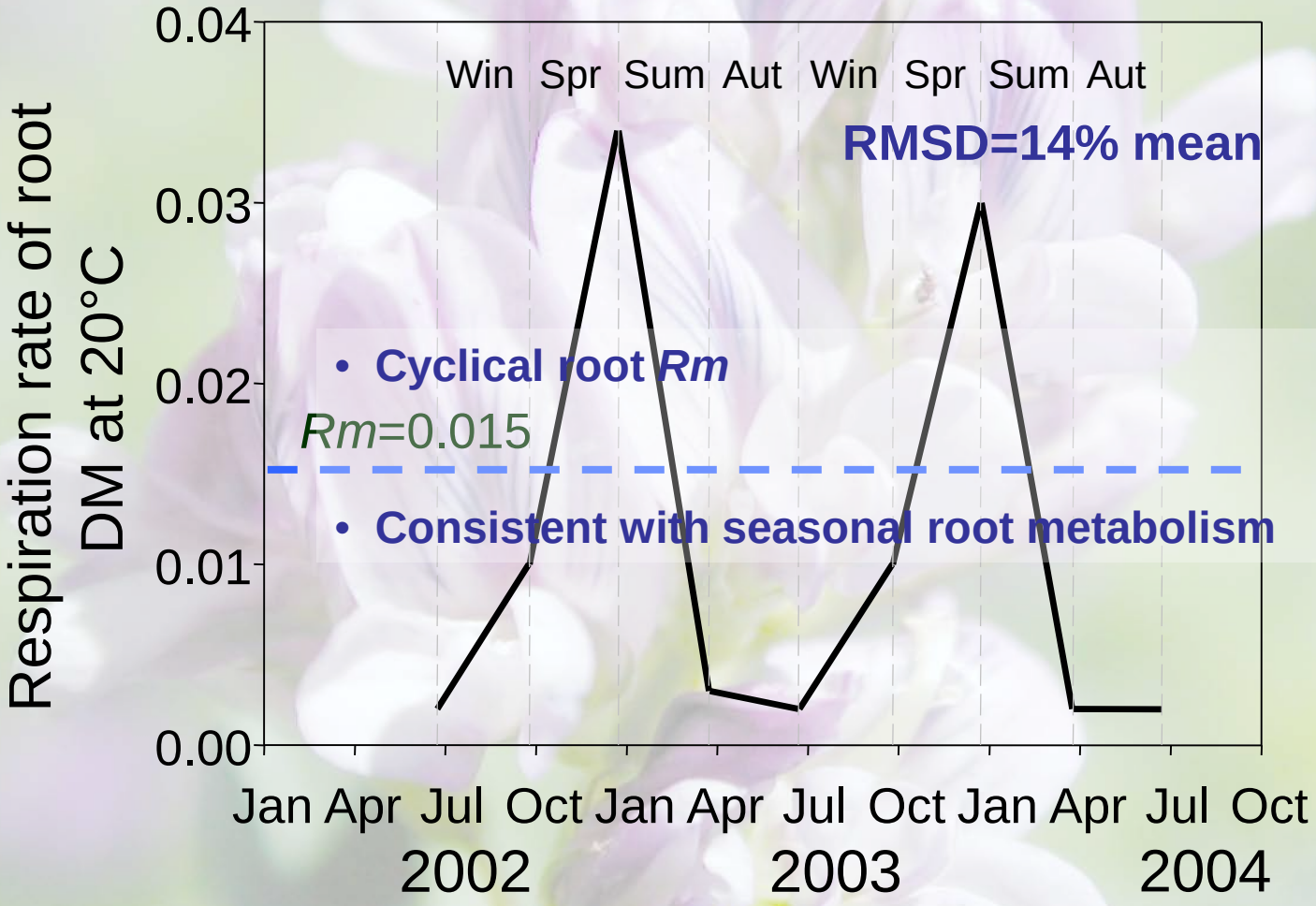
Seasonal pattern Rm values

Best fit: Seasonal pattern of R_m at 20°C



Teixeira *et al.* 2009

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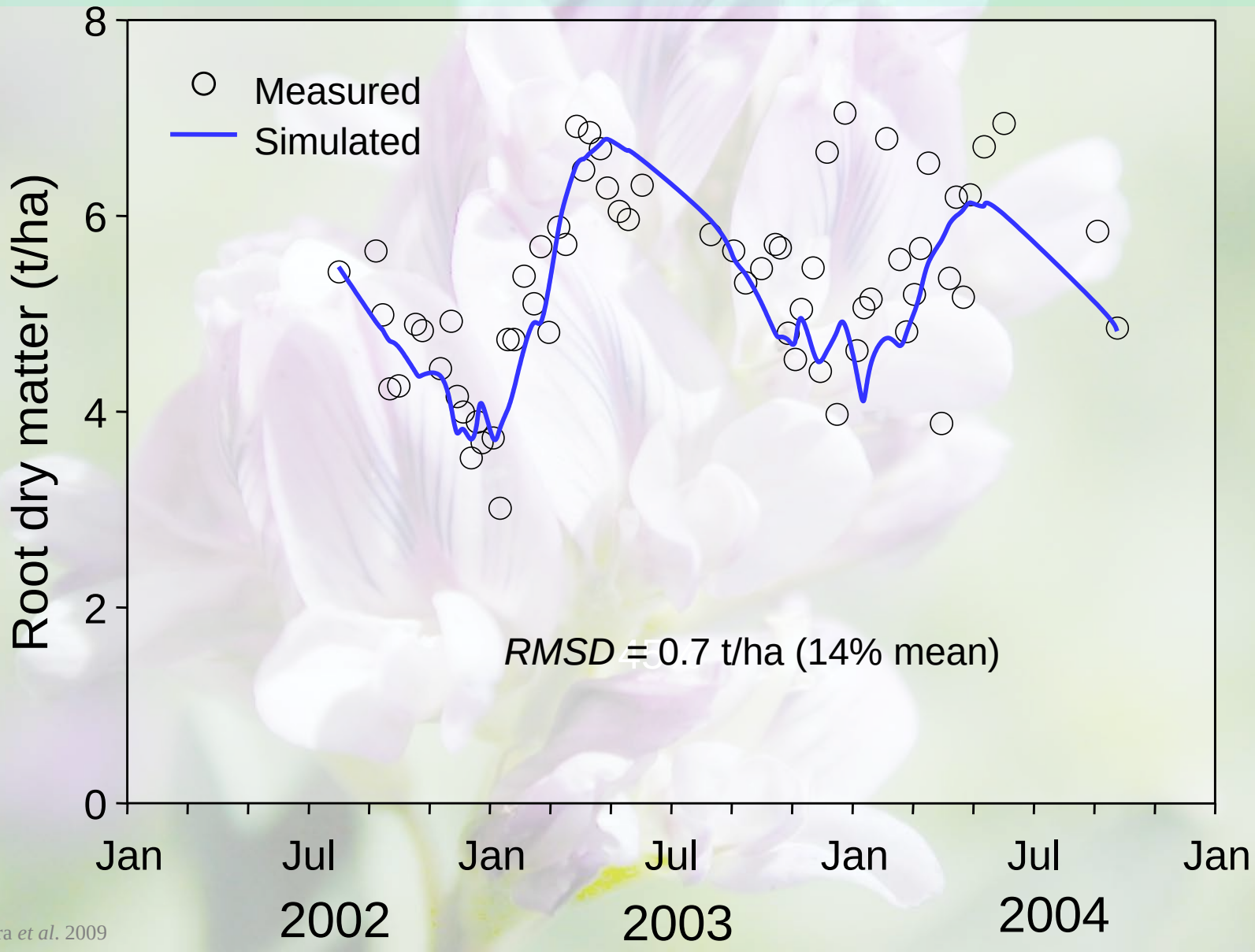
Adjusting Rm for the best fit



Teixeira *et al.* 2009

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Model results

Accurate prediction of the seasonality of lucerne:

Growth

Canopy expansion

Vegetative development

was obtained by the use of:

(i) Thermal-time sum with 3-hour period and broken stick model

(ii) LAI = *f*(temperature, Pp)

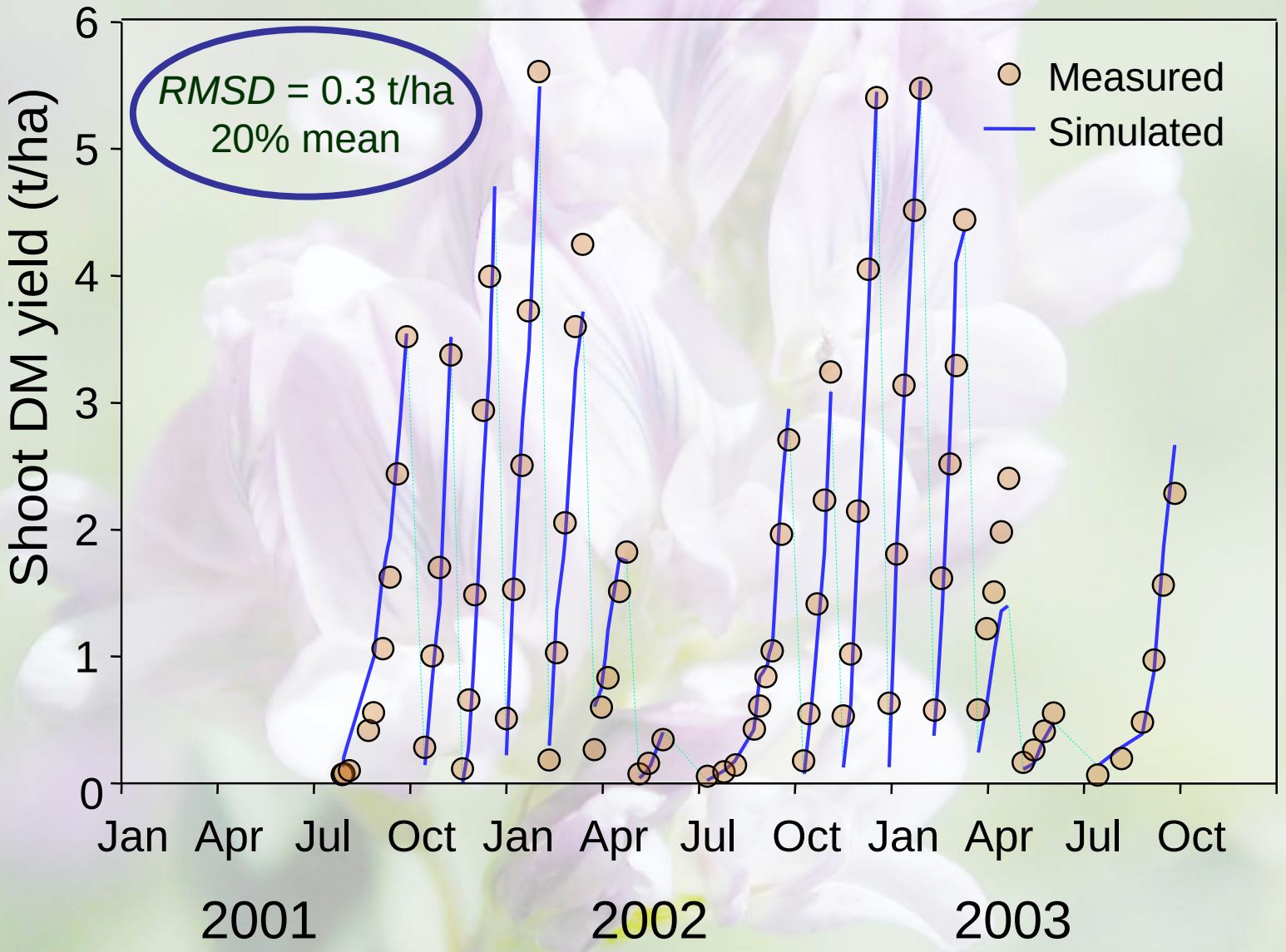
(iii) $RUE_{shoot}=RUE_{total}*(1-p_{root})$

Root biomass

(iv) Cyclical coefficient of root maintenance respiration rate (R_m)

Teixeira *et al*. 2009

Predictions of shoot yield



Teixeira *et al*. 2009

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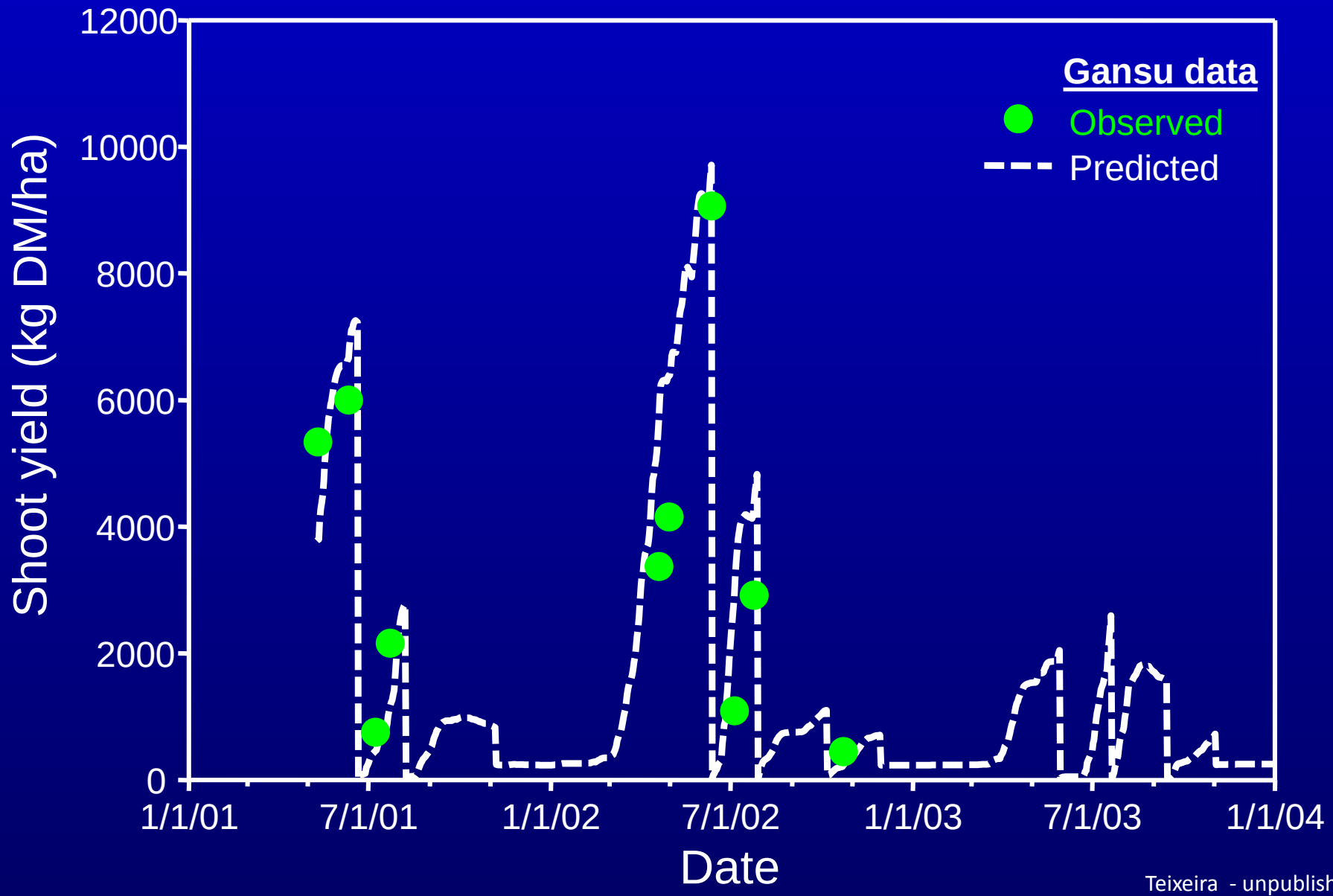
APSIM Lucerne Validation



Teixeira - unpublished

4) Extension

SERVANT LEADER

Where to plant

Photo: 'Bonavaree' Marlborough

When to graze

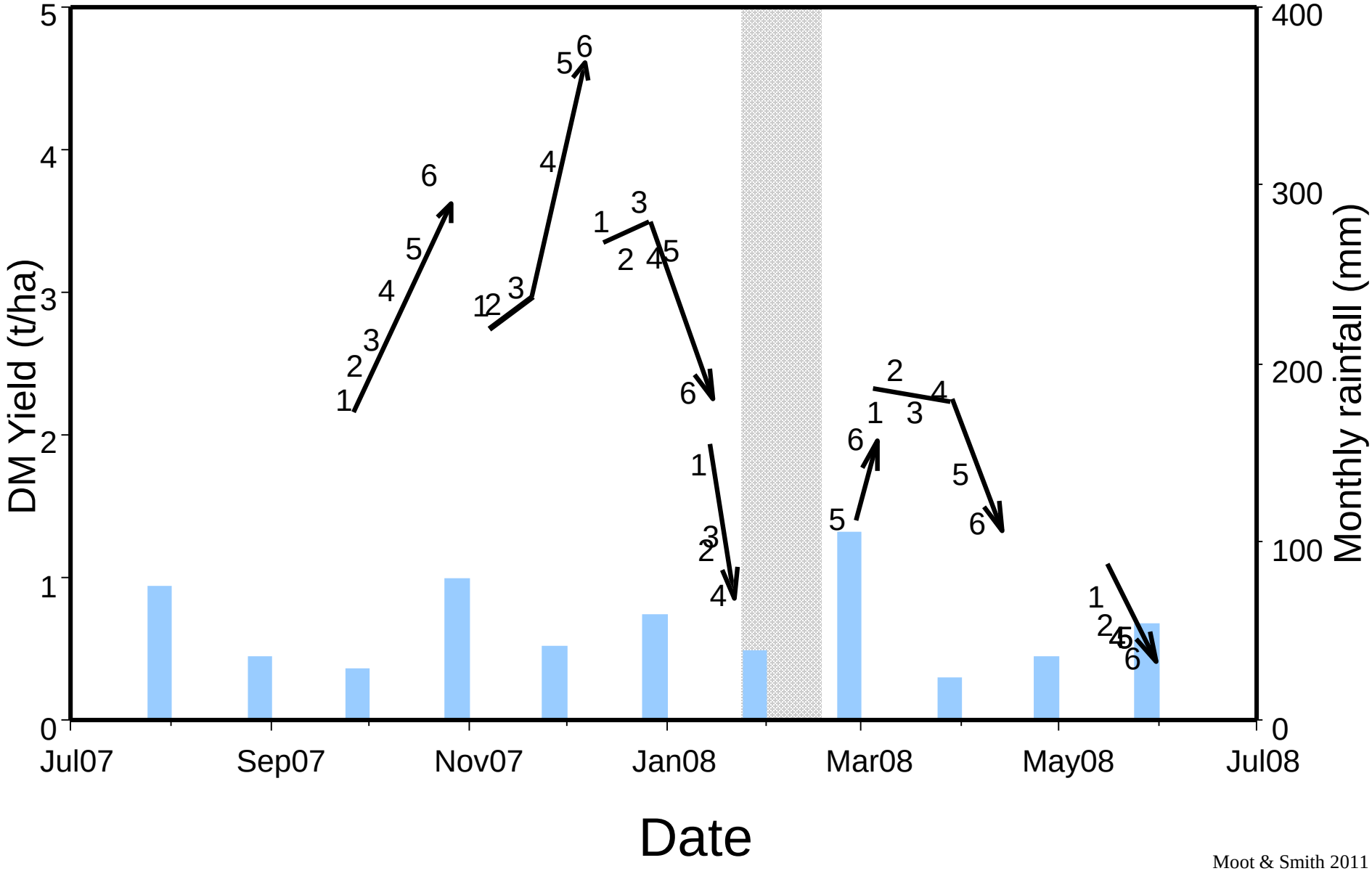
Photo: 'Bonavaree' Marlborough

How to graze

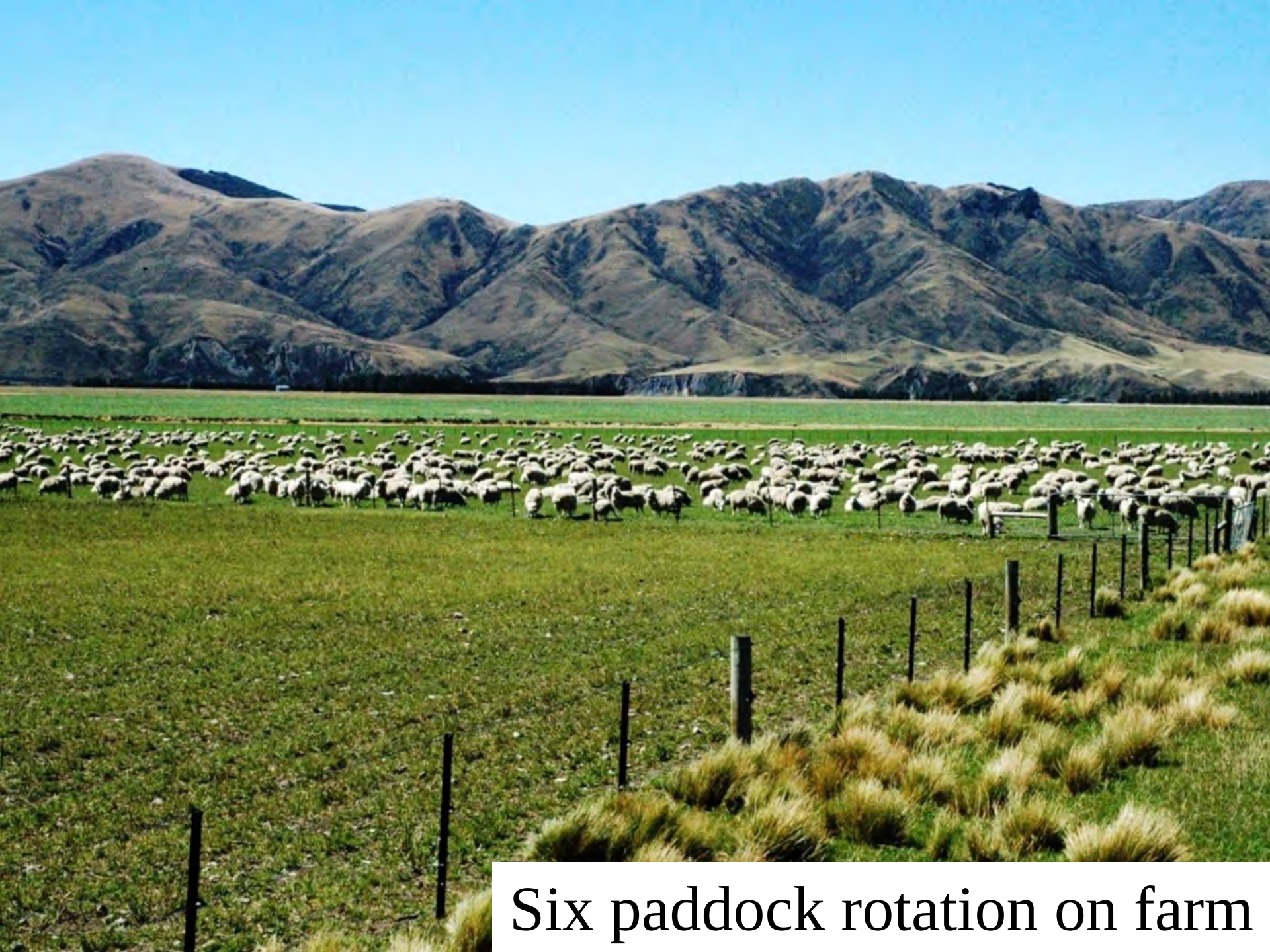
Photo: 'Bonavaree' Marlborough

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

Experiment 3 at Lincoln University



Moot & Smith 2011



Six paddock rotation on farm

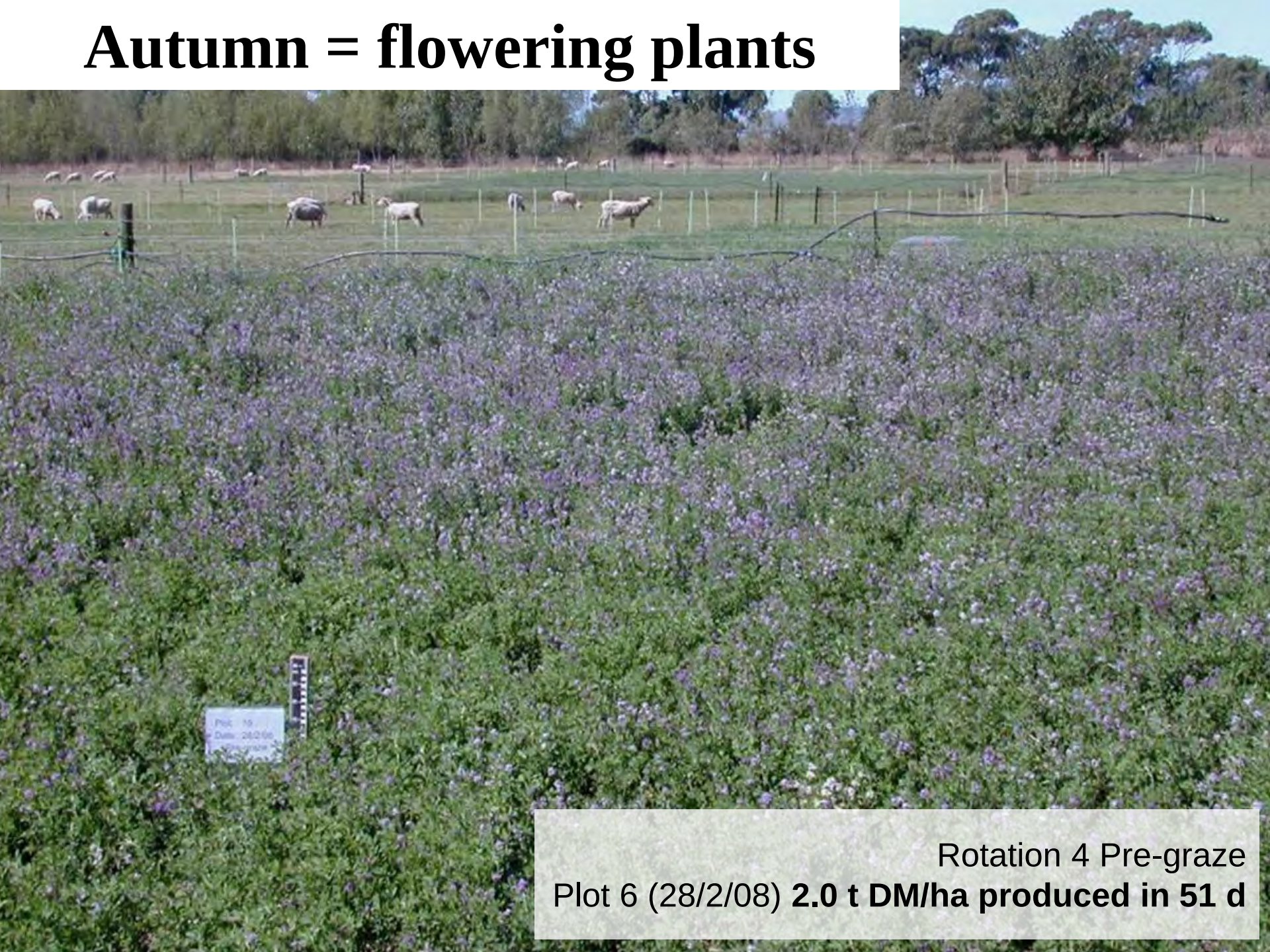
What else to feed

Photo: 'Bonavaree' Marlborough

Spring = animals

Photo: 'Bonavaree' Marlborough

Autumn = flowering plants



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

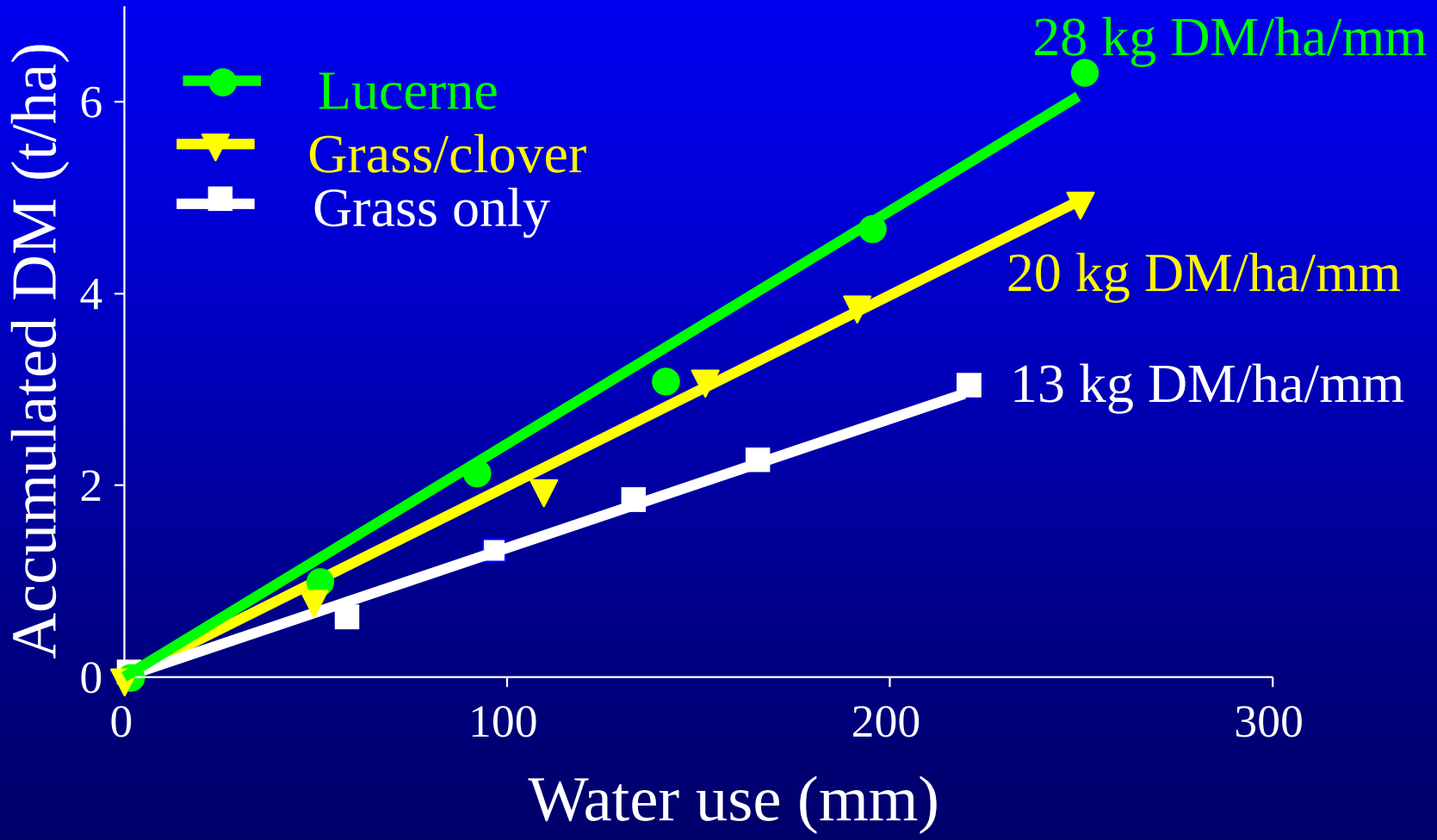
Which animals?

Photo: 'Bonavaree' Marlborough

Deer = no risk of bloat

How to manage water

Spring WUE



Moot *et al.* 2008

Lucerne + cocksfoot

Lucerne + Prairie grass

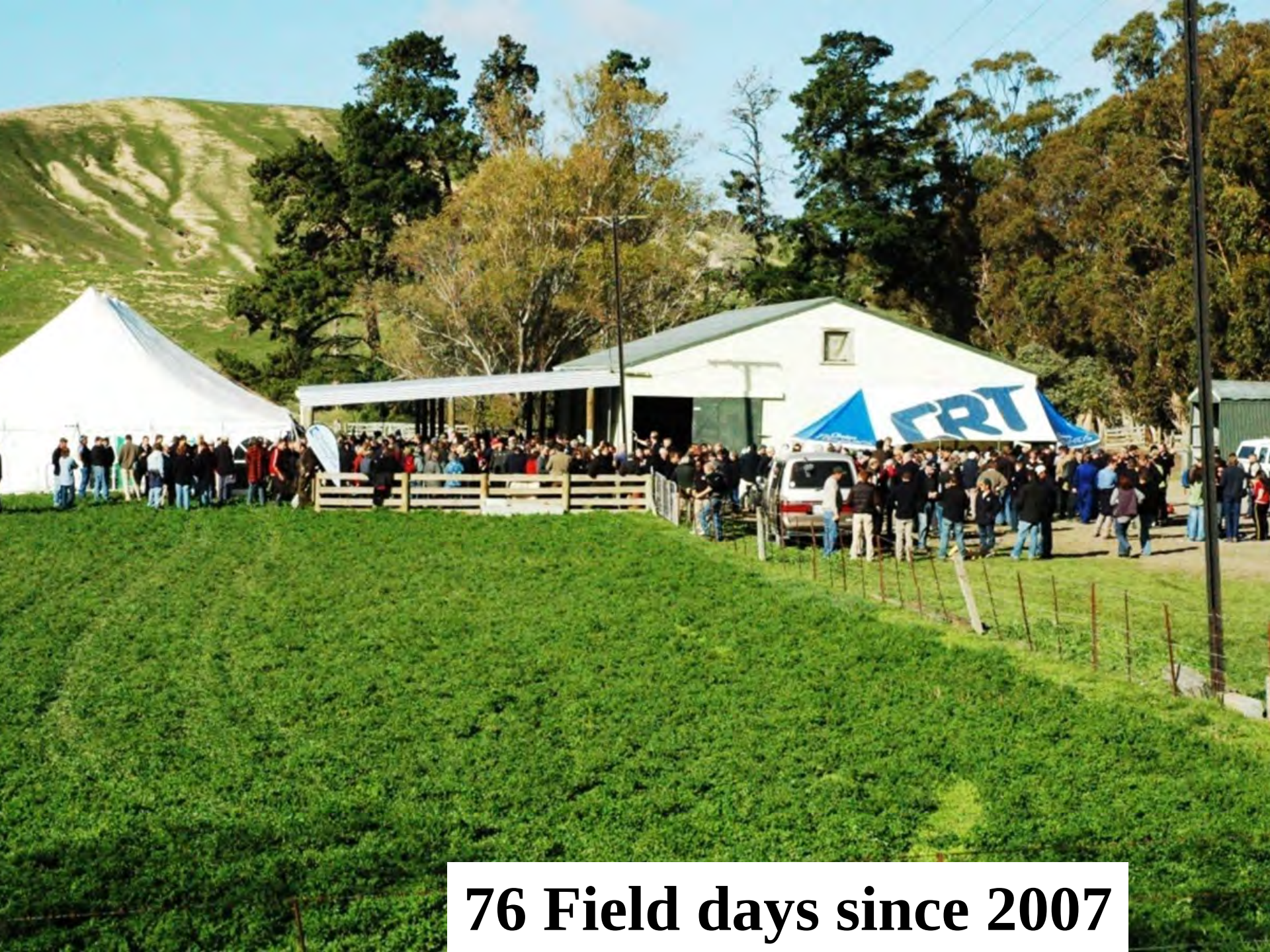
Talk to the farmers

In the field

Again

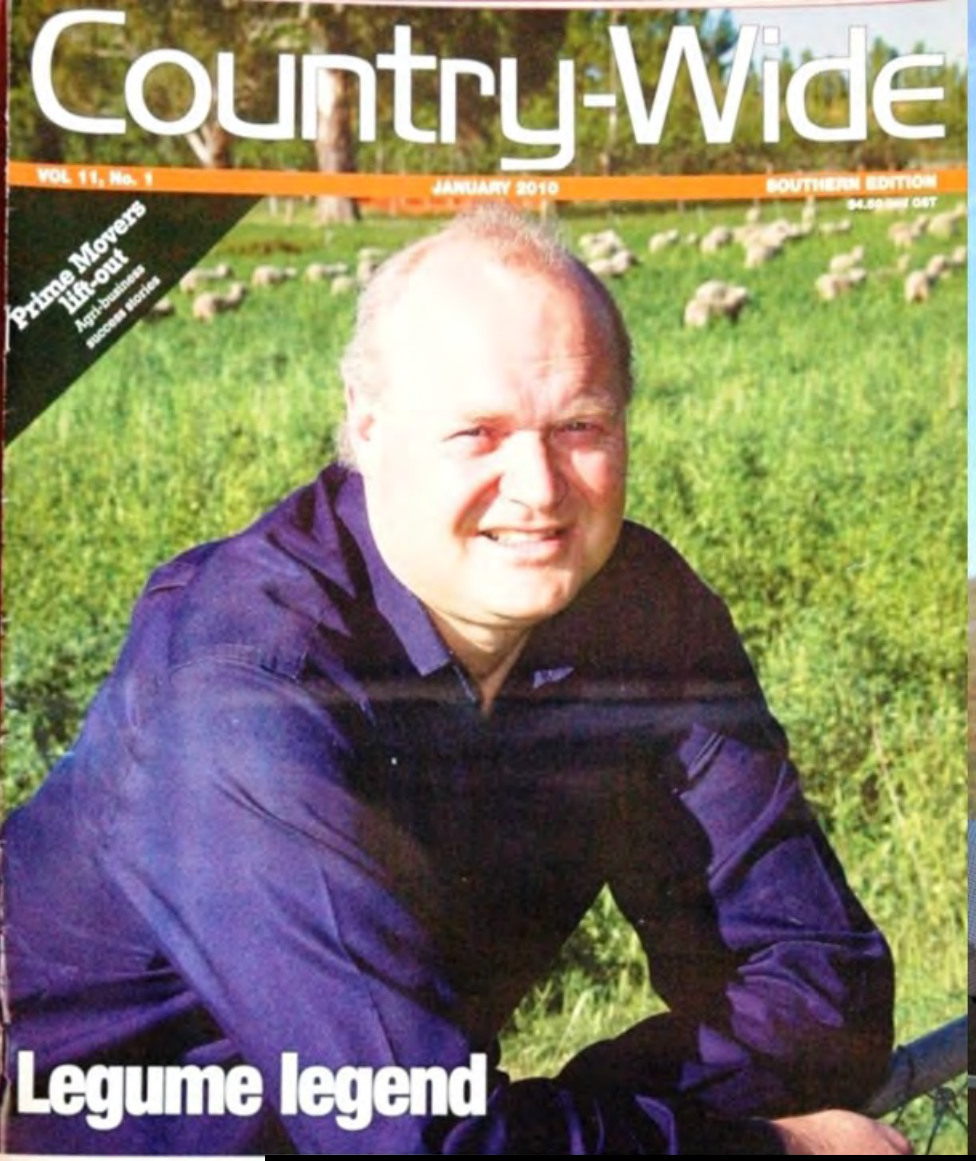

And again


And again



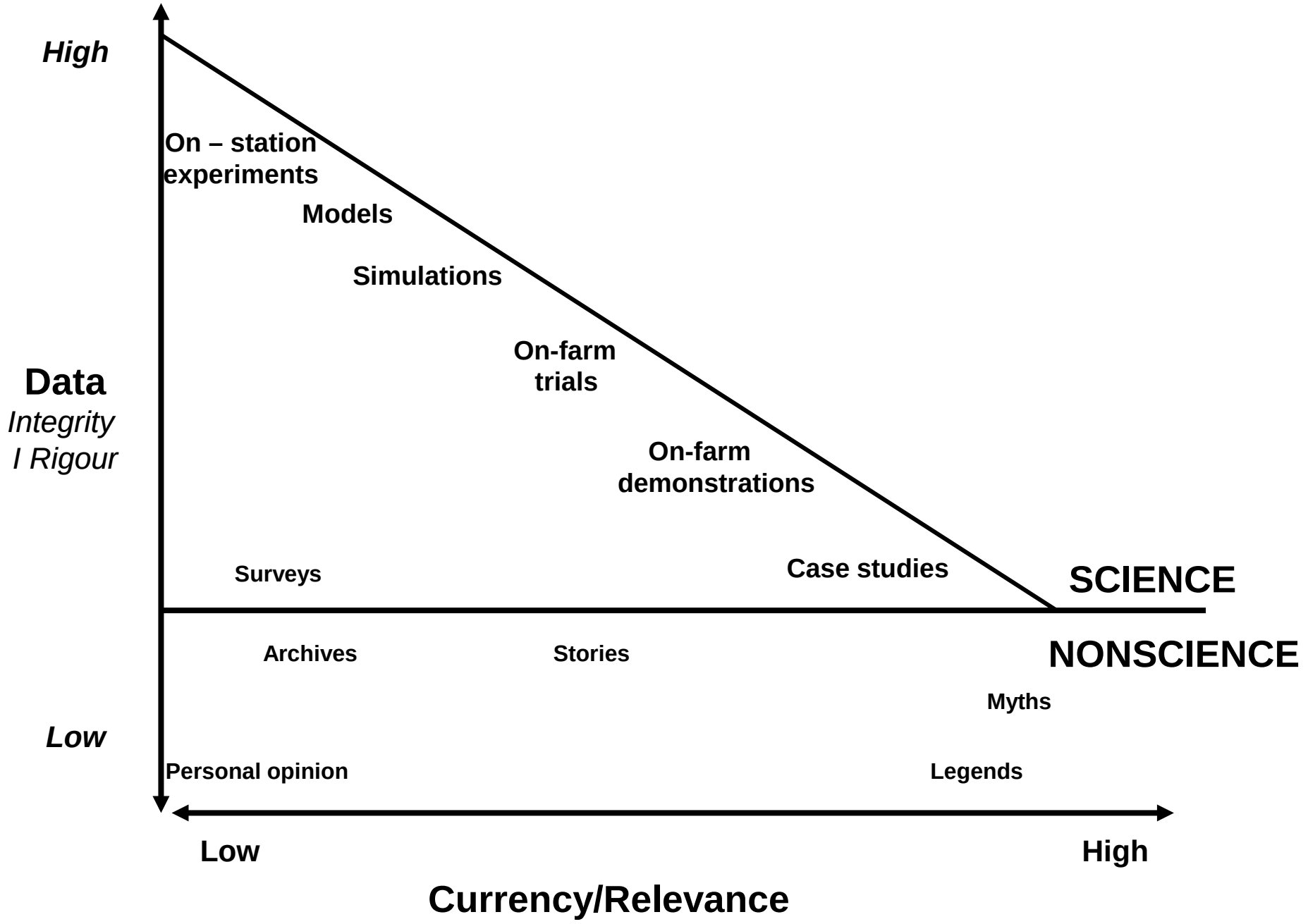
76 Field days since 2007


10
MonitorFarm
Old fashioned pasture species proving their worth
by Howard Keene
Plant species choice key to success
Profit in the dry
Making the most of Water
Lucerne powers change on-farm
NEW WAYS WITH LUCERNE
Stop, look, and change
Legume legend
Lucerne is likely drought-beater
Lucerne behind four-fold increase in profit
'God's plant' the saving grace
85 rural news articles since 2007
Cocksfoot on the comeback trail
Moot points on management
Clear signal for system change
Innovation is the key
Benefits of climate change
Lucerne beats drought
Lucerne myths exposed at Marlborough field day
Professor sings lucerne's praises
Subterranean clover key to farm system
Profits despite drought



Integrity & Trust

Modified from Carberry 2001



Keys to extension success ?

- Innovative farmers with incentives to change – economic, land sustainability, social.
- Attention to all technical aspects at the same time
  - Without sub division grazing mgmt does not exist.
- Appropriate research to deliver best mgmt.
- Mutual integrity and trust between scientist and farmers with ongoing engagement and mentoring.

Acknowledgements

Drs Mills, Brown, Teixiera, Pollock, Varella, Peri, Black
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Prof. Derrick Moot
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at the

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on
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Gansu Province China,
14-17 June 2011