NZSAP

Napier 30 June 2014

Lincoln University

Te Whare Wānaka o Aoraki

AOTEAROA • NEW ZEALAND

Research and extension on lucerne in in New Zealand

Dr Derrick Moot

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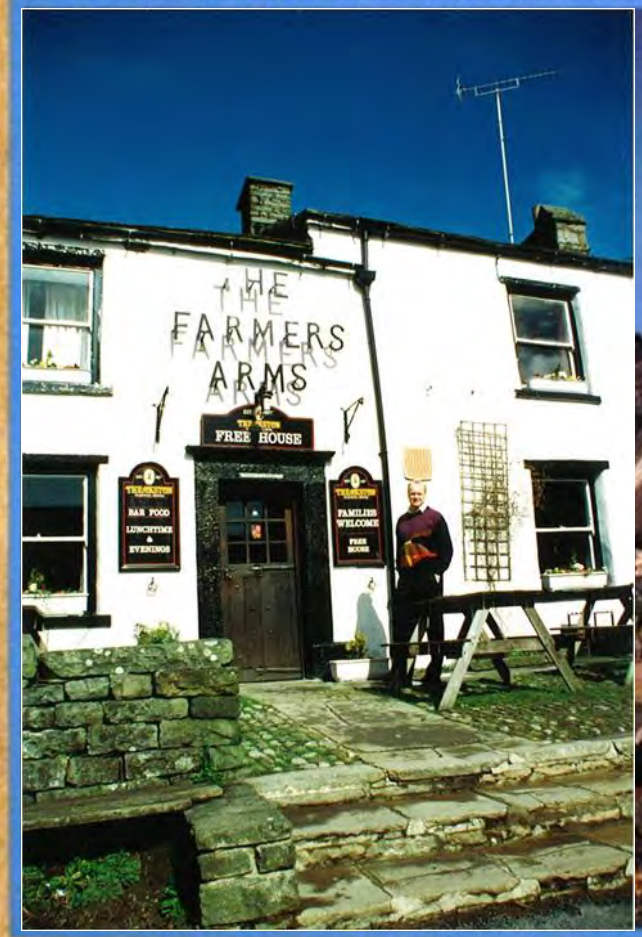
New Zealand's specialist land-based university

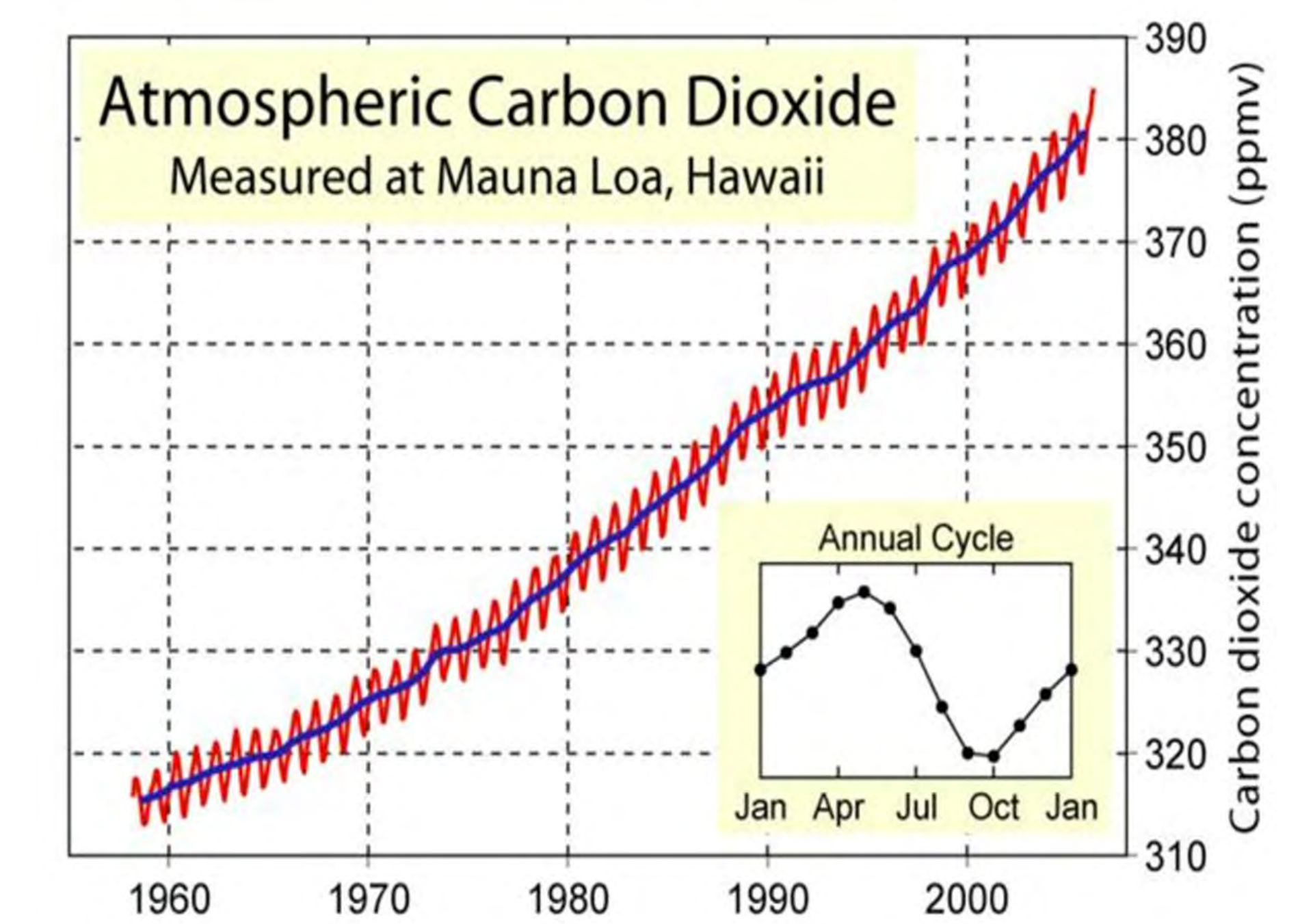
This presentation was associated with the following conference paper:

Moot, DJ. 2014. A review of recent research and extension on dryland lucerne in New Zealand. Proceedings of the New Zealand Society of Animal Production, 74, 86-93. www.sciquest.org.nz/nzsap

The Village Pub



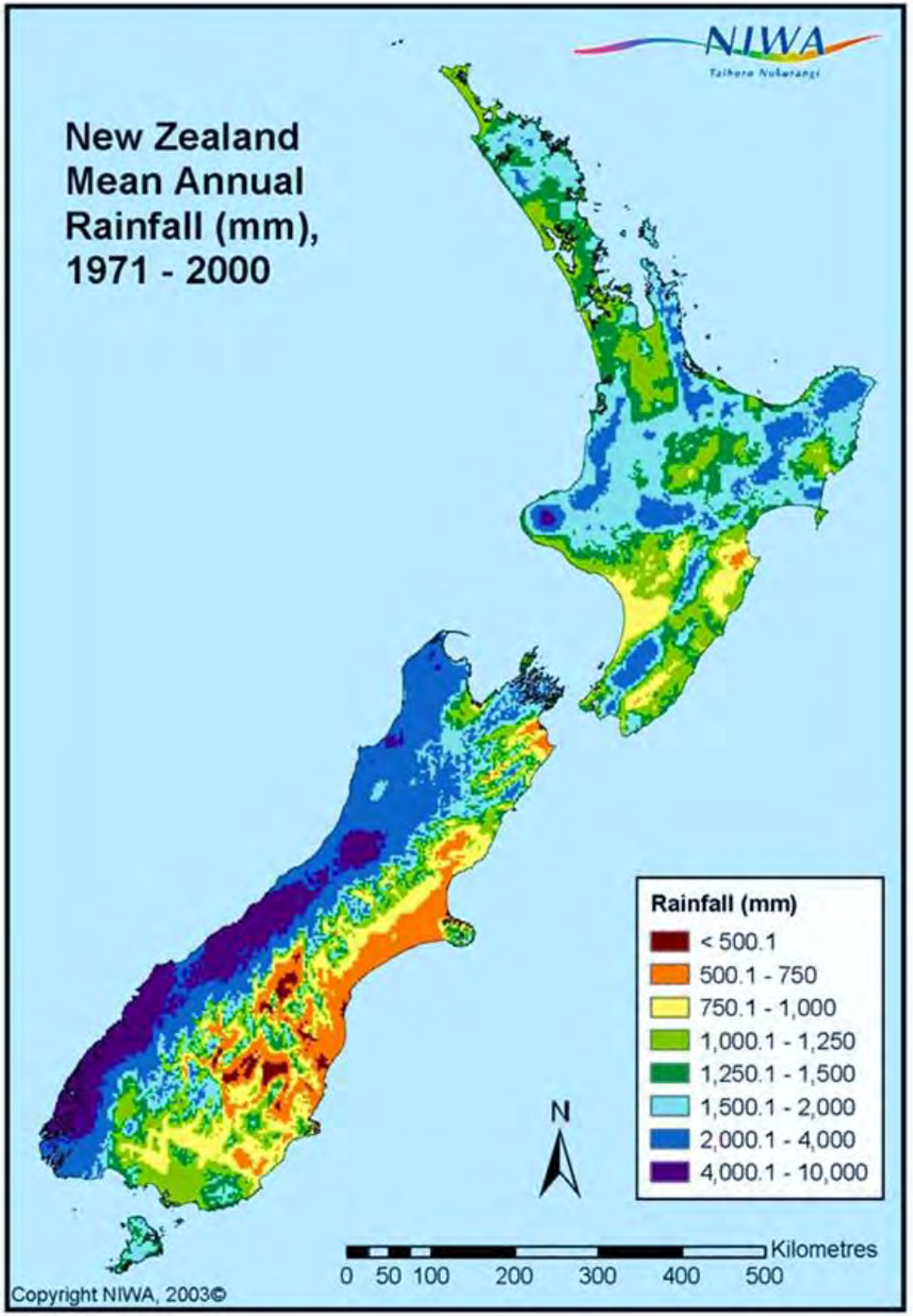
Roger Protz *and* Homer Sykes



Source: *Dr. Pieter Tans, NOAA/ESRL (www.esrl.noaa.gov/gmd/ccgg/trends/) and Dr. Ralph Keeling, Scripps Institution of Oceanography (scrippsco2.ucsd.edu/).*
http://www.esrl.noaa.gov/gmd/ccgg/trends/mlo.html#mlo (accessed: 7/1/2013)

Strong rainfall gradient

West ⇒ East



Source: NIWA 2013

Rain fed 300-800 mm

East coast - summer dry

By 2030 - Drier:

Drought – increased duration and frequency

Annual and tap rooted dryland pasture species?

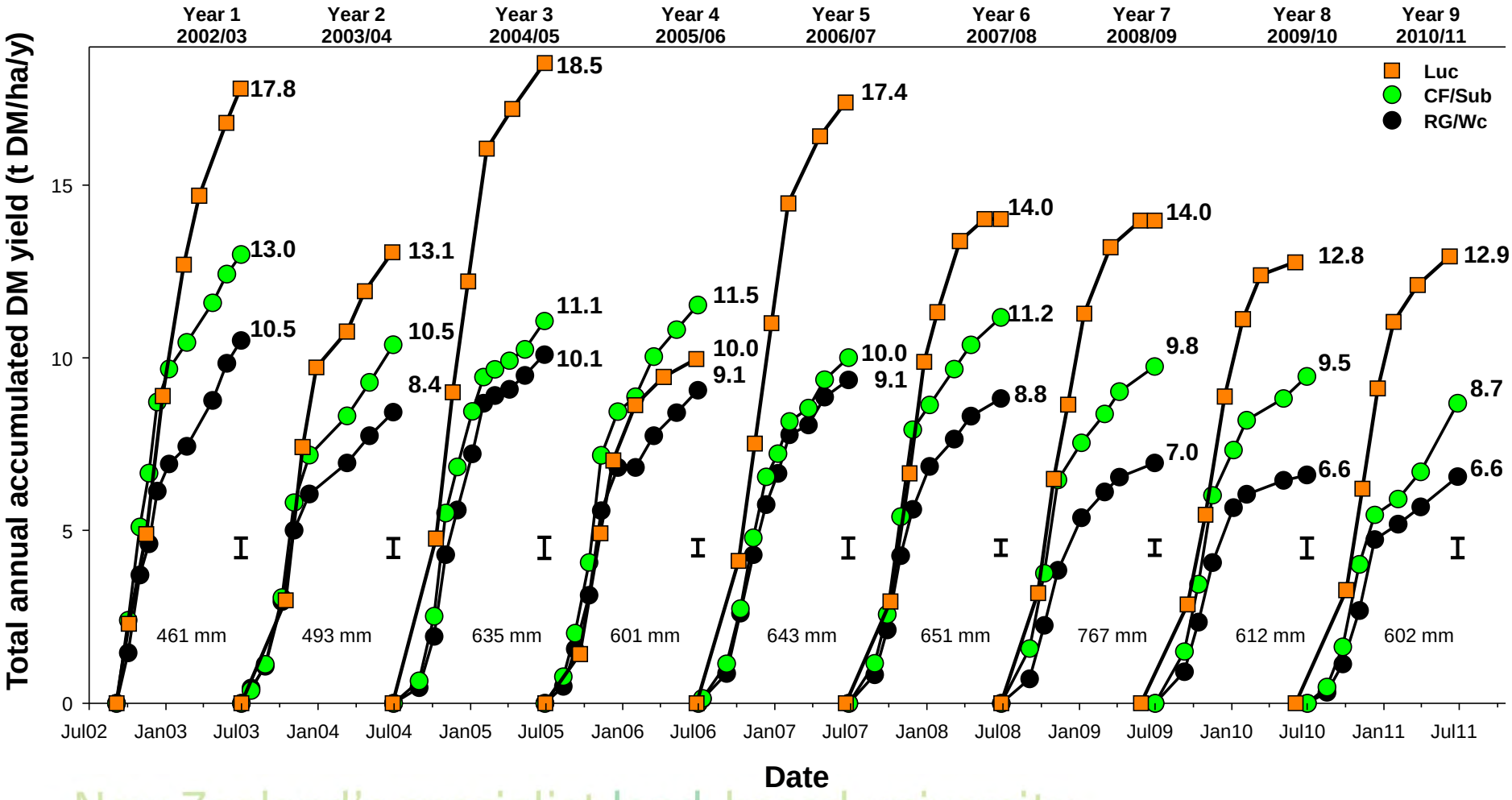
Farmer lucerne questions?

a) Which dryland species?

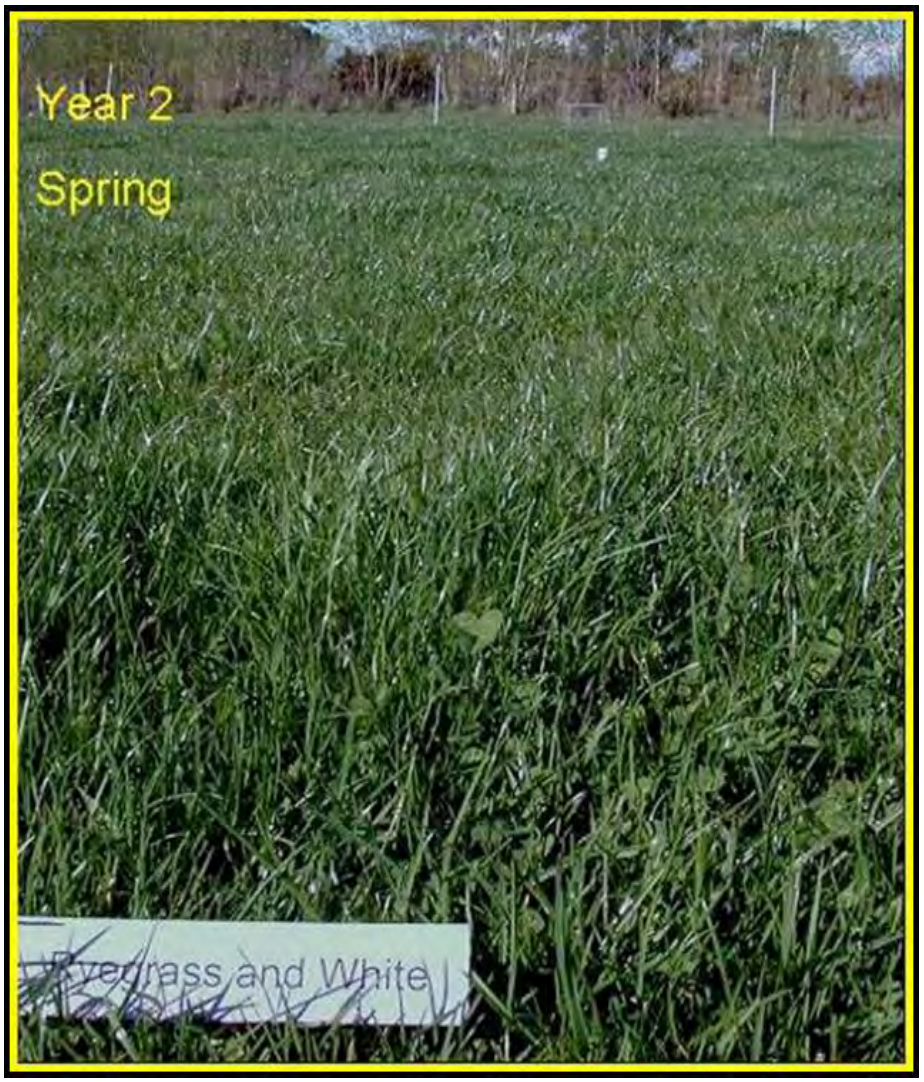
- Ryegrass/white clover familiar but fails
- Other grasses - different mgmt
- Lucerne – cut and carry

‘ Grazing Expt. - MaxClover’

MaxClover Total DM yields



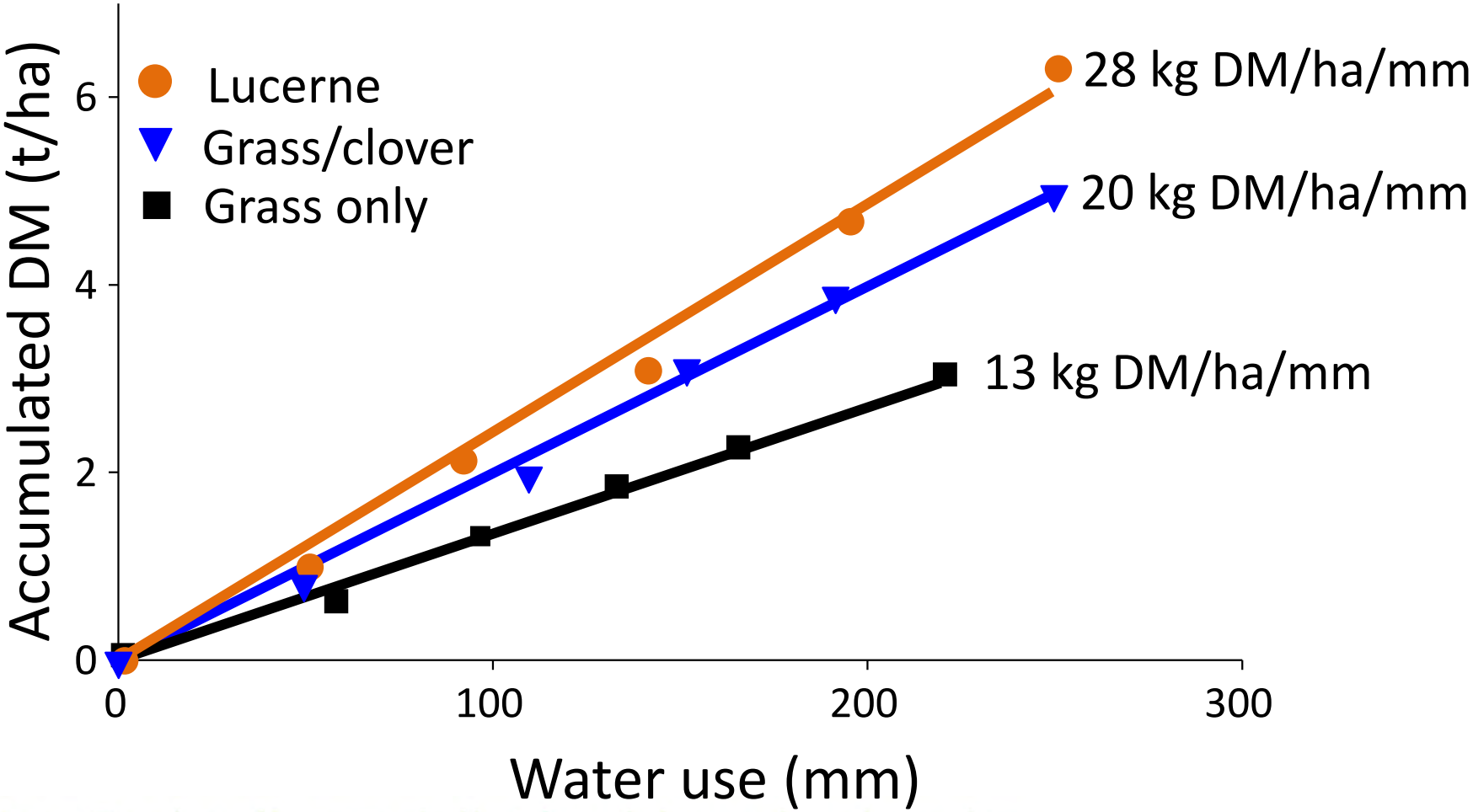
Source: Moot 2012



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

RG/Wc pastures

Spring WUE



Source: Moot *et al*. 2008

Farmer issues

b) With lucerne - inappropriate mgmt!

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

Experiment - flexible grazing

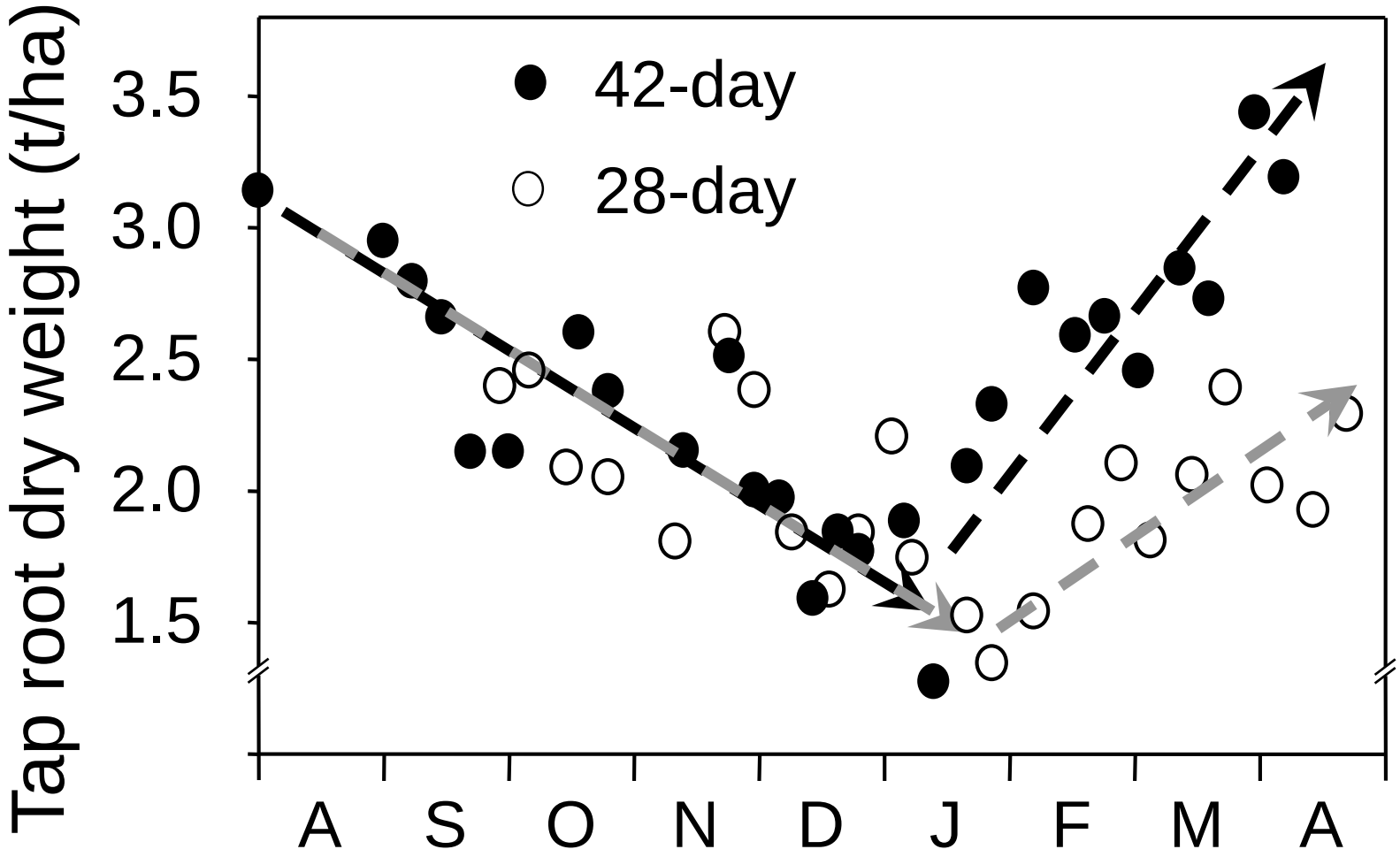
38 days resting

4 days grazing

25 days resting

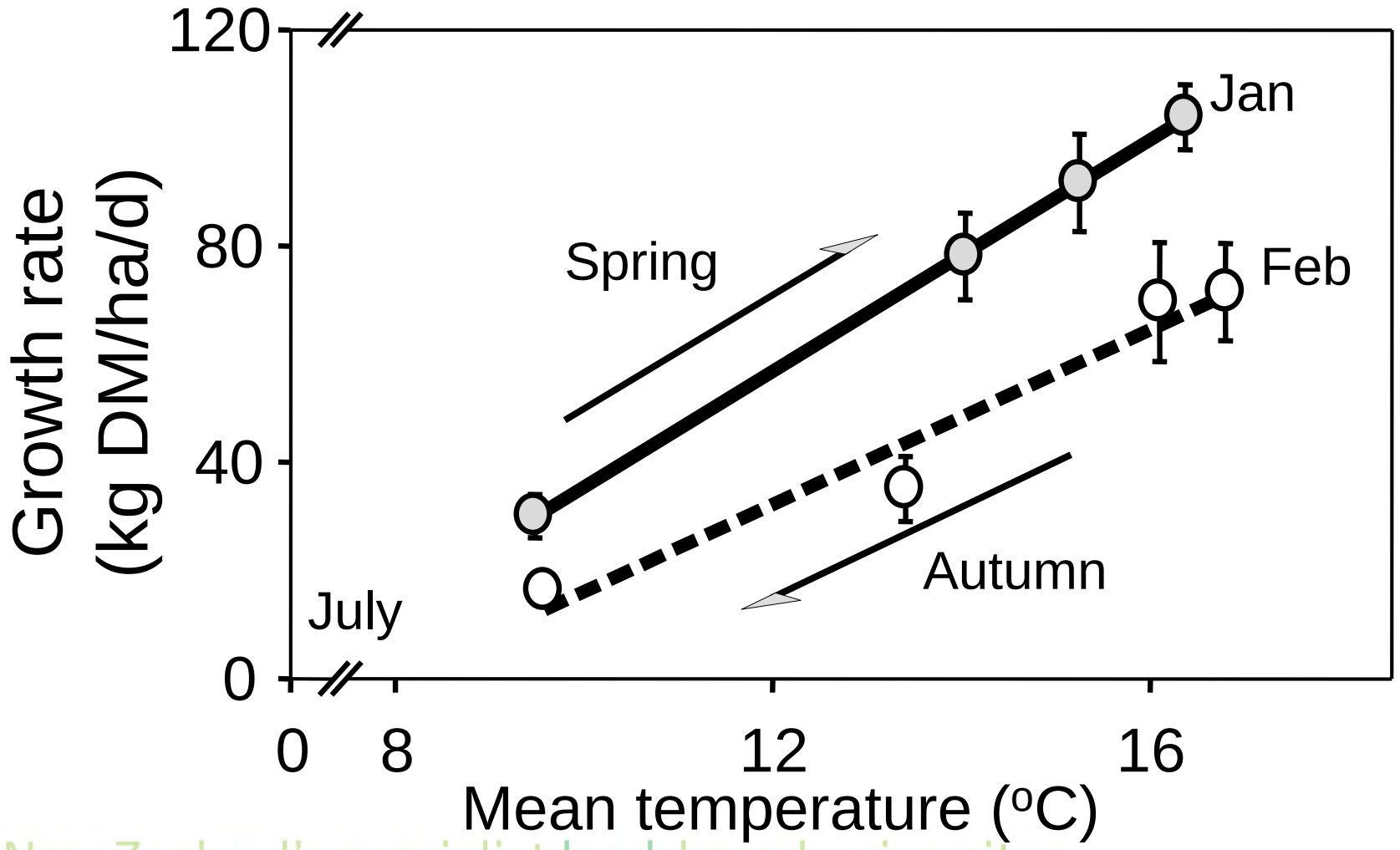
3 days grazing

Partitioning to roots



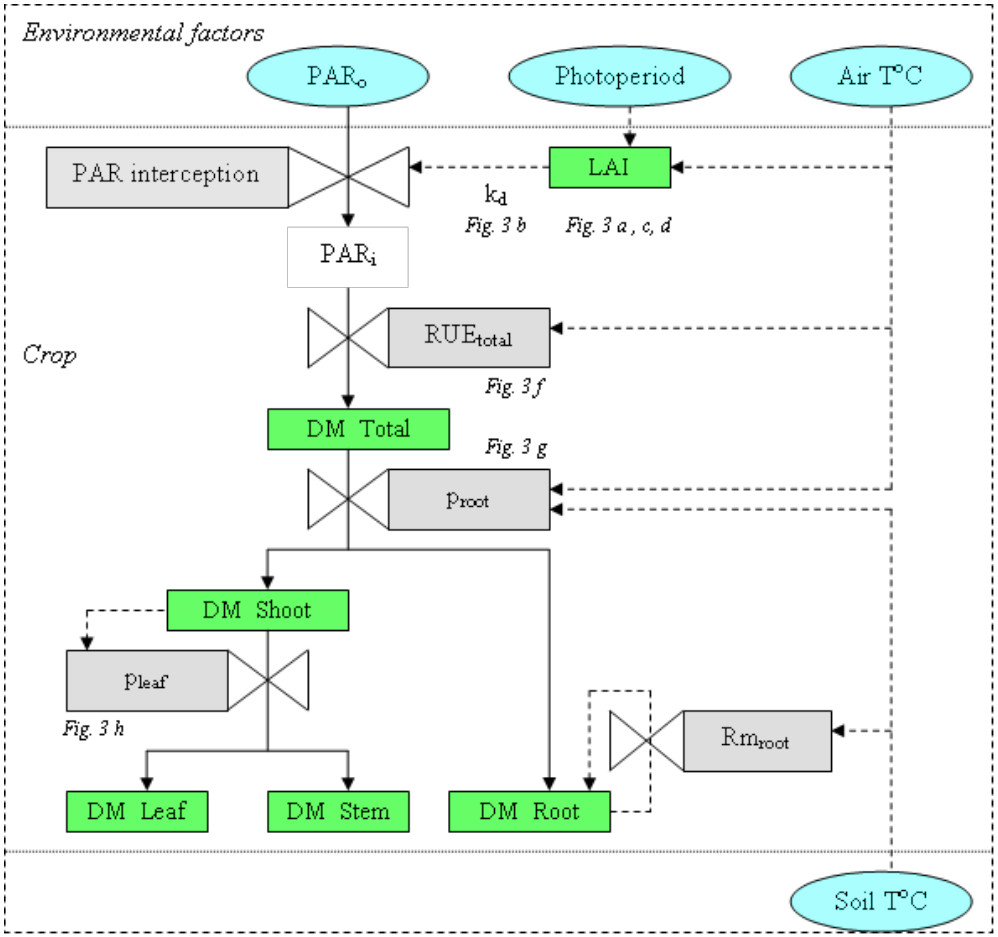
Source: Moot *et al*. 2003

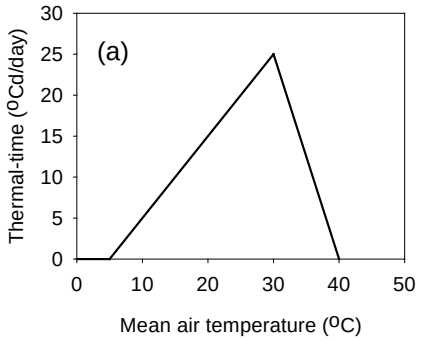
Vegetative growth

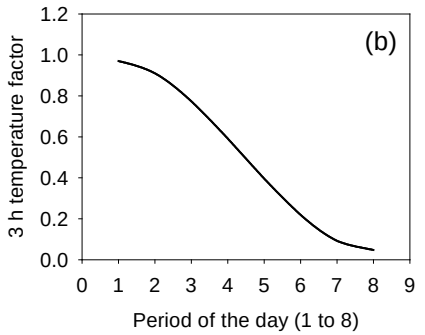


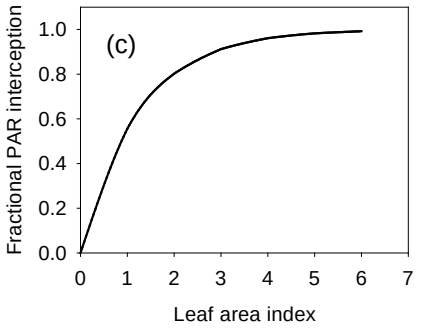
Source: Moot *et al*. 2003

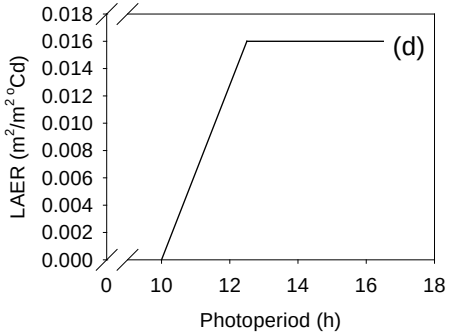
Modelling

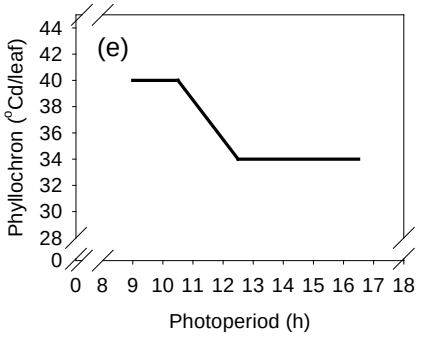

Environmental factors
PAR$_o$
Photoperiod
Air T°C
PAR interception
LAI
k_d
Fig. 3 b
Fig. 3 a, c, d
PAR$_i$
Crop
RUE$_{total}$
Fig. 3 f
DM Total
Fig. 3 g
p_{root}
DM Shoot
p_{leaf}
Fig. 3 h
Rm$_{root}$
DM Leaf
DM Stem
DM Root
Soil T°C

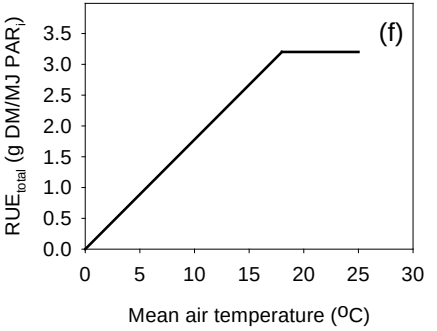

(a)
Thermal-time (°Cd/day)
Mean air temperature (°C)

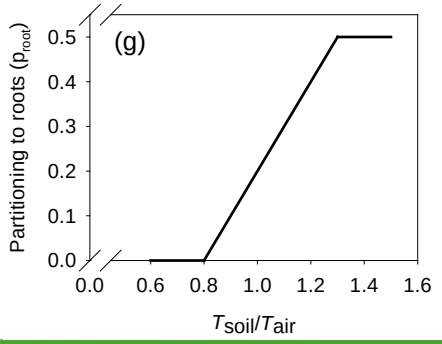

(b)
3 h temperature factor
Period of the day (1 to 8)

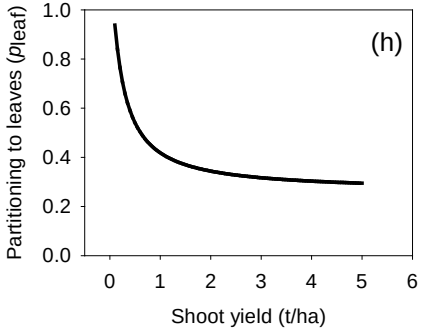

(c)
Fractional PAR interception
Leaf area index


(d)
LAER (m²/m²°Cd)
Photoperiod (h)

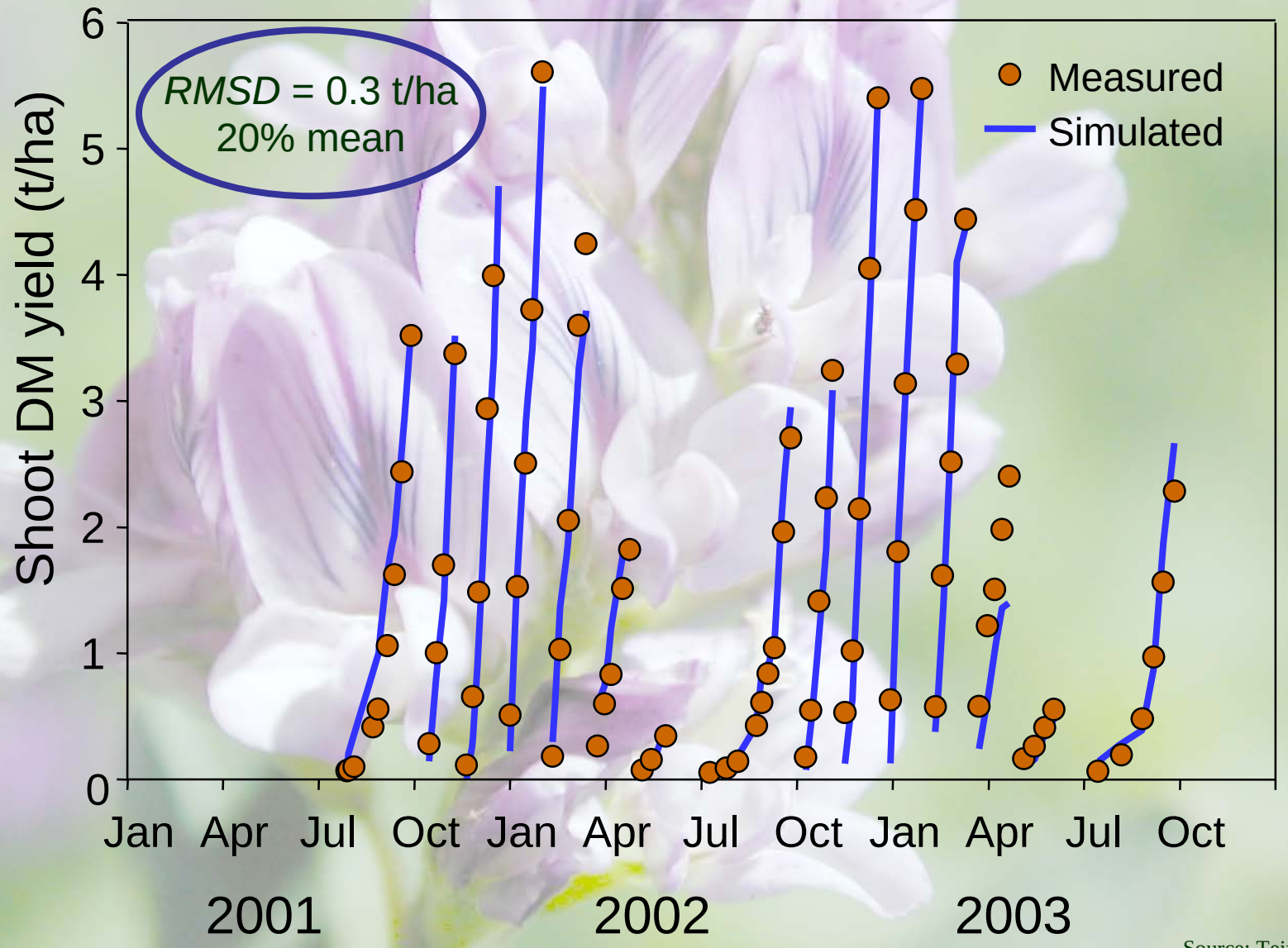

(e)
Phyllochron (°Cd/leaf)
Photoperiod (h)


(f)
RUE$_{total}$ (g DM/MJ PAR$_i$)
Mean air temperature (°C)

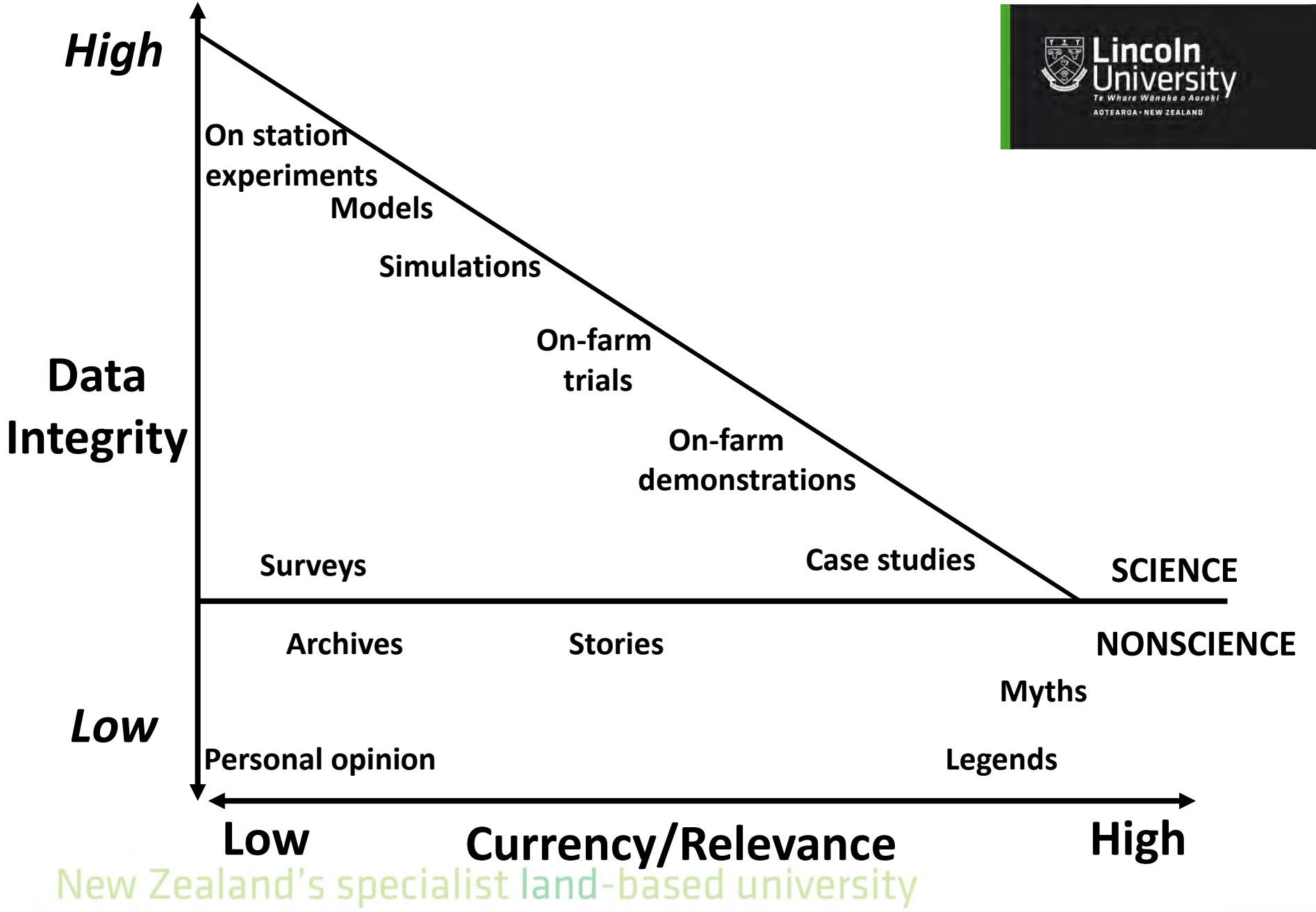

(g)
Partitioning to roots (p_{root})
T_{soil}/T_{air}


(h)
Partitioning to leaves (p_{leaf})
Shoot yield (t/ha)

Predictions of shoot yield



Source: Teixeira *et al*. 2011



Source: Modified from Carberry 2001

Extension – solution to every problem

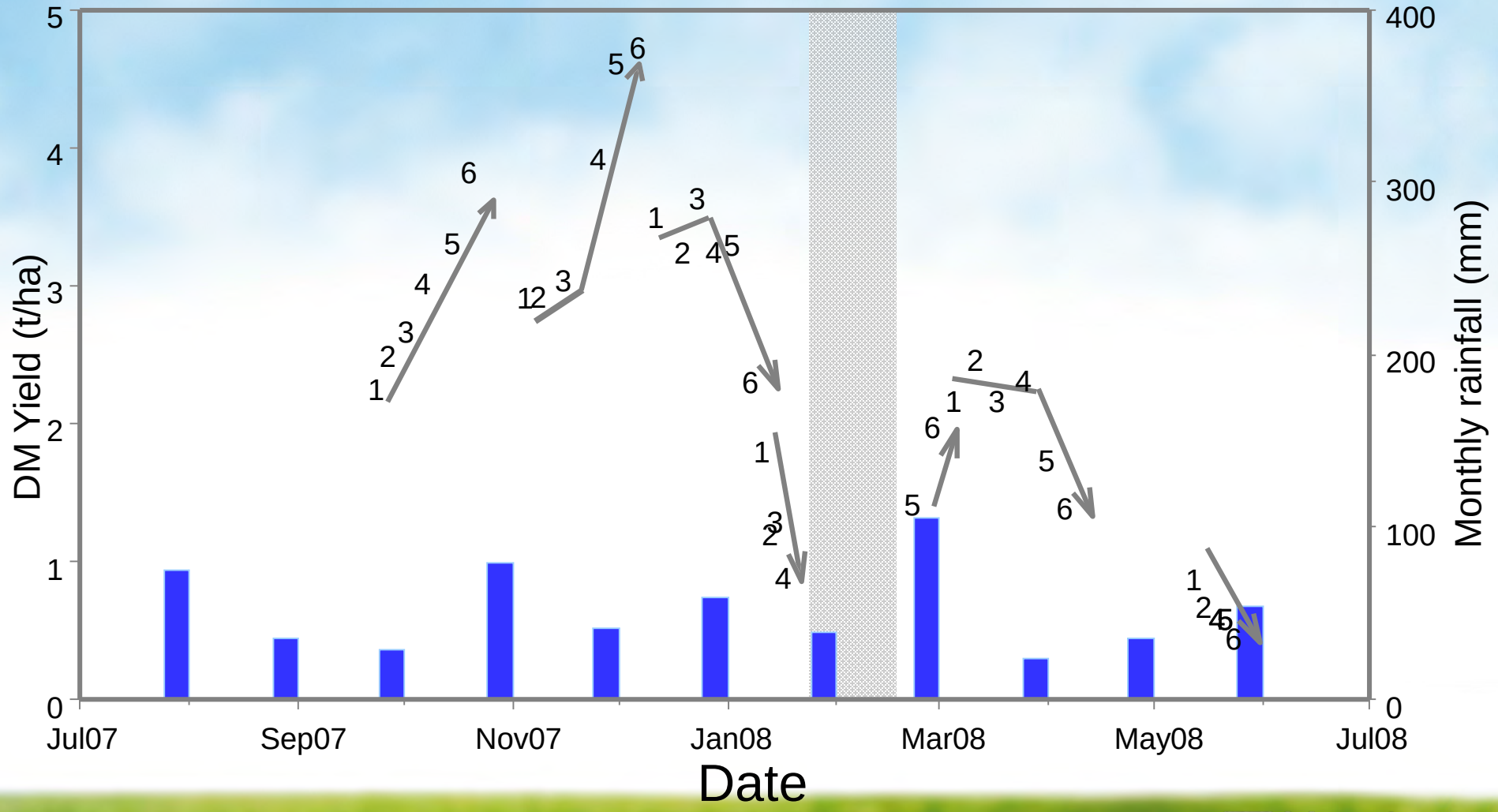
Where to plant

When to graze

How to graze

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

Experiment 3 (MaxClover)



Moot & Smith 2011
Practical Lucerne Management Guide

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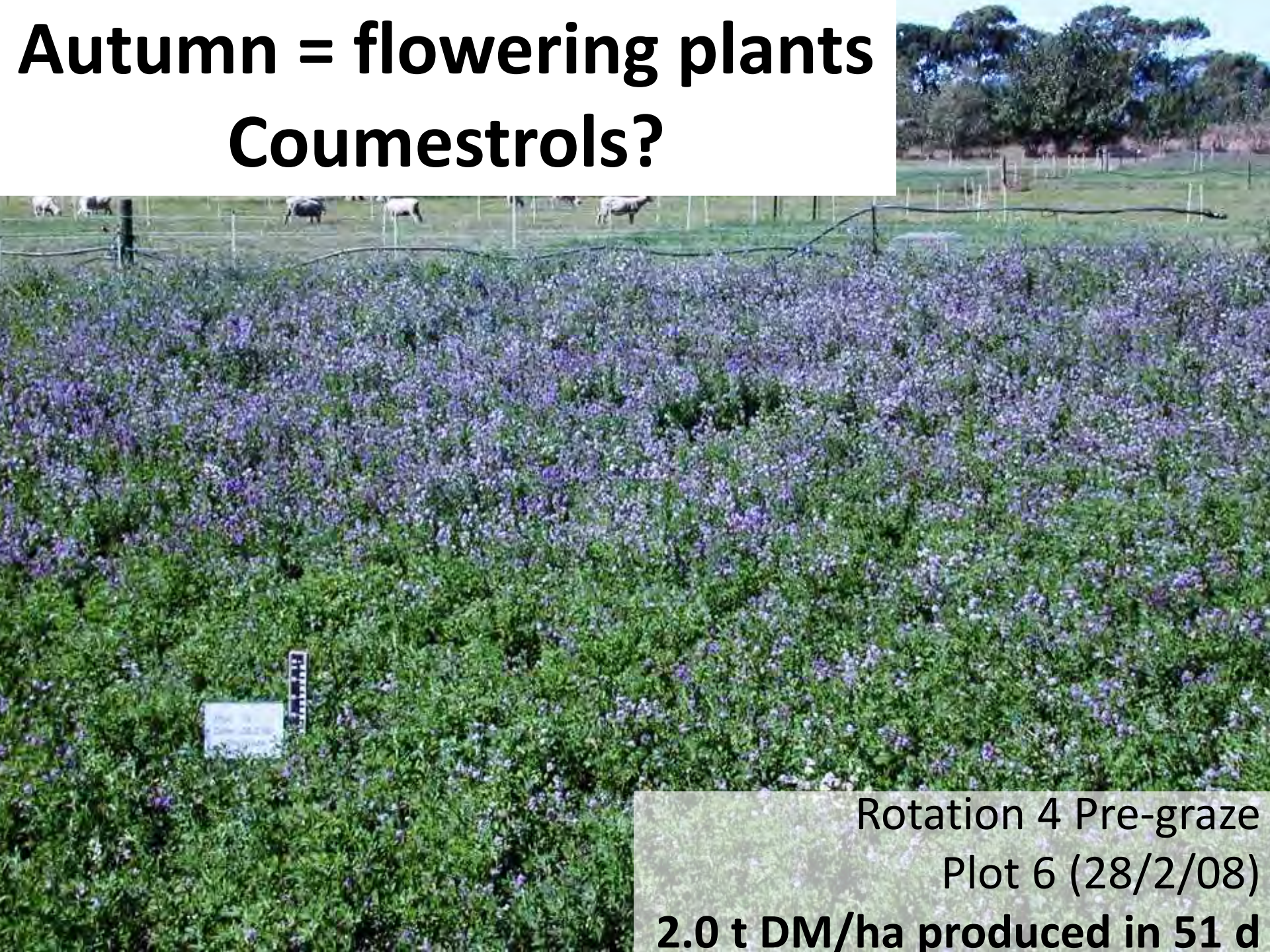
5th September 2011 – Cave Sth Canterbury

What else to feed

Spring = animals

Autumn = flowering plants
Coumestrols?



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

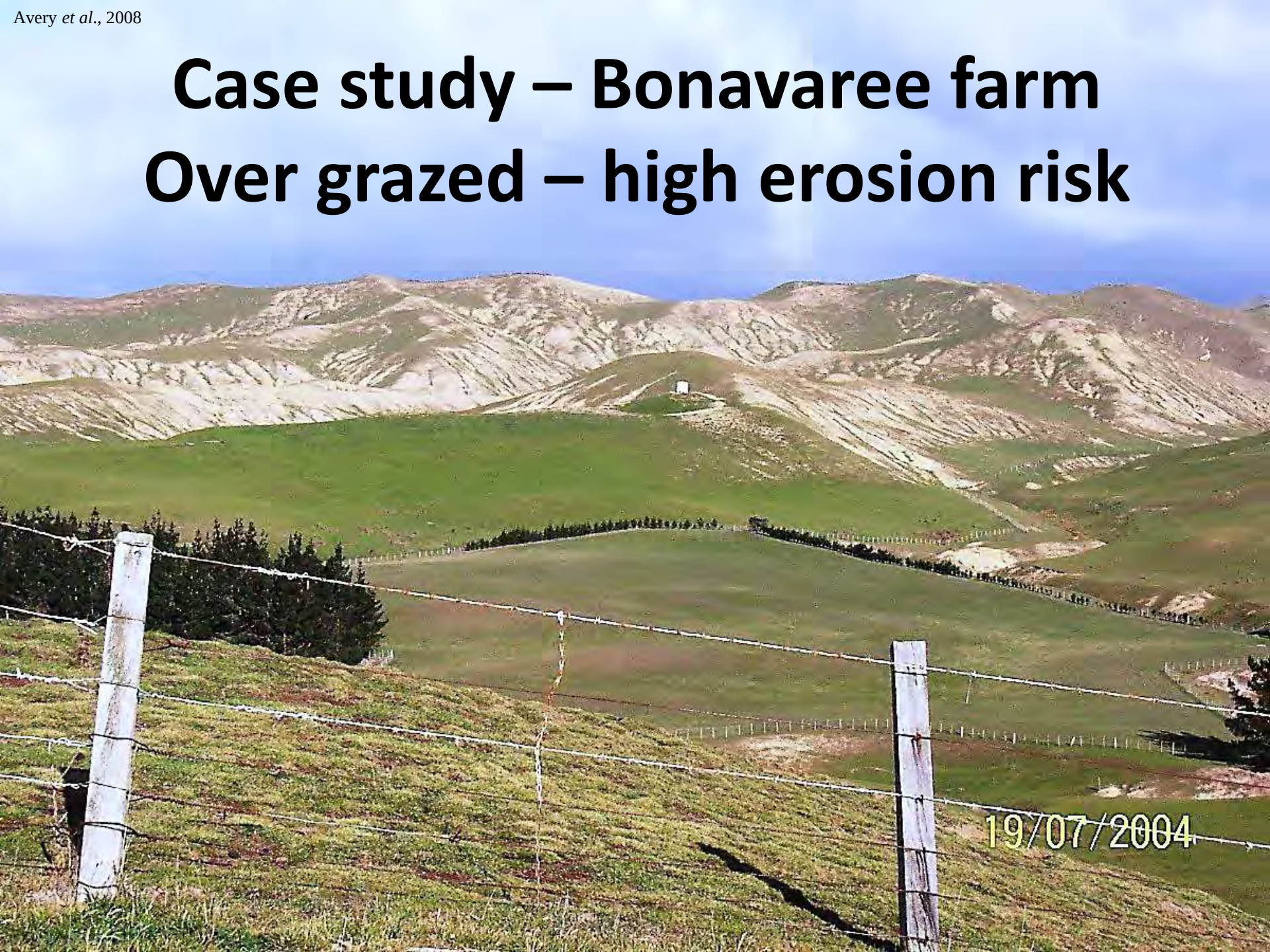
In the field

165 Extension days since 2007

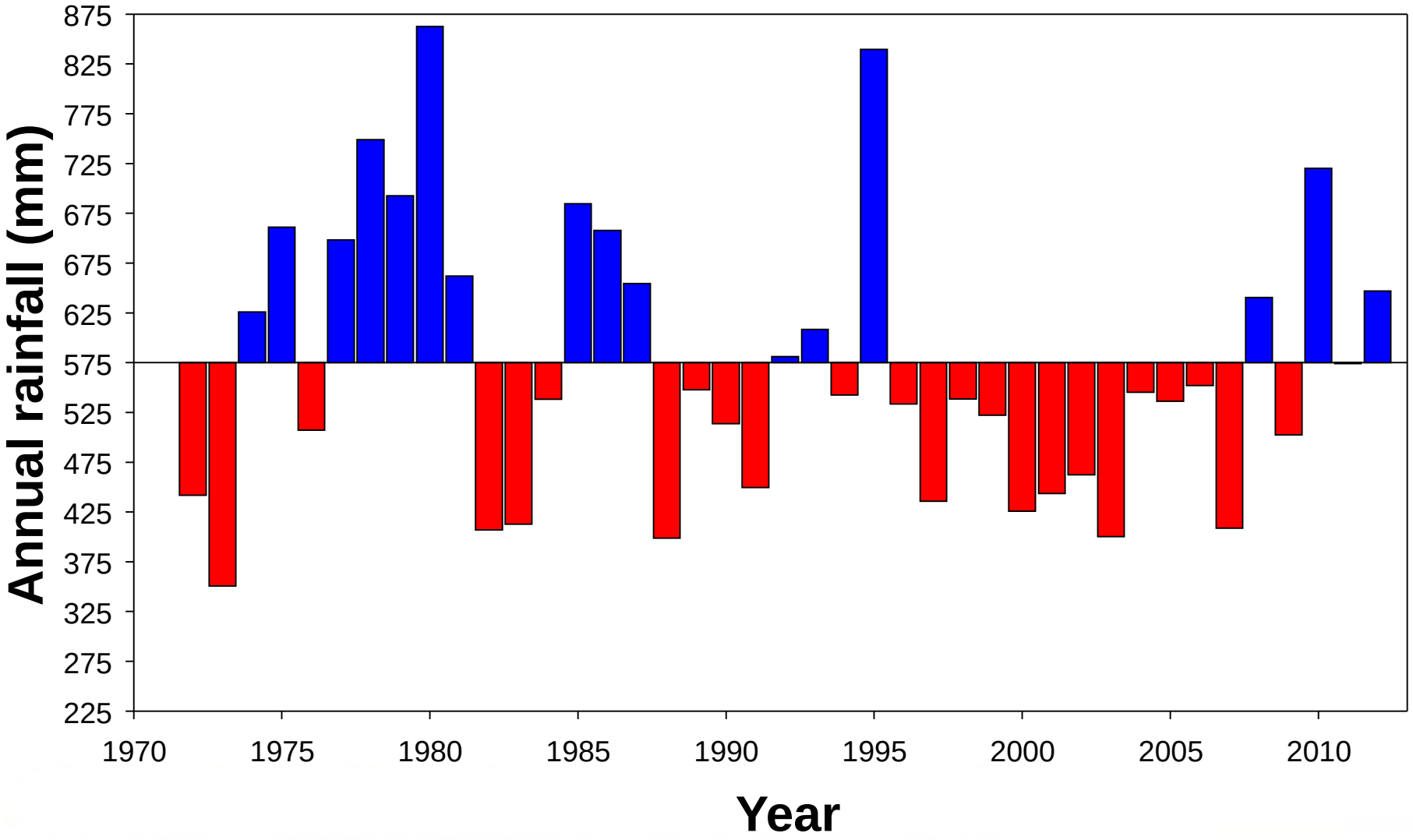
(to June 2014)

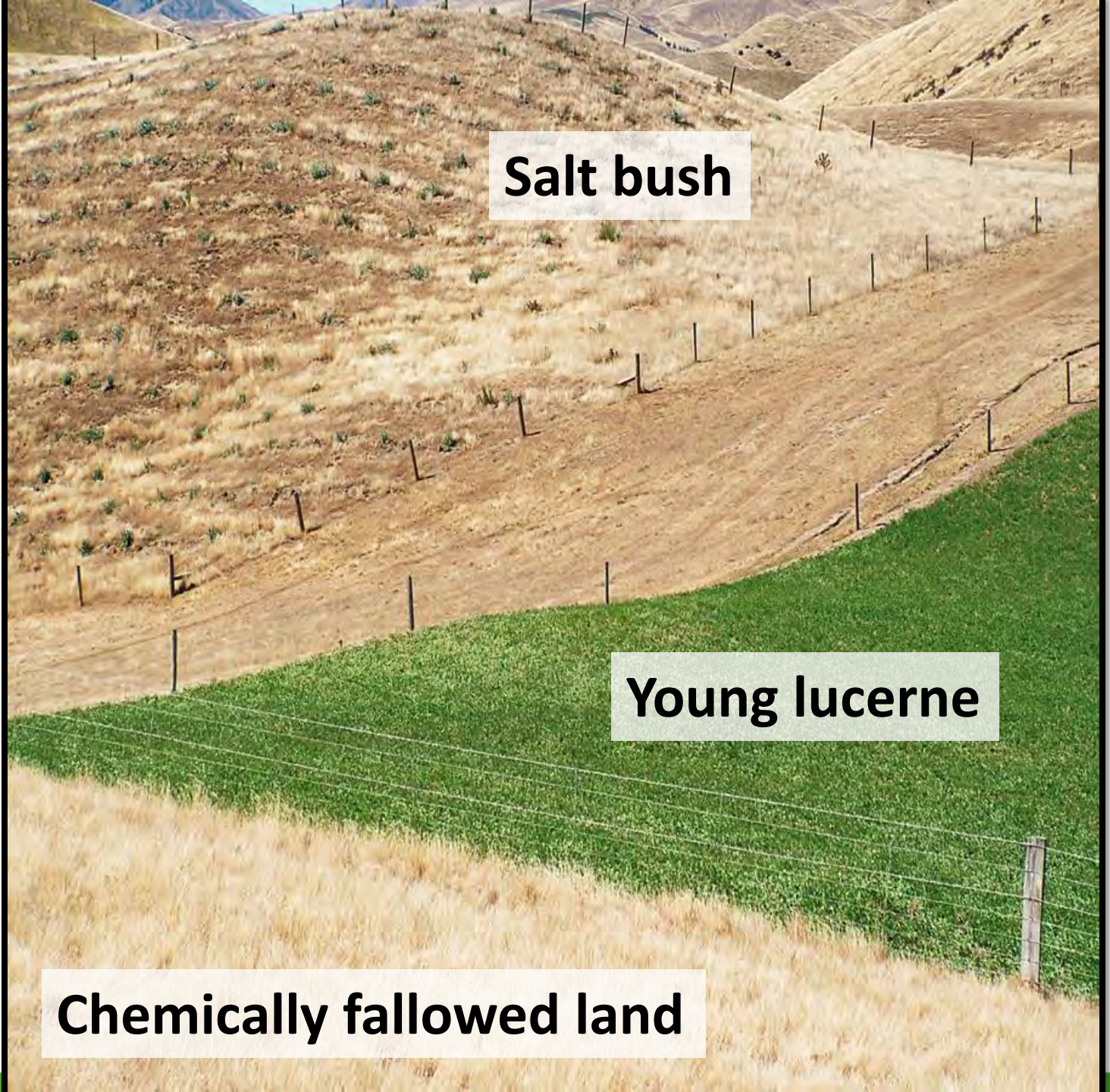
Avery *et al*., 2008

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)	$500	$1300	↑ 149%

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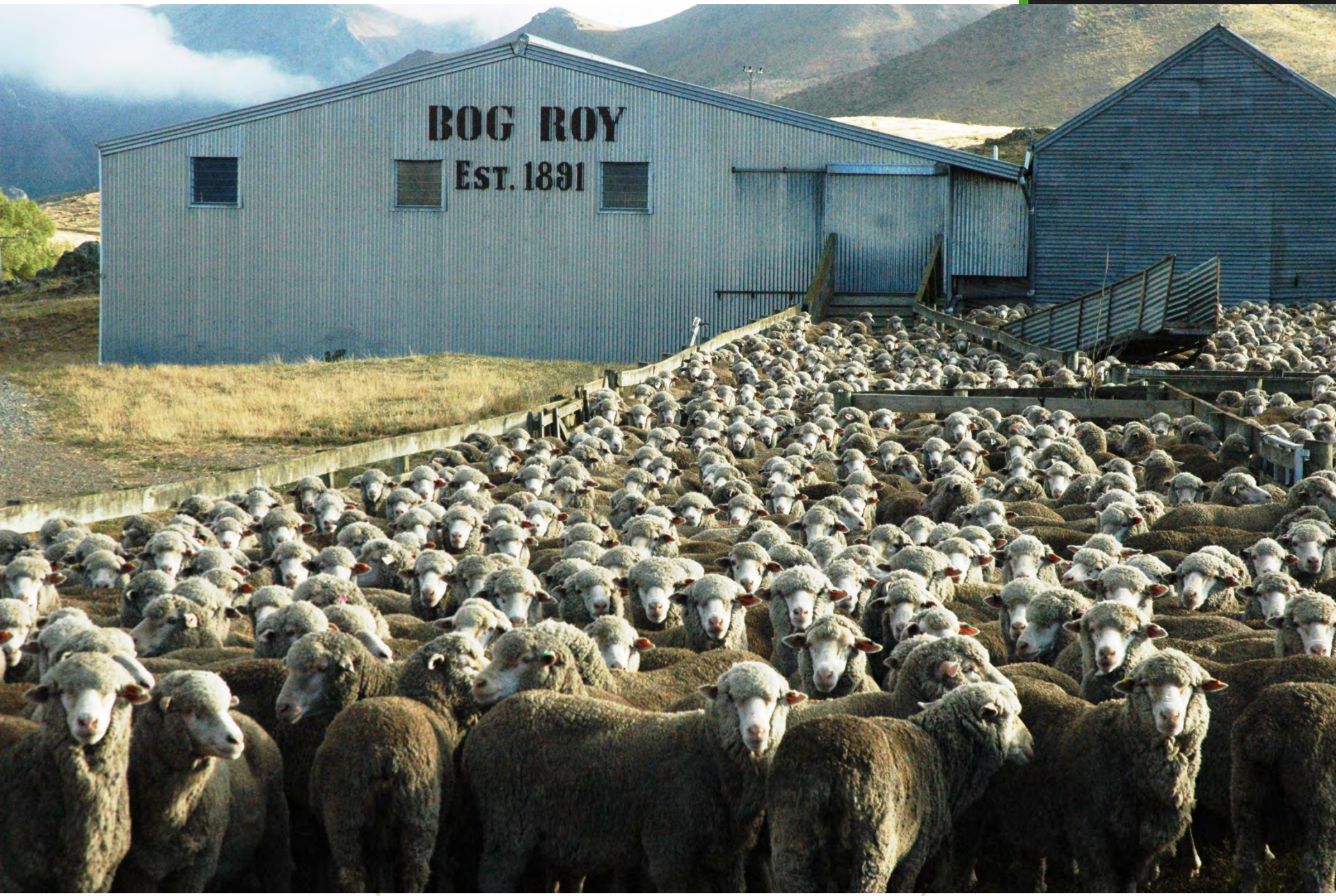
"With better income we can focus on the environment and preserve it for generations to come"

(Doug Avery)

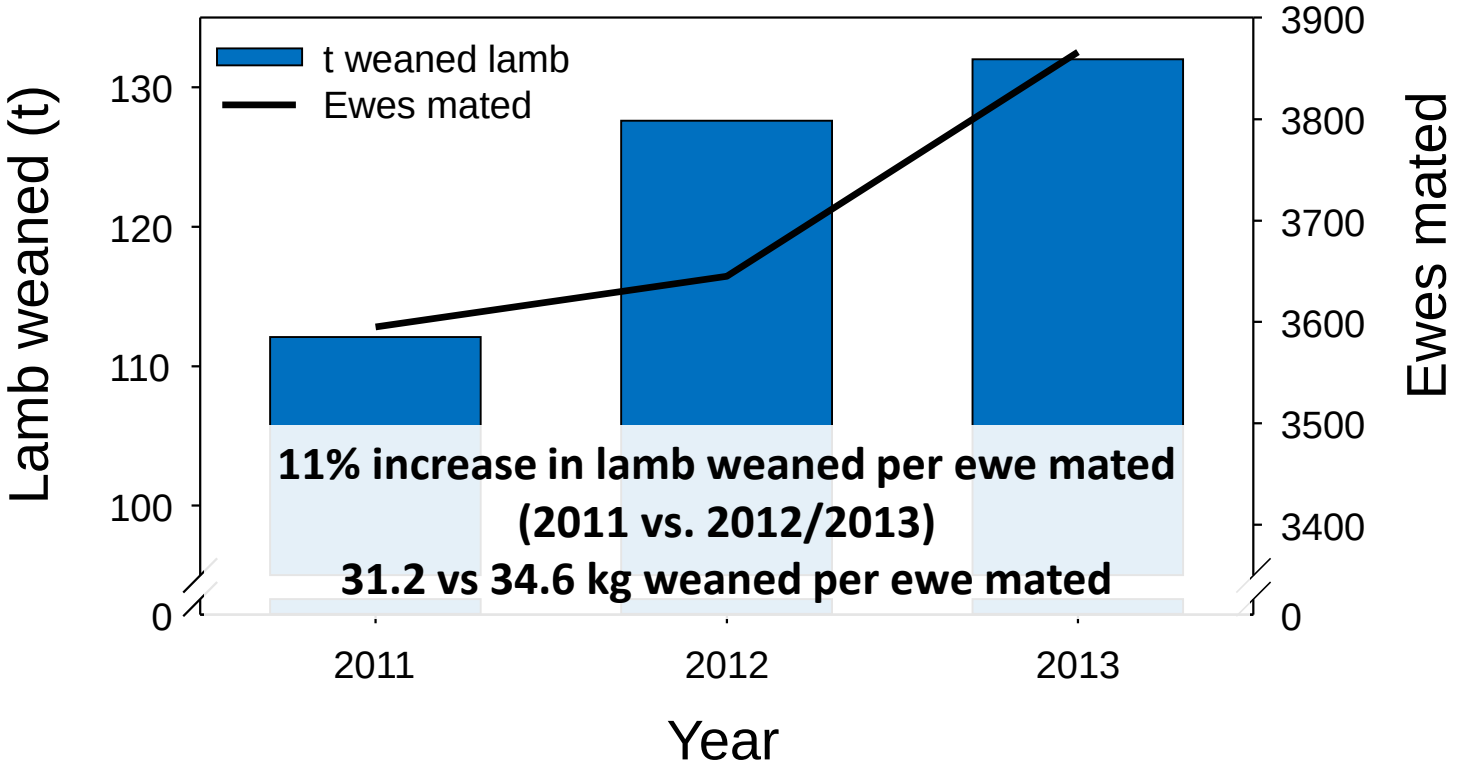
Resilient drought-proofed landscape

SI Farmer of the Year 2010


BOG ROY
EST. 1891

Landscape farming

Lamb weaned and Ewes mated



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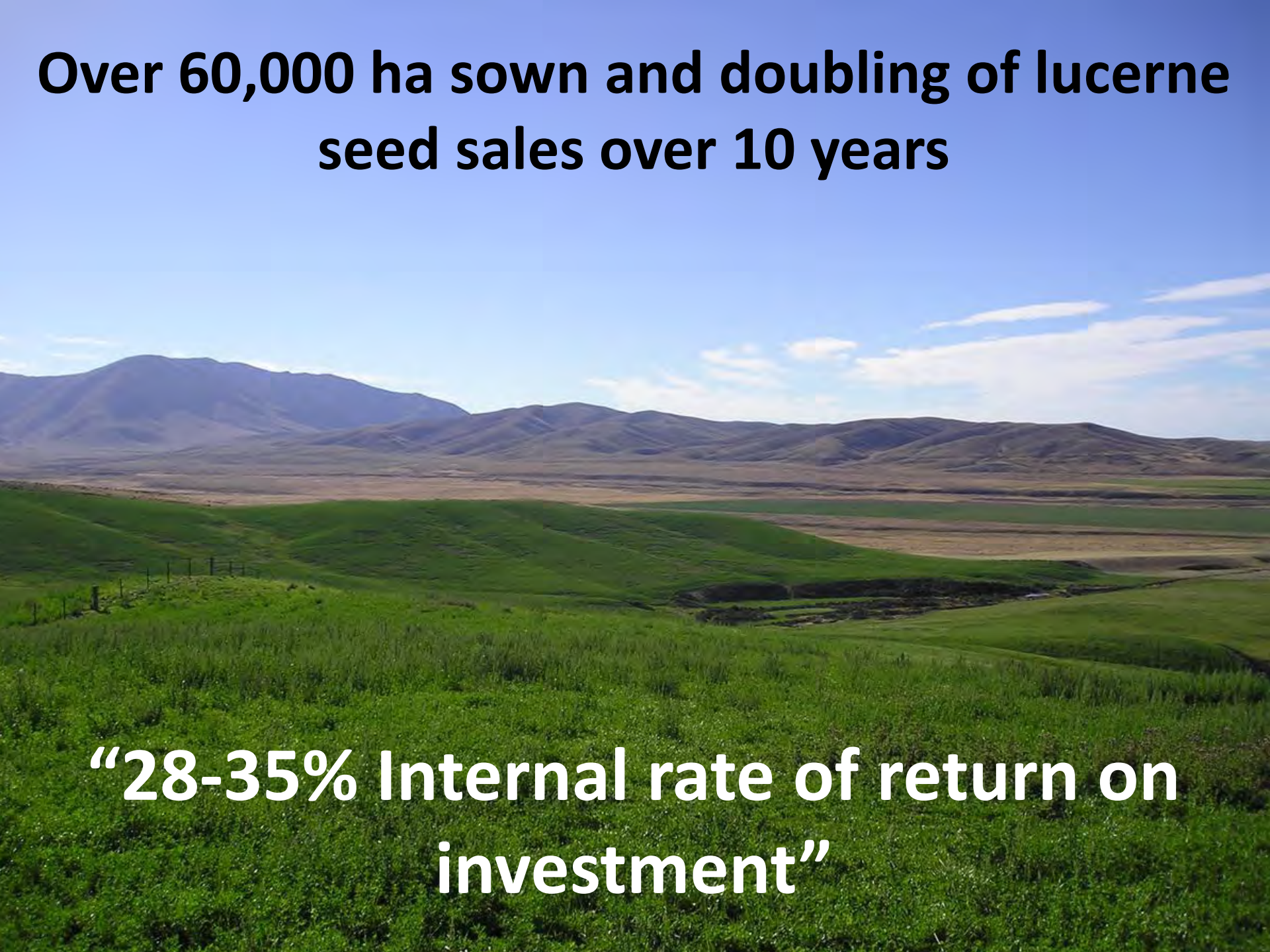
Kearney *et al*., 2010

Transformational change
&
Resilience to climate change


Over 60,000 ha sown and doubling of lucerne seed sales over 10 years
“28-35% Internal rate of return on investment”

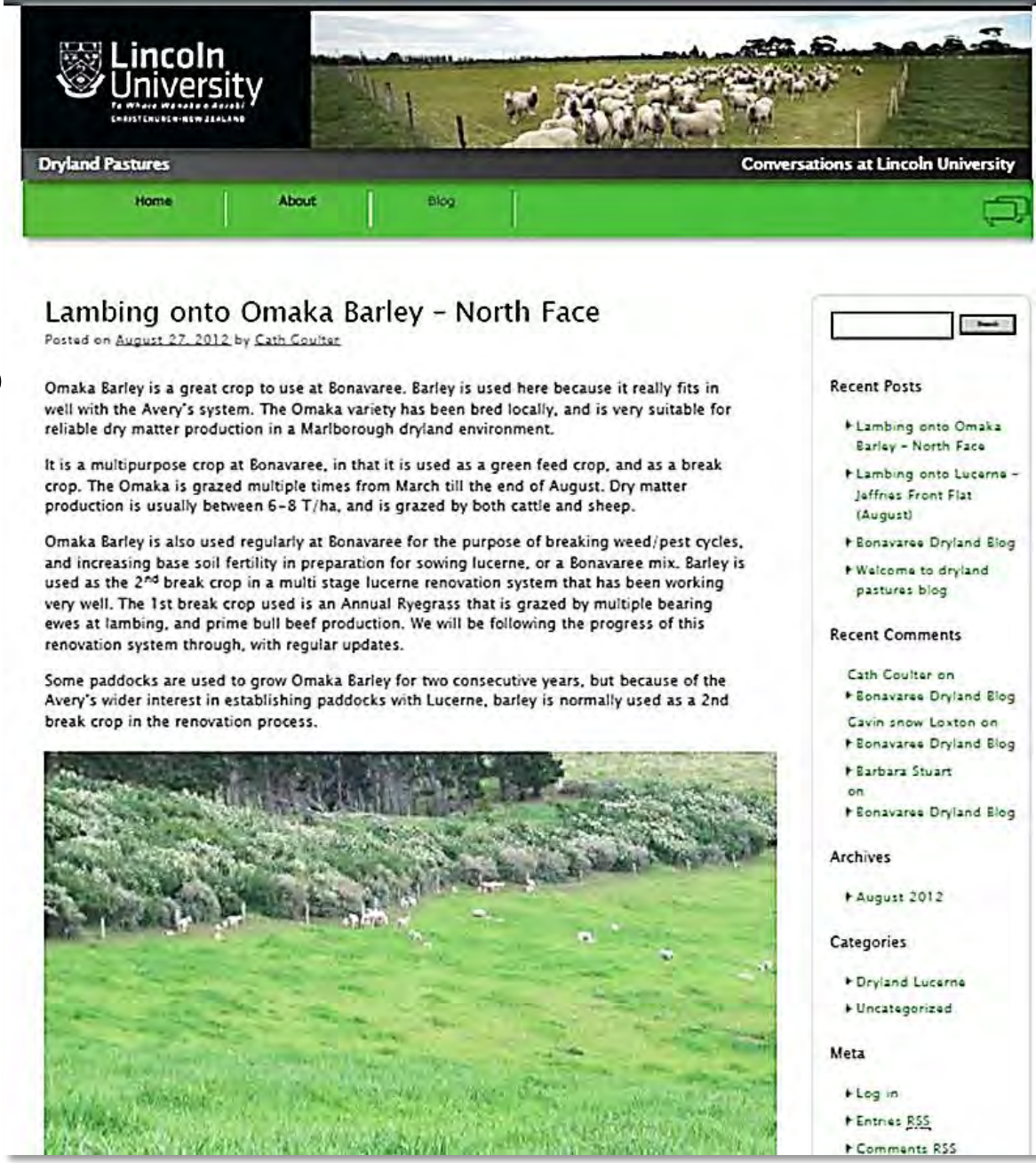

You will fail

The Blog…

- On-farm activity diary
- Slide shows, photos & video
- Ability for farmers to comment/question/query
- Farmers and researchers can respond

BLNZ txt service

There is also a website for information on projects, presentations, handouts, student project info and FAQs at: www.lincoln.ac.nz/dryland



www.lincoln.ac.nz/conversation/drylandpastures

Sustainable transformation

- Farmers with incentives to change – economic, land sustainability, social.
- Appropriate research - on-farm application to reduce complexity of intensification
- Mutual integrity and trust between scientist and farmers
- On-going engagement and mentoring.

Acknowledgements

Lincoln University

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beef + lamb new zealand

Sustainable Farming Fund

Ministry of Agriculture and Forestry

Te Manatū Ahuwhenua, Ngāherehere

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