



Ministry of Agriculture and Forestry
Te Manatū Ahuwhenua, Ngāherehere



Coyhaique 18 April 2018

Lucerne – why and how?

Professor Derrick Moot



New Zealand's specialist land-based university





Photo: S Larsen
Lincoln University

85 post grads + 40 visiting interns/scholars



Dryland Pastures Research

Learn more about Lincoln's research in Dryland Pastures.



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Find out more about some of the dryland pastures research projects.



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View the latest scientific publications.



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View Field Day handouts and conference presentations.



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View our current and previous postgraduate students.



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Learn from some of our interns and visitors about their time at Lincoln and working with the Dryland Pastures team.



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Check out our list of frequently asked questions, broken down into categories for you.



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Blog

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Website

Handouts & presentations



FAQs

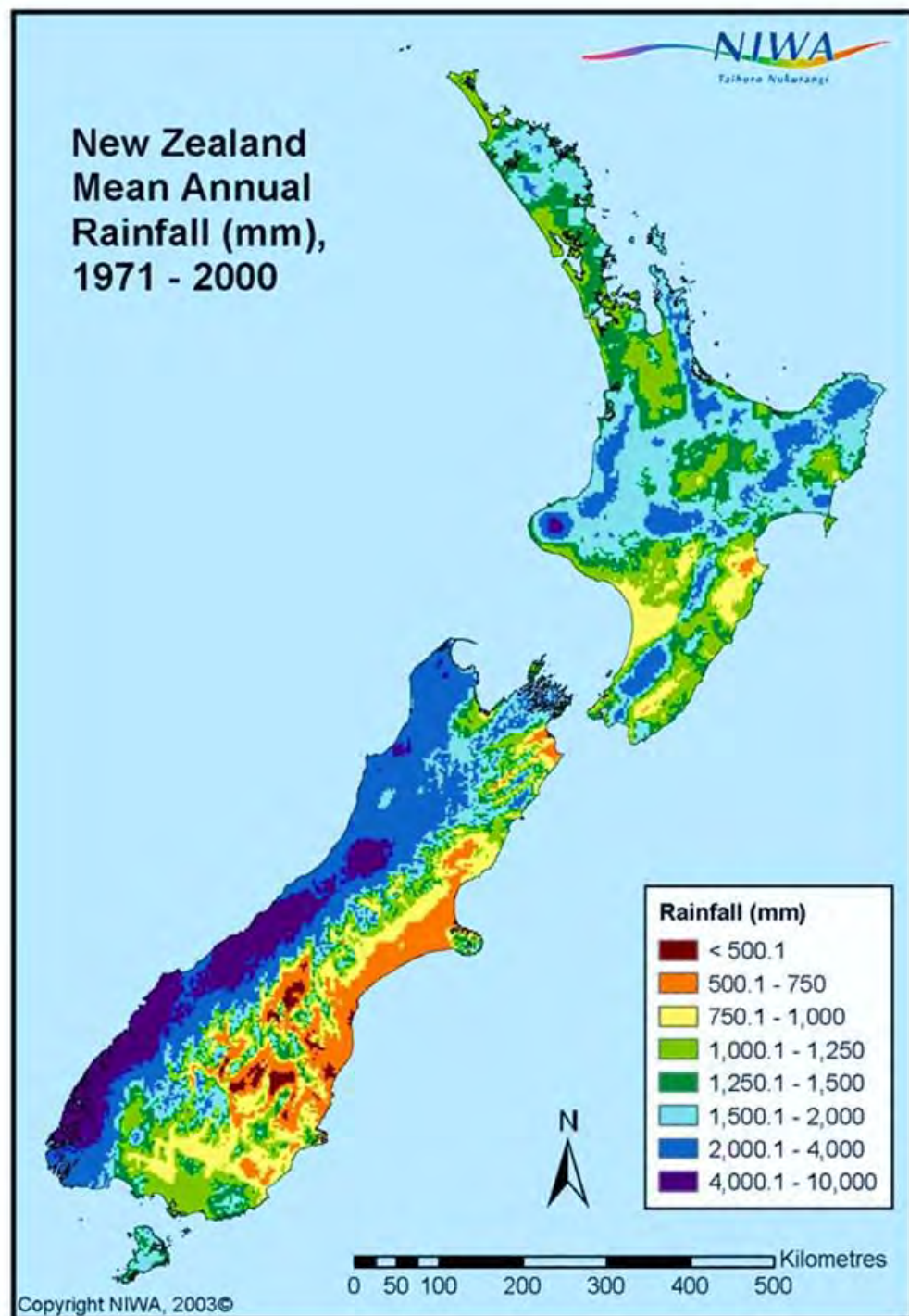


Direct link to Blog



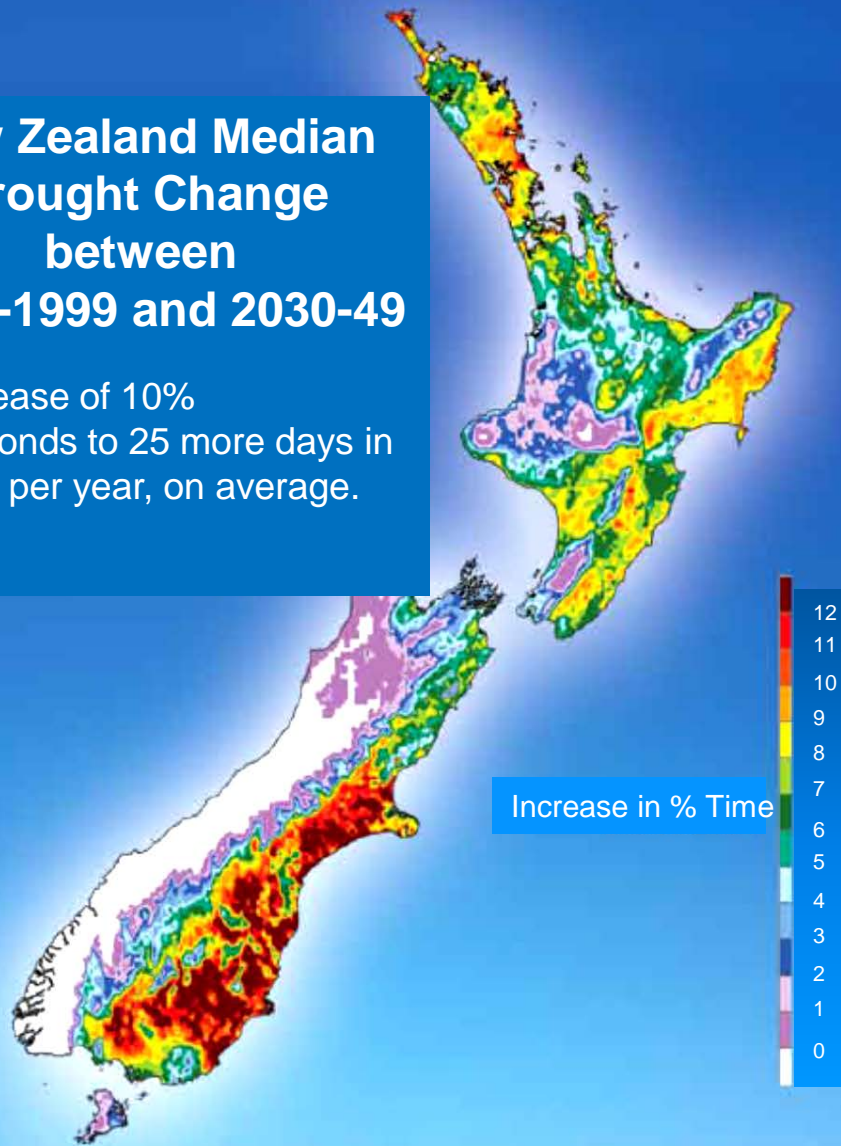
www.lincoln.ac.nz/dryland

**Strong rainfall gradient
West ⇒ East**



New Zealand Median Drought Change between 1980-1999 and 2030-49

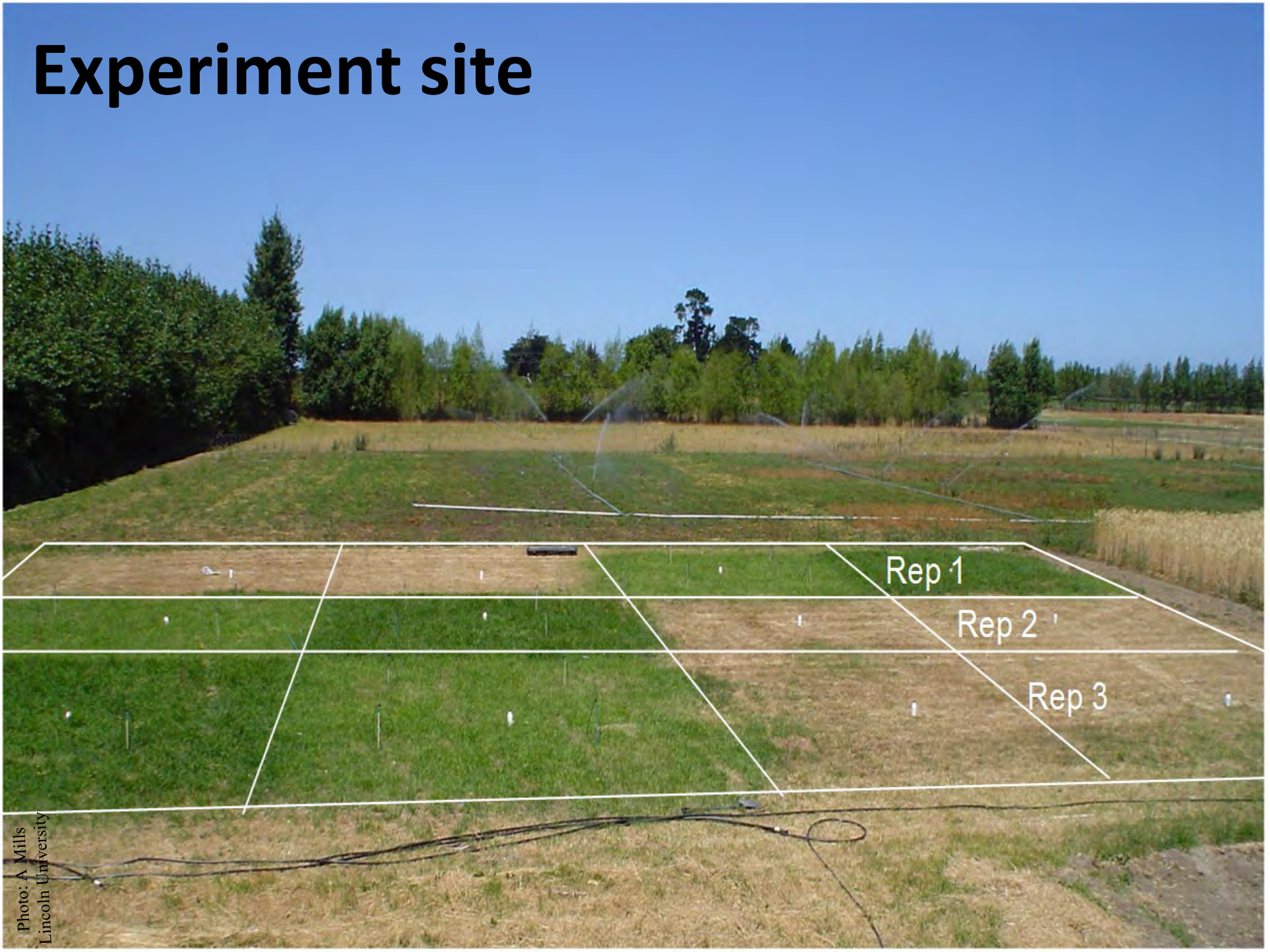
An increase of 10% corresponds to 25 more days in drought per year, on average.



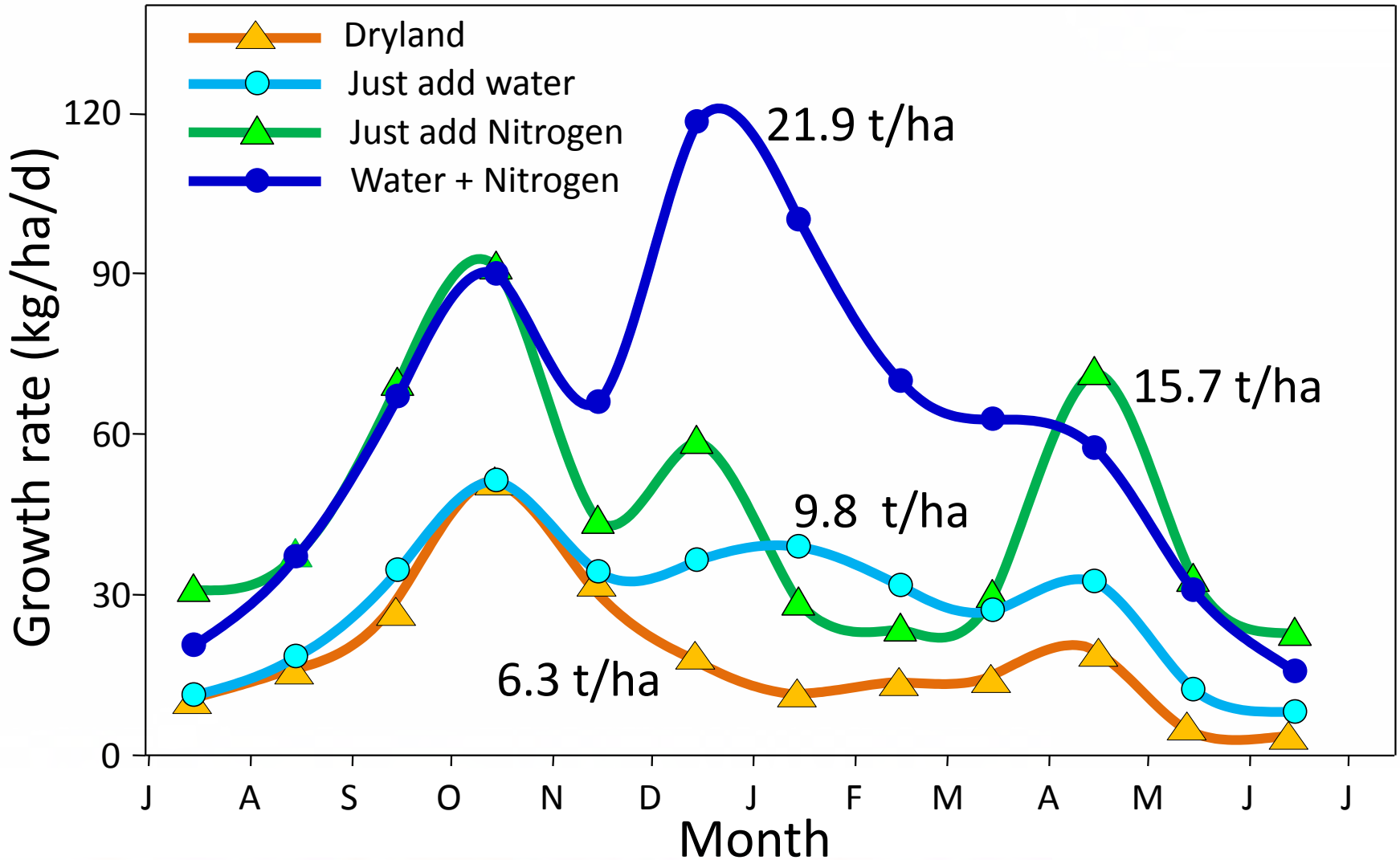
Predicted climate change in New Zealand by 2040



Experiment site



Growth rates (2 year means)

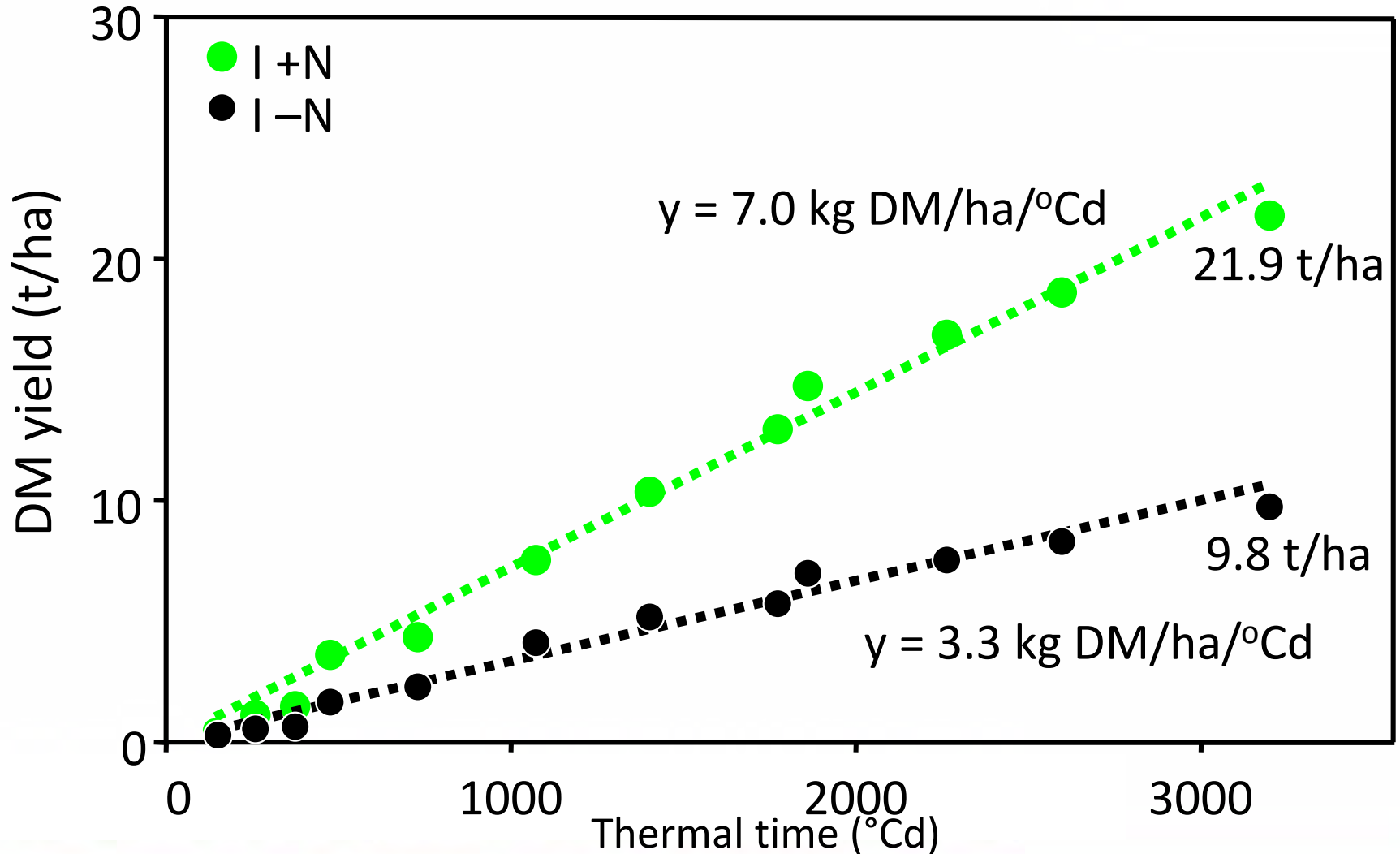


Winter

⇒ temperature response



The Nitrogen gap



Nitrogen deficient pasture

←
1000 kg N/ha

Soil moisture deficit 2003/04

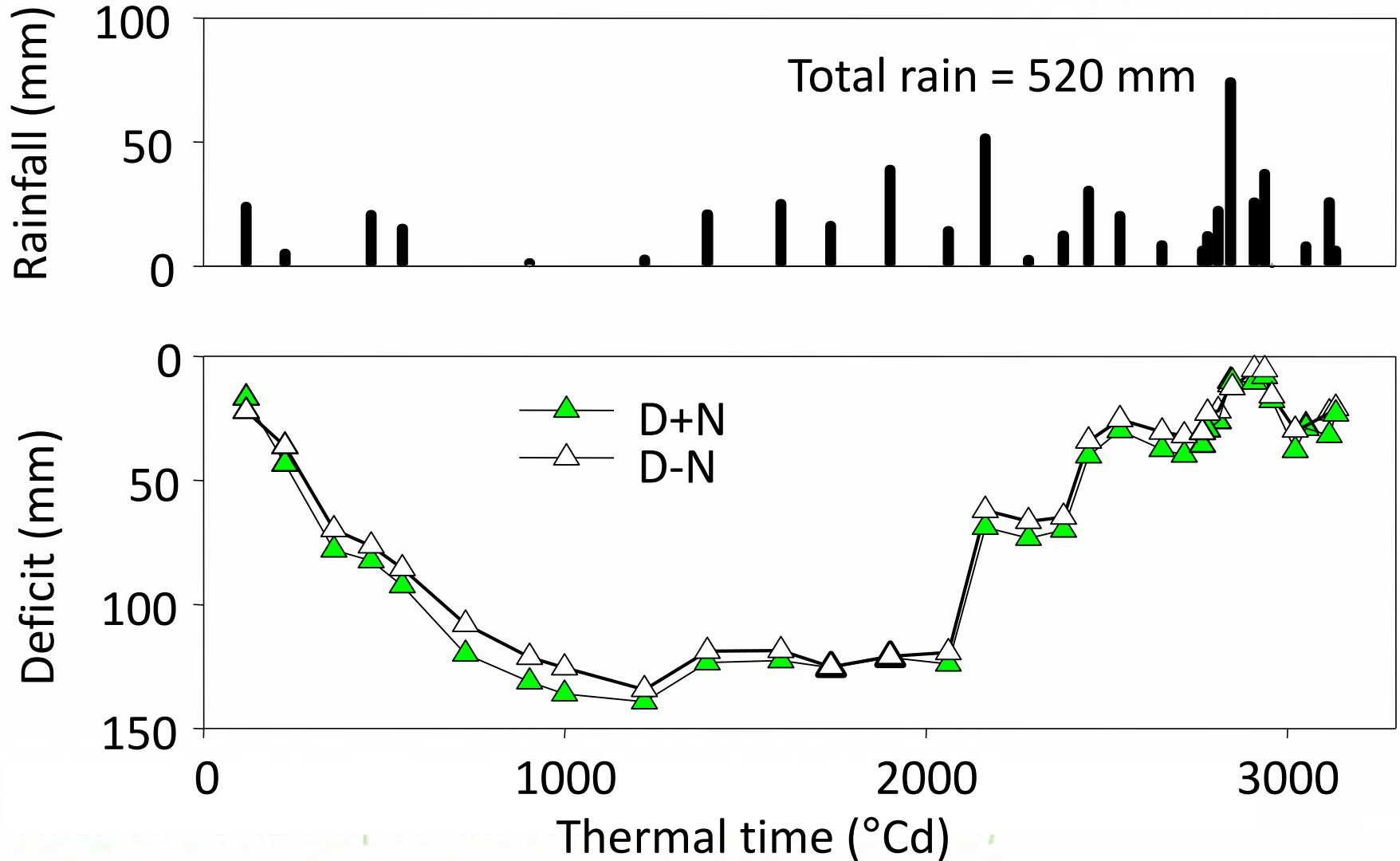




Photo: DJ Moot
Lincoln University

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Growth rates (2 year means)

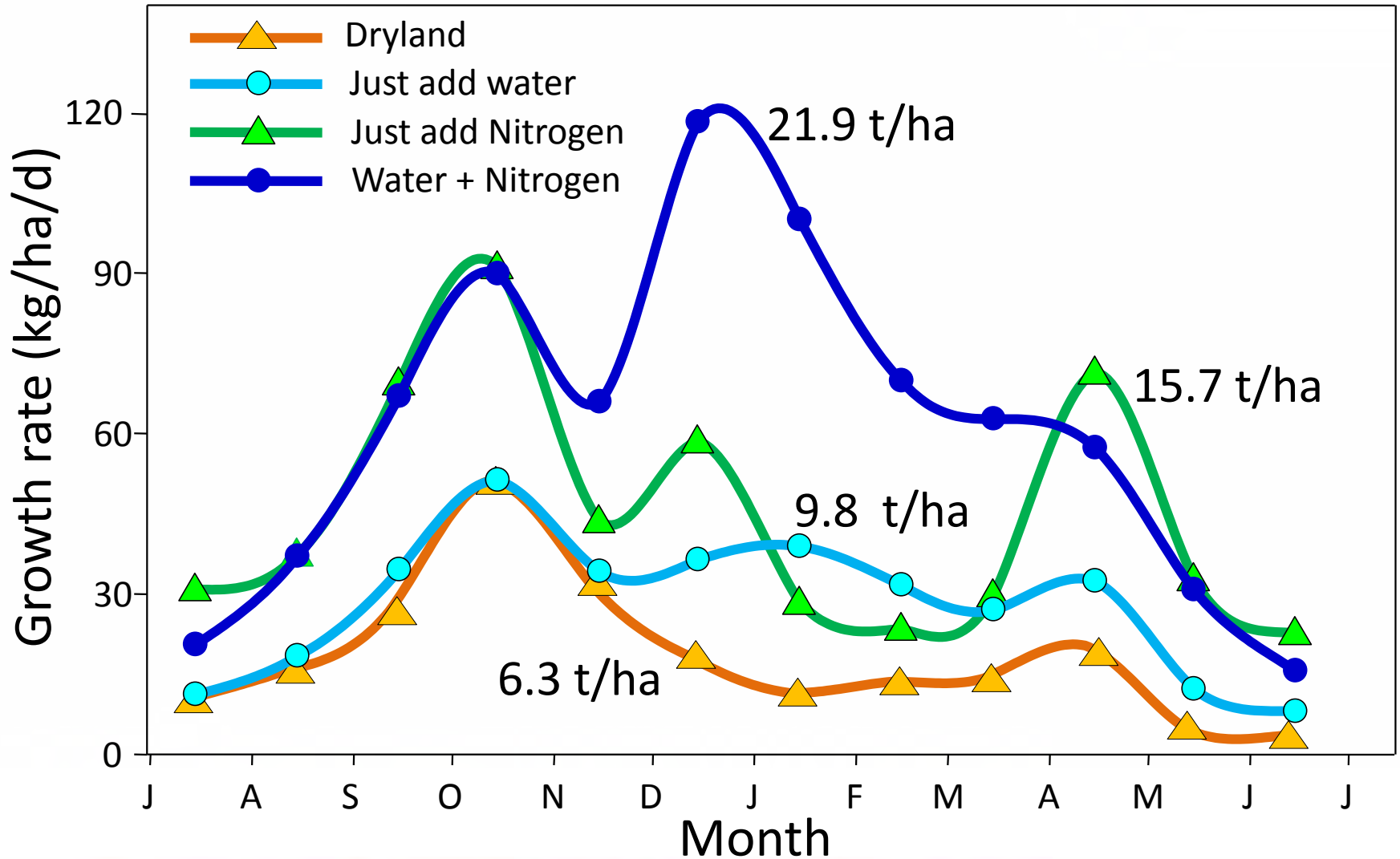


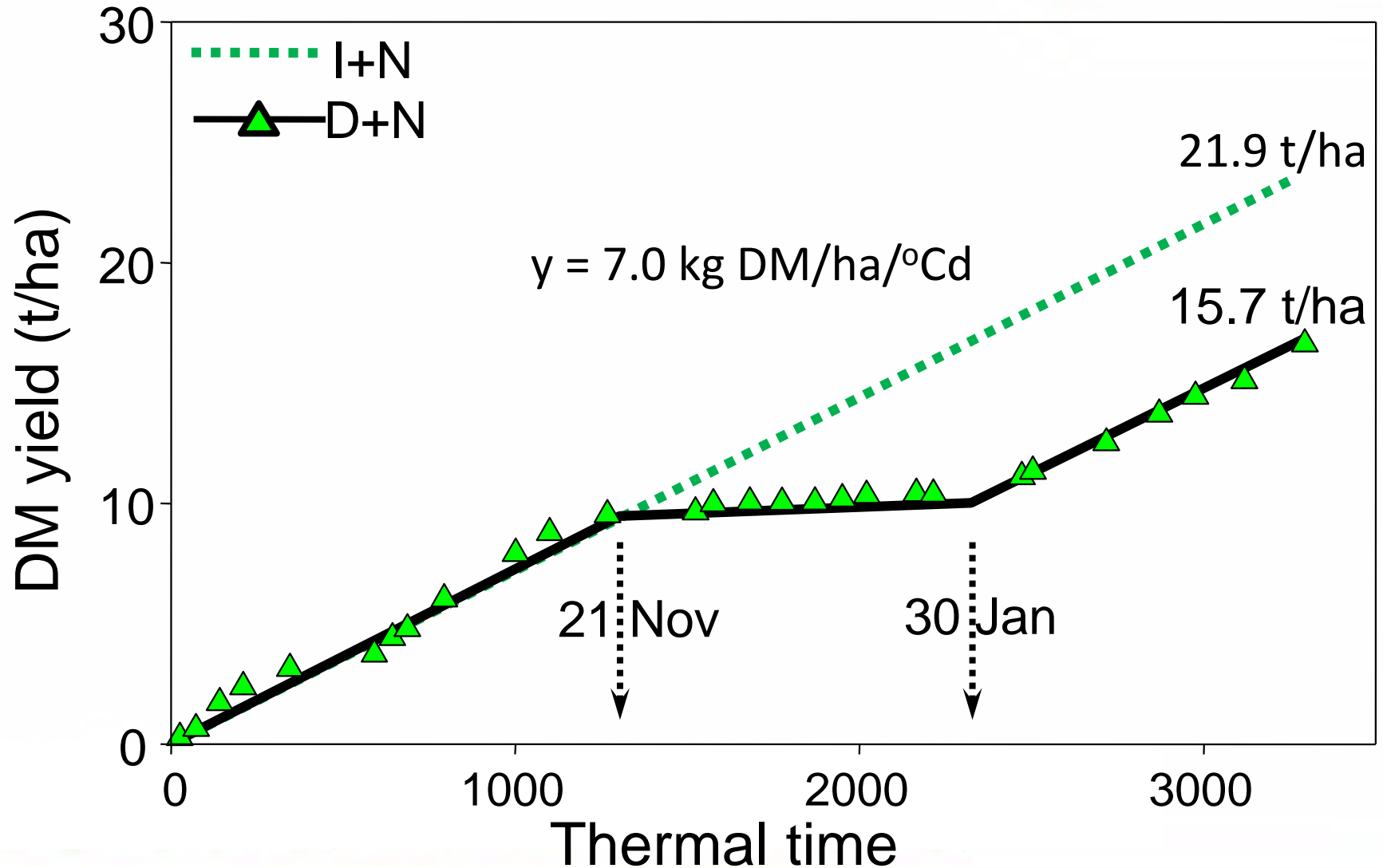


Photo: A Mills
Lincoln University

Mills 2007

Summer \Rightarrow moisture response

Water stress effect on yield



Ashley Dene

9 Jan 2015



**Required lamb growth =
5 to 35 kg
in ~100 days**

Sheep prefer 70% legume, 30% grass



Dryland pastures

- Limited water supply
- N to make plants grow!
- Meet animal demand (lactation)
- Minimize impact on air, soil, water
- Productive and profitable
- Socially acceptable

Legume dominant

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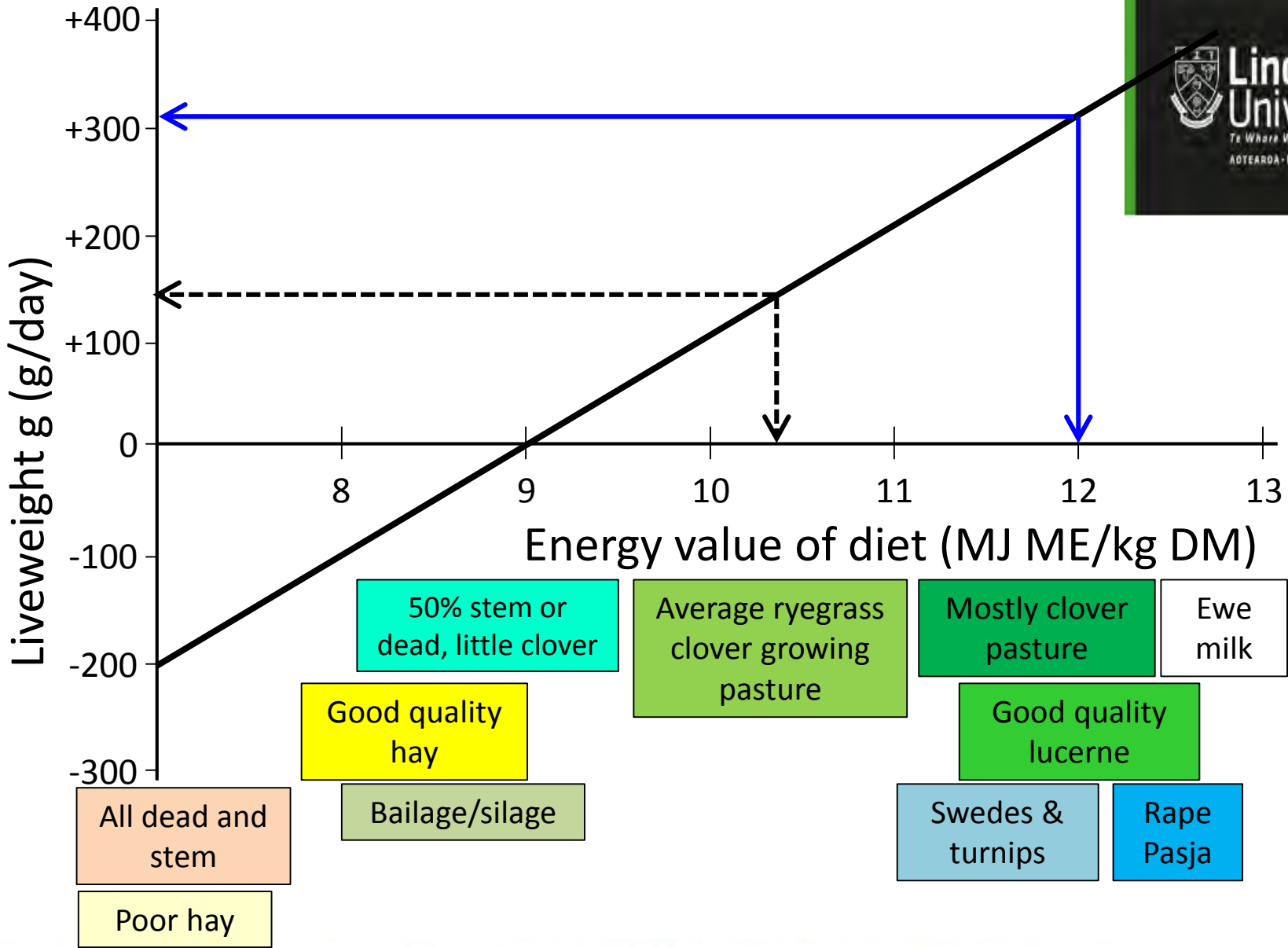


Nitrogen fixation
25-30 kg N/t DM



High feeding value pastures have;

- high legume content
- high leaf content
- low stem content
- young herbage age



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Farmer grazing issues – lucerne?

- 10% flowering – basal bud formation
- Average 23% higher but 3-weeks later
- Mostly cut and carry for hay/silage
- Ewes and lambs on lucerne pre-weaning?
- Animal health issues e.g. bloat, red gut

Supplement Production Balage/Hay/Silage/Chaff.....



Growth:

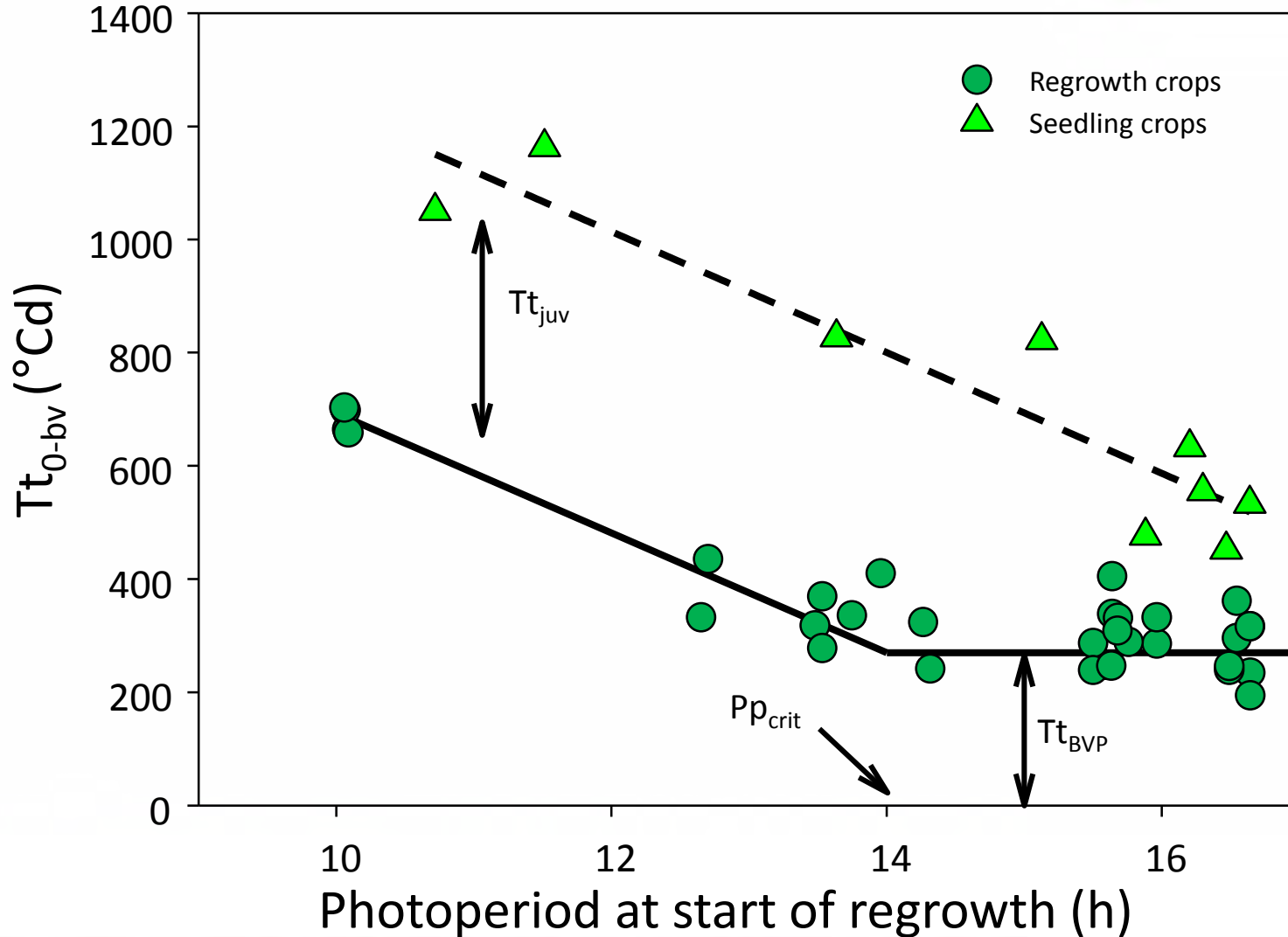
is dry matter accumulation as a result of light interception and photosynthesis

Development:

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

Growth and development are both influenced by environmental signals

Time to flowering



**10% flowering
60% stem**



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)



**Lucerne root
~8 months after sowing
> 1.5 m length**

Weed control

- Ensure adequate control of perennial weeds before sowing lucerne
- Triflurilan pre sowing – note dry conditions
- Spinnaker and 2,4 DB post emergence - or graze at 15 cm if weeds are an issues.
- Fathen only lasts one year.
- Minimal winter weed control in Year 0.

Establishment

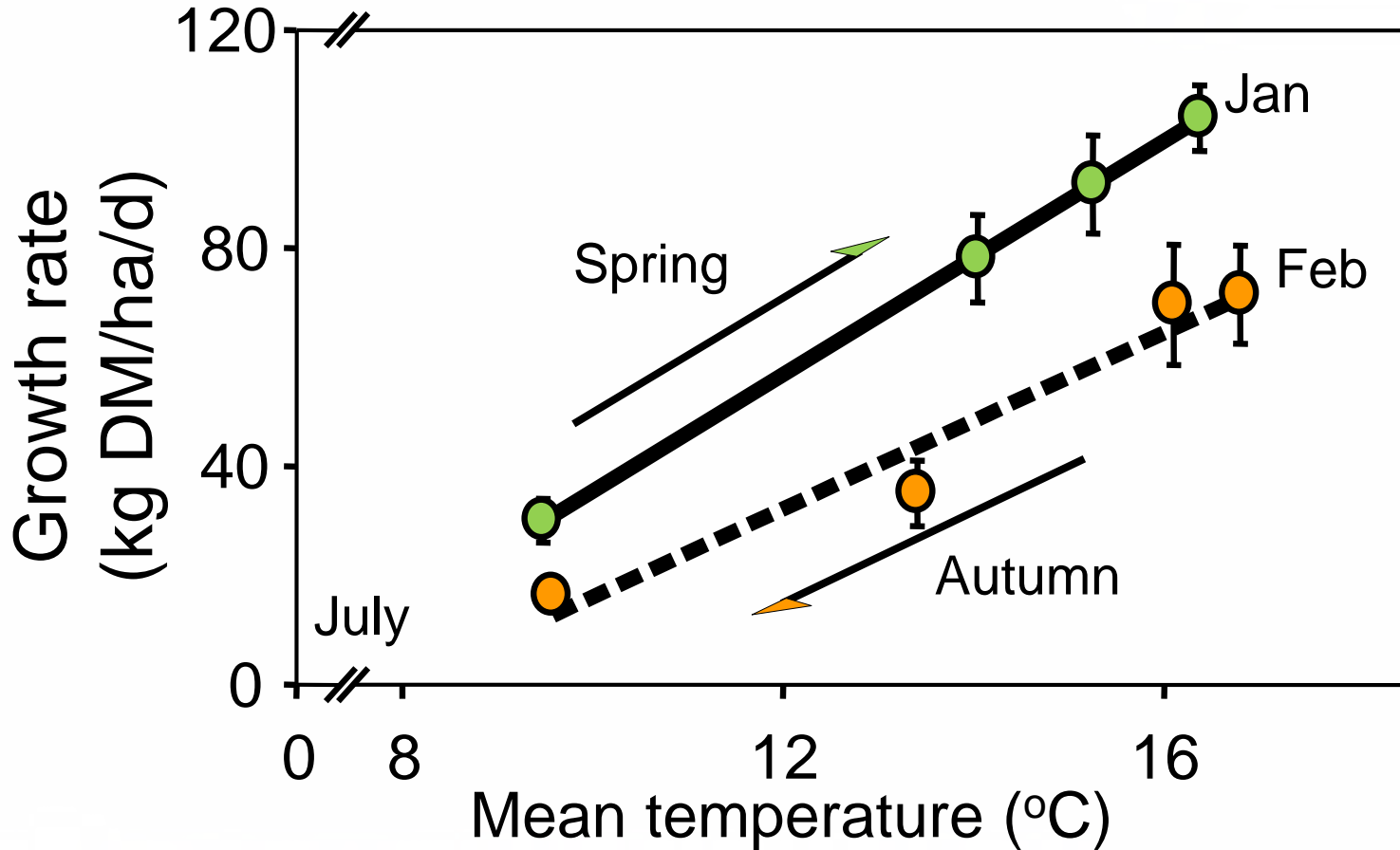
- Pre sowing – fertility and weed control pre sowing
- Firm seed bed for accurate seed depth (1 cm)
- Spring sow – October
- First crop cut – December
- Graze earlier if weedy - then flowering
- Start rotational grazing in January 15-30 cm
- Don't need 10% flowering

- **Be patient!**

The canopy: the energy capture device



Vegetative growth



Experiment 2

flexible grazing

38 days resting

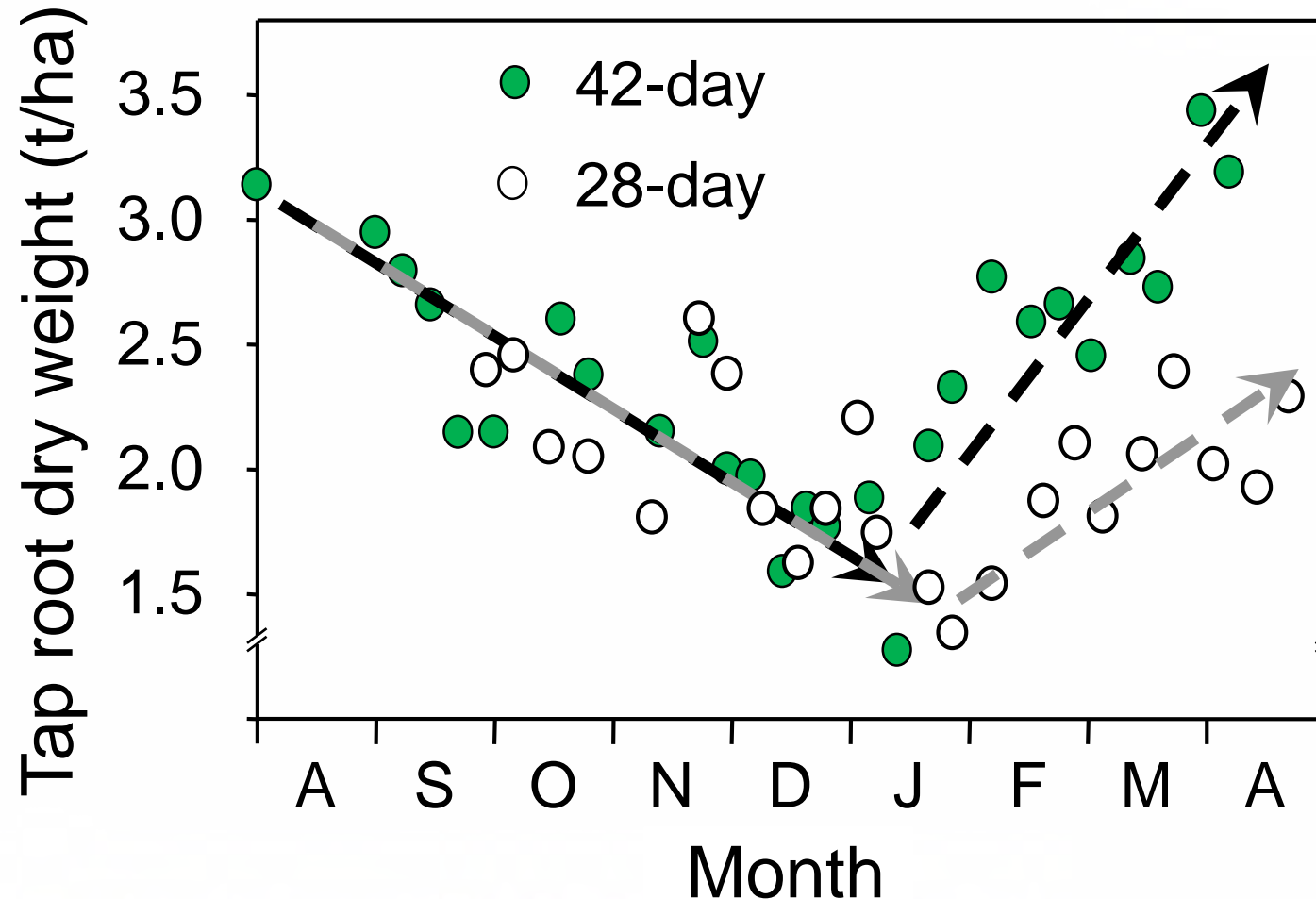
4 days grazing

25 days resting

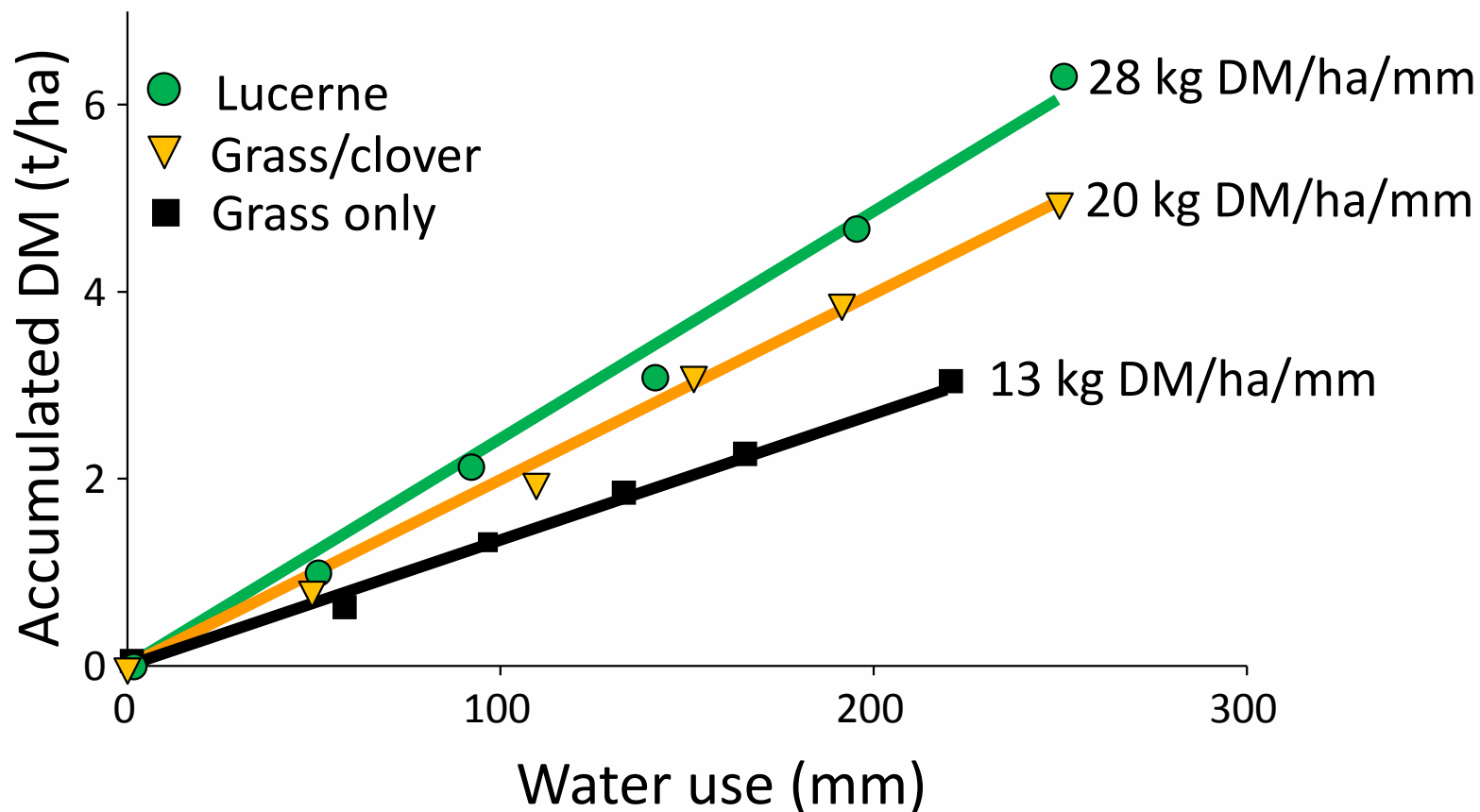
3 days grazing



Partitioning to roots



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



Photo: M Smith
Lincoln University

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

Grazing sequence – Plot 25

Day 0 (7/9/2009)



Grazing sequence – Plot 25 Day 1 (8/9/2009)





**Grazing sequence – Plot 25
Day 2 (9/9/2009)**



Photo: M. Smith
Lincoln University

**Grazing sequence – Plot 25
Day 3 (10/9/2009)**

Grazing sequence – Plot 25 Day 4 (11/9/2009)



Grazing sequence – Plot 25 Day 5 (12/9/2009)



Photo: M Smith
Lincoln University

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Grazing sequence – Plot 25

Day 7 (15/9/2009)



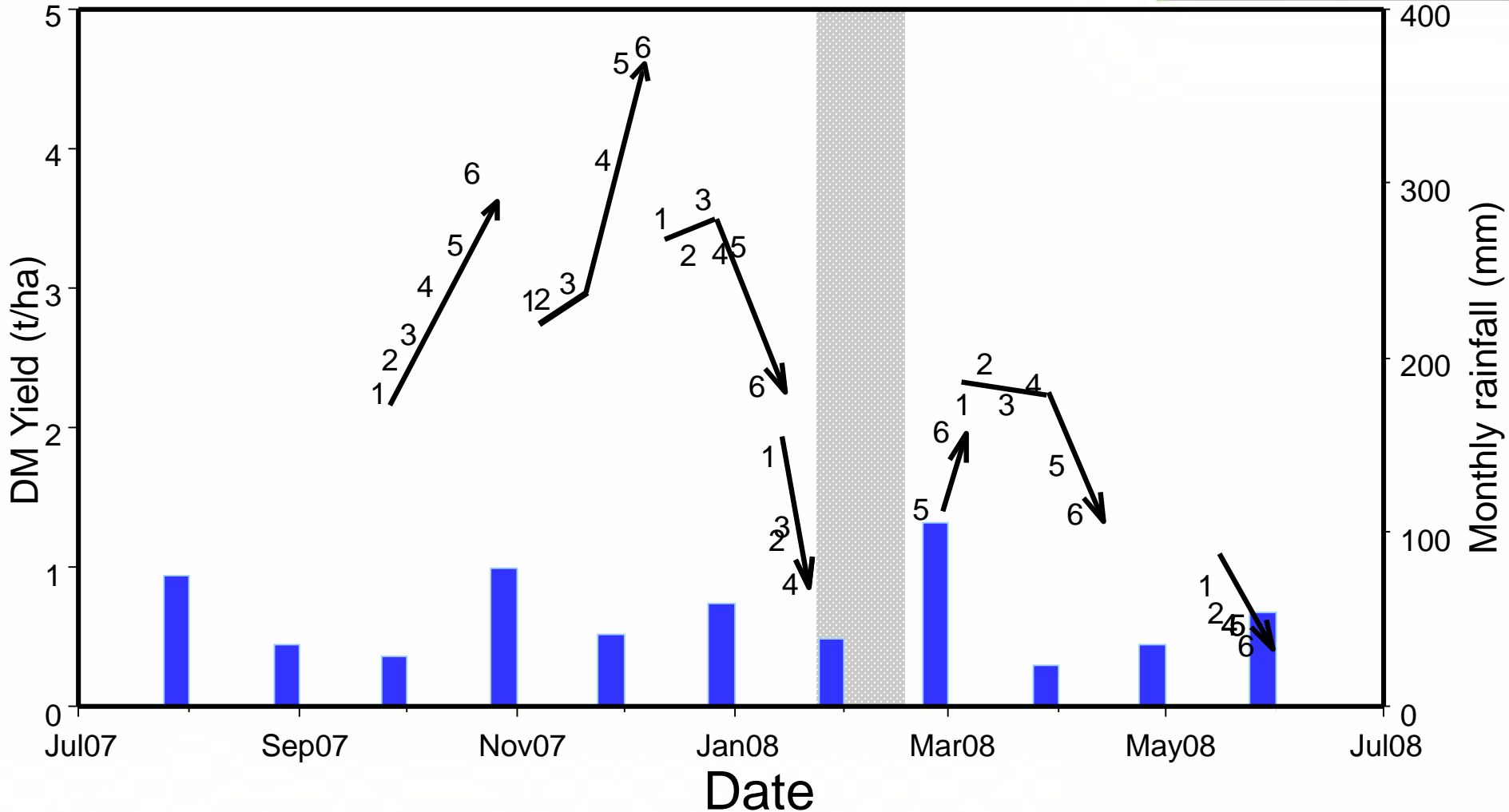
Photo: M Smith
Lincoln University

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Photo: M. Smith
Lincoln University

MaxClover – 38-42 day rotation



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5th September 2011 – Cave, South Canterbury



Photo: DJ Woot
Lincoln University

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8 Aug 2001



cm



Photo: DJ Moot
Lincoln University

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22 Aug 2001

13
12
11
10
9
8
7
6
5
4
3
2
1

cm

Photo: DJ Moot
Lincoln University



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12 Sep 2001



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Te Whare Wānanga o Aoraki
CHRISTCHURCH • NEW ZEALAND



Photo: DJ Moot
Lincoln University



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Te Whare Wānanga o Aoraki
CHRISTCHURCH • NEW ZEALAND



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

High numbers for 7-10 days



Photo: DJ Moot
Lincoln University

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Photo: D Avery
Bonavaree, Marlborough

Fibre and salt

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Photo: D Avery
Bonavaree, Marlborough



Pre graze mow

06/10/2015

Bloat ... (yes it survived)



30/09/2014

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

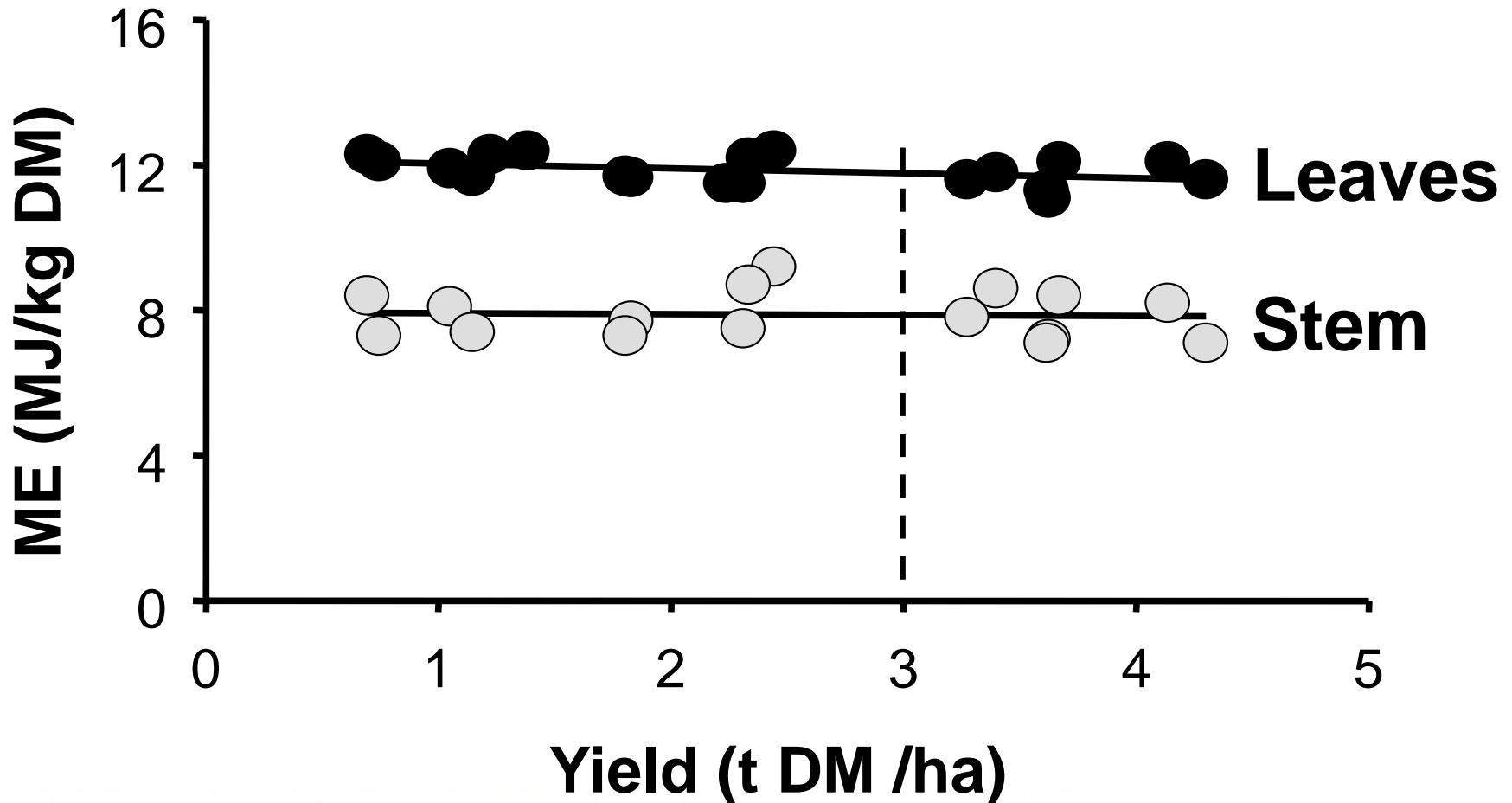


Plot 6
28/2/08



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

Metabolisable energy of lucerne



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



Photo: DJ Moot
Lincoln University



**Lincoln
University**

Te Whare Wānaka o Aoraki
AOTEAROA • NEW ZEALAND

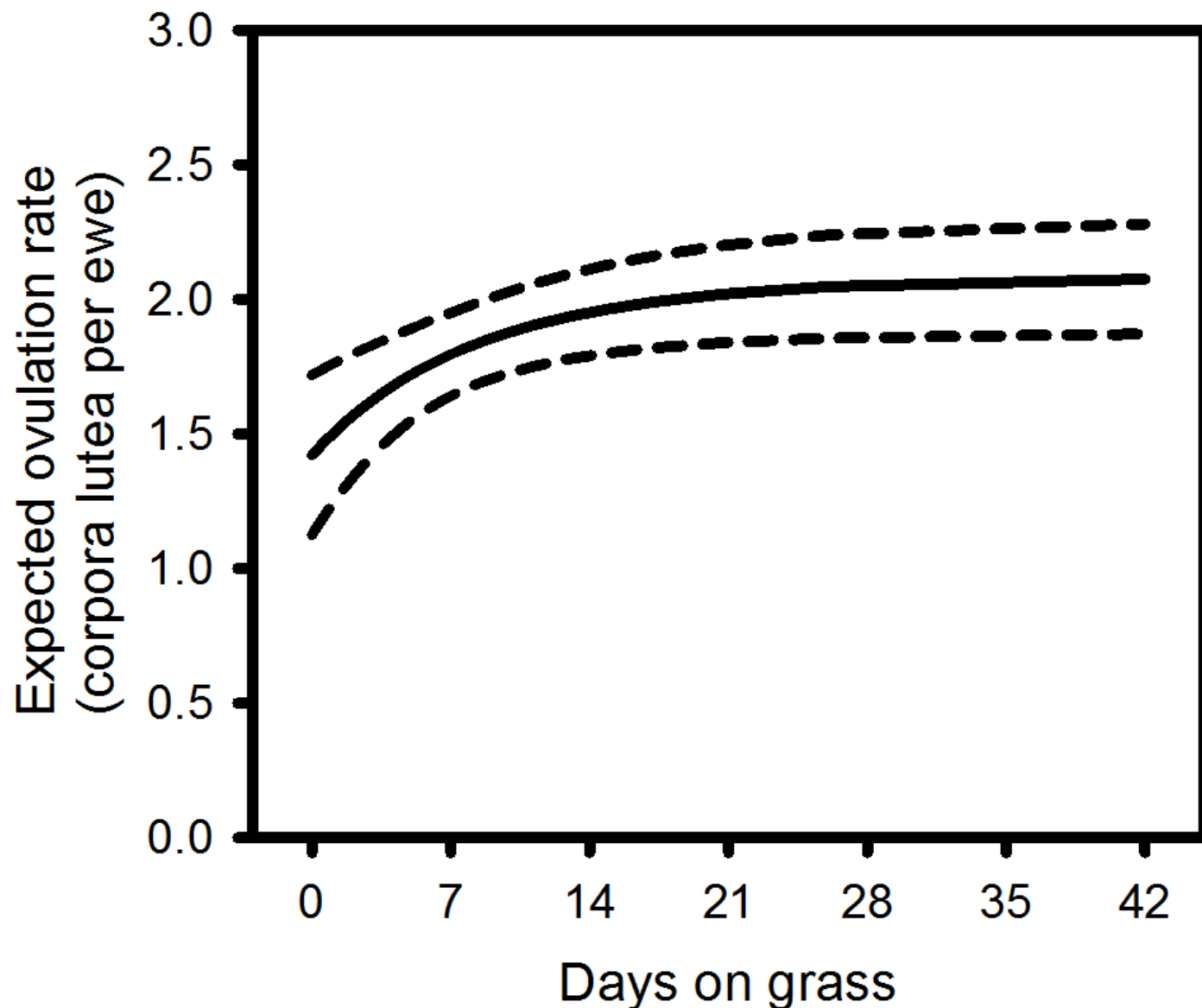
Animal health

- **Clostridial bacteria:** vaccinate
- **Cobalt:** vitamin B12 injection
- **Worm haven:** Camping on small area – river edge?
- **Avoid flushing if:** leaf spots or dull weather

When is coumestrol high?

- Ranges from 0 to 600 mg/kg.
- **>25 mg/kg** sufficient to reduce ewe ovulation rate.
- Produced in response to fungal pathogens.





**Two weeks
off lucerne
was
sufficient for
recovery.**

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

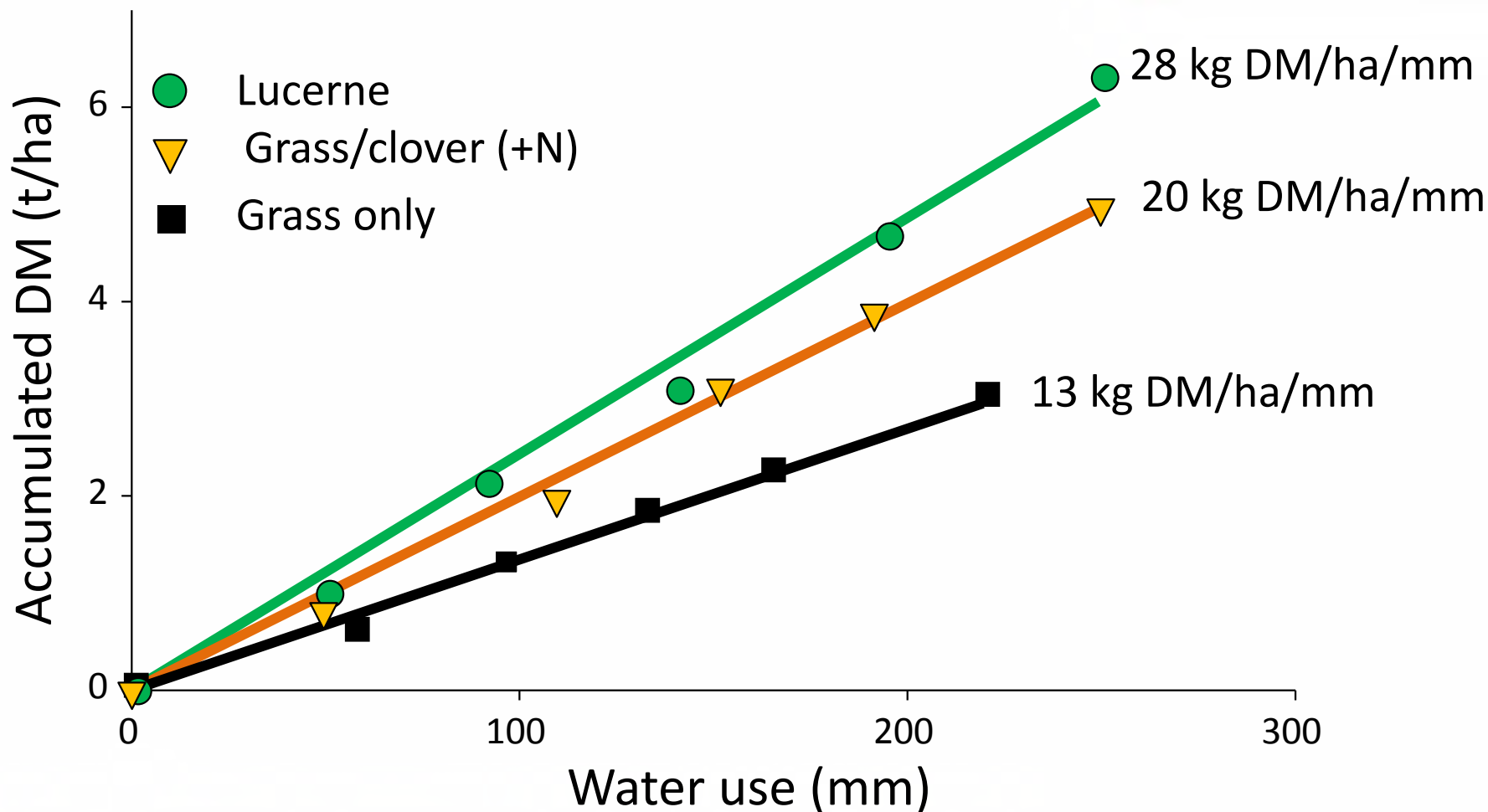
Case study – Bonavaree farm, Marlborough
Over grazed – high erosion risk
Financially – no return
Dryland lucerne conversion



Photo: Doug Avery
Bonavaree, Marlborough

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Spring WUE



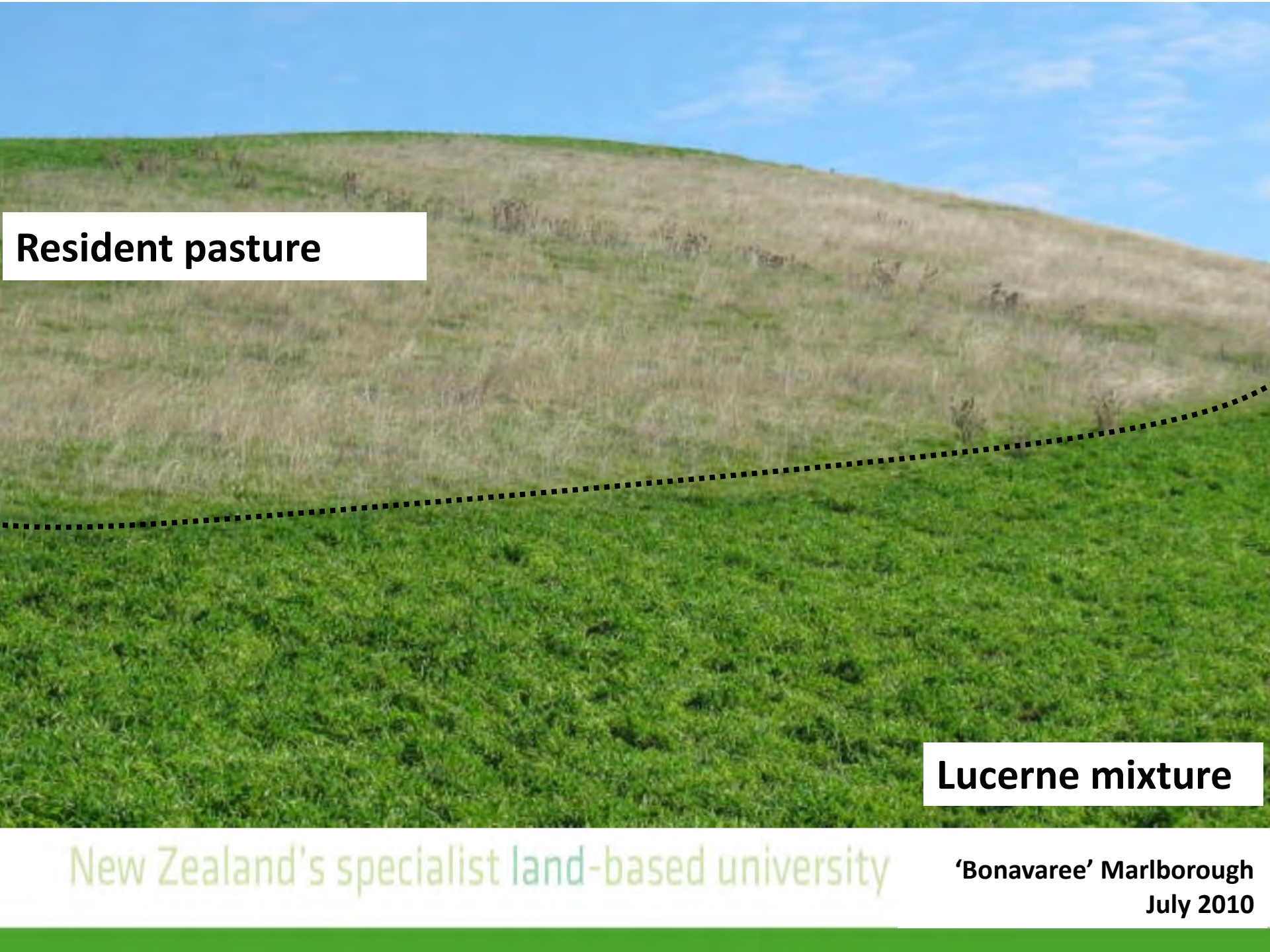
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Photo: Doug Avery
'Bonavaree', Marlborough

23/01/2005

Doug and Fraser Avery "Bonavaree"



Resident pasture

Lucerne mixture

Bonavaree 14/8/2017



Photo: DJ Moot
Lincoln University

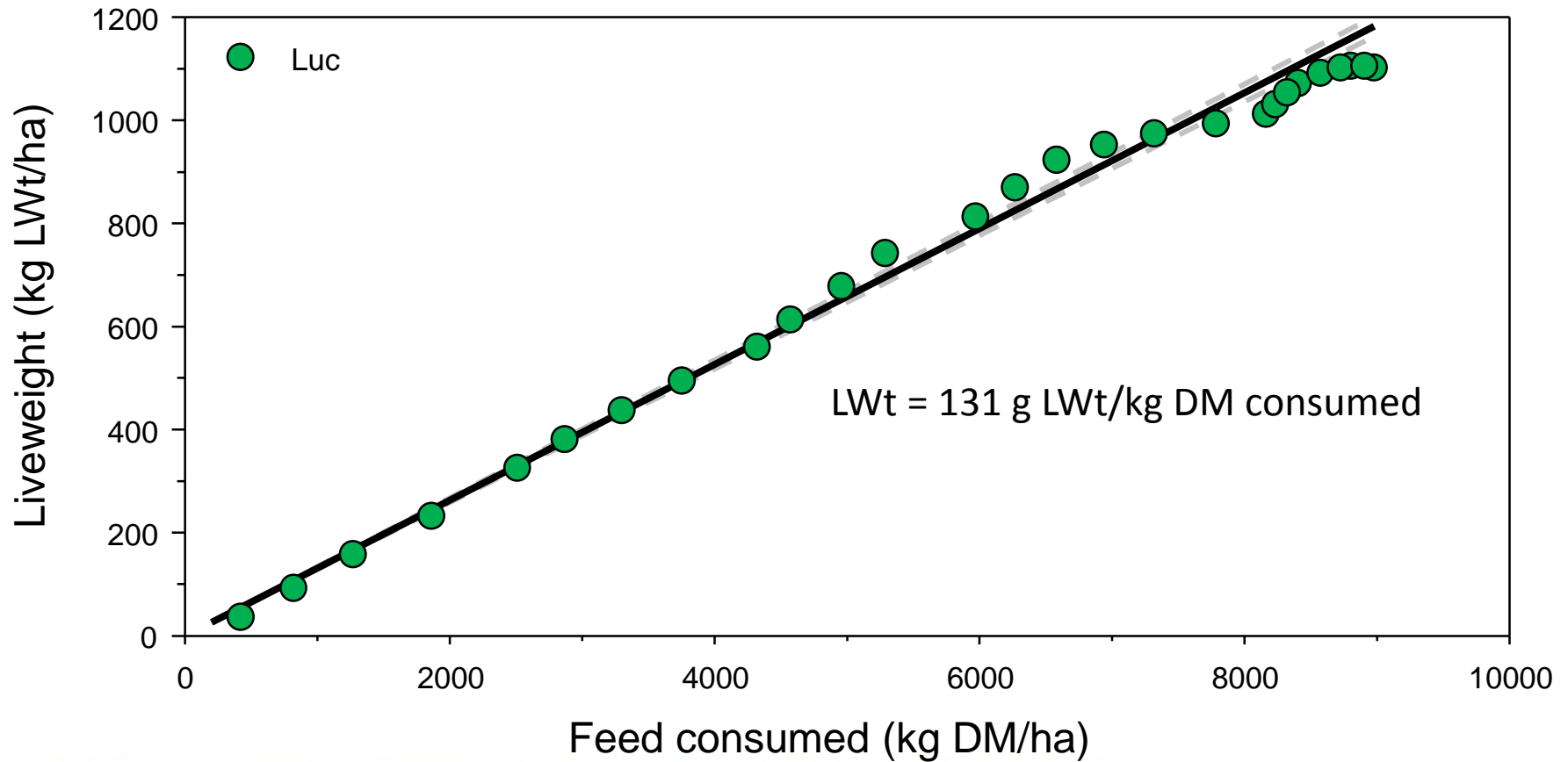
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Photo: Doug Avery,
Bonavaree

26/10/2016

Relationship between LWt production and feed consumed



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Change in stock performance

A large flock of sheep is grazing in a lush green field. The sheep are of various breeds, including some with white wool and some with brown wool. They are scattered across the field, some standing and some lying down. In the background, there is a line of tall, dark trees and a fence. The overall scene is a peaceful rural landscape.

Ewes growing lambs at 360- 400 gms per day.
Average for NZ is 175 gms per day

27/09/2013

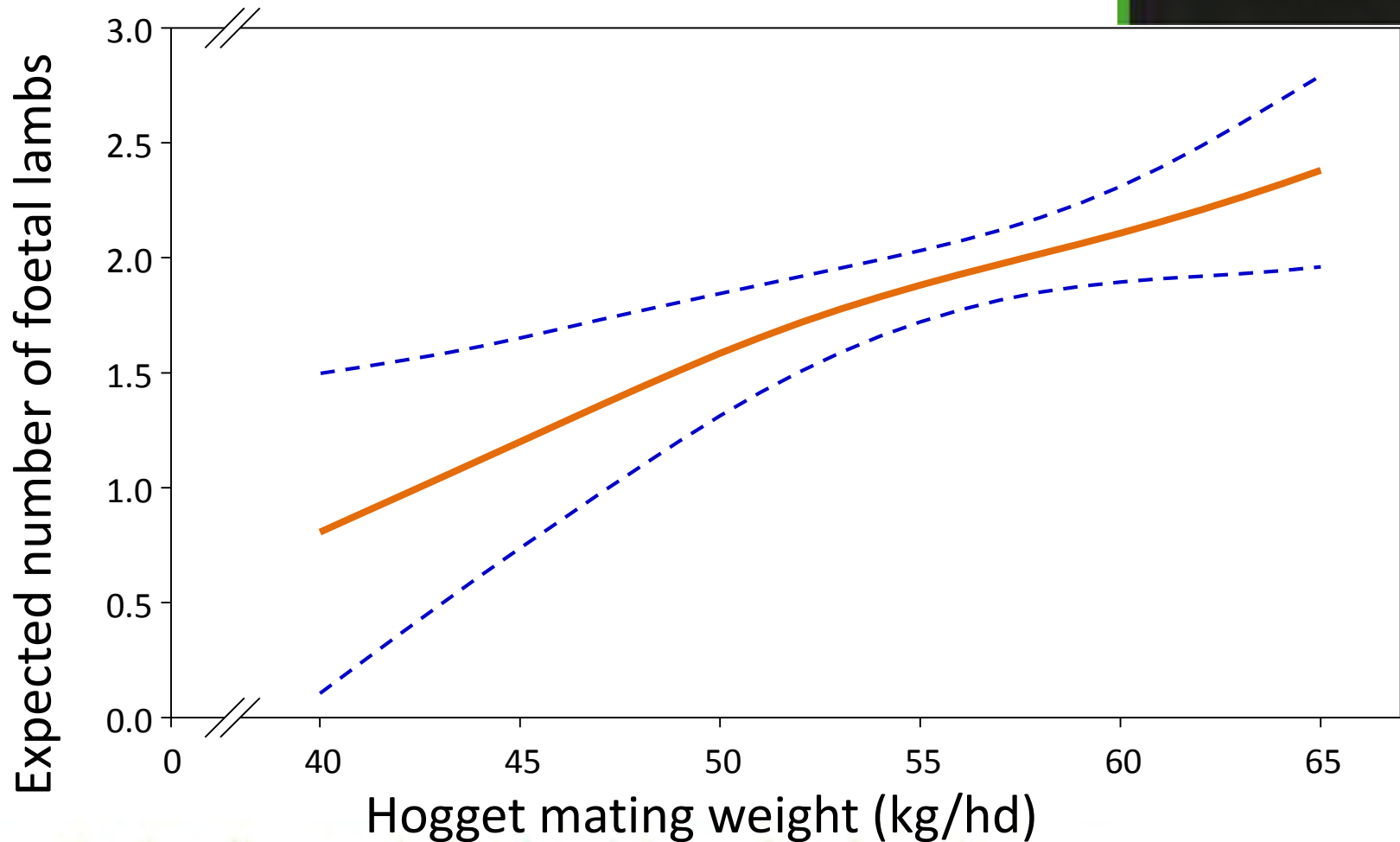
Ewe hoggets grown on lucerne 54 kg ave





Hogget scanning increased from 40% to 162%

Foetal lambs vs. mating weight



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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%

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THE RESILIENT FARMER

Weathering the
challenges of life
and the land

DOUG AVERY

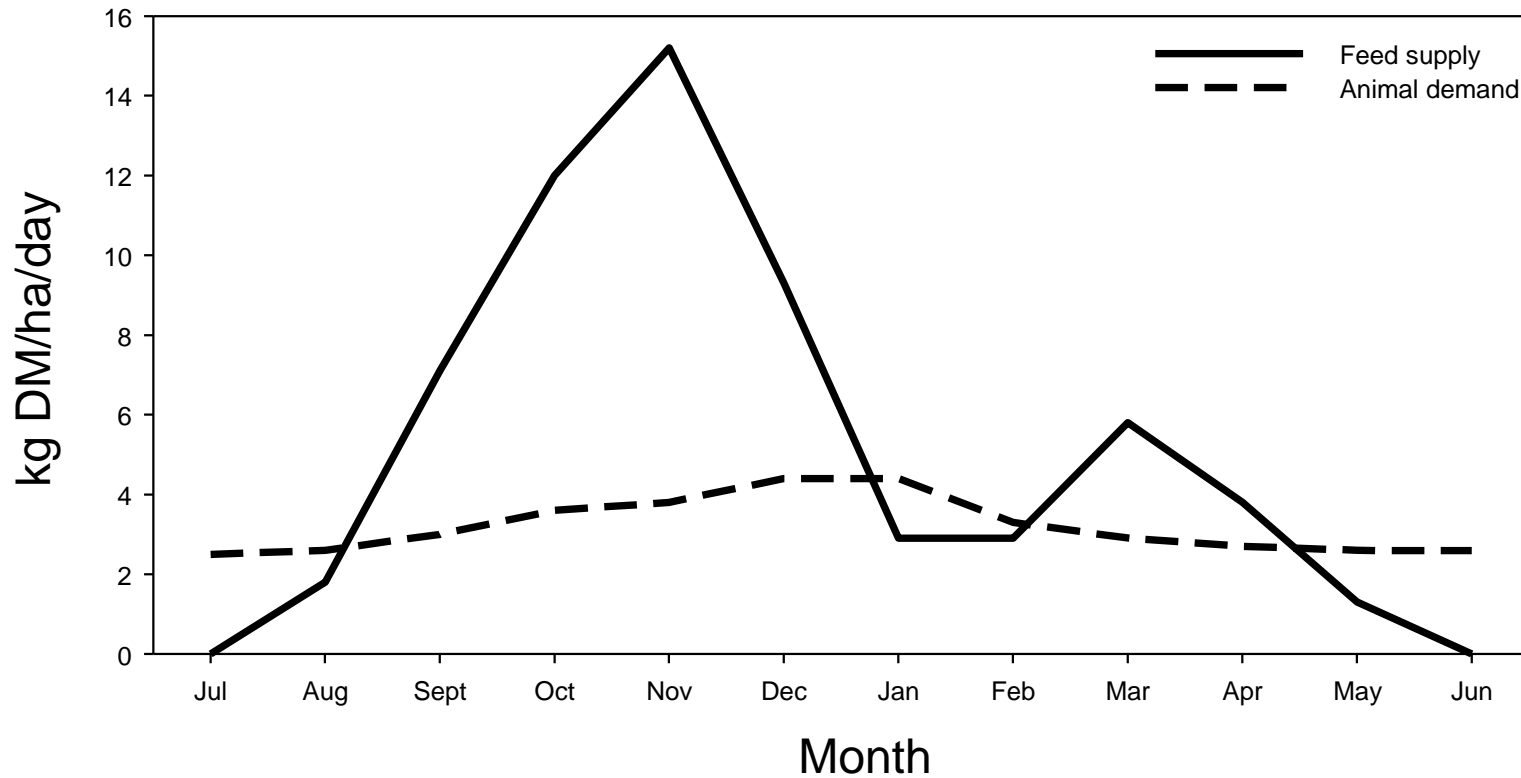
'Both Doug and his story are hugely inspirational.' SIR JOHN KIRWAN



Photo: Bog Roy Station

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Pasture supply & Animal demand



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Landscape farming – Bog Roy Station



Photo: DJ Woof
Lincoln University

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Browntop – *Agrostis capillaris* – stolons and rhizomes

Autumn herbicide and burn





3 cm of organic matter – not soil Carbon



Just add ryecorn

Ryecorn – *Secale cereal*
Break feed in winter/spring

Pre-development

- browntop
- hieracium
- sweet vernal
- <5% legume

Autumn Spraying

- Timing is Critical
- Very important tool
- Glyphosate, granstar, penetrant

Key Result

- Conserve soil moisture
- Kill mass root systems



2nd Spray – Spring
Glyphosate, insecticide, penetrant

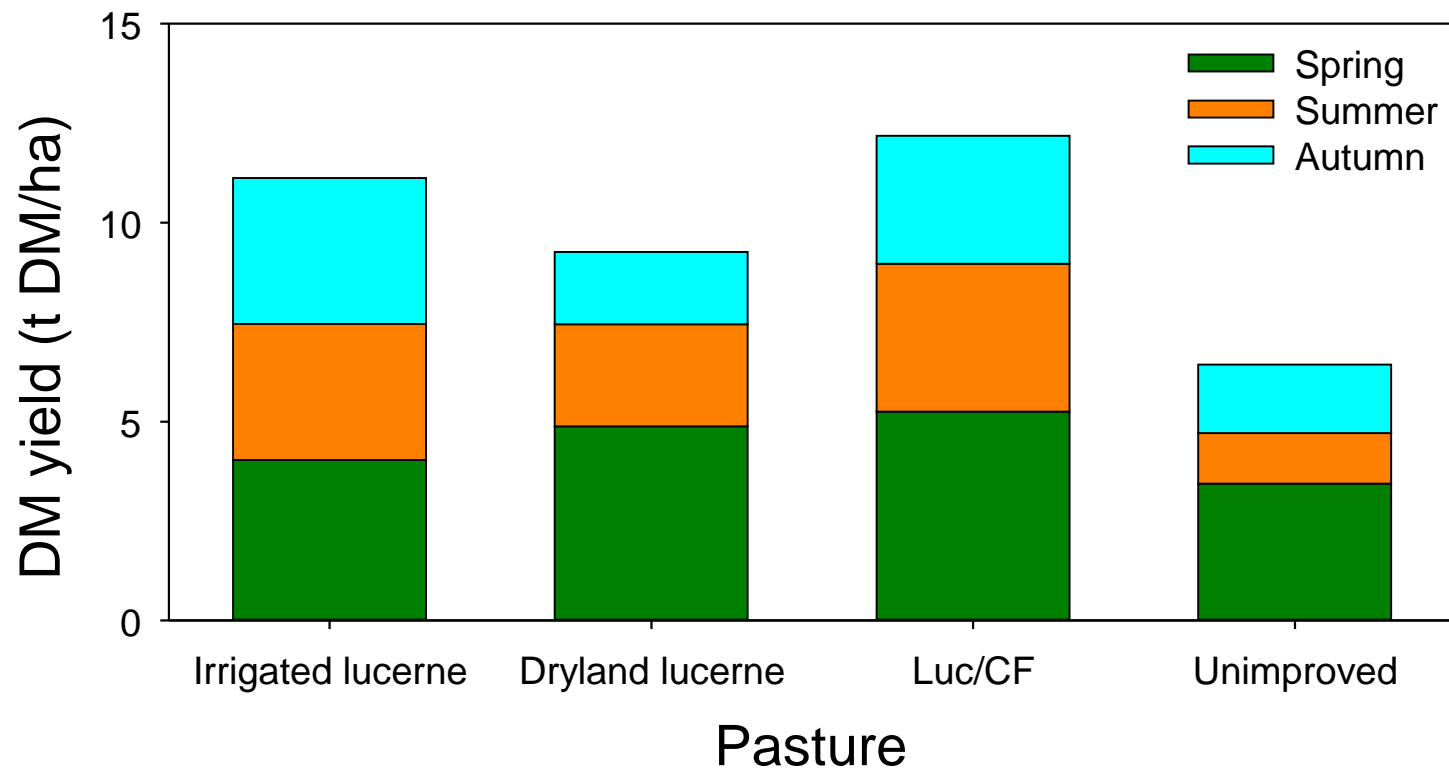
Result from Autumn spray, photo taken 1 November 2010

Drilling seed with fertiliser

Direct drilling = seed + fertiliser



Seasonal pasture production (3-yr average)



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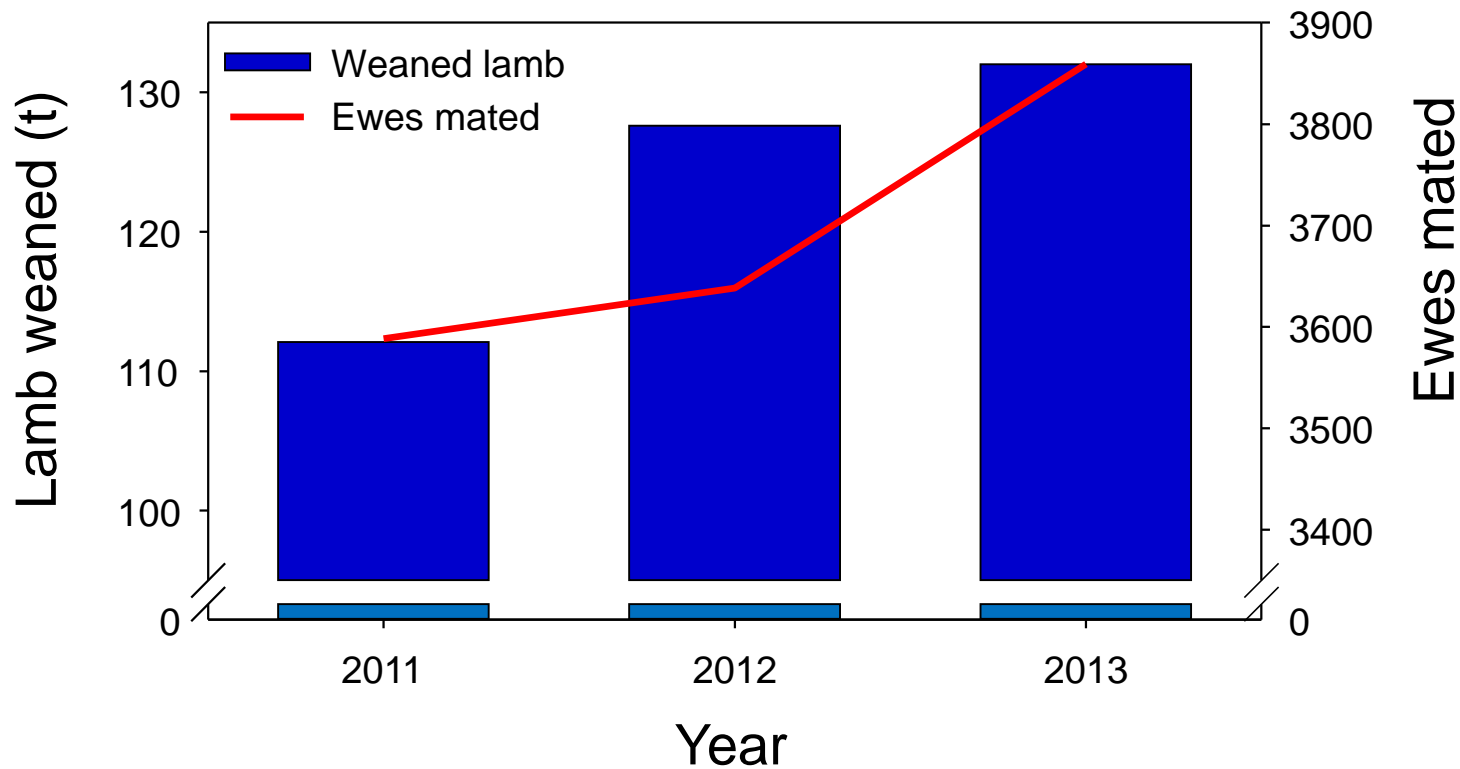
2011 10 7

Change in system performance

	Historic (Pre 2010)	Year 3 (target)	Year 3 (actual)	% Change
<u>Mixed age ewes</u>				
Tupping wt (kg)	57.0	60.0	59.5	↑ 4.3
Ewes scan (%)	165	165	165	-
Ewes wean (%)	115	125	130	↑ 13.0
Ewe lamb mort (%)	30.0	25.0	21.0	↓ -30.0
Lamb wean wt (kg)	27.0	29.0	29.0	↑ 7.4
Lamb growth rate (g/hd/day)	205	235	235	↑ 14.6

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Lamb weaned and Ewes mated



11% increase in lamb weaned per ewe mated (2011 vs. 2012/2013)
31.2 vs 34.6 kg weaned per ewe mated



INNOVATION



■ Sites of Dryland Hubs.

A large blue sign stands in a field of sheep. The sign features a landscape image of snow-capped mountains and a golden field. The text on the sign reads "MANIOTOTO" and "A TIMELESS LAND". The background shows rolling hills and a blue sky with light clouds.

MANIOTOTO

A TIMELESS LAND

150,000 ha sown - lucerne seed from 20 to 200 t/yr

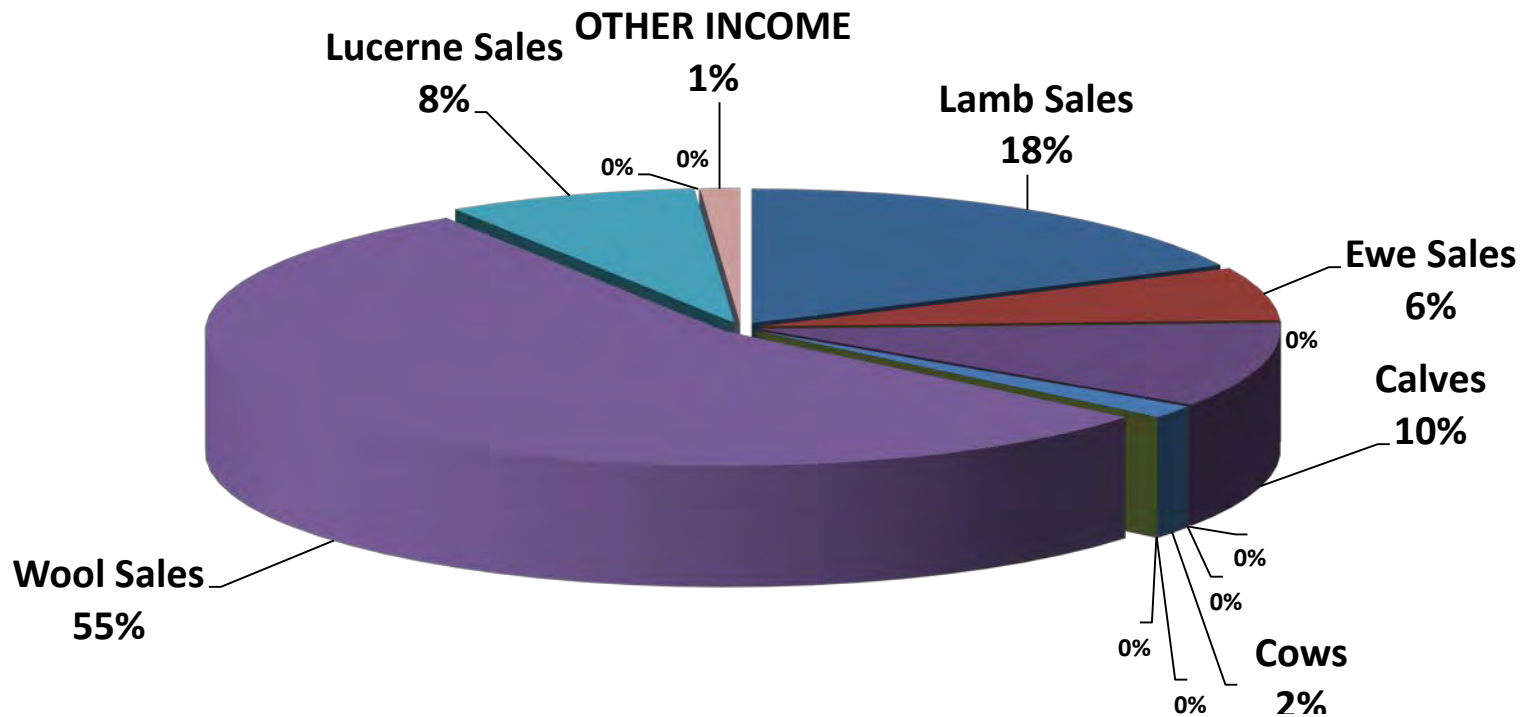
**“35% Rate of return on investment”
850 people on txt alerts
Defined system after 15 years**

Conclusions

- Nitrogen drives water use in rainfed systems
- Lucerne grazing is possible
- Start spring grazing at 15 - 20 cm
- Quality maximized at 30 cm
- Leaf and soft stem are highest quality
- Cattle sheep deer dairy
- Drop out paddocks if recovery is rapid
- Extended growth in autumn
- Transforming NZ high country – traditionally hay

Bonavaree before...

BONAVAREE FARM CO LTD INCOME SOURCE

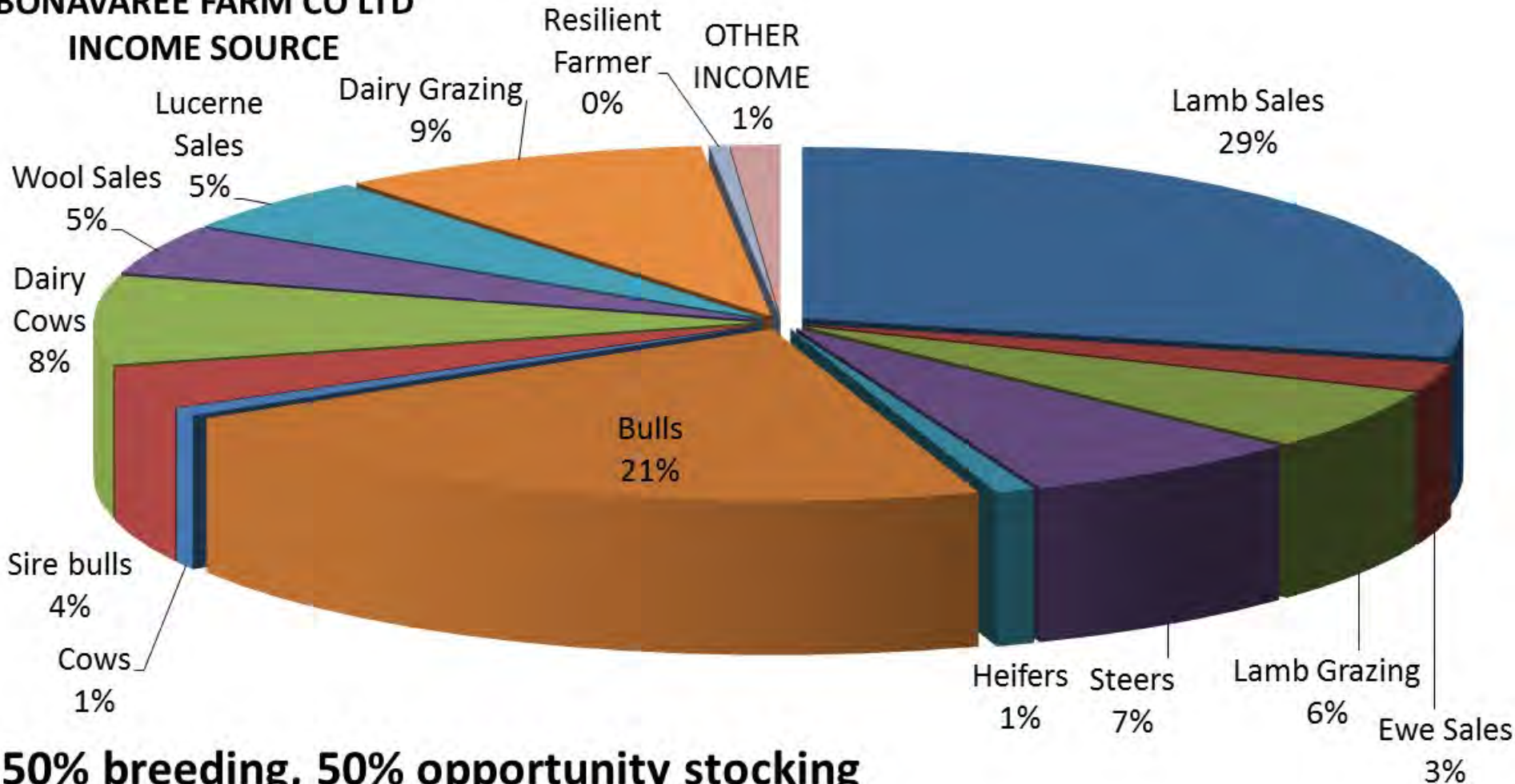


Old model, 100% breeding. 70% sheep, 30% cattle
Plus some cropping.

Bonavaree today (580 mm rainfall)



BONAVAREE FARM CO LTD INCOME SOURCE



50% breeding, 50% opportunity stocking
50% cattle, 50% sheep plus some crop.

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