Lucerne
Agronomy

Dr Derrick Moot
Professor of Plant Science
The website...

**Info on:**
- Current projects
- Field day presentations
- Scientific publications
- FAQs
- Postgraduate study
- Photo Diary
- Direct link to BLOG

www.lincoln.ac.nz/dryland

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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
The ‘MaxClover’ Grazing Experiment was established at Lincoln University, Canterbury in Feb 2002.

There were six paddocks of each of the six pasture types. This gave 36 individual plots of 0.05 ha each.


No nitrogen fertiliser or irrigation was applied to any pasture over the nine years. Other nutrients (S, P) and lime were applied in response to annual soil tests.

Annual soil test results can be found on the ‘MaxClover’ page at [www.lincoln.ac.nz/dryland](http://www.lincoln.ac.nz/dryland)

No irrigation was applied. Annual rainfall ranged from 490 to 770 mm and the mean is about 630 mm/yr at this location.

Rainfall is variable and unpredictable, particularly from September to March when potential evapotranspiration exceeds rainfall leading to the development of soil moisture deficits.

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### Dryland

4 clovers + cocksfoot
v R/W v Luc
(Reps 1 - 4 sown Feb, 2002)
(Reps 5 & 6 sown autumn, 2003)

<table>
<thead>
<tr>
<th>Rep 6</th>
<th>Rep 5</th>
<th>Rep 4</th>
<th>Rep 3</th>
<th>Rep 2</th>
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<tbody>
<tr>
<td>36 C+B</td>
<td>35 C+B</td>
<td>34 R+W</td>
<td>33 C+S</td>
<td>32 C+Cc</td>
<td>31 Luc</td>
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<tr>
<td>30 C+B</td>
<td>29 C+B</td>
<td>28 R+W</td>
<td>27 C+S</td>
<td>26 C+Cc</td>
<td>25 Luc</td>
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<tr>
<td>6 C+Cc</td>
<td>5 C+S</td>
<td>4 R+W</td>
<td>3 C+B</td>
<td>2 Luc</td>
<td>1 C+W</td>
</tr>
<tr>
<td>12 Luc</td>
<td>11 R+W</td>
<td>10 C+Cc</td>
<td>9 C+W</td>
<td>8 C+B</td>
<td>7 C+S</td>
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<tr>
<td>18 C+W</td>
<td>17 Luc</td>
<td>16 C+B</td>
<td>15 C+Cc</td>
<td>14 C+S</td>
<td>13 R+W</td>
</tr>
<tr>
<td>24 C+S</td>
<td>23 C+B</td>
<td>22 C+W</td>
<td>21 R+W</td>
<td>20 C+Cc</td>
<td>19 Luc</td>
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<td>35</td>
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<td>23</td>
<td>22</td>
<td>21</td>
<td>20</td>
<td>19</td>
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</table>

**Notes:**
Plot numbers (1-36) are indicated for each plot.

The plan (not to scale) has been rotated so it has the same orientation as the aerial photo on the next page.

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<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 x 23m</td>
<td>0.05 ha</td>
</tr>
</tbody>
</table>
The ‘MaxClover’ Grazing experiment in paddock H19 at Lincoln University
Grazing management

Lucerne was always rotationally grazed.

Grass-based pastures underwent a period of set stocking, short (2-paddock) or intermediate (3-paddock) rotational grazing in early spring before being rotationally grazed in a six paddock rotation until insufficient feed supply led to destocking of the pastures (drought or low winter temperatures).

Pastures were generally destocked in winter when there was insufficient feed. This simulated a commercial farm system when sheep would be removed to graze winter forage crops or a smaller area of the farm set aside for winter grazing.

For pastures with annual clovers (sub or balansa) stock were removed to allow re-seeding. The timing differed as pastures were closed sequentially as the rotation progressed.

When necessary, ewes were used to hard graze annual clover pastures in early autumn to open the sward in preparation for the germination of annual clover seedlings after autumn rains.
Total spring LWt production

- CF/Sub
- CF/Bal
- CF/Wc
- CF/Cc
- RG/Wc
- Luc

Mills et al. 2014b

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Total summer LWt production

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Mills et al. 2014b
Total autumn LWt production

- CF/Sub
- CF/Bal
- CF/Wc
- CF/Cc
- RG/Wc
- Luc

Autumn LWt (kg/ha)

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Mills et al. 2014b
Yield and composition of six dryland pastures over nine growth seasons

- Lucerne produced more DM than all grass based pastures in most years.

- Its tap-root enabled access to water from lower soil layers but it also used water more efficiently than the grass based pastures - especially in spring.

- CF/Sub clover was the highest yielding grass based pastures in Years 6-9.

- Yields of all pastures declined over time.
Figure 1. Total annual accumulated dry matter production

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Total annual accumulated DM yield (t DM/ha/y)</td>
<td>17.8</td>
<td>12.9</td>
<td>13.1</td>
<td>11.2</td>
<td>11.5</td>
<td>10.8</td>
<td>11.2</td>
<td>14.0</td>
<td>12.8</td>
</tr>
</tbody>
</table>
Summary of yields in Figure 1

- RG/Wc yield declined from 10.5 to 6.6 t/ha in Year 9.
- Lucerne yield was over 17 t/ha in 3 years and 12.9 t/ha in Year 9.
- CF/Sub yield declined from 12 t/ha to 8.7 t/ha in Year 9.
- CF/Wc, CF/Cc, CF/Bal yields were lower than CF/Sub in most years.
Figure 2. Change in the proportion of originally sown pasture components (grass + clover) over time

All the cocksfoot pastures lost sown components at about 3% per annum

The perennial ryegrass/white clover pasture lost RG+Wc at about 10% per annum

Source: Mills et al., 2014a
Summary of Figure 2

- After 9 years about 10% of the RG/Wc pasture was from originally sown species compared with about 60% in the cocksfoot based pastures. Lucerne (not shown) was about 85% pure due to winter weed control.

- In Years 1-3 the RG/Wc pastures maintained a high proportion of ryegrass and white clover. Most experiments only run for 3 years – this long-term experiment shows how this pasture deteriorated from Year 4 to Year 9.

- By Year 5-6 only about half the yield in RG/Wc pastures is from the sown species. Ideally pasture renewal would be recommended at this point.

- By Year 9 only about 10% of the 6.6 t DM/ha that was produced was from RG or Wc.

- For cocksfoot, sown pasture species decreased by about 3% per year. This meant after 9 years about 60% of the total yield produced by the four cocksfoot based pastures was from the originally sown pasture species.

- Cocksfoot was persistent but pasture vigour had declined. These pastures did not require renovation but had the potential for increased production. We recommend overdrilling in autumn with 10 kg/ha sub clover plus 1 kg/ha white clover to increase clover content and nitrogen fertility which would stimulate production from the existing cocksfoot component.
Unsown species <5% in Year 1 .......>45% in Year 6

RG/Wc pastures
Spring WUE

- **Lucerne**: 28 kg DM/ha/mm
- **Grass/clover**: 20 kg DM/ha/mm
- **Grass only**: 13 kg DM/ha/mm

Source: Moot et al. 2008
Lucerne Objectives

• Establishment

• Grazing management to maximise production, quality and persistence

• Examples of lucerne on farm
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)
Inoculation Experiment

- At Lincoln University
- Dryland, variable silt loam soil
- No history of lucerne
- Split plot design with 3 replicates
- 4 sowing dates
- 4 seed inoculant technologies used
- Bare seed control also used (no rhizobia)
No inoculant (bare seed)
Inoculated with peat
What a root nodule looks like

Engine room for N-fixation
Lucerne root
~8 months after sowing
> 1.5 m length
Autumn Spraying

Timing is Critical
Most important tool
Glyphosate, granstar, penetrant

Key Results
Conserve soil moisture
Kill mass root systems

Source: Kearney et al. 2010
Drilling seed with fertiliser
Direct drilling = seed + fertiliser
Hills Creek Station
Sown 4/11/2008
Photo taken 5/11/2010

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

“35% Rate of return on investment”
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

Source: Moot et al. 2012
Sown seed & plant population over time

Sowing rate of coated seed (kg/ha)
- 7
- 10
- 13
- 16

Seed or plants/m²

Seed or plants/m²

Source: Moot et al. 2012
Seedling lucerne yield to early June

Coated seed rate: kg/ha

<table>
<thead>
<tr>
<th>Sowing date (2007)</th>
<th>21 February</th>
<th>02 March</th>
<th>16 March</th>
<th>30 March</th>
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</thead>
<tbody>
<tr>
<td>Coated seed rate</td>
<td>7</td>
<td>10</td>
<td>13</td>
<td>16</td>
</tr>
</tbody>
</table>

Source: 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

Sowing date (2007)
- 21 Feb
- 02 Mar
- 16 Mar
- 30 Mar

Stand age
- Year 1
- Year 2
- Year 3
- Year 4
- Year 5

Source: Moot et al. 2012
Annual yield in relation to sowing rate

Annual DM yield (t/ha)

Lucerne seed rate: kg/ha
- 7
- 10
- 13
- 16

SEM

Stand age
- Year 1
- Year 2
- Year 3
- Year 4
- Year 5

Source: Moot et al. 2012
Richard Sim PhD results

1. Soil type & sowing date
2. Seedling vs regrowth crops (yr 2)

- Low soil water at Ashley Dene on stones
- High soil water at LU on silt!
1) Lismore stony silt loam

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2) Wakanui silt loam

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Regrowth (year 2)

Seedling
Delayed sowing cost yield

### Establishment

**Ashley Dene**
- 17 kg DM/day
- $R^2 = 0.88$

### Year Two

**Iversen Field**
- 80 kg DM/day
- $R^2 = 0.98$
- 50 kg DM/day
- $R^2 = 0.95$
Taproot mass

Sown: February ~ October

Sampled: June
## Root mass (t DM/ha)

<table>
<thead>
<tr>
<th>Sowing date</th>
<th>Establishment</th>
<th>Year Two</th>
<th>Shoot+root (Year 2)</th>
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</thead>
<tbody>
<tr>
<td>October</td>
<td>5.3&lt;sub&gt;b&lt;/sub&gt;</td>
<td>6.7&lt;sub&gt;a&lt;/sub&gt;</td>
<td>21.9</td>
</tr>
<tr>
<td>November</td>
<td>5.7&lt;sub&gt;a&lt;/sub&gt;</td>
<td>6.6&lt;sub&gt;a&lt;/sub&gt;</td>
<td>20.0</td>
</tr>
<tr>
<td>December</td>
<td>4.9&lt;sub&gt;ab&lt;/sub&gt;</td>
<td>6.6&lt;sub&gt;a&lt;/sub&gt;</td>
<td>21.2</td>
</tr>
<tr>
<td>January</td>
<td>3.2&lt;sub&gt;c&lt;/sub&gt;</td>
<td>6.9&lt;sub&gt;a&lt;/sub&gt;</td>
<td>20.3</td>
</tr>
<tr>
<td>February</td>
<td>1.1&lt;sub&gt;d&lt;/sub&gt;</td>
<td>5.7&lt;sub&gt;b&lt;/sub&gt;</td>
<td>19.5</td>
</tr>
</tbody>
</table>

*P* <0.001 <0.05

SEM 0.30 0.23

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Establishment – sowing to June 2011

Year Two – June 2011 to July 2012
## Taproot mass – Ashley Dene

<table>
<thead>
<tr>
<th>Sowing date</th>
<th>Establishment</th>
<th>Year Two</th>
<th>Shoot+root (Year 2)</th>
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<tbody>
<tr>
<td>October</td>
<td>2.2&lt;sub&gt;a&lt;/sub&gt;</td>
<td>4.8&lt;sub&gt;a&lt;/sub&gt;</td>
<td>9.3</td>
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<tr>
<td>November</td>
<td>2.0&lt;sub&gt;a&lt;/sub&gt;</td>
<td>4.6&lt;sub&gt;ab&lt;/sub&gt;</td>
<td>9.2</td>
</tr>
<tr>
<td>December</td>
<td>1.6&lt;sub&gt;ab&lt;/sub&gt;</td>
<td>4.0&lt;sub&gt;b&lt;/sub&gt;</td>
<td>8.2</td>
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<tr>
<td>January</td>
<td>1.2&lt;sub&gt;b&lt;/sub&gt;</td>
<td>3.5&lt;sub&gt;b&lt;/sub&gt;</td>
<td>8.1</td>
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<tr>
<td>February</td>
<td>0.6&lt;sub&gt;c&lt;/sub&gt;</td>
<td>3.4&lt;sub&gt;b&lt;/sub&gt;</td>
<td>8.5</td>
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<tr>
<td>P</td>
<td>&lt;0.001</td>
<td>&lt;0.05</td>
<td></td>
</tr>
<tr>
<td>SEM</td>
<td>0.19</td>
<td>0.24</td>
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**Establishment** – sowing to June 2011  
**Year Two** – June 2011 to July 2012
Potential yield of alternative crops

<table>
<thead>
<tr>
<th>Date</th>
<th>Ashley Dene</th>
<th>Iversen 12</th>
</tr>
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<tbody>
<tr>
<td>Feb-11</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mar-11</td>
<td>2</td>
<td>0</td>
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<td>Apr-11</td>
<td>4</td>
<td>0</td>
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<tr>
<td>May-11</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Jun-11</td>
<td>8</td>
<td>0</td>
</tr>
</tbody>
</table>

1 Chakwizira (2008), Chakwizira et al., (2011); 2 Martini et al., (2009); 3 Martini, (2012)
Water extraction – understanding yield

- Neutron probe (2.3 m)
- Seedling vs. regrowth lucerne
- The influence of soil type
Water extraction

Year 1: Establishment

Ashley Dene

Year 2

Iversen 12

Volumetric water content (mm³/mm³)

Depth (m)
Water extraction

- Field capacity
- Start of extraction
- Rate of extraction
- Lower limit

Extraction front velocity

Sim 2014
Extraction front velocity - establishment

Ashley Dene

- Depth (m)
- Oct-11, Jan-12, Apr-12
- 15.1 mm/d
- $R^2 = 0.68$

Iversen 12

- Depth (m)
- Oct-11, Jan-12, Apr-12
- 12.9 mm/d
- $R^2 = 0.95$
Ashley Dene
Sown 10 October
Emerged 18 October
200 plants/m²

Iversen 12
Extraction front velocity – Year 2

**Ashley Dene**
- Depth (m)
- Oct-11: 32.6 mm/d, $R^2 = 0.97$
- Jan-12: 32.6 mm/d, $R^2 = 0.97$
- Apr-12: 32.6 mm/d, $R^2 = 0.97$

**Iversen 12**
- Depth (m)
- Oct-11: 14.2 mm/d, $R^2 = 0.97$
- Jan-12: 14.2 mm/d, $R^2 = 0.97$
- Apr-12: 14.2 mm/d, $R^2 = 0.97$
Feed supply
- Regrowth vs seedling crops
- Sowing window: Oct-Dec

First grazing in 3 months (50% flowering)
Conclusions from establishment

• Spring sow or grow a forage crop
• Yield in year one is lower due to partitioning
• Plant population self thins over time
• Inoculation is important in new sites
• Sow on deep soils
• Regrowth crops on shallow soils use soil water quickly
• Spread feed supply by new sowings each year
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

Source: 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

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

Source: 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
Lucerne grazing options
- Rotational grazing
  - Set stocking
  - Grass mixes

Pastoral 21 BLNZ funded programme
Cemetery Block
103.93ha

Main Block

Total experimental area
2013/14 = 30.0 ha

47.88ha
Home Block

C9 (North)
New Legume/grass mixes
A) Lucerne/grass

C9 (South)
Old – terminated Mar 2013
B) Clover/grass

H7
Spring grazing management
of lucerne

Lincoln University
Te Whare Wananga Akear
CHRISTCHURCH–NEW ZEALAND

beef+lamb
new zealand

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Objective

• Evaluate three spring grazing management strategies for lucerne monocultures
  – Rotational grazing (6 paddock system)
  – Set stocked (SS) until weaning
  – Semi set stocked (SSS) until weaning (10 day shifts)

• After weaning SS and SSS lambs mobbed up and moved to an 8 paddock rotational grazing system (RECOVERY PHASE)

Contributes to: Critical measures A & B
Project 3 –
Spring grazing management of lucerne
Total LWt produced

Lactation phase - E&L

<table>
<thead>
<tr>
<th>Growth season</th>
<th>Total spring LWt production (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009/10</td>
<td>0</td>
</tr>
<tr>
<td>2010/11</td>
<td>200</td>
</tr>
<tr>
<td>2011/12</td>
<td>400</td>
</tr>
<tr>
<td>2012/13</td>
<td>600</td>
</tr>
<tr>
<td>2013/14</td>
<td>800</td>
</tr>
</tbody>
</table>

- Rotational
- SS
- Semi SS
- Control

No Semi SS treatment
Crop canopy

- Leaf area index
- Start of grazing period
- Closed canopy

Graph shows the progression of leaf area index from September 2011 to December 2011, with different stocking systems indicated by symbols: ▲ for Set Stocked and ○ for Rotational.
RULES FOR SET STOCKING LUCERNE

1. Manage lucerne pure swards first.

2. Choose paddocks to lamb on early in autumn – shelter, older, early clean-up graze and winter herbicide application.

3. Lucerne grass mixes – grass transition.

4. Early and late for condensed lambing (1 cycle).

5. Drift onto lucerne ~14 d prior to lambing

6. Lucerne ~20 cm tall and keep it there.
RULES FOR SET STOCKING LUCERNE (CONT.)

7. Stock at about half the rotational grazing rate
8. SS for 4-5 weeks – then rotate
9. SS lambs use the taller feed as shelter.
10. Stocking rate to keep closed canopy!
11. Canopy gets taller over 4-5 weeks not shorter
12. Once canopy reduces begin rotational grazing
14. Paddocks need autumn (6 wks) recharge.
Lucerne/grass mixes

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Early spring

Plot 1 - Luc

Plot 2 – Luc/CF
Total Accumulated LWt production

![Graph showing accumulated LWt production for different phases and livestock types, with labels for Luc, Luc/Brome, Luc/CF, and various livestock stages like Ewes, Weaned lamb, Ewe hogget, and Ram hogget. The x-axis represents dates from July 2012 to July 2013 and from July 2013 to July 2014, with key points marked for November, March, and July. The y-axis shows accumulated LWt production in kg/ha, ranging from 0 to 1000 kg/ha.]
DM Yield

- Luc(-)
- Luc/Brome
- Luc/CF

Total accumulated yield (kg DM/ha)

Date: Jul12, Sep12, Nov12, Jan13, Mar13, May13, Jul13, Sep13, Nov13, Jan14, Mar14, May14, Jul14
Integrating lucerne into a high country merino system

D. Anderson, L. Anderson, D.J. Moot and G.I. Ogle
Pasture supply & Animal demand

Anderson et al. 2014

New Zealand’s specialist land-based university
Seasonal pasture production (3-yr average)

New Zealand’s specialist land-based university

Anderson et al. 2014
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

Anderson et al. 2014
### Bog Roy change in system performance

<table>
<thead>
<tr>
<th></th>
<th>Historic (Pre 2010)</th>
<th>Year 3 (target)</th>
<th>Year 3 (actual)</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mixed age ewes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topping weight (kg)</td>
<td>57.0</td>
<td>60.0</td>
<td>59.5</td>
<td>↑ 4.3</td>
</tr>
<tr>
<td>Ewe scanning (%)</td>
<td>165</td>
<td>165</td>
<td>165</td>
<td>-</td>
</tr>
<tr>
<td>Ewe weaning (%)</td>
<td>115</td>
<td>125</td>
<td>130</td>
<td>↑ 13.0</td>
</tr>
<tr>
<td>Ewe lamb mortality (%)</td>
<td>30.0</td>
<td>25.0</td>
<td>21.0</td>
<td>↓ -30.0</td>
</tr>
<tr>
<td><strong>Lamb weaning weight (kg)</strong></td>
<td>27.0</td>
<td>29.0</td>
<td>29.0</td>
<td>↑ 7.4</td>
</tr>
<tr>
<td><strong>Lamb growth rate (g/hd/day)</strong></td>
<td>205</td>
<td>235</td>
<td>235</td>
<td>↑ 14.6</td>
</tr>
</tbody>
</table>

Note: Anderson et al. 2014
Case study – Bonavaree farm, Marlborough
Over grazed – high erosion risk
Annual rainfall at ‘Bonavaree’

Year

Annual rainfall (mm)
225 275 325 375 425 475 525 575 625 675 725 775 825 875

Long-term Average

New Zealand’s specialist land-based university
Salt bush

Young lucerne

Chemically fallowed land
### ‘Bonavaree’ production change over 10 years

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2012</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land area (ha)</td>
<td>1100</td>
<td>1800</td>
<td>↑ 64%</td>
</tr>
<tr>
<td>Sheep numbers</td>
<td>3724</td>
<td>4158</td>
<td>↑ 12%</td>
</tr>
<tr>
<td>Lambing (%)</td>
<td>117</td>
<td>145</td>
<td>↑ 24%</td>
</tr>
<tr>
<td>Lamb weights (kg)</td>
<td>13.3</td>
<td>19</td>
<td>↑ 43%</td>
</tr>
<tr>
<td>Lamb sold (kg)</td>
<td>38324</td>
<td>74460</td>
<td>↑ 94%</td>
</tr>
<tr>
<td>Wool (kg)</td>
<td>18317</td>
<td>20869</td>
<td>↑ 14%</td>
</tr>
<tr>
<td>Sheep:cattle</td>
<td>70:30</td>
<td>50:50</td>
<td></td>
</tr>
<tr>
<td>Gross trading profit (ha)</td>
<td>$317</td>
<td>$792</td>
<td>↑149%</td>
</tr>
</tbody>
</table>
The website...

Info on:
- Current projects
- Field day presentations
- Scientific publications
- FAQs
- Postgraduate study

www.lincoln.ac.nz/dryland
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
References & Links

Lincoln University Dryland Pastures Website: http://www.lincoln.ac.nz/dryland
Lincoln University Dryland Pastures Blog: http://www.lincoln.ac.nz/conversation/drylandpastures/
MaxClover Photo Diary (18 MB; PDF File)


Black, D. B. S. and Moot, D. J. 2013. Autumn establishment of lucerne (Medicago sativa L.) inoculated with four different carriers of Ensifer meliloti at four sowing dates. Proceedings of the New Zealand Grassland Association, 75, 137-144.


