Strong rainfall gradient
West ⇒ East
Rain fed 300-800 mm

East coast - summer dry
Objectives

• Outline the role of lucerne in New Zealand farming systems
• Describe management to maximise production, quality and persistence
• Quantify perennial ryegrass growth in relation to nitrogen and water
• www.lincoln.ac.nz/dryland
Growth vs. Development

**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

![Graph showing the relationship between mean temperature and growth rate (kg DM/ha/d) for different seasons. The graph indicates a positive correlation between mean temperature and growth rate, with higher temperatures leading to increased growth rates.]

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
Grazing Expt. - ‘MaxClover’
MaxClover Total DM yields

Year 1
2002/03

Year 2
2003/04

Year 3
2004/05

Year 4
2005/06

Year 5
2006/07

Year 6
2007/08

Year 7
2008/09

Year 8
2009/10

Year 9
2010/11

[Graph showing annual accumulated DM yield for different years and species, with data points for Luc and CF/Sub, and the source: Moot 2012]
Unsown species <5% in Year 1 ......<45% in Year 6

RG/Wc pastures
Spring WUE

New Zealand’s specialist land-based university

Source: Moot et al. 2008
Extension – solution to every problem
Seasonal grazing management

Spring

• 1\textsuperscript{st} 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

Moot & Smith 2011
Practical Lucerne Management Guide
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

Bonavere, Marlborough
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

'Bonauree', Marlborough
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
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
Establishment

**Soils**  - deepest free draining soils  
- $pH_{(H_2O)}$ 6.0 (....or 5.2 in CaCl)  
- 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

Photo: D. Hollander
Lincoln University
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
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)

Seed or plants/m²

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

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

DM yield (kg/ha)

Sowing date (2007)
- 21 February
- 02 March
- 16 March
- 30 March

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

Annual DM yield (t/ha)

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) vs. Lucerne seed rate: kg/ha

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

Source: Moot et al. 2012
Irrigation

• Before sowing to encourage root growth
• When the canopy is closed to reduce soil evaporation and weed growth
• Large amounts (50 mm) infrequently rather than small (15 mm) amounts frequently
• Fallow – dry soil vs wet soil
Lambs set stocked
Crop canopy

![Graph showing leaf area index over time with labels for Sep-11 to Dec-11, depicting the rotational grazing period and closed canopy phase.](image-url)

- **Start of grazing period**
- **Closed canopy**
- **Leaf area index**
- **Rotational**
Crop canopy

Leaf area index

Start of grazing period

Closed canopy

Set Stocked

Rotational

Sep-11  Oct-11  Nov-11  Dec-11
# Water Use

<table>
<thead>
<tr>
<th>Grazing treatment</th>
<th>Transpiration</th>
<th>$E_s$</th>
<th>Total WU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set stocked</td>
<td>297&lt;sub&gt;a&lt;/sub&gt;</td>
<td>77&lt;sub&gt;b&lt;/sub&gt;</td>
<td>374</td>
</tr>
<tr>
<td>Semi-set stocked</td>
<td>282&lt;sub&gt;a&lt;/sub&gt;</td>
<td>76&lt;sub&gt;b&lt;/sub&gt;</td>
<td>358</td>
</tr>
<tr>
<td>Rotational</td>
<td>231&lt;sub&gt;b&lt;/sub&gt;</td>
<td>128&lt;sub&gt;a&lt;/sub&gt;</td>
<td>359</td>
</tr>
<tr>
<td>P</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>ns</td>
</tr>
<tr>
<td>SEM</td>
<td>10.6</td>
<td>8.0</td>
<td></td>
</tr>
</tbody>
</table>
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 = 40 kg/ha/t DM removed + P and S from super
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

Website: www.lincoln.ac.nz/dryland

Dryland pastures blog: http://www.lincoln.ac.nz/conversation/drylandpastures/


