Legumes for Hill Country

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CHRISTCHURCH–NEW ZEALAND

New Zealand’s specialist land-based university
Dryland – Hawke’s Bay

Napier average PSMD 444 mm

120 mm to over 650 mm in 1982/83

Significant PSMD (> 100 mm) in over 85% of years by 1 Dec.

Severe PSMD (> 150 mm) in 55% of years by 1 Dec.

(Source: Salinger 2003)
Need N to improve grazing of other grasses
4 S’s of hill country development

1) Subdivision – *most important*

2) Stock – *to control additional feed*

3) Super – *for legumes*

4) Seed – *not a silver bullet!"
Growth in the field
white clover
20 months old
– grazed by sheep

Source: Brock et al. 2003
Subterranean Clover

• Large seed, 10x wc therefore 10x sowing rate
• Winter annual

  *autumn sow soil temp. <11°C*

• Rapid but variable germination with rainfall from Jan-May

• When can seedlings be grazed in autumn?
• How to maximize summer seed set?
Seedling Development

terminal bud
cotyledonary bud
seminal root

axillary bud
hypocotyl
contraction

(Source: Thomas 2003)
• Direct drill before rain
• Initial population for seed build up
Autumn Management in later years
(200 seedlings/m² in pasture)

High strikes after extended hot periods
- bare ground for seedlings to establish in
- high temperatures break dormancy

January rains are often false break
- seedlings die (March is usual)

Amount of cover in autumn is crucial
Seedling density is what gives us fast recovery
Time (days) to safe grazing of subterranean clover

PGPM >800 kg DM/ha

Date of opening rain

<table>
<thead>
<tr>
<th>Location</th>
<th>1-Feb</th>
<th>1-Mar</th>
<th>1-Apr</th>
<th>1-May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lincoln</td>
<td>26</td>
<td>29</td>
<td>37</td>
<td>53</td>
</tr>
<tr>
<td>Alexandra</td>
<td>26</td>
<td>30</td>
<td>46</td>
<td>102</td>
</tr>
<tr>
<td>Blenheim</td>
<td>25</td>
<td>27</td>
<td>34</td>
<td>47</td>
</tr>
<tr>
<td>Napier</td>
<td>23</td>
<td>25</td>
<td>30</td>
<td>39</td>
</tr>
</tbody>
</table>

Source: Moot et al. 2003
Dry matter yields

Accumulated DM (t/ha)

Source: Moot et al. 2003
Subterranean Clover
Takes several years to build seed reserves
Drilled pasture mix

8 kg AR1/AR37 perennial ryegrass
10 kg subterranean clover
   *early and late flowering cultivars*
1½ kg white clover
1 kg cocksfoot

Hill country = 10 kg/ha sub. alone
Subterranean clover tool kit

- Autumn sowing (10 kg/ha = 150 seeds/m²)
- Difficult to oversow – manage current population
- “Finger and thumb” test - minimal seedling failure at six-leaf stage (~30 days after rain)
- Manage for seed set in 3-5 years (2000/m²)
  - light-moderate set-stock in spring PGPM >1200
  - cattle are great
- flowering ~ 80 days before summer dry
- hard graze cover before autumn rain PGPM=800
Balansa clover + annual forages
Flowering is essential in estab. year

28 Oct

Photo: D.P. Monks
Lincoln University
End of summer must have 50% bare
Build seed bank in first year

Early flower – late Sept
Late flower – mid Oct
Seed maturing – early Nov
Mature seed – late Nov
Gland clover
SFF Dryland Legume Tech Transfer

‘Breach Oak’ Seddon

Unimproved, resident hill pasture
SFF Dryland Legume Tech Transfer

‘Breach Oak’ Seddon

Improved pasture

Photo: Warwick Lissaman
## SFF Dryland Legume Tech Transfer
### ‘Breach Oak’ Seddon

<table>
<thead>
<tr>
<th></th>
<th>Unimproved</th>
<th>Improved</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewe Tally (ha)</td>
<td>3.6</td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>Ewe tally (twin)</td>
<td>22 Ewes</td>
<td>30 Ewes</td>
<td></td>
</tr>
<tr>
<td>Set Stocking rate (ewes/ha)</td>
<td>6.1</td>
<td>7.3</td>
<td>+1.2 ewes/ha (+20%)</td>
</tr>
<tr>
<td>Ewe LW (kg/hd) in (15/8/11)</td>
<td>74</td>
<td>72</td>
<td>-2.0 kg/hd</td>
</tr>
<tr>
<td></td>
<td>452 kg/ha</td>
<td>525 kg/ha</td>
<td>+73 kg/ha</td>
</tr>
<tr>
<td>Ewe LW (kg/hd) out (18/10/11)</td>
<td>68</td>
<td>76</td>
<td>+ 8 kg/ewe</td>
</tr>
<tr>
<td></td>
<td>415 kg/ha</td>
<td>550 kg/ha</td>
<td>+ 135 kg/ha</td>
</tr>
<tr>
<td>Avg. Condition score (18/10/11)</td>
<td>2.7</td>
<td>3.8</td>
<td>+ 1.1 C.S.</td>
</tr>
<tr>
<td>Lamb LW (kg/hd) avg. (18/10/11)</td>
<td>21.0</td>
<td>24.7</td>
<td>+ 3.7 kg/hd (+17%)</td>
</tr>
<tr>
<td>Lamb LW range (kg)</td>
<td>18-26.5</td>
<td>18-34</td>
<td></td>
</tr>
<tr>
<td>Lamb LW Gain* (g/hd/d)</td>
<td>288</td>
<td>347</td>
<td>+ 59 g/hd/day (+20%)</td>
</tr>
<tr>
<td>*assuming 3.4 kg birth weight, avg birth date 28/08/11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamb No.</td>
<td>41</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Lamb %</td>
<td>186</td>
<td>183</td>
<td></td>
</tr>
<tr>
<td>Lamb kg/ha (18/10/11)</td>
<td>210</td>
<td>330</td>
<td>121 kg/ha (+ 58%)</td>
</tr>
<tr>
<td>Total LW/ha (18/10/11)</td>
<td>625</td>
<td>881</td>
<td>256 kg/ha (+ 41%)</td>
</tr>
</tbody>
</table>
Bog Roy – Lisa, Gundy Anderson

Quantify benefits of lucerne over resident pasture

• Monitoring lucerne growth in paired samples vs. unimproved
• Experimental oversowing of annual legumes
Bog Roy

Experimental: Five annual clovers vs. lucerne

Individual species – 6 reps, hand broadcast
1. Prima gland
2. Bolta balansa
3. Seaton Park sub
4. Rosabrook sub
5. Trikkala sub
6. Force4 lucerne

Drilled mixture of same legumes + cocksfoot around edges
Mt Grand Station – Evan Gibson

Establishing and utilizing annual clovers

Aerial over-sowing, ‘Bolta’ balansa,
Balansa hay (with seed) baled and fed out on steeper slopes

Photo: Keith Pollock Lincoln University
Mt Grand Station

Hard early spring grazing to open up weed competition
Mt Grand Station

Cottage paddock – ‘Bolta’ balansa clover trial

- Even with a reasonably cool and dry spring the clover leapt out of the ground smothering any competition and was a foot tall and starting to flower by labour weekend, 24th October.

- Flowering and growth continued until at least the end of November when the plants were around 80 cm tall and a mass of flowers at different stages.

- The ground on both the grazed and baled parts of the paddock were littered with seed and the hay bales have a lot of seed in them also.
Mt Grand Station

Flowering, 30th Nov.

Photos: Evan Gibson
Mt Grand Station

60 x 230 kg bales, mowed 22\textsuperscript{nd} Dec, raked 26\textsuperscript{th} Dec, photo taken 27\textsuperscript{th} Dec
Mt Grand Station
Second generation seedlings 19th Jan 2012

Photo: Evan Gibson
Mt Grand Station
First strike (Jan) seedlings on 3rd March 2012
Mt Grand Station

Second strike of seedlings on 3rd March 2012

Photo: Evan Gibson
Mt Grand Station

Valley Block Hay experiment

Twins on hay and salt strips
19th Jan 2012

Photos: Evan Gibson
Mt Grand Station

bare ground strip ..................two days later and seeds

Photos: Evan Gibson
Clover seedlings near top of the strip.

Tall oat grass more dominant because of less salt applied.
Mt Grand Station

Valley Block Hay experiment

Photos: Evan Gibson
Mt Grand Station

Valley hay experiment

The strip coming away again
(8 Mar 2012)

(Note: person not to give scale, he is only 3 ft tall not 6 ft)
Mt Grand Station
Annual clover trial – Patterson’s block

Traditionally, set stocked with 200 ewes for the tupping then lambed onto through spring to early to mid January.

26 ha of steep sunny face @ 500-600 m altitude
Mt Grand Station
Annual clover trial – Patterson’s block

March 2011
- Grazed hard by 1400 ewes just prior to sowing.
- Top dressed 200 kg/ha of Maxi sulphur super.

End March 2011
- 13 ha at the eastern end of the block was over-sown.
- 6 kg ‘Campeda’ sub clover + 4 kg ‘Prima’ gland clover + 4 kg ‘Bolta’ balansa clover + 1 kg ‘Tonic’ plantain.

Early April 2011
- 750 2-tooths trampled in seed

- Spelled until the 4th of May then 206 older ewes until the mid July.
Mt Grand Station
Annual clover trial – Patterson’s block

Gland and balansa clovers flowering  
(31 Oct 2011)

Smothered by striated clover

Redoing 13 ha  
(9 Mar 2012)

± reseeding

Photos: Evan Gibson
Conclusions

• Sub division - allows grazing mgmt
• Legumes for N to improve hill country
• Annual clovers require specialist mgmt
• If you can drill sub do so
• If over sowing – bare ground is key
• Build seed reserves for 2-3 years
• Try balansa in wet/dry regions!
• Diverse topography = diverse solutions
Seasonal clover growth

(Source: Brown et al. 2006)
References


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