Water use efficiency and irrigation management of Tasmanian forage options

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Summary

- Forages and WUE
- Irrigation scheduling
- Pasture productivity
- Grazing management
Water use efficiency (WUE)

• Ratio of dry matter (DM) production to water used

• Perennial ryegrass 1.1–1.2t DM/ML
• Turnips 4t DM/ML
• Maize 5t DM/ML

• Achieving high forage yields (t DM/ha) is a key determinant to maximising WUE
Irrigation scheduling

• Need to know
  – Readily available water
  – Evapotranspiration
  – System capacity

– Soil moisture probes are useful to visualise what is in the bucket!!
Readily Available Water (RAW)

- Ranges between 9 and 27mm for pasture with root depth of 30cm

<table>
<thead>
<tr>
<th>Texture</th>
<th>mm/cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>0.3</td>
</tr>
<tr>
<td>Loamy sand</td>
<td>0.5</td>
</tr>
<tr>
<td>Loam</td>
<td>0.9</td>
</tr>
<tr>
<td>Clay Loam</td>
<td>0.8</td>
</tr>
<tr>
<td>Medium Clay</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Bill Cotching 2009 Soil health for farming in Tasmania
Water in and out

System capacity

• The system capacity is the maximum possible rate at which the machine can apply water to the irrigated field area.

• Expressed in mm/day — NOT the depth applied per pass (mm).

Evapotranspiration

6 to 6.5 mm/day maximum in January
- RAW 24mm
- ETo max 6.5mm/day
- Designed system capacity 6.5mm/day
- Irrigating one day in three
- Depth applied 6.5mm every third day
- Managed system capacity 2.17mm/day
Irrigation scheduling and pasture productivity
Pasture growth rates 2016
Cressy vs Montana

Montana

Cressy

kg DM/ha/day
The green drought

Average ETo = 4.9mm/day
Designed system capacity = 6.3mm/day
Managed system capacity = 1.8mm/day
Need to water 5.5 days out of seven.
The farmer’s calculation

• Cressy averaged 30–40kg DM/ha/day

• Opportunity loss of 20kg DM/ha/day

• Opportunity loss of 210t pasture on 117ha pivot replaced with purchased grain

• $200/t extra cost

• $42,000 extra cost over three months
2016/17 pasture growth rates

Cressy

kg DM/ha/day

Cutting silage  Grazing management

0 10 20 30 40 50 60 70 80 90

6/11/2016  26/11/2016  16/12/2016  5/01/2017  25/01/2017  14/02/2017  6/03/2017  26/03/2017  15/04/2017  5/05/2017
2016/17 soil moisture

2016/17 Soil Moisture

Under irrigating

2016/17 Soil Moisture

83  42  48  54  83  50  67  32  kg DM/ha/day

Under irrigating

Dry 10cm  Dry 20cm  Dry 30cm  Refill Point  Field Capacity

19/07/2016  07/09/2016  27/10/2016  16/11/2016  04/02/2017  26/03/2017  15/05/2017

Soil Moisture Deficit (mm) Rain and Irr

Rain

Def

83

43

54 kg DM/ha/day
WUE calculations

- 36.3kg DM/ha/day
- 90.5mm rainfall + irrigation
- 1.1t DM/ML

- 83.3kg DM/ha/day
- 159mm water requirement
- 1.5t DM/ML
Grazing management

Water budget 01 Jan - 10 Feb 2017

Soil Moisture Deficit (mm)  Rain and Irrig

Irrigation  Rain  Deficit

54  44  83  71  56  50

kg DM/ha/day

Grazing management

83  56

kg DM/ha/day

54  44  83  71  56  50

kg DM/ha/day

Grazing management

83  56

kg DM/ha/day

54  44  83  71  56  50

kg DM/ha/day

Grazing management

83  56

kg DM/ha/day

54  44  83  71  56  50

kg DM/ha/day
Top three take-home messages

- Beware of the green drought
- Poor watering costs production and money
- Grazing management important (utilisation is key to profitability)
Tools, resources and training

The Yield
http://www.theyield.com/products/free-growers-app

Irrisat
https://irrisat-cloud.appspot.com/

Scheduling Irrigation Diary (SID)
https://sid.usq.edu.au/
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Farmers