Drought-hardy and carbon-conscious grazing systems with perennial shrubs

Sustainable Agriculture Flagship

Dean Revell
## Seasonal rainfall distribution & variability

<table>
<thead>
<tr>
<th></th>
<th>summer (Dec-Feb)</th>
<th>autumn (Mar-May)</th>
<th>winter (Jun-Aug)</th>
<th>spring (Sep-Nov)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average</strong></td>
<td>8%</td>
<td>23%</td>
<td>51%</td>
<td>18%</td>
</tr>
<tr>
<td><strong>Co-efficient of variation (%)</strong></td>
<td>98</td>
<td>39</td>
<td>19</td>
<td>34</td>
</tr>
</tbody>
</table>

- **5 x more variable** than winter rainfall
- **2 x more variable** than winter rainfall
summer-autumn rainfall as % of annual rainfall each

... and capitalise on ones like this

You want to cope with years like this

Last 100 years
Pasture growth rate for the shire of Pingelly from 1994 to 2005 (kgDM/ha/d)

Weekly pasture growth rate (kg DM/ha)

Pastures from Space ® (data supplied by Gonz Mata)
Total dry matter production (kg DM/ha)

Uncertainty

Pastures from Space® (data supplied by Gonz Mata)
Variability is the name of the game

- on average we can expect $\frac{1}{3}$ of annual rainfall in summer-autumn
- 3 out of 5 years will have a drier than average summer
- but summer rainfall events, when they occur, can be substantial
- the break of season can vary by months and annual pasture production can vary two-fold year-to-year

Our most common solution is to use supplementary feeding

- use only when needed
- expensive
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**Alternative options?**

- plants that can tolerate variability
- manage with little rainfall over summer-autumn
- provide digestible nutrients to (partially) fill a feed gap
- respond favourably when times are good (low opportunity cost)
- contribute more broadly to a functional system
We’ll need a mixture of plants to do the jobs we need
Individual plants are not silver bullets

But they can be part of a system that **copes** & **capitalises**
• **Forage shrubs** can be the ‘fuel additive’ to give better performance

• They are not a substitute for the fuel
• ...but they can make complex things work better
Fuel for livestock = metabolisable energy (MJ ME)

**Characteristics of the feed**

**Macronutrients**
- e.g. protein, carbohydrates (fibre, starch)

**Micronutrients**
- minerals & trace elements

**Extra-nutrients**
- plant secondary compounds

Gross energy → faeces

Digestible energy

Metabolisable energy → methane

Production
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Digestible energy → methane

Metabolisable energy → Production
Different plants have different effects

from Zoey Durmic & Phil Vercoe
Methane

0% *Eremophila glabra*

15% *Eremophila glabra*

25% *Eremophila glabra*

*RUSITEC (rumen simulation) from Zoey Durmic & Phil Vercoe*
We’re interested in changing the ecosystem out here...

... to influence the ecosystem in here
Let’s go back to the whole-farm system
What about resilience?
An extra layer to the vegetation can be an additive to the natural resources as well

- Shade and shelter
- Control of wind erosion
- Water use
- Reservoir for desirable invertebrates (IPM)
- Corridors for critters
- Carbon sequestration

Providing a good thermal environment can easily save 25% of maintenance costs
Perhaps the most consistent benefit of shelter on animal productivity is via improved pasture production through conservation of soil moisture.

Direct effects on livestock production by improving their thermal environment can be icing on the cake.
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What about coping and capitalising?