Alternative summer forages to offset purchased concentrate costs: A Queensland Perspective.

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Nutrition and Feeding Systems

WA Dairy Innovation Day - May 2018
Why Alternative Forages?

“Sir, you’re only outta patience, I’m outta grass, outta feed, outta water, and outta money!”
Feeding system changes in northern Australia

**Tropical/Temperate Pasture Systems**
- High water allocation
- Smaller farm size
- High rainfall areas

**PMR & TMR Systems**
- 7 years Drought
- Concentrate use increased
- No Irrigation water
- Silage feeding increased

**Mix of Feeding System**
- Tropical/temperate Pasture: 40%
- Partial Mixed Ration (PMR): 45%
- Total Mixed ration (TMR): 15%

**PMR & TMR Systems**
- Investment into feeding & cow comfort infrastructure
- Alternative forages to replace concentrates

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Department of Agriculture and Fisheries
Profitable use of concentrates

• Purchased grain, concentrates and other:
  • Approx 25% - 33% of costs alone

<table>
<thead>
<tr>
<th></th>
<th>Vic</th>
<th>NSW</th>
<th>Qld</th>
</tr>
</thead>
<tbody>
<tr>
<td>c/L</td>
<td>11.5</td>
<td>13.8</td>
<td>19.9</td>
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<tr>
<td>$/kg MS</td>
<td>1.49</td>
<td>1.80</td>
<td>2.74</td>
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<tr>
<td>% of costs</td>
<td>27.6</td>
<td>25.6</td>
<td>33.8</td>
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</table>

• Concentrate Use:

<table>
<thead>
<tr>
<th>T/cow/yr</th>
<th>Vic</th>
<th>NSW</th>
<th>Qld*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ave</td>
<td>2.3</td>
<td>2.6</td>
<td>3.6</td>
</tr>
<tr>
<td>Top 25%</td>
<td>2.7</td>
<td>3.1</td>
<td>4.2</td>
</tr>
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</table>
Why the reliance on starch and protein?

Barber et al, unpublished data
Department of Agriculture and Fisheries
Proftitable use of concentrates

Soybean Silage

Ryegrass Pasture

Ryegrass Silage

Marginal Response to Concentrates (L/kg DM)

Barber et al, unpublished data
Department of Agriculture and Fisheries
Selecting Alternative Forages

- A change in feeding systems has driven a change in forage selection
- Need to consider the feeding system type
- Depends on what you are looking for in your system:
  - Quantity
  - Quality
  - Low cost
  - Specific nutrients
  - All of the above!!!
Potential Forages

Cereal Silage Crops:
- Corn
- Forage Sorghum
- White Sorghum
- Red sorghum
- Barley
- Triticale

Pastures:
- Kikuyu
- Setaria
- Annual Ryegrass
- Lucerne
- Lablab
- Oats
- Chicory/Plantain
- Prairie/Fescue
- Brassicas

Protein Silage Crops:
- Soybeans
- Lablab
- Forage wheat
- Lucerne
- Lupins
- Faba Beans

Headlages:
- Corn
- White Sorghum
- Red Sorghum
- Wheat
- Barley
- Triticale

Novel Forages:
- Fodderbeet
- Duckweed
- Filamentous Algae
- Quinoa
- Cassava

Over 25 forage options to balance nutrients in the diet
Quantity vs Quality

- Our biggest challenge with tropical forages
  - High yielding
  - Lower quality relative to temperate forages
  - High Water Use efficiency (WUE)

- Management is critical
  - Forage selection
  - Harvest time & height

- Annual temperate forages can be used strategically to fill quality gaps (Autumn)
Legumes

Soybeans

Lablab

Lucerne
Soybeans

• High Protein Silage
• DM Yield
  • 3 to 6 t DM/ha Dryland
  • 6 to 12 t DM/ha Irrigated
• Cost: $150 – 200/t DM

• Harvest (90 to 110 days):
  • flowering to Pod development
  • Use a swather

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield (t DM/ha)</th>
<th>ME</th>
<th>CP%</th>
<th>NDF%</th>
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</thead>
<tbody>
<tr>
<td>P791</td>
<td>3.91</td>
<td>9.82</td>
<td>23.6</td>
<td>39.2</td>
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<tr>
<td>Bunya</td>
<td>4.78</td>
<td>9.63</td>
<td>22.3</td>
<td>37.3</td>
</tr>
<tr>
<td>A6785</td>
<td>3.14</td>
<td>9.48</td>
<td>21.8</td>
<td>38.0</td>
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<tr>
<td>Hayman</td>
<td>5.61</td>
<td>8.91</td>
<td>19.5</td>
<td>43.4</td>
</tr>
<tr>
<td>Leichhardt</td>
<td>4.14</td>
<td>8.95</td>
<td>17.7</td>
<td>41.4</td>
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</tbody>
</table>
Lablab

- High Protein Grazing or Silage
- DM Yield
  - 3 to 5 t DM/ha Dryland
  - 5 to 9 t DM/ha Irrigated
- Cost: $100 – 150/t DM
- 4-8 week establishment
- 4 week inter grazing interval

<table>
<thead>
<tr>
<th></th>
<th>ME</th>
<th>CP%</th>
<th>NDF%</th>
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<tbody>
<tr>
<td>Dryland</td>
<td>10.3</td>
<td>23.6</td>
<td>31.9</td>
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<tr>
<td>Irrigated</td>
<td>11.1</td>
<td>32.1</td>
<td>28.1</td>
</tr>
</tbody>
</table>
Cereal Crops

High Chop Corn Silage

White Sorghum Silage

Forage Sorghum
High-chop Corn

High chopped corn cut at approx. 40cm

Standard corn chop height ~10cm
High chopped V normal corn silage?

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>High Cut (40 cm)</th>
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<tbody>
<tr>
<td>Dry Matter Yield (t/ha)</td>
<td>18.50</td>
<td>17.00</td>
<td>-1.5</td>
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<tr>
<td>Dry Matter (%)</td>
<td>40.4</td>
<td>41.4</td>
<td></td>
</tr>
<tr>
<td>ME (MJ ME/kg DM)</td>
<td>10.8</td>
<td>11.3</td>
<td>+0.5</td>
</tr>
<tr>
<td>CP (%DM)</td>
<td>8.9</td>
<td>8.9</td>
<td></td>
</tr>
<tr>
<td>Starch (%DM)</td>
<td>38.7</td>
<td>41.7</td>
<td>+3.0</td>
</tr>
<tr>
<td>NDF (%DM)</td>
<td>37.2</td>
<td>32.2</td>
<td>-5.0</td>
</tr>
<tr>
<td>NDF Dig 24hr (% of NDF)</td>
<td>44.6</td>
<td>51.3</td>
<td>+6.7</td>
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<tr>
<td>Total cost in pit ($/t as fed)</td>
<td>60.98</td>
<td>63.71</td>
<td></td>
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<tr>
<td>Cost $/t DM</td>
<td>151.05</td>
<td>153.89</td>
<td>+2.84</td>
</tr>
<tr>
<td>Cost $/kg Starch</td>
<td>0.39</td>
<td>0.37</td>
<td>-0.02</td>
</tr>
</tbody>
</table>

Potential Benefit – up to 8 L/cow due to higher DM & starch intake
White Sorghum

- High Starch Silage or Headlage
- DM Yield
  - 5-7 t DM/ha Headlage
  - 12-18 t DM/ha Silage
- Cost:
  - Headlage - $145/t DM
  - Silage - $150/t DM

- Headlage:
  - Offset grain use at lower cost

- Silage:
  - Replace 2-3 kg DM corn silage at lower cost

<table>
<thead>
<tr>
<th></th>
<th>ME</th>
<th>CP%</th>
<th>NDF%</th>
<th>Starch%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headlage</td>
<td>11.3</td>
<td>13.2</td>
<td>25.0</td>
<td>47.5</td>
</tr>
<tr>
<td>Silage</td>
<td>9.46</td>
<td>12.2</td>
<td>48.5</td>
<td>20.5</td>
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</tbody>
</table>
Forage Sorghum

• Grazing or Silage
• DM Yield
  • 3-6 t DM/ha each grazing
  • 8-16 t DM/ha Silage
• Cost:
  • Pasture - $75/t DM
  • Silage - $150/t DM

<table>
<thead>
<tr>
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<th>CP%</th>
<th>NDF%</th>
<th>Starch%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasture</td>
<td>9.1</td>
<td>19.3</td>
<td>52.7</td>
<td>-</td>
</tr>
<tr>
<td>Silage</td>
<td>7.8</td>
<td>11.1</td>
<td>56.2</td>
<td>12.3</td>
</tr>
</tbody>
</table>
Temperate Forage Crops

**Fodderbeet**
25 t DM/ha

**Field Pea**
3 t DM/ha
Temperate Forage Crops

Turnips
3-5 t DM/ha

Brassicas
5-10 t DM/ha
Forage Combinations for Silage

- Corn & Soybeans
- Barley & Vetch
- Corn & Sunflowers
- White Sorghum & Soybeans
- Barley & Field Peas
Developing High Forage Feeding Systems

• Margins on-farm declining
  – Concentrate use & cost increasing
  – Production per cow only increased slightly

• Over 25 forage types available

• Can we substitute high starch and protein forages for grain and protein meal increase MOFC?
Feed alternatives developed previously

**Corn Silage –**
- High cut
- Yield 52 t/ha wet; 17 t DM/ha
- Cost $65/t wet; $157/t DM
- 37.7 c/kg starch (corn = 53.2 c/kg starch@$335/t)

**Headlage –**
- Grain variety grown and cut at height of first leaf
- Yield 11.5 t/ha wet; 6.6 t DM/ha
- Cost $80/t wet; $142/t DM
- 33.8 c/kg starch (corn = 53.2 c/kg starch@$335/t)
Feed alternatives developed previously

**Soybean Silage –**
* Yield 9 t/ha wet; 5.4 t DM/ha
* 20.5% CP; 45% NDF
* Cost $75/t wet; $123/t DM
* 60.0 c/kg CP (canola = $1.22/kg CP @ $460/t)

**Lablab Silage –**
* Yield 24.4 t/ha wet; 8.3 t DM/ha
* 20% CP; 51% NDF
* Cost $52/t wet in bag; $152/t DM
* 75.4 c/kg CP (canola = $1.22/kg CP @ $460/t)
High Forage Developmental Trial

- Industry F:C ratio between 40:60 & 60:40
- 5-year average MOFC: PMR - $6.11
  TMR = $4.67

<table>
<thead>
<tr>
<th></th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TMR</td>
<td>PMR</td>
<td>TMR</td>
</tr>
<tr>
<td>Milk Yield (L/cow)</td>
<td>22.6</td>
<td>19.0</td>
<td>22.8</td>
</tr>
<tr>
<td>Diet Cost ($/cow/day)</td>
<td>5.29</td>
<td>3.74</td>
<td>5.23</td>
</tr>
<tr>
<td>MOFC ($/cow/day)</td>
<td>8.27</td>
<td>7.66</td>
<td>8.45</td>
</tr>
</tbody>
</table>
Key Messages

• Choose forages that provide the most cost-effective mix of nutrients for your feeding system & environment.

• Tropical forages may provide options with low water availability.