Seed quality traits – the Australian experience

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www.csiro.au
In 2014/15 the top 10% of growers averaged 3300 kg/ha (2945 lb/ac)
Global trends in Cotton Yield

Australia, Brazil, China, India, Pakistan, Turkey, USA, Uzbek, Fr Africa
## Gin turnout and seed size (density)

<table>
<thead>
<tr>
<th>Seed Line</th>
<th>Gin turnout</th>
<th>Seed Index</th>
<th>seeds/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sicot 714B3F</td>
<td>40.8</td>
<td>10.8</td>
<td>9300</td>
</tr>
<tr>
<td>Sicot 746B3F</td>
<td>44.4</td>
<td>8.3</td>
<td>12040</td>
</tr>
<tr>
<td>Sicot 748B3F</td>
<td>43.0</td>
<td>9.0</td>
<td>11140</td>
</tr>
</tbody>
</table>

**Mean Industry Yield**

![Mean Industry Yield Graph](chart.png)
Gin turnout and seed size (density)

Area

- Sicot 748B3F 30%
- Sicot 746B3F 50%
- Sicot 714B3F 20%
Seed size

• Increased gin turnout has resulted in reductions in seed index (size vs density)

• When first introduced, some difficulties with establishment, but largely overcome with education.

• We did offer to withdraw the varieties, which almost caused a revolt in the industry.

• Given a choice, growers will always choose yield.
  • If an Australian farmer plants cotton they will always aim for the highest productivity (no Farm Bill).

• Significant discussions around increased oil – highest value commodity will win every time.
Relationship between oil and protein

\[ \text{Oil\%} = 17.46 + 1662\exp(-0.293\text{Protein\%}) \quad r^2 = 0.85 \]

- CBT 2019  |  Warwick Stiller
Relationship between oil and seed yield

$r^2 = 0.76$
What is Australian cottonseed used for

<table>
<thead>
<tr>
<th>Year</th>
<th>Crushing</th>
<th>Domestic Feedlot</th>
<th>Domestic Grazing</th>
<th>Export Feedlot</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>20%</td>
<td>40%</td>
<td>10%</td>
<td>30%</td>
</tr>
<tr>
<td>2017</td>
<td>15%</td>
<td>40%</td>
<td>25%</td>
<td>20%</td>
</tr>
<tr>
<td>2018</td>
<td>10%</td>
<td>35%</td>
<td>40%</td>
<td>15%</td>
</tr>
<tr>
<td>2019</td>
<td>-</td>
<td>50%</td>
<td>40%</td>
<td>10%</td>
</tr>
</tbody>
</table>
What is Australian cottonseed used for

Wholesale price of oil in $AUD

• Soybean – BASE
• Canola + $200
• Cottonseed + $400

• Although landscape has changed regarding consumers ie healthy oils, cottonseed oil still commands a premium in the market.
Case study - Modified cottonseed oil

- Between 1994 and 2007 CSIRO developed a new GM cottonseed oil - MonoCott
- low in saturated fatty acids (7%), low in cyclopropenoic fatty acids, and high in oleic acid (>80%)
- Aimed at food sector or biodiesel, some opportunity in stockfeed
- Assuming 10% price premium, this would add ~3% to gross value of the industry (unproven)
- Due to significant regulatory costs, an international approach would be required.
- Marketing – two choices; niche segregated or commodity
- Project was terminated in 2010 due to lack of interest by possible commercial partners.
Case study – analysis of 20 years of varieties
Summary

1. Lint yield will drive variety uptake and industry profitability.

2. Care must be taken when continually selecting for increased turnout.

3. There is some evidence that gin turnout can be increased while maintaining seed index – but it is difficult.

4. No evidence that oil and lint yield can be simultaneously improved (yet)
   – Will require step change in Assimilation, Canopy distribution of assimilate and Assimilate partitioning.
Thank you
Dr Warwick Stiller
CSIRO Agriculture and Food
Cotton Breeding – Objectives

Through novel research and applied plant breeding develop Australian cotton varieties with the package of:

– increased yield
– fibre quality preferred by international spinners
– resistance to all important diseases
– widely adapted
– with GM traits of importance.

Achieved through the integration of traditional breeding and modern tools