SESSION NINE
Session Nine
Fruit size and production

New Zealand and Australia Avocado Grower’s Conference’05
20-22 September 2005
Tauranga, New Zealand
Canopy Management
Reasons for Canopy Management

- Tree size control
- Optimise light interception and penetration
- Improve efficiency of spraying and harvesting
- Rejuvenate tree health and productivity
- Maintain consistent cropping
Large Trees

Problems with:
- harvesting
- effective spraying
- orchard access
Orchard Crowding

- reduced light penetration
- large unproductive areas
Previous work

Effect of pruning and plant growth regulator (Sunny®) application on shoot growth, flowering, yield and fruit quality
Mechanical pruning
Tree Size and Shape

- Trees pruned to an ‘A’ shape
- Variations in pruning angle (15-20°)
- Height 80% of inter-row spacing (max. 6m)
Pruning Time

Trees can be pruned
- after harvest/prior to flowering
- during summer (removal of spring growth flush)
Growth regulators (Sunny®)

Suppress spring growth & Control regrowth
### Pruning & Yield (t/ha)

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unpruned</td>
<td>23</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>Pruned</td>
<td>10</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td><em>In Year 2 Unpruned trees 80cm wider</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Site 2**|        |        |        |
| Unpruned  | 25     | 21     | 26     |
| Pruned    | 17     | 12     | 26     |
| *In Year 3 Unpruned trees 1m wider* |        |        |
Pruning & Fruit Position

<table>
<thead>
<tr>
<th></th>
<th>% of Fruit (0-2m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 2</td>
</tr>
<tr>
<td>Unpruned</td>
<td>29%</td>
</tr>
<tr>
<td>Pruned</td>
<td>42%</td>
</tr>
</tbody>
</table>
## Pruning & Fruit Quality
*(Incidence - % of fruit affected)*

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unpruned</td>
<td>5.8b</td>
<td>6.7a</td>
</tr>
<tr>
<td>Pruned</td>
<td>40.6a</td>
<td>3.3a</td>
</tr>
</tbody>
</table>

Diffuse discolouration
### Pruning & Fruit Ca

<table>
<thead>
<tr>
<th></th>
<th>Ca %</th>
<th>Severity (% of flesh affected)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stem-end rots</td>
</tr>
<tr>
<td>Unpruned</td>
<td>0.060a</td>
<td>0.1b</td>
</tr>
<tr>
<td>Pruned</td>
<td>0.046b</td>
<td>0.6a</td>
</tr>
</tbody>
</table>

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**Notes:**
- The table compares the severity of stem-end rots and vascular browning in avocado fruit, depending on whether the fruit was pruned or unpruned. The values indicate the percentage of flesh affected, with different letters indicating significant differences between the groups.
## Timing of Post-Harvest Prune

<table>
<thead>
<tr>
<th></th>
<th>Growth at harvest (cm)</th>
<th>Yield (t/ha)</th>
<th>Body rots (% of fruit affected)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unpruned</td>
<td>17b</td>
<td>26a</td>
<td>8c</td>
</tr>
<tr>
<td>Pruned after harvest (17(^{th}) June)</td>
<td>31a</td>
<td>18b</td>
<td>41a</td>
</tr>
<tr>
<td>Pruned 1 month later (11(^{th}) July)</td>
<td>22b</td>
<td>20b</td>
<td>28b</td>
</tr>
<tr>
<td>Pruned 2 months later (13(^{th}) August)</td>
<td>20b</td>
<td>20b</td>
<td>19bc</td>
</tr>
</tbody>
</table>
Summer Pruning & Sunny®
(Regrowth length)

Unpruned | Dec Prune | Jan Prune | Feb Prune
---|---|---|---
No Sunny | 1% Sunny

Regrowth length (cm)
Summer Pruning & Sunny®
(Regrowth flowering)

% flowering

- Unpruned
- Dec Prune
- Jan Prune
- Feb Prune

Yellow: No Sunny
Red: 1% Sunny
Other PGRs

Reduce regrowth in pruned trees

NAA (naphthalene acetic acid)

In California 1\% formulation + paint controlled regrowth up to 18 months
### NAA: Small branches (2 cm)

<table>
<thead>
<tr>
<th></th>
<th>No. of shoots (0-20 cm)</th>
<th>No. of shoots (below 20 cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>3.4</td>
<td>0</td>
</tr>
<tr>
<td>NAA 0.5%</td>
<td>0.1</td>
<td>2.3</td>
</tr>
<tr>
<td>NAA 1%</td>
<td>0</td>
<td>2.2</td>
</tr>
</tbody>
</table>
# NAA: Large branches (10 cm)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of shoots (0-20cm)</th>
<th>No. of shoots (below 20cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>4.9</td>
<td>0</td>
</tr>
<tr>
<td>NAA 0.5%</td>
<td>0.9</td>
<td>3.9</td>
</tr>
<tr>
<td>NAA 1%</td>
<td>0.2</td>
<td>2.3</td>
</tr>
</tbody>
</table>
Other PGRs

Prohexadione-Ca (Apogee® or Regalis®)
- Inhibitor of GA biosynthesis
- In Chile foliar spray at mid-bloom (1.25g/l) ↑ yield by 7 t/ha
Previous work - Outcomes

- Pruning can stimulate growth
- Pruning reduced yield in first year
- Timing of post-harvest prune
  - Minimise regrowth during fruit set
  - Regrowth can affect fruit quality
- Timing of summer prune
  - Regrowth flowering
- Sunny® reduced regrowth & increased flowering
- Results from warm subtropical sites
Previous work

Analysis of Canopy Management options for use in Avocados
Previous work - Outcomes

- Identified several CM systems
- Developed a method to compare CM systems
  - Productivity ratings (t/ha/year)
  - CM costs ($/ha/year)
- Identified need for further evaluation
Development of canopy management practices to suit the different growing environments across Australia
Canopy Management Strategies

- Selective limb removal
- Mechanical /hedge-row pruning
- Stag-horning/stumping
- Tree removal (orchard thinning/block recycling)
- Top-working
- Cincturing/girdling
- Plant growth regulators
Selection of Orchards/Growers

- Sites identified from the Avocado CM review
- Meetings with growers
- 3-5 growers from each of the major production areas (N Qld, Central Qld, S Qld/Northern NSW, Sunraysia & WA)
Evaluation of CM Systems

- Growers to perform & record operations (timing & cost)
- Report timing of events (flowering, flushing, harvest)
- Collect information on tree size, yield and fruit quality
- Provide history of CM operations
Identify best CM Systems

- Analyse in terms:
  - Productivity (t/ha/year)
  - Fruit size (pack-outs)
  - Fruit quality (reject %’s)
  - CM costs ($/ha/year)

- Determine suitability in terms of cost/benefit to the grower
Uptake of Results

- Meetings with growers to evaluate success of each CM system
- Sites selected to be used as demonstration blocks during field days