Australia is a land of climate extremes

“Managing the climate risks are probably the single most important management input for the Australian fruit grower”
Topics

1. Inadequate winter chill
2. Frost
3. Hail
4. Heat Stress
5. Drought
6. Floods/Cyclones/Windstorm
1.0 Inadequate winter chill
Winter Chill portions
Impacts

• Delayed defoliation/dormancy
• Poor flower bud formation
• Delayed and uneven flowering
• Reduced fruit quality
• Unsustainable production
Strategies for Low chill

• Low chill apple and pear cultivars
• Promote dormancy
• Minimise mixed wood age
• Use dormancy breaking sprays
• Apply chemical thinning strategies appropriate for mixed age bloom
• Set up for Multiple pick harvest
• Alternative low chill crops e.g. avocados
2.0 Frost
Fruit bud susceptibility to Frost (depends on stage)

- As flowers swell less resistant to cold temperatures
- Not all buds equally tender – (varies within tree)
- Slower developing buds more resistant
- Some varieties more susceptible (russet) early after fruit set
  (if weather conditions favourable, some sprays &/or water can damage fruit)

<table>
<thead>
<tr>
<th>Growth stage</th>
<th>Critical temp for 10% kill</th>
<th>90% Kill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Tip</td>
<td>-7.5°C</td>
<td>-12.2°C</td>
</tr>
<tr>
<td>Tight cluster</td>
<td>-2.7°C</td>
<td>-6.1°C</td>
</tr>
<tr>
<td>First pink</td>
<td>-2.2°C</td>
<td>-4.4°C</td>
</tr>
<tr>
<td>Full pink</td>
<td>-2.2°C</td>
<td>-3.9°C</td>
</tr>
<tr>
<td>First bloom</td>
<td>-2.2°C</td>
<td>-3.9°C</td>
</tr>
<tr>
<td>Full bloom</td>
<td>-2.2°C</td>
<td></td>
</tr>
<tr>
<td>Post bloom</td>
<td>-2.0°C</td>
<td></td>
</tr>
</tbody>
</table>

Source: WSU
Frost- clean sward & short grass
Strategies for Frost risk

- Good forecast
- Wind machine/helicopters
- Short grass sward
- Clean weed free herbicide strip
- Overhead or under tree sprinklers
- Moist soil
- Allow cold air to drain from orchard- lift curtains or holes in shelter
- Care & timing with dormancy breakers
- Protectant sprays- Low Biuret urea copper, others?
- Early basal spur leaf development (good autumn nutrition)
3.0 HAIL
Protective netting
Protective Net:- many designs, colours & benefits.
As temperatures rise, netting provides viable option to help mitigate

- Sunburn
- Hail
- Soil temperature
- Wind speed
- Birds, bats
- Pollination
- Bleaching etc

- Packouts
- Soil moisture
- Shoot length
- Vigour
- TCA
- etc
# Futures Orchard Trial

<table>
<thead>
<tr>
<th></th>
<th>Tops</th>
<th>Bottoms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class 1</td>
<td>Class 2</td>
</tr>
<tr>
<td>Un-netted</td>
<td>62%</td>
<td>29%</td>
</tr>
<tr>
<td>Netted White</td>
<td>71%</td>
<td>28%</td>
</tr>
<tr>
<td>Difference</td>
<td>+9%</td>
<td></td>
</tr>
</tbody>
</table>

Tasmanian Grower Community Group, Hansen Orchard, Craig Hornblow & Sophie Folder
Structures must be fit for purpose
Design improvements to reduce failure
Alternative to fixed - throw over net
4.0 Heat stress
No of days above 35°C
Increasing sunburn risk
Impact of nets on fruit temperature
Other Heat Induced fruit quality symptoms

- Bitter Pit
- Water core
- Scald
- Poor foreground colour and advanced background colour
- Lenticel breakdown
Impacts of Heat on tree productivity

- Reduced photosynthesis
- Increased respiration
- Overall lower plant performance
- Reduced fruit size
- Increased risk of biennial bearing
Strategies to minimize heat stress

- Plant crops or varieties tolerant of your microclimate
- Use rootstocks suited to your microclimate
- Overhead netting
- Growing structures
- Great nutritional balance
- Good soil and foliar calcium program
- Evaporative cooling (overhead and under-tree)
- Sunburn protectants
Strategies to minimize heat stress

• Healthy trees with large active root systems
• Excellent soil moisture management
• Long grass swards
• Good biennial bearing management
• Fruit colour enhancements
• Fruit maturation retardants (Retain, Harvista)
• Harvest at optimum maturity
• Appropriate storage regimes
5.0 Drought

**Monthly Water Use 2019**

**McKie Block 6 - Modi**
comparison: Northern Victoria, Apple

Weather Station is Moorenena
Zero irrigation has been recorded for this block.

**Monthly Water Use 2019**

**Jazz Shed grafts (6 stem)**
comparison: Queensland, Apple

Weather Station is Applethorpe
Zero irrigation has been recorded for this block.
# Irrigation Water requirements

<table>
<thead>
<tr>
<th></th>
<th>Shepparton 2017</th>
<th></th>
<th>Shepparton 2018</th>
<th></th>
<th>Shepparton 2019</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ET</td>
<td>Rainfall</td>
<td>ET</td>
<td>Rainfall</td>
<td>ET</td>
<td>Rainfall</td>
</tr>
<tr>
<td>Oct</td>
<td>113</td>
<td>41</td>
<td>Oct</td>
<td>133</td>
<td>29</td>
<td>Oct</td>
</tr>
<tr>
<td>Nov</td>
<td>159</td>
<td>35</td>
<td>Nov</td>
<td>170</td>
<td>34</td>
<td>Nov</td>
</tr>
<tr>
<td>Dec</td>
<td>177</td>
<td>53</td>
<td>Dec</td>
<td>161</td>
<td>95</td>
<td>Dec</td>
</tr>
<tr>
<td>Jan</td>
<td>205</td>
<td>33</td>
<td>Jan</td>
<td>237</td>
<td>36</td>
<td>Jan</td>
</tr>
<tr>
<td>Feb</td>
<td>159</td>
<td>32</td>
<td>Feb</td>
<td>168</td>
<td>5</td>
<td>Feb</td>
</tr>
<tr>
<td>March</td>
<td>143</td>
<td>37</td>
<td>March</td>
<td>151</td>
<td>10</td>
<td>March</td>
</tr>
<tr>
<td>April</td>
<td>79</td>
<td>72</td>
<td>April</td>
<td>101</td>
<td>7</td>
<td>April</td>
</tr>
<tr>
<td></td>
<td>1035</td>
<td>303</td>
<td></td>
<td>1121</td>
<td>216</td>
<td></td>
</tr>
</tbody>
</table>

|                | Deficit        | CF = 70%       |                | Deficit        | CF = 70%       |                | Deficit        | CF = 70%       |
|                | 732 mm         | 512 mm         |                | 905 mm         | 634 mm         |                | 1035 mm        | 725 mm         |
|                | 5.1 ML         | 6.3 ML         |                |                |                |                |                | 7.2 ML         |

<table>
<thead>
<tr>
<th></th>
<th>Stanthorpe 2017</th>
<th></th>
<th>Stanthorpe 2018</th>
<th></th>
<th>Stanthorpe 2019</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ET</td>
<td>Rainfall</td>
<td>ET</td>
<td>Rainfall</td>
<td>ET</td>
<td>Rainfall</td>
</tr>
<tr>
<td>Oct</td>
<td>118</td>
<td>74</td>
<td>Oct</td>
<td>104</td>
<td>149</td>
<td>Oct</td>
</tr>
<tr>
<td>Nov</td>
<td>140</td>
<td>40</td>
<td>Nov</td>
<td>125</td>
<td>61</td>
<td>Nov</td>
</tr>
<tr>
<td>Dec</td>
<td>158</td>
<td>80</td>
<td>Dec</td>
<td>135</td>
<td>69</td>
<td>Dec</td>
</tr>
<tr>
<td>Jan</td>
<td>157</td>
<td>95</td>
<td>Jan</td>
<td>170</td>
<td>76</td>
<td>Jan</td>
</tr>
<tr>
<td>Feb</td>
<td>133</td>
<td>41</td>
<td>Feb</td>
<td>106</td>
<td>73</td>
<td>Feb</td>
</tr>
<tr>
<td>March</td>
<td>97</td>
<td>224</td>
<td>March</td>
<td>99</td>
<td>60</td>
<td>March</td>
</tr>
<tr>
<td>April</td>
<td>75</td>
<td>34</td>
<td>April</td>
<td>87</td>
<td>19</td>
<td>April</td>
</tr>
<tr>
<td></td>
<td>878</td>
<td>588</td>
<td></td>
<td>826</td>
<td>507</td>
<td></td>
</tr>
</tbody>
</table>

|                | Deficit        | CF = 70%       |                | Deficit        | CF = 70%       |                | Deficit        | CF = 70%       |
|                | 290 mm         | 203 mm         |                | 319 mm         | 223 mm         |                | 529.5 mm       | 371 mm         |
|                | 2.0 ML         | 2.2 ML         |                |                |                |                | 3.7 ML         |                |
Drought Strategies

- Know your current and future irrigation water requirements (ML/ha)
- Can you increase water supply to match planted area
- Alternatively match planted area to water supply
- Minimize storage wastage
- Overhead netting
- Soil moisture micro management
- Drip not spray
- Night not day
- Good Organic Matter & Mulching
- Encourage deep rooting
- Match rootstocks and scion varieties
6.0
Cyclones
Floods
Windstorm
Flood causes silting, tree decline, irrigation washing away & a big cost to clean up.
Improve drainage in wetter years.
Tops broken out - wind & fruit weight more support and fastened
Cyclone Mitigation Strategies

• Good forecasting
• Good tree support
• Great soil drainage both surface and subsurface
• Management of silt and debris