

# Future Orchards 2012

The FO2012 Roadmap presented over the past 2 years.

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A roadmap to an internationally competitive  
apple and pear industry.

The “FUTURE ORCHARDS 2012” project started with a “Statement of Purpose”

**“To provide Australian apple and pear growers with the technology roadmap they need to make their orchards globally competitive now and into the future”.**

Over the past two years there have been many facets of the orchard and its associated business that have been presented all with the intention of clarifying a little more that ever changing roadmap.

The following paper is our attempt at summarising the key components of the map, bringing together all the topics that have been presented. This paper does not attempt to go into any detail on any topic as the detail can be found in one of the earlier referenced papers.

## Orchard Location

Objective: “Australian growing conditions vary markedly providing many challenges which need to be recognized and managed.”

<i>Key points</i>	<i>References</i>	<i>Examples</i>
<b>Climate</b> Winter chilling > 800 Richardson chill units required for consistent cropping. Spring air frost : <- 3°C from tight cluster and < -2.3°C in bloom damages crop. Summer heat > 35°C causes stress. Hail damages fruit marketability	September 2007 Orchard Walks – Frost monitoring and protection	
<b>Water Availability</b> In absence of significant summer rain 3 to 6 megalitres per hectare required. Water access can limit the plantable area.		
<b>Soils</b> > 40 cm rooting depth. ,pH 5.8 to 7.0, no drainage or waterlogging problems. Check soil profile by digging holes to 1.0m.		
<b>Labour Supply</b> Harvesting needs 0.8 man days per tonne.		

## Climate Modification / Risk Management

Objective: “To optimise pipfruit production under most Australian growing conditions requires climate modification and risk management to a significant degree.”

<i>Key points</i>	<i>References</i>	<i>Examples</i>
<b>Hail Netting</b> <b>Advantages</b>	September 2007– Hail net investments, do they pay? By Ron Gordon	QL10

<p>Eliminates most hail damage, controls avian pests, wind run reduced by 50%, irrigation efficacy increased by &gt; 20%. Tree vigour increased, Marketable packout lifted.</p> <p><u>Disadvantages</u>  Doubles orchard development cost. Maintenance costs add to annual costs of production. Pollination and fruit set reduced. Needs higher fruit value margin and production levels to cover additional costs.</p>		
<p><b>Frost Protection</b>  Intensive orchards on dwarf rootstocks need frost protection more than standard plantings.</p> <p>Wind machines – need warm air inversion layer or supplementary heat – protects 6 to 7 ha.  Water sprinkling – requires 35000 l/ha/hr to prevent damage from –6°C air frost.</p>	<p>September 2007 orchard walks – Frost monitoring and protection</p>	
<p><b>Irrigation</b>  Trees on dwarf rootstocks need irrigation right from planting.  Trickle irrigation &gt; 1.5 times more efficient than sprinkler systems.  Trickle irrigation suits high density plantings well.  Monitor soil moisture and match application to requirements.  Prioritise irrigation to new orchard developments and high value/high production blocks in times of water shortage.</p>	<p>November 2006 Orchard Walk – Notes for participants.  November 2006 Batlow summary notes, Henry Schneider DPI Vic, Water issues in drought.</p>	
<p><b>Support Structures</b>  Adequate support structure. 70 tonnes/ha crop = 25 kg/metre of row.  Strong assemblies and intermediate posts every 7-8 trees.  Trellis height to within 0.5 m of ultimate tree height</p>		<p>NW23, VC47</p>

<h2>Variety Mix</h2>		
<p><i>Key points</i></p>	<p><i>References</i></p>	<p><i>Examples</i></p>
<p>Plant the best available today.</p>	<p>March 2007 Orchard Walk – New planting</p>	

	options 2007 and beyond	
Grow varieties that perform well on your orchard and in its microclimate.	Variety strategies June 2007	
Avoid heat sensitive varieties in hot districts, eg, Braeburn, Jonagold, Honey Crisp™.		
Keep abreast of changing market demand by reviewing and upgrading the variety mix on a continual basis. Plant varieties that can achieve good block profitability for 10-15 years into the future.		
It is easy to change varieties grown on intensive systems by grafting.		
Align your production to the requirements of your marketer.		

<b>Nursery Tree</b>		
Objective: “Understand the potential, high health, well- feathered trees have on the orchard investment. Plan well in advance ”		
<i>Key points</i>	<i>References</i>	<i>Examples</i>
Order trees 2 – 3 years ahead of requirement.	June 2007 orchard walk handouts..	
Decide on variety 18 months ahead of delivery.		
Agree the tree specification with the nurseryman – feathered trees need minimum of 6 to 8 feathers at 80 cm above the bud union or higher to be of any use.	Nursery tree specifications and tree types. June 2007	
Well-feathered trees at planting give commercial crops in the second year.		
High health virus free trees give crops > 40% more than virus infected trees.	Variety strategies	

<b>Pre-Plant Preparation</b>		
Objective: “Preplant preparation is a key component of successful block establishment and productivity”		
<i>Key points</i>	<i>References</i>	<i>Examples</i>
Survey the soil to determine depth, structure, pH, salinity, nutrient status and drainage. Apply remedial soil treatments to ameliorate any problems found, eg, if soil shallow ridge, if wet drain.	Reference: Orchard walk September 2006 – Notes for Participants	

Correct pH and any nutrient deficiencies with lime and capital fertilizer applications.		
If replant soil, fumigate to control SARD – presence of SARD can depress cumulative yields by over 90 tonne/ha over the first seven years.	Orchard walk March 2008 – Dr Gordon Brown Soil treatments against replant pests and diseases.	
Ensure soil cultivation is done adequately to ensure excellent soil/root contact. Dwarf rootstocks need ideal conditions at planting to make a good start.		

<b>Orchard System</b>		
Objective: “To create an orchard system that achieves rapid yield accumulation, produces high volumes of quality fruit with a low cost of production”		
<i>Key points</i>	<i>References</i>	<i>Examples</i>
Have a clear vision of your orchard system and tree structure, and then communicate clearly to all involved.	Orchard walk September 2006 – Notes for participants. Orchard walk October 2006 – Notes for participants. Orchard walk Jan/Feb 2007 – Robinson orchard systems paper and Simon Middleton paper	
Generally the simplest systems are the easiest to manage and offer best return on capital.		
Single rows 3 to 4 m apart on dwarfing rootstocks at 2000 to 3000 trees per hectare is the preferred intensive system.	Martin Thomann :Sept 2007 Paul James June 2007 Orchard walk notes Nov 2007	Compare VC47 and VC48
Use dwarfing rootstocks and match rootstock to allotted space and variety, to achieve a calm tree at maturity	John Palmer High Density Plantings~ principles and pitfalls Nov 2007	
Often the standard of crop husbandry overrides the effect of different intensive planting systems.		
Orchard system dynamics will change over time, introduce new technologies to your orchard as and when they become effective. (eg robotic technologies)		

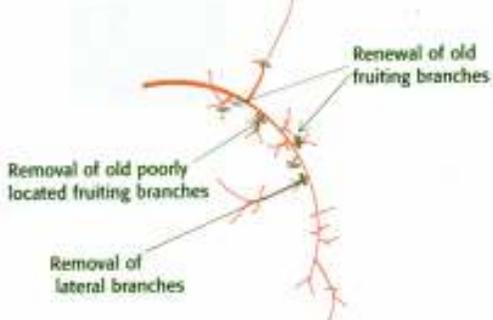
## Rapid Yield Accumulation ~ Fill the Allotted Space Quickly

Objective: “Canopy volume drives yield”

<i>Key points</i>	<i>References</i>	<i>Examples</i>
Avoid scion rooting – bud union needs to be 10-20 cm above soil.		
Make the trees grow tall rapidly – achieve full tree height in four to five years at most.	Young tree growth Sept 2007	QL10
Avoid water stress. Have irrigation available from day 1.	Rapid Yield Accumulation March 2007	
In hot climate reduce heat and moisture stress with organic mulches.		
In non-bearing period run high N fertilizer programme and correct any other nutrient deficiencies which may become limiting, eg, magnesium, zinc.		
Avoid weed competition along tree row and control pest and disease.		VC47
Tree density helps achieve early canopy and yield. Choosing the appropriate density for the variety, soil type, location, not based on the mower width. Have slightly more trees per hectare than you think is necessary, as we have more tools to control vigour than to increase.	Ross Wilson Loop1: Orchard walk Nov 2006 – Notes for participants	VC47
So often doing the basics well (irrigation and fertiliser) is overlooked. Timing of the application of these is as, or more important, than quantity. Dwarf rootstocks have small root systems and can be checked very easily, so little and often are best.	Getting new plantings to perform – presentation by John Wilton Nov 2006	
Branch bending is a tool used to control branch vigour and increase fruitfulness. Branches should be trained when they have reached their length, or if the diameter of the branch has reached 50% of the trunk. Bending should be 45° in the bottom and 60° in the top of the tree.	Craig Hornblow: Nov 2006 Martin Thomann Sept 2007	VC47 and VC48 Aug 2007 photos
Do not over-crop young trees, but carry some crop to aid tree training, reduce biennial bearing		
Growth regulators such as Regalis can help control vigour in lower parts of the tree while still trying to fill to upper canopy.		

## Winter Pruning

Objective: “Focus on achieving a calm tree, and maintaining consistent light through the canopy to achieve strong buds and high quality fruit. Remember pruning is also the first step in crop load management ”

<i>Key points</i>	<i>References</i>	<i>Examples</i>
<p>The process of fruit growing is simple. We are harvesting light and converting the energy produced to fruit. Therefore you must have good light interception and penetration. Once you capture more than 60% of the available light, marketable yield and quality decreases. Light comes from the heavens start pruning from the top of the tree.</p>	<p>Simon Middleton: Loop3 John Palmer: Loop 7. Colin Little Sept 2007 Vigour management Sept 2007 Pruning and Training June 2007</p>	
<p>Extinction style pruning produces calm productive fruit units, while renewal pruning vigour. Simple fruiting systems allow for simple rules and therefore consistency in the result. Consistency is a key to successful management and performance.</p>		<p>QL10, NW19</p>
<p>Fruit targets can be expressed as winter buds per tree and used as initial crop load management for most varieties. Bud numbers can be used as a monitoring tool during pruning to ensure a consistent job.</p>	<p>Orchard walk</p> $  \begin{array}{ccc}  \text{Yield /ha} & \longrightarrow & \text{Yield/ tree} \\  \uparrow & & \downarrow \\  \text{Buds/ branch} & \longleftarrow & \text{Yield/ branch}  \end{array}  $ <p>5</p>	

## Crop Loading

Objective: “Maximise marketable yield by setting appropriate targets and apply consistently”

<i>Key points</i>	<i>References</i>	<i>Examples</i>
The first step is always to know what you are trying to achieve: Market, Yield, Size , Fruit Number per tree. Use TCA and cropping history to fine-tune crop load targets	Crop Loading Nov 2007 “Crop Load Calculator” Nov 2007	South Australia growers crop load trials Paul James:
Simple crop load trials within your orchard will help you understand the yield potential of the newer rootstocks.	Robinson Gala fruit size Jan 2007	
Develop relationships between winter buds and fruit set. Too many buds, too many flowers leads to very hard thinning and too many fruit.		
We have numerous chemical options for thinning but many growers over look the basics, understanding application of the product and correct timing.	Sally Bound: Treefruit Chemical thinning and application Craig Hornblow: Sept 2007	
Stick to your targets at hand thinning, don’t get greedy. Apply your strategies consistently. Using fruit size as a key criteria for thinning can help monitoring.		

## Harvest Management

Objective: “Optimise eating quality, storage potential and profit ”.

<i>Key points</i>	<i>References</i>	<i>Examples</i>
It is critical to harvest fruit at its correct maturity to optimise eating quality. The fruit is a fuel cell you can choose to use the fuel up during harvest or save some for storage. Starch is the key indicator of maturation for most varieties. Foreground colour and pressure are not maturity parameters	Orchard walk 3, Pome Fruit maturation and storage ~ March 2008	
Planning your harvest flows and peaks is the first in ensuring you have the labour “Horse power” to harvest the crop at the right time.	Marcel Veens: March 2008 Maturity and harvesting of late varieties	

	March 2007	
Early Fruit colour gives options for picking so use all tools to enhance colour.		
ReTain can help with harvest planning, also improving fruit size but can retard colour development.		

<p><b>Measure, Manage and Improve</b></p> <p>Objective: “You cannot manage what you don’t measure.”</p>		
<i>Key points</i>	<i>References</i>	<i>Examples</i>
Regular fruit size measuring through the season allows you to see if you are on track for your targets.	Steve Spark Loop 1 and loop 7	South Australian growers Pink Lady monitoring
Analysing block performance and profit is simple and has many benefits. It helps identify the appropriate goals for maximise profit for each block and objectively identifies the blocks for removal.	John Wilton Loop 8 Block profitability June 2007	
Measure Total Orchard Profitability and Benchmark where possible.		