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# **Tactical horticultural water decisions in northern Victoria: fruit tree irrigation options and economic responses**

Bob Farquharson, Thiagarajah Ramilan, Ian Goodwin, and Mark O'Connell

Contributed presentation at the 60th AARES Annual Conference,  
Canberra, ACT, 2-5 February 2016

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THE UNIVERSITY OF  
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SCIENCES

# **Tactical horticultural water decisions in northern Victoria: fruit tree irrigation options and economic responses**

**Bob Farquharson, Thiagarajah Ramilan, Ian  
Goodwin, and Mark O'Connell**

- For horticultural industries in northern Victoria, irrigation is essential
- But supply and traded prices have fluctuated
  - Millennium Drought, then floods!
  - But what about the future?
- Competing demand for water (e.g. environment)
- Tactical water options are available
  - Deficit irrigation management of trees, or
  - Trading of seasonal allocations
- What are potential benefits of these management options for orchardists?



# 1. Orchard irrigation management

- Regulated deficit irrigation (RDI)
  - Withhold water at start of growing season up to the start of rapid fruit growth, then apply to match crop water requirements
- Post-Harvest Deficit Irrigation (PH)
  - Cut back on water applied post-harvest, provided no effect on developing flowers and buds for the next season
- Sustained Deficit Irrigation (SDI)
  - A continuous irrigation deficit, maintain tree at constant water stress throughout the growing season
- Severe water deficit (parking the tree) (P)
  - Apply minimum irrigation for tree survival, so that subsequent production is not affected

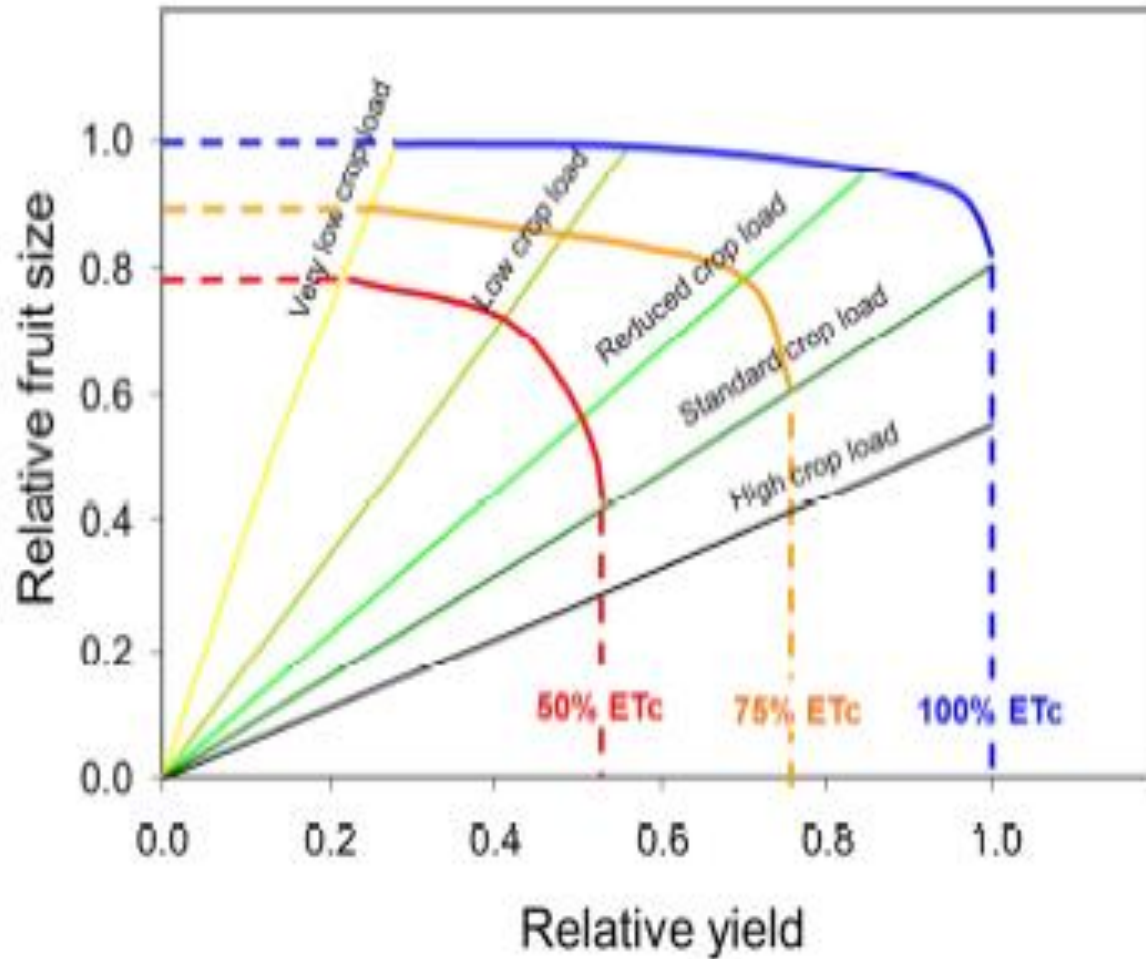


# Effects of Deficit Irrigation

Drought strategy	Cost	Irrigation saving (%)	Yield penalty (%)	
			Year 1	Year 2
RDI	Low	20	0	0
PH	Low	15 - 20	0	0
SDI	Low	60	30	0
P	Low	75	50	0

- Goodwin, I., O'Connell, M.G. (2016). Drought water management: An Australian perspective, Acta Horticulturae, In process

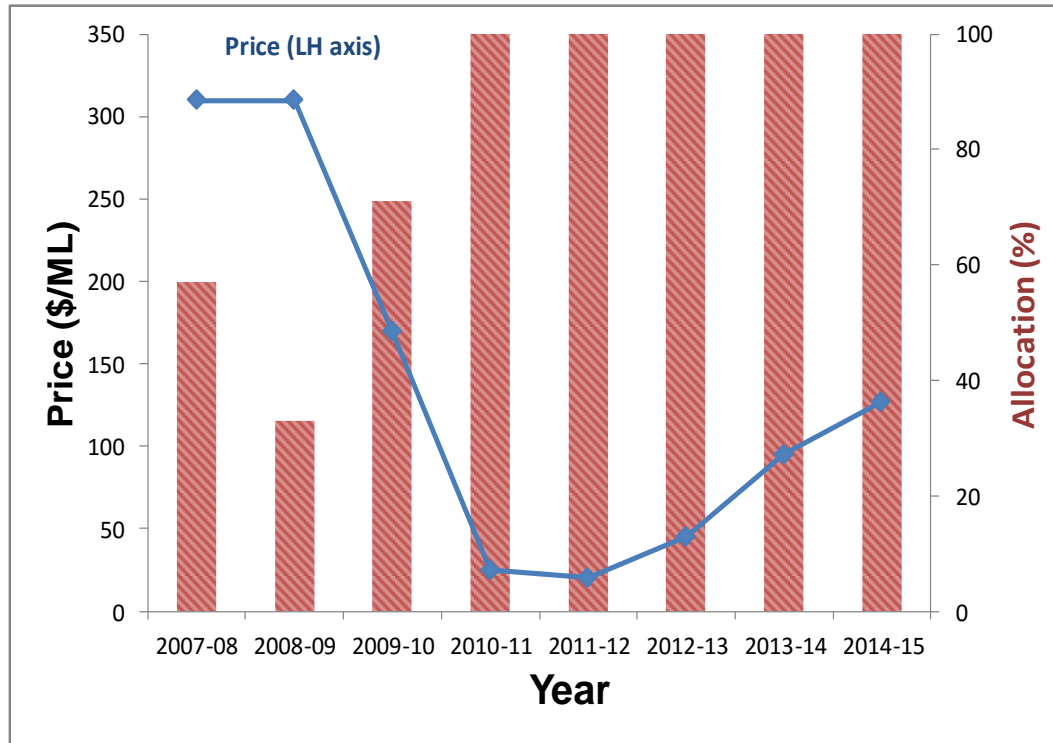
# Effects of $ET_c$ and thinning



Goodwin and O'Connell 2016



## 2. Trade : Goulburn water allocation

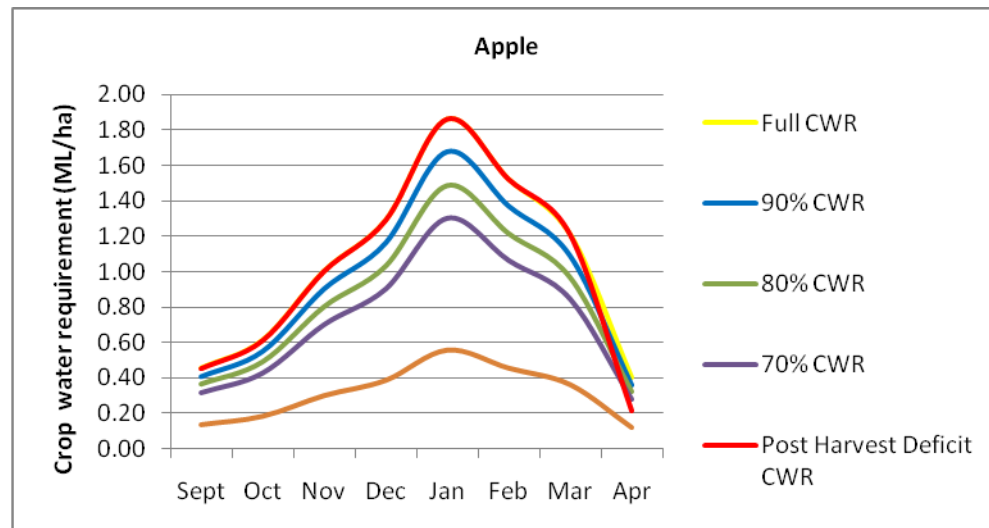
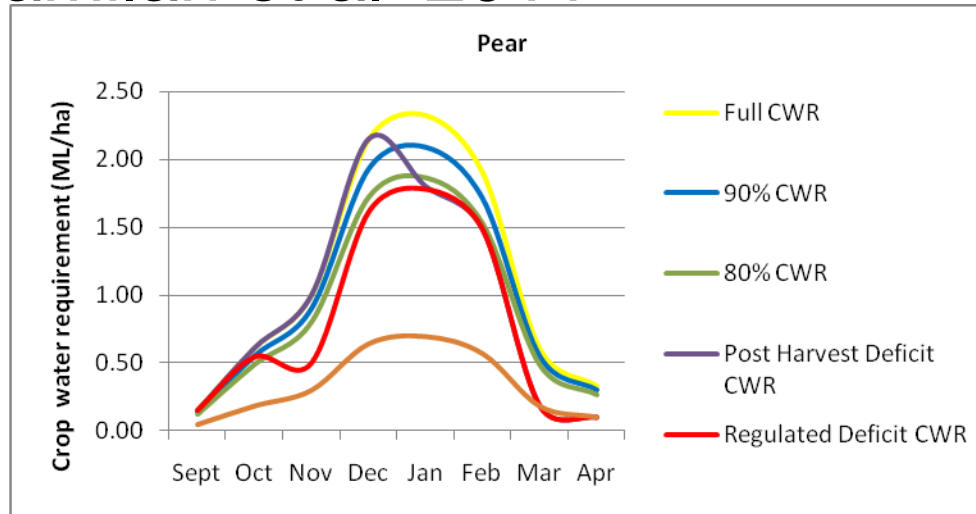


- Victorian water register (Goulburn prices and trade)
    - \$20 - \$320/ML
  - But Basin-wide prices 2007-08
    - \$200 - \$1200/ML
- (Mallawaarachchi & Foster 2009)



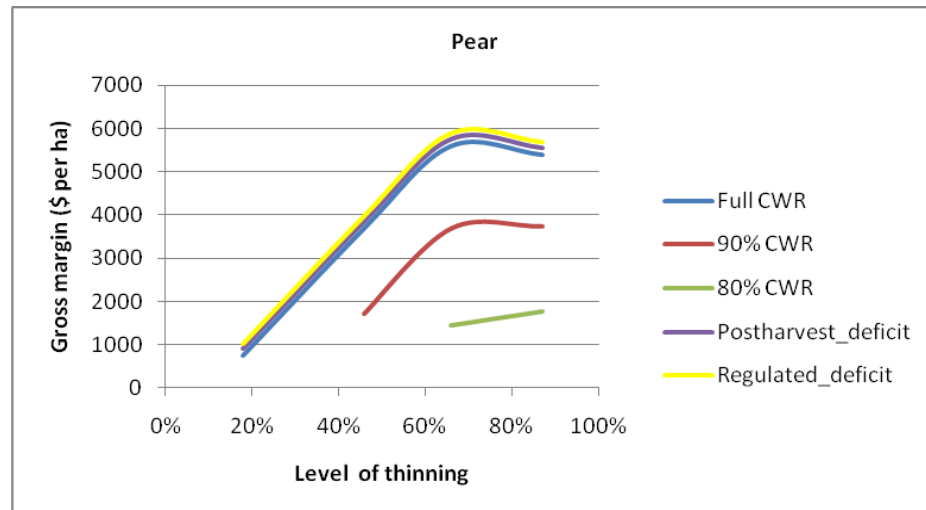
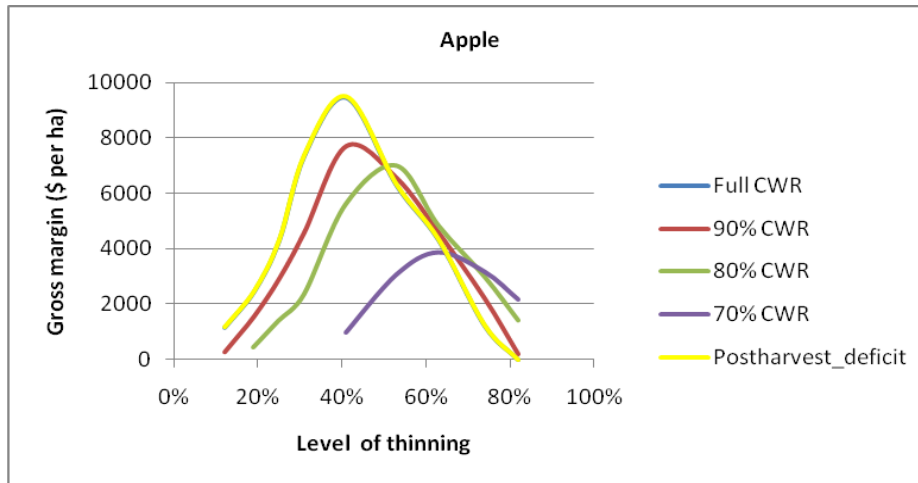


Ramilan et al. 2011





Ramilan et al. 2011



- A representative orchard for the district
- A profit objective
- Tactical management (decisions within a year)
- Water is limiting (consider a future dry year)
- Tactics: apply deficit irrigation management to trees and/or trade water
- Constrained optimisation (Linear Programming)
- Develop information for orchard decisions



# Pear variable costs

Variable costs (\$/ha 2013 values)

Item	Sources	Unit	Quantity	Total
Labour				
- Hand harvesting	<i>Plunkett's P02</i>	bins	96 @ \$52/bin	4935
- Pruning	<i>Plunkett's P02</i>	ha	1	3928
- Other wages	<i>Plunkett's P02</i>	ha	1	2838
TOTAL WAGES		ha	1	11701
Water	<i>Plunkett's P02</i>	ML/ha	7.0 @ \$60/ML	422
Other				
- Weed, pest & disease control	<i>Plunkett's P02</i>	ha	1	2513
- Fertiliser & lime	<i>Plunkett's P02</i>	ha	1	656
- Machinery	<i>Wilson and Stone 2014</i>	ha	1	3919
- Pollination	<i>Wilson and Stone 2014</i>	ha	1	79
TOTAL OTHER		ha	1	7167
GRAND TOTAL		ha	1	19290



- Data from industry/growers/research
- Quantify bio-physical relationships
- Water supplies and prices vary
- Interaction with orchardists
  - Grower reference group
- Developing relevant information for orchardist decisions
- A model that can be re-used?

# Pomefruit orchard at Shepparton





