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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 MELBOURNE

FACULTY OF VETERINARY & AGRICULTURAL SCIENCES

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

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# Issue

- 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

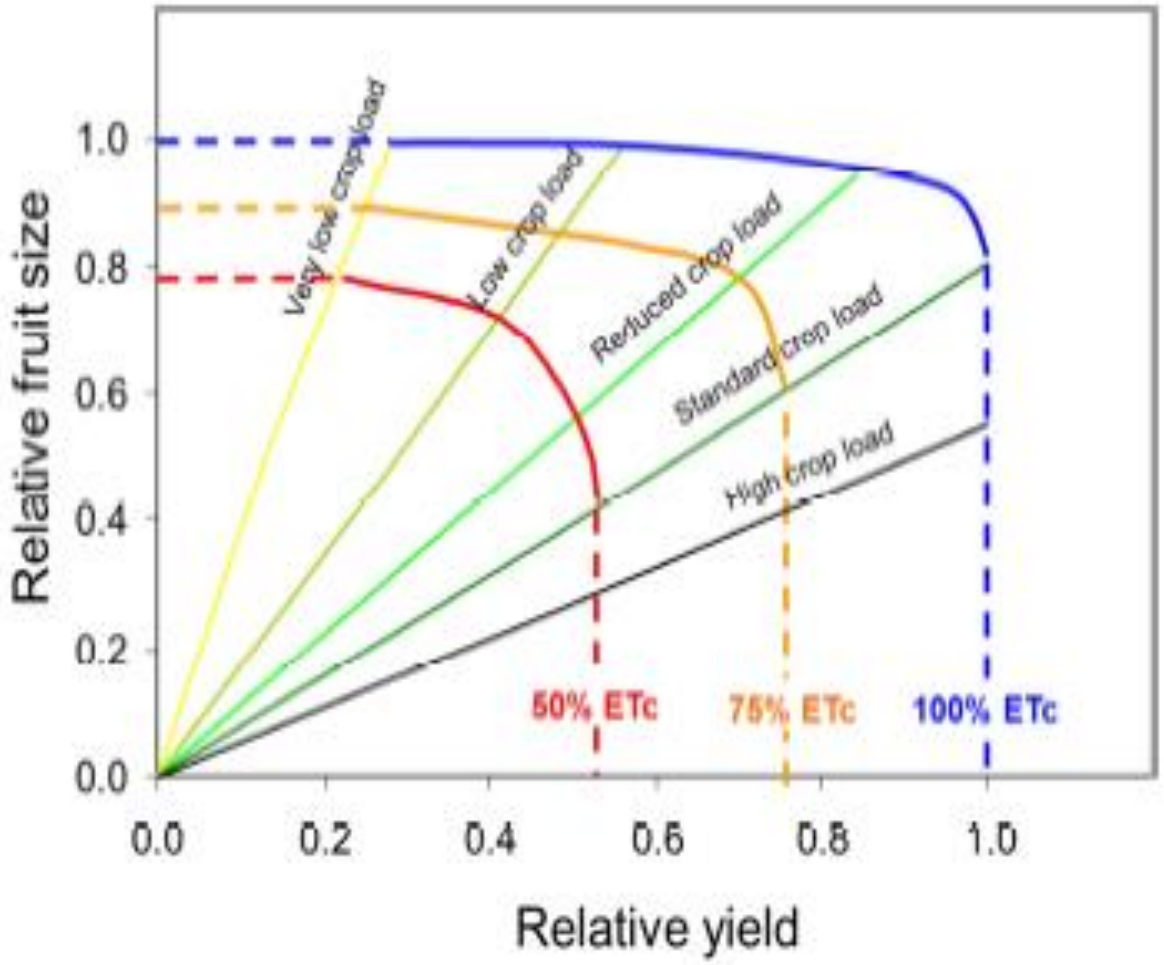
- Regulated deficit irrigation (RDI)
  - Withhold water at start of growing season up to the start of rapid fruit growth, then apply to match crop water requirements
- Post-Harvest Deficit Irrigation (PH)
  - Cut back on water applied post-harvest, provided no effect on developing flowers and buds for 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 |

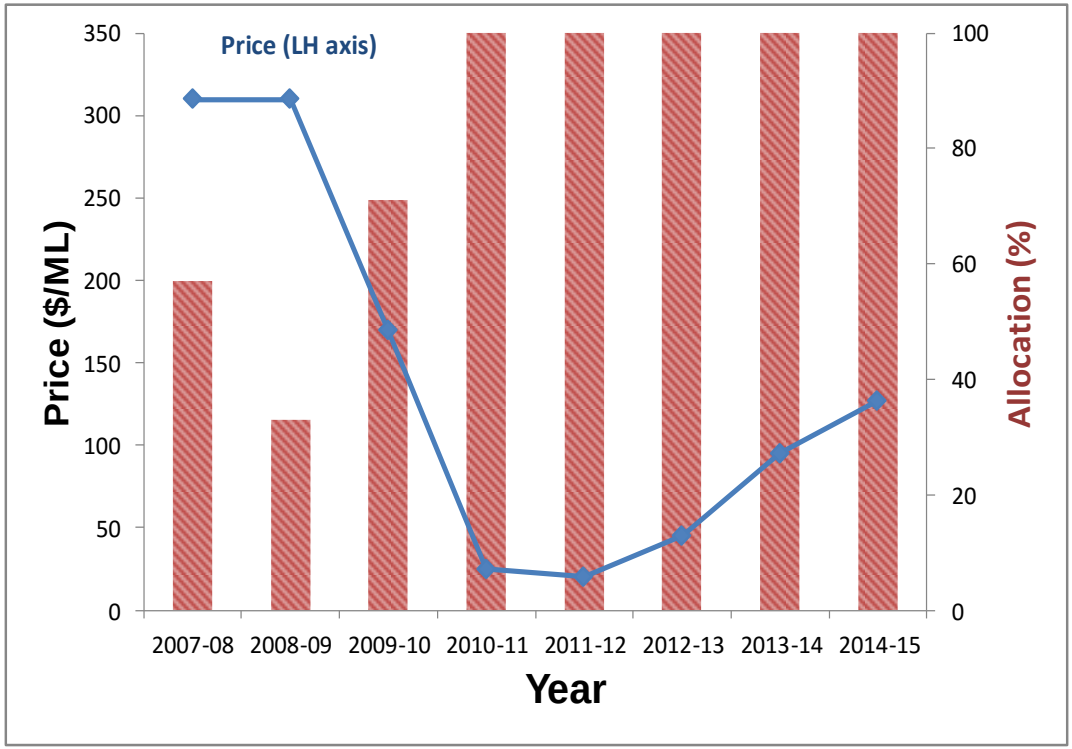
- Goodwin, I., O'Connell, M.G. (2016). Drought water management: An Australian perspective, Acta Horticulturae, In process

# Effects of $ET_c$ and thinning




Goodwin and O'Connell 2016

# 2. Trade : Goulburn water allocation

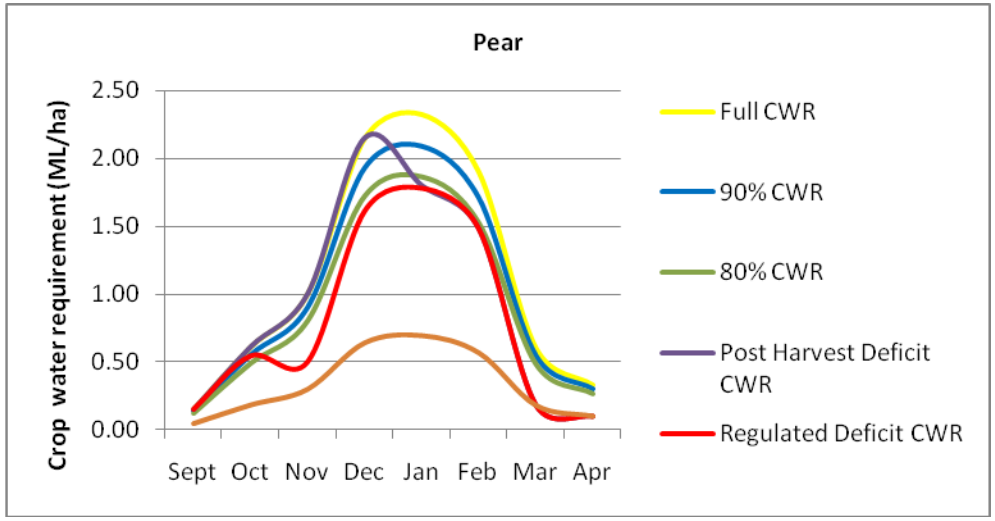


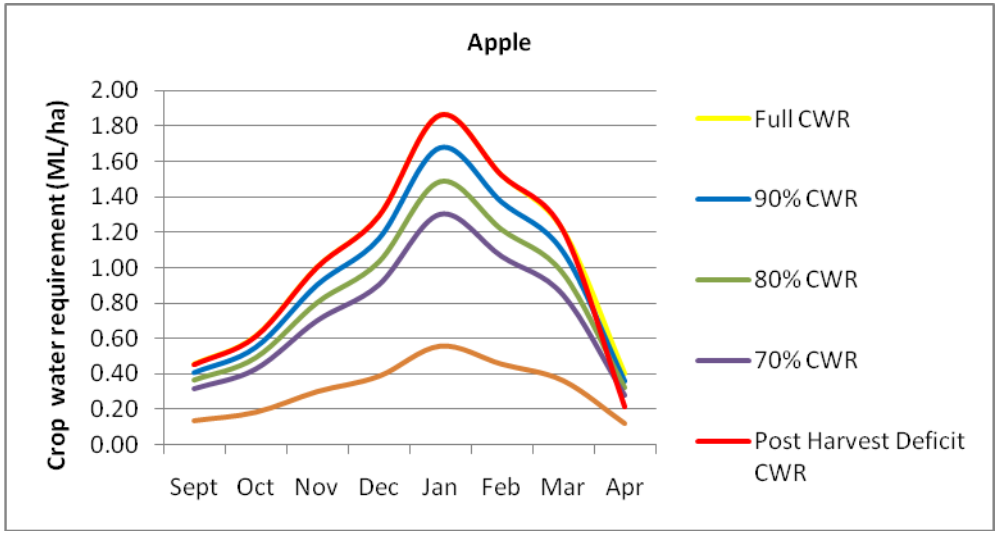

- Victorian water register (Goulburn prices and trade)
  - $20 - $320/ML
- But Basin-wide prices 2007-08
  - $200 - $1200/ML

(Mallawaarachchi & Foster 2009)

# Estimating crop water requirements

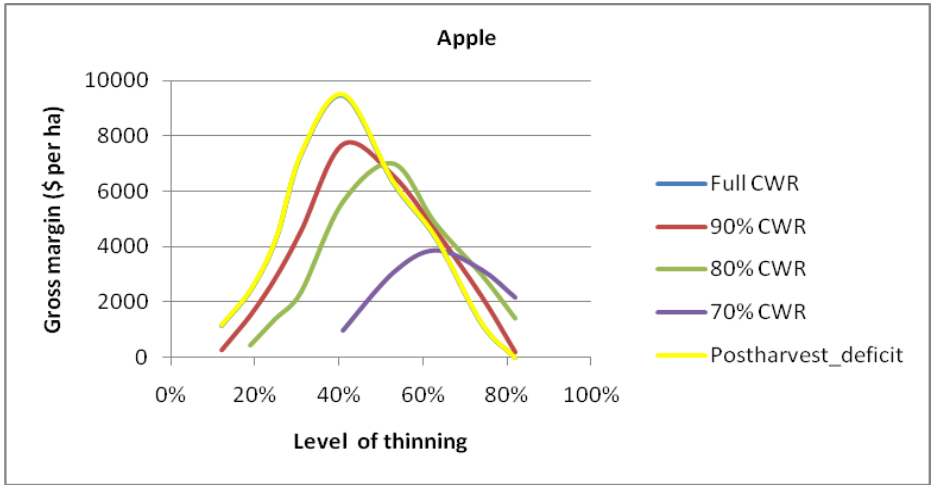
## Ramilan et al. 2011

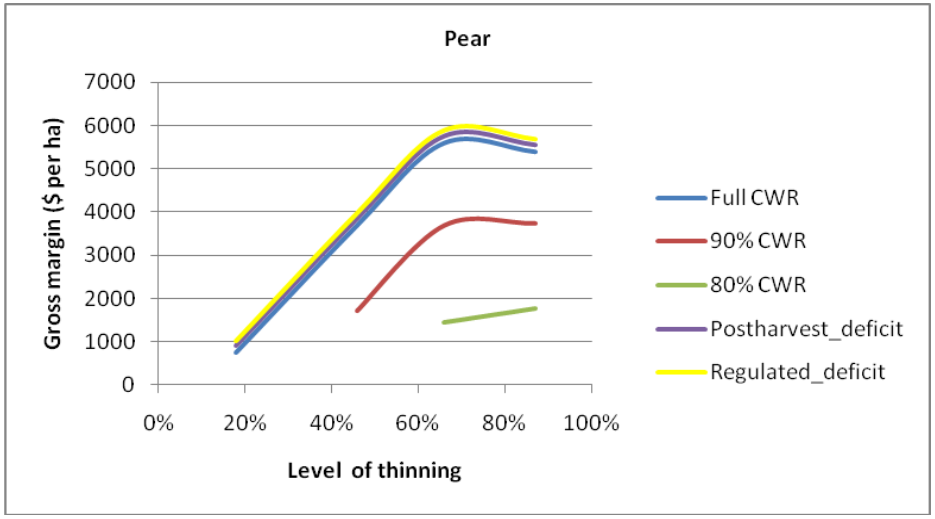


# Estimating crop Gross Margins

## Ramilan et al. 2011



# Method

- 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 | *Plunkett's P02* | bins | 96 @ $52/bin | 4935 |
| - Pruning | *Plunkett's P02* | ha | 1 | 3928 |
| - Other wages | *Plunkett's P02* | ha | 1 | 2838 |
| TOTAL WAGES | | ha | 1 | 11701 |
| Water | *Plunkett's P02* | Ml/ha | 7.0 @ $60/Ml | 422 |
| Other | | | | |
| - Weed, pest & disease control | *Plunkett's P02* | ha | 1 | 2513 |
| - Fertiliser & lime | *Plunkett's P02* | ha | 1 | 656 |
| - Machinery | *Wilson and Stone 2014* | ha | 1 | 3919 |
| - Pollination | *Wilson and Stone 2014* | ha | 1 | 79 |
| TOTAL OTHER | | ha | 1 | 7167 |
| GRAND TOTAL | | ha | 1 | 19290 |

# Issues for the project

- 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