Sustainable intensification of horticulture in SE Australia 2050

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The Primary Industries Climate Challenges Centre is a joint venture between the University of Melbourne and the Victorian Department of Environment and Primary Industries

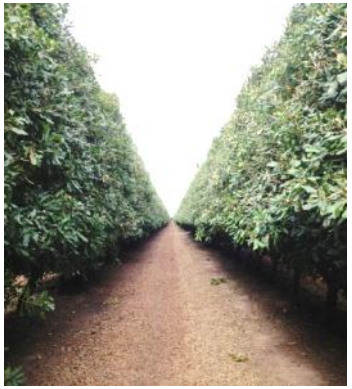
THE UNIVERSITY OF MELBOURNE

State Government Victoria
Department of Environment and Primary Industries

Core Principles - 2050

- Consistent high yields of quality product
- Reduction in resource use
- Climate ready production systems
- Carbon neutral







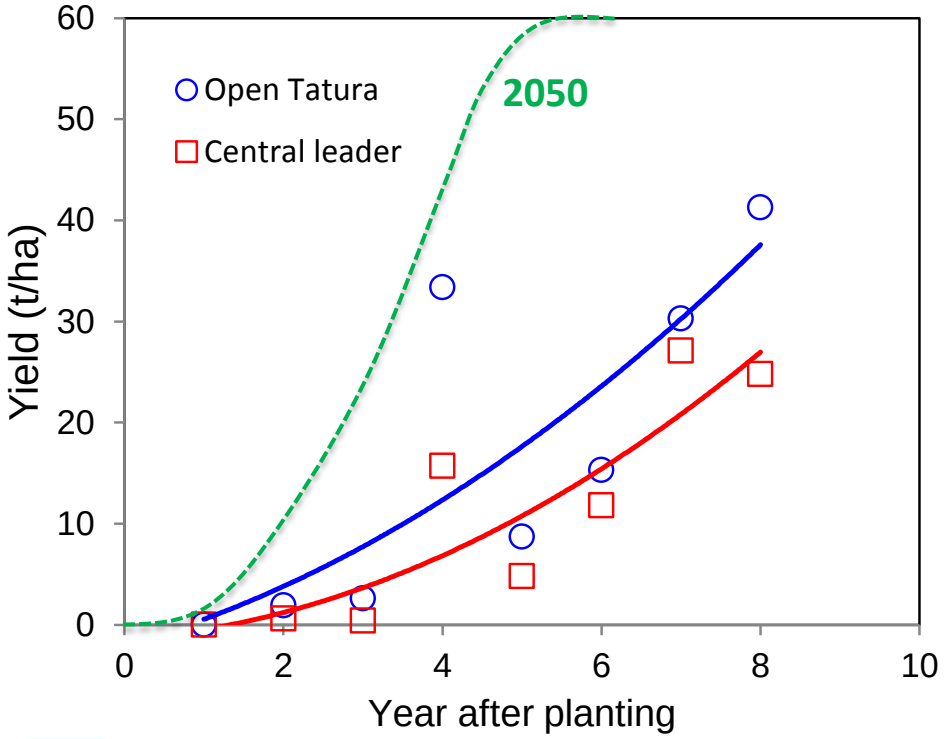

1. Consistent high yields of quality fruit

Yield and quality - 2014

- Long period from planting to maximum yield
  - Species dependant
  - Improved with high-density planting

Open Tatura

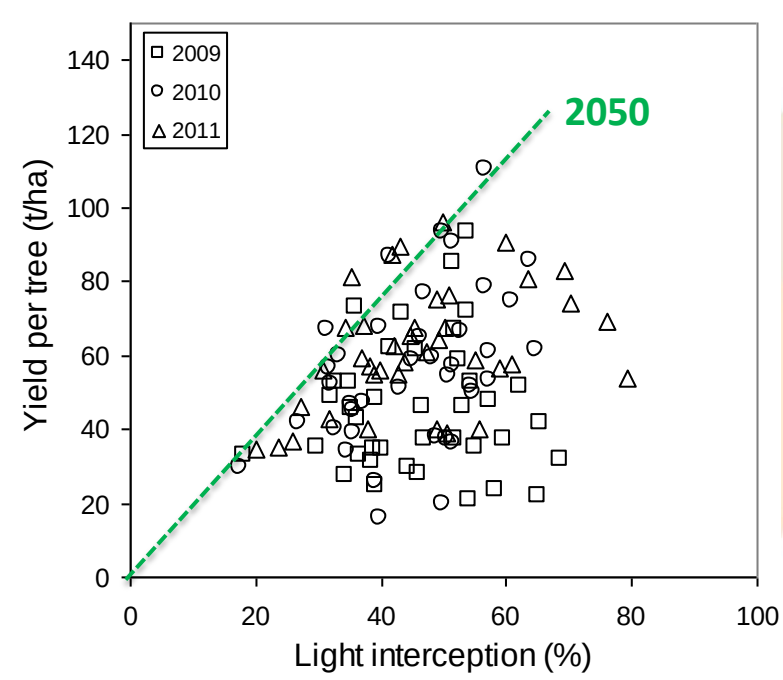
Central leader

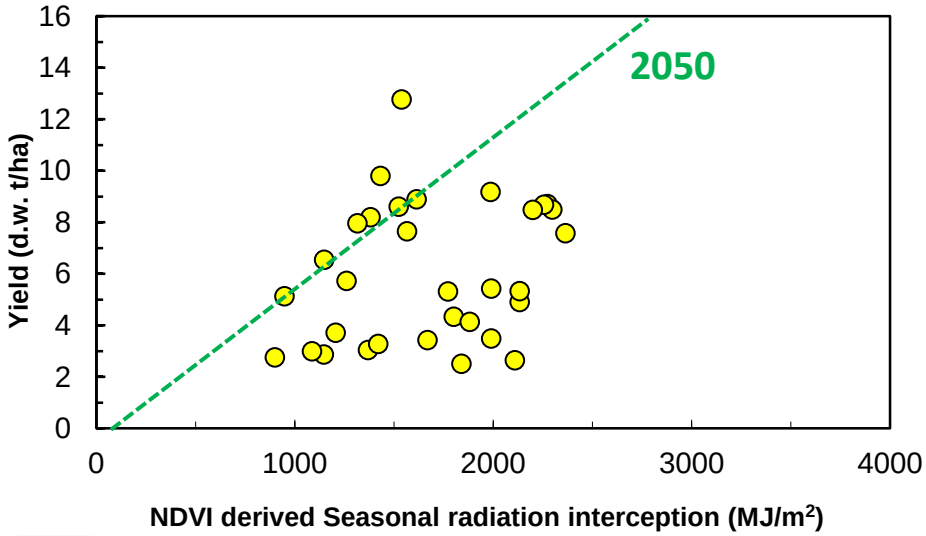


van den Ende et al. (2003)

Yield and quality - 2014

- Large spatial variation in yield
  - Cannot be attributed to light interception

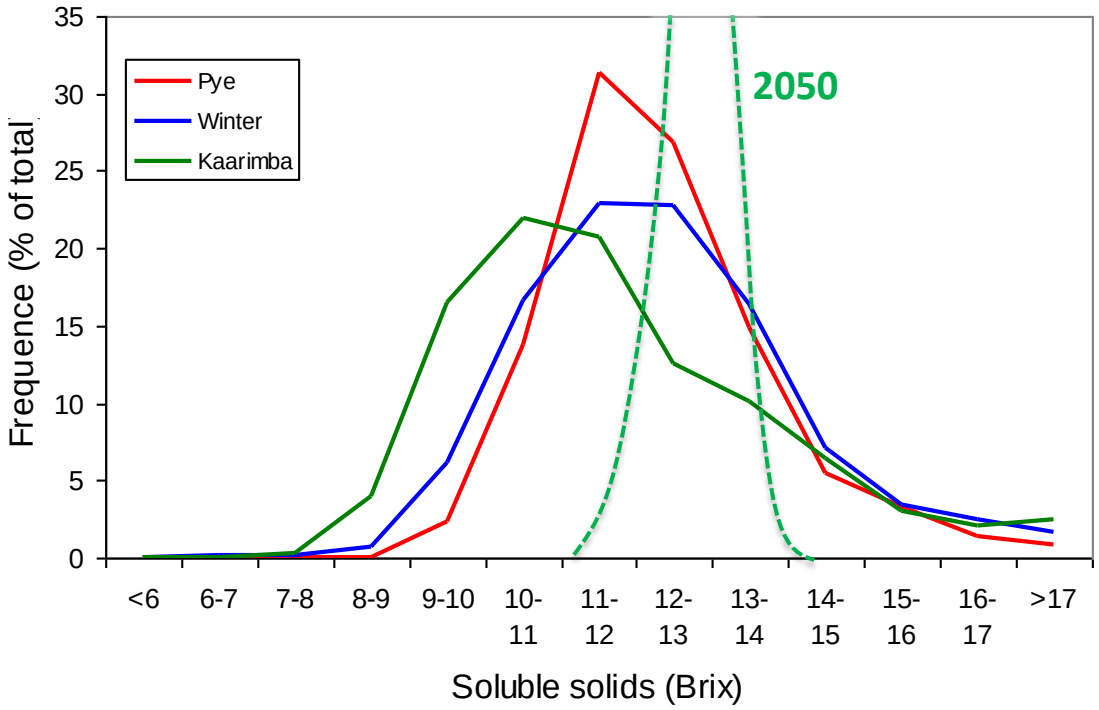




O'Connell et al. (2012)

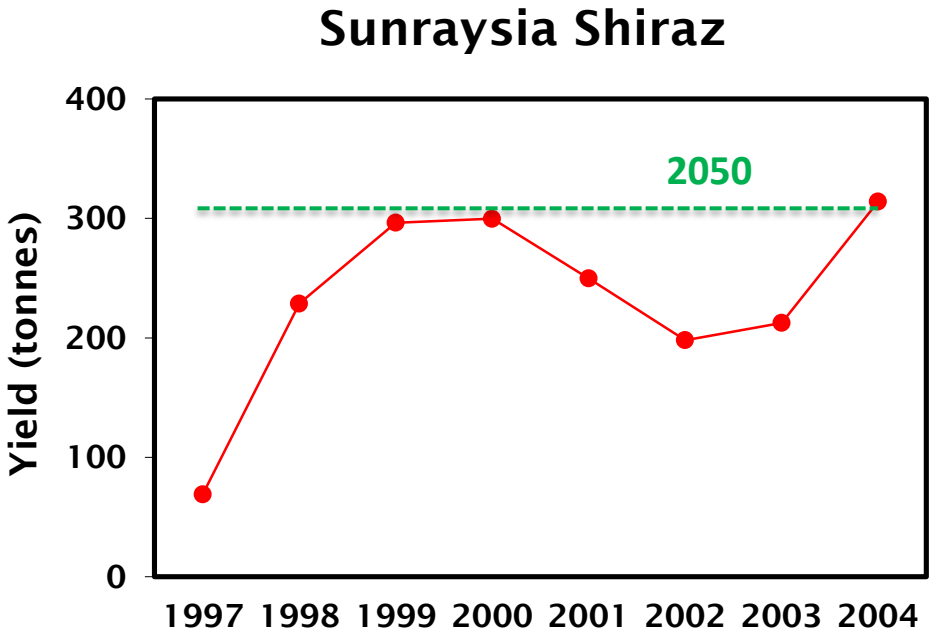
Yield and quality - 2014

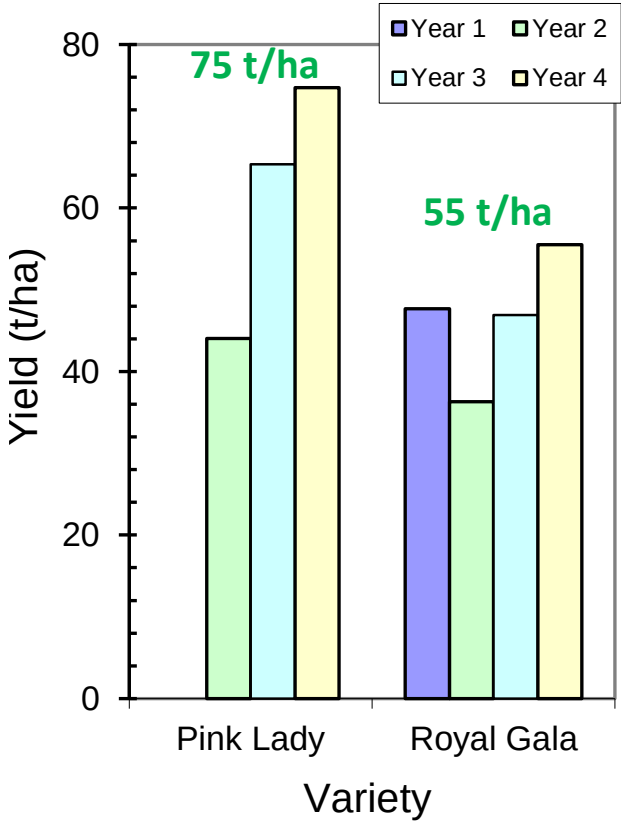
- Large spatial variation in quality
  - Both between and within paddocks



Yield and quality - 2014

- Large temporal variation in yield
  - Associated with fruit size and fruit number

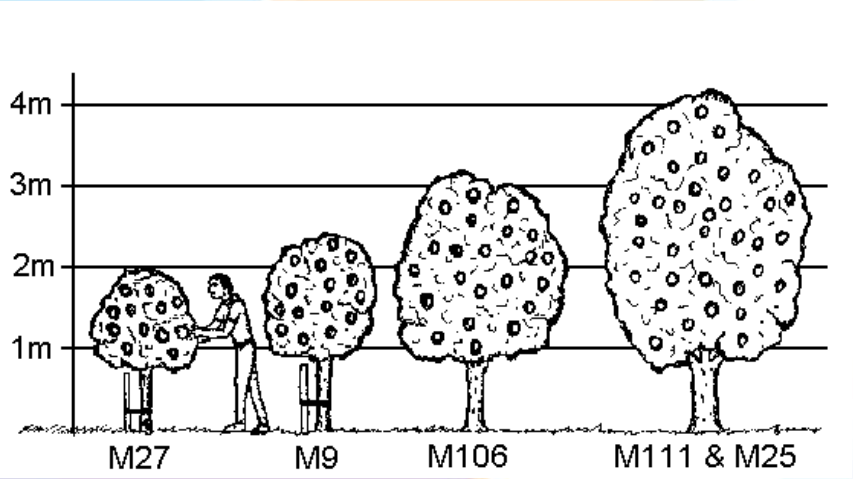




Dunn (unpublished)

Yield and quality - 2050

- Varieties and rootstocks
  - Early bearing and dwarfing rootstocks for all tree crops
  - High harvest index and radiation use efficiency
  - Minimum temporal and spatial variation in yield, maturity and quality
  - Resistance to pests and disease
  - Match quality attributes to markets (e.g. crisp pears for Asia, non-browning fruit for fresh cuts)



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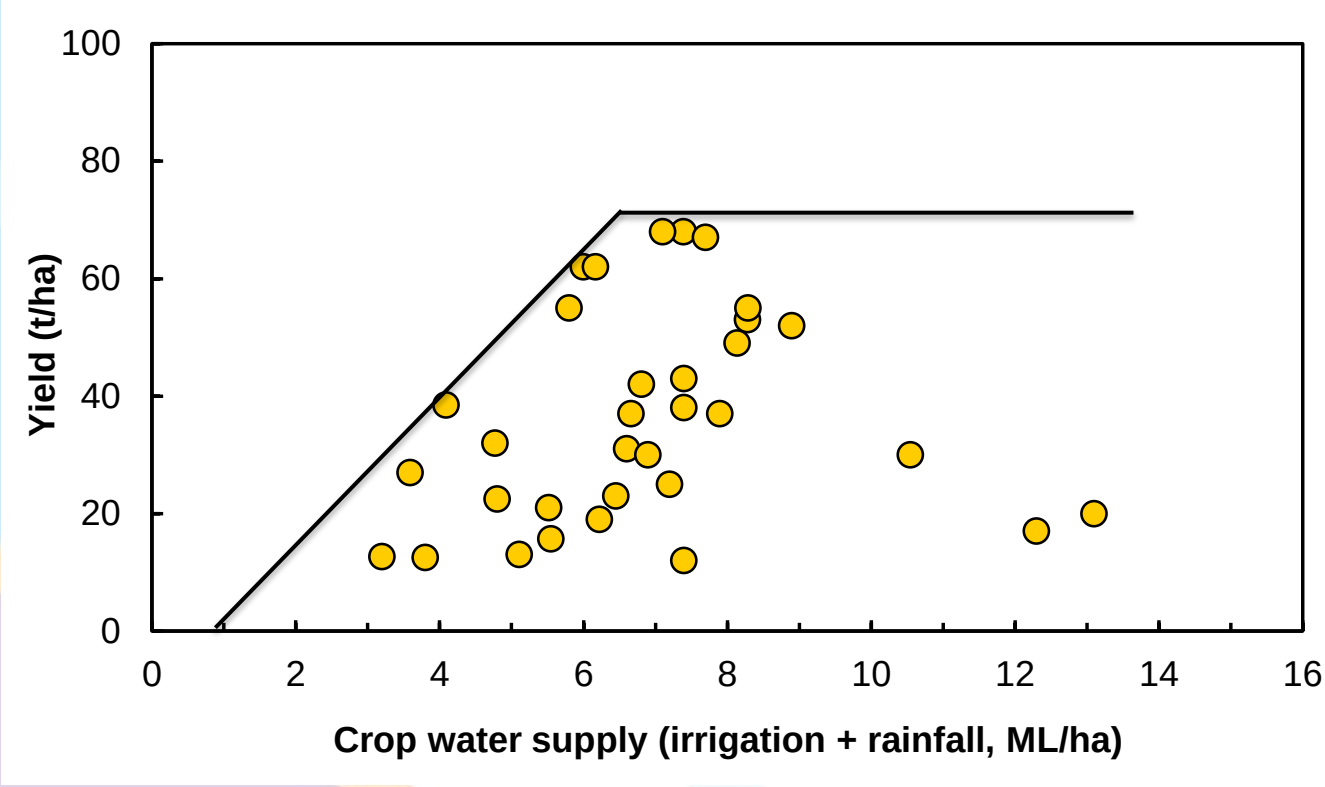
Yield and quality - 2050

- Planting and training systems
  - Early bearing
  - High light interception and light distribution
  - Consistent high packout of quality fruit
  - Reduced labour, suitable for mechanisation
  - Capacity to rework trees

2. Reduction in resource use

Resource use - 2014

- Large variation in water use efficiency
  - Across all horticulture crops
  - Despite majority enterprises using micro-irrigation



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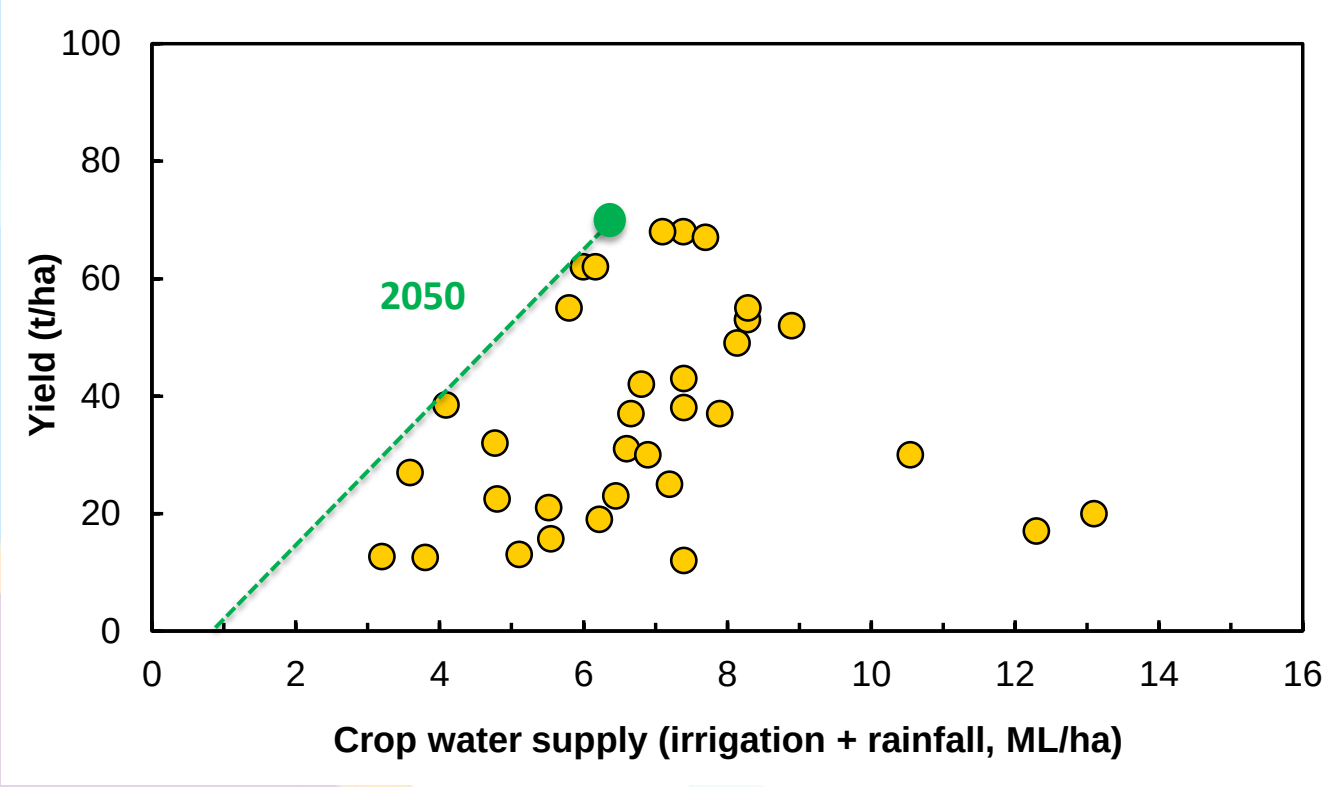

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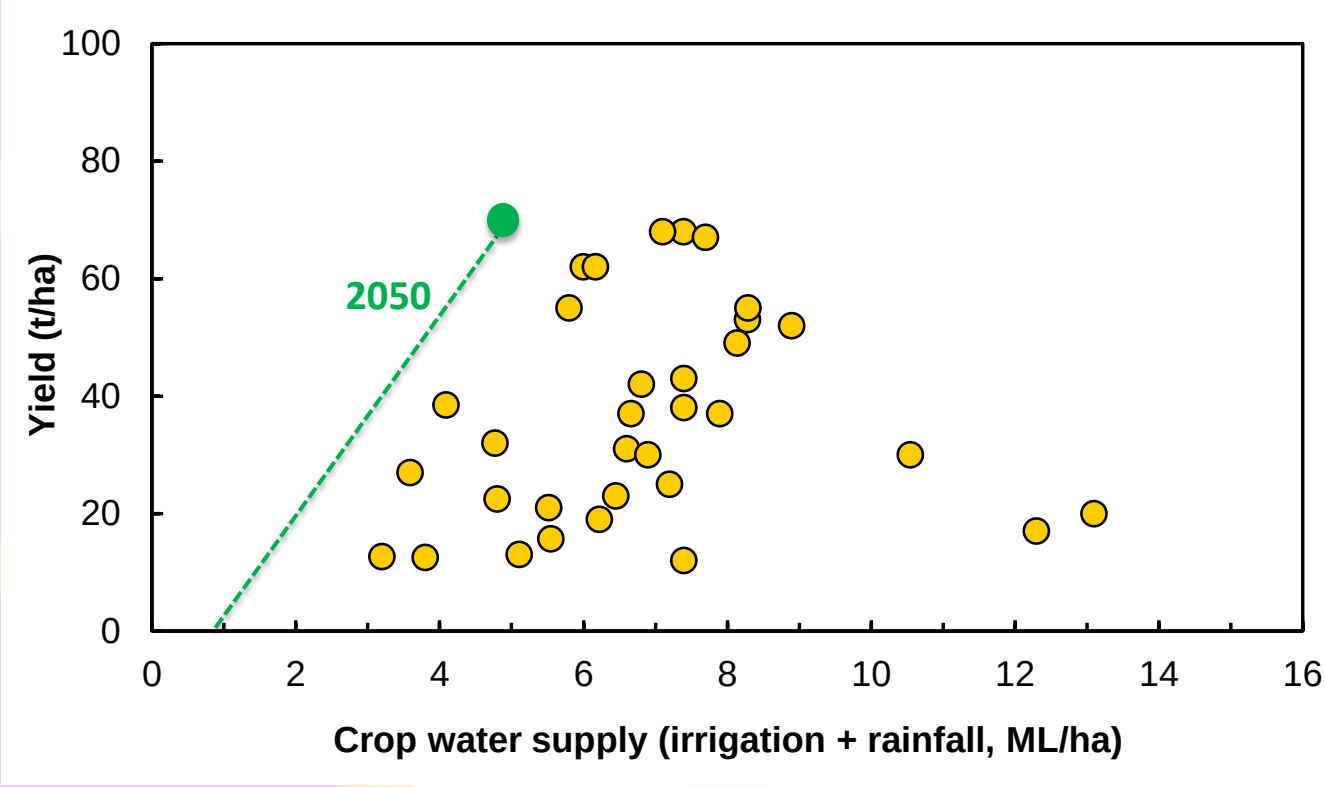
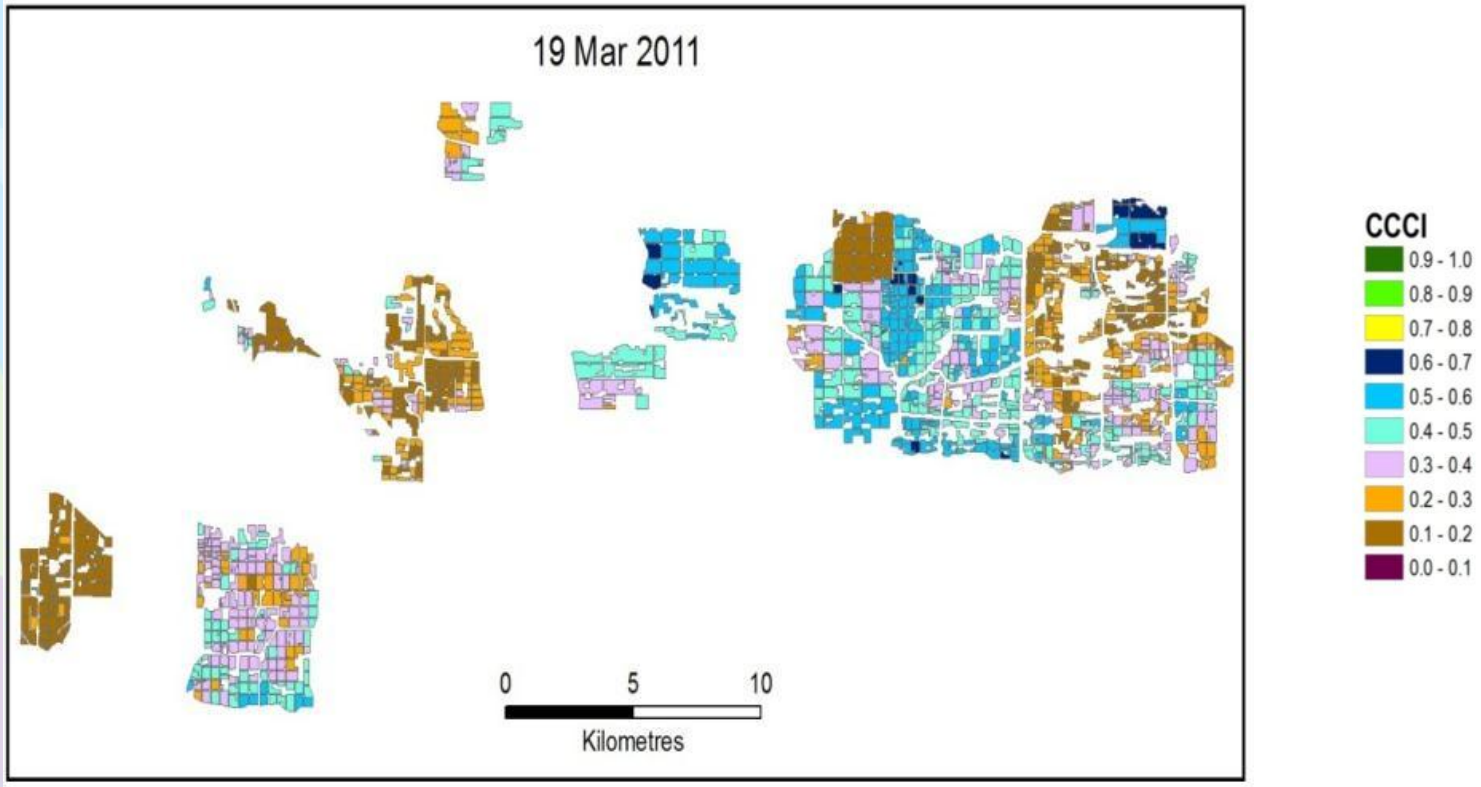


O'Connell et al. (2012)

Resource use - 2014

- Large variation in nitrogen status
  - Example, almonds in NW Vic



O'Connell et al. (2014)

Resource use - 2014

- Chemicals for pest and disease control
- Plant growth regulators
- Rest-breaking agents

Resource use - 2050

- Modernisation of regional water delivery infrastructure

Resource use - 2050

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- On-farm system design
  - Irrigation management units: Match irrigation system to soil type and crop water requirement
  - Stable performance (e.g. DU > 90%)
  - Low energy (low pressure)
  - Efficient fertigation systems
  - Soluble fertiliser products

Resource use - 2050

- Solid set canopy delivery system

Niemann et al. (2014)

3. Climate ready production systems

Climate ready - 2014

- Extreme events
  - Netting (hail, sunburn)
  - Evaporative cooling (sunburn)
  - Frost fans

Climate ready - 2050

- Extreme events
  - Combined netting and evaporative cooling
  - Frost fans (doubled as wind turbines)

- Flowering
  - Well defined varietal x rootstock chill and heat requirements (synchronise pollination)
  - Winter evaporative cooling

4. Carbon neutral

Carbon neutral - 2050

- Carbon emissions
  - Reduction in resource use (water, nutrients, chemical, energy)
    - Post-harvest must be considered (storage, grading, transport)
  - Conversion of wood (prunings, replanting) to fuel or Biochar
  - Energy generation (solar, wind)
- Carbon sequestration
  - Increased yield and quality
    - varieties and rootstocks
    - planting and training systems

www.piccc.org.au

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