



Industry &  
Investment

# Improving Prune Irrigation Efficiency – DP04002

Prune Quality Field Day

# Aims

- Irrigation strategies
- Results
- Conclusions
- Future

• Irrigation strategies • Results • Conclusions • Future

- Water balance
- Regulated deficit irrigation (RDI)
- Partial root zone irrigation (PRZI, PRD)

■ Water balance

- Available soil water reserve

-  $ET_0 = E_{pan} \times 0.85$

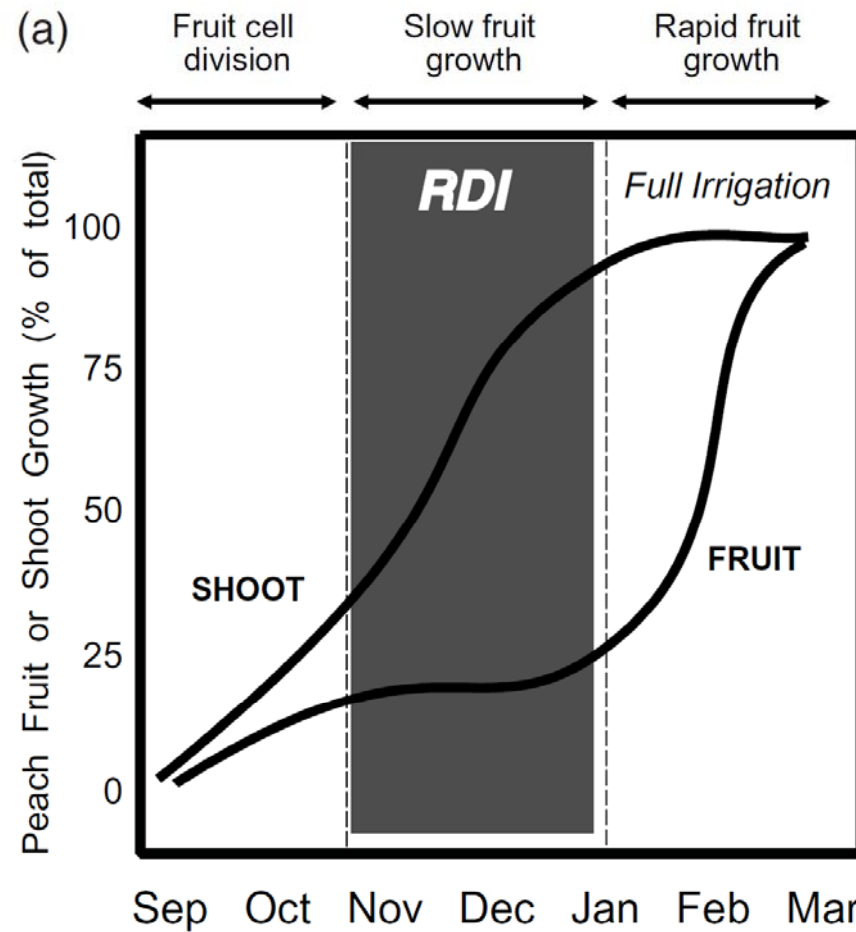
-  $ET_C = ET_0 \times K_C$

• Irrigation strategies • Results • Conclusions • Future

- Regulated deficit irrigation (RDI)
- Irrigate as required for water balance but withhold water during rapid shoot growth stage

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### Typical shoot and fruit growth pattern for (a) peach



I. Goodwin and A.-M. Boland (2002). [Deficit irrigation practices](http://www.fao.org/DOCREP/004/Y3655E/y3655e10.htm) Series title: Water reports - 22, 109 pp. ISBN: 9251047685. <http://www.fao.org/DOCREP/004/Y3655E/y3655e10.htm>

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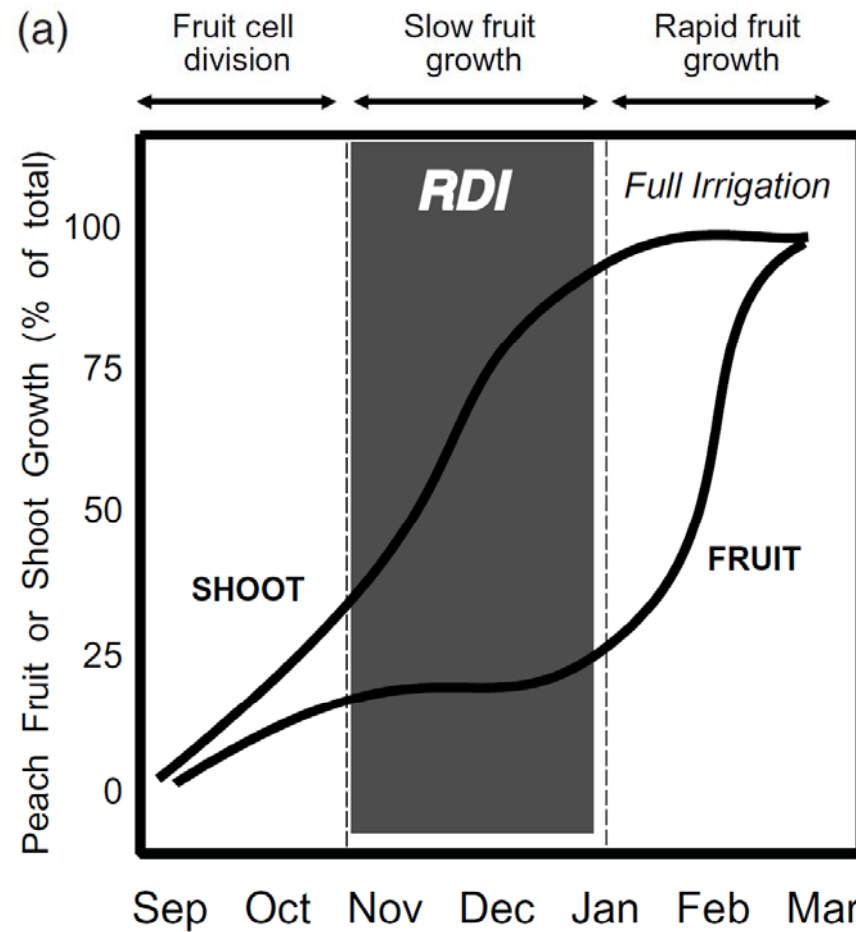
- Partial root zone irrigation (PRZI)
- Irrigate as required for water balance but apply to half the root system in alternate weeks

## Strategy philosophy

- Control irrigation based on available water in the root zone and replacing  $ET_c$  regularly
- RDI withholds water during stage 2 of shoot growth (shoots are sensitive to water stress)
- PRZI allows drying-side roots to produce hormones that close stomata and reduce  $ET_c$

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## Trial site

- DPI Centre for Irrigated Agriculture
- d'Agen prunes 3 m x 6 m on Marianna or Myrobalan
- 3 irrigation strategies

## Water applied

<b>Treatment</b>	<b>2006-2007 (ML/ha)</b>	<b>2007-2008 (ML/ha)</b>
<b>Control</b>	<b>17.732</b>	<b>6.756</b>
<b>PRZI Total</b>	<b>14.748</b>	<b>6.643</b>
<b>RDI</b>	<b>6.055</b>	<b>7.582</b>

## Water applied – CIA v grower

Water use	2005-2006	2006-2007	2007-2008
<b>CIA</b>			
ML/ha	-	17.7	6.7
KL/tree	-	31.9	12.2
<b>Grower</b>			
ML/ha	14.5	13.5	11.1
KL/tree	45.9	46.4	35.3

## Fresh weight yield per tree

<b>Season</b>	<b>Irrigation</b>	<b>kg/tree</b>
<b>2005-2006</b>	<b>Control</b>	<b>106</b>
	<b>RDI</b>	<b>121</b>
	<b>PRD</b>	<b>119</b>
<b>2006-2007</b>	<b>Control</b>	<b>48</b>
	<b>RDI</b>	<b>42</b>
	<b>PRD</b>	<b>30</b>
<b>2007-2008</b>	<b>Control</b>	<b>68</b>
	<b>RDI</b>	<b>87</b>
	<b>PRD</b>	<b>100</b>

## Fresh weight per fruit

<b>Season</b>	<b>Irrigation</b>	<b>g/fruit</b>
<b>2005-2006</b>	<b>Control</b>	<b>28</b>
	<b>RDI</b>	<b>27</b>
	<b>PRD</b>	<b>27</b>
<b>2006-2007</b>	<b>Control</b>	<b>22</b>
	<b>RDI</b>	<b>20</b>
	<b>PRD</b>	<b>21</b>
<b>2007-2008</b>	<b>Control</b>	<b>21</b>
	<b>RDI</b>	<b>20</b>
	<b>PRD</b>	<b>20</b>

## Dry weight per fruit

<b>Season</b>	<b>g/fruit</b>
<b>2004-2005</b>	<b>7</b>
<b>2005-2006</b>	<b>8</b>
<b>2006-2007</b>	<b>7</b>
<b>2007-2008</b>	<b>6</b>

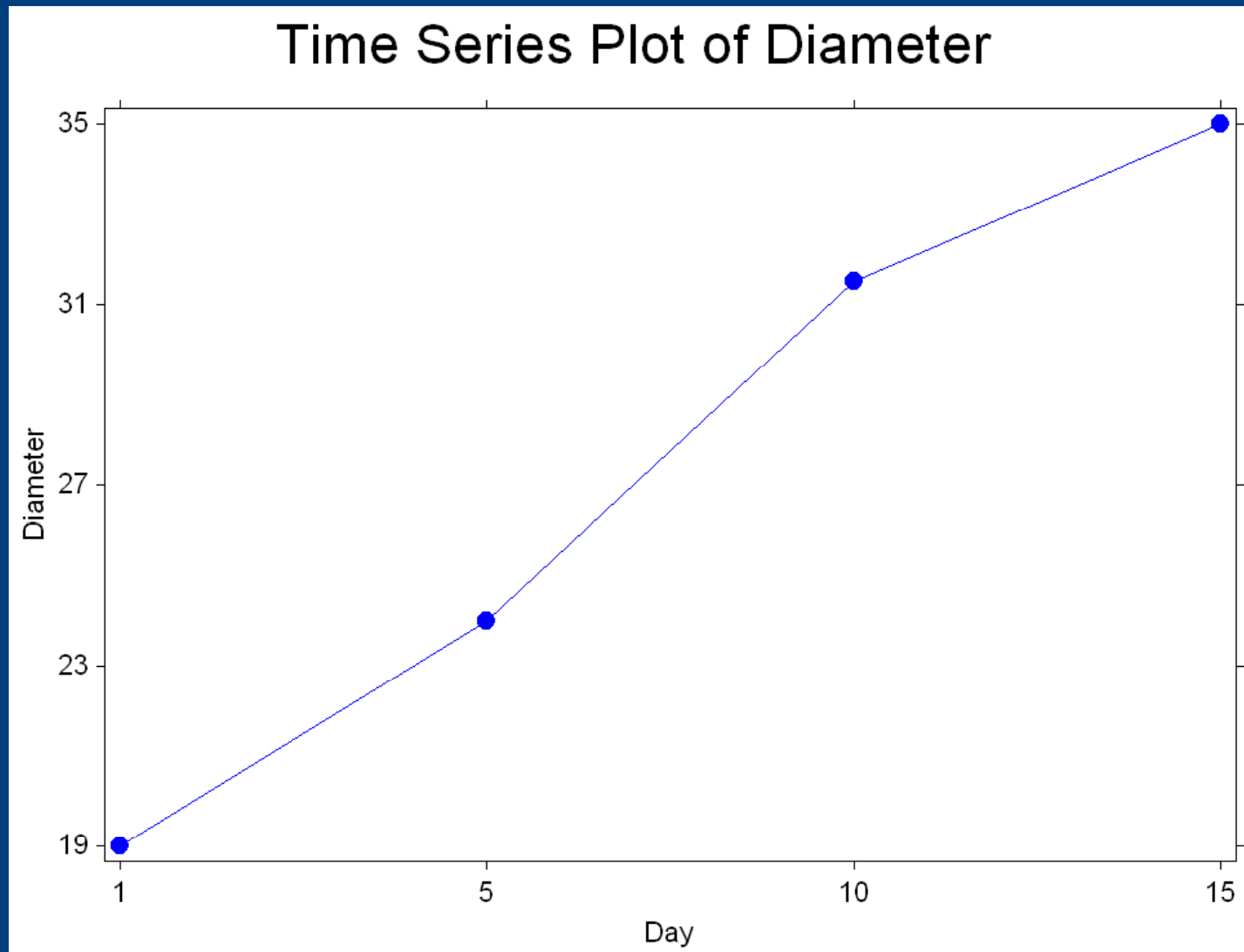
## Dry out ratio

Season	Irrigation	DOR
2005-2006	Control	3.5
	RDI	3.3
	PRD	3.4
2006-2007	Control	3.2
	RDI	3.2
	PRD	3.1
2007-2008	Control	3.5
	RDI	3.5
	PRD	3.7

## Soluble solids contents of fruit

<b>Season</b>	<b>°Brix</b>
<b>2005-2006</b>	<b>23.3</b>
<b>2006-2007</b>	<b>24.0</b>
<b>2007-2008</b>	<b>20.9</b>

- Irrigation strategies (RDI) were not implemented
  - fruit growth near linear
  - no shoot growth measurements
  - seasonal (climatic) interventions
  - equipment breakdown



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- RDI used 50% less water in 2006-07
- Similar amounts applied in 2007-08
- PRZI requires 2 lines
- Remain with replacement irrigation

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- Reduction in overall water use
- Plant water stress monitoring (orchard variation)
- Managing water stress during [blue drop](#) period
- Water application at harvest – size v dehydration
- RDI – need shoot growth pattern, spring soil water
- PRZI – application volume on each side, stomatal conductance
- California trip to study fruit tree irrigation Jul-Aug



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