

# Irrigation management: fruit quality

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Stonefruit Research Roadshow - August 2019

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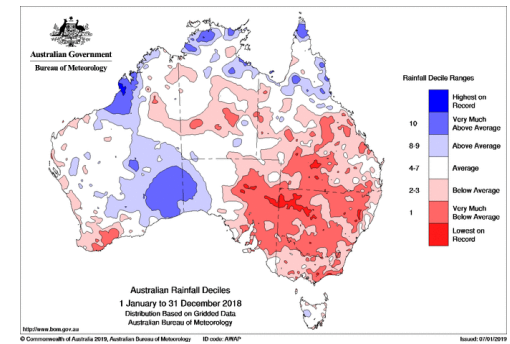


# Background

- Water scarcity
- Crop water requirements
- Deficit irrigation
- Yield and fruit size
- Fruit maturity, firmness, sweetness, colour

**Hort  
Innovation**  
Strategic levy investment

**SUMMERFRUIT  
FUND**



Stonefruit  
Experimental  
Orchard  
Tatura  
Australia



Stonefruit  
Experimental  
Orchard  
Tatura  
Australia



# Approach

- Advisory committee (growers, industry, Hort Innovation, Agriculture Victoria)
- Experimental orchard (3 ha, est. 2013), field experiments and tours
- On-line grower information (HIN website), regional and national roadshows

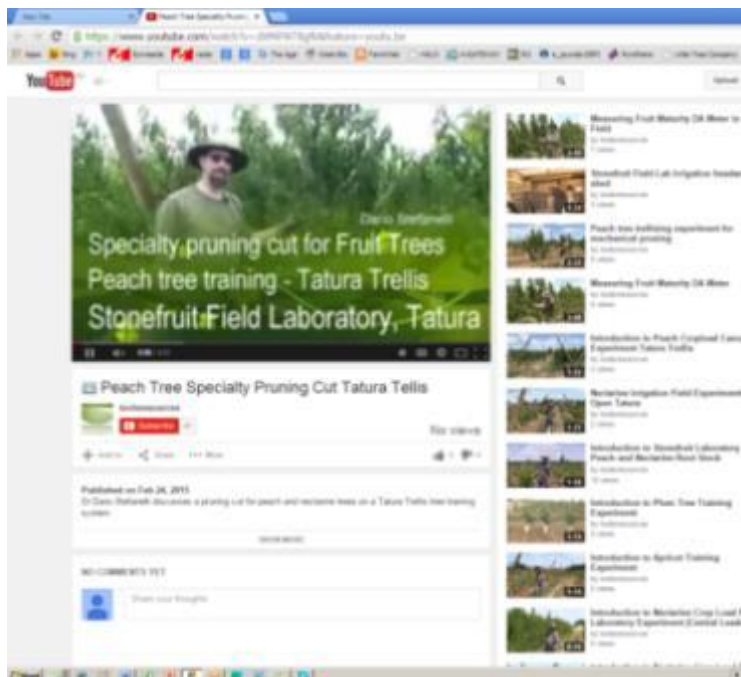
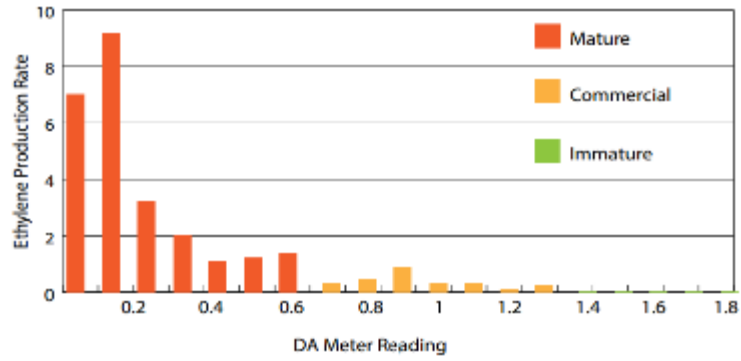
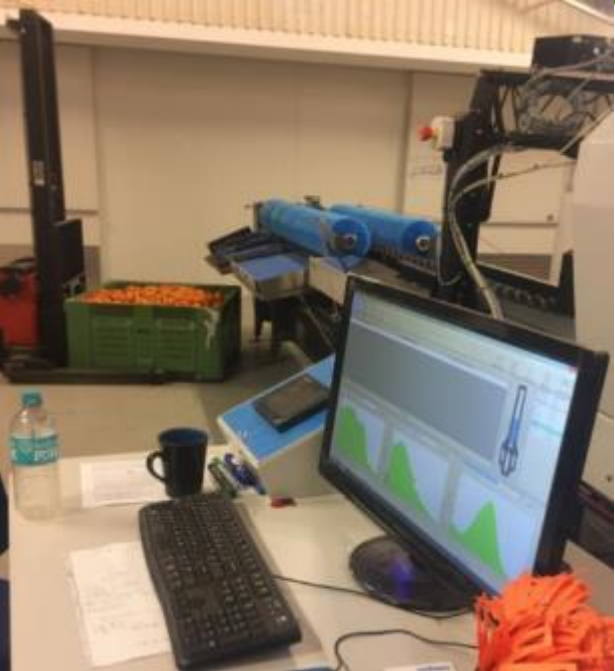
## Summary of field experiments and demonstration blocks of the Stonefruit Field Laboratory, Tatura.

Experiment	Species, cultivar	Treatment <sup>A</sup>	Tree training	Number of leaders per tree	Row spacing (m)	Tree spacing (m)	Year planted
1a	Peach, September Sun	Rootstock x Crop load	Vase	4	4.5	2	2013
1b	Nectarine, Rose Bright	Rootstock x Crop load	Vase	4	4.5	2	2013
2a	Peach, August Flame	Crop load	Vertical	2	4.5	1	2013
2b	Peach, August Flame	Crop load	Tatura Trellis	2	4.5	1	2013
2c	Nectarine, Autumn Bright	Crop load	Vertical	2	4.5	1	2013
2d	Nectarine, Autumn Bright	Crop load	Tatura Trellis	2	4.5	1	2013
3a	Apricot, Golden May	Crop load	Vase	4	4.5	1	2014
3b	Apricot, Golden May	Crop load	Tatura Trellis	2	4.5	1	2014
3c	Plum, Angeleno	Crop load	Vase	4	4.5	1	2014
3d	Plum, Angeleno	Crop load	Tatura Trellis	2	4.5	1	2014
4	Nectarine, September Bright	Irrigation level x Timing	Open Tatura	2	4.5	1	2014
Buffer 1	Nectarine, Ice Princess	Demonstration 1	Central Leader	1	4.5	2	2014
Buffer 2	Nectarine, August Bright	Demonstration 2	Palmette	2	4.5	2.4	2014
Buffer 2	Nectarine, Snow Flame 23	Demonstration 3	Palmette	2	4.5	2.4	2014
Buffer 2	Nectarine, Snow Flame 25	Demonstration 4	Palmette	2	4.5	2.4	2014
Buffer 2	Peach, O'Henry	Demonstration 5	Palmette	2	4.5	2.4	2014
Buffer 2	Peach, O'Henry	Demonstration 6	Cordon	2	4.5	2.4	2014
Buffer 3	Peach, Snow Fall	Demonstration 7	Central Leader	1	4.5	2	2015
Buffer 3	Peach, Red Haven	Demonstration 8	Central Leader	1	4.5	2	2015
Buffer 3	Nectarine, September Bright	Demonstration 9	Central Leader	1	4.5	2	2015

<sup>A</sup>Crop load and irrigation treatments to be implemented once trees become fruit bearing (3<sup>rd</sup> leaf).

# Methods

- Experimental orchard
- Growth, phenology, yield, fruit quality
- Light interception, crop water relations
- Field tours, Roadshows
- On-line information & products (HIN)



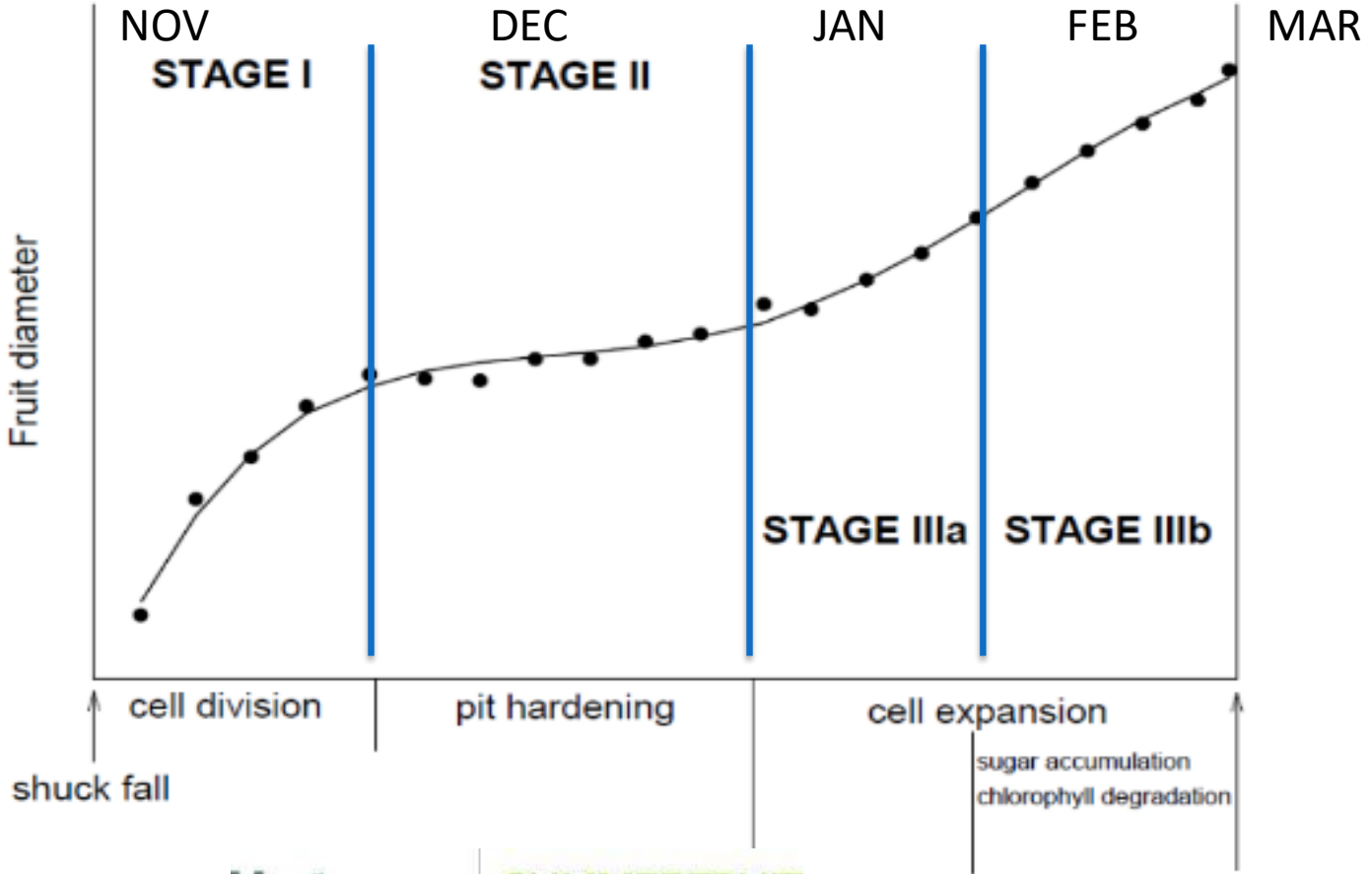
**Figure 1.** Nectarine Autumn Bright ethylene production and segregation in maturity classes of similar ethylene behaviour correlated to DA values. Maturity classes were: Mature = ripe (climacteric fruit), Commercial = usual maturity at commercial harvest (On-set of climacteric) and Immature = unripe (pre-climacteric fruit).

# Deficit irrigation

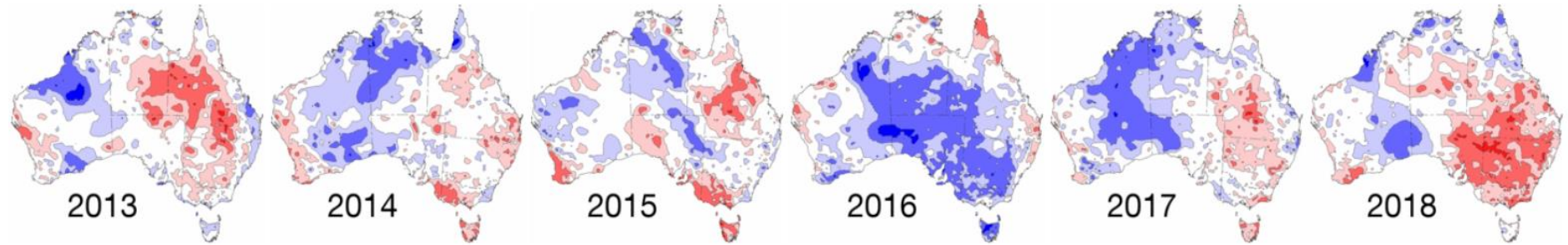
		Fruit growth stages			
		I	II	IIIa	IIIb
Irrigation treatments	0% of ETc	0% of ETc	0% of ETc	0% of ETc	0% of ETc
	20% of ETc	20% of ETc	20% of ETc	20% of ETc	20% of ETc
	40% of ETc	40% of ETc	40% of ETc	40% of ETc	n.a.
	Full irrigation: 100% of ETc				



'September Bright' Nectarine



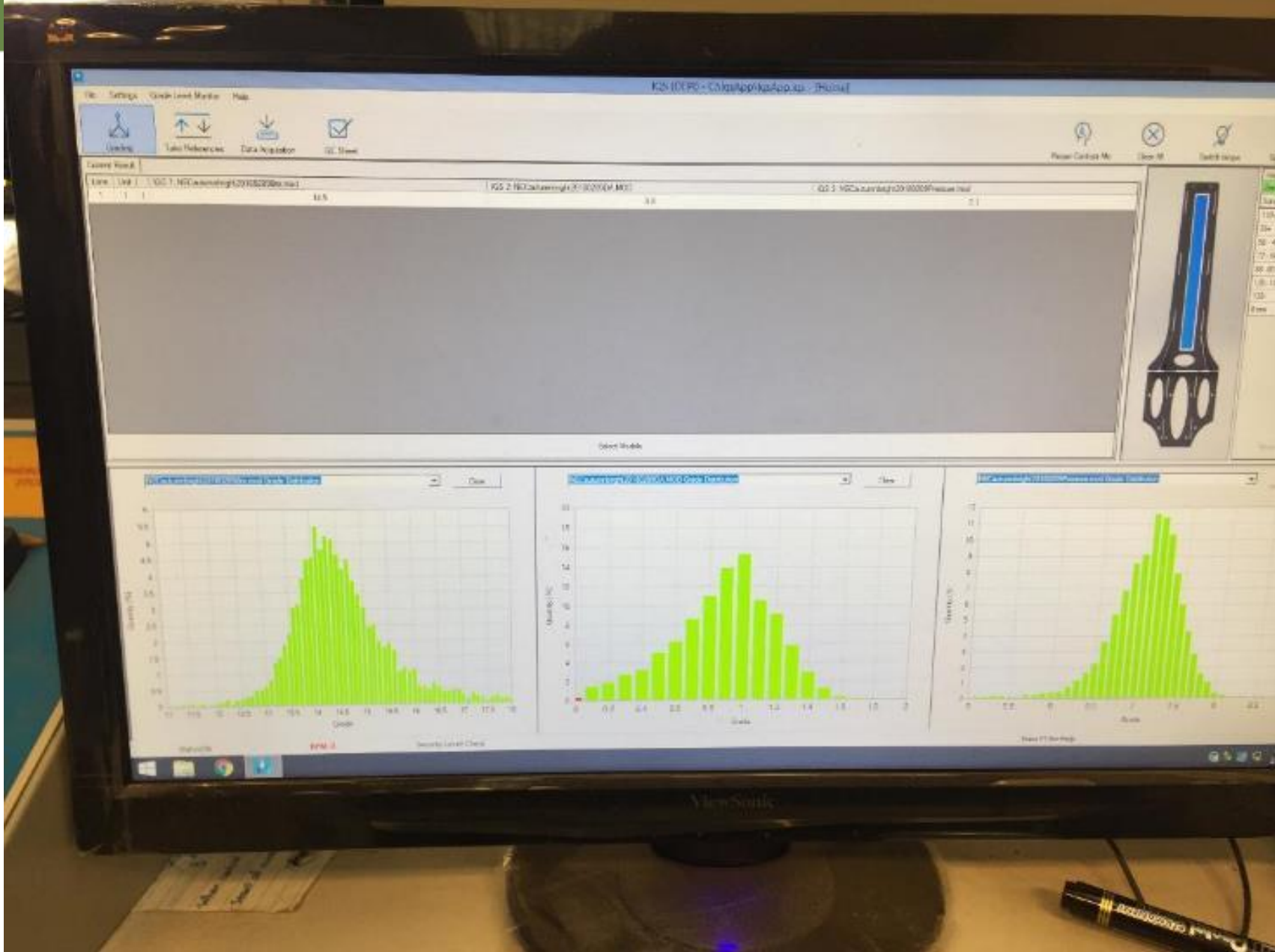
# Seasons 2013-2018



[www.bom.gov.au](http://www.bom.gov.au)







# Deficit Irrigation

## Tree performance ?

## Fruit behaviour ?

**SUMMARY**

RED = not significant

- Field measurements (pre-harvest, post-harvest)
  - irrigation, rainfall, evaporative demand
  - phenology, pruning weight, light interception, trunk diameter
  - fruiting lateral strength
  - fruit diameter (growth)
  - fruit floescence, leaf floescence
  - leaf conductance, stem water potential
- Grading/Packhouse measurements (harvest)
  - yield
  - fruit number
  - fruit quality (size, sweetness, maturity, skin colour)



# Deficit Irrigation



# Deficit Irrigation 40% ETC

**SUMMARY**

Stage I (cell division, rapid fruit growth):

- reduces yield
- reduces fruit size, colour
- reduces vegetative vigour (pruning biomass, light interception)

Stage II (pit hardening, slow fruit growth, max. vegetative growth):

*Regulated Deficit Irrigation (RDI):*

- maintains yield
- maintains fruit size, sweetness, colour, maturity
- maintains vegetative vigour (pruning biomass, light interception)



Stage III early (cell expansion, rapid fruit growth):

- reduces yield
- reduces fruit size
- advances fruit maturity
- maintains fruit sweetness, colour
- maintains vegetative vigour (pruning biomass, light interception)

# Severe Deficit Irrigation (rainfed, 20% ETC)

**SUMMARY**

Stage I (cell division, rapid fruit growth)

Stage II (pit hardening, slow fruit growth, max. vegetative growth)

Stage III *early* (cell expansion, rapid fruit growth)

- reduces yield
- reduces fruit size
- reduces vegetative vigour (pruning biomass, light interception)

Stage III *late* (cell expansion, rapid fruit growth + sugar accumulation):

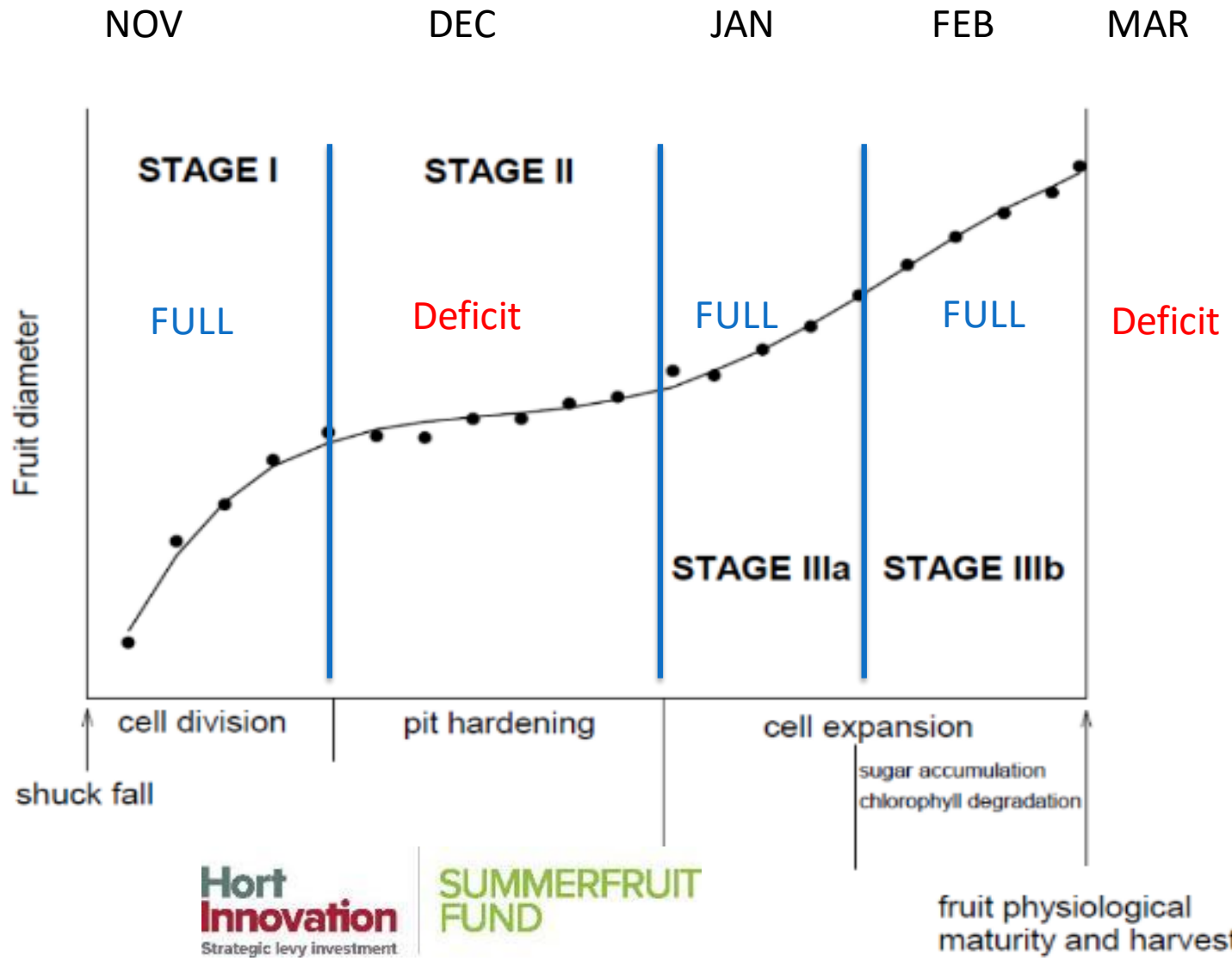
- reduces yield
- reduces fruit size
- increases fruit sweetness, colour
- delays fruit maturity
- reduces vegetative vigour (pruning biomass)



# Water limited season

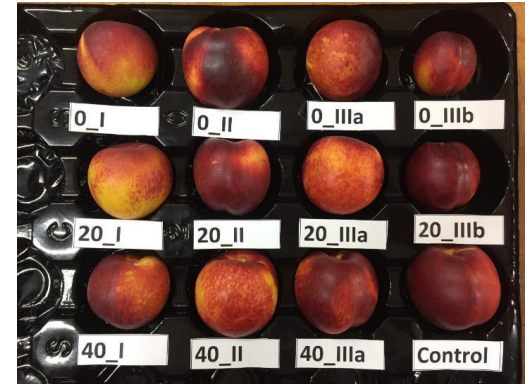


'September Bright' Nectarine



# Conclusions

- Low irrigation inputs:
  - reduces yield and fruit size
- Stage II deficit irrigation 40% ETC Regulated Deficit Irrigation (RDI)
  - maintains yield, fruit size and fruit quality







## Acknowledgments

**Hort  
Innovation**  
Strategic levy investment

**SUMMERFRUIT  
FUND**

Economic Development,  
Jobs, Transport  
and Resources