



# Irrigation Field Day: Avowest - Carabooda





# Waterwise on the Farm

- **Waterwise on the Farm is a joint irrigation and training initiative, delivered by the Swan Catchment Council and Dept of Agriculture and Food.**
- **The project aims to raise awareness of sustainable irrigation management practices and to identify opportunities for improving on farm water use efficiency.**
- **Irrigation Efficiency – Principles to Practice training courses**
- **Sustainable Irrigation Demonstration Sites**
- **Landholder support**
- **Funded by the Federal Government's National Landcare Program (NLP)**



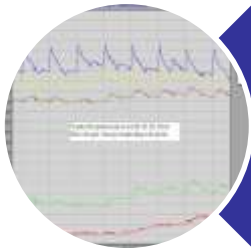
# Main Discussion Points



**Sprinkler Trials and Results**



**Water Savings**



**Management Issues of  
Converting to Micro  
Sprinklers**



# Reasons for Conversion



Original Naan Mamkad sprinklers had a average Distribution Uniformity of 61% across the orchard. 75% min for head to head systems. Large flow variation (200-400L/hr)



Sprinklers were delivering a significant amount of water between the rows where root activity appeared to be reduced and less uptake by the trees.



Remain within or close to water allocation for the property



Water and power savings



Something to do???



# Supporting Data for Conversion

## Leachate lysimeter data (05-06 irrigation season)

**Midrow: 7609mL (168mm)**

**Treerow: 1006mL (22mm)**

**168mm (168L/m<sup>2</sup>) could be redirected to  
the treerow area, where it is most  
needed**

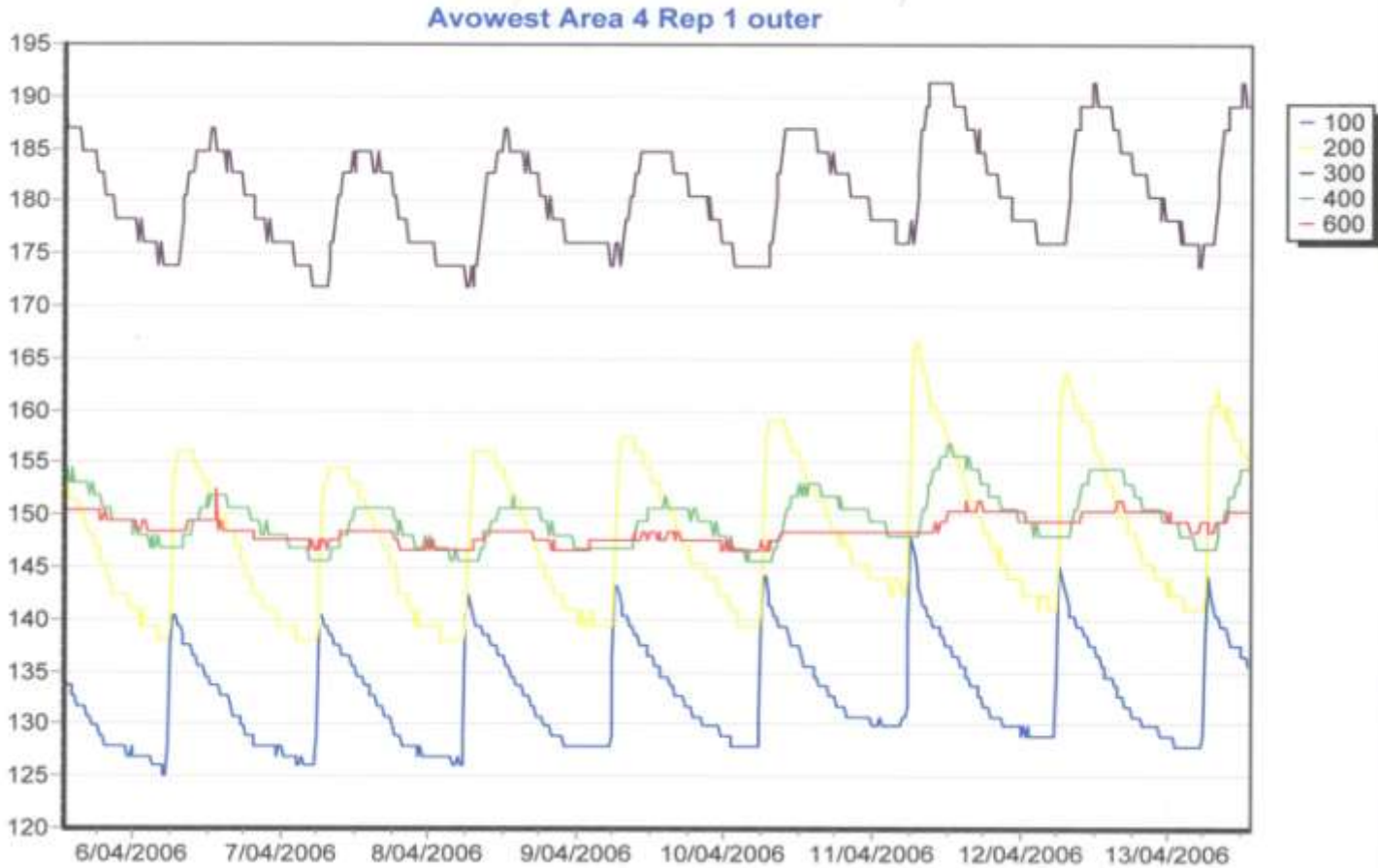


# Supporting Data cont.





# Supporting Data cont.





# Sprinkler Requirements

- 1. Wetted radius up to 4m or 7 m wetted diameter to mould with tree spacing. Greatest application within first two metres**
- 2. Flow of 90-95L/hr per sprinkler @ 200kPa**
- 3. Pressure compensated (even flow at variety of pressures, sloping blocks)**
- 4. Durable (squirrel damage)**
- 5. 1-2mm/hr application in the midrow (wetted radius touch between tree rows)**
- 6. Value for money**



# Sprinkler Models

4 sprinklers were selected with a variety of nozzles, plates, swivels etc

Netafim Supernet GS  
Toro Waterbird IV  
Naan 2002 Aquasmart  
Nelson R5





# Results from Trials

	Wetted radius	MAR	Field flow	Midrow 1-2mm	Price (2008)
<b>Netafim (90L/hr)</b>	3.25m	4.2 mm/hr	101L/hr and 96.6L/hr	0.4mm /hr @ 3.25m	\$3.13 (+GST)
<b>Toro (90L/hr)</b>	3.75m	3.5 mm/hr	92L/hr @ 280kpa*	1.6 mm/hr @ 3.25m*	\$3.86 (+GST)
<b>Naan (95L/hr)</b>	3.5m	4 mm/hr	91L/hr @ 290kpa 94L/hr @ 200kpa	1.6mm/hr @ 3.5m	\$3.95
<b>Nelson (91L/hr)</b>	4.25m	4.2 mm/hr	?	2.5mm/hr @ 3.5m	\$3.95



# Results from Trials

1. Nelson R5 (green plate) had a good uniformity (65%) and low water application in the midrow (2.5mm/hr), but were expensive to purchase (in 2006).
2. Netafim Supernet application in the midrow was low (0.4mm/hr), 200kPa max pressure, plates stick (observation), wide variety in flow (up to 100L/hr)
3. Toro Waterbird sprinklers had high flow variation at different pressures, higher midrow throw at higher pressure
4. Naan 2002 Aquasmart displayed even flow at different pressures, 1.6mm/hr in midrow (higher throw), highly visible, can convert to other sprinkler stands (toro, wingfield challenger)

**Note: sprinklers should be trialled at a variety of pressures**



# Conversion Process

- 1. Removal of 269 Mamkad 300's, 58 Olive sprinklers (35L/hr) and 18 Dan 150's.**
- 2. Link stations A1 and A5 to form 1 station**
- 3. Install approx 556 new sprinklers (3.5m spacing, 2 per tree) Netafim sprinklers choosen (was this the right choice?)**
- 4. Altered the irrigation schedule for the new sprinklers (new MAR)**



# Savings!

## Old sprinklers

**Runtime** (6mm evaporation/day)

$6\text{mm} \div 5.5\text{mm (MAR)} \times 60$

= 65mins

$65\text{mins} \times 2 \text{ (stations)} = 130\text{mins}$

## Water flow

130 mins @ 830L/min

= 107,900L (107kL)

## New sprinklers

**Runtime** (6mm evaporation/day)

$6\text{mm} \div 4\text{mm (MAR)} \times 60$

= 90 mins

## Water flow

90 mins @ 830L/min

= 74,700L (81kL)

**Save 40 mins pump runtime/irrigation**

**= 33.2kL/6mm irrigation**

**11,841kL saved over 1 year**



# Savings!

## Power (demo site area)

Peak: \$841

Off Peak: \$260

(18.5Kw pump, 19.13c peak, 5.9c off peak, irrigate all year round)

## Nutrients

Hard to quantify, but no longer fertigating in the midrow

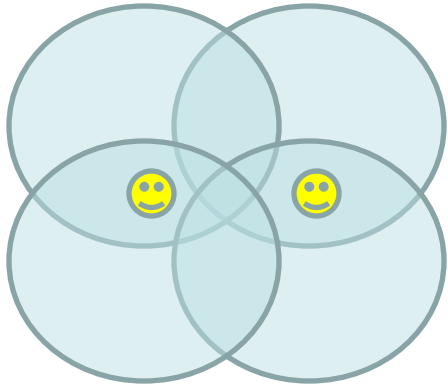


# Management Issues Identified

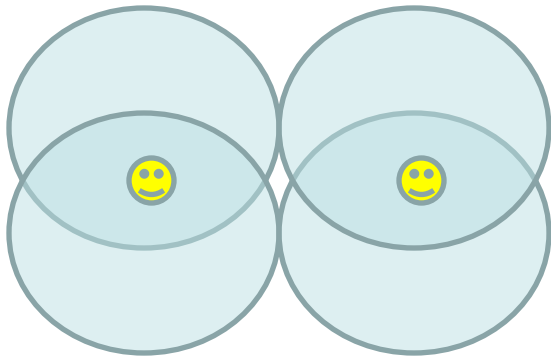
- **Salts in the rootzone**
- **Critical irrigation times**
- **Depletion of soil water reserves**
- **Rainfall and canopy effects**



# Salts in the rootzone



- Irrigation water: 1.2 dS/m
- Avg 2.0 dS/m before new sprinklers, Avg 3.0 dS/m after change over
- Variable throughout the year (dependant on irrigation and rainfall)





# Salts in the rootzone

**Converting to micro sprinklers will reduce the wetted area under the trees.**

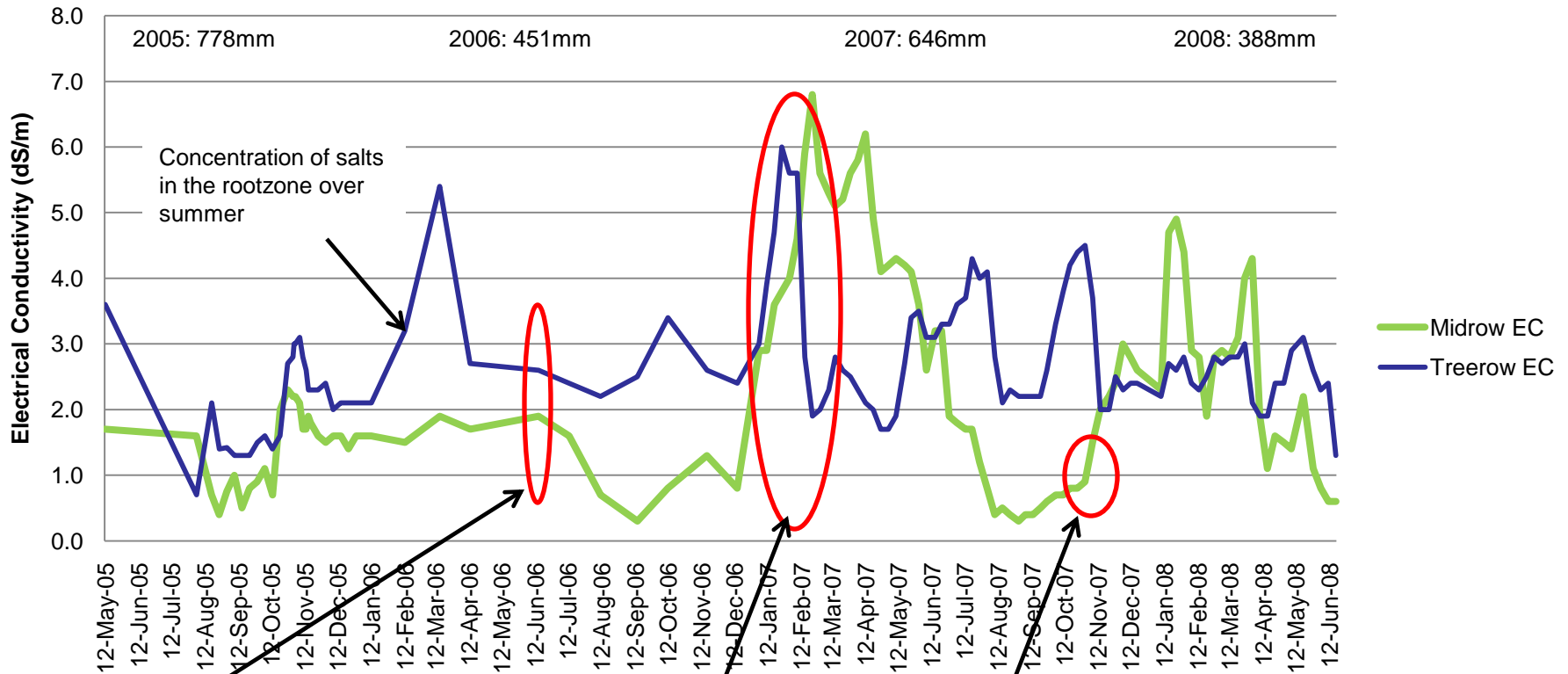
**Irrigation dependant feeder roots in the midrow area no longer have access to water and nutrients.**

**Increased management of the new wetted zone is needed to ensure the trees receive enough irrigation and that salts do not build up.**



# Salts in the rootzone

## Treerow and Midrow EC (15cm) 2005-2008



Netafim sprinklers installed

Pulsing causing EC to rise in treerow

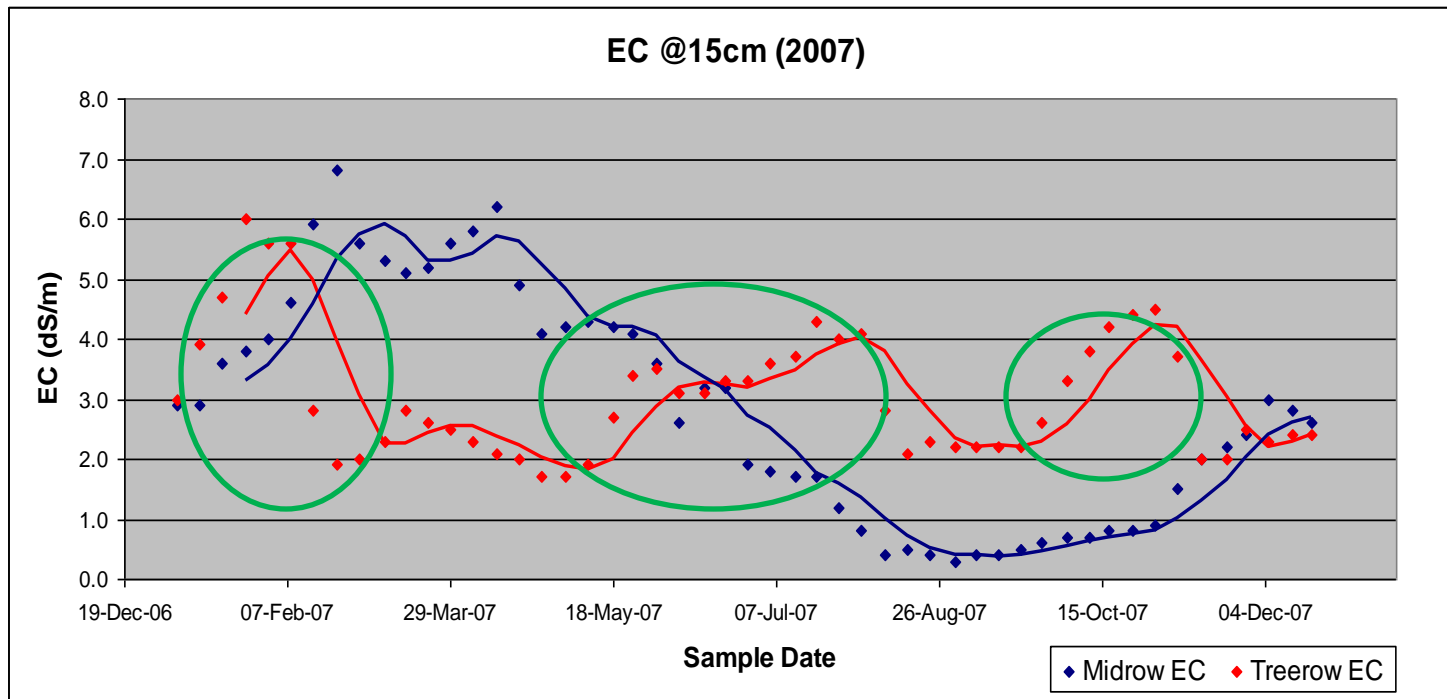
Moved equipment to Mamkad are



# Critical irrigation times

Identified end of summer, end of winter and end of spring as critical irrigation times (spikes in EC and sodium)

Flowering (September)





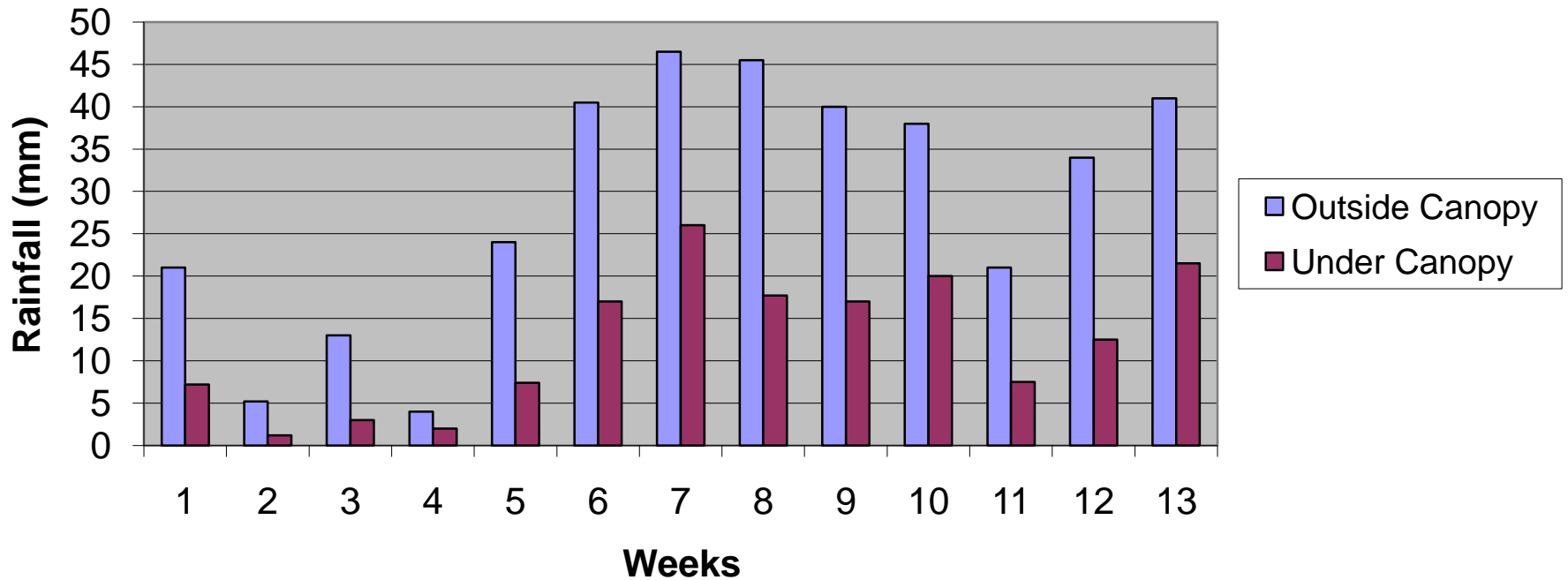
# Depletion of soil water reserves

- Week starting 28<sup>th</sup> Nov 2007 – graph shows how soil moisture is depleted with one irrigation per day. At 4-5pm flat lines occur, trees are shutting down. High evaporative demand
- Strategy to combat this was to irrigate at approx 4pm (8<sup>th</sup> December 2007), stop the trees from shutting down – disadvantage of this is evaporation
- Leaching irrigations – (19<sup>th</sup> Jan 2008 to 8<sup>th</sup> Feb 2008) 2-3 irrigations per day (usually at night). Strong wetting fronts, leaching the top 150mm. EC from 2.8 to 2.3dS/m. Highest metered usage for the season.



# Canopy Effects

## Effective Rainfall Under Avocados



Effective Rainfall = 40% reached the ground under the canopy



# Soil Moisture Monitoring

- **Ventek Capacitance Probes**
- **Sentek Capacitance Probes**
- **MEA G-bug**
- **Campbell Scientific – Hydrosense TDR probe (CS620)**
- **Full Stop Wetting Front Detector**
- **any others?**



Thanks for listening!!