

Salinity Impact on Lower Murray Horticulture

Tri-State (SA, VIC & NSW) Salinity Project



Gerrit Schrale¹, Tapas Biswas¹, Rob Stevens¹, Graeme Sanderson², J Alam³ Masoud Edraki⁴ and Kate Cunnew⁴



¹SARDI Water Resources & Irrigation, PO Box 397, Adelaide 5001. Schrale.Gerrit@saugov.sa.gov.au

²NSWDPI, Dareton Agricultural Research Station, PO Box 62, Dareton NSW 2717

³PIRSA Rural Solution, PO Box 411, Loxton SA 5333 ⁴VicDPI, PO Box 905, Mildura VIC 3502

ISSUES

- Sustainable irrigation relies on leaching of root zone
- A higher Water Use Efficiency (WUE) may increase root zone salinity
- Leaching Efficiency¹ (LE) may explain why more salts are found in the root zone
- Regional horticulture with gate value of \$2-3 billion/year is potentially at risk

PROJECT OBJECTIVES

- Determine/update the crop salinity relationships
- Determine the variability of EC (soil water) and leaching efficiency in the field
- Simulate different scenarios of River Murray salinity at Morgan
- Input to the MDB Salinity Strategy and Integrated Catchment Management Plan

FINDINGS

- 14 properties: mean 63% leaching efficiency with a CV of 77% (Table 1)
- <10% RZ drainage in summer under drip (Table 2)
- Soil Solution EC under drip often much higher than threshold salinities (Figure 1)
- Seasonal salt build up: 800 EC irrigation adds 2t salt/ha: potential major yield loss
- Model simulation enables future scenario assessment (Figure 2)
- For precision irrigation with high EC water: RZ salinity management is critical!!

Table 1. Riverland/Sunraysia salinity survey on Leaching Efficiency

No of farms surveyed	Years under irrigation	Clw	Observed Clsw	Leaching Fraction =1-FAE or Clw/Clswb [*]	Predicted Clsw	Leaching Efficiency
		mmol/L	mmol/L		mmol/L	
14	>45	1.2	12	0.2	4.1 –5.1**	63%

Clw= Cl conc in the applied water. Clsw= Cl conc in the soil solution

^{*}estimated as twice the Cl concentration in the saturated paste extracts ^{**}P=0.01 paired t-test between Clsw and predicted Clsw

Table 2. Estimated Deep drainage from citrus and vineyards in Riverland & Sunraysia

Site/crop/Irrig system	Irrigation	Rainfall	Deep Drainage
	mm		%
Loxton vine drip	510	177	ND ^a
Irymple vine drip	343	116	1 (±0.02; n=10) ^b
Loxton vine uc sprinkler	735	177	21 (±3; n=53)
Dareton citrus uc sprinkler	912	102	17 (±4; n=31)

^aND=Not detected ^bvalue in parenthesis indicates standard deviation (SD) and n = sample size

¹Leaching efficiency = Fraction of drainage water consisting of displaced soil solution (Bouwer, H. 1969. J Irrigation & Drainage, 95:153-170)

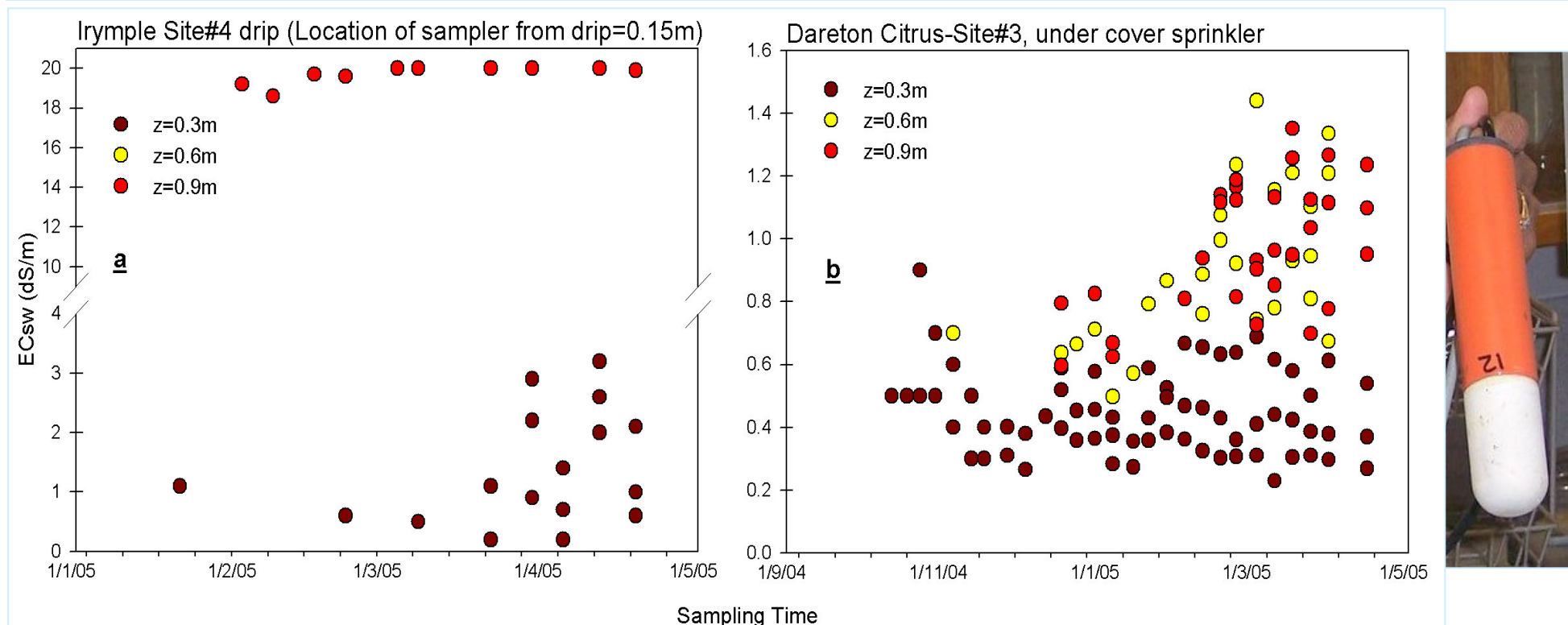


Figure 1. Soil water salinity (ECsw) under (a) a drip irrigated vine and (b) an under-cover sprinkler citrus tree. On the right: soil solution extractor

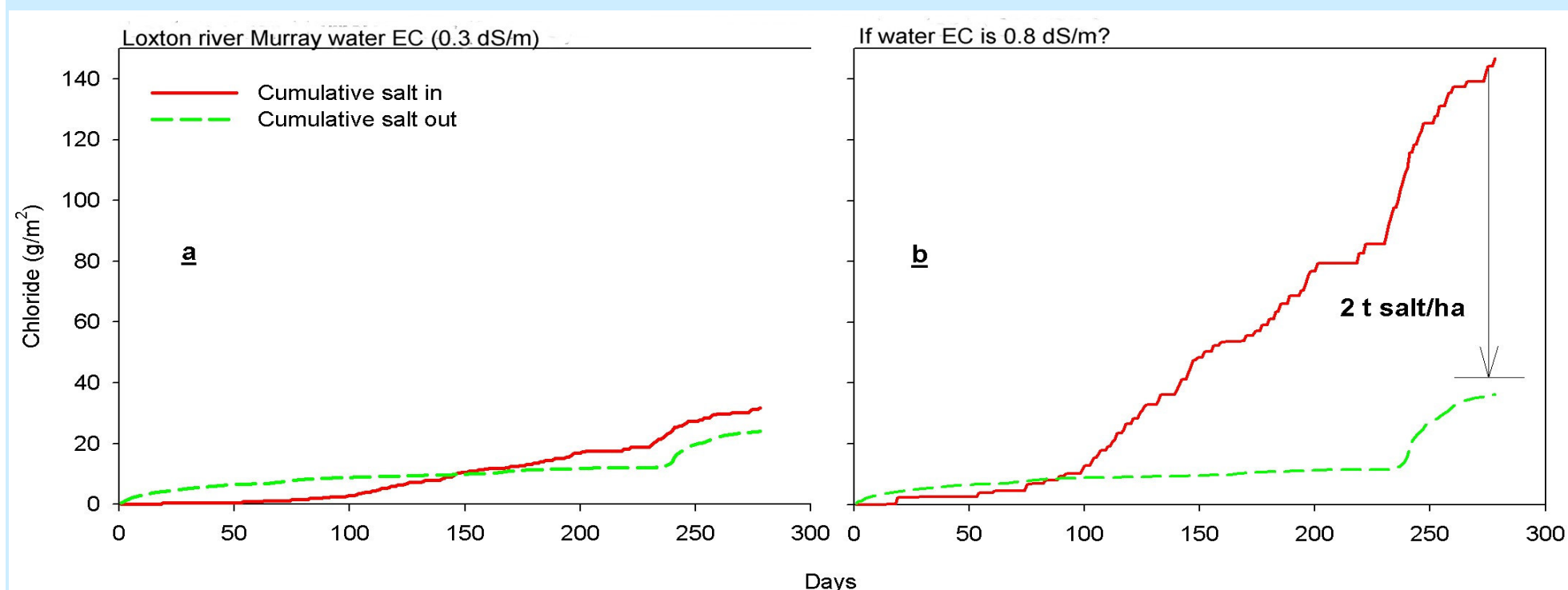


Figure 2. Predictions of a two dimensional salt transport model on root zone salinity for two River water ECs, (a) 0.3 dS/m (current), and (b) 0.8 dS/m at Morgan

FUTURE DIRECTION

- A user-friendly toolkit for growers to monitoring root zone salt
- A robust simulation model that accurately predicts root zone salinity under different Leaching Efficiency, River EC and climate conditions
- Management strategies for minimum yield losses in times of high River EC

ACKNOWLEDGEMENTS

Funding from NPSI (LWA), MDBC, RMCWMB and Mallee-CMA

Project Team: Jahangir Alam, Bill Ashcroft, Tapas Biswas, Ann-Maree Boland, John Bourne, Kate Cunnew, Masoud Edraki, Stuart Putland, Graeme Sanderson, Maxine Schache, Gerrit Schrale, Rob Stevens, Mike Treeby, and Rob Walker