



Department of  
Primary Industries



South East  
**Soil & Water**  
Environmental & Agricultural Science

# Soils

## *Structure and Irrigation*

Sam North – NSW DPI, Deniliquin

Christian Bannan – South-East Soil & Water

# Past research

## 1999 – Colin Aumann, Bill Ashcroft, Alf Cass

- 20 sites, 12 soil types, drip and furrow irrigated
- physical – PSA; AFP: BD; WSA; slaking/dispersion; PR; RAW; TAW
- chemical – pH; EC; SAR; Na & Cl
- TomCHECK ???

## 2000–2004 – HAL, Unilever & Outsourced Environmental

- monitoring system and BMP for processing tomato
- development of EMS
- water and nitrogen management – findings = ???

## 2015 – Miing Tiem, Richard Doyle, Peter Fisher

- cations and fines moving away from emitters

# Problem definition

## Visit from CRC Soils – Oct 2018

- Rochester Sth
- Rochester – Echuca
- Boort

## Visit to Gelch Farms – Jan 2019

- 12 t/ha wheat crop in 2018 after 4 yrs tomato
- 48°C day
  - year 1 crop – thriving
  - year 2–3 crop – reduced leaf area

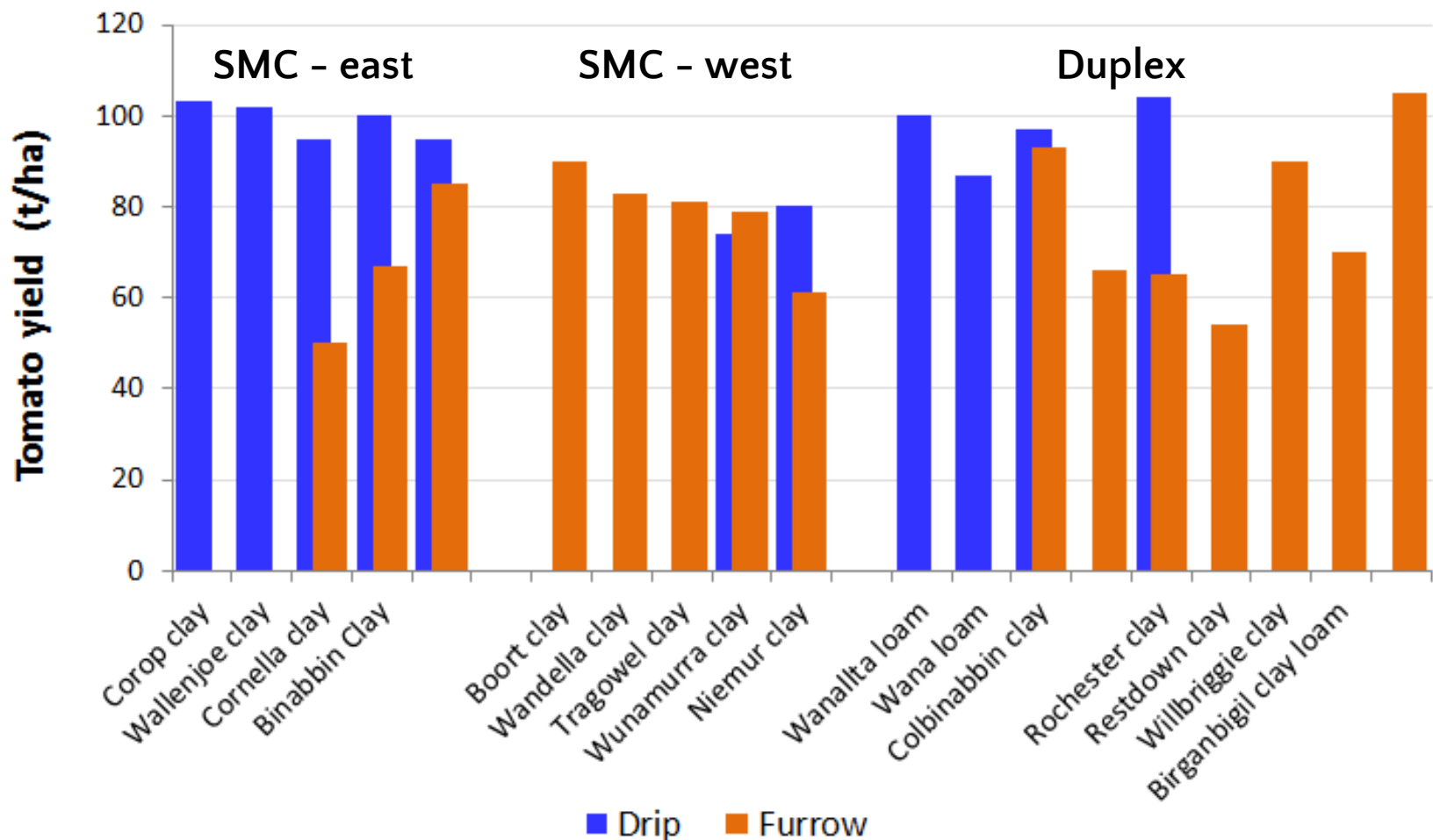
**cause – condition – effect**



# Soils & irrigation systems - should match

Pick the system that best suits the soil type (intake rate)

- TomCHECK avg yield data 1995-97 (from Aumann et al 1999)



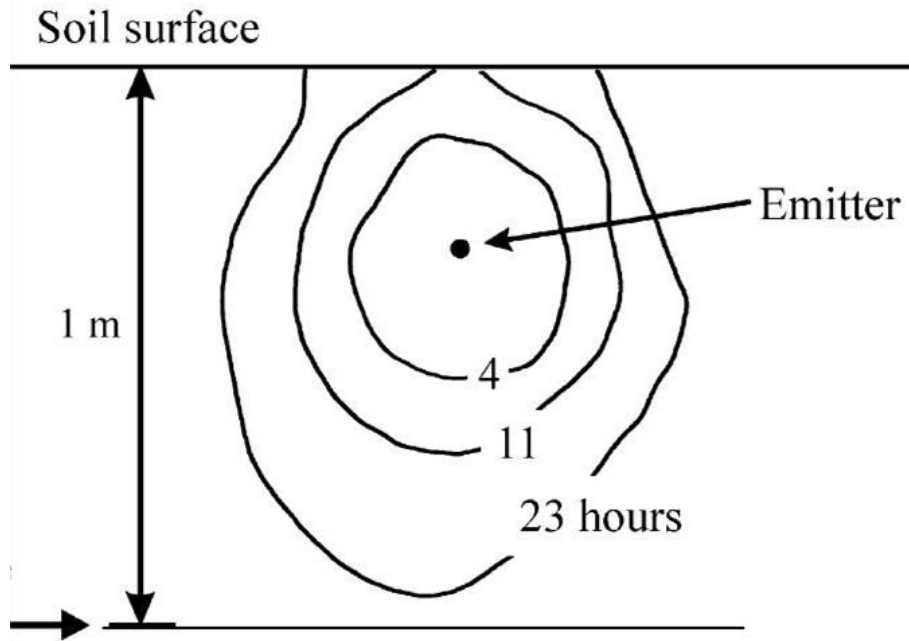
# Soils & irrigation systems – should match

## SSD emitter rates and $K_{sat}$

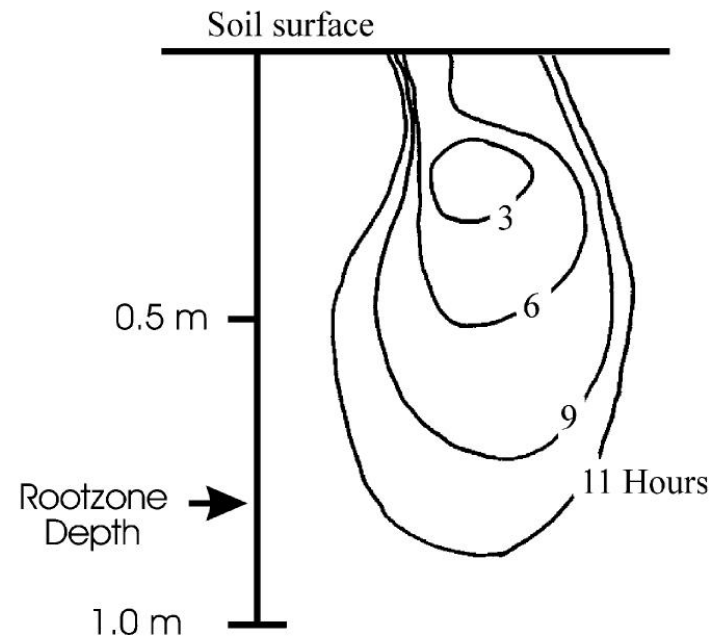
- Miing Tiem – transport of “fines”
  - only one soil – Rochester clay
  - A horizon  $K_{sat} = 19.5$  mm/hr      (*B horizon  $K_{sat} = 1.73$  mm/hr*)
- current SSD system
  - 0.5 m spacing & 1.65 L/hr
  - radius of sphere when emitter rate =  $K_{sat}$  is 0.26 m
- match emitter to soil hydraulic properties
  - to supply 20 mm/day to  $0.4 \text{ m}^2 = 8$  L/day
  - this = 0.67 L/hr over 12 hrs
  - radius of sphere when emitter rate =  $K_{sat}$  is 0.16 m

# SSD and soil type

uniform - silty clay loam (lucerne)



duplex - loam over med clay (cotton)

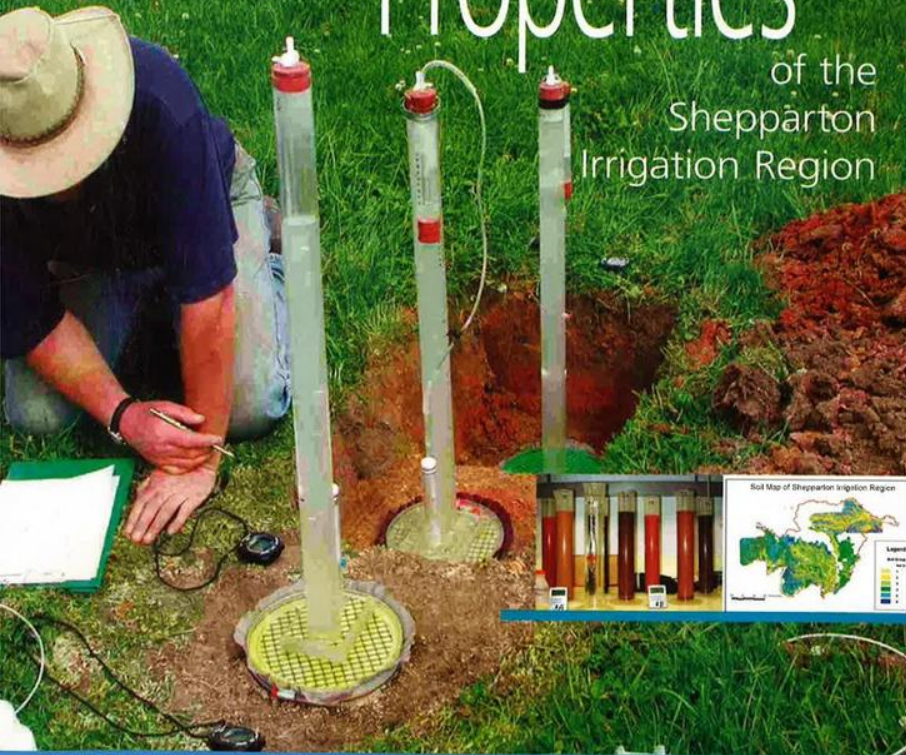


Battam, Sutton & Boughton (2003) [Soil pits as a simple design aid](#) for subsurface drip irrigation systems. *Irrigation Science*, 22: 135-141

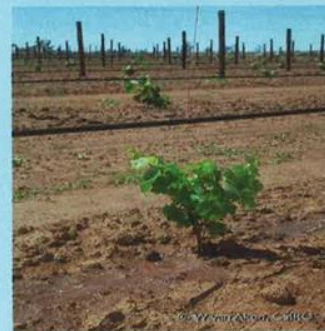


# Soil Hydraulic Properties

of the  
Shepparton  
Irrigation Region



## PHYSICAL PROPERTIES OF SOILS IN THE MURRUMBIDGEE AND COLEAMBALLY IRRIGATION AREAS



J. Hornbuckle and E. Christen

CSIRO Land and Water  
Griffith NSW 2680

Technical Report 17/99

June 1999

# Summing up

- good work has been done – needs collating/review
- benchmarking – where is it at?
  - TomCHECK
  - EMS
- cause – condition – effect
  - problem = financial
    - yield decline with mono-culture
    - cost of replacing tape every 4 yrs
  - on Rochester clay only? soil structural? emitter rates and soil pressures? disease build-up? loss of beneficials? soil chemical state (redox and pH)?
- investigate – **not experiment** (to link plant response with condition)
  - water and O<sub>2</sub> status, pH; soil microbial population; leaf area
  - multiple soil types – duplex, SMC east, SMC west
  - years in tomato – 1, 2, 3, 4+



