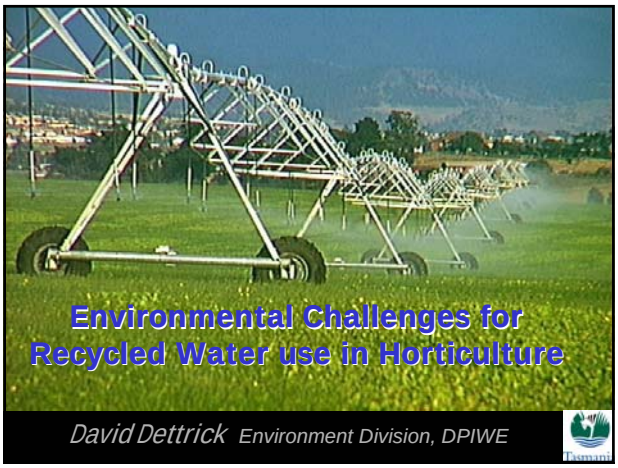


# Environmental Challenges for Recycled Water use in Horticulture

*David Dettrick* Environment Division, DPIWE

## Overview of Presentation

1. Cultural Challenges
2. Public Perception and Safety
3. Farm 'Biz as usual' Challenges
4. Water Quality Challenges
5. Soil-Geo-Climate Challenges
   Nutrients, Salt, Sodicity, Heavy Metals
6. Economic Challenges

## Cultural Challenges

- European cultural baggage - unmentionable, taboo issue
- Many Asian cultures see us as unclean - toilet seats, dumping effluent in rivers
- Farmers culture "he's using shit water"
- Easier than NZ -Maoris will not permit recycling human wastes
- TALC appears to have no problems in Tassie -other indigenous groups?

**Community Involvement:**

**Education + Participation = Acceptance**

Adapted from *Integrated Water Cycle* Listowski 2003

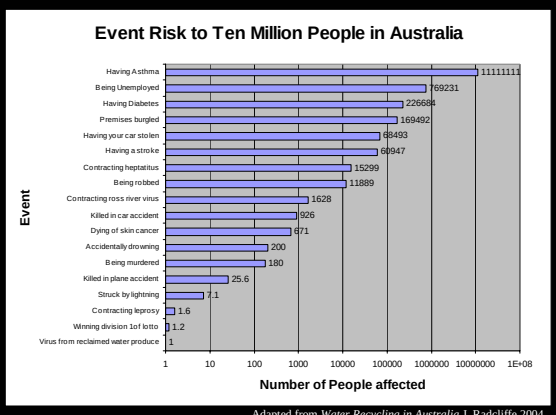
## Cultural Challenges

**Some possible solutions:**

- Educate public about resource recovery and soil loss
- Favourable comparison with existing practices such as manuring, or poor QA on farm dam water
- Avoid focusing on raw product, avoid language that over simplifies treatment such as "from toilet to paddock".
- Use "recycled water" as accepted terminology

## Public Perception and Safety

- Sounds like a risky activity
- Pathogens, Salt, Heavy Metals, Ground water pollution etc
- Consumer boycot fears -Simplot boycott of vegetables grown with recycled water
- Relative risks -cars o.k but wastewater is dangerous!
- Food safety fears



Adapted from *Water Recycling in Australia* J. Radcliffe 2004

## Public Perception and Safety

**Solutions may be:**

- Continue high profile for public debate
- Demonstrate strong HACCP, food safety QA, and OHS risk management both supply and demand
- Education about use of recycled water - stormwater, greywater & management systems
- Demonstrate the environmental and health risk reduction logic
- More classes of water for management
- Funding for recycling, education, guideline development

## Farm Biz Challenges

- Economic cost -storage, irrigation gear, benchmarking and ongoing monitoring
- Drought proof, but not pathogen proof still risks to farmers -crop failure
- Insufficient technical skills -agronomy, irrigation schedule, ground water monitoring
- Environmental Management Plan - sustainability, regulators, third party examination of conditions -hard work?


AGFEST 2002

## Farm Biz Challenges

**Possible solutions:**

- Training for water recycling growers e.g. “Wise Watering Training”
- Water suppliers provide high level technical support to growers
- Demonstrate benefits -better productivity, farm management system EMS or EUREPGAP “ready”

## Water Quality Challenges

- Potable Water Recycling -technically feasible, *culturally* impossible at present?
- ‘*Class A*’ recycled water -salad crops, very expensive to achieve -status complicated by new national guidelines
- Salt content -limitation to site life
- P content -limitation to site life

**4 stage, on-demand, under sink Reverse Osmosis**

**$480**

**(3 stage RO $300)**

Purestream Water Filters

## Water Quality Challenges

- **Nutrient removal usually required to allow full hydraulic capacity to be used on most soils**

| | WW Conc. | Paddock | WW Conc. | Paddock | Ryegrass/clover |
|---|---|---|---|---|---|
| P | 10 mg/L | 60kg/ha | 1mg/L | 6kg/ha | 9kg/ha |
| N | 40 mg/L | 240kg/ha | 20mg/L | 120kg/ha | 125/kg/ha |
| | Secondary Effluent | | Basic Nutrient Removal | | |

Assume 600mm WW applied per ha per year

## Soil-Geo-Climate Challenges

- **50% of Tasmania too wet for irrigation?**
- **Soil sustainability -Salt, PAC, SAR, ESP, CEC, OM ?**
- **Groundwater monitoring -who's role?, how to interpret?**
- **Agronomics -crop rotations, fallow paddocks -salt leaching**
- **Climate information, storage design and construction**
- **Irrigation technology -scheduling control, spray drift**
- **Nutrient removal for small Councils/WWTP -future salt removal?**

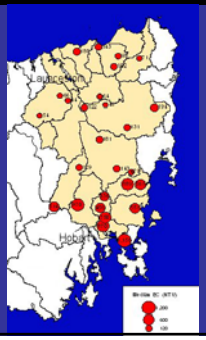
## Soil-Geo-Climate Challenges

**Nutrient management**

- Nutrient management required to protect WQ for surface and groundwater
- Irrigation scheduling based around nutrient budget and hydraulic crop requirements
- Buffer distances to surface waters assessed on case by case basis
- Slopes < 10%
- Groundwater & surface water monitoring
- PAC assessment to determine site life

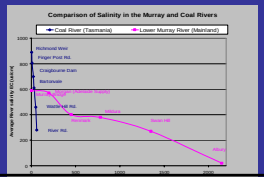
**Semi-solid set, Teatree Brighton**

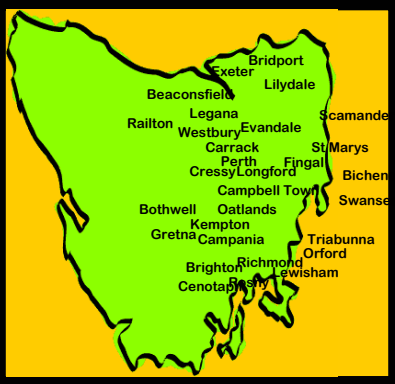
## Soil-Geo-Climate Challenges



**Salinity Management**

- Most waterways in South-Eastern Tasmania are highly saline.
- South East Tas has saline surface/w
- Recycled water can also be saline
- EC may not be a good test for sodium





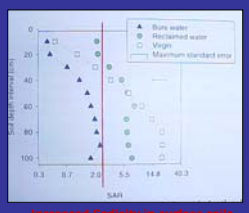

Location of Water Recycling Schemes in Tasmania

Buck's Horn Plantain *Plantago coronopus*
-two different forms

# Soil-Geo-Climate Challenges

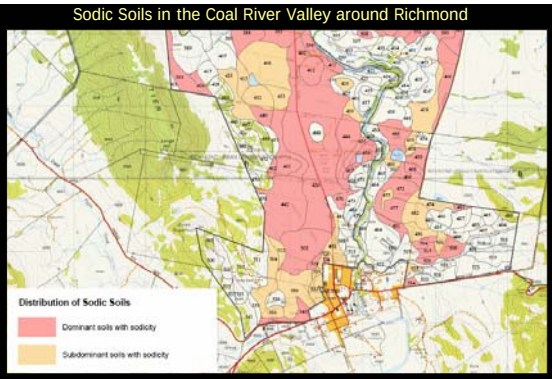
## Sodicity Management

- Almost nothing is known about sodicity in the TAS NAP area.
- Poor understanding of its effects on production and the environment.
- Research effort is required to investigate economic options for managing sodic soils.
- Standard remediation with Gypsum is expensive (Tassie $150t, Mainland $40-$60t).
- Greater mapping and documenting sodicity problems is required.



Increased Sodicity in surface soils resulting from irrigation with wastewater (NRE South Australia).

Sodic Soils in the Coal River Valley around Richmond




* Poor root penetration,
* Highly erodable
* No sodicity mapping in Tasmania except historic problem sites
* Hold little water
* Crust badly.
* Wide spread

# Soil-Geo-Climate Challenges

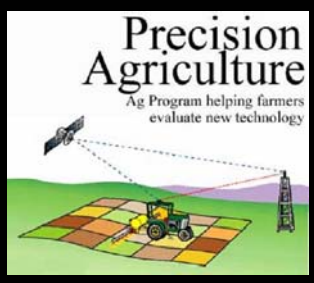
## Heavy metal management

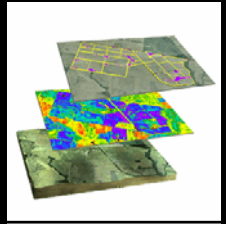
- Long term risk only in Tasmania
- Few industrial sources entering waste stream
- Improved trade waste management
- Most soils Cu & Zn deficient

Chemicals of Concern
•Pharmaceuticals
•Personal Hygene Product
•National Working Group

Heavy Metal Analysis for 6 Reuse Schemes in Tasmania

| | Cd | Cr | Cu | Pb | Zn | Ni | Fe |
|---|---|---|---|---|---|---|---|
| **BOT** | 0.001 | 0.001 | 0.026 | 0.005 | 0.066 | 0.004 | 0.416 |
| **STM** | 0.002 | | 0.02 | 0.01 | 0.036 | | |
| **SWN** | 0.001 | 0.005 | 0.0165 | 0.005 | 0.028 | 0.0045 | 0.448 |
| **LLD** | 0.001 | 0.005 | 0.014 | 0.005 | 0.026 | 0.005 | 0.53 |
| **BPP** | | | 0.001 | 0.005 | 0.011 | 0.01 | 0.12 |
| **LEG** | 0.001 | | 0.0063 | 0.005 | 0.027 | 0.005 | 0.98 |
| **DPIWE Guidelines** | <0.01 | 0.1 | 0.2 | 5 | 2 | 0.2 | 0.2 |



## Soil-Geo-Climate Challenges

**Solutions:**

- Research dedicated to water recycling
- Research soil sustainability for moderate P, sodicity and salt in Tasmanian soil
- Farmer irrigation training programs
- WWTP operator training -BNR!
- Precision agriculture - on-line moisture detection, GPS control of irrigator position and watering rates

## Economic Challenges

- Infrastructure cost -municipal and on-farm
- Risk -is recycling sustainable?
- Maintenance
- Monitoring programs
- Additional staff?


The Triple Bottom Line

The three lines represent society, the economy and the environment. Society depends on the economy - and the economy depends on the global ecosystem, whose health represents the ultimate bottom line.

## Economic Challenges

**Possible solutions:**

- Agreements for 20 year investment, Partnership -DPIWE, Council, Grower.
- Government funding -grants to Council, community, farms
- Improved productivity
- Direct and indirect Job creation makes recycling industry self-sustaining
- Waste disposers become wealth generators

## The End

**Thank you**
**Marcus Hardie**
**Jane Lovell,**
**Daryl Stevens,**
**and conference organisers**