

## Use of Compost to Improve Soil Properties and Plant Growth in Saline Soil

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**ASIA PACIFIC AFRICA**

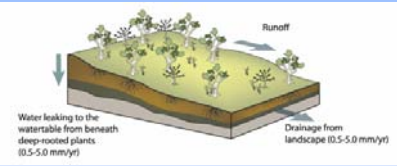
  
*The Organic Force*

<h2>Saline Soil</h2>	<h2>Sodic Soil</h2>												
<ul style="list-style-type: none"> <li>• High amount of soluble salts with Na, Cl, Ca, Mg, SO<sub>4</sub> and NH<sub>3</sub> ions</li> <li>• Soil structure stable</li> <li>• Salinity Ratings <sup>1)</sup></li> </ul>	<ul style="list-style-type: none"> <li>• High proportion of Na, compared to Ca and Mg</li> <li>• ESP &gt; 6%</li> <li>• Soil structure degrades</li> <li>• Prone to erosion</li> </ul>												
<table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="border-top: 1px solid black; border-bottom: 1px solid black; padding: 5px;">Ratings</th> <th style="border-top: 1px solid black; border-bottom: 1px solid black; padding: 5px;">EC<sub>1:5</sub> (dS/m)</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">Very low</td> <td style="padding: 5px;">&lt; 0.15</td> </tr> <tr> <td style="padding: 5px;">Low</td> <td style="padding: 5px;">0.15 - 0.45</td> </tr> <tr> <td style="padding: 5px;">Medium</td> <td style="padding: 5px;">0.45 - 0.9</td> </tr> <tr> <td style="padding: 5px;">High</td> <td style="padding: 5px;">0.9 - 2.0</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 5px;">Very high</td> <td style="border-bottom: 1px solid black; padding: 5px;">&gt; 2.0</td> </tr> </tbody> </table>		Ratings	EC <sub>1:5</sub> (dS/m)	Very low	< 0.15	Low	0.15 - 0.45	Medium	0.45 - 0.9	High	0.9 - 2.0	Very high	> 2.0
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<small><sup>1)</sup> Values for conditions in Australia according to Shaw 1985</small>													



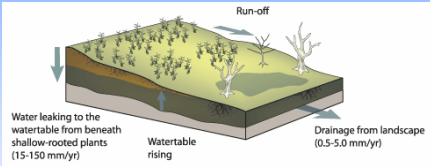
## Salinity / Sodicity

- Naturally occurring
- Man-made
  - Land clearing → rising water table, rising salt



Water leaking to the water table from beneath deep-rooted plants (0.5-5.0 mm/yr)

Drainage from landscape (0.5-5.0 mm/yr)




Water leaking to the water table from beneath shallow-rooted plants (15-150 mm/yr)

Water table rising


Drainage from landscape (0.5-5.0 mm/yr)

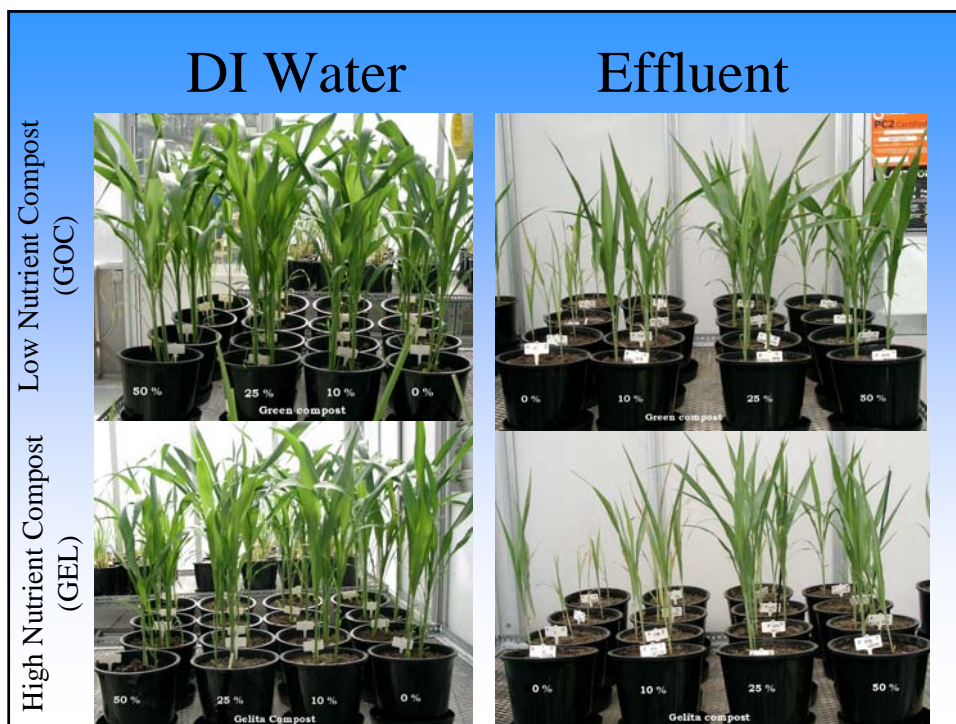
- Irrigation
- Irrigation with low quality ground water / wastewater



## Irrigation with Industrial Effluent

- 475 ML/year irrigated on 121 ha pasture/trees
- Effluent has high  $\text{NO}_3$ ,  $\text{NH}_4$ , Ca, Na, Cl,  $\text{SO}_4$ , EC ~ 8 dS/m, pH > 7
- 10 years of irrigation with effluent
- Mainly heavy cracking clays (Vertosol) with some lighter soils
- Topsoil is acidic with medium – high salinity, changing to sodic with increasing depth
- Composting of 10,000 t/a organic residues

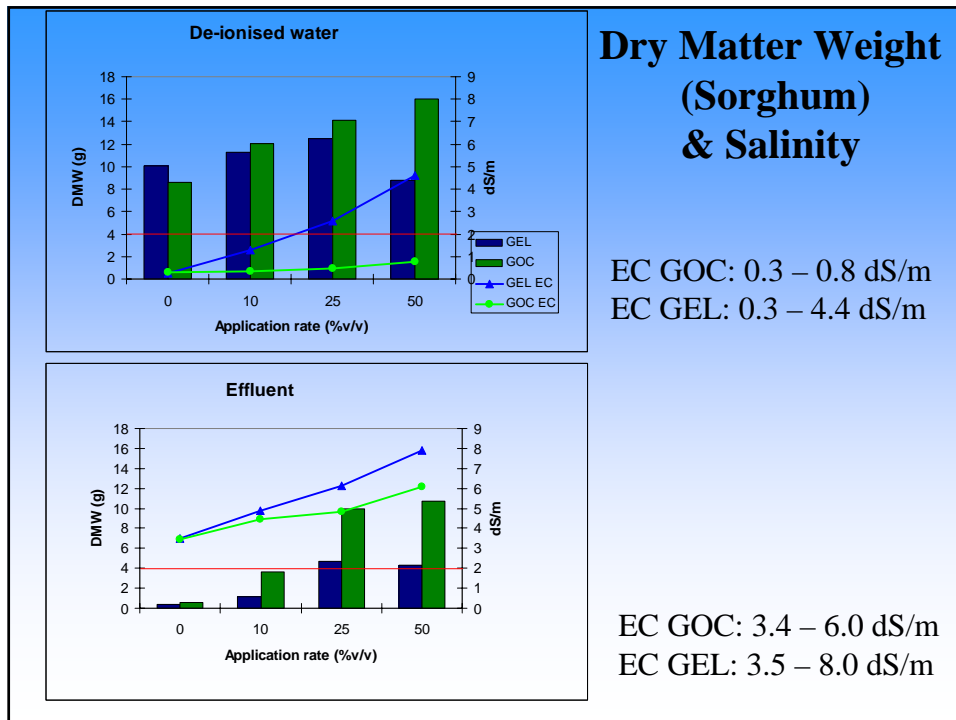




## Compost Characteristics

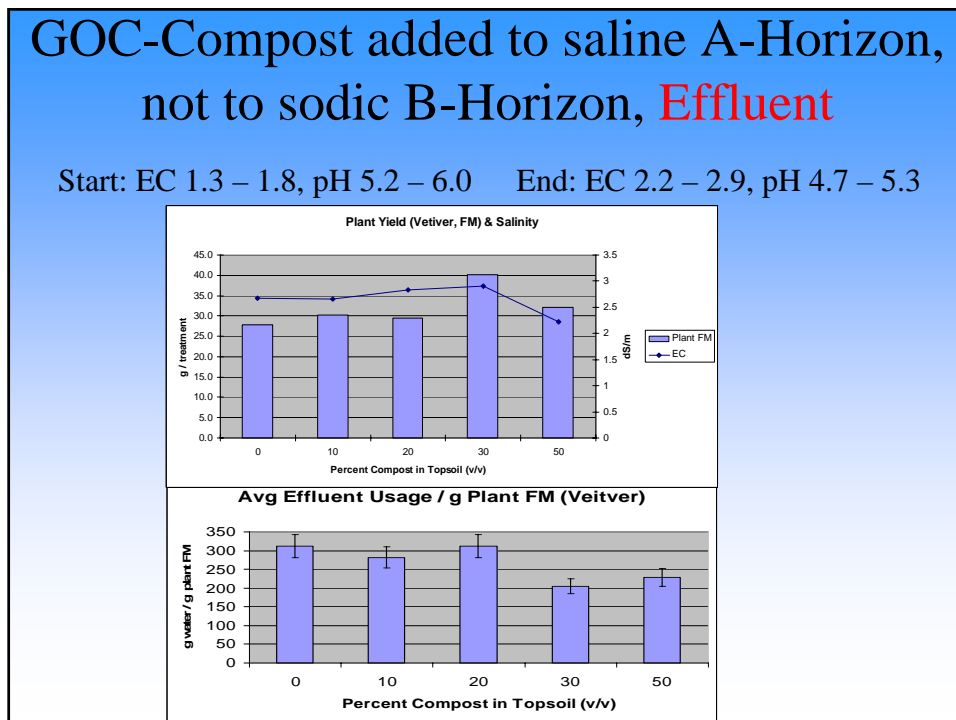
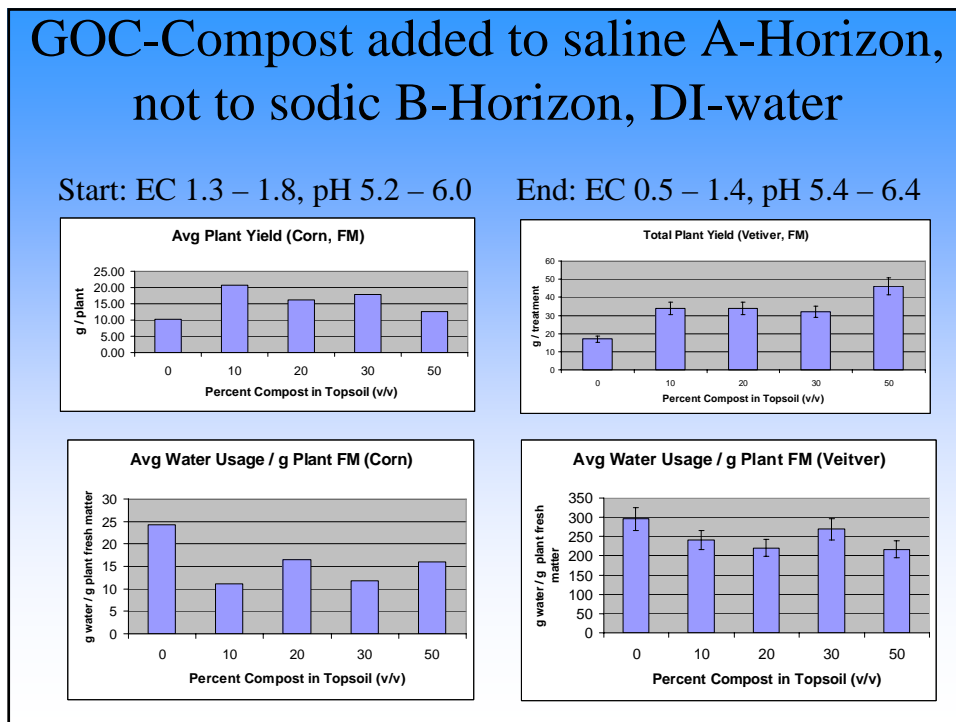
- Low Nutrient Compost made from Garden Organics (GOC)
- High Nutrient Compost made from Gelatine Manufacturing Residues (GEL)

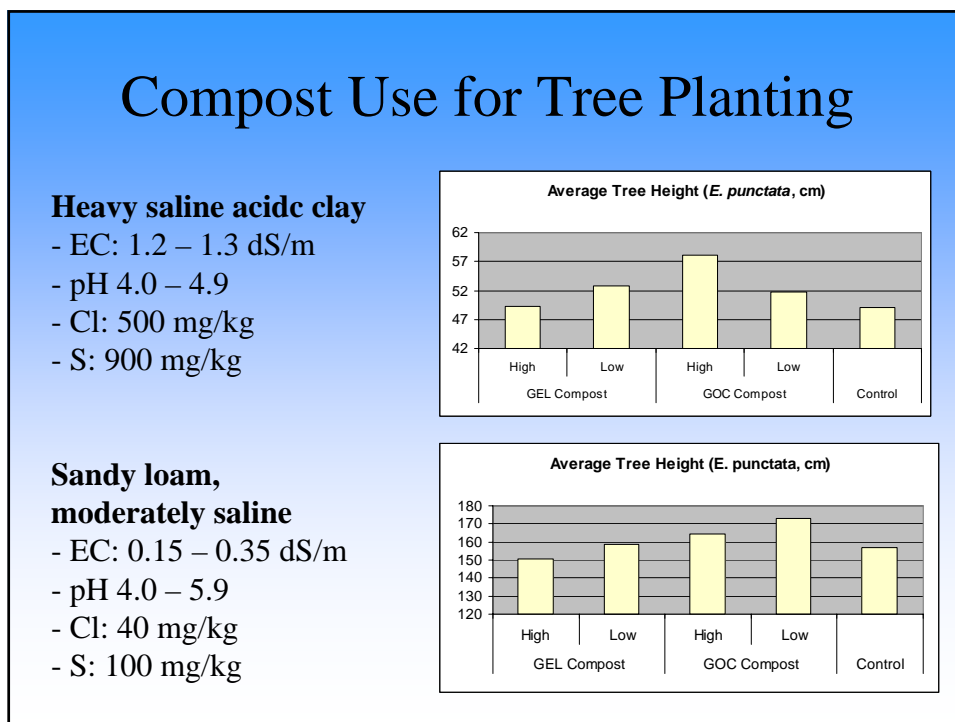
Characteristics	Unit	GOC	GEL
Total Nitrogen	% dm	1.2	2.3
NH4 - N	mg/kg	5	2224
NO3 - N	mg/kg	338	4
C/N Ratio		21.6	10.4
EC	dS/m	3.8	17.9
Exch. Ca	meq/100g	29	131



## Initial Results from Pot Trials

- Improved plant growth (except highest GEL rate)
- Improved pH (4.8 → 6 –7)
- Na and Cl concentrations did not limit plant growth
- Low nutrient compost absorbed excess nitrogen
- Nitrogen draw-down did not limit plant growth
- Low nutrient compost was superior in tested conditions
- **Compost use raised threshold at which salinity (EC) showed detrimental effects on plant growth**





## From Research into Practice

### - Compost Use for Land Rehabilitation - (Dept of Environment & Climate Change, NSW)

**Tarago Demonstration Site**

- Highly saline/sodic discharge line over 5ha
- Sedimentary profile prone to sheet / gully erosion
- Dispersive B-horizon, little vegetation
- ESP 54%; very sodic soils >15%
- EC 5.4 dS/m
- 0.9% Org C and low fertility status

## Works Undertaken

- Earthworks, sediment traps, diversion banks
- Ripping /mounding across all site
- Soil tests informed compost application rates
- Composted soil conditioner 2-5 cm deep harrowed
- Composted mulch broadcasted, 2-3 cm deep
- Salt tolerant grasses clovers sown
- Tube stock to follow
- Gypsum req ~4.8 t/ha; compost app equivalent to ~5 t/ha
- ~1,640 m<sup>3</sup> of compost used



## Tarago Demo Site 6 Months after Application



## Pejar Demonstration Site

(Partnership with Catchment Management Authority)

- Saline/sodic drainage line over 12ha; evident salt scalds
- Sedimentary profile prone to sheet / gully erosion
- Dispersive B-horizon, little vegetation
- ESP 27%; very sodic soils >15%
- EC 4.6 dS/m
- Ca:Mg 0.01:1; highly magnesian
- Low fertility status



## Works Undertaken

- Earthworks, sediment traps, diversion banks
- Ripping /mounding across all site
- Soil tests informed compost application rates
- Composted soil conditioner 2-5 cm deep harrowed
- Composted mulch broadcasted, 2-3 cm deep
- Salt tolerant grasses clovers sown
- Tube stock to follow
- ~2,350 m<sup>3</sup> of compost used



## Pejar Demo Site 6 Months after Application



After Some Promising Initial Results...



There is Much More Work Ahead...