Sub Soil Modification 2015
Point Pass Agricultural Bureau

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Government of South Australia
South Australian Murray-Darling Basin Natural Resources Management Board

Natural Resources
SA Murray-Darling Basin
Sub soil Modification

Based on work conducted by Rick Peries DEPI Victoria and Researchers from Southern Farming Systems, La Trobe University, Victoria

Targeting a range of hostile clays – heavy textured, sodic, slightly saline, those with bleached A2, also hard capped – delved and not delved

Clay modification by microorganisms and organic matter to increase size of macro pores - improve clay ped structure, infiltration, drainage, root access & volume, air supply

Proof of concept stage – under a range of soils and conditions, lower rainfall than early Victorian sites
Clay subsoil changes – P Sale, R Peries, et al

4 years after Lucerne pellets at 30 -40 cm in clay

Before

After
Subsoil treatments

- Control
- Rip Only
- Plant based compost – 20 to 40 t/ha
- Plant and Animal manure based compost – 20 to 40 t/ha
- Neutrog Chicken Manure pellets – 20 – 40 t/ha
- Gypsum – 10 t/ha
- Brew - Mixture of Compost, chicken manure pellets and gypsum – 40t/ha
- TPR and Grape Marc mixtures
- Compost and Biochar
- Pig Manure Compost
Robertstown Site – Low OC, Sodic
<table>
<thead>
<tr>
<th>Depth cm</th>
<th>Texture</th>
<th>Colour</th>
<th>Gravel %</th>
<th>pH H₂O</th>
<th>pH CaCl₂</th>
<th>Acid Reaction Free % Lime</th>
<th>EC 1:5 dS/m</th>
<th>Ece dS/m</th>
<th>Org.C %</th>
<th>NO₃ N mg/kg</th>
<th>Avail. P mg/kg</th>
<th>Avail. K mg/kg</th>
<th>Boron mg/kg</th>
<th>SO₄²⁻ S mg/kg</th>
<th>Trace Elements (DTPA) mg/kg</th>
<th>CEC cmol(+) /kg</th>
<th>Exchangeable cations cmol(+) kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>FSCL</td>
<td>Orange</td>
<td>5-Jan</td>
<td>7</td>
<td>6.2</td>
<td>0.18 N</td>
<td>0.109</td>
<td>1.58</td>
<td>0.43</td>
<td>15</td>
<td>32</td>
<td>65</td>
<td>275</td>
<td>0.87</td>
<td>7.2</td>
<td>0.91</td>
<td>0.37</td>
</tr>
<tr>
<td>10-30</td>
<td>MClay</td>
<td>Dk Red</td>
<td>0</td>
<td>9</td>
<td>8</td>
<td>0.28 N</td>
<td>0.452</td>
<td>3.42</td>
<td>0.48</td>
<td>5</td>
<td>3</td>
<td>395.3</td>
<td>412</td>
<td>5.8</td>
<td>29.1</td>
<td>19.91</td>
<td>6.68</td>
</tr>
<tr>
<td>30-40</td>
<td>LMClay</td>
<td>Dk Red</td>
<td>0</td>
<td>9.2</td>
<td>8.3</td>
<td>2.5 Mod</td>
<td>1.109</td>
<td>6.06</td>
<td>0.32</td>
<td>3</td>
<td>5</td>
<td>893</td>
<td>572</td>
<td>16.52</td>
<td>128</td>
<td>31.05</td>
<td>8.56</td>
</tr>
<tr>
<td>70+</td>
<td>LMClay</td>
<td>BrOr</td>
<td>0</td>
<td>9.3</td>
<td>8.3</td>
<td>31 V High</td>
<td>0.978</td>
<td>7.1</td>
<td>0.17</td>
<td>2</td>
<td>3</td>
<td>825.6</td>
<td>390</td>
<td>9.69</td>
<td>138</td>
<td>24.92</td>
<td>9.29</td>
</tr>
</tbody>
</table>

Critical / Ideal values: pH 6-8, EC 5-7, NO₃ N <0.7 mg/kg, Avail. P <1 mg/kg, Avail. K <15 mg/kg, Boron <6 mg/kg, SO₄²⁻ S <2 mg/kg, Copper Cu <0.2 cmol(+), Zinc Zn <0.5 cmol(+), Iron Fe <1.0 cmol(+), Manganese Mn <25% of CEC, Calcium Ca <20% of CEC, Magnesium Mg <5% of CEC, Sodium Na <5% of CEC.
Robertstown site
Dry matter relative to Control treatment

% of Control

1 Control
2 Plant Compost
3 Chicken Manure
4 Brew
5 Rip Only
6 Gypsum
7 TPR
8 Biochar & TPR

% of Control
Point Pass – Lentils after 30mm rain
Lentil yield as % of Control

- 1 Control
- 2 Mixed Compost
- 3 Chicken Manure
- 4 Brew
- 5 Pig Manure
- 6 Gypsum
- 7 TPR
- 8 TPR & Biochar
- 9 Rip Only
Ebenezer Sub soil Modification site

Normally Waterlogged, not in 015, heavy textured clay
Yield as % of Control

Ebenezer Sub Soil Manuring Grain yield - % of Control

- 1 Control
- 2 Mixed compost
- 3 Chicken Manure
- 4 Brew
- 5 Rip Only
- 6 Gypsum
- 7 Grape Marc
- 8 TPR
- 9 Compost & Biochar
Giles Corner – Cracking clay, No-Till, stubble retained, Controlled Traffic 15 years
Taller crop, Pod height 20 to 30cms Higher
Alma South – Beans growth response
Rip only – similar to Control
Brew – Compost, Gypsum & Chicken Manure
Long Plains – Barley limited by rainfall
Halbury – Barley 6t/ha
Stockport Sub soil Modification site

Waterlogging variability due to slope, heavy textured clay
Dry matter relative to Control treatment