Organic fertilisers – variable pasture yield responses in local trials

Southern Farming Systems
7/3/2016
Biological trials: 17 pasture, 6 crop across Corangamite
Biological products in trials

- Pig manure – composted from grower sheds
- Poultry litter from broiler sheds
- Pig effluent - stored in a dam
- Commercial compost - animal manure based
- Commercial compost – Geelong green waste
- TM - biological stimulant
- Humates - brown coal soil conditioner
- Mcal - liquid calcium
- Worm castings plus lime
- Nutrisol – liquid plant food & soil bacteria
- Seasol & Powerfeed – plant conditioner & organic fish fertiliser
Soil test results 2014
Olsen P 8, Cowell K 120, S (KCL40) 7.4, Org C 3.5%

Constraints: Acidity, N, P, K

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>pH Ca</th>
<th>Al% of cations</th>
<th>CEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>4.5</td>
<td>7.8</td>
<td>4.89</td>
</tr>
<tr>
<td>10-20</td>
<td>4.5</td>
<td>20.3</td>
<td>2.66</td>
</tr>
<tr>
<td>20-30</td>
<td>4.6</td>
<td>18.8</td>
<td>1.81</td>
</tr>
</tbody>
</table>
Deans Marsh 2015

Fig 1. Total mean pasture yields from May, Aug, Oct and Nov cuts. P=0.037, LSD(p=0.5) 534

Poultry Litter applied 2014 only
Commercial compost 3 t/ha 2014 & 2015
Fertiliser Super Potash 3:1: 2014 150 kg/ha, 2015 300 kg/ha
Cooriemungle

Soil test results 2014
Olsen P 29, Cowell K 97, S (KCL40) 14,
Organic C% 4.5

Constraints: Subsurface acidity, K

<table>
<thead>
<tr>
<th>Depth (cm)</th>
<th>pH Ca</th>
<th>Al% of cations</th>
<th>CEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>4.5</td>
<td>2.4</td>
<td>16.93</td>
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<tr>
<td>10-20</td>
<td>4.2</td>
<td>30.7</td>
<td>6.25</td>
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<tr>
<td>20-30</td>
<td>4.0</td>
<td>56.5</td>
<td>4.30</td>
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</table>
Cooriemungle 2015

Total mean dry matter from cuts May, July, Aug, Oct, Nov. p=0.011 LSD(p=0.05) 406

Fertiliser: Muriate of Potash 60 kg/ha
Commercial compost: 3 t/ha
<table>
<thead>
<tr>
<th>Product</th>
<th>Rate (kg/ha)</th>
<th>DM %</th>
<th>Nitrogen (kg/ha)</th>
<th>Phosphorus (kg/ha)</th>
<th>Potassium (kg/ha)</th>
<th>Sulphur (kg/ha)</th>
<th>Approx. Paddock cost/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure Compost 2014</td>
<td>3000</td>
<td>56.1</td>
<td>35</td>
<td>7</td>
<td>14</td>
<td>11</td>
<td>$290</td>
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<td>Lime 2014</td>
<td>2500</td>
<td>92.5</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>3</td>
<td>$115</td>
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<tr>
<td>Muriate of Potash</td>
<td>60</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>30</td>
<td>0</td>
<td>$60</td>
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<td>Plant Compost 2014</td>
<td>3000</td>
<td>65.7</td>
<td>26</td>
<td>22</td>
<td>14</td>
<td>3.6</td>
<td>$270</td>
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<tr>
<td>Plant Compost 2015</td>
<td>3000</td>
<td>79.7</td>
<td>29</td>
<td>17</td>
<td>22</td>
<td>4.3</td>
<td></td>
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<tr>
<td>Poultry Litter 2014</td>
<td>2000</td>
<td>71.8</td>
<td>73</td>
<td>17</td>
<td>29</td>
<td>8</td>
<td>$190</td>
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<tr>
<td>Pig manure 2014</td>
<td>4000</td>
<td>50.1</td>
<td>62</td>
<td>28</td>
<td>36</td>
<td>14</td>
<td>$250</td>
</tr>
<tr>
<td>Pig manure 2014</td>
<td>4000</td>
<td>50.1</td>
<td>62</td>
<td>28</td>
<td>36</td>
<td>14</td>
<td>$250</td>
</tr>
</tbody>
</table>

Table 1. The rate and total quantity of nutrients applied per hectare of different biological and lime products.
Quantifying benefits

Measuring:
• Total organic carbon, carbon fractions
• Bulk density
• N Mineralisation – indirect measure of microbial activity
• Soil pH
• Cation Exchange Capacity (CEC)
• Fertility
• Feed quality tests
• Dry matter yields
Subsoil acidity demonstrations planned for 2017 using lime and organic amendments
Take home messages

• Soil tests (0-10, 10-20 & 20-30 cm) & visual soil assessments help to identify what is constraining production and should be used to guide product selection.

• Production responses from biological products could generally be attributed to the nutrients they contain and deficiencies in the soil.

• Not sure when the soil benefits from biological products will kick in (4 years?) and if and how much they will provide additional pasture yield.

• The cost effectiveness of a biological product will depend on:
  • the composition of the product
  • what the soil/plant requires (nutrients, porosity, good pH or C)
  • the price of the product spread relative to inorganic fertilisers
Acidity take home messages

• Pasture production losses from acidity are hidden & are increasing at depth because topsoil pH\(_{(Ca)}\) (0-10 cm) is not kept above 5.5.

• Estimate if you have high aluminium levels > 13%, then with a ryegrass system you could be losing 500 to 1000 kg DM/ha over the growing season.

• Fertiliser responses were constrained by acidification and lime responses were constrained by nutrient deficiencies.
Further questions?

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