Cereals, organic materials and soil (COMS) project

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Soil – its complexity

Nutrient supply
pH

Chemistry
Physics
Biology

Compaction
Drainage

?
Soil formation

c.500 years to produce 1 cm soil

Bacteria and fungi need feeding

BUT we remove everything

Applying organic manures = investment, i.e. return is realised in the long term
Soil – a bank?!
Application of the organic materials using the SlurryKat plot slurry application system
Organic manures

Soil fauna and microbiome

Nutrient availability

Infiltration and workability
Results from the COMS project

- Grain yields were similar from all sources of nutrients – whether organic or inorganic

### Crossnacreevy 2014: grain yield of spring barley (t/ha at 85%DM)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>N</th>
<th>P2O5</th>
<th>K2O</th>
<th>s.e. mean</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig</td>
<td>160</td>
<td>118</td>
<td>164</td>
<td>0.22</td>
<td>0.072</td>
</tr>
<tr>
<td>Dairy</td>
<td>87</td>
<td>40</td>
<td>241</td>
<td>0.22</td>
<td>0.072</td>
</tr>
<tr>
<td>Digestate</td>
<td>88</td>
<td>73</td>
<td>210</td>
<td>0.22</td>
<td>0.072</td>
</tr>
<tr>
<td>Inorganic</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>0.22</td>
<td>0.072</td>
</tr>
<tr>
<td>Control</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.22</td>
<td>0.072</td>
</tr>
</tbody>
</table>

Note: Treatment x Additional N
• Legacy effects of organic materials (or inorganic nutrients) were not evident

Hillsborough 2013-15: grain yield (t/ha at 86%DM)

- 2013 Winter wheat: s.e. mean 0.39 P<0.001
- 2014 Winter barley: s.e. mean 0.17 P = 0.068
- 2015 Spring wheat: s.e.mean 0.22 P = NS

Treatment applied in 2013 (urea applied to all treatments in 2014 and 2015)
• Differences in the amounts of nutrients applied did not affect yield but did affect nutrient offtake

Crossnacreevy 2014: nutrients applied (kg/ha)
• Application of an inorganic topdressing along with the organic material enhanced offtake of nutrients other than those supplied.
COMS Crossnacreevy Earthworm biomass (g)

October 2014 Sig. 0.008 s.e. mean 0.710

Pig
Cattle
Digestate
Inorganic
Control
COMS Crossnacreevey Earthworm biomass (g)

October 2014: Sig. 0.008 s.e. mean 0.710
November 2015: Sig. 0.046 s.e. mean 0.796
Some conclusions from COMS project

• Grain yields were similar from all sources of nutrients – whether organic or inorganic
• Legacy effects of organic materials (or inorganic nutrients) were not evident
• Nutrients applied affected nutrient offtake
• Nutrient offtake enhanced by inorganic top dressing
• Provision of e.g. minor nutrients (Mg and S) and trace elements in the organic materials replenishes those removed by the crop from the soil
• Earthworms respond to organic materials but the biggest impact on their presence and activity is cultivation
Guidance about using organic manures

Limits to amounts (from NI NAP 2015-18):

• Livestock manure N loading: 170 kg N /ha farm limit
• Follow N-Max for cereals
• If P content is >0.25 kg total P per kg total N, then organic materials can only be applied where the crop requires P

→ Sample the manure
COMS Downpatrick: Nutrients applied 2013 & 2014 (kg/ha)
Guidance about using organic manures

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→ Sample the manure

Apply nutrients from all sources to meet crop requirement, and particularly do not exceed N & P

→ Sample the soil

Apply organic materials at a time and using a method that maximises the availability of the nutrients

Adjust fertiliser applications to take account of organic manure applications
Organic manures

Soil microbiome and fauna

Nutrient availability

Infiltration and workability
Conclusions

• Take-home messages:
  – Use both organic materials and fertiliser
  – Follow Nitrates Action Programme guidance
  – Over-years benefits from nutrient content not found
  – Applying organic manures is a good investment