Using Soil Tests for Soil Fertility Management

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Overview

Soil Testing and soil fertility levels

Managing soil fertility – 5 Simple steps
Soil Testing

- Soil analysis measures plant available nutrients
- Establish soil nutrient levels
- Ensures correct nutrient supply & reduces risk to the environment
- Regular Soil analysis essential part of good nutrient management

*You wouldn’t feed animals without looking at their condition, so why do it to your soils.*
Soil K Trends

Soil pH in 2010

Soil pH of samples analysed through Teagasc in 2010

60% of grassland samples with pH < 6.0

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5 Steps to Soil Fertility Management

1. Soil Analysis Results
2. Apply lime to achieve target soil pH
3. Aim for soil Index 3 in all fields
4. Use organic manures efficiently
5. Ensure a balanced nutrient supply

Step 1 – Soil Analysis Results

Establish farm soil fertility levels
>50% of samples with low P and K – you need to know which ones are low or high!
Small annual cost – 0.50c/ac
Take a good soil sample
   1. Sampling area 2 to 4 ha
   2. Representative sample
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  1. Sampling area 2 to 4 ha
  2. Representative sample
  3. Sampling time
  4. Sampling depth

Monitor soil fertility levels over time & adjust applications were required

Step 2 – Maintain Correct Soil pH

Benefits of correct soil pH
- Increase availability of soil and applied nutrients
- Essential for cereals / more productive grasses

Aim to maintain soil pH in optimum range

<table>
<thead>
<tr>
<th>Crop</th>
<th>Optimum Soil pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beet, Beans, Peas, OSR</td>
<td>7.0</td>
</tr>
<tr>
<td>Cereals &amp; Maize</td>
<td>6.5</td>
</tr>
<tr>
<td>Grassland</td>
<td>6.3</td>
</tr>
<tr>
<td>Grassland (high Mo)</td>
<td>6.2</td>
</tr>
<tr>
<td>Potatoes</td>
<td>6.0</td>
</tr>
</tbody>
</table>
**Liming Advice**

**Grassland**
- >7.5t/ha → split
  - apply 7.5 t/ha now
  - remainder in 2 yrs
- High Mo soils
  - Maintain <pH 6.2
  - Reduce app. by 5t/ha

**Tillage Soils**
- Lime to the most sensitive crop in rotation
- Apply after harvest to stubble
- Low Soil Mg select Mg lime

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**Liming Advice**

**Timing**
- Apply lime at convenient time
- Best to apply 2 yrs in advance of sensitive crops
- Ideally apply in Sept / Oct

Check soil Mg levels & select suitable lime source
- Avoid Mg lime where soil high in Mg
Step 3 – Soil P & K Index 3

Soil test results show plant available P & K in mg/l
Aim for soil Index 3 – **Optimum soil Index**

<table>
<thead>
<tr>
<th>Soil Index</th>
<th>Response to fertilisers</th>
<th>P (mg/l)</th>
<th>K (mg/l)</th>
<th>Mg (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Grass</td>
<td>Tillage</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Definite</td>
<td>0 - 3.0</td>
<td>0 - 3.0</td>
<td>0 - 50</td>
</tr>
<tr>
<td>2</td>
<td>Likely</td>
<td>3.1 - 5.0</td>
<td>3.1 - 6.0</td>
<td>51 - 100</td>
</tr>
<tr>
<td>3</td>
<td>Unlikely</td>
<td>5.1 - 8.0</td>
<td>6.1 - 10.0</td>
<td>101 - 150</td>
</tr>
<tr>
<td>4</td>
<td>None</td>
<td>&gt;8.0</td>
<td>&gt;10.0</td>
<td>&gt;150</td>
</tr>
</tbody>
</table>

**Effects of low soil fertility**

**Grassland Farms**
- Very Low P soils
  - 1.5 t DM/ha
- Very Low K soils
  - 1 to 3 t DM/ha (G Silage)

**Tillage Farms**
- Very low P soils
  - 0.55 t/ha (S. Barley – Irl)
  - 2.75 t/ha (S. Barley – RB209)
- Very low K soils
  - 2.35 t/ha (W. Wheat – RB209)

**Indicators**
- Loss of rye grasses / clovers
- Increased reseeding costs
- Reduced early grass prod
- Reduced tillering
- Reduced rooting
- Reduced grain yield
- Lower grain quality

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P & K Advice

Index 4
• Soil P & K reserves **High**
• Omit P until re-test / Omit K for 1 yr & revert to Index 3 advice

Index 3
• Soil P & K reserves **Medium**
• Replace P & K off takes
• Aim to maintain soil fertility

Index 2
• Soil P & K reserves **Low**
• Replace P & K off takes
• Apply additional P or K to build soil fertility

Index 1
• Soil P & K reserves **Very Low**
• Replace P & K off takes
• Apply additional P or K to build soil fertility
P and K Removals

Spring Barley @ 7.5t/ha

7.5t/ha (Grain & Straw)

- 28kg/ha P
- 86kg/ha K

Replace P & K off takes to maintain soil fertility

Step 4 - Organic Manures

Valuable sources of N, P K & other nutrients
Determine the nutrient content
- Lab analysis
- Quick tests – Slurry hydrometer / Agros N meter / etc...

<table>
<thead>
<tr>
<th>Dry Matter</th>
<th>units/1,000gal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Cattle slurry</td>
<td>7%</td>
</tr>
<tr>
<td>½ slurry + ½ soiled water</td>
<td>4%</td>
</tr>
<tr>
<td>Soiled water</td>
<td>4%</td>
</tr>
</tbody>
</table>

N  P  K
50 kg

6 - 5 - 39
5 - 4 - 23
4 - 0.7 - 5
Step 4 – Organic Fertiliser Management

• Identify low P & K fertility fields
• Determine nutrient content
• Agitate well to reduce nutrient variability
• Apply evenly / correct rate
• Apply under suitable conditions to maximise N recovery
• Incorporate to reduce N losses
• Reduce bag fertiliser appropriately

Step 5 – Nutrient Balance

• Nutrient in shortest supply limits yield
• Ensure a balanced nutrient supply
• Select most suitable fertiliser to balance crop nutrient requirements

Source: Brady and Weil, 1996
### Spring Barley 7.5 t/ha

<table>
<thead>
<tr>
<th>Index</th>
<th>Advice (kg/ha)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>49</td>
<td>2.3</td>
<td>2.0</td>
<td>1.7</td>
<td>K</td>
</tr>
<tr>
<td>2</td>
<td>39</td>
<td>2.9</td>
<td>2.6</td>
<td>2.2</td>
<td>P</td>
</tr>
<tr>
<td>3</td>
<td>29</td>
<td>4.0</td>
<td>3.4</td>
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</tr>
<tr>
<td>4</td>
<td>0</td>
<td>K</td>
<td>K</td>
<td>K</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Options
- **Index 1**: P K – 3 bags/ac 12-8-20 + 2,000gal/ac Pig Slurry
- **Index 2**: P K – 3.4 bags/ac 11-9-22
- **Index 3**: P K – 3.8 bags/ac 13-6-20

18-6-12 or 10-10-20 not always ideal. 1:2 product plus MOP.

Select most suitable fertiliser
Deliver crop N, P & K requirements
3 bags ‘v’ 3 - 4 bags

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**In Summary**

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Thank You For Your Attention