Online Fertiliser Planning system for Ireland

Stan Lalor
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Why Fertilizer Planning ??
Increasing Fertilizer prices

Source: CSO
Declining Fertilizer Usage

Source: Fertilizer Use Survey (Lalor et al., 2010)
Soil Fertility Levels

Optimising soil fertility

Focus on all nutrients is essential

More to fertilizer planning than N & P !!!

Good Overall Fertility:
Soil pH > 6.2; Soil P and K Index 3 or 4

Optimum 9%

91%
Environment

Cornerstone of many Environmental Policies

- Nitrates & WFD
- GHG
- Ammonia
Productive Agriculture

Maximise Return on investment in fertilizer

Efficient use of on-farm resources

Sustainable nutrient inputs
Why Fertilizer Planning ??

Around a long time:
- Agronomic (Advice, soil sampling, etc.)
- Schemes & Regulations

Need to do it better
Soil Fertility Management

1. Soil Testing
2. pH & Lime
3. P and K levels & Indices
4. Slurry efficiency
5. Balanced fertilisation
Soil Testing

Only the first step in a process

What you do with the results is much more critical!

Real need to improve uptake of best practice at farm-level

41% of Soil Sample results used for Agronomic Purposes
Remainder only for compliance

(O’Doherty et al., 2012)
Current situation

- Regulatory demands are distracting from the agronomic need for fertiliser planning

- Multiple tools used in Ireland to develop Fertiliser Plans
  - Significant overhead of keeping multiple tools up-to-date
  - Outputs vary substantially in how useful they are at farm-level
  - Not farmer-friendly

- Nitrates regulations increasing in complexity
  - Single sample soil test reports and advice have become dangerous!
  - Need whole-farm data to determine fertilizer plan in each field
# Current Fertilizer Plans

## Fertilizer Program

<table>
<thead>
<tr>
<th>Farmer</th>
<th>John Farmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Somewhere Near Bagenstown</td>
</tr>
<tr>
<td>County (Zone)</td>
<td>Carlow</td>
</tr>
<tr>
<td>Herd No.</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>2012</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Land Areas</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>60.00 ha</td>
</tr>
<tr>
<td>Grassland</td>
<td>50.00 ha</td>
</tr>
<tr>
<td>Non-Grassland</td>
<td>10.00 ha</td>
</tr>
<tr>
<td>% Grassland</td>
<td>83%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stocking Rates</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Farm</td>
<td>182 kg/ha</td>
</tr>
<tr>
<td>Grassland</td>
<td>219 kg/ha</td>
</tr>
</tbody>
</table>

### Total Manures (t) - Available & Allocated

<table>
<thead>
<tr>
<th>Manure</th>
<th>Available</th>
<th>Allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle Slurry</td>
<td>725</td>
<td>730</td>
</tr>
<tr>
<td>Soiled Water</td>
<td>900</td>
<td>899</td>
</tr>
</tbody>
</table>

### Lime (i.e. Ground Limestone)

Where the lime requirement is > 7.5 t/ha (3 t/acre), apply 7.5 t/ha (3 t/acre in year one), and the remainder after 2 years.

| Total Requirement | 196 tonnes |

## Soil Test Results

<table>
<thead>
<tr>
<th>Soil Test P summary</th>
<th>Soil Test K summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>ha (%)</td>
<td>ha (%)</td>
</tr>
<tr>
<td>No Test (Index 3)</td>
<td>0 ha (0%)</td>
</tr>
<tr>
<td>Index 1 (Very Low)</td>
<td>10 ha (17%)</td>
</tr>
<tr>
<td>Index 2 (Low)</td>
<td>20 ha (33%)</td>
</tr>
<tr>
<td>Index 3 (Target)</td>
<td>25 ha (42%)</td>
</tr>
<tr>
<td>Index 4 (High)</td>
<td>5 ha (88%)</td>
</tr>
</tbody>
</table>

### Chemical Fertilizer (kg nutrient)

<table>
<thead>
<tr>
<th>N</th>
<th>P</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>14,080</td>
<td>1,310</td>
<td>-</td>
</tr>
</tbody>
</table>

## Straight N Fertilizers - Tonnes

<table>
<thead>
<tr>
<th>Nutrients Applied</th>
<th>Manures / Slurry</th>
<th>Fertilizer Products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cattle Slurry</td>
<td>Soiled Water</td>
</tr>
<tr>
<td></td>
<td>gals/acre</td>
<td>gals/acre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bags/acre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bags/acre</td>
</tr>
<tr>
<td>0-10-20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-10-10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Nutrients Applied

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Crop/Method</th>
<th>Area</th>
<th>Index</th>
<th>Lime</th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>Cattle Slurry</th>
<th>Soil Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Grazing</td>
<td>1</td>
<td>2</td>
<td>1.6</td>
<td>55</td>
<td>28</td>
<td>47</td>
<td>4000</td>
<td>4000</td>
</tr>
<tr>
<td>2</td>
<td>Grazing</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>17</td>
<td>28</td>
<td>72</td>
<td>4000</td>
<td>4000</td>
</tr>
<tr>
<td>3</td>
<td>Grazing</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>13</td>
<td>32</td>
<td>4000</td>
<td>4000</td>
</tr>
<tr>
<td>4</td>
<td>Grazing</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>13</td>
<td>32</td>
<td>4000</td>
<td>4000</td>
</tr>
</tbody>
</table>

Teagasc accept no responsibility for inaccurate information provided or for changes in planned stock numbers, land or concentrate feeding levels.
Why an Online Tool ??

- Complexity of calculations:
  - Nitrates & Regulations
  - Agronomy

- Potential to combine National datasets

- Centralised version control and quality control
System Requirements

Prototype lead by Agricultural Catchments Programme

Surveys and Research Focus to establish system requirements
- Advisors
- Farmers

Key outcomes:
- Tailor plan to the needs of the farmer/client
- Simple and user-friendly interface & outputs
- Map based outputs
Objectives

- Develop an online fertiliser software programme:
  - Available to all advisers/consultants in Republic of Ireland
  - Farmer friendly outputs exploiting the benefits of modern mapping technologies
  - Fully satisfy Nitrates requirements
Objectives

- Maximum use of existing databases within Ireland including:
  - LPIS
  - Animal Identification and Movement System (AIM)
  - Soil Analysis results
  - Environmental Indicator maps
Outputs from the system

- Farmer friendly outputs
  - Colour Coded Maps
  - Well designed nutrient plan
  - Simple or detailed plan option
  - Records output
    - Monitoring soil fertility and fertiliser on farms
    - Compliance requirements
Functionality

- Fertiliser Plan
  - Lime,
  - N, P, K,
  - Trace Elements
  - Organic Manures
- Storage requirements
- Derogation Plan
- Map-based outputs
Plan Options & Map Options

Farm Fertilizer Planner

Plan options
- Simple Whole Farm Plan
  - Multiple crops / Fields
  - Importing Manures
  - Exporting Manures
  - Non-grassland crops
  - Alternative Cereal Crops Yields
  - Alternative P levels in Conc Feeds
  - Manure storage
- Derogation Plan
  - Exporting Manures
  - Alternative Cereal Crops Yields
  - Alternative P levels in Conc Feeds
  - Map Outputs
- Fertilizer Advice
  - Derogation
  - Importing Manures
  - Exporting Manures
  - Alternative Cereal Crop Yields
  - Alternative P levels in Conc Feeds
  - Manure storage
  - Map Outputs

Soil Results
- Soil P mg/L
- P Morgan Indices
- Soil K mg/L
- K Morgan Indices
- Soil Magnesium mg/L
- Soil Zinc mg/L
- Soil OM %
- pH
- Trace Elements
- Select All

Activity Maps
- Slurry rates
- Fertilizer A
- Fertilizer B
- Fertilizer C
- Fertilizer D
- Lime Rate

Map Colour Options
- P Index
- K Index
- Plus or Minus Slurry
- Lime Requirement
- Display Watercourse/Wells/Buffers
- None

Trend Maps
- Changes in Fertility
- Off Takes
- Balance: inputs-outputs
Fertiliser Application - Map
Where are we now?

- Prototype built in MS Excel (Ag Catchments Programme + Excel Templates)

- Detailed specification developed
Timeline

- Tendering • 2013/2014
- Development/Testing • 2014
- Full Rollout • 2015
Overall Goal

- Online database system for fertiliser planning
- Simple user-interface
- Plans suited to the needs of the farmer
- A tool for management
  - Less paper
    - More Impact on nutrient management practice on farms
    - Improved farm production and environmental outcomes
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