Upper Nisbet Climate Change Focus Farm meeting

Discussion group meeting held at Upper Nisbet on Thursday 6th March 2014 11am by kind permission of Robert and Jac Neill.

Meeting Theme – Looking forward; ways to improve arable margins

The meeting focused on crop nutrient, trace element requirements and early season fungicide programmes. Guest speakers were Alex Sinclair from SAC Consulting in Aberdeen, Donald Dunbar from the SAC Consulting St Boswells Office, David Cairns from McCreath Simpson & Prentice (MSP) Agriculture and Robert Neill from Upper Nisbet. The meeting was chaired by SRUC Agricultural Consultant and Farm Facilitator Moira Gallagher.

Winter Barley
The first stop at Upper Nisbet looked at a field of winter barley (Cassia). Donald lifted a few plants to examine growth stage and any visible signs of disease or deficiencies; plants were showing three good strong tillers. Some mildew was evident and the crop was ready for its first application of nitrogen which was due to be applied the following day.

Nutrient application
Alex Sinclair discussed nutrient requirements of the winter barley crop. N deficiency was beginning to become apparent in the crop, with the older leaves beginning to turn yellow as N moved within the plant to support new plant growth. David measured soil temperature at 6°C, so it was unlikely that plants would be able to access that much useful soil nitrogen at this time. Robert advised that he would be applying a top dressing of 55kg/N/ha as soon as he could get on to the fields; this would likely be the day after the meeting. Alex agreed that Robert should apply $\frac{1}{3}$ of the total nitrogen and then follow with a single application of the remaining 2/3. Alex felt it would be ok to apply the remaining N in one go, rather than splitting this into a second and third application, reducing working time and an additional trip across the field.

Trace elements
Trace element analysis showed the crop had an adequate N:S ratio and that levels of N, P & K were all satisfactory. Manganese levels were borderline and copper was low.

Spray requirements
With input from David, the group discussed the ideal spray requirements and at what stage fungicides should be applied.
The key points were
- $T_0$ (tiller) spray has been demonstrated to give a yield uplift in winter barley
- Need to time $T_1$ (GS31-32) spray; get on at the right time to knock back mildew
- Mildew has overwintered this year due to mild conditions so could be more of an issue

**Winter wheat**
The group then moved on to look at a field of winter wheat (Istabraq). Again, a few plants were lifted to examine growth stage and any visible signs of disease or deficiencies. Interestingly in this field there were some lighter patches of growth across the field which were also visible in the neighbouring field. These were difficult to account for; there were no obvious classic signs of mineral deficiency, nor were there any visible soil structural issues.

Some discussion centred around what could be the cause of these lighter patches. Drainage issues, pH ‘hotspots’, trace mineral deficiencies and nutrient application methods were all considered. Moira and Donald took samples of both the healthy and affected crops for subsequent analysis to identify the cause of the impeded growth. Later investigation confirmed that unusually the lighter patches were in fact manganese deficiency.

It was recommended that the field be soil sampled after harvest for soil pH at 4 samples per ha and mapped and lime applied variably to try and even up soil pH over the field.

**Nutrient application**
Robert highlighted that when they arrived at Upper Nisbet, soils were around pH 5.0. Robert and Jac have targeted pH levels across the farm to achieve pH 6.2. Alex pointed out if the fields were grid sampled at 4 samples per ha for soil pH he would have confidence to lower the target pH by 0.1.

The wheat crop was slower to get going; Robert is looking to apply 30% of N before growth reaches $T_1$. First N application will be between 50 to 70kg/N/Ha but will be adjusted to take account of residual N.

The source of nitrogen was discussed; ammonium nitrate will be quicker to get going than urea. Alex recommended avoiding urea on high pH fields as this will increase the risk of ammonia loss. Key message was to get total N requirement on in good conditions and in good time to support the growing crop.

**Trace elements**
Similar to the winter barley field, trace element analysis showed the crop was low in copper but had adequate levels of manganese.

The group discussed the need for a sulphur application with first N; sulphur has been routinely recommended in the past, but may not be needed across the board.

**Spray requirements**
Wheat in south east can be prone to mildews and rusts; *Septoria* can be a particular issue. Mildew has overwintered this year due to mild conditions; need to get on at the right time to spray and suppress mildew issues early.
Crop update; Trace elements, deficiencies and requirements
Back in the workshop, Alex Sinclair gave a more detailed presentation on trace elements. Alex highlighted the role pH has on availability of trace elements; due to soil chemistry, some trace elements can be present but unavailable. Alex showed examples of common symptoms of nutrient deficiencies. Trace element deficiencies need to be identified early to avoid any yield penalty. The slides presented by Alex are included in Appendix 2.

Alex highlighted the usefulness of the SRUC Technical Note TN 656; Soils information, texture and liming recommendations. The note also contains a link to soil maps created by The James Hutton Institute (previously The Macaulay Institute) which can identify your soil type using your postcode.

Fungicide programmes
Moira drew the groups attention to fungicide programme developed by SRUCs Fiona Burnett at the previous discussion group meeting. This information is contained in Appendix 1.

Cropbench
‘Measure to manage’ was a key part of Donald Dunbar’s presentation, highlighting the value of using your own data in the HGCA programme CropBench. Donald demonstrated the type of data you could use to compare with your peers using anonymised data from the Monitor Farm group. Local farmers are able to compare both fixed and variable costs and identify areas for business improvements. Donald highlighted how monitor group farms were using this as a way to consistently track and compare costs with other growers in their area, rather than relying on national data which can be variable.

Summary
Key points from the meeting included
- Balance nutrient applications with soil nutrient status and crop demand
- Get full N application on in good time for the growing crop (based on nutrient budget)
- Sulphur additions may not always be required
- Take tissue samples before applying trace elements
- Applying the right amount of nitrogen fertiliser at the right time will help to mitigate emissions of nitrous oxide.

Moira thanked Robert, the group and invited speakers for their input.

Further information was provided at the meeting, including Farming for a Better Climate practical guides http://www.sruc.ac.uk/downloads/120198/improve_farm_efficiency and the SRUC Technical note TN 656.

Do you farm and would you like to attend to future meetings?
The meetings provide sensible ideas for the farm business, from invited speakers and other farmers, to improve efficiency whilst reducing the loss of greenhouse gases. It’s free to come along and you will be able to influence the topics, recommend speakers and location of future meetings.

Contact SAC’s Moira Gallagher for details of the next Upper Nisbet event at moira.gallagher@sac.co.uk or telephone the SAC St Boswells office on 01835 823322.

If you want to keep up to speed with what’s happening at Upper Nisbet but don’t want to attend all the meetings, ask to be added to the Upper Nisbet email list; you will receive notification of future events and meeting notes.

Visit the website at www.farmingforabetterclimate.org or email climatechange@sac.co.uk
Appendix 1 - Early Fungicide Programme (developed by Fiona Burnett at previous discussion group meeting)

<table>
<thead>
<tr>
<th>Crop</th>
<th>T₀</th>
<th>T₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>WB</td>
<td>Kayak (cyprodinil) for rhynchosporium protection @ 0.75 – 1 l/ha ± Corbel 0.25-0.5 l/ha (morpholine) to eradicate mildew if present. Exclude PGR if high tiller numbers present</td>
<td>Main spray for WB. If planning to use SHDI use here. Siltra (bixafen + prothioconazole) @ 0.4-0.6 l/ha ± mildew control or Fandango (fluoxastrobin + prothioconazole) @ 1 l/ha Growth regulators Moddus 0.1l/ha ± Cycocel 1.25</td>
</tr>
<tr>
<td>WW</td>
<td>Cherokee (chlorothalonil + cyproconazole + propiconazole) @ 1 l/ha One member reported mixing problems associated with high pH water or AltoElite (chlorothalonil + cyproconazole)</td>
<td>If Eyespot risk high use: Tracker @ 1 l/ha + Bravo (chlorothalonil) 1 l/ha Early sowing is a relatively small eyespot risk factor but warm wet winter increases risk. Check for stem based browning. Otherwise: Adexar (bixafen + prothioconazole) @ 0.8 l/ha or Proline (prothioconazole) 0.4 – 0.8 l/ha (eyespot activity at higher rate) + Bravo 1l/ha NB: limited to 2 straight hits of chlorothalonil. Important not to exceed 2,000g/ha active. Growth regulator 0.1 l Moddus + 1.25 l Cycocel</td>
</tr>
<tr>
<td>WOSR</td>
<td>2nd LLS Proline 0.3l/ha (does have some sclerotina activity) If missed autumn spray and can go in early increase dose of Proline to 0.5 l/ha or Prosaro (prothioconazole and tebuconazole) @ 0.5 l/ha + Folicur (tebuconazole) @ 0.5 (mix helps get both sorts of LLS). LLS variable in its sensitivity so don’t go below ½ rate.</td>
<td>Sclerotina Early flower x 1 or 2 if sclerotina risk A lot of choice: Filián (boscalid) 0.5 l/ha broad protectant Amistar (azoxystrobin) Spray will only provide cover for two weeks. Wet weather is a big trigger also higher if flowering over prolonged period. Action Point Recommend tissue sampling before applying any trace elements. Boron risk factors: light sandy soils, pH 8.</td>
</tr>
<tr>
<td>WO</td>
<td>It’s a mildew season, apply protectant before disease present Flexity (metrafenone) 0.25l/ha early</td>
<td>Proline or Fandango (fluoxastrobin and prothioconazole) Growth regulator @ GS30 &amp; 31</td>
</tr>
<tr>
<td>SB</td>
<td>Early mildew – Flexity 0.25 l/ha Weed control: Liberator (diflufenican and flufenacet) has off label approval for pre emergent in spring barley. Good on AMG but experience of group in 2013 not so great on BL weeds but could be related to the season.</td>
<td>Proline 0.3 + Bravo 1.0l/ha Growth regulator unlikely, adjust N</td>
</tr>
</tbody>
</table>
Crop update – trace element deficiencies and requirements: Mn, Cu, B & S

Dr Alex Sinclair
SAC Consulting, Environment & Design Group

SAC Consulting is a division of SRUC
Leading the way in Agriculture and Rural Research, Education and Consulting
Effect of soil pH on micro nutrient conc in ryegrass and red clover
Soils information, texture and liming recommendations.

SUMMARY

- Web based access to information on your soils on your farm is described.
- Soil texture classes of mineral soils are described and identified by hand texturing.
- Liming recommendations for different soils and managements are tabulated.

1. Introduction

Scotland’s soils have been comprehensively surveyed, classified, and studied over the past 75 years. Understanding and using this information at the farm level has up till now been difficult due to its complexity and the accessibility of information. The development of web based tools has changed this and the James Hutton Institute, who hold the National Soils Database for Scotland, have created the SIFSS (Soil Indicators for Scottish Soils) website which allows you to access information on your soils. SIFSS is also available as a free iPhone app for you to find out what soil type is in your area, discover the differences in soil characteristics between cultivated and uncultivated soils, and also to examine a range of key indicators of soil quality.

In this technical note the influence of soil texture on target soil pH values and liming requirements of crops and grass is described. Regular soil testing is required every 4 - 5 years in order to monitor success in maintaining targeted levels of lime. This note can be used along with PLANET Scotland, a software tool designed for routine use by Scottish farmers and advisers to plan and manage lime and nutrient use on individual fields.

There is also on-going work that will make the information relevant to how we manage our soils on a daily basis. Further technical notes are planned linking trace element status with soil parent material, texture and pedological drainage status; and rates of phosphate fertiliser to build up and run down soil P status with a different set of soil properties.
Lime recommendations (t/ha product with NV 50% CaO)

<table>
<thead>
<tr>
<th>Soil pH</th>
<th>Sand</th>
<th>Sandy loam / shallow</th>
<th>Other mineral soils</th>
<th>Humose</th>
<th>Peaty</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.1</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.0</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.9</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5.8</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5.7</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>5.6</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>
Manganese Deficiency Symptoms

- Field patches of lime green, limp growth
- Leaf symptoms appear from GS 14 onwards in cereals
- Older leaves show rows of interveinal grey streaks (oats), white streaks (wheat) and brown streaks or flecks (barley)
- Similar symptoms result from sulphur deficiency in oilseed rape
Manganese deficiency symptoms in S Barley
Manganese deficiency symptoms in W Wheat
Manganese Deficiency Occurrence

- Sandy soils above pH 6.2 and heavier-textured soils above pH 6.5
- Soils with VH P status
- Peaty soils
- Soft seedbeds
- Dry soils
- Immediately after liming.
• Foliar application of Mn fertilisers is the recommended treatment.

• The most common Mn fertiliser used is Mn sulphate, which contains around 24% Mn in solid form but concentration varies with the degree of hydration and the application rate ranges from 1.5 – 3.0kg Mn/ha.

• Foliar application of Mn chelates can also be used to treat deficiency. Chelates are usually based on EDTA as the chelating agent and typically contain 6 - 7% Mn in liquid form as supplied for subsequent dilution.

• Treatment of crops with Mn fertilisers is recommended only when tissue analysis results indicate that a deficiency is present, except where moderate to severe deficiency has occurred regularly in the past and an ‘insurance’ spray would be recommended.
### Tissue analysis: HGCA Research Review No.78 & Information Sheet 25 (2013)

<table>
<thead>
<tr>
<th>Trace element</th>
<th>Crop</th>
<th>Tissue analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boron (B)</td>
<td>Oilseed rape can be affected</td>
<td>Deficiency more likely below 20 mg B/kg</td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>Cereals can be affected</td>
<td>Not reliable</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>Cereals &amp; oilseed rape can be affected</td>
<td>Deficiency more likely below 20 mg Mn/kg</td>
</tr>
</tbody>
</table>
Copper deficiency symptoms in cereals

- Symptoms in cereals not seen until end of tillering
- Yellowing and wilting of the tips of the youngest leaf is often followed by spiralling of the leaves
- Leaf tips become elongated and spear-like
- Ears are sometimes trapped in the leaf sheath and those that emerge have white tips and do not fill with grain (“blind-ear”)
- Secondary growth with lots of “greens”
- Similar symptoms result from drought stress, herbicide or frost damage.
<table>
<thead>
<tr>
<th>Element</th>
<th>Very low</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
<th>Excessive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deficiency probable</td>
<td>Deficiency possible</td>
<td>No deficiency expected</td>
<td>No risk of deficiency</td>
<td>Crop toxicity may occur</td>
</tr>
<tr>
<td>Cu</td>
<td>&lt;1.0</td>
<td>1.0 - 1.6</td>
<td>&gt;1.6 - 8.5</td>
<td>&gt;8.5 - 80</td>
<td>&gt;80</td>
</tr>
<tr>
<td>B</td>
<td>&lt;0.3</td>
<td>0.3 - 0.5</td>
<td>&gt;0.50 – 1.0</td>
<td>&gt;1.0 – 3.5</td>
<td>&gt;3.5</td>
</tr>
</tbody>
</table>
Copper rates from HGCA No.78 (Aug 2013)

• Soil applied fertilisers include Cu sulphate (about 25% Cu) and Cu oxychloride (about 50% Cu). The correcting effect of soil applied Cu fertilisers may last up to 10 years depending on the amount applied e.g. 2.5 to 5.0 kg Cu/ha.

• There are 3 main sources of foliar fertilisers: Cu sulphate, Cu oxychloride and Cu chelates. Cu chelates (e.g. EDTA), about 9% Cu w/v whilst Cu oxychloride contains about 25% Cu in liquid formulation. Foliar fertilisers are very useful if a deficiency is determined through tissue analysis. Typically, for Cu oxychloride application rate is between 200 and 500 g Cu/ha and approximately 70 g Cu/ha for chelated Cu.

• Generally foliar application at the late tillering stage is most effective.
Copper (1996-2008)
Copper concentration in the subsoil is expected to give best indication of inherent soil Cu status.
Sulphur Deficiency Symptoms

- Overall pale green leaves.
- Interverinal chlorosis starting in younger leaves.
- Upward cupping of leaves.
- Pale yellow flowers and shortened pods of oilseed rape.
- Similar symptoms result from N deficiency but in younger leaves first.
- Iron deficiency.
Sulphur Deficiency Occurrence

- Low organic matter, sandy soils far from sources of industrial sulphur dioxide.
- High N-fertiliser use
- Restricted root growth.
## Sulphur Fertilisers

<table>
<thead>
<tr>
<th>Product</th>
<th>S (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elemental S</td>
<td>80-96</td>
</tr>
<tr>
<td>Ammonium sulphate</td>
<td>24</td>
</tr>
<tr>
<td>Ammonium sulphate nitrate</td>
<td>13</td>
</tr>
<tr>
<td>Kieserite</td>
<td>23</td>
</tr>
<tr>
<td>Potassium sulphate</td>
<td>20</td>
</tr>
<tr>
<td>Gypsum</td>
<td>18</td>
</tr>
<tr>
<td>Manganese sulphate</td>
<td>14</td>
</tr>
<tr>
<td>Magnesium sulphate</td>
<td>13</td>
</tr>
<tr>
<td>Single superphosphate sulfate</td>
<td>12</td>
</tr>
<tr>
<td>Copper sulphate</td>
<td>11</td>
</tr>
</tbody>
</table>

E.g. Ammonium sulphate = 21% N + 24% S (= 60% SO₃)
## Sulphur rates

<table>
<thead>
<tr>
<th>Crop type</th>
<th>$\text{SO}_3$ (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals and spring oilseed rape</td>
<td>40</td>
</tr>
<tr>
<td>Oilseed rape, winter</td>
<td>75</td>
</tr>
<tr>
<td>Potatoes</td>
<td>25</td>
</tr>
</tbody>
</table>
Boron Deficiency Symptoms

- Disintegration of internal tissue leading to internal browning and water-soaking eg. carrots, “Raan” of turnips/swedes
- Browning of cauliflower curd
- Hollow stems in brassicas.
**Boron rates from HGCA No.78 (Aug 2013)**

- B fertilisers commonly used to treat deficiencies include Borax (11.3% B), Solubor (20.5% B), liquid organics and also B in blended fertilisers.

- Solubor can be either soil or foliar applied.

- Generally application rates supply about 2.5 kg B/ha.

- Methods reported in order of most effective for improving yield in oilseed rape were incorporation > seedrow > foliar.
Boron Deficiency Occurrence

- Coarse textured soils of high pH
- Recent liming
- Dry summer following wet weather.
Boron (1996-2008)
Magnesium Deficiency Symptoms

- Interveinal chlorosis beginning on older leaves, giving a mottled appearance
- Leaf margin scorch in semi-circles
- Similar symptoms result from agrochemical spray damage causing check to nutrient uptake.
Magnesium rates: TN633

• Where soil Mg status is very low or low and soil acidity needs to be corrected, apply magnesian limestone. An application of 5 t/ha of magnesian limestone will add at least 750 kg MgO/ha, and this Mg will become plant-available over many years. However, if used too frequently, the soil Mg Status can become unnecessarily high. In this situation care should be taken to ensure that there is sufficient available K in soil to ensure that there is no risk of K deficiency in the crop being grown.

• Where Mg status is very low or low but additional lime is not required, alternative sources of Mg should be used e.g. calcined magnesite (typically 80% MgO) or kieserite (25% MgO). In such cases between 80 and 120kg/ha MgO should be applied.

• Foliar sprays: Epsom salts?
Soil P status by Scottish sub-region (1996-2010)
Soil K status by Scottish sub-region (1996-2010)