The fifth meeting of the Castlemains Climate Change Focus Farm discussion group met at Stonelaws to see cover cropping and no till in practice.

**Key points:**

- Could min-till or no-till work on your farm to minimise soil damage?
- Cover cropping helps to improve and maintain soil organic matter whilst reducing soil erosion, capping and compaction
- Cover crops take up nutrients which may prevent nutrient loss over the winter.
- Min-till saves Colin around £19/ha in fuel, reducing his carbon footprint by nearly 9,000kg of CO₂ across his whole arable area.

**Stonelaws**

A change in policy to “conservation agriculture”

Colin Hunter farms Stonelaws in East Lothian, sharing machinery and labour with his brother and nephew, who farm in Midlothian. Following a horrendously wet 2012, Colin noted some serious damage to his soils, with compaction, water logging and soil capping a common sight. He feels strongly that the use of traditional cultivation techniques is causing long lasting damage to our soils, and a great loss of topsoil and organic matter. He noted that 40 years ago around 8-10% of the topsoil contained organic matter, now it is estimated to be as low as 2-4%, and if we continue farming in the same way, there could be no organic matter left at all.

Colin started to look for different ways to farm that would protect his soils, and therefore the value of his land. He started by changing to min-till, and now has converted completely to no-till, whilst also using cover crops to protect soils. This is known as ‘conservation agriculture’ where a variety of crops, cover crops and no-till minimises soil disturbance whilst maximising soil organic matter and protecting soil biodiversity.
Increasing soil organic matter
How Colin adds organic matter to his soils

Soil organic matter plays a significant role in maintaining soil quality as it positively influences a wide range of soil properties such as water retention and release, the provision of nutrients, as well as reducing the risks of soil compaction, capping and erosion. It is important to maintain soil organic matter. Colin uses no-till and a diverse rotation to maintain good soil structure and benefit soil biodiversity. Colin keeps a few cows, but not enough to generate significant quantities of farmyard manure that could be used to maintain soil organic matter, so he started to look for alternatives. He has used garden waste compost, gypsum, brewers cake, biochar and anaerobic digestate to provide nutrients and organic matter.

The biggest change to his farming system for Colin has been the switch to cover crops to further increase the organic matter he is adding back to the soil. He has tried a variety of seed mixes including black oats, fodder radish, clovers and vetch.

Colin’s current cover crop mix consists of home saved oat seed, black oats and crimson clover which works well for his farm. The seed mix costs around £34 per ha, with a seed rate of 33kg/ha for the crimson clover and black oats and 40kg/ha for the home saved oats.
The value of cover crops

The nutrient content of cover crops

Colin discussed the importance of viewing the cover crop as a valuable crop in its own right, and that it should be established as early as possible to get good growth before the winter. The value of the crop is significantly increased the earlier it is sown. Whilst it is difficult to put a financial value on the benefit of the overall effect of cover crops, it is possible to estimate the nutrient value using dry matter analysis. Before the meeting we took some samples of the black oat, oat and crimson clover cover crop mix that is growing at Stonelaws. This was weighed and sent to the lab for analysis of dry matter and nutrient content. The oat cover crop that was sown in September had a fresh weight of 12,000kg per ha, and a dry matter of 1,272kg/ha. The nutrients taken up by the plants and the financial value of those nutrients is shown in Table 1 below.

Table 1 - Financial value of nutrients taken up by the oat cover crop mix

<table>
<thead>
<tr>
<th>% nutrient/kg DM</th>
<th>Nitrogen</th>
<th>Phosphate</th>
<th>Potash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrients taken up kg/ha</td>
<td>3.01</td>
<td>0.54</td>
<td>3.74</td>
</tr>
<tr>
<td>Straights £/t</td>
<td>38.3</td>
<td>6.9</td>
<td>47.6</td>
</tr>
<tr>
<td>Value of nutrients £/ha</td>
<td>0.53</td>
<td>0.74</td>
<td>0.53</td>
</tr>
<tr>
<td>Value of nutrients £/ha</td>
<td>20.27</td>
<td>5.08</td>
<td>25.37</td>
</tr>
</tbody>
</table>

The total financial value of the nutrients taken up by the crop is £50.72.

The Westerwolds/Italian ryegrass mix was also analysed for dry matter and nutrient content. The fresh weight was 72,000kg/ha with 5,760kg DM/ha. The nutrient content and value are show in Table 2.

Table 2 - Nutrient content taken up by the Westerwolds cover crop mix

<table>
<thead>
<tr>
<th>% nutrient/kg DM</th>
<th>Nitrogen</th>
<th>Phosphate</th>
<th>Potash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrients taken up kg/ha</td>
<td>3.35</td>
<td>0.4</td>
<td>4.4</td>
</tr>
<tr>
<td>Straights £/t</td>
<td>193</td>
<td>23</td>
<td>253.4</td>
</tr>
<tr>
<td>Value of nutrients £/ha</td>
<td>0.53</td>
<td>0.74</td>
<td>0.53</td>
</tr>
<tr>
<td>Value of nutrients £/ha</td>
<td>102.16</td>
<td>17.03</td>
<td>135.17</td>
</tr>
</tbody>
</table>

The total financial value of the nutrients taken up by the crop is £254.35.

In both cases, these nutrients wouldn’t necessarily have been lost if the cover crop had not been sown, but supposing the cover crop saves around 10% of the value of the nitrogen and potash, then a financial value of around £5/ha can be given to the oat cover crop, and around £25/ha can be attributed to the grass mix. If these cover crops were ploughed in and incorporated, then there would be a further benefit of increasing soil organic matter and providing greater biomass for bacteria, fungi and insects to feed upon.
Min-till and fuel usage
Switching to min-till or no-till can save fuel

Hew Hunter demonstrated his Horsch drill which is used for establishing all the crops at Stonelaws. Many farmers don’t record how much fuel is used for each operation, but it can be useful to see exactly how much it costs you to plough, power harrow, drill and roll your crops.

Min-till or no-till can save time and money establishing crops. Colin has calculated that fuel costs him £8/ha to establish crops using his Horsch drill. Using figures from the SAC Farm Management Handbook, establishing crops using a plough and combi-drill would cost around £27/ha in fuel. **Colin uses 18l of fuel less per ha than conventional establishment.** The SAC AgRECalc assumes each litre of diesel generates 3.18kg of CO₂. For Colin, this would save 8,927kg of CO₂ across his arable area, and also represents a financial saving of £2,960 in fuel.

What’s next?
We have been working on a nutrient plan for Castlemains using PLANET. Our next meeting on the 25th January 2017 will discuss the benefits of putting together a nutrient plan and we'll show you how to prepare one. Free lunch included.

There are nine climate change focus farms in Scotland. Keep up to date with their activities at www.farmingforabetterclimate.org

Meetings are free to attend and all farmers are welcome.

For Castlemains, contact farm facilitator Mary-Jane Lawrie on 0131 603 7523 or via email at mary-jane.lawrie@sac.co.uk for more information.

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