Introduction

Benefits of increasing soil carbon include: better water retention, increased carbon sequestration, better soil structure, and improved plant productivity. An organic Cotswold farm has been managed for the past 7 years with this in mind.

Two key features have been introduced: diverse swards and "mob grazing". Soil organic matter levels of 3.8 to 4.2% were recorded in 2006. The farm is being used as a Case Study to address two questions:

Immediate: What is the current productivity on these swards?

Long-term: What are the effects on soil carbon?

The System: Manor Farm Chedworth

- Soil—Cotswold brash prone to drought
- Long history of arable in many fields
- 188 dairy cows and followers: Friesian, Shorthorn and crosses
- Spring calving from 2013
- Grazing area for milkers 74 ha plus 20 ha after first cut
- Aim to graze grass Feb to Nov, and winter cover crops

Mob grazing approach used at Manor Farm compared with traditional UK rotational grazing:
- High stocking density for a short period of time (typically 188 cows on 0.8 ha moved twice a day)
- Longer recovery times between grazings (40–50 day rotation)
- Grazing more mature swards, leaving higher cover to increase organic matter returns to soil

Diverse sward benefits:
- N fixation by legumes
- Mineral supply increased by deep rooting herbs
- Resilience in adverse conditions
- A less seasonally fixed decline in digestibility
- More opportunity for cows to select

Monthly monitoring

- Herbage DM available to cows and residual in 3 x 1 m² quadrats in paddock ahead of and behind cows respectively
- Grass, clover and broadleaf components of sward
- Metabolisable energy (ME) and crude protein (CP) of available and residual herbage by wet chemistry.
- Comparisons with a ryegrass/clover plot

Results: Cow performance

<table>
<thead>
<tr>
<th>Month 2013</th>
<th>Estimated grazed intake / cow/day: kg DM and (ME)</th>
<th>Supplementary feed/cow/day</th>
<th>Milk sales (/cow/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td>4.25 (87 MJ)</td>
<td>Silage + 6 kg cake</td>
<td>18</td>
</tr>
<tr>
<td>April</td>
<td>7.45 (87 MJ)</td>
<td>Silage + 4 kg cake</td>
<td>22</td>
</tr>
<tr>
<td>May (14th onwards)</td>
<td>18.0 (206 MJ)</td>
<td>2 kg cake</td>
<td>22</td>
</tr>
<tr>
<td>June</td>
<td>14.0 (141 MJ)</td>
<td>1 kg cereal meal</td>
<td>21</td>
</tr>
<tr>
<td>July</td>
<td>18.0 (184 MJ)</td>
<td>1 kg cereal meal</td>
<td>16</td>
</tr>
</tbody>
</table>

Results: Herbage production

<table>
<thead>
<tr>
<th>Date and sward type</th>
<th>ME (MJ/kg DM)</th>
<th>CP (% of DM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 27th Herbal</td>
<td>11.5</td>
<td>9.3</td>
</tr>
<tr>
<td>July 6th Herbal</td>
<td>10.5</td>
<td>13.6</td>
</tr>
<tr>
<td>July 6th Ryegrass/white clover</td>
<td>10.9</td>
<td>14.2</td>
</tr>
</tbody>
</table>

Discussion

Cold spring conditions resulted in slow herbage growth and more supplementary feeding than anticipated. Grazing allocations resulted in measurable residual herbage from late June onwards. The proportion of non-grass species increased over the summer. By late July, cows were selectively grazing legumes and broadleaves, rejecting stalks of grasses, chicory and plantains. The estimation of herbage and energy intakes from such variable swards presents a large challenge. Continued monitoring is needed to evaluate the effect on soil carbon.

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