

Case Study: Grassland & Clover Management



Climate change is bringing about a new set of challenges and opportunities for agriculture. While global warming may lead to extended crop growing seasons, it could also lead to unpredictable weather, new pests and diseases, and a requirement for farmers to substantially reduce their carbon footprint.

Soil Association Scotland is running a skills development programme to help farmers and growers improve their business sustainability, cut greenhouse gas emissions, reduce agriculture's carbon footprint and increase resilience to climate change.

Grassland and clover management

Improving the sustainable production and utilisation of grass-clover swards - and avoiding reliance on artificial fertilizer - will result in significant savings on input costs, as well as reducing greenhouse gas emissions associated with fertiliser production and application. Clover is a legume, which means it can naturally 'fix' nitrogen from the atmosphere within their roots, making it available to grass in the ley mix and any following crops.

Once established, the prolific rooting system of the clover sward means it has an excellent ability to deal with both drought and wet conditions. The high protein content of clover-based swards and silage will also reduce reliance on expensive purchased feeds (and associated transportation). The role of grazing cattle and sheep on long-term grasslands in storing carbon in the soil (known as carbon sequestration) is also a key part of the climate change equation - and a strong argument for red meat production as part of a sustainable farming system.

Ellands Farm

Ellands Farm is a family-run mixed organic farm of 246ha on mainly grade 3(2) land, situated 5 miles east of Nairn. The farm achieved full organic status in November 2008.

The cropping programme consists of: 100ha spring cereals (including barley, wheat and oats); 10ha winter wheat; 16ha of carrots (grown as a joint venture with a local carrot processor); 10ha of hay for a horse livery business; and 110ha of temporary grass for grazing and silage. The rotation is based on approximately half the farm being in grass/clover mix at any given time, with the other half in cereals and carrots.

The farm also runs a herd of 120 spring calving cows of mixed breeds, crossed with an Aberdeen Angus or Limousin bull. An organic broiler chicken unit was established in spring 2011, providing a throughput of 1,600 birds a week for a national organic poultry processor.

The farm is run on the basis of achieving the best gross margin from each enterprise but with an overall holistic approach to ensure that the general sustainability of the business is maintained. This is achieved by looking at the rotation and the capacity of the land, and considering changes to cropping plans and harvesting times.

Twenty hectares of spring cereals are undersown annually as part of the rotation with a mixture of red clover, white clover and rye grass. In 2011, the following grass seed mixture (minimum 65% organic seed as required) was sown at 40kg/hectare (at £4.43/kg):

- 8.67 kg Perennial ryegrass *Calibra* (organic)
- 8.67 kg Perennial ryegrass *Tivoli* (organic)
- 8.67 kg Perennial ryegrass *Lasso*(organic)
- 1.82 kg Timothy *Erectra*
- 1.83 kg Timothy *Comer*
- 2.00 kg Red clover *Merviot*
- 1.00 kg White clover *Merwi*
- 1.00 kg White clover *Crusader*

The undersown crop helps to smother out any weeds, while the clover provides some nitrogen for the growing cereal crop. It is important to monitor the crop closely near to harvest as the red clover can quickly become a problem by engulfing the grain crop and making harvesting operations more difficult.

To avoid this problem, the farm is also looking at the possibility of establishing grass after late lifted carrots at the end of May. This would remove the need to undersow spring cereals and reduce the risk of the clover engulfing the cereal crop just before harvest. A seed mix containing Westerwolds ryegrass would provide a cut of silage in September.

The clover/rye grass ley is down for three/four years to provide grazing and silage, as well as fertility for the following spring wheat or oat crops. Farm yard manure from the cattle enterprise is applied to the silage/hay ground. Recent soil analysis shows no significant changes in phosphorus (P) and potassium (K) levels over the last five years as a balance has been maintained and yields have not dropped. Since converting to organic production farm inputs have significantly reduced, yet gross margins have been maintained at sustainable levels.

The red clover appears to reduce in vigour towards the end of the four year rotation, particularly if the crown is damaged due to overgrazing or poaching in wet conditions. One of the surprising aspects of organic grazing is how satisfied the cattle appear on short grass. The most nutritious grass is the first couple of inches above ground and keeping the sward height short is important.

Although the organic system produces lower crop yields, the price per tonne of the finished product has been higher than non-organic cereals. The high price of artificial fertilisers has generally resulted in a comparative gross margin for organic

growers over recent years. While the current price of non-organic wheat makes the organic system look less favourable, the rising cost of fertiliser and oil in general is likely to make the organic system sustainable.

Cattle are housed from January to April, depending on availability of straw. They are fed silage with no supplementary grain, although the housed cows are fed a restricted silage diet before calving due to the high energy and DM content of the feed. One week after calving they are moved outside to sheltered areas and fed ad lib silage because the silage meets the requirements of the lactating cows for energy and protein - no supplementary concentrates are required. Recent silage analysis reveals a D value of 65, ME 10.4, protein of 131g/kg DM and a stable pH of 4.6. Store cattle are housed from November until April when they are sold. During this time they are fed ad lib silage and approximately 1kg of bruised barley a day, with a small amount of home grown protein beans as a supplement. The beans have a protein content of 24%.

Clover: The benefits

Clover content naturally varies throughout the growing season and is at its strongest during late summer, although you should aim to have 30%-50% clover to grass content throughout the year. The aim is to produce a quality sward which has plenty of clover to produce the optimum amount of nitrogen per hectare, which can range from 150-200kg nitrogen/ha. If a sward contains sufficient levels of clover it can achieve yields of 13t DM/ha. In other words, white clover leys will produce the same yield as a grass only ley, but without the need for nitrogen fertiliser. White clover has a high protein content at around 27%, while perennial ryegrass contains about 17% protein. A combination of both clover and ryegrass will increase the overall protein content from between 2%- 20%. Like other forage legumes, clover results in a higher voluntary intake than grasses. Its low structural fibre/soluble plant cell content ratio also means that it passes faster through the rumen. Clover's improved palatability and higher digestibility means that stock will eat more forage, resulting in an increase in live weight gain.

Red clover: High yielding

Red clover is a high yielding, high quality and high protein forage. It is most commonly used for silage production and also as a fertility building break, as it fixes high levels of nitrogen for subsequent exploitative crops in the rotation. Due to its deep rooting nature, red clover is relatively drought tolerant and winter hardy. It is not a very persistent plant and will usually last 2-3 years, although this makes it ideal as the fertility break in an arable rotation. It is best grown along with grasses as this provides a higher total forage yield and makes better silage. However, you should avoid feeding red clover to ewes 6 weeks before and after conception due to its high natural oestrogen content.

White clover: A versatile forage

Although it can yield less, white clover is more popular than red clover because it persists longer in the sward and is more adaptable, as it can be grazed hard and cut for silage. White clover differs from other clovers in having a stem that runs along the ground, which produces edible leaves and flower heads at low levels. This makes it highly suitable for grazing.

A large number of white clovers are available and are classified by leaf size. In general terms, the smaller the clover leaf size, the more tolerant it is to close grazing. The medium leafed varieties are more productive when cut for silage or hay. Large leaf clovers are best utilised in silage production or for grazing cattle, as they do not survive when grazed hard by sheep.

Sowing and establishment

Clover will never reach its full production potential in compacted soils which are low in pH, potassium and phosphate. To get the most from your clover ley it is best to address any soil compaction issues and aim for a soil pH of around 6.0.

When sowing clover it is important to pay attention to the timing of sowing and depth of seed bed. Clover requires a soil temperature of at least 7⁰C before satisfactory germination will take place, as well as sufficient moisture. The seed will not germinate satisfactorily if it is sown at a depth of more than 1cm. As clover seed is smaller than grass seed it should be sown in to a well consolidated seed bed. Rolling the seedbed before and after sowing is essential to ensure that the clover seed is in direct contact with the soil for maximum germination.

If you are looking at reseeding a field it makes sense to introduce clover into your sward. Sowing a grass-clover ley will save you time, money and energy in the long run, particularly as fertiliser prices and fuel costs are predicted to rise further.

Sources of further information

James Bretherton, AgScope, Feeding soil plant and animal
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Gavin Hill, Scottish Agricultural College, Team Leader Beef & Sheep Select
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Dods of Haddington, Haddington, Edinburgh,
Tel: 01620 823305 Email: dodseed@lineone.net

Cotswold Seeds Ltd, *The Case for Clover*
Website: www.cotswoldseeds.com

Soil Association Scotland

18C Liberton Brae, Tower Mains, Edinburgh EH16 6AE
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