



Managing clover for Better Returns



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Better Returns Programme

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White and red clovers provide a good source of protein in ruminant diets, both when grazed or conserved and have high intake characteristics.

There is the added benefit of nitrogen (N) fixation by the clover plants, so less artificial nitrogen fertiliser is required for grass growth.

Clover-rich swards fit well into forage or arable rotations and benefit soil fertility and structure.

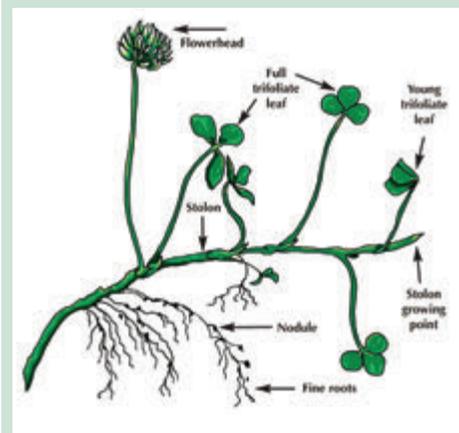
Ruminants have evolved to eat and utilise the nutrients in forage. However, methane emissions from livestock increase as forage quality reduces. In future, producers will need to improve and maintain sward quality to mitigate any adverse effects.

AHDB Beef & Lamb has funded research at IBERS to identify clovers that improve phosphorus and nitrogen uptake. The aim is to find ways for producers to save money on fertiliser inputs, whilst reducing their environmental footprint.

This manual outlines the significant advantages of including clovers in the farming system and the management needed to optimise their contribution to the farm business.



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AHDB Beef & Lamb



White clover

White clover is a perennial legume. The key to its survival and production potential is its multi-branched creeping stem called a stolon, which provides sites for new leaves, roots and flowers.

The stolon also stores carbohydrates and proteins, giving the plant the ability to over-winter and regenerate in spring.

Why use white clover?

Nitrogen fixation – bacteria that live in nodules on clover roots convert nitrogen from the air into nitrates. These stored nitrates are released to the companion plants and following crops through the root decay and the new roots and nodules that grow to replace them.

In a well-balanced and stable grass/clover sward, it is estimated that the usable nitrogen generated through the fixation process is equivalent to 100-150kg N/ha.

Intake – ruminant livestock may consume 20-30% more white clover than grass, assuming equal access, which will increase liveweight gains.

Feed value – white clover has higher digestibility, protein and mineral content than grass-only swards. Unlike grass, white clover retains its digestibility throughout the season, as there is continual renewal of leaves and little stem development.

Clover will increase the crude protein (CP) content of first cut silage by 1% for every 10% increase in the amount of clover in the sward.

Table 1: Typical quality characteristics of white clover and perennial ryegrass

	White clover	Perennial ryegrass
Digestibility (D-value) (%)	75-82	65-75
Crude protein (%)	27	17
Dry matter (DM) intake by sheep (kg/day)	1.9	1.4
Calcium content (%)	1.6	0.6
Magnesium content (%)	0.18	0.16
Phosphorus (%)	0.6	0.3
Copper (parts/million)	10.0	6.5
Selenium (parts/100 million)	0.6	0.2

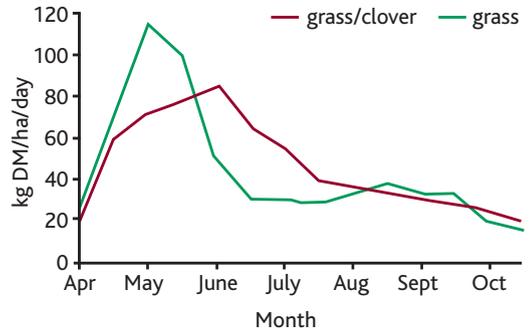
Soil structure – the root system of white clover can help tackle soil compaction. This results in more gaps between soil particles, which enhances movement of nutrients and water and improves crop yields.

IBERS research showed that soils with better structure as a result of using clover, also enable the crop to use fertiliser more efficiently.

Different growth pattern – clover starts growing when soil temperature is 8°C, as opposed to 5°C for grass, which means its growth pattern is different. Clover is particularly valuable during mid and late season when grass growth starts to fall away (see Figure 1).

Varieties – clover breeders have developed a range of clover varieties compatible with new ryegrasses according to their role in a mixture, achieved by selection under a range of field conditions.

Figure 1: Grass growth curve pattern



How to use white clover

The type of clover sown depends on the intended use of the ley.

Leaf type	Leaf area*	Uses
Small	Less than 700mm ²	Continuous sheep grazing
Medium	700-1000mm ²	Rotational sheep grazing Continuous cattle grazing Cutting
Large	More than 1000mm ²	Cutting Rotational cattle grazing

*See Recommended Grass and Clover Lists

Grass/clover mixtures

Mixtures produce scientifically proven yield benefits, compared to the same varieties sown individually.

White clover has been selected to withstand being grazed or cut, so the choice of companion grass depends on the primary use of the sward, ie grazing or cutting.

The ideal grass is typically ryegrass, as it has good nitrogen use efficiency. This means it can successfully convert the nitrates produced by the clover into plant yield.

Grasses such as bent, fescue, meadow grass and Yorkshire fog, have lower nitrogen use efficiency, so do not make good companion grasses if production is the main objective.

The large European Union-funded MULTISWARD project, found that by including deep and shallow rooting and N-fixing and N-lifting species, yields and animal performance were higher than pure ryegrass

swards receiving significant inputs of N fertiliser. The project, carried out across Europe, found that swards with two or three legumes in mixtures with perennial ryegrass receiving 150kg N/ha, performed as well as monoculture ryegrass swards receiving 300kg N/ha.

The multi-species swards including clover promoted higher forage intake across all livestock and increased output per ha.

With clover also being an increasingly important source of N on farm, an AHDB-funded study trialled different grass species with white clover to find the most suitable companion grass. At under 200kg N, clover still accounted for 29 to 53% of annual DM yield. The growth habits of different grass species appear to dictate clover patterns and when established with late heading timothy, clover contribution was highest (see Table 2).

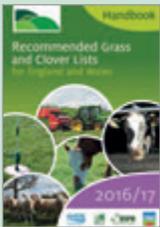


Table 2. Impact of companion grass on white clover yield and contribution under silage management

Companion grass	Grass + clover yield (t DM/ha)	Clover yield (t DM/ha)	Clover contribution (%)
Cocksfoot	13.9	4.0	29
PRG	13.9	5.9	42
PRG (T)	13.9	6.4	46
Timothy	13.8	7.4	53

(T) = Tetraploid cultivar

Buy recommended varieties



The Recommended Grass and Clover Lists are drawn up after rigorous testing for attributes such as yield, persistency, quality and disease resistance.

The scheme is no longer partially funded by merchants, which means the data are available to all.

The testing is funded by plant breeders through the British Society of Plant Breeders and the ruminant levy boards – AHDB Beef & Lamb, AHDB Dairy and Hybu Cig Cymru (HCC/Meat Promotion Wales).

The Recommended Grass and Clover Lists are available to farmers and all industry specialists. They provide detailed information on performance measures, including seasonal growth and agronomic characteristics for each variety, so that the best possible seed combinations can be selected.

Contact AHDB Beef & Lamb for a free copy of the latest list by emailing brp@ahdb.org.uk or calling **024 7647 8834** or download a copy at www.britishgrassland.com

White clover content

Clover content of 10% of DM



The optimum amount of clover in a field is 30% of the DM of the total sward. At this level, clover can fix 150kg N/ha per year and both animal and companion grass performance will benefit from it being there.

The proportion of clover growing is often over-estimated, as its leaf lies face up compared to grass.

To reach 30% clover, the sward needs to look more like there is 50-60% clover at its peak growth in August.

Clover content of 30% of DM



Under rotational sheep grazing, swards with 30% white clover content can be maintained for at least ten years, with total sward DM yields reaching 10-11t/ha per year.

Management guidelines to maintain 30% white clover:

- Assess stolon growth in the spring and treat as though the stolons are weak and vulnerable
- Avoid excessive stolon damage from poaching
- If clover content is too low, do not allow grass to shade it out. Make sure it is grazed frequently, or cut before it gets too mature
- Keep grass at 4-6cm over winter to protect stolons from frost damage
- If clover content is too high, use intensive grazing by sheep or strategic N use to increase grass growth

Clover content of 60% of DM



Establishing white clover

In a rotational system grass/clover leys may follow cereals, roots or brassicas, as these will have reduced nitrogen levels in the soil, which encourages clover establishment.

Sowing essentials

- A clean, firm seedbed, ring-rolled prior to sowing
- Soil pH of 6.0-6.5. Any lime applied to correct pH should be done well in advance of sowing
- Nitrogen fertiliser on low N status soils, and only up to 50kg N/ha (40 units N/acre)
- Apply phosphate and potash if soil indices are below 2
- 5-10mm is the optimum seed depth
- Broadcasting is the most reliable method of establishing a clover-based sward

Timing

Clover should be sown into a warm soil from April to August. Stolon production must start before winter.

Seed rate

In mixtures, aim for the clover seed rate to be 1-4kg/ha (0.5-1.5kg/acre).

Dealing with weeds

Here is an establishment method to achieve weed-free grass/clover swards:

- Use glyphosate to kill off old ley and any weeds
- Sow new ley without clover
- Monitor the new ley and treat any weed problems
- Stitch or broadcast clover into the established sward from six weeks after weed control

In an organic situation clover is successfully established into stale seedbeds, ie preparing the seedbed for planting a sufficient number of days before drilling to let the weed seeds germinate and emerge. When soil moisture is at a level to allow germination, subsequent flaming, harrowing or drilling will eliminate many of the germinating weed seeds.

Coated seed

White clover seed that has been coated with material that absorbs water to aid establishment and also inoculated with rhizobia, the bacteria that fix nitrogen, is available from some seed merchants. Research has shown that the rhizobia need to be matched to the variety for maximum benefit to be derived from using inoculant in coated seed.

Introducing white clover into existing swards

This can be done by:

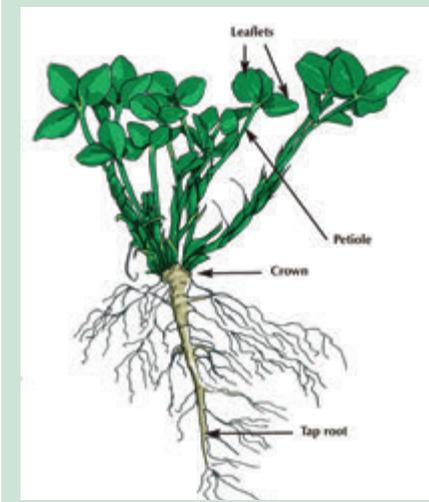
- Slot seeding/direct drilling
- Broadcasting following scarification
- Hoof and tooth, ie use animals to trample seed in and graze grass tight, if 20-40% bare soil is visible

Sowing guidelines:

- Minimise competition from existing plants before sowing by heavy grazing or harrowing to open up the sward
- Sow between April and August
- Sow when soil has optimum nutrient status and good soil structure
- Sow when grass is least vigorous, ie after flowering in July, as long as there is sufficient soil moisture. After a silage cut offers a good opportunity
- Ensure soil is sufficiently disturbed to allow seed-to-soil contact and coverage
- Use a higher seed rate (4kg/ha or 1.5kg/acre) than conventional sowing to compensate for greater seedling loss
- Lower seed rates (2.5kg/ha or 1kg/acre) may be used for a periodic top-up in long-term swards
- Use slug pellets
- After sowing graze hard in short intensive three to four day periods every month, until clover is well established, to reduce competition from other plants



White clover can be introduced using a direct drill or can be broadcast on.



Red clover

Red clover is a perennial legume that lasts for three to four years, with newer varieties lasting four to five years. In contrast to white clover, it has an upright growth habit and a strong deep taproot.

The crown, located at the base of the stem, acts as a store for nutrients. Differences in the size and storage capacity of the crown affect the persistency and suitability of different red clover varieties for particular management regimes.

Why use red clover?

Nitrogen fixation – like white clover, bacteria in the nodules on red clover roots convert nitrogen from the air into nitrates. These stored nitrates are released to the companion plants and following crops through root decay and the new roots and nodules that grow to replace them.

Red clover tends to fix between 150–250kg N/ha per year compared to about 100–150kg N/ha per year for white clover.

High yields – red clover/ryegrass swards are capable of producing 10–15t DM/ha per year.

Break cropping – red clover has significant benefits as a break crop in mixed farming situations, due to its ability to improve soil structure and soil nitrogen status.

Organic production – red clover is a key forage and fertility building crop for organic farms.

Feed value – protein content is particularly high in red clover and is protected so there is less protein loss from silage (Table 3)

Less protein breakdown of red clover silage is a result of the action of the polyphenoloxidase (PPO) enzyme, which increases the quality of the protein. A further benefit of red clover silage feeding is an increase in beneficial polyunsaturated fatty acid (PUFA) in animal products, such as meat and milk.

Feed value is often greater than it appears on a silage analysis depending on the laboratory method used, unless wet chemistry for protein content is used.

Table 3: Comparison of nutritional value of average grass and red clover silage

	Average grass silage	Average red clover silage
DM %	34.8	25–30
D-value %	66	60–70
ME (MJ/kg DM)	10.6	9.8–11.4
CP %	13.8	14–19
pH	4.6	4.0–4.5
Ammonia (% N of total N)	8.8	<5

Source: ADAS and IBERS

How to use red clover



Red clover swards are generally grown for high protein silage production, with aftermath grazing in the autumn. The development of varieties that are more tolerant of being grazed and more persistent, is creating potential for red clover to be used in rotational grazing systems.

Red clover is primarily grown in a mixed sward, but can also be grown as a monoculture.

Italian, hybrid and perennial ryegrasses are possible companion grasses.

Advantages of growing red clover with a companion grass are:

- Reduced impact of poaching
- Improved nutritional balance, especially with grasses that have high water soluble carbohydrate content
- Utilisation of fixed N by the grass. Nitrogen loss can be reduced four-fold when grown with companion grasses instead of monoculture

Table 4: Example mixture for four to five-year ley for silage and autumn lamb grazing

Type	Seed rate
Intermediate heading perennial ryegrass (diploid and tetraploid)	20-24kg/ha (8-10kg/acre)
Red clover	7.5kg/ha (3kg/acre)

Hybrid ryegrass is a useful companion grass where three or four-year short-term leys are required. Italian ryegrass is most useful as a companion species in predominantly arable rotations where two-year leys are more common.



Reducing crown damage

Red clover only grows from its crown, so if this is damaged the plant will die. As the crown is above ground, it is crucial to protect this area of the plant.

Ensure:

- Height for all silage cuts is no lower than 7-8cm
- Excess wheelings from heavy machinery is avoided
- Grazing height of aftermath is maintained above 6cm and the crop is over-wintered at 4-6cm
- Poaching by animals is minimised

Establishing red clover

Red clover can be drilled or broadcast, or undersown to an arable silage crop in April. It can also be introduced into an existing sward.

Sowing essentials

- A clean, firm seedbed, ring-rolled prior to sowing
- Soil pH of 6.0-6.5. Any lime applied to correct pH should be done well in advance of sowing
- Nitrogen fertiliser on low N status soils, but only up to 50kg N/ha
- Apply phosphate and potash if soil indices are below 2
- 5-10mm is the optimum seed depth

Timing

Red clover should be sown into warm soil from April to late July.

Seed rate

- For monoculture swards use 15kg/ha (6kg/acre)
- For mixed swards use 7kg (3kg/acre) of red clover per ha and 22kg (9kg/acre) of grass per ha

A monoculture or mixture of legumes can also be grown under the CAP policy greening rules on a farm which has more than 10 or 15ha of arable cropping.

Target establishment: 200 clover plants per m² by October in the sowing year.

MULTISWARD

Researchers across Europe are exploring the benefits of using multi-species mixtures that will improve livestock performance.

In the MULTISWARD project, ryegrass, tall fescue or chicory were compared with swards containing two grass species and around 33% legume (white clover or red clover).

Under both cutting and grazing management at all sites, the swards containing red or white clover out-yielded grass monocultures at the same N fertiliser level and produced the same yield as the high N grass monocultures.

Animal intake and milk yield were compared on swards containing perennial ryegrass only and a mix of four species; perennial ryegrass, white clover, red clover and chicory at two different N levels. The multi-species sward promoted higher forage intake across all livestock and better output per ha.

Managing red clover

For silage

- Graze swards lightly in the autumn of the sowing year
- Take two to three cuts (four maximum), at six to eight week intervals. Should yield 13-14t DM/ha on fertile sites, or 10t DM/ha on upland sites
- Ensilage at 30% DM to minimise wilting losses
- Do not use a mower conditioner. Wilt for up to 48 hours, turning the swath once
- Avoid crown damage by not cutting too low – aim for 7-8cm
- Graze autumn re-growth lightly to finish lambs or cattle
- Do not apply nitrogen except in year one
- Apply 200-300kg/ha of phosphate (160-240 units/acre phosphate) or 100-150kg/ha of potash (80-120 units/acre potash) to achieve soil indices of 2
- Good yields achievable for four to five years with modern varieties
- For every tonne of DM removed, approximately 8kg of phosphate and 27kg of potash is removed, which needs replacing

For grazing

- Use aftermath to graze lambs or cattle. Superior growth rates from red clover can be achieved compared to ryegrass (Table 5)
- Avoid grazing in wet or damp conditions to limit bloat and reduce risk of poaching

Table 5: Lamb performance from grazed red clover or ryegrass

	Red clover	Ryegrass
Growth rate (g/day)	229	182
Days to finish	40	49
Eye muscle depth (mm)	27.1	25.9
Subcutaneous fat depth (mm)	4.1	3.9
Cold carcase weight (kg)	18.8	17.7
Killing out %	51	48



Source: IBERS

The BRIMVAR (Breeding for Improved Varieties) project is developing red clover varieties for resistance to crown rot (*Sclerotinia trifolium*) and to stem eelworm (*Ditylenchus dipsaci*), the main causes of low persistency.

Other research with red clover is concentrating on grazing tolerance. This may, in future, lead to varieties that can be used in a grazing ley, without the problems of crown damage that can occur with currently available commercial varieties.

Potential problems

Bloat

Bloat is caused by an excessive build-up of gas (carbon dioxide and methane) inside the animal. This causes distress and sometimes death, as the distended rumen exerts pressure on the diaphragm, heart and lungs. The problem is caused by rapid breakdown of clover protein.

Effective management can minimise or eliminate the risk of bloat in livestock grazing clover-dense swards.

- Limit access when stock is first introduced to the field
- Do not turn hungry stock out onto clover-rich pastures



- Feed fibre such as hay or straw, before turnout
- Provide fibre (hay/straw) in the field
- Take special care when the day is foggy or damp
- Feed an anti-bloat feed additive

The risk of bloat appears to be less when feeding red clover silage, but care still needs to be taken to provide a balanced ration.

Fertility

Breeding ewes should not be fed red clover, either fresh or ensiled, or diseased white clover for six weeks before and after tupping.

Red clover and stressed white clover contain high levels of phyto-oestrogens, which become more concentrated when ensiled. Phyto-oestrogens can cause 'clover disease' or 'clover infertility' in ewes.

Clover disease causes low lambing rates, prolapsing, difficult lambing, uterus inflammation and bacterial infection.

Clover infertility, due to permanent damage of the reproductive tract, worsens with exposure to the phyto-oestrogens. The structure of the cervix and sperm transport is affected causing a reduction in conception rates. Clover infertility has no visual signs – ewe cycling and ovaries appear normal. Accurate diagnosis is usually limited to abattoir feedback.

Additionally ewes fed high oestrogen clover may also suffer from temporary infertility, which can be reversed within a month of changing the diet. Vulva and mammary gland swelling will be visible in some breeds.

There have been no reports of negative effects on the fertility of male stock.



Effects are less severe in white clover, but high phyto-oestrogens can cause reduced ovulation and delayed oestrus.

Breeding cows rarely graze red clover, but experiments have shown that silage made from this crop does not affect herd fertility.

Clover dominance

If clover becomes dominant through most of the season and little grass is visible, it can unbalance the sward. This may increase weed infestations, as there is less ground cover during late autumn, winter and early spring, when clover growth has slowed or stopped.

If clover dominance is a problem:

- Avoid regular silage cutting, as the offtake of nitrogen and light falling on the growing points encourage clover growth
- Consider using smaller-leaved clover varieties
- Graze more intensively, particularly with sheep
- Use tactical applications of nitrogen to stimulate grass growth enabling it to out-compete the clover



Weed control options

- Sow into a clean seedbed to avoid competition from weed species during establishment
- Maintain soil fertility to ensure grass and clover can be competitive against weeds
- Sow grass seed first, then use a non clover-safe herbicide to control weeds, before white clover is introduced through over-seeding
- Most weeds in reseeds can be controlled by management, ie grazing or topping, and do not need herbicides
- If herbicides are needed, use a clover-safe product and only spray if clover plants are vigorous and well developed
- Use a weedwiper to treat target weed species only
- Involve a BASIS trained adviser
- Appropriate certificates are needed for anyone using sprays on-farm and equipment (except knapsack sprayers) needs testing. This is part of the Sustainable Use Directive



Use herbicides carefully or lose them!

The *Grassland weed control* leaflet produced by The Voluntary Initiative and the Agricultural Industries Confederation (AIC) provides advice on how to control the main grassland weeds, while minimising any effects on the environment.

See www.voluntaryinitiative.org.uk/grassland for more information.

Pests and diseases

Disease	White clover	Red clover
Clover rot (<i>Sclerotinia</i>)	<p>Most important disease.</p> <p>Seen typically in December/January. Causes a generalised rot of the plant, leaves and stems from which plants rarely recover.</p> <p>Select for resistant clovers.</p> <p>Limited herbicides available.*</p>	<p>Most important disease.</p> <p>Clover rot cannot usually be controlled safely or economically in situ, so a five to seven year rotation between red clover crops is strongly recommended.</p> <p>Select for resistant clovers.</p> <p>Limited herbicides available.*</p>
Crown and root rot (<i>Fusarium</i>)	<p>Not applicable.</p>	<p>Plants look pale green and stunted, roots and crowns have darkened diseased tissue.</p> <p>Three to four year rotation, ideally to cereals or pure grass swards where serious.</p> <p>Control insects and reduce cutting to reduce stress to plant.</p> <p>Ensure optimal nutrition and soil pH.</p> <p>Use a fungicide.*</p>
Powdery mildew	<p>Not applicable.</p>	<p>Visible in small patches of fine, white-grey cobweb-like growth on upper leaf surface which develops into a white dusting.</p> <p>Apply fungicide* at first sign of disease unless late in season, where application will not be cost-effective.</p> <p>Use resistant varieties.</p>
Viral diseases	<p>Clover Yellow Vein Virus (CYVV) – severe strains can cause intense severe yellowing of leaves, followed by premature death. Plants are usually stunted and seed pods show some deformation.</p> <p>A number of aphid species including the pea aphid, can transmit the virus.</p>	<p>Red Clover Vein Mosaic Virus (RCVMV) – causes plants to appear stunted, with leaves yellowing and curling. There is a rapid wilt and collapse of the plants.</p> <p>A number of aphid species, including the pea aphid, can transmit the virus.</p> <p>There are no known resistant commercial cultivars.</p>
Pepper spot	<p>The blackish brown, small lesions of about 1mm in diameter are produced in great abundance and the whole leaf looks like it has been sprinkled with black pepper. The surrounding areas gradually turn yellow and eventually the leaf withers.</p> <p>It occurs most severely in cool and damp conditions with frequent rain.</p>	<p>Not applicable.</p>

Pest	White clover	Red clover
Stem eelworm	Causes distortion of growing buds and young leaves and death of the plant. Note: Not the same strains for white and red clover, so white clover can be sown between red clover crops to break the pest cycle.	Most important pest. Most effective control is rotation – a five year break is recommended between red clover crops, extended to seven years if stem eelworm is present.
Slugs	Major pests for both red and white clover. Use molluscicide.*	
Sitona weevil	More common in arable areas – leads to removal of small semi-circular sections of leaflets. Treatments for frit fly or leatherjackets likely to reduce pest problem, but no specific insecticide available.	Not applicable.
Leatherjackets	More common following ploughing old pastures. Sprays for leatherjacket control are no longer available. Consider killing off the grass in the autumn and leaving the land fallow over the winter, before reseeding in the spring. Improve soil drainage. May be potential for biocide use, eg <i>Bacillus thuringiensis</i> , but no clear scientific support as yet.	Not applicable.

*Seek advice from a qualified professional and ensure sprayer operators are fully qualified.

Recovery

White clover will often rapidly recolonise areas affected by pests or diseases, by extending the stolons of the remaining plants into the gaps.

As red clover plants grow from a single crown, recolonisation of areas affected by pests or diseases cannot happen. Grow with companion grasses to help prevent weed ingress into bare patches.

Undersowing

Undersowing crops with clover or grass can help maximise production per ha and provides a good way to establish leys. Spring-sown cereals are ideal for undersowing, as they are less dense than winter sown crops such as winter wheat. Cereal varieties should be early maturing and resistant to lodging. Barley is a preferred option as it is less competitive than triticale or oats. Open canopy crops, eg brassicas or potatoes, can also be undersown successfully, helping with pest and weed control.

Tips

- Sow the clover or grass on the same day as the cover crop
- Cereal sowing rate should be reduced by one third
- Open canopy crops can be sown at their usual sowing rate, with the clover or clover/grass mix sown at normal rate
- Approximate rate recommendations for undersowing cereal with clover:
 - White clover alone: 4kg/ha (1.5kg/acre)
 - White clover with ryegrass: clover 2.5kg/ha (1kg/acre) and ryegrass 29.5kg/ha (12kg/acre)
 - Red clover alone: 12-14kg/ha (5-6kg/acre)
 - Red clover with ryegrass: clover 7.5kg/ha (3kg/acre) and ryegrass 19kg/ha (7.5kg/acre)

Benefits

- Reduced N leaching
- More available N for successive crop
- Quick establishment of grazing ley
- Reduced cultivations
- Less weed pressure
- An undersown spring cereal is a high value conservation option for Entry Level Stewardship–EG1



Potential drawbacks

- Undersown crop may compete with cover crop – most likely where there is a high proportion of ryegrass
- In wet years, the undersown crop may become more green and vigorous, making harvesting difficult
- Establishment of the secondary crop may be poorer than if it had been drilled after harvest of the main crop, if it does not get enough sunlight and nutrients
- At high fertiliser rates, undersown clover alone can increase nitrate leaching
- There may be implications for fungicide and pesticide applications

Summary of clover management tips

In general

- ✓ Aim for 30% clover content of sward
- ✓ Choose a leaf size according to whether the ley is going to be short, medium or long term

Establishment

- ✓ Establishment options include direct drilling, broadcasting, hoof and tooth and undersowing
- ✓ Soil pH should be 6.0-6.5. If required, liming should be done well in advance of sowing
- ✓ Apply up to 50kg N/ha (40 units/acre) and phosphate (P) and potash (K) only if required
- ✓ Sow at an optimum seed depth of 5-10mm

Management

- ✓ Clover content too high? Graze intensively or use strategic N applications
- ✓ Clover content too low? Oversow with more clover seed at 2.5kg/ha (1kg/acre) or take more cuts
- ✓ Companion grasses can improve N utilisation and provide a more nutritionally balanced sward

- ✗ Do not turn hungry stock out onto clover-rich pastures. Limit access when animals are first introduced to field with additional hay/straw fed before and during grazing

White clover specific

- ✓ Sow April-August
- ✓ Fixes around 100-150kg N/ha per year
- ✗ Avoid diseased white clover six weeks before and after tugging due to infertility risk



Red clover specific

- ✓ Sow April-July
- ✓ Fixes between 150-250kg N/ha per year
- ✗ Do not take silage cuts below 7-8cm, graze below 6cm, or allow excess wheelings or poaching, to reduce crown damage risk
- ✗ Do not graze or feed ensiled red clover six weeks before and after tugging due to infertility risk



IBERS research

Research is currently underway to develop new varieties of clover with additional useful characteristics.

Some of these varieties are already being field-tested for inclusion in future Recommend Grass and Clover Lists, eg:

- White clover with lower phosphorus requirements
- Red clover that has reduced nitrate losses via leaching which enables more efficient use of nitrogen in the rumen
- White clover that is lower in protein so there is more efficient capture of nutrients in the rumen
- White clover varieties that are more drought tolerant
- A novel hybrid between the stoloniferous species white clover and the rhizomatous species Caucasian clover

For more information visit www.sureroot.uk

Other BRP publications available

Joint Beef and Sheep BRP

- Manual 1 – Improving pasture for Better Returns
- Manual 2 – Assessing the business for Better Returns
- Manual 3 – Improving soils for Better Returns
- Manual 4 – Managing clover for Better Returns
- Manual 5 – Making grass silage for Better Returns
- Manual 6 – Using brassicas for Better Returns
- Manual 7 – Managing nutrients for Better Returns
- Manual 8 – Planning grazing strategies for Better Returns
- Manual 9 – Minimising carcase losses for Better Returns
- Manual 10 – Growing and feeding maize silage for Better Returns

See the AHDB Beef & Lamb website beefandlamb.ahdb.org.uk for the full list of Better Returns Programme publications for beef and sheep producers.

For more information contact: Better Returns Programme

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