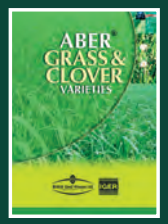
## Information Sources and Contacts

The following publications provide more details on Aber grass and clover varieties and are available from British Seed Houses.


High Sugar Grass - the definitive guide to the new 'Aber' varieties developed by IGER for more efficient meat and milk production.


AberHybrid Ryegrass - pioneering varieties that harness together the best traits of Perennial and Italian Ryegrass.




Aber Grass and Clover Guide - a guide to 'Aber' grass and clover varieties bred by IGER.


Seed Mark - top quality grazing and silage mixtures including AberHSG, Aber Hybrid Ryegrass and other IGER-bred varieties for conventional systems.


Aber Clover Blends - a guide to 'Aber' white clover varieties and blends.

## Acknowledgements

Major sponsors of IGER grass and clover research include BBSRC, DEFRA and the EU.

Data in this publication has been reproduced from NIAB Recommended Lists.



**£5**

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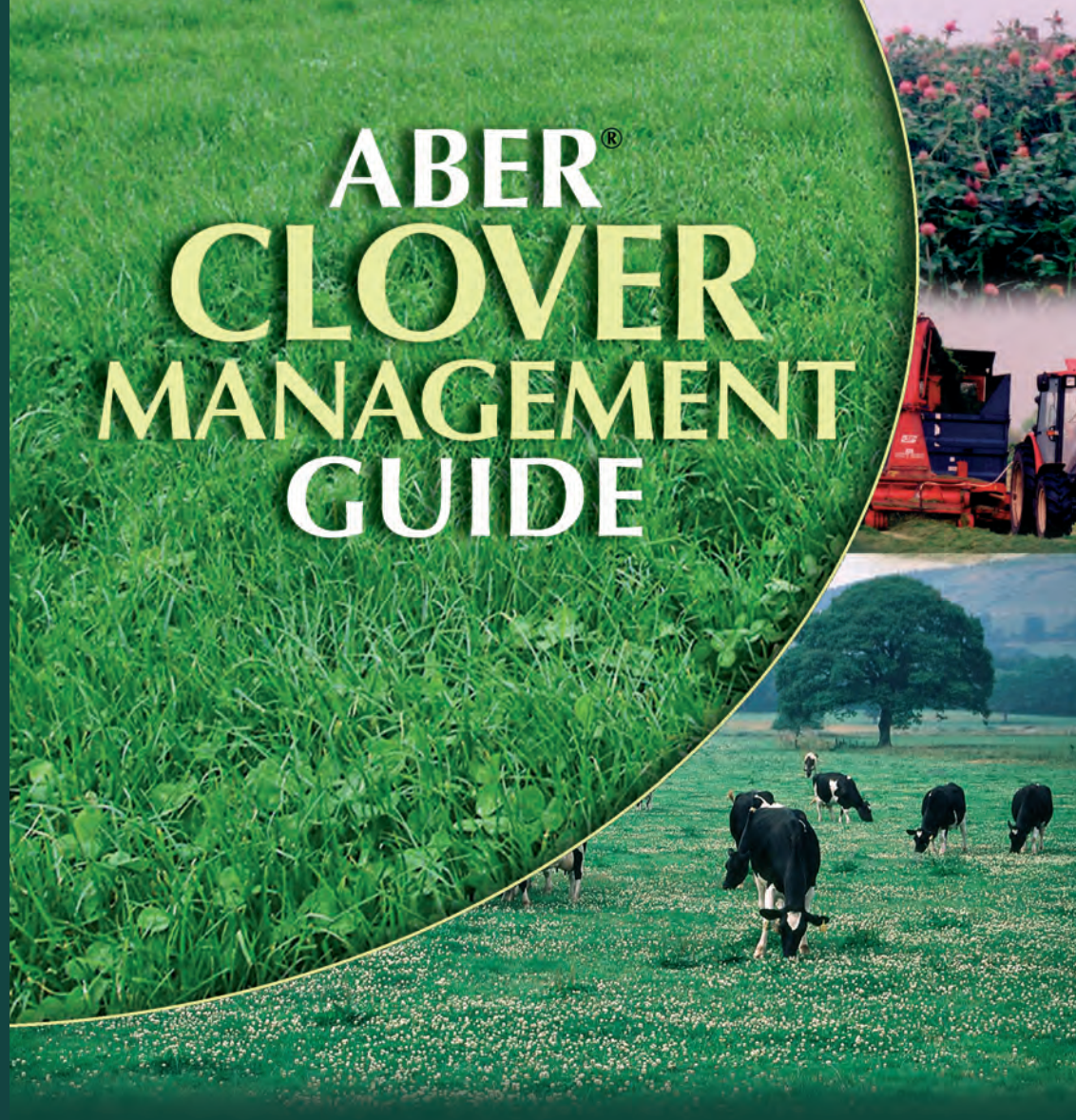
**www.britishseedhouses.com**



# ABER® CLOVER MANAGEMENT GUIDE

BRITISH SEED HOUSES

IGER

# Contents





# The Developing Role of Clovers in UK Livestock Production

Modern varieties of white and red clover offering higher yields, greater persistency, increased versatility and reliability are challenging out-moded perceptions of these crops and providing the impetus for a growing role in sustainable livestock systems.

No longer are these crops only relevant and economically attractive in low input/low output systems and for organic production. Instead, they are increasingly important within progressive forage-based enterprises, independent of intensity of production, as cost effective providers of high quality home grown protein that also help reduce reliance on fertiliser nitrogen. As farming adapts to a new regime following CAP reform, so clovers will become even more important across the full spectrum of livestock systems.

Long-standing white clover development programmes at IGER, and a more recent resurgence in work on red clover, are underpinning this increased interest and uptake.

White clover has sometimes been seen as an inconsistent performer, but new varieties bred at IGER are now achieving optimum targets of a 30-35% contribution to total sward dry matter under a range of both grazing and conservation management systems. This is just one of the results of breeding work that has focussed on the key factors affecting white clover performance such as winter hardiness, pest and disease resistance and nitrogen tolerance. Compatibility with modern Aber ryegrass varieties is another important dimension, and is also a strength of IGER's breeding programmes.

Red clover breeding work recommenced at IGER in 1998 and is already producing new varieties such as AberRuby that are considerably better suited to the current requirements of UK livestock farming than their predecessors.

Red clover is increasingly being grown both as a stand-alone crop and as a companion species to modern grasses, primarily for high quality silage and also for grazing. Breeding objectives include a focus on sustaining yields into a third year and beyond, enhanced grazing tolerance, and improved pest/disease resistance.

A close affinity with agricultural practice remains a strong feature of IGER's work. Selection and testing takes into account performance in the silo and in the rumen, as well as in the field under appropriate conditions (e.g. cattle and/or sheep grazing for white clover, conservation cuts and aftermath grazing for red clover). This co-ordinated approach, and IGER's on-going commitment to breeding, is geared to ensuring that white and red clover continue to make a significant contribution to the UK's changing livestock farming industry for many years to come.

Clover breeding at IGER is building on the agronomic platform described above and also helping to reduce the environmental impact of livestock agriculture, whilst enhancing the quality of the meat and milk produced.

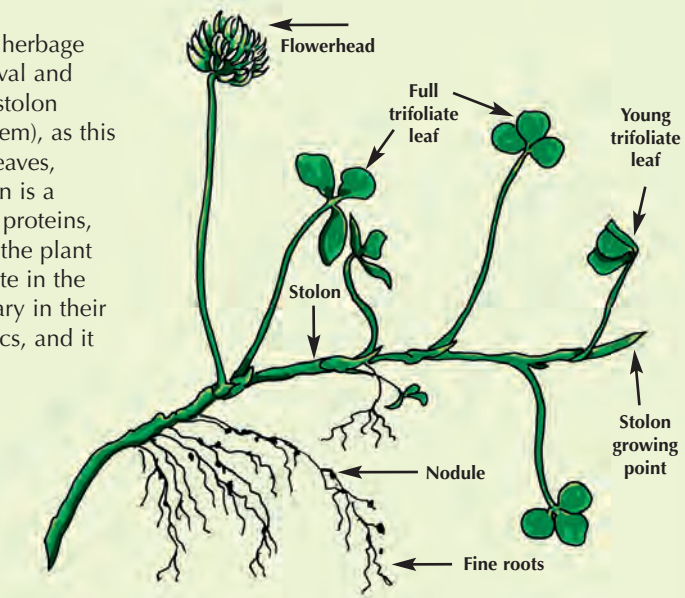
Michael T. Abberton.

**Dr Michael Abberton** Head of Clover Breeding, IGER

# Understanding White Clover

## The Plant

White clover is a perennial herbage legume. The key to its survival and production potential is the stolon (multi-branched creeping stem), as this provides the sites for new leaves, roots and flowers. The stolon is a store for carbohydrates and proteins, and provides the ability for the plant to over-winter and regenerate in the spring. Varieties of clover vary in their leaf and stolon characteristics, and it is these often quite marked differences that help to determine agronomic performance.




## Usage

White clover is almost universally grown with a companion grass, and most typically with ryegrass, with the type of ryegrass being dependent upon the primary use of the sward.

Developments in white clover breeding have increased the versatility of its use and the longevity of white clover within swards, with greater nitrogen tolerance being a key feature in more intensive systems. Sustainable systems incorporating white clover range from long term leys for continuous sheep grazing (using small leaved white clover varieties) through to medium term leys for rotational sheep or cattle grazing (modern medium leaf varieties), and short term cutting and cattle grazing leys (large leaf varieties).

## Key Benefits of White Clover

**Nitrogen Fixation –** Rhizobium bacteria, which exist symbiotically within protuberances or 'nodules' on clover roots, convert nitrogen from the air into a form that can be utilised by the plant; this process is called nitrogen fixation. This nitrogen becomes available for companion grasses and/or subsequent crops as it is released following plant decay or from the dung and urine of grazing livestock.

It is estimated that the utilisable nitrogen generated through the fixation process is equivalent to 100–150 kgN/ha in a well-balanced and stable grass and clover sward.



# Understanding White Clover

**Intake –** Ruminant livestock may consume 20-30% more white clover than grass, assuming equal access.

**Feed Value –** Response per unit of feed intake is greater for white clover than it is for grass. This higher nutritive value is due to a lower proportion of structural fibre, higher protein content, and more of certain key minerals than grass (see table below).

**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 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 per million) | 10.0 | 6.5 |
| Selenium (parts per 100 million) | 0.6 | 0.2 |

White clover has the added advantage of retaining high digestibility throughout the season, as there is continual renewal of leaves and petioles and relatively little stem development.

**Soil Structure –** White clover root systems improve soil structure and can help to overcome problems of soil compaction.

Studies at IGER have demonstrated improved soil structure resulting from a greater white clover component in the sward:

- White clover has been shown to significantly decrease the bulk density of soils and increase porosity.
- Fertiliser recovery from soils with improved structure due to white clover was shown to increase from less than 50% to over 75%.
- General movement of nutrients was improved, with the result that more grass was produced.

**Improved soil structure is seen in the soil core with a higher clover content (right)**

## Clover Dominance

The proportion of clover in a grass/clover sward is commonly over-estimated, typically by twofold. The images below should be used as a guide to achieving the optimum balance as described later.

If clover does become dominant (i.e. when very little grass is visible), then it can out-compete the grass component and unbalance the sward. This may lead to increased weed ingression and greater vulnerability of the clover to winter damage. This is most common in the second and thirds years of a ley, and a more desirable grass/clover balance will be seen in the third year and beyond.

If clover dominance is a problem:

- avoid regular silage cutting sequences, as the regular removal of nitrogen will encourage more clover;
- consider using smaller leaved clover varieties in future;
- more intensive grazing, particularly by sheep, will suppress the clover;
- tactical application of nitrogen.

5 - 15%

16 - 30%

31 - 50%

50% plus





## Sward Composition

Maintaining an optimum dry matter balance of 30% white clover to 70% grass as an average across the season is the key to grass/clover sward management, as this is expected to provide best exploitation of the clover's nutritional and nitrogen fixing attributes alongside high yielding grass.

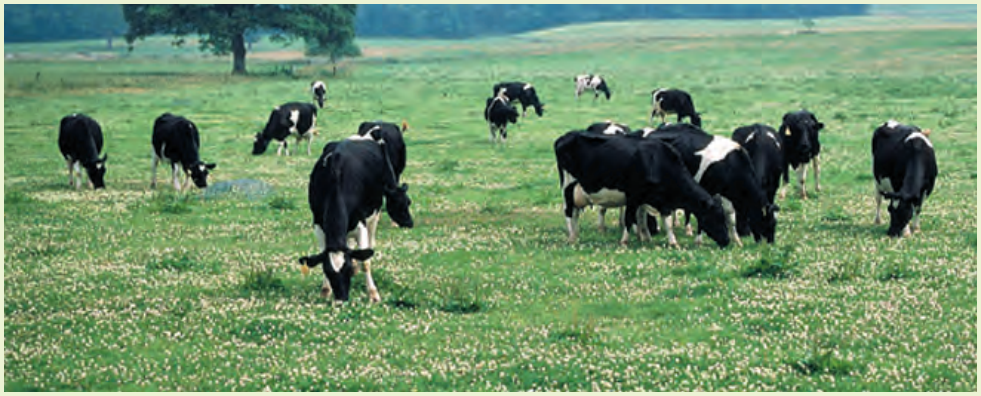
In the past, white clover growth patterns and the nature of the interaction with grass have tended to cause significant seasonal variation of clover content in swards – from as little as 5% in the spring up to 60% in summer – but clover breeding work at IGER is producing varieties that are more compatible with modern ryegrasses and have more even seasonal growth curves.

## Bloat Awareness

Bloat is the excessive build up of gas (carbon dioxide and methane) in the rumen resulting in distress and possible death due to the exertion of pressure on the animal's diaphragm, heart and lungs. Some legumes, including white clover because of the rapid breakdown of protein in the rumen, present an increased risk of bloat if the correct management is not applied.

Effective management procedures to minimise or eliminate the risks of bloat in livestock grazing clover-dense swards should include:

- Limiting access to swards when stock are first introduced;
- Feeding high dry matter forage such as hay/straw prior to turnout;
- Offering hay/straw at intervals (e.g. to dairy cows at milking times);
- Feeding an anti-bloat feed additive.



# Managing White Clover

## Successful Establishment

### Targets
The aim at establishment should be to achieve a minimum of 150 clover seedlings per square metre within a mixed white clover/grass sward.

### Techniques
In a rotational situation, preceding crops should ideally be cereals, roots or brassicas, which lead to reduced nitrogen levels in the soil and encourage clover establishment.
Broadcasting is the most reliable method of establishing a clover-based sward, and is generally considered more successful than drilling.
Undersowing to a cereal crop is an alternative, particularly if the cereal is to be harvested early (July) for wholecrop. If undersowing grain crops, cereal varieties should be early maturing and lodging resistant, and cereal seed rate should not exceed 140kg/ha.
White clover can be introduced into an existing sward (see Sward Renovation).

### Timing
April – mid-August is the optimum sowing period on most UK farms. Seedlings must have begun producing stolons before the onset of winter.

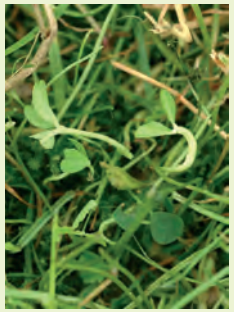
### Seedbed
A clean seedbed is essential, and this should ideally be ring rolled prior to sowing. Optimum soil pH is 6.0 – 6.5. Liming to correct pH should be carried out well in advance of sowing.
Fertiliser nitrogen should only be applied in low N status soils, up to 50kgN/ha. Phosphate ($P_2O_5$) and potash ($K_2O$) is required at application rates of 50 – 120 kg/ha, depending on soil indices.

### Seed Rate and Sowing Depth
Seeds mixtures should contain between 2 and 4kg/ha of white clover seed depending upon environmental conditions to achieve target establishment and an optimum balance in the sward.
Optimum seed depth is 5 – 10mm.

### Combating Pests and Diseases
The main pests affecting white clover during establishment are:

- Slugs; potentially devastating in problem areas.
- Stem eelworm; causes distortion of growing buds and young leaves and death of the plant.
- Sitona weevil; more common close to arable areas and leads to the removal of small semi-circular sections of leaflets.
- Leatherjackets; more common following the ploughing of old pastures.


Sitona weevil - leaf damage


Stem eelworm damage



# Managing White Clover

The most common disease affecting white clover is clover rot (Sclerotinia), which causes a generalised rot of the plant (see page 16).

It is important to be aware of the risks of both pests and diseases and take the appropriate action, including selection of new stem nematode resistant Aber varieties (where available) and use of agrochemicals following advice from a qualified agronomist.

In the case of damage from both pests and disease, the mobility of white clover resulting from stolon extension allows rapid re-colonisation by surviving (and possibly resistant) plants, thereby reducing the impact of infestation.

### Weed Control
First and foremost, a clean seedbed is essential in order to avoid competition from weed species during establishment.

Most annual and some perennial weeds can be controlled by regular pasture topping, but it may be necessary to use herbicides in some circumstances, in which case ensure a clover-safe product is used and only spray if clover plants are vigorous and well developed.

### Pelleted Seed
Techniques of white clover seed pelleting have been developed at IGER as a means of improving establishment especially in areas where white clover has not been previously grown.

**Features and benefits of white clover seed pelleting**

| Features | Benefits |
|---|---|
| Increased seed size | Improved seed placement in the seedbed |
| Phosphate fertiliser | Promotes root growth |
| | Reduces competition for nutrients |
| Lime | Neutral micro-environment to aid root development |
| Pesticide | Protection against pests such as Sitona weevil |
| Rhizobium inoculants | Rapid nodulation by efficient nitrogen fixing strains |

## Two stage establishment

Dow AgroSciences


Effective control of annual and perennial weeds in new sown leys has become more difficult due to the withdrawal of some key products in recent years.

Particular difficulties occur in relation to clover, so new approaches are required to ensure the establishment of weed free grass and clover swards.

One such method is to establish a weed free grass ley in advance of introducing clover, using a two-stage system.

### Following an existing ley with perennial weed problems (docks, thistles etc.)

1. For autumn reseeds start the control of perennial weeds in the preceding spring, with root acting chemistry that has good activity on the weeds e.g. Doxstar (Docks), Thistlex (Thistles), Pastor (Docks, Thistles, Nettles).
   For spring reseeds start weed control in the previous season.
   These products are not clover safe.
2. Use glyphosate (3-6 litres/ha) to "burn off" old ley and any surviving weeds.
3. Sow new ley mix (excluding clover).
4. Monitor ley during establishment. Treat weed problems if necessary from 3 true leaves of the grass onwards. Non clover safe options give broader more effective weed control. E.g. Doxstar at 1.5 litres/ha in 200 litres water (chickweed, seedling docks); Pastor at 2.0 litres/ha in 200 litres water (broad spectrum).
5. Stitch clover into established sward (April – August) having allowed minimum of 6 weeks following use of non clover safe materials (see Sward Renovation on p.12).

### Following arable crops/maize or weed free swards

1. Use glyhosate at 1.5-4.0 litres/ha (arable stubbles) or at 3-6 litres/ha (grass swards) to "burn off" old ley and any weeds.
2. Repeat steps 3- 5.

**For further advice telephone The Dow AgroSciences Hotline on 0800 6898899**

**ALWAYS READ THE LABEL USE PESTICIDE SAFELY**


Doxstar contains triclopyr and fluroxypyr. Pastor contains clopyralid, fluroxypyr and triclopyr. Thistlex contains clopyralid and triclopyr





## Systems in practice

### Grazing management of White Clover

- Observe size and vigour of stolons in the spring in order to determine optimum management strategy
- Ensure the appropriate variety is grown for intensive grazing
- Avoid excessive stolon damage through poaching
- Use intensive grazing, particularly by sheep, as a brake on clover content, or less frequent cutting to increase clover content
- Keep grass at 4-6 cm over winter to protect stolons from frost damage
- Choose suitable companion grasses and the best clover varieties of appropriate leaf size for the system

### Continuous Grazing

- Use smaller leaved varieties to withstand hard grazing pressure
- Modern varieties grown with compatible companion grasses in long term leys can sustain high dry matter yields for the duration of the ley, assuming low nitrogen fertiliser inputs

### Rotational Sheep Grazing

- Modern medium leaved varieties are most suitable
- Consider inclusion of small leaved varieties where grazing pressure is heavy
- Swards with 30% white clover content can be maintained for at least 10 years, with total sward dry matter yields of 10 –11 t/ha/annum
- The use of modern nitrogen tolerant Aber varieties enables high clover content swards to be maintained with nitrogen ferilizer levels up to 200 kgN/ha/annum.

**Annual P & K requirements of white or red clover / grass leys (kg/ha)***

| Soil P or K Index | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Grazing | | | | | |
| P | 60 | 40 | 20 | 0 | 0 |
| K | 60 | 30 | 0 | 0 | 0 |
| Silage(3 Cut) | | | | | |
| P | 130 | 105 | 80 | 20 | 0 |
| K | 340 | 290 | 250 | 90 | 0 |

*Some of the P and K can be supplied in manures/slurry. Eg 40 $m^3$/ha dairy cow slurry may supply 48 kg/ha P and 140 kg/ha K.

# Managing White Clover

### Rotational Cattle Grazing

- Modern medium leaved varieties grown with compatible companion grasses can provide a total sward dry matter yield of 11 – 13 t/ha/annum.
- Longevity of the sward is determined by the companion grasses, with perennial ryegrass offering up to 8 years, hybrid ryegrass up to 5 years, and Italian ryegrass 2 – 3 years duration.
- Modern nitrogen tolerant varieties perform well in swards receiving up to 350 kgN/ha/annum.
- Where swards are cut frequently (for silage) it is beneficial to include a proportion of the white clover content as large leaved varieties.

### Sward Renovation

White clover can be introduced to an existing sward through a variety of methods, from slot seeding to broadcasting following scarification. Greatest success will be achieved by observing the following principles:

- Minimise competition from existing plants prior to sowing by heavy grazing and/or harrowing to open up the sward.
- Observe normal sowing timings (April –August) and soil nutrient/pH status parameters.
- Take advantage of the period when grass is least vigorous (after flowering in July) if there is sufficient soil moisture, particularly after a silage cut.
- Ensure soil is sufficiently disturbed to allow seed contact and coverage (5-10mm seed depth).
- Use a higher seed rate (4kg/ha) than conventional sowing to compensate for greater seedling loss. Lower seed rates (from 2.5 kg/ha) may be used for a periodic top-up in long term swards.
- Use pelleted seed to improve establishment, where necessary.
- Use slug pellets as an established sward may well harbour this pest.
- Graze lightly and in short periods until clover is well established.

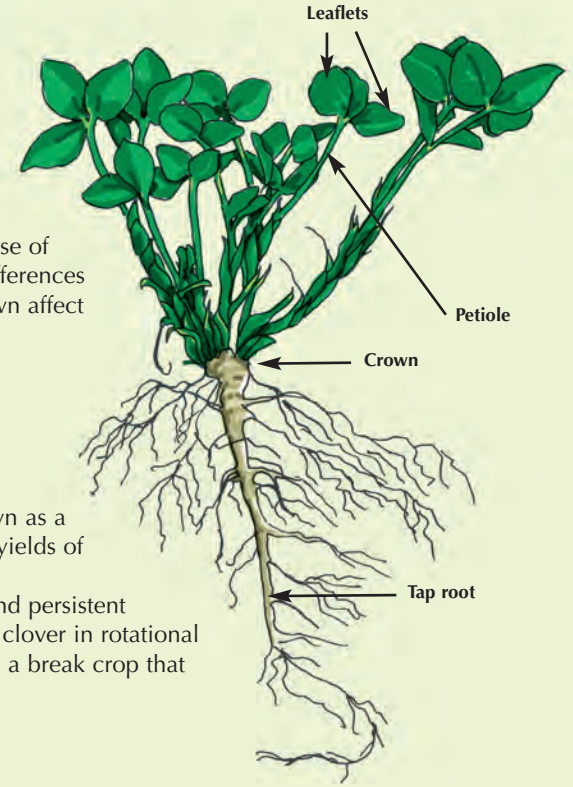
### White Clover Blends

Blending complementary varieties of white clover, with a range of leaf sizes, offers significant advantages over growing single varieties, particularly in varying environmental and management situations.



# Understanding Red Clover

## The Plant




Red clover is a short-lived perennial herbage legume that typically persists for 2 – 4 years. In contrast to white clover, it has a upright growth form and a strong deep tap root from which finer roots arise. The crown, located at the base of the stem, acts as a store of nutrients. Differences in the size and reserve status of the crown affect persistency and suitability for particular management regimes.

## Usage

Red clover is often grown as part of a grass/clover sward, but can also be grown as a monoculture, primarily to provide high yields of protein rich forage for conservation. The development of more grazing tolerant and persistent varieties is creating the potential for red clover in rotational grazing systems, and it also has value as a break crop that improves soil structure and fertility.

## Cutting and Grazing Heights

As the crown is above ground, damage must be avoided to ensure plant survival:

- Cutting height for all silage cuts should be 7-8 cm;
- Optimum grazing height of aftermaths or over winter is 4-6 cm;
- In wet weather, avoid heavy machinery, and limit grazing to sheep.

## Key Benefits of Red Clover

**Nitrogen Fixation** - Rhizobium bacteria exist symbiotically within red clover root nodules and produce available nitrogen, the same as white clover and other legumes.

**High yields** – Red clover swards are typically capable of producing 10-15 tonnes DM/ha annually.

**Feed Value** – Protein content is particularly high in red clover, and – due to a form of biochemical protection – there is a reduction in protein loss in the silo. Feed value is greater than it appears on analyses due to the composition of the protein.

# Understanding Red Clover

**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 nutrient status.

## Monoculture or Companion Grass

Red clover is primarily grown in a mixed sward, but can also be grown as a monoculture. Italian, hybrid and perennial ryegrasses, and Timothy, are possible companion grasses.

Advantages of growing red clover with a companion grass:

- reduced impact of poaching
- improved nutritional balance (from Aber High Sugar Grass)
- utilisation of fixed nitrogen by grass

Hybrid ryegrass and intermediate heading perennial ryegrass at 20-24 kg/ha with red clover at 7.5 kg/ha has been shown to be an effective 3-4 year ley mixture providing high yields of quality silage followed by late season lamb grazing.
Italian ryegrass is most useful as a companion species in predominantly arable rotations where a 2 year ley is preferred.

## Bloat Awareness

Red clover presents similar risks of bloat to white clover.

Management procedures to minimise or eliminate the risks of bloat are the same as for white clover.

## Oestrogenic Content

Red clover typically contains high levels of phyto-oestrogens, particularly formononetin, which can cause a reduction in ovulation rates in ewes. It is therefore advisable to avoid grazing red clover varieties with ewes six weeks before and six weeks after tupping.

New red clover varieties with low levels of formononetin are being developed, offering the potential for greater flexibility in the use of this crop for sheep farmers.



# Managing Red Clover

## Successful Establishment

### Targets

The aim when establishing a red clover ley is to achieve 200 plants per square metre by October in the sowing year.

### Techniques

Red clover can be drilled or broadcast, and can be undersown to an arable silage crop in April. It can be introduced into an existing sward (see Sward Renovation on page 18).

### Timing

April – late July is the optimum sowing period on most UK farms.

### Seedbed

A fine, firm seedbed is essential, and this should ideally be ring rolled prior to sowing.

Soil pH should be 6.0 or above. Liming to correct pH should be carried out well in advance of sowing.

Fertiliser nitrogen should only be applied in low N status soils, up to 50kgN/ha.

Phosphate ($P_2O_5$) and potash ($K_2O$) is required at application rates of 50 – 120 kg/ha, to achieve soil indices of 2+.

For full data on P and K requirements see page 11.

### Seed Rate and Sowing Depth

Monoculture swards should be sown at 15kg/ha.
Seed rate for mixed swards should be 7kg/ha red clover and 22kg/ha of Italian or hybrid ryegrass.

Optimum seed depth is 5 – 10mm, and should never exceed 15mm.

**The height of a red clover sward should not go lower than 4-5 cm when grazed in order to avoid damage to the crown (inset)**

**Clover rot (Sclerotinia) is the most common disease affecting both red and white clover (pictured) and is characterised by a general rot of the plant**

### Combating Pests and Diseases

Clover rot (Sclerotinia) is the most important disease affecting red clover. This fungal disease, seen typically in December/January, causes a generalised rot of the crown, leaves and stems from which plants rarely recover. Clover rot cannot usually be controlled safely or economically in situ and hence a 5 – 7 year rotation is strongly recommended.

Stem eelworm is the most important pest affecting red clover and the most effective control is rotation. A five year break is recommended between red clover crops, and this should be extended to seven years if stem eelworm is known to be present.

Crown and root rot (typically caused by Fusarium) and powdery mildew also affect red clover, but are less devastating.

Agrochemicals for the prevention of pest and disease problems should only be used following advice from a qualified agronomist.

### Weed Control

Adopt the same weed control measures as for white clover (see page 9)





## Systems in practice

### Conservation

- Graze swards lightly in the autumn of the sowing year.
- Four cuts at 6-8 week intervals yielding 13-14 tonnesDM/ha on fertile sites (10 tonnesDM/ha on upland sites).
- Ensile at 25 – 30% DM to minimise wilting losses.
- Avoid crown damage caused by low cutting height.
- Graze autumn re-growth lightly to finish lambs or cattle.
- No nitrogen, 100-150 kg/ha $K_2O$, 200-300 kg/ha $P_2O_5$.
- 3-4 years good yields achievable with modern varieties.

| Typical analysis of red clover/ryegrass silage | |
|---|---|
| Metabolisable Energy | 9.8 – 11.4 MJ/kg DM |
| Crude Protein | 14 – 19% |
| pH | 4.0 – 4.5 |
| Ammonia Nitrogen | < 5% of total nitrogen |

# Managing Red Clover

| 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 carcass weight (kg) | 18.8 | 17.7 |
| Killing out percentage (%) | 51 | 48 |

Source: Institute of Grassland and Environmental Research

### Grazing

- Aftermath grazing for sheep.
- Superior lamb growth rates from red clover compared with ryegrass.
- Grazing in wet or moist conditions must be avoided to limit bloat and reduce poaching.

### Organic

- Key conservation crop for organic livestock farms.
- Typically undersown to spring barley.
- Valuable break crop that improves soil nutrient status and soil structure.

### Sward Renovation

- Potential for upgrading existing swards due to large seed and vigorous seedlings.
- Cost effective improvement of soil fertility and soil structure.
- Apply similar principles as for white clover.
- See Bronydd Mawr data on page 23.

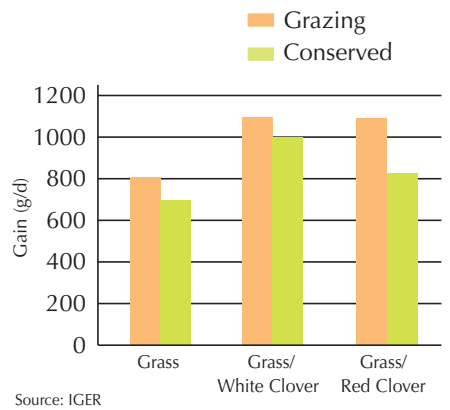


# Forging an Effective Combination

The benefits of combining grass and clover in swards for both grazing and conservation are long established and well proven. The most important benefits can be summarised as:

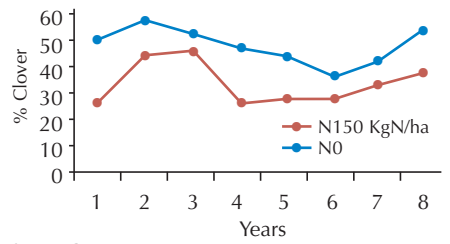
- improved forage quality and feed value due to a boost in digestibility, intake potential, and protein and mineral content of the sward
- reduced reliance on fertiliser due to nitrogen fixation
- "soil structuring" by white clover root systems that can help to overcome problems of soil compaction

**Liveweight Gains on Clover (Beef Cattle)**




Source: IGER

**Evidence of persistence of modern white clover varieties (AberDai)**




Source: IGER

Accumulated experience and scientific evidence indicate that the optimum balance is achieved with a clover content of 30-35% of the total annual dry matter yield of the sward.

In reality, the clover content of a mixed sward will vary from a low level in the spring (as low as 5% of total dry matter) to as high as 60% in July/August. This level of variability in the clover content is not ideal from the perspective of managing the feeding value for livestock and can also cause deterioration in sward quality over time. Hence, greater compatibility between grass and white clover varieties is vital in order for livestock farmers to gain maximum benefit.

### Breeding for compatibility

A compatible grass/clover mixture is one with a clover content that is sufficiently large to optimize the nutritional and nitrogen fixing attributes of the clover when growing with a high yielding companion grass.

Grass and clover varieties differ in their aggressiveness towards each other due to their abilities to compete for nutrients, water and light. At IGER, breeding for general compatibility is high on the agenda and varieties are routinely tested for this attribute.

Evidence of the progress that takes clover into a new era of utilisation is summarised by three key areas:

- Annual clover contributions of 30% or greater from IGER-bred varieties have been proven experimentally and are now being seen on the farm
- Compatibility with modern Aber Italian, AberHybrid and high yielding Aber perennial ryegrass varieties
- Evidence from long-term experiments showing effective levels of clover being maintained in swards for many years under high and low N regimes

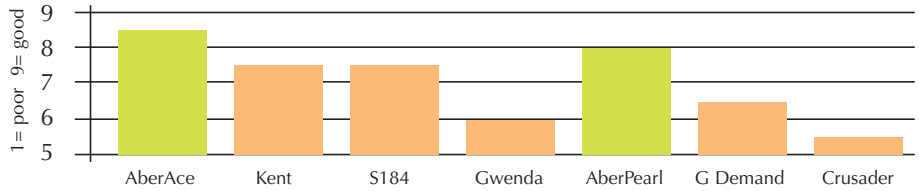
# Aber White Clovers: Small Leaved Varieties

### AberAce
This new variety has the smallest leaf size of any on the recommended lists and was bred specifically for continuous sheep grazing in lowland and upland conditions. It has an exceptionally dense network of stolons and will persist well under the most rigorous of sheep grazing systems.

### AberCrest
Productive under sheep grazing as well as under rotational grazing by dairy cows.
Bred from wild populations collected in Switzerland, AberCrest's major attribute is its good cold hardiness and stolon survival. It possesses a thick stolon compared with other small leaved varieties and shows more rapid regrowth following cutting or grazing in spring.

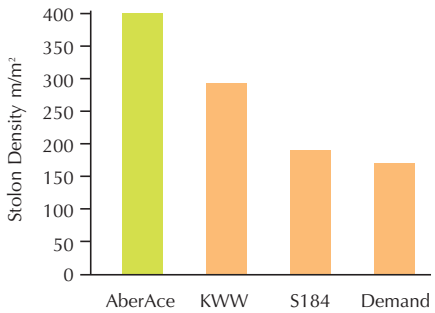
### AberPearl
A new small leaved variety combining exceptional ground cover under hard grazing and with high annual yield. Bred from a gene pool of varieties showing exceptional spring growth, this variety is ideal where livestock farmers wish to maintain a healthy balance between grass and clover throughout the year. Growth characteristics allow grass to compete with the clover in mid summer, but its persistence gives good clover content in the spring and autumn.

**Spring Ground Cover Rating**




Source: NIAB R.L. 2005/06

**AberAce Stolon Density**




Source: IGER, Bronydd Mawr

White clover varieties being assessed for persistence by sheep at IGER

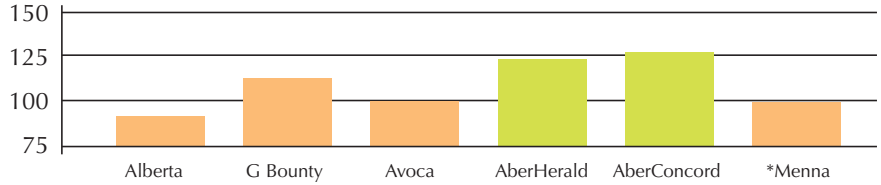
# Aber White Clovers: Medium Leaved Varieties

### AberHerald
With a relatively small leaf size, this variety is high yielding and has excellent winter survival combined with the ability to regrow rapidly in spring. AberHerald is also tolerant of nitrogen, and has been maintained in swards at 25% with inputs of 380kgN/ha. This variety is suitable for rotational sheep and cattle grazing systems, and can also be cut for silage.

### AberDai
This variety was bred from winter hardy material to provide flexibility in response to various management regimes. It offers high yields and survives well in systems ranging from continuous sheep grazing to rotational grazing by cattle or sheep.

### AberConcord
A new medium leaved variety producing yields as great as some large leaved clovers and gives good performance over a wide range of N inputs (0-450kg/ha). This trait contributes to a stable clover yield over several years by allowing clover to tolerate the build-up of nitrogen in the soil. AberConcord also provides good winter survival and spring growth, regrowing rapidly following cutting and grazing, and is suitable for a range of management systems, from rotational grazing by sheep and cattle to conservation.

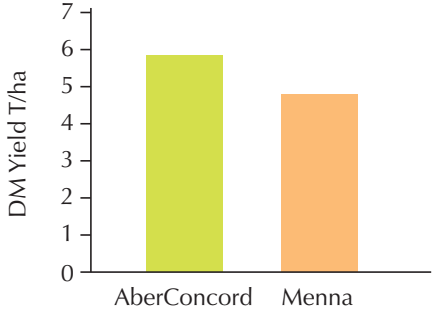
**Relative DM Yield (3rd Harvest Year)**




Source: NIAB R.L. 2005/06

(*Yield of Menna = 3.18 t/DMha)

**Annual DM Yield (150kgN/ha/yr)**




Source: IGER

**Response to Grazing Management**

| | Annual Dry Matter Yield (t/ha/annum) | |
|---|---|---|
| | Continuous sheep grazing | Cutting |
| Olwen (large) | 2.0 | 7.5 |
| Menna (medium) | 3.7 | 5.1 |
| AberDai (medium) | 4.1 | 6.9 |

Source: IGER

# Red Clover Development

## The re-emergence of red clover

Growing interest in safe, traceable homegrown protein - together with the continuing development of organic farming systems – has resulted in significantly greater demand for red clover in recent years. This situation is likely to continue in the era after CAP reform as livestock farmers seek greater returns from homegrown feed.

This resurgence in the crop is being underpinned by the recommencement of red clover breeding at IGER after an interval of 15 years. A new DEFRA-funded programme began in 1998 and the first new variety – AberRuby – features in official recommended lists in 2005.

### Red clover breeding objectives

The main objectives of IGER's red clover breeding programme are:

- Greater overall persistency.
- Higher yields, particularly in the third year and beyond.
- Enhanced grazing tolerance, to allow greater flexibility in use (e.g. aftermath grazing).
- Improved resistance to pests and diseases, with emphasis on stem nematode (eelworm) and clover rot (Sclerotinia).
- Improved nutritional quality to enhance protein utilisation and reduce nitrogenous losses.
- Lower oestrogen content to reduce the potentially deleterious affects on ewe fertility.

### Red clover in the uplands

Studies at IGER's Bronydd Mawr research farm on the edge of the Brecon Beacons indicate that red clover could have great potential on upland farms. Good yields have been obtained for up to five years from overseeding on upland pastures.

The increased persistence seen at upland sites is thought to be due to two particular features:

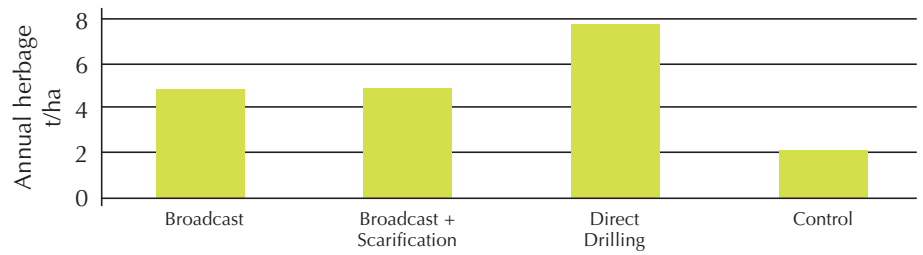
- Development of the crown closer to or beneath the soil surface, when compared with growth in the lowlands, which gives the plant greater stability and less vulnerability to cutting and grazing.
- Lower burden of pests and diseases than in lowland situations.



# Red Clover Development

The Bronydd Mawr study has included work on overseeding establishment methods, which showed a yield benefit for direct drilling in the first two years. Yield differential between direct drilling and alternative methods (broadcast and scarify/broadcast) lessened in later years. In this study, AberRuby red clover was sown into a three year old hybrid ryegrass ley.

**Red Clover Establishment at Bronydd Mawr (Year 1 and Year 2 mean, AberRuby)**



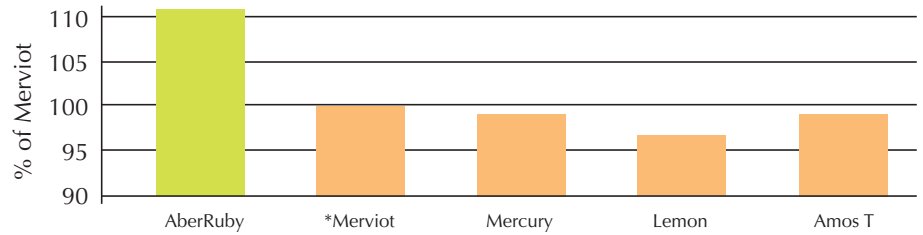

Source: IGER, Bronydd Mawr

### Aber Red Clovers

#### AberRuby

The first of a new generation of red clover varieties released from IGER. AberRuby out performs all the other varieties on the NIAB list, achieving a record yield of 115% in year one and 111% overall. AberRuby is a broad leaved early diploid variety.

**Red Clover Yield NIAB List 2005/6**




Source: NIAB D.L. 2005/06 (*Yield of Merviot = 13.23 t/DMha)

### New varieties currently being assessed

A range of new red clover varieties with comparable yield to AberRuby is now emerging from the IGER breeding programme.

These will offer advantages as outlined in the breeding objectives, including low oestrogens, resistance to key diseases, increased persistency, grazing tolerance and yield.