



Hybu Cig Cymru  
Meat Promotion Wales

# Grassland management

A guide for beef and sheep farms



## About HCC

Hybu Cig Cymru - Meat Promotion Wales (HCC) is the organisation responsible for the development, promotion and marketing of Welsh red meat. We work with all sectors of the Welsh red meat industry - from the farmers through to the retailers, to develop the industry itself as well as develop profitable markets for Welsh Lamb, Welsh Beef and pork from Wales.

This booklet forms part of a series of publications produced by HCC's Industry Development team.

The Industry Development team undertake a range of activities that include:

- Technology Transfer
- Research and Development
- Market Intelligence
- Training
- Benchmarking

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# Introduction

Grass is the most important crop in Wales. It underpins the livestock industry providing a cost-effective, natural, high quality feed for sheep and cattle.

Better grassland management can help improve the quality and quantity of grass and forage produced, optimise livestock growth rates and carrying capacity and improve financial returns.

Good grassland management begins with the soil and its impact is felt right through to the eating quality of the final product by the consumer.

This booklet aims to provide sound practical advice on grassland management highlighting opportunities to manage soil, animal manures, fertilisers, grazing systems and forage crops for improved efficiency and positive environmental impact.

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# Sward establishment and maintenance

Maintaining viable stocking rates and good animal growth rates relies on optimising output from swards sown for cutting and grazing. In short-term (2-3 years) and longer-term swards (5+ years) the proportion of sown productive ryegrass species drops as indigenous species, (including bent and rough-stalked meadow grass) regenerate. This reduces both the quality and yield of the sward.

## Establishing New Swards

As short-term swards reach the end of their productive life the most practical strategy is to reseed the field. In longer-term leys based on perennial ryegrass the options include a full reseed, renovation by over seeding or slot seeding into the existing sward. If short and medium-term leys are regularly reseeded a rotation plan is needed to suit the livestock system.

Reseeding can boost production compared to older long-term leys by over £3000/ha (£1200/acre) over 5 years, with well managed grazed reseeds producing 10 tonnes/ha dry matter (DM) and silage leys 14 tonnes/ha DM.

## Benefits of Reseeding

- Higher yield which supports higher stocking rates
- More grass in the shoulder periods (early spring and late autumn)
- 25% more responsive to nitrogen than permanent pasture
- Better feed quality
- Provides lower risk grazing to gastro-intestinal worm infections
- Opportunity for weed control
- Fertility building phase in a crop rotation

New swards are usually established on lowland farms in the spring or late summer, whereas late June to early August is often the most suitable time on many upland farms. Spring sowings provide herbage for silage and grazing later in the same season, while late summer sowings allow up to two cuts of silage to be taken before re-seeding and causes less disruption in many systems. Spring barley is a useful nurse crop for establishing spring-sown swards. Mixtures that include clover should be sown before mid-August.



*soil corer*

## Reseeding Best Practice

- Aim to reseed 10-15% of improved grassland each year to maintain production. Identify the fields which will respond most to reseeding based on quality, productivity and weed content rather than age.
- Consider sowing a break crop e.g. kale-rape hybrid before establishing the new ley to help reduce grass-specific pest and disease problems and produce low risk parasite free grazing.
- Choose the best seeds mixture for intended use and order well in advance to ensure the seed of choice is available.
- Check and remedy soil problems or deficiencies. Test the soil to identify deficiencies in phosphate (P), potash (K), magnesium (Mg) and acidity (pH). Target soil indexes are 2 for both P and K. Consider additional tests if there is a risk of trace element deficiency. Always remedy compaction.
- Assess weed type and severity of infestation. Controlling weeds before reseeding will help improve establishment of the new ley.

For further information see the HCC booklet “**Getting the Most from Your Soil**”.

## Seed Mixtures

Select a seeds mixture suited to the job for which it is intended. The needs of a short term silage ley are very different from a long term sheep grazing ley.

Key questions:

- How long the ley is required to last?
- What type of livestock will graze it?
- Will it be used for cutting, grazing, or both and when?
- Will fertiliser nitrogen or white clover be the main source of nitrogen?

Choose a mixture using varieties from the current Recommended Grass and Clover Lists for England and Wales to take full advantage of developments in plant breeding. This will improve yields, disease resistance and ground cover and provide a choice of heading date and seasonal production to suit the system. The spread of heading dates of the varieties in the mixture should be no more than 5 - 10 days for grazing and 5 - 15 days for silage swards.

Swards for grazing should include species and varieties that maintain productivity during the grazing season, provide dense ground cover and persistency. Many mixtures include both intermediate and late heading

perennial ryegrass varieties. Seed mixtures used for establishing longer-term swards may include other species including timothy (highly palatable), meadow fescue (tolerates wetter conditions), cocksfoot (deep rooting and suited to dry soils), festulolium (ideal for short term leys in dry conditions), alsike clover (tolerates lower pH and soil fertility than red clover) or herbs such as chicory and plantain (deep rooting, high mineral content).



## Variety choice and sward use

- Perennial ryegrass for longer-term swards for grazing/silage with or without white clover
- Multi species mixtures that include a range of grasses and broadleaved species like chicory and plantain that are deep rooting and mineral rich for grazing
- Italian and Hybrid ryegrass for short-term swards for cutting with or without red clover
- Tetraploid and Diploid Italian ryegrass for a 1 - 2 year ley, renovation, early bite grazing and heavy silage crops
- Tetraploid perennial ryegrass for 2 year ley and renovation (see section on Choice of Reseeding Methods)
- Hybrid ryegrass and early perennial ryegrass for 3 - 4 year ley, for silage production and cattle rotational grazing, with or without clover.



*a mixed perennial ryegrass and white clover sward*

### Seed rates

#### Full reseed

- 30 - 35 kg/ha plus 2.5 kg/ha white clover for ryegrass and white clover mixtures
- 22 kg/ha plus 7.5 kg/ha red clover for ryegrass and red clover mixtures

#### Renovation

- 20 - 25 kg/ha for ryegrass mixtures
- 4 - 5 kg/ha for white clover

#### Undersown with barley

- Half rate barley 100 - 125 kg/ha plus 7.5 kg/ha red clover and 20 kg/ha ryegrass for silage
- Half rate barley 100 - 125 kg/ha plus 2.5 kg/ha white clover and 30-35 kg/ha ryegrass

### Weed Management

Herbicides may be applied to the old sward to target specific weeds such as docks, when they are a problem. They can also be used to kill or open up the sward (chemical topping) before reseeding. Chemical topping can be difficult where the sward has formed a thick mat of vegetation so hard grazing can be used to provide actively growing vegetation that enables the herbicide to work effectively. Results can be very variable depending on the grass species in the original sward and the season. To maximise success herbicides should always be used as described in the manufacturer's instructions. An alternative to herbicides is to cultivate a stale seedbed and destroy weed seedlings before re-seeding.

## Choice of Reseeding Methods

Ploughing and cultivation offer the best chance of successfully alleviating soil compaction and creating an ideal seed bed for reseeding.

Swards are most commonly renovated by over sowing, slot seeding or direct drilling. When oversowing, the seed is broadcast onto the soil surface whilst slot or direct drilling uses a specialised grass seed drill to place the seed in the soil.

In medium to long-term swards with good soil structure and fertility, perennial ryegrass content can be used to guide decisions on whether to reseed, renovate or rejuvenate by management. Where less than 30% ryegrass is present a full reseed is needed, at 50% ryegrass renovation by introducing seed to an existing sward is often successful and swards with between 50 - 70% ryegrass can often be improved by good management.



*slot seeding into an existing sward*

## Sward Renovation

Pros	Cons
<ul style="list-style-type: none"> <li>• Cheaper and faster</li> <li>• Swards are out of production for less time</li> <li>• Can be effective on thin soils and steep land</li> <li>• Fewer stones and weed seeds are brought to the surface</li> <li>• Risk of soil erosion is reduced</li> </ul>	<ul style="list-style-type: none"> <li>• Species and varieties used for successful establishment are less persistent</li> <li>• Does not resolve issues with soil structure</li> <li>• Greater risk of failure if conditions are too dry or too wet.</li> </ul>

## Renovation of an Existing Sward

Creating the right conditions for good seed to soil contact is the key to successful renovation. Always check and correct soil deficiencies and ensure the soil is moist and warm. The optimum time will depend on the individual farm situation; where there is pressure on spring grazing, later renovation is often most practical. In spring lower soil temperatures can delay seed germination and rejuvenation may then be less successful because of competition from existing grass plants. Providing soil moisture is adequate, renovation after a silage cut will provide a more open sward and less competition from existing grass.

## Oversowing, slot seeding and direct drilling

For these techniques it is essential to create an open sward with at least 25% bare soil surface by grazing down to a sward height of 3 – 4cm and harrowing or raking the area in two directions until most of the weed grasses and trash in the bottom of the sward has been

removed (normally between 2 and 6 passes). Introduce seed immediately after harrowing. Apply P and K fertiliser if required but no nitrogen (N).

### Over sowing

- To get an even spread of clover seedlings, mix the seed with sand or fertiliser in the hopper immediately before sowing

### Slot seeding or direct drilling

- Sow seed at the correct depth, no more than 10mm for grass and 5mm for clover

### Following sowing

- Use a flat roller to create good seed to soil contact; stock can also follow to trample in seed
- Continue to graze until seedlings start to emerge, then rest the area for 4 - 5 weeks
- Control pests such as slugs, leatherjackets and frit fly

## Sward Rejuvenation

Excellent soil, grazing and soil management together with alternating cutting and grazing is used to encourage productive grasses. Low rate glyphosate may or may not be used to kill unproductive grasses as part of a rejuvenation programme.

## Undersowing

Reseeds can be established under a cereal crop in the spring. This gives a high yield of arable silage and an aftermath ready for grazing or a second cut of silage. However the cereal seed rate should be dropped by up to 50% and the silage crop taken early to avoid shading of the ley. The management of the ley should take precedence over the cereal crop.



*barley undersown with clover*

Pros	Cons
<ul style="list-style-type: none"> <li>• Lower cultivation costs</li> <li>• Available to graze immediately after silage crop</li> <li>• Weed control</li> </ul>	<ul style="list-style-type: none"> <li>• Lower cereal silage yield</li> <li>• Risk of competition to establishing ley</li> </ul>

## Maintaining Sward Quality and Yield

Maintaining good production depends on the survival of the sown species of grass and white clover:

- Good management of cutting and grazing swards
- Adopting soil nutrient management to match supply with crop offtake
- Monitoring yield and quality to identify poor performing swards early
- Managing the sward to minimise poaching and compaction and correct as soon as ground conditions allow
- Strategic use of renovation techniques can improve swards after a late silage cut or if poaching has occurred

Precision farming techniques can improve the efficiency of grassland farming. Accurate mapping of soil type, compaction and nutrient status using Global Positioning Systems (GPS) enable variable treatments to be applied across each field. Mobile 'apps' are being developed to improve uptake of this technology.



*grass harrow*



# Managing soil nutrients

Maximising output from grassland systems while minimising the environmental impact depends on the efficient use of on-farm manures and slurry, the use of legumes to provide nitrogen via fixation and the application of purchased fertiliser.

## Nutrients for Grazing and Silage

Whether grass and grass/clover swards are to be grazed or cut the availability of adequate nutrients will ensure that good yields are achieved. Applying excess nutrients from either fertilisers or on-farm manures increases the risk of environmental losses, feed energy-protein imbalance and unnecessary costs. All soil nutrient inputs should be based on the Fertiliser Manual (RB209, 8th edition) [www.gov.uk/government/publications/fertiliser-manual-rb209](http://www.gov.uk/government/publications/fertiliser-manual-rb209)

The main sources of nitrogen (N), phosphate (P), potash (K) on grassland farms are from

- nutrients in the soil, including residual nitrogen from previous clover crops
- farm yard manure (FYM) and slurry – a valuable source of nutrients
- nitrogen fixation by clovers and other legumes
- purchased fertiliser applications that supply straight N, N-P-K, lime, trace elements or sulphur
- excreta from grazing stock



*artificial fertiliser*

## Nitrogen

Nitrogen has a major role in the growth and quality of grass swards. Nitrogen sources include soil N, applied manures, legumes and fertiliser. Nitrogen in the soil is influenced by the previous management.

The efficiency of N fertilisers is optimised by

- a balanced supply of P and K and a soil pH of 6.0 - 6.2
- good soil structure
- a minimum soil temperature before spring fertiliser applications of 5°C for 5 days at 10cm depth
- correct timing to replace N removed by grazing and cutting



*white clover can contribute the equivalent of 450kg of 34.5%N fertiliser/ha*

## Total Nitrogen Requirements (kg/ha) for Cut and Grazed Swards

The RB209 Fertiliser Manual distinguishes between application rates for dairy, beef and sheep systems. Recommendations are made according to grass growth class and intensity of the system.

### Beef - Nitrogen recommendations for silage production

Beef: Grass growth class <i>Average</i>			
	Concentrate use (t/animal/yr)	Stocking rate (LU/ha)	Total N requirement (kg/ha/year)
Moderately grazed (upland and lowland suckler herds; lowland dairy steers and heifers)	0.2	1.4	310
		1.2	290
		1.0	280

### Sheep- Nitrogen recommendations for silage production

Sheep: Grass growth class <i>Average</i>		
	Stocking rate (LU/ha)	Total N requirement (kg/ha/year)
Extensively to moderately grazed	0.9	260
	0.7	250
	0.5	230

Soil N supply and N from manures must be subtracted from total N requirement when calculating N fertiliser needs for each field. Use a FACTS (Fertiliser Advisers Certification and Training Scheme) qualified adviser to interpret N recommendations.

### A guide to the Soil Nitrogen Supply (SNS)

Soil nitrogen supply (SNS) status	Previous management	Previous nitrogen use (kg/ha) (including fertilisers + available manure/slurry N)
High	Long term grassland	>250
Moderate	Long term grassland that received 100-250 kg N/ha last year OR with substantial clover content. Or a first-year ley following 2 or more years of arable – NOT on light sand soil.	100-250
Low	Long term grassland with low inputs. First-year ley following 2 or more years of arable crops on light sandy soil	<100

## Sulphur and Sulphur Fertilisers

Sulphur (S) is a key nutrient for grass growth. Correcting a deficiency will improve grass yield and quality, feed value, N use efficiency and reduce N losses to the environment.

In 2012 the British Survey of Fertiliser Practice found that only 14% of grass for silage and 6% of grazed grass received S as fertiliser. In 2013 herbage test results from Farming Connect demonstration farms indicated S deficiency in 50% of grass sampled in the spring and over 60% of grass sampled pre-cutting.

To benefit from applying S ensure soil fertility is correct. The pH needs to be 6 - 6.2 with soil indexes of 2 for P and 2- for K.

The increase in silage yield from fields with S deficient sandy soils could provide up to 70 extra winter feed days/ha for growing beef and 350 days extra winter feed/ha for sheep.

## Manure and Slurry

These are valuable sources of N, P and K that can reduce purchased fertiliser inputs.

PLANET, MANNER-NPK and ENCASH are nutrient management software tools available for use by farmers and advisers to improve efficiency of soil inputs and grassland production.

- The nutrient content of manures and slurry is highly variable depending on their dry matter, how they are stored and how the animals were fed. It is important to estimate their nutrient content and standard values (see the RB209 Fertiliser Manual) are useful for general planning. Laboratory analysis of a representative farm sample gives a more accurate assessment. Near Infra-red Reflectance Spectrometry (NIRS) can provide low cost, rapid and reliable analysis of slurry.
- The contribution of P and K from bio-digestate via on farm anaerobic digestion of slurry and bi-products is significant. Recent work as part of the PROSOIL project showed that digestate had 2kg/m<sup>3</sup> P and 4kg/m<sup>3</sup> K on average from samples analysed over four years.
- Availability of P and K varies little but N availability varies greatly. The RB209 Fertiliser Manual details nutrient availability by soil type and season.



slurry injector

## Nutrients in animal manures

	DM%	Total Nutrients	Total Nutrients	Available Nutrients	Total Nutrients	Available Nutrients	
		Nitrogen	Phosphate		Potash		Sulphur*
		(N)	(P <sub>2</sub> O <sub>5</sub> )		(K <sub>2</sub> O)		(SO <sub>3</sub> )
Solid manures kg/t							
Cattle FYM	25	6.0	3.2	1.9	8.0	7.2	2.4
Layer manure	35	19.0	14.0	8.4	9.5	8.6	4.0
Broiler Litter	60	30.0	25.0	15.0	18.0	16.2	8.0
Cattle Slurry kg/m <sup>3</sup>	2	1.6	0.6	0.3	2.4	2.2	0.3
	6	2.6	1.2	0.6	3.2	2.9	0.7
	10	3.6	1.8	0.9	4.0	3.6	1.0

\* "sulphur inputs from manures should largely be regarded as contributing to the maintenance of soil reserves" (RB209)

### Application Methods to Improve N use Efficiency

To make the most of the N, slurry, with less than 6% dry matter should be injected into the soil or applied by trailing shoe. Typical cattle slurry (6% DM) contains up to 3kg/m<sup>3</sup> N. Half of this is available immediately for uptake by the sward. In summer up to 90% of this available N is lost to the atmosphere as ammonia if it is surface spread. Slurry injection or trailing shoe applications of slurry are options in the GLASTIR agri-environment scheme.

A typical application of 35m<sup>3</sup>/ha (3200 gallons/acre) of 6% DM slurry when injected could save 9kg N/ha (7 units/acre). In late winter/early spring atmospheric losses are lower from surface applied slurry and the economic benefits of injecting are reduced.

### Slurry Spreading Guidelines

- Follow all regulations that apply to animal manures especially in Nitrate Vulnerable Zones
- Follow a soil nutrient and manure management plan and record applications
- Use injection or a trailing shoe in the summer where practical
- To reduce soil compaction use an umbilical system
- Check that spreaders are calibrated correctly and spread accurately
- Avoid high risk times when high rainfall increases nutrient leaching and runoff and low soil temperatures reduce plant uptake
- Do not apply slurry on steep slopes and avoid waterlogged or frozen ground. Do not spread within 10m of a watercourse
- Apply **only** what the crop needs, check soil indexes and account for nutrients in slurry and from legumes

# Weed control

Weeds compete directly with grass for light, water and nutrients; reducing yield, palatability, forage quality, animal performance, livestock output/ha and sward longevity.

Weeds are competitive and adapt to quickly fill bare ground. Problems can be minimised by good husbandry.

- Maintain correct soil pH and fertility
- Manage drains and ditches
- Prevent and remedy soil compaction and poaching
- Sound crop rotation
- Quick sward establishment
- Good grazing management
- Alternate cutting and grazing
- Cutting swards at correct height and stage of maturity
- Even spreading or injecting of manures and slurries

## Docks

Docks thrive in bare soils and open swards, developing a deep tap root and producing seed that can remain dormant for up to 70 years which germinate when exposed to light. Docks are most common in silage fields with high fertility, receiving slurry applications before cutting. They are also a problem in fields grazed only by cattle rather than cattle and sheep where swards are poached.

### To prevent seeding

- Cut swards before docks seed, top grazed fields before docks begin to flower

### To reduce dock plants establishing

- Treat docks with herbicides or remove by hand pulling before reseeding, drag roots to the surface, remove and desiccate. When reseeding, use a nurse crop (spring barley) to establish spring-sown swards, graze to establish a dense sward, apply the appropriate quantity of slurry evenly and avoid poaching

### To prevent seedlings maturing

- Use sheep to graze newly established swards and remove any rogue weeds by hand

Herbicides can provide a “quick fix” to control weeds in improved grassland. There are a range of herbicides to reduce weeds in grassland and to be effective, good husbandry and cultural control is needed to prevent weeds re-establishing from the seed bank in the soil. As herbicide regulations are complex and changing it is advisable to take professional advice. Repeat treatment may be needed.

Thistles, docks and rushes are the main weeds of concern on Welsh beef and sheep farms. Chickweed can be a problem in newly sown swards and bracken and ragwort can be a specific issue on some grassland farms.



*docks*

### To kill seeds

- Compost manure thoroughly (minimum 3 days at 55°C)

## Thistles

Two thistles cause problems in grass swards on Welsh farms.

### Creeping thistle

Creeping thistle is the most common perennial weed of permanent grassland. It grows well in low phosphate or high potash soils and vigorously in more fertile soils. Thistles spread by seeds and root growth and broken roots can form new plants. In 2 years the roots of a single plant will cover 80m<sup>2</sup>. Creeping thistle is common where sheep are heavily stocked in winter and spring and under-grazed in summer. Livestock reject grazing in a 30 cm zone around each shoot reducing grass utilization.

#### To prevent seeding

- Pull or cut frequently at early flower bud with the cutter set low to remove all shoots and leaves and repeat annually. Cut silage before thistles flower

#### To reduce plants establishing

- Prevent seeding. Broken roots are less likely to regrow if roots are chopped into very small fragments by repeated cultivation and any regrowth tine harrowed at the 4 - 7 leaf stage
- Graze continuously with cattle (sward height 7cm or 2000kg DM/ha) May to July, and avoid heavy stocking in winter and spring

#### Herbicide Use

- Herbicides applied with a weed wiper in successive years gives good control



*creeping thistle*



*thistles rapidly take over large areas*

### Spear thistle

An upright biennial weed which grows from seed forming a rosette in the first year and a flowering stem in the second. Large numbers of wind borne seeds establish quickly on bare soil.

#### To prevent seeding

- Dig out rosette, or top before July

#### To reduce plants establishing

- Create a dense sward through good grazing management but do not overgraze

#### Herbicide Use

- Herbicide efficacy can be improved by treating 2 weeks after nitrogen application

Thistles are associated with an increased risk of orf in sheep flocks. Orf results in low lamb liveweight gain, premature culling of ewes and is a significant animal welfare issue.

## Rushes

Rushes grow in areas of high rainfall and poor drainage. They create dense, deep rooting clumps developing dense fibrous root mats which hold water. Rushes reduce the area and grazing quality of swards and can produce up to 8 million seeds per m<sup>2</sup> per year.

### To prevent seeding

- Graze hard in summer with cattle, top repeatedly at 4 - 8 week intervals and remove the mulch

### To reduce plants establishing

- Improve drainage and soil fertility, graze lightly to minimise poaching and compaction, reseed with a competitive seeds mix

### Herbicide Use

- Apply when actively growing before flowering and cut 4 - 6 weeks later. Selective application by spot spraying or weed wiping will help maintain the existing sward. Repeat as needed and encourage sward development by careful grazing



*rushes*

## Applying Herbicides

There are a range of methods of applying herbicides to grassland including weed wipers, weed wands, tractor/ATV mounted sprayers and knapsacks. They should be used by a competent operator registered with the National Register of Sprayer Operators (NRoSO) [www.nroso.org.uk](http://www.nroso.org.uk). Equipment should be well maintained and tested annually to ensure it delivers accurate application rates.

- Read the label carefully
- Follow procedures for handling, application, filling and washing out sprayers
- Use approved application method
- Adhere to recommended grazing interval (i.e. duration that stock should be excluded)
- Wear the correct personal protective equipment
- Keep a record of herbicide use

## Looking after Clover Swards

Many herbicides damage clover, check the label to see if it is 'clover safe'. Where clover is to be introduced after herbicide application ensure there is no residual activity before sowing.

## Spraying and the Environment

Herbicides must be applied safely and effectively to protect the environment. Grassland herbicides are found

in water supplies and their use may be restricted in future unless they are used more responsibly; see "The Voluntary Initiative"

[www.voluntaryinitiative.org.uk/en/home](http://www.voluntaryinitiative.org.uk/en/home)

## Weeds and the Law

### Reducing spread

The Weeds Act 1959 (UK) and the Ragwort Control Act England and Wales (2003) gives Ministers the power to serve clearance notices to farmers to prevent the spread of curled and broad leaved dock, creeping and spear thistle and common ragwort.

### New Legislation: Sustainable Use Directive

Use of plant protection products i.e. herbicides and pesticides, is governed by UK Law. The Plant Protection Products (Sustainable Use) Regulations 2012 implements the Directive 2009/128/EC on the Sustainable Use of Pesticides. Failure to comply with new measures will lead to prosecution and may affect single farm payments.

- From 2014 farmers need to demonstrate that their farming system uses integrated pest management
- From 25 November 2015 all sprayer operators must hold a recognised certificate of competence
- After 26 November 2016 all working crop spraying machinery must have a certificate from the national crop sprayers testing scheme. [www.nsts.org.uk](http://www.nsts.org.uk)

# Grazing management and livestock performance

Well managed grass provides a cheap, high quality feed for livestock. Good grassland management aims to optimise grass quality, utilisation and livestock growth rates. Maintaining a dense leafy sward extends sward life and reduces reseeding costs.

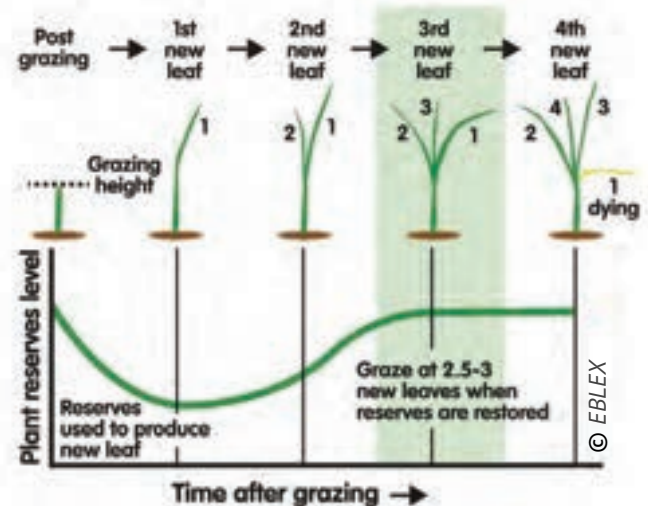
Good grazing management balances the amount of grass grazed with the amount of grass grown. Understanding how ryegrass grows, matching grass growth with livestock needs and measuring grass regularly are all vital to make the most of grazed grass.

Research shows that on many farms only 50% of grass grown is used. If this is increased to 80% utilisation there is the potential for livestock to harvest an extra 3 tonnes of forage/ha each year from a grazed sward growing 10 tonnes/ha.

## Understanding Ryegrass for Good Sward Quality and Growth

A ryegrass tiller can only support three live leaves; when the fourth leaf starts to grow the first one dies (unless it is cut or grazed). Leaf production is highest when grass is growing fast, so in May a new leaf appears every four to five days with all three leaves on a tiller replaced in just over two weeks. In the winter it can take from 30 to 90 days to produce a new leaf. The first leaf grows from energy reserves stored in the base of the plant. The second leaf begins to replenish energy and the third leaf restores the energy reserves. Root growth mirrors leaf growth as the energy is replaced. To optimise quality and quantity the ideal time to graze is when each tiller has 2.5 to 3 live leaves.

Leaf growth and energy reserves in ryegrass



## Grazing Quality

Nutritional quality is determined by 3 main factors

### Dry Matter Content (DM %)

- Low forage DM reduces livestock intake
- Below 12% DM animals cannot eat enough forage to meet their needs so extra feed is required
- DM varies with season, grass type, growth stage and management
- Tetraploid ryegrasses have a lower DM content than diploids; livestock grazed on tetraploid leys need to eat 33% more fresh grass per day

### Digestibility (D Value) and Energy

- The D value changes throughout the grazing season
- Young, leafy swards are most easily digested

- Clover improves sward digestibility
- Grass varieties on the current Recommended Grass and Clover Lists for England and Wales have a D value 10 units higher than 30 years ago

### Protein

- Protein levels change with grass growth stage and season
- Grass protein is affected by N uptake and is influenced by N applications as well as soil P, K, S and pH
- High protein in forage needs to be balanced by energy in the diet to optimise utilisation



## Maintaining High Sward Quality

### Graze at the correct stage

Graze as close to the ideal “3 leaf” stage as possible. This can be achieved by counting live leaves or measuring sward heights. Sward height guidelines are based on research and when followed maintain grass at the 2.5 to 3 leaf stage. Sward height can also be expressed as ‘cover’ (the weight of grass in kg DM/ha) by using standard figures on sward sticks or plate meters or by cutting and drying a known area. Knowing the weight of grass available for grazing allows grass to be rationed in the same way as supplementary feeds and silage.

Knowing the amount and quality of forage available helps to

- graze with the right number of livestock
- put the productive stock on the best fields
- optimise fertiliser use
- identify when to give supplementary feed
- extend the grazing season

### Keep a high percentage of sown species in the sward

The digestibility (D value) of well managed ryegrass is 20 units higher than indigenous species, which will improve livestock growth rates.

- Check that sown species (e.g. ryegrass, timothy, clover) predominate the sward
- Reseed or over-sow if necessary to maintain sward quality
- Select the right varieties e.g. ryegrasses bred for high sugar levels have been shown to improve livestock performance

### Manage clover

White clover is an excellent companion species in grazed ryegrass swards. An average of 30% white clover over the season will fix 150 kg N/ha. Red clover incorporated in cutting leys can fix 250 kg N /ha/year and can be grazed by finishing stock in late summer and autumn.

- Clovers are a good source of high protein forage
- They increase forage intakes and grow later in the summer when grass growth drops

### Mixed grazing of cattle and sheep

Mixed grazing reduces rejection areas around dung



*mixed grazing can improve pasture utilisation*

patches and increases the sward white clover content. Expressed as livestock units a ratio of 60:40 of either cattle to sheep or sheep to cattle gives maximum benefit.

Mixed grazing of cattle and sheep can

- improve pasture utilisation and maintain sward quality
- increase livestock growth rates and output/ha
- reduce internal parasite burdens for parasites that are host specific. Liver fluke can affect both sheep and cattle and mixed grazing strategies can increase the prevalence of this parasite

### Operate a leader-follower system

Following productive stock with less productive or dry stock is an effective method of maintaining high livestock performance and grass quality. It results in more evenly grazed swards with fewer rejection areas.

### Slurry injection

The surface application of dirty water and slurry will taint a sward for several weeks which stops efficient grazing and limits livestock intakes. Research has shown that grazing behaviour is significantly affected for up to 8 weeks by surface applications. Using injectors, trailing shoes or band spreaders reduces negative effects to around 3 weeks.

### Correcting poor management

If grass has started to head, mowing to just below target grazing height encourages tillering and improves sward density. ‘Pre mowing’ immediately before grazing is a useful tool to improve sward quality. Grass harrows can remove invasive species (e.g. creeping bent and moss) and dead material.

## Measuring Swards

Sward measurements estimate available grazing, help ration stock accurately and keep swards at the correct height to optimise growth and quality. Measuring height or cover (kg DM/ha), counting leaves or cutting and drying a known area of grass will provide the information needed to inform good grazing decisions.

### Measuring height or cover

Any tool that measures height in centimetres (cm) or kg DM/ha can be used. This includes a sward stick, a rising plate meter (RPM), a ruler or a stick, pipe or boots marked with a scale. For consistency measurements should be made by the same person each time. With practice estimates can be made by eye but there is no substitute for walking fields and measuring swards.

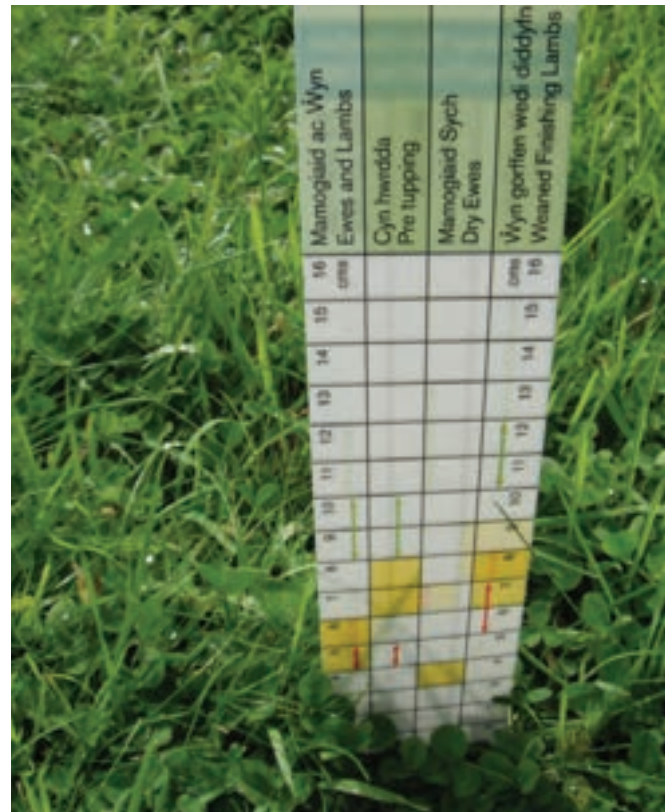
### Measuring with a sward stick or ruler

- Place the ruler on the ground and take a reading of the top level of the grass leaf – do not measure flowering heads or weeds
- Repeat this 30 times whilst walking in a ‘W’ pattern across the field. Avoid uneven ground and gateways
- Record the measurements in notebook or smartphone app e.g. farmGRAZE or PocketWedge
- Repeat route weekly

### Measuring with a rising plate meter

- Place the RPM on the ground firmly without force or rolling it
- Walk across a field in a ‘W’ pattern taking at least 30 readings in each field
- Avoid gateways, troughs and fence lines
- Repeat route weekly
- Record the average result for each field in a notebook or smartphone app e.g. farmGRAZE or PocketWedge

An RPM has been calibrated for perennial ryegrasses and white clover swards. Pastures with different species are likely to give inaccurate readings. Accuracy can be improved by calibrating the RPM for local conditions, sward dry matter and density. Plate meter readings will be incorrect in wet, windy, snowy or frosty weather and in poached swards, weed patches or mature stemmy grass.



*measuring grass height with a swardstick*



*measuring grass with a plate meter*

## Sward Surface Height Guidelines (SSH)

### Beef cattle

Livestock Type	Graze Period	Rotational		Continuous	Notes
		Pre-graze cm	Post-graze cm	cm	
Suckler Cows	Turnout-May	10-14	5-6	5-6	Before grass reaches the pre-graze height turn out cattle if ground conditions allow for part of the day or turn out and offer supplementary feed but do not graze below post graze level
Lactating	June-July	12-15	7-8	7-8	
	Aug-Nov	12-15	8-9	7-9	Graze to 5cm with dry stock Nov/Dec
Suckler Cows Dry		5	3	4	Note condition. Increase to 5-6cm for thin cows and restrict grazing for fat cows
Growing/ Finishing Cattle	Turnout-May	10-12	5-6	5-6	Increase by 1-2cm for finishing cattle through season
	June-July	10-14	6-7	6-7	SSH should be gradually increasing
	Aug-Sept	10-15	7-8	7-8	
Weaned stores		9	5	7	Increase height to increase stock growth rates

### Sheep

Livestock Type	Graze Period	Rotational grazing		Continuous	Notes
		Pre-graze cm	Post-graze cm	cm	
Ewes & lambs	Turnout-April	8-10	4-5	4	Provide supplementary feed until sward height is 4cm
	May-wean	8-10	4-6	4-6	
Dry Ewes	July Aug	4+	4+	4+	Increase from 4cm for ewes with condition score less than 3
Pre-tupping	Sept-Nov	8-10	4-5	6-8	Note condition and restrict grazing for fat ewes
Weaned lamb for finish	July-Sept	10-12	5-7	6-8	Allow gradual increase in cover. Check stock growth rates
Store lambs	July-Start of finishing period	5	3	4	Increase sward cover to increase lamb growth rates

## Grazing Cover Guidelines (kg DM/ha)

### Beef cattle

Livestock Type	Graze Period	Rotational		Continuous kg DM/ha	Notes
		Pre-graze kg DM/ha	Post-graze kg DM/ha		
Lactating Suckler Cows/Bulling Heifers	Turnout-May	2400	1500	2000	Before grass reaches the pre-graze cover turn out cattle if ground conditions allow for part of the day or turn out and offer supplementary feed but do not graze below post graze level
	June-July	2600-3000	1500	2300-2500	
	Aug-Nov	2700-3000	1500	2300-2500	Graze to 1500 kg DM/ha with dry stock Nov/Dec
Suckler Cows Dry		1800	1500	1900	Note condition. Increase cover for thin cows; restrict grazing for fat cows
Growing/Finishing Cattle	Turnout-May	2400	1500	2000	Increase cover for finishing cattle through season
	June-July	2600-3000	1500	2300-2500	Sward cover should be gradually increasing
	Aug-Sept	2700-3000	1500	2300-2500	
Weaned stores		2200-2700	1500	1900	Increase cover to increase stock growth rates

### Sheep

Livestock Type	Graze Period	Rotational		Continuous kg DM/ha	Notes
		Pre-graze kg DM/ha	Post-graze kg DM/ha		
Ewes & lambs	Turnout-April	2000	1500	1750	Provide supplementary feed until sward cover reaches 1500 kg DM/ha
	May-wean	2200-2400	1500	1800	
Dry Ewes	July Aug	1700-1900	1500	1800	Reduce sward cover for ewes with condition score less than 3
Pre-tupping	Sept-Nov	1700-2100	1500	1900	Note condition: restrict grazing for fat ewes
Weaned lamb for finish	July-Sept	2100	1700	2400	Allow gradual increase in cover. Check stock growth rates
Store lambs	July-Start of finishing period	1900	1500	1500	Increase sward cover to increase lamb growth rate

## Cutting and drying grass

Cutting and drying a known area of grass is a direct measure of the amount of grass available which can be used to cross check the accuracy of RPM readings.

- Place a wire ring\* 0.1m<sup>2</sup> on the sward and cut grass to ground level
- Take at least 3 samples per hectare
- Dry samples either in a microwave (containing a glass of water) or a conventional oven at 60-80°C for 20hrs
- Weigh and multiply the dry weight in grams by 100 to get total cover in kg DM/ha
- Subtract post graze target from total cover to calculate how much grass is available for grazing

\*To make the wire ring take a piece of wire 116cm long and bend back 2cm at each end, hook the ends of the wire together to make a 0.1m<sup>2</sup> circle with a diameter of 36cm.

## Three leaf grazing

Three leaf grazing is based on research that shows the optimal time to graze ryegrass swards under rotational grazing is when the tiller has 3 live leaves. Rest and graze times are based on counting and averaging the number of live leaves.

- Pick 10 ryegrass tillers in the field that the stock are about to graze
- Count the number of new leaves on each tiller and record. Ignore any leaves previously grazed which are identified by cut ends
- Work out the average number of tillers
- Re-graze when the number of live leaves per tiller averages as close to 3 as possible
- The time taken to regrow 3 live leaves can be estimated. Firstly calculate leaf appearance rate by dividing the number of days since last grazing by the number of leaves per tiller. Multiply result by 3 to get the average time for a tiller to produce 3 leaves which will indicate when the sward should be ready for grazing

### Remember

- Measurements are only a guide, no method gives an absolute measure and each has its merits. The relative change in readings is as valuable as the measurements. The greater the number of measurements the more accurate the results. Measurements do not take into account the quality of the sward i.e. dry dead material is low feed value.

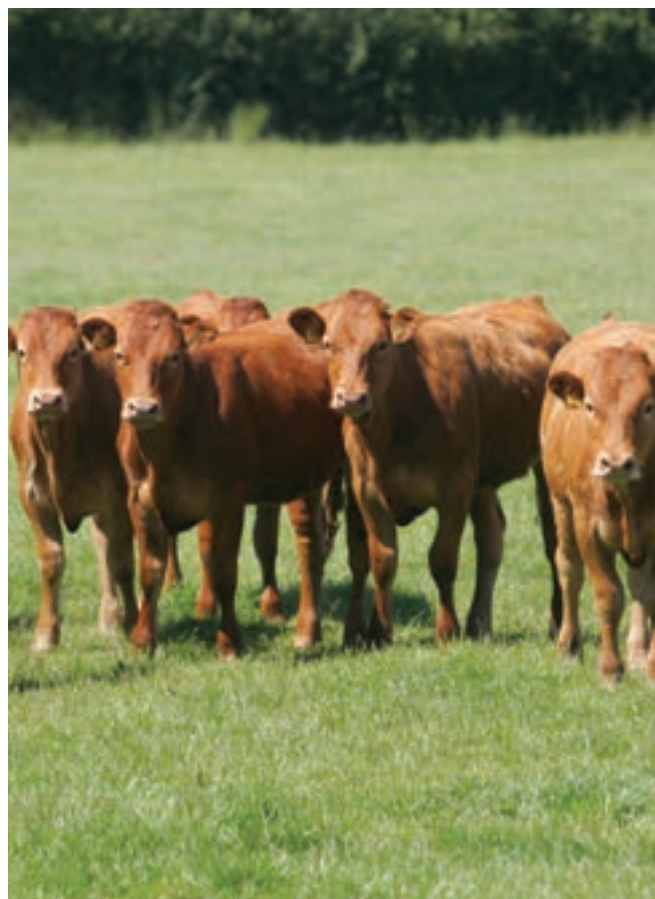
## Using a Grazing Wedge

A grazing wedge is a tool for planning the grazing available for the next two to three weeks. It gives a picture of the amount of grass ahead of the stock and how fast grass is re-growing after grazing. It provides a guide to grass availability and can highlight if a surplus or shortfall is likely. It assumes all fields are the same size, large fields may need to be split and measured separately or small fields combined and measured together.

The average sward measurement for each field is plotted on a bar chart to show whether grazing is in deficit or surplus and can be used for continuous or rotational systems.

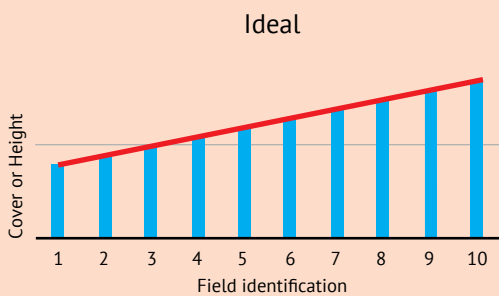
- Plot the average sward measurement for each field on a bar chart from lowest measurement to highest
- Draw a target line on the graph. For rotational grazing the top end of the target line is the pre-graze target and the bottom end the post graze target

In an ideal situation the average farm sward height or cover should be the mid point between pre-graze sward height/cover and post graze sward height/cover.



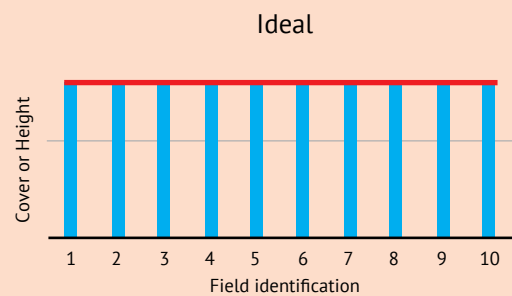
### The Sward Wedge and Rotational Grazing Ideal situation

the wedge follows the red target line; good grass availability.



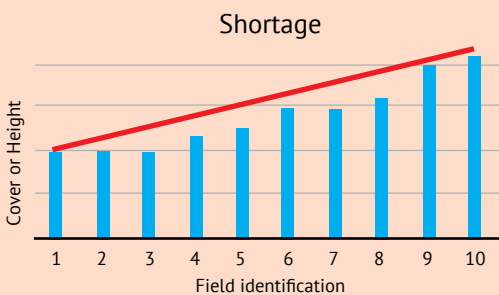
### The Sward Wedge and Continuous Grazing Ideal situation

the wedge follows the red target line; good grass availability



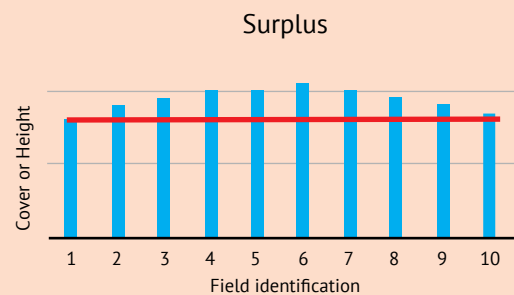
### Shortage imminent

several fields are below the red target line



### Surplus imminent

several fields are above the red target line



### Actions

- Increase grazing area
- Introduce a forage buffer
- Creep feed suckling calves and lambs
- Wean stock
- Aim to increase sward height /pasture cover to improve re-growth and animal performance

### Actions

- Close some of the grazing area for silage or as a buffer feed
- Top to maintain quality
- Aim to decrease sward height /pasture cover in the **grazing area** to improve re-growth and animal performance

## Grazing Systems

A good grazing system needs to be carefully planned yet flexible. Key considerations are access to a suitable number of fields or paddocks, electric fencing, water troughs, gateways in the right place and in some cases livestock tracks.

There are 2 basic grazing systems:

### Rotational

- Moving stock around a series of small paddocks grazed for between 0.5 and 3 days. The paddocks are then rested and allowed to regrow until they are at the ideal stage for grazing

### Continuous

- Stock are grazed in one or a small number of fields with no more than one week's break between fields.

In both systems grass supply is matched with demand by measuring grass and adjusting the grazing area and/or stock numbers as well as supplementary feed. To adjust the grazing area a field or part of a field is shut up to cut for young leafy silage. If grass supply starts to drop before silage is cut the area can be strip grazed.

Research suggests overall sward production under well managed continuous or rotational grazing systems is similar, although it can be more uniform under continuous grazing as the spring peak associated with development of seed heads is suppressed. However at very high stocking rates, for example over 1.8 livestock units/ha, rotational grazing of 0.5 - 3 day paddocks has been shown to give the highest yields of re-growth and optimise stock performance. This is because livestock are prevented from grazing the first new leaf as it appears allowing the second and third leaves to grow. When fields are grazed for 7 - 10 days approximately half the regrowth is re-grazed leading to a 25% reduction in growth in the next rotation. Rotational grazing can lead to a more even distribution of dung and urine across the grazing area as stock do not have the opportunity to create "camps".

The choice of grazing system should be based on ease of management and target level of performance. Efficient grazing based on regular measuring and following the guidelines gives good results whichever grazing system is used.



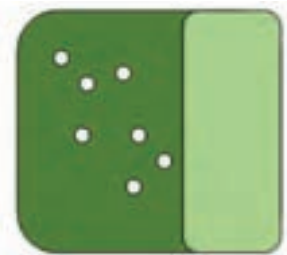
*electric fences are a good way to make paddocks of a manageable size*

## Continuous Grazing

Livestock have access to a large area or 2 or 3 smaller areas for most of the grazing season. Neither the area nor stock numbers are fixed. Swards should be measured and when growth exceeds grazing target up to 33% of the area is shut up either for silage or for re-introduction to the grazing area if grass supply falls.



Stock graze the whole area



Area fenced off during period of surplus grass growth

## Rotational Grazing

Livestock graze specific areas in turn, these are often created using an electric fence.



Stock graze one paddock or field before moving



Stock graze one paddock or field before moving. One or more paddocks can be fenced off during period of surplus grass growth

## Cell grazing

This is a form of rotational grazing where livestock graze very small paddocks for 0.5 - 1 day at maximum stocking density to match the grass available. 'All grass wintering' involves cell grazing during the winter with livestock offered deferred grazing which may be supplemented with additional forage.

## Leader follower (forward creep)

This form of grazing is where livestock graze a number of fields or paddocks in turn with older or less productive stock following younger or more productive stock. This allows the productive livestock to graze the best quality grass ahead of the older stock. It is essential to monitor the follower group to check their performance is not being compromised.

## Deferred grazing

This depends on building up a reserve of grass in the late summer and early autumn period by shutting off fields in late August/early September. Grass growth can be encouraged with an appropriate application of manure, slurry or fertiliser. The grass can extend the grazing season providing cheap forage for overwintering.

### Low Risk Pastures for Parasite Control

Managing land so that it has a very low or no worm infestation can be very beneficial to livestock, particularly lambs and calves. It reduces the internal parasite challenge, time and cost of treatment and improves growth rates and animal performance. See SCOPS (Sustainable Control of Parasites in Sheep) [www.scops.org.uk](http://www.scops.org.uk) and COWS (Control of Cattle Parasites Sustainably) [www.cattleparasites.org.uk](http://www.cattleparasites.org.uk) guidelines.

Examples of low risk grazing include

- New ley re-seeds or forage crops
- Cattle grazing or silage only in the previous year for sheep
- Sheep grazing or silage only in the previous year for cattle
- For cattle from July onwards silage aftermaths which were only grazed by sheep the previous autumn
- For sheep from July onwards silage aftermaths which have been grazed by cattle only since the previous autumn

### Extending the Grazing Season

Grass or high-quality forage crops can be used to extend the grazing season. This reduces the costs of feed, winter housing, labour, machinery, and manure spreading. It is a way to expand production with low capital cost. Soils and livestock must be managed to meet cross compliance and animal welfare requirements. The general public often have a negative perception of extended grazing so it is important to take time to work with local people and explain how the system can benefit livestock.

Correct field choice, managing the system with meticulous attention to detail and planning an alternative strategy for bad weather are vital for the system to be successful.

### Deferred Grazing

Deferred grazing is suitable for cattle or sheep. Recent research has shown that the feed costs of ewes grazed on deferred grass can be significantly reduced and spring sward quality improved. Grazing ewes on deferred grass can free up buildings for cattle and reduce poaching damage. Use electric fences to allocate grazing and to back fence. The length of the grazing period is influenced by the quantity of grass available and ground and weather conditions.

Assess the risk of poaching when planning extended grazing. In addition to the environmental impact, the yield

from poached areas is lower in the following grazing season, leading to extra costs if reseeded is needed to ensure that adequate grass yields are achieved.



*cattle on deferred winter grazing*

To avoid these problems:

- Graze swards on well-drained soils
- Choose swards with a dense base and be prepared to renovate in the spring
- Maintain an appropriate stocking density to prevent over grazing
- Avoid grazing during periods of heavy rainfall and adverse ground conditions

### Early Turnout

Reseeding with short term specialist mixtures can allow earlier turn-out in the spring. Mixtures should include early heading grasses, forage rye, Italian and Hybrid ryegrass. Alternatively direct drill these grasses into an existing sward during the autumn.

Managing extended grazing and early turn out

- Strip or block graze using an electric fence
- Use a back fence to improve crop utilisation, avoid waste and minimise poaching
- Restrict vehicle access to the field during the winter
- Provide a consistent quantity of fresh forage each day to avoid changes in the diet
- Big bale forage or straw can be placed in the field in the summer to provide additional winter feed
- Provide an appropriate mineral supplement for the type of stock
- Check that livestock maintain their body condition



# Other forage options

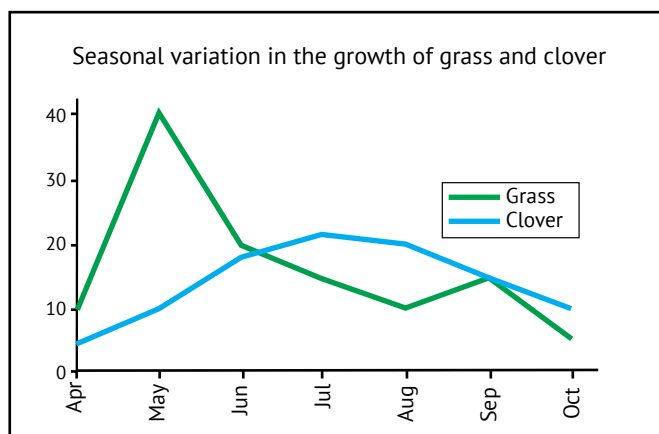
There is a range of forages that can supplement and complement grass. These can increase livestock intake and improve performance, fill gaps when grass growth is declining and reduce reliance on purchased supplementary feed. Plant breeders are continually working to develop new forage species and varieties to meet the needs of livestock and reduce the environmental impact of livestock farming.

## White Clover

White clover is the most important forage legume currently grown in the UK. It is a palatable source of home grown protein which can fix 150kg N/ha/yr. Over the last 20 years plant breeders have developed new varieties that are flexible with improved grazing and stress tolerance, better pest and disease resistance and greater compatibility with ryegrass. It grows on a network of above ground stems (stolons) which store energy and allow the plants to spread. White clover can contribute the equivalent of 450 kg of 34.5% N fertiliser/ha.

### Benefits

- Can improve livestock dry matter intake and performance by 20%
- Well suited to grazing and silage
- Improves soil structure, nutrient movement and fertiliser recovery
- Increases the forage crude protein
- Complements the grass growth curve, growing as grass growth declines



## Varieties and establishment

There are a range of leaf sizes to suit different systems. Small leaves are more suitable for sheep grazing, medium for rotational cattle grazing and silage and large leaves are also well suited to silage production. Choose suitable varieties from the current Recommended Grass and Clover Lists for England and Wales.



white clover

## Optimising performance from white clover

An average clover percentage of 30% gives optimum yield, animal performance and nitrogen fixation. To achieve this, aim for 10 - 20% clover in spring, 50% in summer, and 20% in autumn. Careful grazing or cutting is the key to keep optimum balance with grass levels.

## Keeping white clover in the sward

Healthy stolons are 2 - 3mm wide and extend to 40cm in length with many rooting points. Check stolons and clover content in the early spring and in July to guide management.

Small weak stolons	Dominant white clover
<ul style="list-style-type: none"> <li>• Graze rotationally</li> <li>• Graze rather than cut</li> <li>• Limit early N fertiliser</li> <li>• Light winter grazing</li> </ul>	<ul style="list-style-type: none"> <li>• Cut rather than graze in spring and follow by hard sheep grazing in July</li> <li>• Apply N fertiliser</li> <li>• Continuous grazing</li> </ul>

### Red Clover

A forage legume well suited to silage which also provides high quality aftermath grazing for finishing lambs or beef cattle.

- High yielding and high protein forage which reduces the need for concentrate feeds
- Fixes up to 250kg N/ha which is equivalent to 724kg of 34.5% N/ha
- Improves soil structure
- Deep rooting and drought tolerant
- May be undersown to spring barley

### Varieties and establishment

Red clover should be grown with ryegrass as pure swards increase the risk of nitrate leaching. Allow at least a 6 year break between red clover leys.

### Managing red clover

Red clover is an upright plant with a strong deep taproot. The crown at the base of the stem stores nutrients. Caring for the crown is vital to red clover survival.

- Avoid heavy machinery and livestock poaching especially in wet weather
- Rotationally graze aftermaths and remove livestock when clover height drops to 5 -6cm (2200kg DM/ha)
- Choose late flowering varieties which are more persistent under grazing conditions

- Match the livestock to the field conditions. Sheep apply high grazing pressure as they selectively graze the red clover especially where herbage density is low. Cattle are less selective graziers but can damage the crown more easily by their weight
- Do not graze with ewes from 6 weeks pre to 6 weeks post tupping

### Red clover silage

- Three to four cuts can be taken each year
- Cut to 7 - 8cm height for silage
- Allow 6 - 8 weeks between silage cuts
- Ensilage at 25 - 35% DM to avoid losses during wilting
- Cut with the dew on and minimise conditioning to reduce leaf shatter
- Use a homofermentative silage inoculant to ensure good fermentation
- Allow at least 28 days after cutting before grazing to enable the crop to recover

Grazing clover or lucerne may cause bloat, especially on cold wet mornings in late summer. Take care that livestock are not hungry when turned out to pasture and provide access to salt licks. Provide a dry fibrous feed such as hay and check livestock regularly.



red clover

## Chicory

Chicory is a broad-leaved forage crop with a thick deep tap-root that lasts for 2 - 6 years.

- High yielding with good nutritional quality (25%CP and 10.4 ME) but low dry matter content (8 - 12%)
- Contains more minerals and trace elements than grass
- Has anthelmintic properties and has been shown to reduce internal parasites in lambs
- Is a useful source of home-grown forage with lamb growth rates of above 250g per day achievable
- Drought tolerant and can reduce forage shortages during a dry summer

## Varieties and establishment

Grow a perennial forage variety of chicory. Sown in a mixture with ryegrass it will give a good balance of energy to protein.

- Sow in May and June after the risk of frost, which can kill the crop during early emergence
- Sow at 6kg/ha in a single stand or at 1.25 - 2.0kg/ha in mixtures with ryegrass / clover
- Tolerant of a wide range of soil pH but prefers 5.6 - 6.0. Soil P and K indices should be 2
- Seed should be shallow broadcast or drilled at 10mm as deeper drilling gives poor establishment

## Grazing

Chicory can be grazed from about 8 weeks after sowing. Rotational grazing is essential to optimise leaf production and reduce the risk of plants bolting. It also avoids it being selectively grazed if sown in combination with grass. One acre of well-managed chicory will carry 20 lambs for 30 - 40 days.

- Graze the plants when they reach 15 - 20cm, above 20cm forage quality declines
- Graze down to 5cm and top if necessary
- Graze one day paddocks or strip graze with a back fence
- Re-graze after minimum rest period of 3 weeks
- Avoid heavy grazing in late autumn and leave ungrazed over the winter in order to protect the crown
- N, P, K needs are similar to grazed grass.



*chicory*

### Lucerne

Lucerne (alfalfa) is usually grown for silage as a pure stand but it can be mixed with grass or undersown to spring cereals. It grows best in deep fertile well drained soils and needs careful management to establish successfully.

- A high yielding, drought tolerant crop
- Roots improve soil fertility and structure
- Fixes N at 250 - 300kg N/ha
- Can persist for up to 6 years



lucerne

### Varieties and establishment

- Choose a high yielding disease resistant variety bred in Northern Europe with a winter dormancy rating of 4 - 5
- Control perennial weeds and remedy soil compaction before sowing. If establishment is poor it is not possible to 'patch' the sward with more lucerne
- Seed should be inoculated with *Rhizobia Melliloti* to ensure root nodulation and N fixation
- Keep pH between 6.2 - 8 and P and K indices at 2
- Trace elements magnesium, sulphur, molybdenum and boron may be needed
- Sow into weed free soil after the risk of frost when soil temp at 10cm is 10°C
- Seedbed N is only needed if it follows cereals, maize, potatoes or brassicas
- Shallow drill at 5 -10mm, with rows 10 - 12cm apart
- Tramlines improve ease of fertiliser and spray application
- Monitor and control pests and diseases such as weevils, aphids, slugs, eelworm, phytophthora, verticillium wilt and crown rot

### Seed rates

Mixture choice	Seed rate kg/ha
100% lucerne	20-25
Lucerne in a mix with cocksfoot, timothy, fescue	lucerne at 15-20, grass at 8
Lucerne undersown to a cereal nurse crop	lucerne at 20-25 cereal at 100-125

### Silage

Lucerne has low water-soluble carbohydrates (WSC) and a high buffering capacity which make it resistant to acidification. An additive is recommended - seek specialist advice for lucerne.

- Always leave a 7 - 8cm stubble to avoid damage to the crown
- Minimise mechanical handling of the crop after mowing to avoid leaf shatter and yield loss
- Wilt to at least 35% DM for clamp silage and 40% DM for bales
- Wrap bales at storage site with at least 6 layers of wrap

The timing of the first cut is crucial and depends on the system. First year cutting guidelines:

- Spring sown first year of growth - cut in mid-August
- Summer sown first year of growth - cut the following spring
- Undersown to cereals - cut when the cereal is at the milky stage

After the establishment year cut before 10% of flower buds open in order to make high quality silage. Persistence of the crop is thought to improve if it is allowed to flower fully once a year but if cut this will reduce silage quality.

### Grazing

Graze lucerne rotationally with careful management. Most of the feed value is in the leaves, so a leader-follower system can be used to graze priority stock first.

- Graze paddocks for 7 - 10 days with 28 - 40 day rest periods
- Graze lightly in the autumn once the crop has stopped growing
- Avoid grazing ewes on diseased lucerne for 4 weeks pre and post mating as increased levels of coumestans may cause infertility

## Forage legumes compared

Characteristic	Red clover	White clover/Grass	Lucerne
Soil type	All types	Not too heavy	Well drained
Ideal pH	6.0 - 7.5	6.0 - 7.0	6.0 - 8.5
Establishment rate	Fast	Medium	Medium
Inoculation needed	No	No	Yes
Drought Tolerance	High	Medium	Very High
Persistence	Low - Medium	High	Medium
Regrowth Rate	High	High	High
Yield	9 - 15 tonnes DM/ha	9 - 14 tonnes DM/ha	12 - 15 tonnes DM/ha
Silage Quality	ME 9.8 - 11 MJ/kg/DM CP 14 - 19% pH 4 - 4.5	ME 9.8 - 12 MJ/kg/DM CP 14 - 18% pH 3.5 - 5.5	ME 9.0 - 11 MJ/kg/DM CP 20 - 23% pH 4.3 - 4.4
Other Features	High PPO*		No PPO

\*PPO Polyphenol oxidase is an enzyme that prevents protein breakdown.



lucerne makes a good silage crop but is more difficult to ensile than grass



### Cereals for Silage

Cereals cut for silage can provide a valuable reliable alternative to grass silage. They offer flexible planting and harvesting windows and can be grown as pure stands or as a nurse crop for reseed. When grown with legumes (bi cropping) the protein content of the silage is increased. In many parts of Wales cereal silage yields and harvesting conditions are more reliable than for maize.

### Arable silage

Arable silage is harvested young and leafy at 11 - 12 weeks and 35% DM with grain at the cheesy dough stage.

### Whole crop cereal silage

Whole crop cereal silage is harvested at a mature crop stage (over 50% DM) for maximum yield and starch level. Some crops are preserved as "Alkalage" using an alkali additive such as urea (20 - 30 kg/tonne of fresh forage). For crops of a high DM a corn cracker will help improve digestibility and an additive will improve the stability of fermentation. Whole crop provides a starchy feed alternative to forage maize for beef rations in areas where maize cannot be successfully grown.



*barley undersown with red clover for silage*

## Festuloliums

A hybrid of ryegrass (*lolium*) and fescue (*festuca*) combining the high yields of ryegrass with the tolerance of fescue to environmental stresses. Their use may increase due to changing weather patterns. The first festulolium on the Recommended Grass and Clover List for England and Wales (AberNiche) is an Italian Ryegrass fescue cross. This is a tetraploid hybrid ryegrass that has deep roots to offer resilience to water stress.

### Multisward Project: pan European research on diverse swards

Preliminary results have shown

- Swards with two or three legumes in mixtures with perennial ryegrass receiving 150kgN/ha performed as well as monoculture ryegrass swards receiving 300kgN/ha
- Legume based multi species swards gave higher forage intakes

## Developments in Grass and Clover Breeding

Plant breeders are developing new varieties of grass and clover to increase efficiency and profitability of agriculture. New varieties will deliver better yields and animal performance, improve nutrient and water use efficiency and reduce reliance on inputs of nutrients.

New varieties of ryegrass with improved water, N and P use plus a low nitrate leaching red clover and more drought tolerant white clover will be commercially available in the future.

High sugar perennial ryegrasses have been bred to provide more readily available energy in the rumen for improved capture of microbial protein which delivers higher yields of meat and milk. They also have better DM intake, digestibility and grass yield which can cut feed bills, improve carbon footprint and farm profit. The increased sugar can also improve silage fermentation.

Future research is looking to change the protein, fibre and fat content of ryegrass and the protein content of white clover to provide a more balanced feed.



*plots on the Multisward project*

## Top ten tips

1. Maintain soil chemistry at pH 6.2, P and K at index 2.
2. Check for soil compaction and correct to keep good soil structure and grass growth.
3. Draw up and follow a soil nutrient plan, adjusting it for changes in soil fertility, application of manures and grazing and cutting management.
4. Make the most of manures and slurry by taking account of their nutrient value, spreading them efficiently and targeting to sward needs.
5. Control weeds at the right stage of growth and use cultural methods to prevent weeds establishing.
6. Identify swards in need of improvement, create a plan and implement it.
7. Use the current Recommended Grass and Clover Lists for England and Wales to choose the best varieties and the right mix of species and varieties for the type of ley needed.
8. Include clovers and consider other forages that may fix N, increase yield, improve energy, protein or mineral levels and offer out of season production.
9. Graze at target 2.5 to 3 leaf stage using sward height or pasture cover measurements. Summer grazing below 4cm (1500kg DM/ha) will reduce sward and stock performance.
10. Develop a grazing system that works for the farm. Use grass wedges to identify periods of grass shortfall and surplus and link to livestock performance.

### Further information

Please contact HCC's Industry Development team  
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For further information on this booklet or the work of HCC please visit [www.hccmpw.org.uk](http://www.hccmpw.org.uk)

