



# Improving pasture for Better Returns



**The information in this booklet was compiled by: British Grassland Society; Charlie Morgan Grassmaster, independent grassland specialist; Michael Shannon, independent forage consultant; Richard Simpson, Kingshay.**

**Research data and information included in this guide has been sourced from AFBINI, Defra RB209, IBERS (formerly the Institute of Grassland and Environmental Research), Kingshay, DairyCo Grass+, Recommended Grass and Clover Lists, SRUC (formerly SAC) and Simon Draper Agronomy.**

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**Illustrations: Tebbit Design  
Photography: Limagrain Europe,  
Dow AgroSciences, Nick Forman,  
British Seed Houses, Alan Hopkins**

For more information contact:

**Better Returns Programme  
AHDB Beef & Lamb  
Stoneleigh Park  
Kenilworth  
Warwickshire  
CV8 2TL**

**Tel: 024 7647 8834  
Email: [brp@ahdb.org.uk](mailto:brp@ahdb.org.uk)  
[beefandlamb.ahdb.org.uk](http://beefandlamb.ahdb.org.uk)**

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Any enquiries related to this publication should be sent to us at AHDB Beef & Lamb, Stoneleigh Park, Kenilworth, Warwickshire CV8 2TL.



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**Better Returns Programme**

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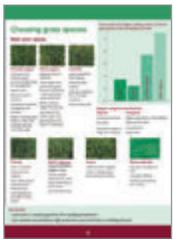
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Grass is one of the most important, yet often overlooked resources for livestock production. Well-managed grassland provides the most economic feed throughout the year, either as grazing or conserved forage.

Yet all too often grassland underperforms. Inadequate crop nutrition, soil compaction, weed infestation and many other factors will all result in reduced performance.

In this updated version of the improving pasture manual, we address the key factors beef and sheep farmers should be considering when planning their grassland management. For the first time we have included specific guidance for producers relying on permanent pasture and upland grazing, as well as those whose systems are based around grass leys.

As production costs continue to rise, there is no doubt that well-managed grassland has an increasingly important role in achieving better returns for beef and sheep producers.

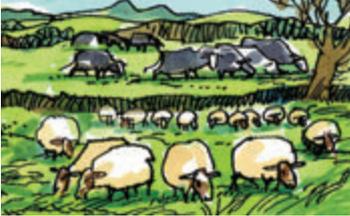


Dr Liz Genever  
Livestock Scientist  
AHDB Beef & Lamb

## What's the potential?

Well-managed, correctly fertilised pasture containing productive grasses and clovers can produce:

### Grazing



# 10–11

t dry matter/ha  
(4–4.5t DM/ha)

### Silage



# 13–14

t dry matter/ha  
(5–5.5t DM/ha)

Equivalent to  
**110 big bales/ha/yr**  
(30%DM) (45 bales/ac)



That's 3,600kg of liveweight  
gain/ha in beef and sheep

### Realising this potential in existing pasture depends on:

- Soil type and site class
- Stocking rates – to keep sward quality
- Fertiliser, manures and soil reserves
- Soil pH
- Compaction
- Sward composition
- Weeds and weed grasses

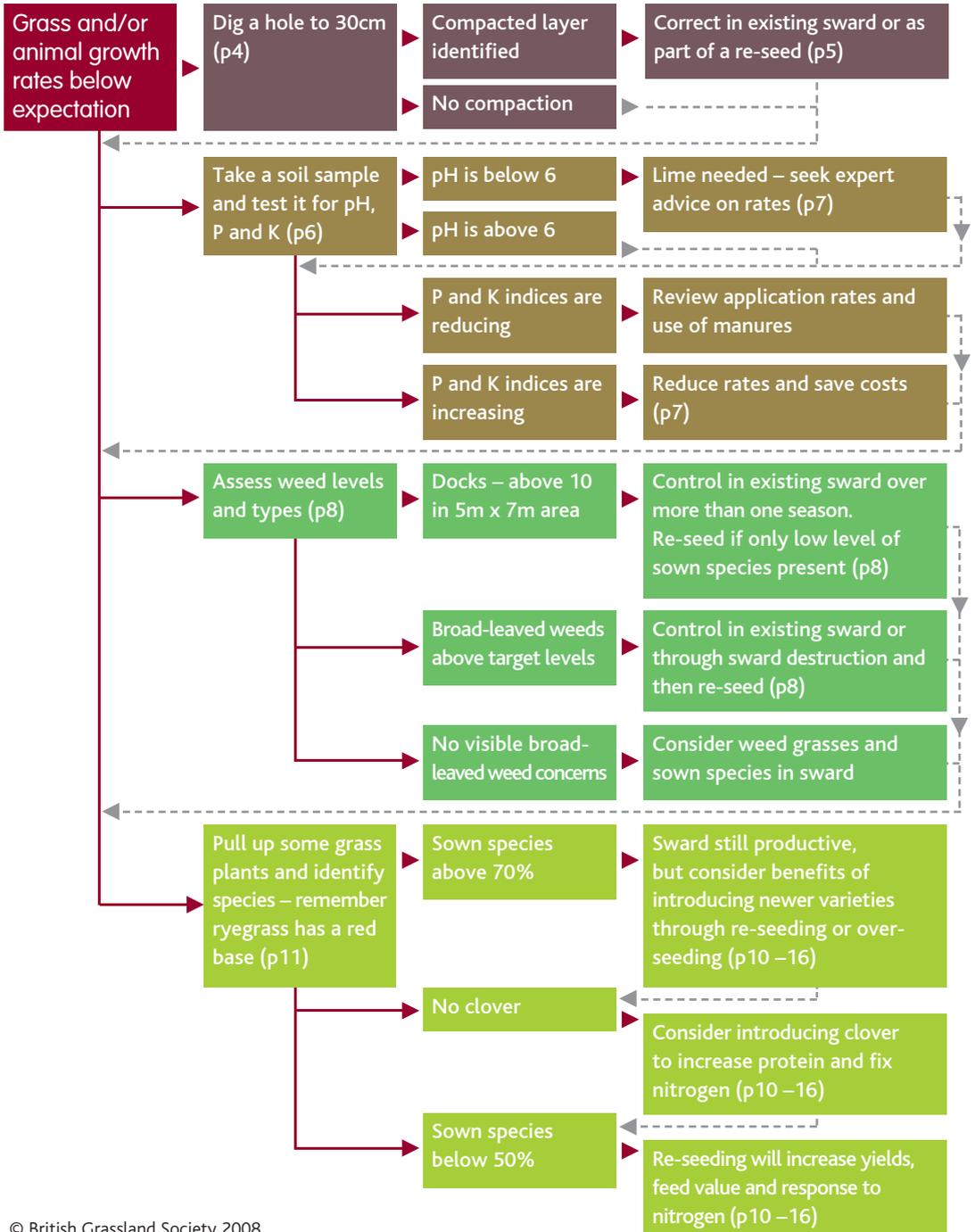
### And introducing new seeds

Newer varieties can boost production from permanent pasture over five years by £1,144/ha (£463/ac)\*, after typical re-seeding costs.



\* Summer 2012, Wheat £160/t, Soya £380/t

# Pasture improvement flow chart



# Assessing compaction



Ideally, where soil depth allows, grass roots should go down 30cm or more. Compaction inhibits root penetration, seriously reduces grass yield and increases the risk of soil and fertiliser run-off. Compaction will also lead to a reduction in the sown varieties in the sward.

## Identifying compaction

A spade is the best diagnostic tool.

- Dig a hole at least a spade's depth, ideally in February or other times when the soil is neither excessively wet or dry
- Look for how far roots and moisture extend down the profile
- Where there is extra resistance to the spade, that is the depth of compaction in the area

Compaction type	Typical causes	Remedies
Surface capping (0-10cm deep)	<ul style="list-style-type: none"> <li>• Grazing in wet conditions</li> <li>• High stocking densities</li> <li>• Rainfall on new cultivations</li> </ul>	<ul style="list-style-type: none"> <li>• Lime/introduce organic matter to encourage earthworm activity to break cap</li> <li>• Soil aerator with spikes or knives</li> <li>• Plough</li> </ul>
Machinery (10-15cm deep)	<ul style="list-style-type: none"> <li>• Silage and muckspreading operations. NB the first wheeling creates 70% of the damage so use tramlines if possible</li> </ul>	<ul style="list-style-type: none"> <li>• Soil aerator with spikes or knives</li> <li>• Subsoiler or sward lifter</li> <li>• Plough</li> </ul>
Plough pans (15cm+ deep)	<ul style="list-style-type: none"> <li>• Repeated re-seeding at one depth</li> </ul>	<ul style="list-style-type: none"> <li>• Subsoiler or sward lifter</li> <li>• Mole-plough (heavy soils only)</li> <li>• Deeper plough just below pan</li> </ul>



Subsoiler or sward lifter



Mole plough

While compaction can be alleviated in existing swards, it is more commonly tackled as part of a re-seed.

**DO NOT** subsoil established swards in wet conditions or the problem will get worse.

Serious poaching or run-off must be dealt with quickly to meet Cross Compliance rules.

# Dealing with compaction

## Subsoiling:

- Reduces runoff caused by compaction
- Allows rain to soak in
- Protects watercourses
- Delays onset of drought stress
- Increases grass yield

Existing pasture can be subsoiled to improve yield. However, it is more commonly practiced when re-seeding. Subsoiling after ploughing or discing saves disturbance to existing swards.

**Ensure work is carried out in favourable soil conditions and with the correct machine, or it may result in more harm than good.**



## Drainage

**Mole ploughing** together with cleaning and repair of existing drains can help improve wet ground.

**New drainage systems** represent a serious investment to tackle wet land where compaction is not present. Uncommon in recent years, a new system may give 20 years or more service.

NB: Wetlands may have environmental benefits from which agri-environmental payments can be claimed.

## When to subsoil?

When the top soil has some moisture but the subsoil is dry.

Roll if the field will be silaged soon afterwards; grazed land will be trodden back.

**DO NOT** subsoil in wet conditions.

While subsoiling can be carried out up to 50cm deep, the key is a working depth just 2.5cm below the compacted layer and maintaining a low forward speed. Winged tines should be spaced at twice the operating depth; tines without wings at 1.5 times depth.

## Slit aeration:

- Improves microbial activity
- Helps nutrient and crop debris breakdown

Timing is critical. Ground should be dry enough to avoid surface damage by the tractor, but have sufficient moisture to allow spikes to penetrate. Spring or autumn are usually ideal times.

While slit aeration is often said to improve performance, there is little independent scientific research available at present. However, a recent trial\* found slit aeration boosted grass production by 0.8t/ha (0.3t/ac) on one farm.

\* Kingshay trial



## Soils manual

BRP has produced a manual which takes a closer look at managing soils for best returns from grassland. Available to download from the BRP literature section of [beefandlamb.ahdb.org.uk](http://beefandlamb.ahdb.org.uk) or

email [brp@ahdb.org.uk](mailto:brp@ahdb.org.uk) or call

**024 7647 8834** to request a free copy.

# Optimising soil nutrient status

## Soil sampling (for pH, P and K)

It is good practice to soil sample every three to five years. Some environmental schemes dictate frequency. The best time to test soil is between October and March.

A list of soil and forage test companies can be found on the AHDB Beef & Lamb website in the BRP section.

More detailed analysis for minerals and trace elements can be beneficial, but expert interpretation is needed.

**DO NOT** sample within nine to twelve months of liming or within six months of a fertiliser application.

### DO:

- Take multiple cores, 25 recommended, to 7.5cm deep in grassland



- Mix samples thoroughly
- Bag up 0.5 - 1kg
- Send them to a soil laboratory (eg commercial company, local farmers co-op, fertiliser merchants, lime suppliers or independent labs)
- Discuss results of tests with your adviser

## Phosphate (P) and Potash (K)

P and K are essential for grass and clover growth. Phosphate is important for root development and energy transfer within plants, while potash has a key role in water regulation and nitrogen efficiency.

Monitoring P and K levels by soil sampling allows targeted, cost-effective nutrient management.

- P and K should be supplied by reserves in the soil, which are maintained by bagged fertilisers and livestock manures
- Index 2 is the soil level to aim for. Fertiliser and/or manure should be applied to match offtakes and so maintain the soil at index 2
- Nutrient offtake is higher on cutting swards

- For every tonne of DM removed, approximately 8kg P and 27kg K is removed
- RB209 recommendations\* can be adjusted if substantially higher or lower crop yields are expected
- When re-seeding consider applying P and K fertiliser when indices are 3 or below for P, and 2 or below for K, but deduct this from the annual requirement
- A single spring P application is generally preferred, but targeted, frequent applications, matching crop offtake, are better at low P indices

\* Fertiliser Recommendations for Agricultural and Horticultural Crops

## Lime



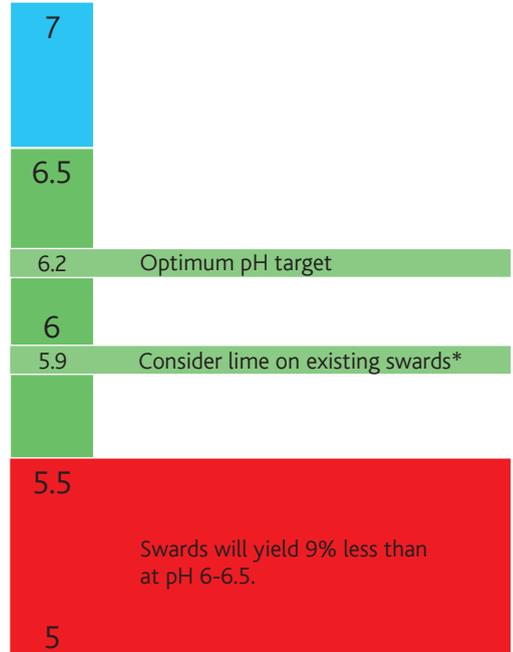
**Correcting the pH status of the soil by applying lime is a simple and effective way to increase grassland productivity.**

Acidity in soil reduces bacterial and earthworm activity as well as nutrient uptake.

How much lime to apply depends on soil type and liming material. Remedying pH can take months, and on very acidic soil may not be fully corrected in one season.

Do not be too heavy-handed as too much lime can lock up minerals.

## pH scale



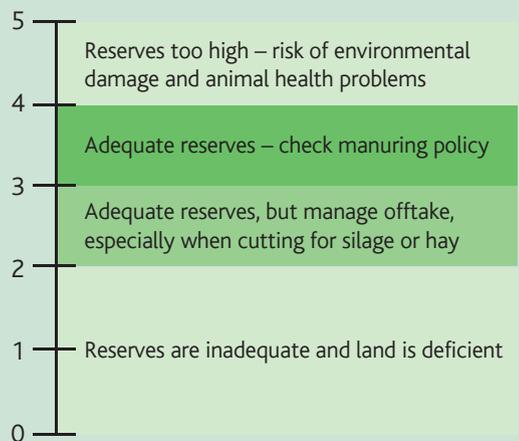
\*Exceptions are peats (pH 5.3) and organic soils (pH 5.7).

- High K indices (above 3) can lead to luxury uptake and mineral lockups, leading to staggers in cattle and sheep
- On grazing land, K is best applied later in the season or as small frequent applications

Use the latest Defra RB209 version which is available free online at [www.ahdb.org.uk/projects/CropNutrition](http://www.ahdb.org.uk/projects/CropNutrition).

**Do not forget to take account of nutrients applied as organic manures.**

## P and K indexes



# Weed control

Weeds reduce sward yields, energy content and quality. Some are poisonous and if left uncontrolled will spread and shed seeds to cause even more headaches in future years.

## Why weeds establish

Weeds are often linked to poor management, eg:

- Low pH, P or K
- Acidic soils
- Over- or under-grazing
- Compaction, eg poaching
- Open swards – so choose varieties carefully

## Do I need to control weeds?

Assess 50x50cm squares at a number of places around a field. If more than 10% of a square has weeds, production is being compromised.

Broad-leaved and grass weeds can be controlled in a sward, or during sward destruction, ie two or three weeks after grazing/mowing and before re-seeding.

Topping reduces the spread of thistles and nettles, but spread may still occur via roots.

Timing of sprays is important, always seek advice from a BASIS-qualified adviser and only use a qualified sprayer operator.

Spot spraying and weed wiping are useful for tackling small areas of invasive weeds.

## Common weeds

### Chickweed



Seeds throughout the year and fills bare patches.

Can control in a sward, but may also need to fill gaps, eg by over-seeding.

A particular problem in re-seeds.

### Control options:

- Heavy graze in the autumn
- Harrow in the autumn
- Include clover in the mix to fill gaps
- Use a herbicide suitable for the ley duration and clover presence/absence
- Control if more than five plants/m<sup>2</sup>

### Thistles



Spread by seeds and roots. Topping helps but will not stop spread completely.

Must control when actively growing by

- Frequent topping
- Suitable herbicide use



## Use herbicides carefully or lose them!

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

Call **024 7647 8834** for a free copy.

### Buttercups



Indicate low soil fertility, particularly nitrogen.

Thrives in wet conditions.

Consider why this weed has invaded.

### Control options:

- Improve drainage
- Increase grass/clover coverage
- Suitable herbicide use

### Docks



Seeds remain dormant for many years and seed even after cutting.

20 docks in a 5m x 7m area reduces grass yield by 3.4t/ha (IBER research). Spraying is likely to be economic at half this level.

- Often requires repeat treatment as seeds germinate through the year and roots spread
- Apply herbicide at the rosette stage in spring or autumn, post-cutting and grazing

### Ragwort



Poisonous, particularly when in silage as animals cannot select it out.

Legal requirement for land occupier to control spread.

- Best controlled by hand pulling (wear gloves and mask); sprays may be needed for large areas and to reduce plant populations
- Sets seed even after uprooting, so dispose of plants carefully
- Target control at the rosette stage in autumn and again the following year before flowering

### Nettles



Nettles like rich soils.

Spread by seeds and roots.

- Topping helps but will not stop spread completely
- Must control when actively growing
- Spraying herbicides suited to the ley duration and sward composition

## Re-seeding

As grass varieties are constantly improved, re-seeding a five-year-old ley can produce an extra £1,144/ha (£463/ac) of feed\*.

Experience shows that in the first year, improved varieties give 33% more yield than a typical five year old ley.▲ Over the next four years, yields will be 10% higher.

Re-seeding benefits:

- **Modern improved varieties**
- **Increased palatability** – from ryegrass and clover
- **Increased protein** – from white and red clovers
- **Improved nitrogen efficiency** – and less leaching
- **Reduced nitrogen requirement** – with clover
- **Opportunity to tackle weeds**
- **Less disease**, eg crown rust – resistant varieties
- **Improved drought resistance** – through using clover and suitable grass varieties
- **Matching sward to growth objectives** – using heading dates and seasonal growth patterns

A full re-seed, including ploughing, costs £375/ha (£150/ac), however, this will quickly be recouped. Tackling other issues that reduce output before re-seeding will maximise benefit.

Establishing an additional autumn crop of kale or stubble turnips will help reduce short term production loss.

\*Based on summer 2012 prices: feed wheat £160/t; soya £380/t and a starting yield of 8.5t DM/ha.

▲Kingshay

### Re-new or re-seed?

Recently, it has become more common to re-new existing swards by over-seeding or slot seeding. This reduces the cost compared to a full re-seed.

Typically over-seeding will cost £175-200/ha (£70 -80/ac).

**Commercial trials – using an over-seeding machine which harrows and sows seed – show up to 40% more grass yield in the following year.**

**Alternatively, harrow before and after broadcasting or drilling seeds, or use a slot seeder/direct drill without cultivation.**

**Over-seeding** is useful where:

- ✓ You do not want to plough (or environmental restrictions prevent it)
- ✓ There are gaps in the sward, eg after poaching
- ✓ Soil structure is good and a base in the sward is required to carry stock
- ✓ More ryegrass or newer varieties are wanted
- ✓ Clover needs to be introduced

However, over-seeding works best with large seeded varieties such as tetraploids, which compete successfully with the existing grasses. It is a short-term fix, as the process may need repeating or a full re-seed may just be delayed.

## To plough or not to plough?

It is important to assess whether ploughing is right for your farm. Consider both costs and the environmental rules applying to the fields, especially if grass is classed as permanent pasture.

Ploughing can:

- ✗ Release soil nitrogen with no crop to use it; so the leaching risk is high
- ✓ Improve soil structure particularly compacted layers
- ✓ Reduce runoff in the longer term

## Direct drilling

An economic operation costing £320/ha (£130/ac):

- ✓ Quick operation
- ✓ Less disruption to ground, sward or stock
- ✗ High cost of machinery
- ✗ Existing weeds and grass can compete
- ✗ Does not address soil compaction



Perennial ryegrass, identified by the red colour at the base of its stems.

## Assessing sward condition

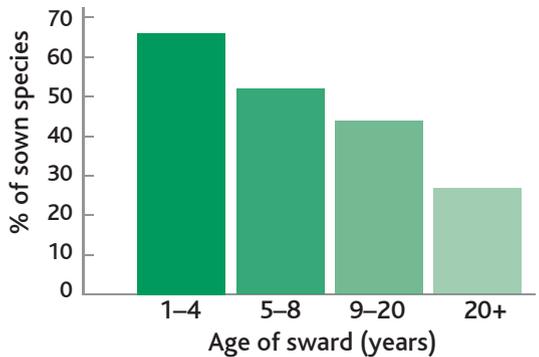
The percentage of ryegrass (or other sown species) is a better indicator of a need for re-seeding than the age of the ley. When a ley is not very old, consider why it has deteriorated and correct problems, eg lime, before re-seeding.

Target: 70% of sown grass and clover species.

Consider re-sowing when sown species falls below 50% depending on species and weeds.

Weed grasses, eg annual meadow grass, make up the rest. These offer less yield, poor feed quality and low response to nitrogen.

## Decline in preferred grass species\* over time on suckler beef swards



\*Includes Perennial ryegrass, Timothy and clover.

Sources: Forbes et al 1980 and *Improved Grassland Management*, John Frame.

# Choosing grass species

## Main sown species



### Perennial ryegrass

Productive with relatively good persistence, depending on management. High D-value. Responds well to nutrients. Worldwide investment in breeding new varieties. Range of heading dates (early to late). Later heading indicates more leafy type.



### Italian ryegrass

Relatively easy to establish. Yields higher than perennial ryegrass but poor persistence – only one to two years production. Better suited to silage than grazing. Cut three to five times a year, with grazing late in the season if necessary.



### Cocksfoot

Lower palatability than ryegrass. Yields less than ryegrass. Suits dry conditions due to drought tolerance. Early heading date.



### Timothy

Slow to establish. Yields less than ryegrass. Suits wetter, heavy soils and winter sheep grazing. Late heading and palatable in early season.



### Hybrid ryegrasses

(a perennial/Italian ryegrass cross) Can last and be productive for three years, potentially up to five years. Suits red clover leys.



### Fescues

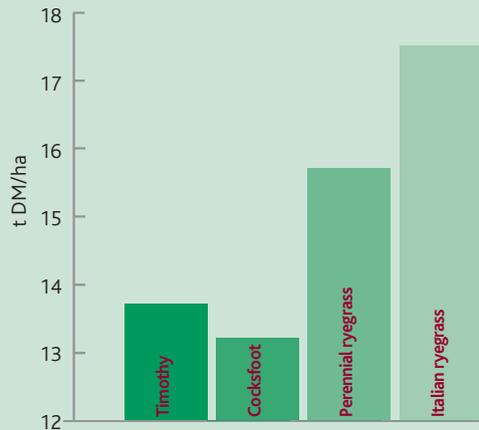
Yields less than ryegrass. Useful in hill grazing or low intensity situations.



### Westerwolds/Rye

One year of production only. Very high yielding. Used for early grazing and cutting.

Annual yield of the highest yielding variety of different grass species in Recommended List trials:



## Ryegrass categories/classifications

### Diploids

Good ground cover. Persistent. Essential in medium/long term mixtures.

### Tetraploids

Higher yield at first cut than diploids. Open growth habit. Less persistent. Large seeds.

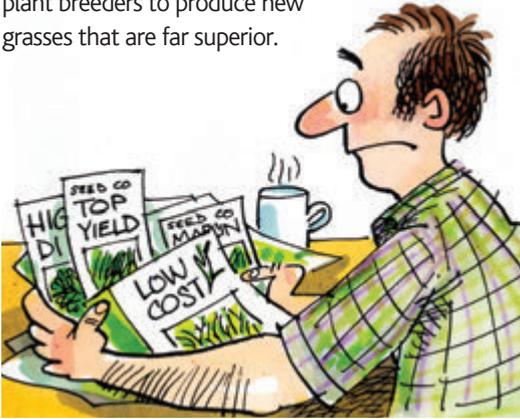
## Remember:

- Seed cost is a small proportion of re-seeding investment
- Top varieties should deliver high production and extend the re-seeding interval

## Selecting mixtures

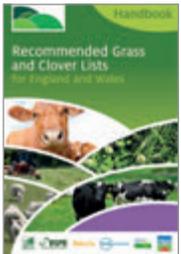
Few farmers these days would want to use bull or ram genetics from the 1950s, but many continue to use outdated varieties in their grassland.

By relying on old varieties, farmers are missing out on millions of pounds worth of investment made by plant breeders to produce new grasses that are far superior.



In the UK farmers tend to re-seed with a mixture of different grasses and clover, rather than sowing a single variety. Mixtures have scientifically proven yield benefits, compared to the same varieties sown individually. They also allow farmers to capitalise on the strengths of different species.

### Recommended Grass and Clover Lists Handbook



The *Recommended Grass and Clover Lists* provide information on the best performing grasses and clovers available today. The varieties that make it onto the lists have been independently tested and heavily scrutinised

by a panel of experts to ensure only varieties of genuine value to farmers are included. As few as 1 in 20 varieties of ryegrasses tested will actually make it to full recommendation.

### Work with your seed supplier

Your merchant can help you make the best decision on what types of grasses are appropriate for your system and requirements, eg silage only, grazing only or both. Ask them to look at all the results of the independent trials, which include information on persistency, seasonal growth patterns, ground cover, winter hardiness, digestibility and disease resistance.

Tell your seed supplier about the field to be re-seeded and your plans for its future use and management. This will ensure that the mixture is matched to each field's particular needs.

### Use it or lose it!

The *Recommended Grass and Clover Lists* are based on independent, rigorous testing of grass and clover varieties. The testing is mainly funded by breeders with additional support from levy boards (AHDB Beef, Lamb, Dairy and HCC). It is no longer funded by a levy paid by merchants and retailers participating in the Grass Levy Scheme.

The breeders, levy boards, British Society of Plant Breeders (BSPB), and the British Grassland Society (BGS) are working together to promote the value of tested and recommended grass and clover varieties to producers.

### Full Recommended Grass and Clover Lists

The full lists are available to all agronomists and other grass seed specialists. They provide detailed information on all the performance measures including seasonal growth and agronomic characteristics for each variety so that the best possible seed combinations can be selected.

## Red and white clovers

Clovers can replace bagged nitrogen in conventional and organic swards. How much nitrogen is fixed depends on the clover content in the sward.

Clovers produce a high protein and palatable crop, which often improves animal performance.

- Warmer soils are needed for growth to begin (8°C compared to 5°C for grass)
- Drought tolerant
- Summer production is often higher than grass alone
- Require soil pH 6-6.5 and P and K indexes above 2 (like grass)

- Strategic nitrogen applications to boost spring grass growth will increase first cut silage/early grazing yields
- Relatively easy and cheap to grow once established
- Limited weed control choice
- Extra care needed when ensiling high DM crop as leaves shatter easily
- Fix nitrogen for subsequent crop, as well for the grass

### Match clover variety to stock



**Small-leaved** – suits continuous, hard sheep grazing

**Medium-leaved** – suits frequent cutting and rotational grazing

**Large-leaved** – suits cutting and rotational cattle grazing



**Red clover** swards can fix between 200-300kg/ha of nitrogen, producing the same yield as a short term ley with the same amount of N applied.

- ✓ Best sown with grass, especially hybrids, to optimise forage yield
- ✓ Crude protein up to 19% in silage depending on the amount in the sward and cutting date
- ✓ High protein content makes it excellent for finishing lambs and cattle in autumn
- ✓ New UK breeding programme began in 1998
- ✗ Cutting too low, or overgrazing in autumn/wet conditions, damages plant crown and risks killing plants
- ✗ Soil-borne disease and pest control create need for a rotation with breaks of five to eight years
- ✗ Unsuitable for sheep grazing for six weeks pre-/post-tupping

**Sowing** is best in spring or mid-July to end-August, replacing 7.5kg/ha (3kg/acre) of grass seed with clover seed. Broadcast or drill to an optimum seed depth of 5-10mm.

**Clover is particularly sensitive to soil pH.**

**Over-seeding can introduce clover into an existing sward.**



**White clover** can fix up to 280kg N/ha, although more typically 150kg N/ha. It suits both grazing and silage and can increase yields by up to 15% depending on clover content and N inputs.

- ✓ A longer-term crop, less disease-prone than red clover
- ✓ Newer varieties can tolerate higher N levels but this reduces the amount of N it fixes from the atmosphere.
- ✓ For every 10% increase in white clover, the protein content of forage will be 1% more. In late summer sward crude protein can increase to 25%
- ✓ Target 25-35% of sward DM as clover. Be patient for full N fixing effect in grass production
- ✓ Up to 50% of sward can become clover and look like an entire clover sward from above
- ✓ Clover can be established at a later date to a main re-seed, either at a more suitable time of year, such as after first cut silage or after weed control in a re-seed. (Avoid introducing clover until the spray residual has been de-natured)
- ✗ Weed control choice is limited

**Sowing** is best in April to August, adding or replacing 2.5kg/ha (1kg/ac) seed. Broadcast or drill to an optimum seed depth of 5-10mm.

## Alternative sward companions

Interest is growing, among both conventional and organic farmers, in alternative plants to solve health problems and boost growth in grazing animals.

Crops such as chicory, which has long taproots, help bring up minerals from the soil profile. The potential of this crop is currently being investigated in a wide range of UK conditions.

### Chicory



Used in many parts of the world as a source of fodder, chicory provides essential minerals to grazing livestock. Improved chicory varieties, including perennial varieties lasting up to eight years, are now available.

With a deep taproot, chicory will grow well in even the driest conditions. It is very productive and will reach 2m height if not grazed.

- ✓ Perennial chicory in mixes has increased daily liveweight gain and reduced finishing time in lambs in trials in Cumbria and Scotland
- ✓ Plants are high in minerals, eg zinc and copper
- ✓ In one Aberdeen trial parasitic worms were reduced by 40%
- ✓ It can be introduced into existing swards
- ✗ Chicory is not a legume and so will not fix N
- ✗ Avoid grazing continuously, or overgrazing in wet conditions, as this can damage the crown and persistence of the crop

There are two main ways to grow chicory. For summer grazing and finishing lambs, a mixture of 2kg chicory, 2.5kg red clover and 1kg white clover can be used – to give about 40% chicory.

For more flexible grazing, a mixture of 1.75kg chicory, 1.5kg white clover, 4kg hybrid ryegrasses and 4kg perennial ryegrasses can be used – to give about 15% chicory.

### Establishing chicory

- Choose a perennial variety and an appropriate mixture
- Select a well-drained field
- Ensure pH of 6, P and K indices of 2
- Control broad-leaved weeds before sowing, as there is no licensed weed control for chicory
- Sow April to June (grass, white clover and chicory swards can be sown early autumn)
- Drill or broadcast into firm seedbed to maximum depth of 10mm
- Use slug pellets
- N, P and K fertiliser requirements similar to grass

For more information, BRP+ document Using Chicory and Plantain in Beef and Sheep Systems available to download from [beefandlamb.ahdb.org.uk](http://beefandlamb.ahdb.org.uk).

### Other herbs to consider

- Sainfoin
- Sheep's Parsley
- Burnett
- Ribgrass
- Yarrow

## First season: management tips

- ✓ Encourage tillering with a light grazing – ideally with young cattle – soon after establishment (six weeks or 10cm high)
- ✓ Graze well before winter to avoid winter kill, which creates bare patches for weeds to come into
- ✓ Take stock off in wet conditions to avoid poaching
- ✓ Alternate cutting and grazing for prolonged productivity
- ✗ Avoid grazing for too long. Stock will graze – and harm – new tiller shoots. An 'on-off' system is best
- ✗ Avoid overgrazing. All plants need green leaf for photosynthesis. Young cattle may be better than sheep for a first grazing
- ✗ Avoid heavier cattle which are more likely to cause damage
- ✗ Avoid a late summer cut

## Pests/Diseases

Pest/Disease	Activity and symptoms	Control
Leatherjackets	<ul style="list-style-type: none"> <li>• Feed on roots and shoots</li> <li>• Plants yellow and die</li> <li>• More common after grass and cool autumn weather</li> </ul>	<ul style="list-style-type: none"> <li>• Applications best used in autumn</li> <li>• Improve soil damage</li> <li>• May be potential for biocide use, eg <i>Bacillus thuringiensis</i>, but no clear scientific support as yet</li> <li>• Insecticide*</li> </ul>
Slugs	<ul style="list-style-type: none"> <li>• Eat young plants</li> <li>• Common in damp condition</li> <li>• Damage and pests easy to see</li> </ul>	<ul style="list-style-type: none"> <li>• Use resistant white clover varieties</li> <li>• Moluscicide</li> </ul>
Frit Fly	<ul style="list-style-type: none"> <li>• Cause new shoots to die</li> <li>• Most common when direct drilled, in autumn and in Italian ryegrass swards</li> </ul>	<ul style="list-style-type: none"> <li>• Use resistant ryegrass varieties</li> <li>• Re-seed four weeks after sward destruction</li> <li>• Increase seed rates</li> <li>• Insecticide*</li> </ul>
Chafers	<ul style="list-style-type: none"> <li>• Larvae feeding produces patches of poorly grown grass that may turn brown in dry weather</li> <li>• Damage is most likely to be seen in Sept-Oct</li> <li>• Substantial bird activity may indicate infestation</li> </ul>	<ul style="list-style-type: none"> <li>• Insecticide*</li> </ul>
Sitona Weevils	<ul style="list-style-type: none"> <li>• Characteristic notching at leaf margins of clover</li> <li>• Larval feeding can also pre-dispose the plant to damage by crown or root-rotting fungi</li> </ul>	<ul style="list-style-type: none"> <li>• No insecticide is specifically approved for weevils, but treatment for frit fly or leatherjackets likely to reduce the population</li> </ul>
Barley Yellow Dwarf Virus	<ul style="list-style-type: none"> <li>• Spread by aphids</li> <li>• Bright yellow upper leaves, gradually spreads throughout the sward leading to severely stunted plants</li> </ul>	<ul style="list-style-type: none"> <li>• Insecticides, use aphid monitoring information to time applications</li> <li>• Tolerant varieties</li> </ul>
Ryegrass Mosaic Virus	<ul style="list-style-type: none"> <li>• Light green streaking of leaves which eventually turn brown and die</li> </ul>	<ul style="list-style-type: none"> <li>• Autumn rather than spring sowing will delay the ingress of the mite</li> <li>• Use resistant ryegrass varieties</li> </ul>
Crown rust	<ul style="list-style-type: none"> <li>• Strikes mainly in late summer and early autumn and results in distinctive yellow-orange pustules on the leaves</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure grass receives sufficient nutrients to fight off the disease</li> <li>• Cutting or topping the grass to remove the leaf 'food supply' for the fungus</li> <li>• Choose resistant varieties</li> </ul>

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

## Improving permanent pasture

Currently only 6% of agricultural grassland is re-seeded and permanent pasture plays a significant role in UK livestock production.

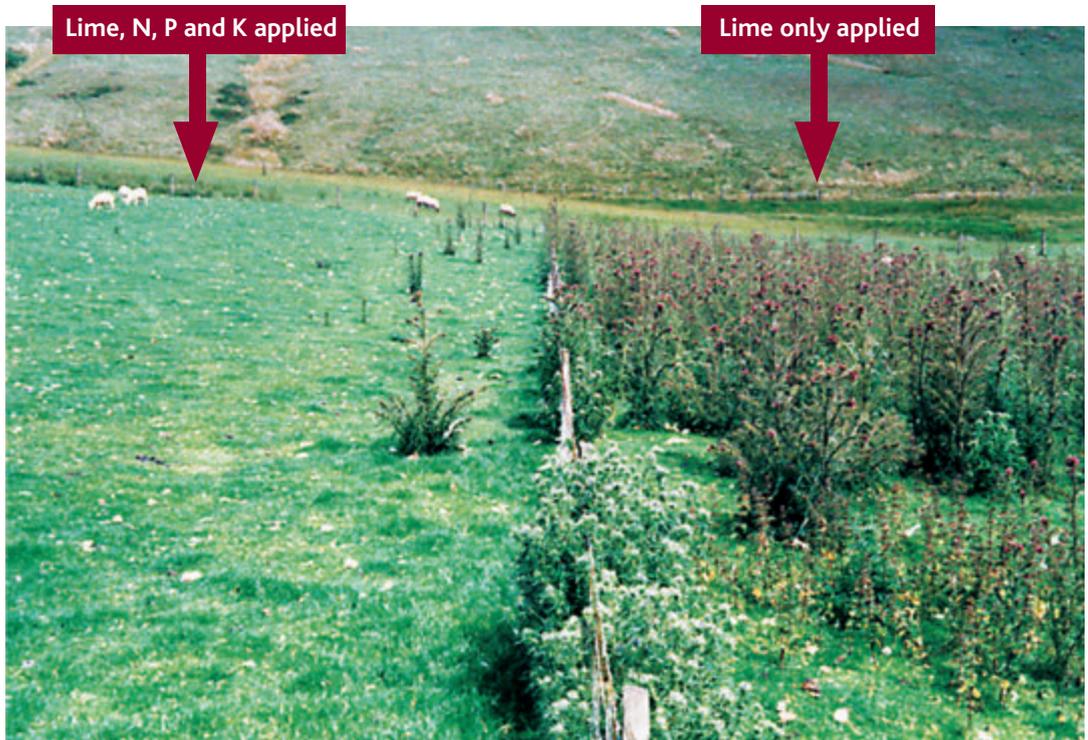
The value of long-term grassland is often under-rated. The maximum annual yield that can be achieved is less than for a new ley – 9t DM/ha compared to 12t DM/ha, but the cost of production is less. It also has a denser sward and is able to carry more stock, especially through the winter months, and the diversity of plant species gives livestock more choice in their grazing.

On the downside, the growing season for permanent pasture is shorter and the quality of the grass can be poorer, depending on the percentage of ryegrass and clover present.

### Management input needed!

Permanent pasture needs managing as much, or even more, than a newly-sown ley. If the soil and the sward are managed well, grass and animal production can be very good, and no herbicides or mechanical topping will be needed to control weeds or maintain quality.

Soil nutrient shortfalls are very common under permanent grass, and addressing any deficits is crucial for improving production and feed value. Grasses produce stem and go to seed much faster if soil nutrient levels are below optimum for growth.



Up until a decade ago, when fields were ploughed lime was regularly applied. But with a greater focus on cheaper methods of seed introduction, lime has been overlooked. This means many soils under long-term grass are now more acid than the ideal pH 6.2.

Pastures that have been cropped for silage or hay and have not had nutrients replaced to balance off-take, will also underperform.

Where land is not under any environmental restrictions, a soil test should be taken so that appropriate fertiliser inputs can be applied.

### Reduce compaction

Soil structure is important for grass health and production. Over the years soils can easily become compacted, restricting the movement of air, water and nutrients down through the soil profile.

As ploughing is often not an option to break up horizontal pans, alternative methods such as aeration may be needed to allow adequate root development and nutrient uptake.

Having adequate drainage is important to prevent unproductive and unpalatable species such as rushes encroaching into the pasture.

### Sward content

A good quality permanent sward should consist of 50% ryegrass and 20% white clover.

In a permanent sward there may be eight to twelve different grasses, and a similar number of broad-leaved species, some of which may

have anthelmintic properties.

Some of these plants will be less desirable plants such as thistles. But good nutrition and tight grazing down to a uniform height to produce a dense sward of around 40,000 tillers/m<sup>2</sup>, will make it hard for unwanted species to gain a foothold.

**In commercial trials, using an over-seeding machine which harrows and sows seeds, shows up to 40% more grass yield the following year.**

If swards do become damaged and ryegrass contents dip below the desired 50%, extra seed can be introduced by over- or slot-seeding. If the ryegrass percentage falls to 30% or less, a complete re-seed after ploughing will be the best option, if allowed. Poached areas in gateways and around feed troughs should be re-seeded annually to prevent ingress of weeds.



## Hills and uplands

Livestock producers relying on grass in hill and upland areas face different and more difficult challenges to those farming in the lowlands.

Air temperature drops 1°C in every 100m rise above sea level, which impacts directly on grass growth, in particular the length of the growing season. North-facing pastures take longer to get going in spring than fields looking south.

Annual rainfall is much higher and soil depth and quality significantly poorer at higher altitudes. The soils tend to be acidic and lacking in nutrients as these are leached away with the rain.

### Appropriate grasses

In these areas, total yield may not be the principal requirement from a grass crop. Winter hardiness and the ability to grow at low temperatures may be key. New varieties of late heading perennial ryegrasses, which produce early spring growth and good ground cover are worth considering.

Other grass species such as fescues and timothy have greater roles to play in upland swards. In trials, red fescue and timothy swards gave

70% and 30% more lamb output/ha in spring respectively, than ryegrass on wet peaty soils.

### Re-seeding

The introduction of new seeds is limited to late spring (April or May) or late summer (July or August), when there is adequate soil temperature and moisture. Leaving re-seeding later than early August is inadvisable as the risk of frost damage to tender, young plants – particularly clover – increases greatly.

White clover will fix nitrogen in upland swards as it does in the lowlands, but here lime and phosphate deficiencies often limit its growth and activity. Investing in lime and phosphate will reap dividends. Research is developing clovers capable of good performance under low phosphate levels.





## Fertiliser applications

A spring application of nitrogen fertiliser will kick-start spring growth. Timing should be governed by soil temperature, assuming that ground conditions are good enough to travel. Measuring soil temperature using a soil thermometer is the most accurate way of deciding when to go.

As a guide, soil at 10cm deep should reach 5°C for at least five days. Records over 30 years in mid Wales showed April 9 to be the average date that this occurs, but the range was from 7 March to 4 May.

## Invest in soil inputs

Sheep research at Bronydd Mawr in an Less Favoured Area in mid Wales over the past 20 years, demonstrates the importance of investing in soils and nutrients for best returns (see photo on page 18).

	Nutrients applied	Scenario	Stocking rate sustained
Treatment 1	Lime, Nitrogen, Phosphate, Potash	Standard practice	30 ewes/ha
Treatment 2	Lime, Phosphate, Potash	No N	25 ewes/ha
Treatment 3	Lime	No N, P, K	15 ewes/ha
Treatment 4	Nil	No nutrient input	7 ewes/ha

NB: Plots grazed by yearling ewes and single lambs April to August – then ewes alone to November. No silage was made off these plots.

## Results

- ➔ Increased perennial ryegrass and clover in Treatment 2
- ➔ Much shorter grazing season in Treatment 4
- ➔ Replacement ewe lambs from Treatment 4 were 6kg lighter than those from Treatment 1 and 2
- ➔ Treatments 1 and 2 were commercially viable

## Which system pays?

Upland and hill farmers have the option of producing finished animals or stores.

Recently more producers in these areas have taken lambs through to slaughter. However, careful consideration is needed to work out whether the store market may generate better returns, as inputs costs will be much lower.

Agri-environment schemes can potentially supply an alternative revenue stream. Different land classifications such as SSSI and semi-natural rough grazing have grazing restrictions. However, during their growing season, they can provide respectable animal performance with no input costs.

# Other BRP publications available

## Joint Beef and Sheep BRP

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

See the AHDB Beef & Lamb website [beefandlamb.ahdb.org.uk](http://beefandlamb.ahdb.org.uk) for the full list of Better Returns Programme publications for beef and sheep producers.

## For more information contact: Better Returns Programme

AHDB Beef & Lamb  
Stoneleigh Park  
Kenilworth  
Warwickshire  
CV8 2TL

Tel: 024 7647 8834  
Email: [brp@ahdb.org.uk](mailto:brp@ahdb.org.uk)  
[beefandlamb.ahdb.org.uk](http://beefandlamb.ahdb.org.uk)

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