Foreword

From its inception in 1959, the Ulster Grassland Society (UGS) has been dedicated to those with a keen interest in all aspects of the production, management and utilisation of grass.

As part of the Golden Jubilee celebrations the UGS Executive Committee commissioned this technical booklet on 'Grazing Management' – a topic vitally important to ruminant livestock production in Northern Ireland.

Over the next few decades on a global scale we will undoubtedly face many new challenges - not least the feeding of a rapidly growing world population and having to deal with the threats of a changing climate.

As future generations seek to solve these global challenges it will be vital that innovators within our agri-food industry continue to adopt technically efficient agricultural production systems involving grass.

In this part of the world grass has been and is likely to remain the cheapest feed available to the ruminant livestock farmer. In order to more fully utilise grass, farmers must continually strive to hone their grassland management skills and adopt new grazing technologies and systems.

Within this booklet the authors have combined 'tried and tested' grazing practices with the latest grazing management concepts such as the mechanics of grazing, tissue turnover, block-buffer and golf-ball grazing systems, eyeballing grass, building grass wedges and grass budgeting to increase the utilisation of grazed grass.

I trust that you will find this booklet of practical use in further developing your grassland management skills within your farming system.

I would like to acknowledge the team of scientists from the Agri-Food and Biosciences Institute (AFBI) and technologists from the College of Agriculture, Food and Rural Enterprise (CAFRE) who have prepared this practical booklet. I know it will be an invaluable tool for those who wish to derive even more benefit from grass.

Roy McClenaghan
President

1 The grazing process

Introduction

When an animal is grazing it is not just removing (harvesting) grass, but it is also returning nutrients, potentially causing treading/poaching damage and may change the way the sward grows, especially if the grazing height is low. So grazing can either benefit or harm grass growth depending on which of these factors has most influence.

Grazing and grass growth

While it is true that ‘grass grows grass’ it can only be achieved within limits. If grass is grazed hard for long periods, its growth will be less than when it has been left to regrow uninterrupted.

However, if left to grow for too long, the oldest grass will begin to die and new growth is only replacing the lost dead grass. In rotational grazing systems, the length of the rotation can be controlled allowing grass the right length of time to reach the optimum growth rate.

A perennial ryegrass tiller usually has one expanding leaf; one just completed expansion, one at maturity and one dying. This means that if the regrowth period is equivalent to 3.5 leaf appearance intervals or more, oldest leaves produced since the previous grazing will die (Figure 1).

During summer, a perennial ryegrass tiller, which is not flowering, produces a new leaf every 7-9 days. So to avoid leaves dying in a sward, grazing interval should be at 2.5 to 3.5-leaf appearance intervals, equivalent to 20 to 30 days, depending on management targets for the sward.

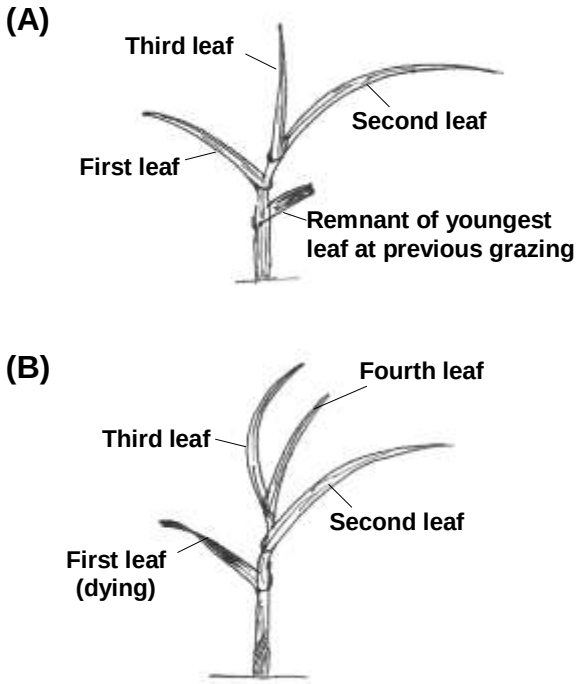

Figure 1. Diagrams of perennial ryegrass tiller in regrowth
(A) 2 fully expanded leaves and an expanding (third) leaf produced since previous grazing (2.5 leaf appearance intervals since previous grazing)
(B) Three fully expanded leaves (the oldest dying) and an expanding fourth leaf (3.5 leaf appearance intervals since previous grazing)

In a continuous stocking system, the animal can revisit a grazed area at any time and so interval between grazings cannot be directly controlled. However, balancing stocking rate and growth rate can indirectly control the average time between return visits by animals to a particular area in a field.

If growth rate is high in comparison to the rate grass is removed (low stocking rate), a patch can be ungrazed for up to 30 days or more, whereas if the sward is hard grazed the interval may be as short as 10 days. This short period between grazings results in slow grass growth.

Varieties of perennial ryegrass, the main component of all seeds mixtures sown for grazing, vary in their suitability for grazing. Trials carried out by AFBI for the Recommended List identify the best varieties for grazing swards. Up-to-date information on varieties can be found on the AFBI website at http://afbi.gov.uk/recommendedvarieties/herbage/.

Grazing and tillering

When grass is grazed hard or is continuously stocked tillering is stimulated, producing a thick carpet of small tillers. These tillers produce short thin leaves but as there are so many of them a short dense sward of grass leaves is produced.

So when the animal takes a bite, although it will not be deep the bite will be dense. In contrast, grass grown for a heavy silage crop or in a long grazing rotation can become thin as tillers die and are not replaced.

Tiller numbers can range from about 10,000/m^2 or less in rotationally grazed dairy paddocks to 40,000/m^2 or more in short swards continuously stocked with sheep. The effect of sward height on intake for both sheep and cattle is shown in Figure 2.

Intake in continuous stocking systems

A target in grazing systems is for the animal to make the most of the grass available, including maximising intake. Obviously, if the amount of available grass is less that the quantity that the animals can eat, intake will be less than the maximum. However, even when there is enough available, if it is not easily grazed, intake will be less than the maximum.

This can be seen in continuous stocking. If the sward is short, even if the grass available per animal is greater than it needs, intake will fall short of the maximum as the animal will not be able to eat a full mouthful with each bite and there is a limit to the number of bites it can take in a day.

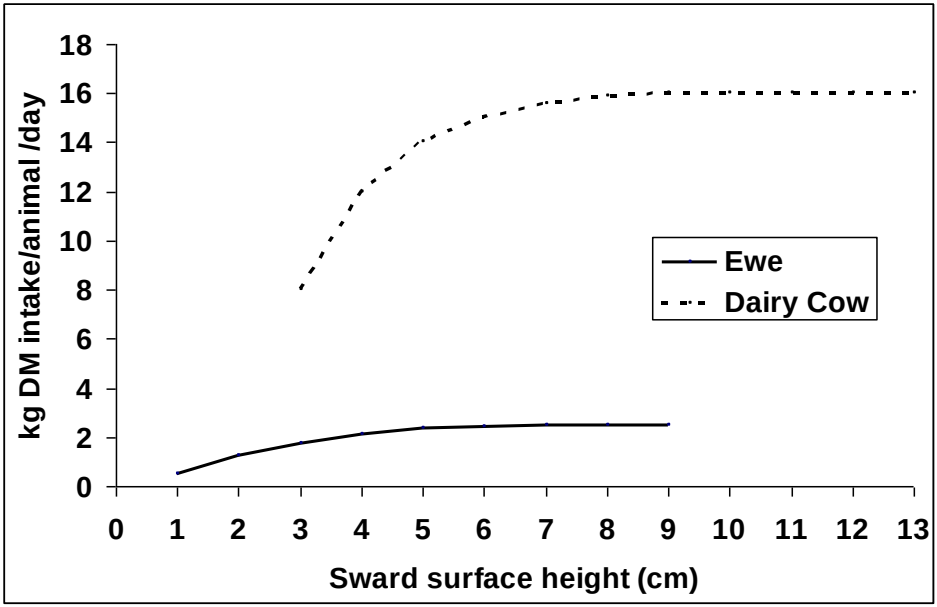

Figure 2. Daily intake of herbage dry matter by a ewe and dairy cow at a range of sward surface heights

Although the height of the sward when intake is almost maximum is lower for ewes than dairy cows i.e. about 5 cm (1,900 kg/ha) for ewes and 8 cm (2,700 kg/ha) for dairy cows, the pattern is the same for both. The effect of sward height on intake of suckler cows is similar to that of dairy cows.

Mechanics of grazing in rotational systems

Generally, a grazing animal removes a layer of grass at a single bite depth at one time. In rotational grazing, the animal will graze across a patch rather than down through the sward at one grazing unless the next layer in the patch is easier to graze than anywhere else nearby.

However it will return to that patch and graze the next layer during its time in the paddock or strip and then possibly return a third time. The relative depth of bites in successive layers of the canopy becomes shallower and of lower nutritive value but increase in density (Figure 3).

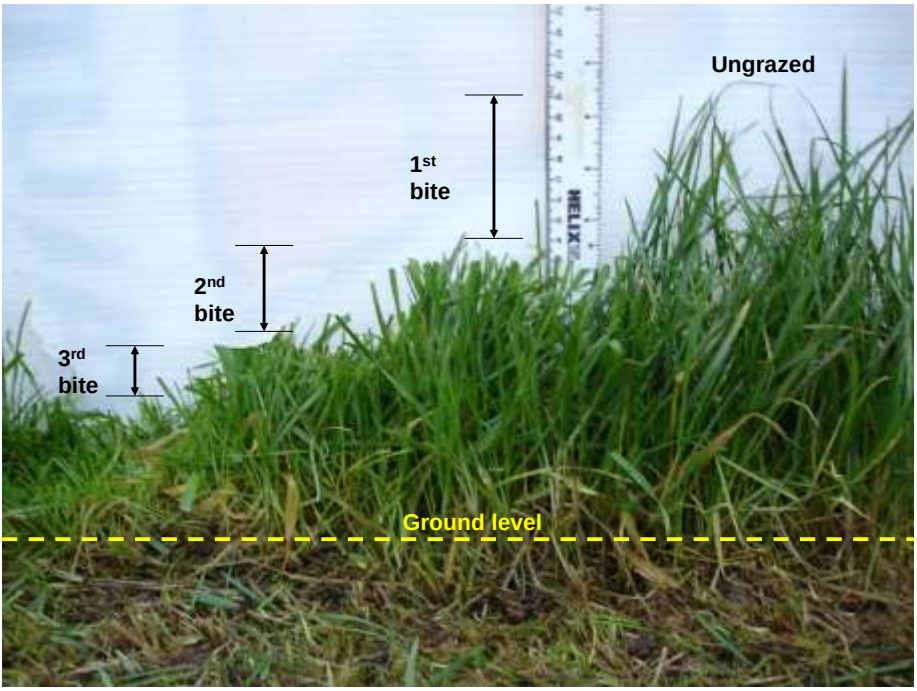

Figure 3. Successive bites by a dairy cow through the canopy of a rotationally grazed sward. Note that the bites become shallower and have a higher content of stem and dead material the further the cow grazes into the sward

Muzzle size will limit how close to ground level an animal will graze. On a patch of level ground, the lowest a dairy cow can graze is about 3 cm whereas a sheep can bite herbage to less than 2 cm.

Some areas may not be grazed if stocking rate is too low or may have been fouled. By the following rotation, the ungrazed grass will be stemmy with a high content of dead matter and be less attractive to the grazing animals than the surrounding grass. Topping becomes necessary for these rejected areas to become grazeable.

While the animal will have a potential intake, sward factors (amount, density of the grass and digestibility) will dictate how close intake will be to its potential.

Animals, even when hungry, do not spend all day grazing. They need time each day to search, chew, ruminate and rest (to idle). So the amount of DM an animal eats in a day is dependent on the size of an average bite and the number of bites taken.

Usually the time spent grazing is divided into periods called ‘meals’. Heavy bites are taken in tall swards as the bites are deeper than in short swards. Going from tight to a very lax grazing the bite weight can be increased by three times, so less bites are needed to achieve maximum intake, but utilisation will suffer.

Nutrient cycling in grazing

Nutrients in dung and urine are cycled during grazing, the amount depending on the content of the diet. The total amount of nutrients eaten will be the total of those in grazed grass (which vary, for example, according to the species in the pasture, the nutrient status of the species, maturity, and time of year) and in concentrates or other forages or supplements fed.

Animals do not use all of the nutrients that they eat and so the amount cycled is also dependent on the proportion not retained by the animal. The percentage of nutrients eaten, which are passed through in the dung and urine range from about 70 to 90% of the N and P and 80 to 90% of the K, depending on the age, physiological state and type of animal.

A grazing dairy cow may eat 18 kg DM/day but if the grass has a digestibility of 80%, 20% of the DM will be excreted i.e. 3.6 kg DM. The excreted DM will include the nitrogen (N), phosphorus (P) and potassium (K) which have not been retained by the animal (Figure 4).

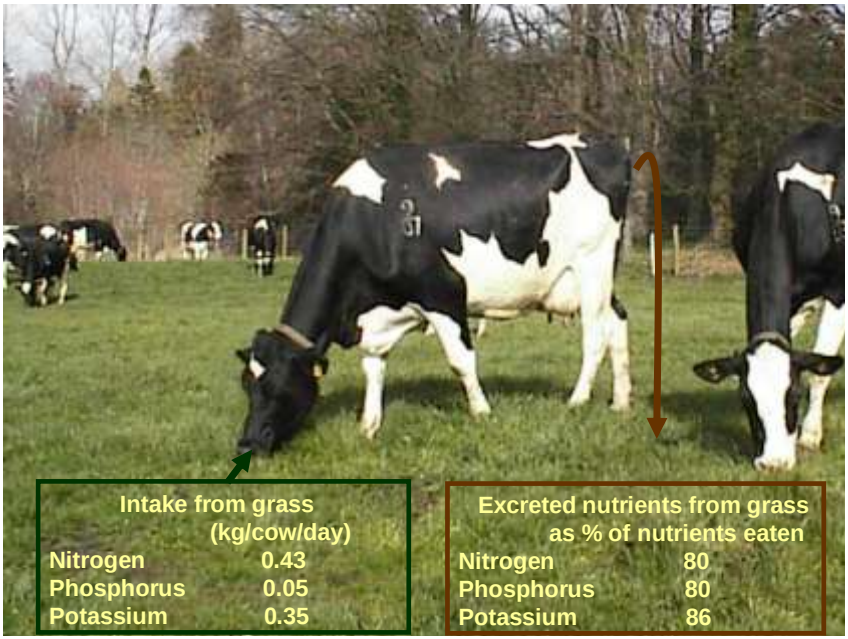

Figure 4. An example of cycling of nutrients in 18 kg DM eaten in grazed grass and excreted each day by a grazing dairy cow receiving no supplements

About two-thirds to three quarters of N and K excreted is in the urine while most (85-90%) of the P excreted is in dung. A patch of urine excreted by a dairy cow can be equivalent to about 1,000 kg N/ha and a sheep 500 kg N/ha.

About 25% of the N in urine and 5% in dung can be lost as gas (nitrous oxide, nitrogen and ammonia), the actual amount depending mainly on temperature and soil moisture. This excess nitrogen can also be lost as nitrate through leaching.

The consequence of cycling is that the ‘same’ nutrient can pass through the animal more than once in a grazing season, mainly due to the low amount which is retained in the animal at each grazing and the ready availability, especially of much of the excreted N and K, to the pasture plants.

Grazing and greenhouse gas emissions

Ruminants, whether grazing or housed, emit greenhouse gases which add to the carbon footprint of beef, lamb and dairy products.

The principal greenhouse gases are carbon dioxide (CO_2), methane and nitrous oxide. In a grazing system, more CO_2 is retained than emitted. Growing grass fixes CO_2 from the air by photosynthesis and this is higher than the CO_2 which is released when animals and plants respire.

The balance is the amount retained in the ungrazed grass, roots and soil as 'sequestered carbon'. The other two important greenhouse gases, which are emitted in any ruminant production system, are methane and nitrous oxide. Although much less of each is emitted than carbon is sequestered, they have much higher impact as greenhouse gases than CO_2.

This is taken into account when the amount emitted is calculated as 'CO_2 equivalents' (Figure 5). Estimates of nitrous oxide emitted and carbon sequestered are highly variable, reflected in the range of each presented.

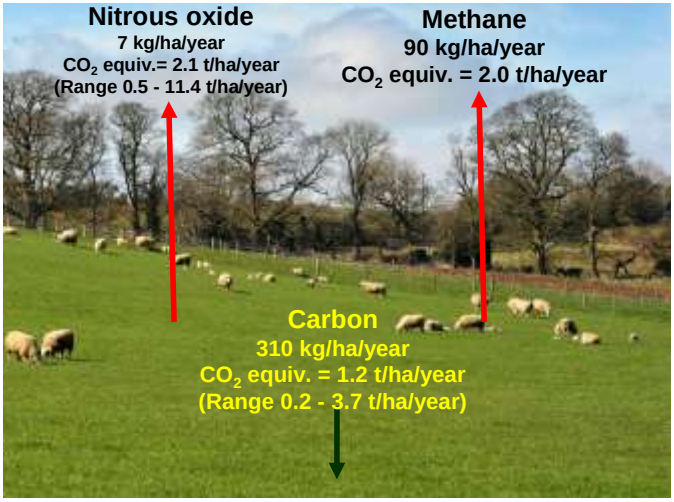

Figure 5. Example of approximate amount of the main greenhouse gases emitted and carbon sequestered (retained) in a continuous stocked sheep system at a stocking density of 7 breeding ewes and 10 growing lambs/ha

Treading and poaching

The pressure on a hoof of a standing ruminant is about 1 to 1.5 kg/cm^2 but increases considerably when the animal is walking.

Although most grassland species are relatively resistant to routine treading some, which grow upright, such as Italian ryegrass or red clover, are prone to treading damage whereas white clover avoids damage by creeping.

Generally when the soil is well drained treading damage is minimal, even at high grazing pressures.

Severe poaching can bury, smear, smother and shear off parts of the grass plant and damage the surface structure of the soil, increasing compaction. However, there can also be a danger in being over-cautious as underutilised grass, due to taking stock off too early or missing a rotation, can have long-term negative consequences on quality of the sward.

Efficiency of grazing

The potential for grazed grass production under lowland Northern Ireland conditions at high rates of N fertiliser (more than 300 kg N/ha/annum) is about 12 t DM/ha. On well-managed dairy farms in Northern Ireland DM utilised at grazing has been estimated to average just over 8 t DM/ha with the highest at 10.5 t DM/ha.

However, the average amount of N applied as fertiliser to grassland in Northern Ireland is about 70 kg N/ha with approximately a further 35 N/ha fertiliser equivalent supplied from organic manures or grazing. So about 7.0 t DM/ha are produced by grazed grass.

Due to poor grazing management on many farms, utilisation is considered to be low at 65 to 75% of grass grown. So only about 5.0 t DM/ha are utilised. The scope to increase output from grazed swards without increasing inputs such as fertiliser is possible by increasing utilisation efficiency, such as by adopting a grazing system, which allows greater control over the use of available grass.

2 Forage and grazing diet costs

Grazed grass and grass silage have been the mainstay of Northern Ireland ruminant livestock feeding systems for many years.

Advances in plant breeding have encouraged a significant number of farmers to also make use of alternative forages in recent years. This chapter highlights the costs and financial returns associated with grazed grass and a range of forages grown and utilised under Northern Ireland conditions.

Utilisable dry matter (DM) yield

There are many ways of comparing the costs of forages. However, the most accurate of these is on a cost per tonne of utilisable dry matter (DM).

Utilisable DM not only takes into account the yield but also field, storage and feeding losses. In essence, it is the yield of forage DM consumed by the animal rather than the total yield produced. The average and range of utilised yield quoted in Table 1 are commercially achievable yields based on physical measurement data from AFBI research studies carried out in Northern Ireland.

Utilised yield per hectare is critical to minimise forage costs

Costs are presented both as a full economic cost in order to allow farmers to make direct comparisons against purchased concentrate feeds, and as a cash cost to assess the impact of management changes in situations where the full infrastructure already exists on farm.

The cash cost does not include a charge for land, depreciation of infrastructure and buildings or feeding out costs.

Costs of forage on farm will vary considerably according to the actual utilised yield. Average farm grass yields calculated through utilised metabolisable energy from CAFRE Benchmarking data suggest that grass dry matter yield across both cutting and grazing systems average 6-7 tonnes of dry matter per hectare on dairy farms.

Table 1. Cash and full economic costs of feeds on Northern Ireland dairy farms

Feed	Utilisable DM yield* (tonnes/ha)	Cash cost (£/tonne DM)	Full economic cost (£/tonne DM)
Grazed grass	8.0 (5-10)	41	77
3-cut silage	11.5 (8-13)	74	120
Fermented whole-crop wheat	11.5 (8-13)	72	122
Forage maize (grown under plastic)	13.7 (7-15)	77	121
Purchased 18% CP dairy concentrate	-	232	236

***** Figures in brackets represent the typical range in forage yields

Assumptions

Straight fertilizer nitrogen has been costed at 63 pence/kg. Silage harvesting costs have been included at £150/ha, maize and whole crop harvesting at £175/ha, land charge taken at £250 per ha per year, concentrates costed at £200/tonne fresh.

Grazed grass

Grazed grass in comparison to other feeds remains the cheapest source of feed available. Difficult grazing conditions in conjunction with increases in both herd size and milk yield have resulted in a reduced dependence on grazed grass in some dairy herds.

Grazed grass remains the cheapest feed on livestock farms

Grass silage

AFBI and CAFRE have costed individual cuts for a 3-cut system. Costs range from £57 to £96/t DM. The lower yields achieved from the third cut of silage result in a significantly increased cost per tonne of utilised DM.

At individual farm level the most economical method of harvesting must be decided between precision chop, forage wagon and big bale systems, depending on expected yield and haulage distances.

Alternative forages

Alternative forages (forage maize and whole-crop wheat) can have a similar cash and full economic cost to grass silage. However, it must be noted that soil and weather conditions in Northern Ireland may not always be ideal for growing these crops.

As a result, DM yield and forage quality may be less consistent than that of grass silage. The yield of forage maize has been found by CAFRE to vary considerably across farms from 7 to 15 t DM/ha. As a result, the cash cost of growing forage maize will vary from £150 to £70 per tonne of dry matter.

Forage maize is an excellent forage feed but can be expensive to grow if poor yields are achieved

Whole-crop wheat and forage maize also typically have lower crude protein (CP) content than grass silage. This may result in added costs to balance the diet if concentrate protein costs are high. Alternative forages are therefore unlikely to replace grass silage as the main forage in the winter diet on the vast majority of Northern Ireland farms.

Concentrates

Concentrates give the greatest flexibility for manipulation of the dairy cow diet and although more expensive than forages, allow the diet to be balanced in respect of energy and protein.

Summer diet costs for dairy and suckler cows

The implications of the forage costs presented in Table 1 for managing dairy cows during the summer grazing season are shown in Tables 2 and 3 below. Many dairy farmers have taken the decision in recent years, for a variety of reasons, to house all their dairy cows at night and feed a total mixed ration.

Table 2. Costs of diets for 40 litre cows

	Grass (kg DM)	Silage (kg DM)	Meal (kg FW)	Diet cost (£/day)	Extra cost (£/day)
Full-time grazing	15		10	3.27	**-**
Day-time grazing	8	5	12	3.80	**0.53**
Housed silage diet		11	15	4.37	**1.10**

The diet costs presented in Table C indicate that buffer feeding 20 litre cows on a 40 litre diet costs an extra £1.53 per cow per day compared to a grazed grass diet. Over a 3-month feeding period, this practice will cost an extra £10,000 per 100 cows compared to grazing.

Table 3. Costs of diets for 20 litre cows

	Grass (kg DM)	Silage (kg DM)	Meal (kg FW)	Diet cost (£/day)	Extra cost (£/day)
Full-time grazing	16			1.02	**-**
Day-time grazing	7	3	6	2.14	**1.12**
Housed silage diet		9	8	2.55	**1.53**

As shown in Table 4, it costs twice as much to feed a housed cow suckling a calf as it does a dry cow. The lower cost option is to manage a spring calving suckler herd where the cows' milk production is sustained by grazed grass.

Assuming 6-month grazing and 6-month housing periods the average daily feed costs of maintaining a spring compared with an autumn calving suckler cow are £0.91 or £1.30/day, respectively.

Therefore an autumn calving suckler cow must wean a calf worth an additional £142 just to cover the extra feed costs

Table 4. Costs of diets for suckler cows.

Feeding option	Cow	Grass (kg DM)	Silage (kg DM)	Meal (kg FW)	Diet cost (£/day)	Extra cost (£/day)
Winter housed-silage diet	**Weaned spring calving**		6.6		0.79	
	Suckling autumn calving		10.1	2.3	1.58	**0.79**
Summer grazing	**Suckling or weaned**	12.4			1.03	

Forage utilisation and farm profit

The CAFRE Benchmarking database has been analysed to examine the relationship between measures of farm profitability and forage use. On dairy farms, the most commonly used measure of forage utilisation is milk from forage per cow.

The relationship is displayed in Figure 6 below. Each 1,000 litres of MFF /cow is worth an additional profit of £100/cow.

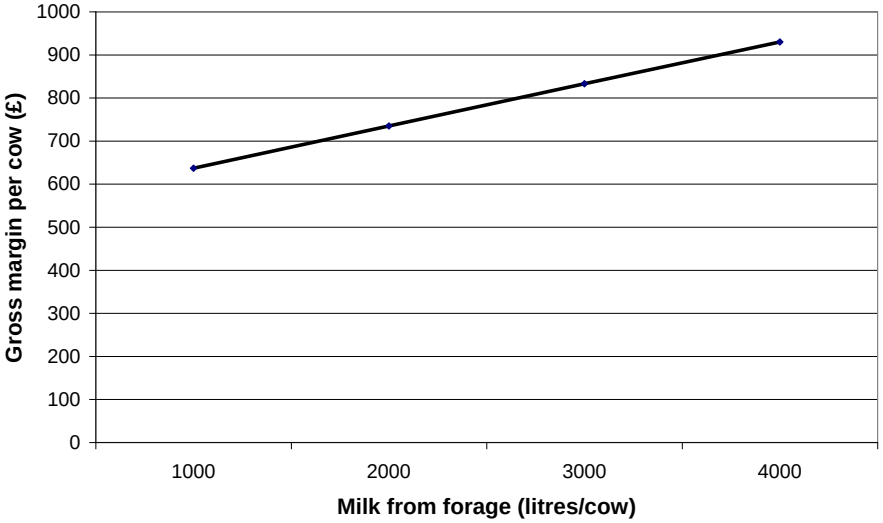

Figure 6. Milk from forage and profit per cow (source: CAFRE Benchmarking)

On beef farms, the relationship between forage utilisation and gross margin per cow in suckler to beef systems is shown in Figure 7. Each 100 kg of beef from forage is worth an extra £100 gross margin per cow as shown in Figure 7.

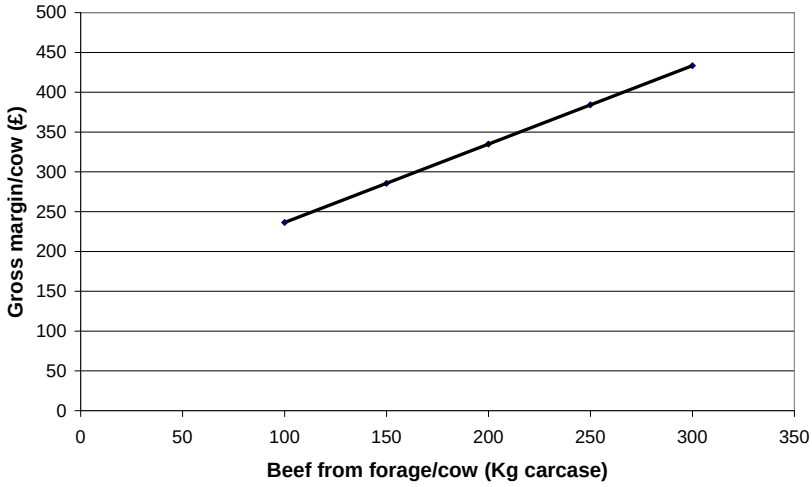

Figure 7. Beef produced from forage and gross margin per cow (source: CAFRE Benchmarking)

An extra 10 kg of lamb produced from forage per ewe is worth £15 gross margin per ewe as indicated in Figure 8.

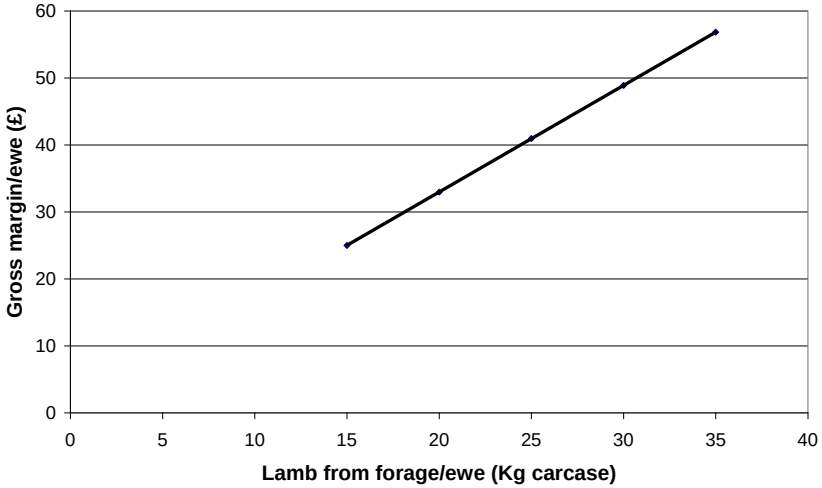

Figure 8. Lamb produced from forage and gross margin per ewe (source: CAFRE Benchmarking)

Summary

- Grazed grass remains the cheapest feed on Northern Ireland farms
- For all forages dry matter yield drives the cost per tonne of forage
- Irrespective of fertiliser price, it is important to make optimum use of nitrogen to ensure good yields of high quality forage to minimise reliance on purchased concentrates
- Irrespective of their cost, concentrates will continue to have a role in ensuring diets are balanced in terms of energy and protein

3 Grass budgeting

Grass growth and animal requirement vary throughout the growing season causing fluctuations in supply and demand for grazing stock. This makes it essential to regularly assess how much grass is available for grazing stock and prepare grass budgets through the season.

Budgeting combines current grass covers with projected grass growth rates. It is a planning tool identifying periods of potential grass surpluses or shortages for a group or groups of grazing livestock. This matching of supply to demand helps ensure a high utilization of quality grass from grazing swards.

Grass growth rate

The universally accepted measurement of grass quantity is kilograms of dry matter per ha (kg DM/ha). Dry matter is the total yield of grass minus the water content. Daily grass growth rates vary from 5-15 kg DM/ha in February/March to 60-100 kg DM/ha in May/June.

Sunlight, temperature and rainfall all affect grass growth. Other factors that affect grass growth, over which the farmer has control, are fertiliser application rates, length of grazing rotation and poaching damage.

Assessing the amount of grass available – grass cover

Grass cover is the average quantity of grass in kg DM/ha to ground level and includes the grass available for grazing and that which will be left after grazing. In this booklet grass covers are presented to ground level, and should not be confused with grass cover in the Republic of Ireland, which refers to grass available over 4 cm in height.

A number of methods have been developed to assess grass cover.

I.) Sward assessment using a rising plate meter

A rising plate meter can be used to measure grass covers until sufficient experience is gained by visual assessment. It relates pasture height and density to yield through a carefully calibrated equation.

The rising plate meter consists of a thin aluminium plate connected to a shaft by a gear linked to a read out of grass height. A mechanical counter records the number of readings from an area.
As the rod is lowered into the pasture, the plate is supported at a height determined by the sward's density and height. A procedure for using the rising plate meter and calculating average farm cover is outlined at the end of this chapter.

Target grass covers are set pre- and post-grazing for various times during the grazing calendar and for different types of stock. Refer to the various livestock sections for more information.

Assessing grass covers in the field using the rising plate meter

II.) Visual assessment by walking the pastures

Assessing the sward height alone is not a true reflection of grass yield. When visually assessing swards or 'eyeballing' as it is often called, sward height and density must be considered. Dense swards, for example a ryegrass/clover sward grazed regularly by sheep, will contain a greater amount of grass than an erect open sward grazed by cattle at the same height.

Estimating grass cover in a field can be difficult when swards are grazed unevenly as a result of poaching, spoilage and/or contamination with urine or dung. However with experience an overall average can be assigned to the field.

Examples of grass covers are presented in the photographs below. The wellie boot has been used by farmers as a rough guide to assessing grass covers.

1300 kg DM/ha

3000 kg DM/ha

4000 kg DM/ha

Calculating grass supply

Grass supply or available grass cover is the amount of grass various groups of stock are offered.

To calculate how much grass is on offer and available to the stock the estimated quantity of grass left after grazing (post-grazing) must be subtracted from the total measured amount of grass in the field before grazing (pre-grazing). This is explained in the following calculation

grass supply or “available grass cover”
= (pre-grazing cover – post-grazing cover) x grazing area (ha)

Typical pre-grazing and post-grazing covers for different classes of livestock in the springtime are highlighted in Table 5. In order to maintain high grass quality it is important to ensure stock enter and leave the grazing areas at the target grass covers.

Table 5. Pre-grazing and post-grazing grass covers for different classes of livestock (Springtime)

Class of Livestock	*Pre-grazing kg DM/ha*	*Post-grazing kg DM/ha*	*Available grass kg DM/ha*
Dairy	3300	1600	1700
Beef	3000	1600	1400
Sheep	2100	1600	500

Stock demand for grass

The individual animal grass demand (kg DM/day) is estimated to be equivalent to 2.5% of the animal's liveweight in the case of beef cattle.

Individual animal demand can vary from 1.75% to 3.25% of bodyweight, depending on stage of growth. However, 2.5% has been found to be an acceptable average figure for calculation purposes.

For example, a 300 kg steer will have a daily grass demand of:

300 x 0.025 = 7.5 kg DM/day

In the case of March lambing ewes suckling 1.5 lambs, intake is estimated at 3.5% of bodyweight.

A ewe weighing 70 kg will have a daily grass demand of

70 x 0.035 = 2.45 kg DM/day

The daily grass demand of a dairy cow will depend on size, milk yield and concentrate feed level.

The data in Table 7, Chapter 4 provides a guide to the grass demands of a 650 kg dairy cow.

The group demand per day is calculated by multiplying the number of animals in the group by the individual animal demand. It is this information that allows the length of the grazing period in a particular paddock or area to be calculated.

GrassCheck

The DARD and AgriSearch funded **GrassCheck** programme monitors the growth of grass swards on a range of sites throughout Northern Ireland.

In addition to this work a model has been developed that allows the prediction of grass growth for the next two weeks based on time of year, previous week's growth and forecasted weather conditions.

This information is presented in weekly bulletins in the local farming press and on the AFBI and Ruralni websites. These predictions can be used to manage grassland swards through the season and help to prepare in advance for any surplus or deficits.

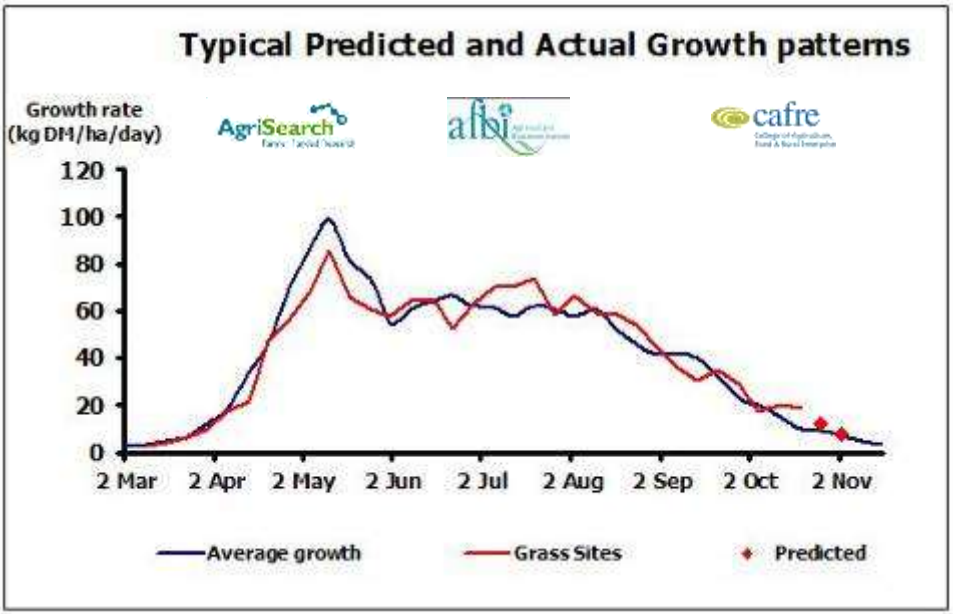

Figure 9. Graph showing actual and predicted grass growth as produced by GrassCheck

Budgeting grass to meet demand

Information on grass growth, grass cover (supply) and stock grass intake (demand) may then be used to prepare a grass budget. A grass budget is simply a statement of grass supply and grass demand for the grazing stock.

Grass growth predictions such as those from **GrassCheck** can also be incorporated to allow you to forward budget grass supply. These variations in grass growth during the year require seasonal adjustment in stocking rates to ensure efficient grassland utilization.

Grass budgeting is particularly useful over a 2-3 month period in spring and autumn when grass growth rates are increasing or declining quite rapidly, or at any period when stock demand is changing significantly.

Developing a grass wedge through rotationally grazing around a number of paddocks or fields is a useful grassland management system. The grass wedge illustrates the quantity of grass available across the grazing platform. Areas are rested between grazings, allowing grass time to regrow.

Those grazing areas with the longest rest periods can be assessed weekly to identify when in the rotation grass surpluses or deficits are likely to occur. A line drawn from the target pre-grazing cover to the target post-grazing cover gives a guide to surpluses and deficits.

Establishing a grass wedge by mid-April through turnout from early March onwards will provide a breakdown of the grass available in each paddock on the farm. To build the wedge the fields due to be grazed first in the spring should be the first to be closed off in the autumn.

The 3 grass wedge charts (Figures 10 – 12) illustrate various scenarios on farm and outline the action that could be taken to correct the problem.

In the three scenarios paddock 1 is the first field to be grazed in the rotation at a pre-grazing target cover of 3,000 kg DM/ha and paddock 20 is the last field in the rotation with a post-grazing cover of 1,600 kg DM/ha.

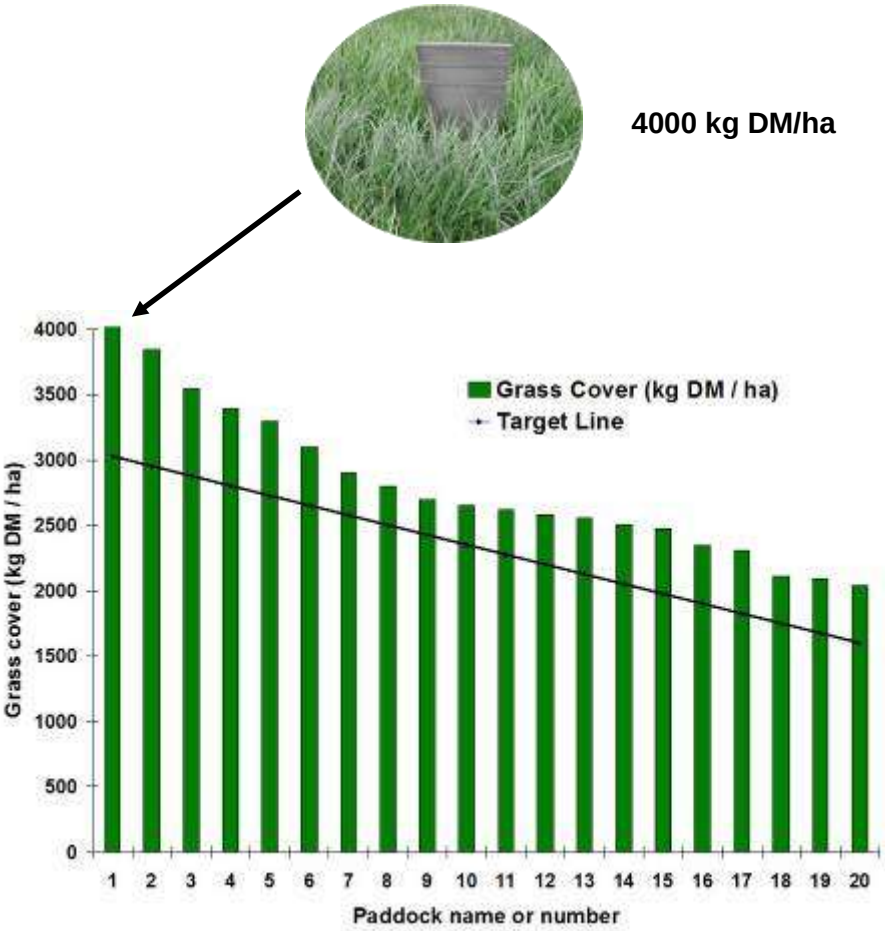

Figure 10. A grass wedge illustrating a surplus of grass across the grazing platform

In this scenario pre-grazing covers are too high and well above target as are post-grazing covers. Action is required immediately. In most instances grass surplus to grazing requirements should be conserved for silage, possibly as round bales.

Other stock such as replacement heifers could be introduced into the rotation to reduce covers. Higher covers are more difficult to graze off cleanly and will have a detrimental effect on spring grass growth due to the presence of dead material at the base of the sward.

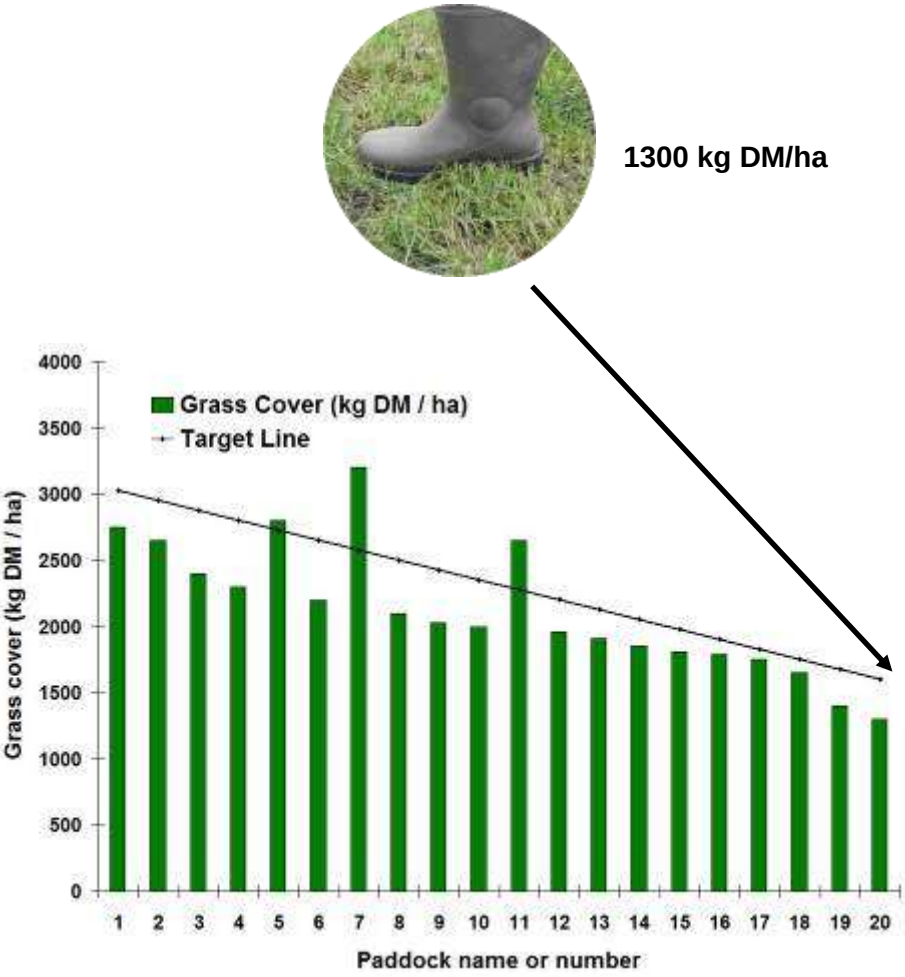

Figure 11. A grass wedge illustrating a deficit of grass across the grazing platform

In this scenario there is a serious deficit of grass on the farm.

Supplementation with concentrate or silage (possibly from round bales made during a grass surplus) will ensure dietary requirements are met. The grazing area could be increased by bringing in silage aftermath or by removing some stock from the grazing platform.

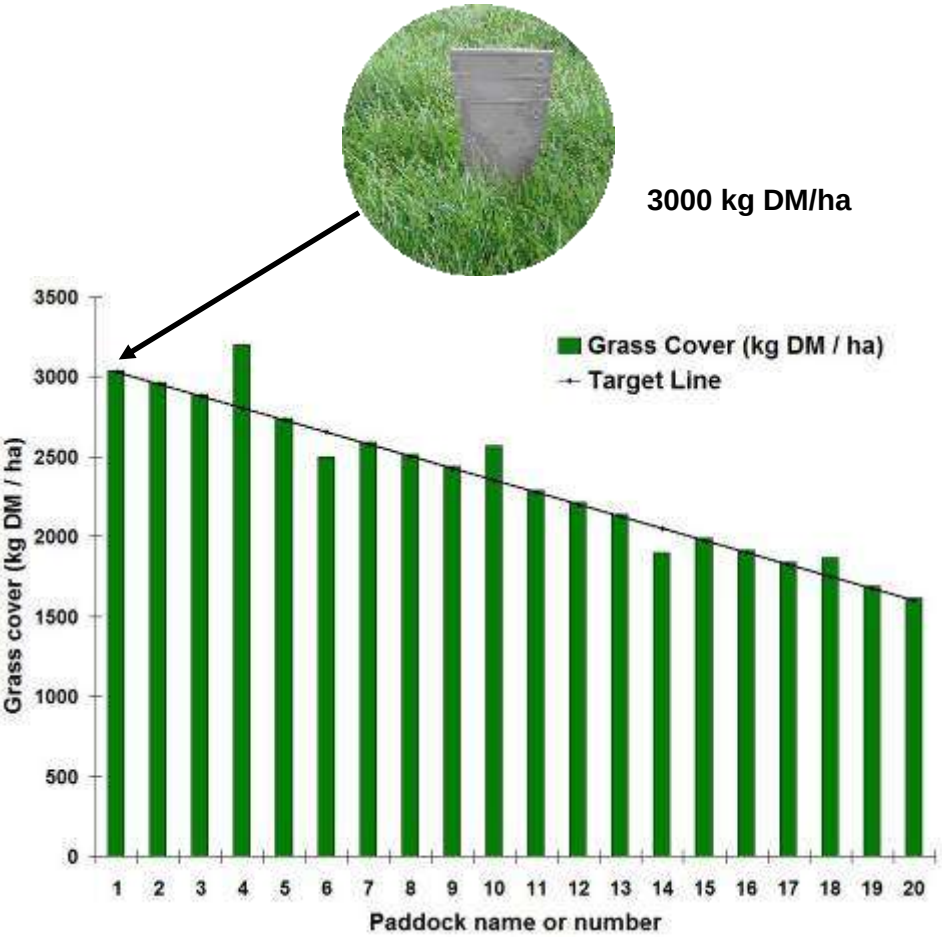

Figure 12. An ideal wedge illustrating no surplus or deficit of grass across the grazing platform

In this scenario there is no surplus or deficit of grass and no action is required.

However it is important to continue to monitor grass covers regularly as changes can occur quickly due to rainfall or temperature fluctuations.

Projecting the grass wedge using GrassCheck

A decision support tool is currently being developed combining information from the estimated grass wedge on the farm and predicted growth rates from **GrassCheck.** The aim is to assist farmers with the projection of future surplus or deficits of grass within the grazing rotation, and help in the decision making process.

This decision making tool will be available at www.ruralni.gov.uk. A practical on farm approach to this process is the concept of 'grazing days ahead'.

Farmers who are experienced in grass budgeting can predict the grazing days ahead for a group of livestock by examining the grass wedge produced on their farm, determining the daily feed demand and incorporating growth information from **GrassCheck**.

Decisions can be made on whether to remove surplus grass from the grazing area based on the number of grazing days ahead of stock. For example during May, 10-12 days ahead is adequate, over 14 days will require remedial action to avoid a surplus.

Less than 10 days indicates an emerging scarcity, which requires one or more of the following options: slowing down the rotation; introducing supplementary feed; grazing some of the silage ground or reducing the stocking rate. As growth rates decline into the autumn time the target grazing days ahead of livestock should increase (25-30 days) to ensure sufficient grass is available.

Pre-grazing covers should also increase into the autumn to allow for a reduction in the quality of grass and the time spent grazing. If this is not possible then some concentrate supplementation may be necessary to maintain livestock performance.

Table 6. Pre-grazing and post-grazing covers for different classes of livestock (Autumn)

Class of Livestock	*Pre-grazing kg DM/ha*	*Post-grazing kg DM/ha*	*Available grass kg DM/ha*
Dairy	3500	1600	1900
Beef	3500	1600	1900
Grazing lambs	2200	1700	500

Flexibility is key to any good grassland management plan, as changes are made throughout the grazing season to cater for periods of grass surplus and shortage.

This is made easier if the grazing area can integrate with the silage making area, which will provide grazing in both the early part of the season and in the back end when grass growth is slow.

Silage fields that are to be grazed early in the springtime should be closed off after being eaten down to approximately 1600 kg DM/ha.

Fields allocated for silage should not be grazed after the first week in April to avoid making stemmy silage.

How to use a rising plate meter

1. Set the top counter of the rising plate meter to 0 and record the opening reading (A) on the rising plate meter before you start

2. Walk through the sward in a 'W' pattern, taking up to 40 measurements at equal distances apart (for example, every five steps), to ensure a uniform distribution of the sward is measured.

   While walking through the sward make sure to record the number of readings taken by clicking the top counter. Sampling is done at random across the grazing area, so dung pats are eligible for measuring, and the only areas to avoid are poached and rutted areas. On slopes keep the plate meter vertical.

3. After walking through the sward, record the number of readings taken and the closing reading (B) on the rising plate meter.

4. Use the equation below to calculate grass cover (kg DM/ha).

$$\frac{\text{Closing reading (B)} - \text{Opening reading (A)}}{\text{Number of readings (C)}} \times 158 + 330 \text{ kg DM/ha}$$

5. To calculate the quantity of grass present in the whole paddock multiply the DM yield of each paddock by the area of the paddock in ha.

6. This should be repeated for all the paddocks that are intended for grazing. Do not measure paddocks that are likely to be cut as silage or grazed by other stock.

7. By adding all the individual paddocks that are to be grazed together, and dividing by the overall total area in ha, the average farm cover present within the grazing area can be calculated.

4 Milk production from grazed grass

The benefits of grazed grass from an economic, environmental and consumer perspective have been highlighted in previous chapters.

However, utilising grazed grass is a growing challenge on many dairy farms in Northern Ireland.

Increasing herd sizes, limited grazing platforms close to milking parlours, increasing cow genetic merit for milk production and wet summers make grazing increasingly problematic.

However, many of these challenges can be overcome through good management practices.

This chapter highlights the objectives of grazing dairy cows and the key management practices for successful grass utilisation with dairy cows including:

- Early turnout management
- Choosing appropriate grazing systems
- Infrastructure development
- Grass budgeting
- Matching genetics to the farming system
- Supplementing the grazing dairy cow diet

The aims of grazing dairy cows

There are three main aims when grazing dairy cows:

- Optimise grass intake
- Graze low enough to encourage a leafy re-growth for the next grazing
- Minimise wastage of un-grazed grass

The grass cover offered to the dairy cow is critical to achieving these objectives. Offering very low covers (<2,500 kg DM/ha) will limit bite size and intake, particularly with high yielding dairy cows. Offering very high covers (>3,500 kg DM/ha) will limit intake and increase grass wastage.

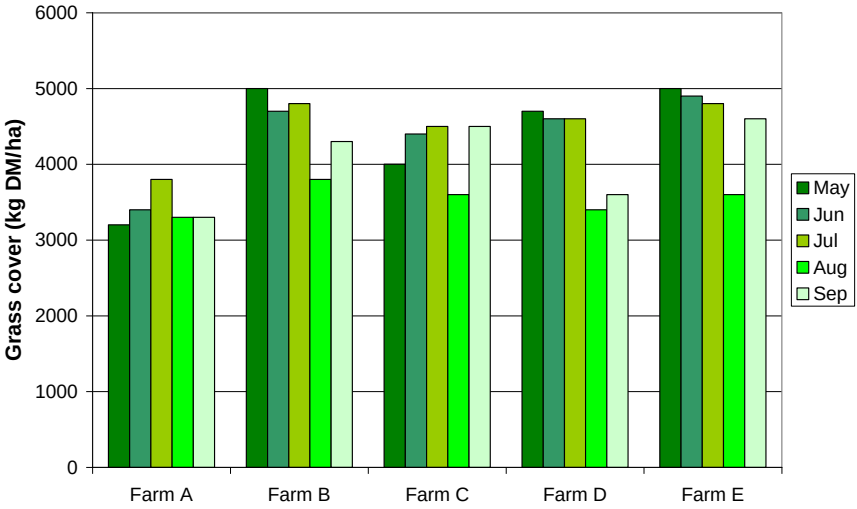

Figure 13. Pre-grazing grass covers on five Northern Ireland farms

Recent work carried out by AFBI and CAFRE on Northern Ireland farms has shown that pre-grazing sward heights are too high on many dairy farms (Figure 13) across the grazing season.

The grazing behaviour of cows was described in Chapter 1. Research has shown that cows are less inclined to take a third bite into the base of a high cover sward due to increasing stem content at the base of the sward. To achieve high grass intakes with high yielding dairy cows, the optimal pre-grazing grass cover is between 3,000 and 3,300 kg DM/ha.

Early turnout management

The aim of early turnout management is to establish a “wedge” (Figure 14) of high quality grass across the farm before peak grass growth in late April/early May.

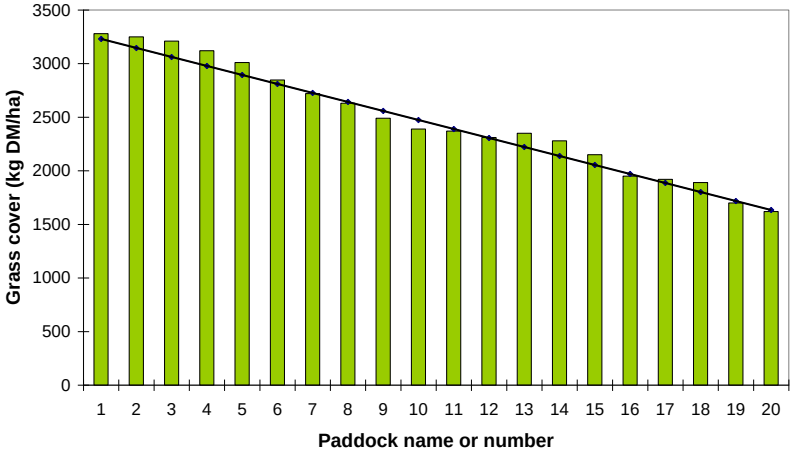

Figure 14. Grass wedge from a farm with cows turned out in March.

This means that the grazing area will have grass covers ranging from 1,600 kg DM/ha on paddocks grazed in the last few days to grass covers of over 3,000 kg DM/ha on the next paddocks due to be grazed (the first paddocks grazed after turnout).

Completing the first grazing rotation by the third week of April and establishing a grass wedge is a critical requirement to ensure that grass covers do not get too high during the rapid grass growth period in late April and early May.

Where cows are not turned out until late April on Northern Ireland dairy farms, grass covers build up, resulting in cows grazing excessively high covers in early to mid-May. This leads to reduced grass intakes, wasted grass and reduced sward quality for the next grazing rotation.

Back-fencing helps to minimise sward damage in difficult grazing conditions

Turnout tips:

- Start grazing all milking cows or a proportion of a large herd (>100 cows) from early March onwards
- Graze cows initially for 2-3 hours/day
- Turn cows out with an edge to their appetite if grazing conditions are marginal
- Use multiple paddock entry / exit points and back-fencing to minimise sward damage in difficult grazing conditions
- Increase grazing time and cow numbers grazing as ground conditions permit to complete the first grazing cycle by the third week of April

Choosing appropriate grazing systems

The choice of the most appropriate grazing system on a dairy farm should take account of the farm layout, land quality, rainfall and the management skills of the farmer. The choice of grazing system ranges from continuous to rotational grazing, paddocks or strip grazing.

On the majority of Northern Ireland dairy farms, the most appropriate grazing management system for dairy cows is a paddock-based approach. Paddocks may be sized for daily grazing, or to provide grazing for three or four grazing periods between milkings.
Good paddock grazing systems require investments in fencing, roadways and drinking troughs.

The benefits of a paddock system include:

- Relatively simple management
- The discipline imposed
- Reduced labour requirements
- Less sward damage in wet conditions

It is important that the size of the grazing paddock is appropriate for the herd or group size, the planned number of grazings and supplementary or buffer feeding practices.

Infrastructure development

Difficult wet grazing conditions are frequently encountered at the start, the end and occasionally during the main grazing season.

Investing in farm infrastructure, providing a network of roadways, tracks and multiple entrances to grazing areas will reduce sward and soil structure damage during wet conditions.

Good infrastructure will also reduce the time required to manage grazing.

The benefits of good roadways and tracks include:

- Cows walk faster to and from grazing.
- Cows spoil less grass.
- Cows are cleaner coming into milking.
- Less poaching when grazing under difficult ground conditions.
- Lameness may be reduced.
- Less labour needed to move cows and fences.

Ideal roadways and tracks are:

- Smooth
- Have a fine surface
- Have no protruding stones
- Are the correct width
- Have no sharp bends
- Allow water to run off onto the pasture

Grass Budgeting

The basic principles of grass budgeting are described in Chapter 3. The daily grass demands of a 650 kg dairy cow at a range of milk yields are given in Table 7.

Table 7. Grass demands of a 650 kg dairy cow (kg DM/cow/day)

	Concentrate feed level (kg)					
Milk yield (litres)	***0***	***2***	***4***	***6***	***8***	***10***
20	16	14	12	10	8	6
25	18	16	14	12	10	8
30	n/a	18	16	14	12	10
35	n/a	n/a	18	16	14	12
40	n/a	n/a	n/a	18	16	14

Dairy cow stocking density recommendations and daily grass areas for a range of situations are given in Table 8. These recommendations are based on pre and post-grazing grass covers of 3,300 and 1,600 kg DM/ha, respectively, for the April to June period.

Table 8. Stocking density, daily grazing area, concentrate feed level and milk yield for dairy cows

Herd average milk yield (litres)	Grass intake target (kg DM/day)	Concentrate feed level (kg FW)	Daily grazing area (ha/100 cows)	21-day rotation stocking density (cows/ha)
20	16	0	1.0	5
20	14	2	0.8	6
20	12	4	0.7	7
25	16	2	1.0	5
25	14	4	0.8	6
25	12	6	0.7	7
30	16	4	1.0	5
30	14	6	0.8	6
30	12	8	0.7	7

As grass growth fluctuates during the year, a key management target is to maintain pre-grazing covers at the optimum level. Assessment of grass cover on a weekly basis is crucial. Where grass growth rates are high and lead to pre-grazing covers in excess of 3,300 kg DM/ha, corrective management action needs to be taken immediately.

Once a surplus has been identified, harvest grass as big bale silage as soon as possible.

Examine the grass wedge on the dairy cow grazing area along with the projected grass growth rates from **GrassCheck** as described in Chapter 3. This will help you make decisions on whether to remove surplus grass on paddocks from the grazing rotation.

If the decision is made to remove surplus grass, the grass should be harvested as soon as possible to ensure a quick re-growth and return of the paddock(s) to the grazing rotation three weeks later. This is often a weakness on-farm where the decision to harvest excess grass is delayed, leading to further problems. Acting quickly and decisively is key to maintaining grass quality and milk production.

Where herds are buffer fed, grazed grass intake will be reduced. Therefore adjustments to stocking densities are required to avoid grass wastage. For example, a high yielding herd averaging 35 litres per day is fed a buffer feed of 5 kg silage dry matter (20 kg fresh at 25% DM) and 5 kg of concentrates in a total mixed ration. In addition, an average of 5 kg concentrate is fed per cow in the milking parlour.

This equates to a total feed intake of 14 kg of dry matter before any grass intake. Grass intakes of approximately 8 kg DM per cow per day will be required to balance the herd diet.

The daily grazing area required for 100 cows grazing the same grass covers in Table 8 above is 0.5 ha or a 21-day stocking density of 10 cows per hectare.

Where buffer feeding is practiced, adjustments need to be made to daily grazing areas to allow for the intake of supplementary feed. A decision support tool is available to help with these calculations at www.ruralni.gov.uk.

Zero grazing

Zero grazing involves daily mechanical harvesting and carting fresh grass to the stock in indoor housing. The advantage of this system is the higher efficiency of grass growth and utilisation per ha through less waste and rejection of grass due to dung contamination.

This benefit is usually offset by the capital and running costs of the machinery employed including the labour required to operate the system. The other disadvantage is the cost of applying the extra slurry throughout the grazing season.

However, zero grazing may have a role where herds cannot access sufficient grazing area due either to droving distances or road traffic. It may also have a role under poor ground conditions.

Matching genetics to the farming system

With lower yielding, “grazing bred” cows such as Friesian-Jersey cross-breds, and where ground conditions are suitable, dairy cows can be managed on lower pre- and post-grazing grass covers. Such systems are colloquially referred to as “golf-ball-grazing”.

Maintaining lower pre-grazing (2,500-3,000 kg DM/ha) and post-grazing (1,300-1,500 kg DM/ha) covers will increase the leaf content of the grazed sward and thus the quality of the grass consumed.

However, individual animal intakes may be reduced due to the reduced size of the third bite into the lower horizons of the grass sward described above. “Golf-ball-grazing” systems require a very high standard of

grassland management and are most suited to specific “grazing-bred” cows rather than high yielding cows with a potential to yield over 35 litres.

Cross-bred cows maximising grazed grass utilisation

Supplementing the grazing dairy cow diet

Where grass intake does not meet the requirements of the cow, supplements need to be fed.

Supplementary feeds generally include concentrates and conserved forages such as grass silage, maize silage and wholecrop wheat.

Supplementary feeds are required in situations where:

- Grass intake is insufficient to meet the energy requirements of high yielding dairy cows (>27 litres)
- Poor grazing conditions reduce grass intake
- Grass quality is poor from previous grazing management and weather conditions
- Grass growth rates are low due to drought conditions
- The grazing area available (the grazing platform) is too small for the herd (>7 cows/ha)

Where grass intake does not meet the requirements of the high yielding dairy cow, supplements need to be fed

Supplementing cows at grass with concentrates

Grass alone will not be sufficient to meet the potential milk yields of high yielding cows (>27 litres) under typical grazing conditions.

Under ideal grazing conditions (leafy grass covers of 3,300 kg DM/ha and good ground conditions), grass has the potential to support up to 27 litres of milk per cow per day in May.

This requires a high grass intake of 18 kg DM per cow. Concentrates should be fed to supplement the grass intakes achieved in practice, to meet the energy and protein requirements of the cow.

How much concentrate should be fed?

The level of concentrate feeding required will be determined by the following factors:

a) Target milk yield of the cow
b) Grass intake achieved

The typical ranges of grass intakes and milk yield from grass are outlined in Table 9.

Table 9: Range of daily grass DM intakes and milk yields from grass alone

	Month					
	Apr	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Grass dry matter intakes per cow (kg DM/cow/day)	14 -16	14 - 18	13 - 17	12 - 15	12 -14	12 - 13
Milk yields per cow from grass (litres/cow/day)	17 - 22	17 - 27	15 - 23	13 - 19	13 - 17	13 - 15

Example: A herd has an average daily milk yield of 33 litres/cow/day in June, with an estimated daily grass intake of 17 kg DM/cow.

From Table 9 above, this grass intake is capable of producing 23 litres of milk from grass. The herd will require concentrate feeding for the additional 10 litres of milk production.

At a concentrate-feeding rate of 0.45 kg/litre, the average concentrate feeding level required will be 4.5 kg per cow. If the herd has a spread calving pattern and a wide range of milk yields, concentrates should be fed to yield.

In practice it may be difficult to achieve the above milk from grass targets for one or other of the reasons below:

- The grass allowance may be restricted to achieve post-grazing cover targets.
- Cows may be grazing stemmy grass.
- Grazing weather conditions may be cold and wet.
- A proportion of the herd may be of low genetic merit and / or autumn calving.

Impact of wet weather on grass intake

Recent research carried out in France has shown that the increased surface water content of grass in wet weather does not reduce grass intake. The reductions in grass intake experienced during wet weather are more likely due to reduced time spent grazing by dairy cows.

Recognising situations where grass intake is reduced and adjusting concentrate feeding levels to supplement grass intakes can help to avoid yield fluctuations.

During poor weather with high rainfall and low grass dry matter content, grass intakes will be closer to the bottom of the range given in Table 9. For the example above, if weather and grazing conditions were poor, intakes may be reduced to 13 kg DM/cow/day. This would leave 15 litres of milk produced from grass. The concentrate-feeding rate would have to be increased to 8 kg/cow/day.

The substitution effect and responses to concentrate feeding

As the level of concentrates fed to cows increases, the cows substitute concentrate intake for grass intake. The milk yield response to feeding concentrates depends on the grazing conditions. Responses to concentrate feeding are lowest with lower yielding cows under good grazing conditions with cows offered high quality grass swards. Responses to concentrates are highest with high yielding cows under poor grazing conditions.

Type of concentrate for grazing and milk quality

When cows are turned out to grass in spring, the digestibility of the forage and the proportion of forage in the diet generally increase. This may reduce milk butterfat levels. If the winter concentrate has been formulated to provide a high proportion of starch (>20%), continuing to feed this concentrate while grazing may further reduce milk butterfat. Concentrates fed from turnout should be formulated to provide starch, digestible fibre and protein levels to complement spring grass quality.

Buffer feeding

Many farmers have taken a decision in recent years to house all milking cows at night and feed a total mixed ration. This decision has been taken on many farms for a variety of reasons. These include:

- Maintaining milk output from high yielding cows in the herd
- A lack of confidence in grazed grass for high yielding cows
- Insufficient grazing area (grazing platform) for all cows in the herd
- Difficult grazing conditions
- To balance a diet of highly digestible spring grass

The data presented in Table 3, Chapter 2 showed the costs associated with buffer feeding low yielding (20 litre) cows. The diet costs indicate that buffer feeding 20 litre cows on a 40 litre diet for 3 months costs an extra £10,000 per 100 cows compared to full-time grazing.

Where there is a limited grazing platform available to graze all the cows in the herd, it may be more profitable to split the herd into two groups. The highest yielding cows could be housed full time, while the lower yielding cows could be grazed full time, producing low cost milk efficiently from grazed grass.

While buffer feeding may be popular, it is likely to be uneconomic on the majority of farms

The results of local research studies at AFBI, Hillsborough suggest that the response in daily milk yield to housing at night is determined by the grazing conditions encountered and the feed value of the silage offered. Under good grazing conditions, and where average quality silage is offered, milk yields are unlikely to be increased.

Under difficult grazing conditions, and when good-quality conserved forage is offered, higher milk yields may be observed with a system involving buffer feeding and housing at night.

However, the economics need to be carefully considered in each farm situation before considering buffer feeding. In essence, while buffer feeding may be popular, it is likely to be uneconomic on the majority of farms.

5 Beef and lamb production from grazed grass

To ensure that grazed grass is the cheapest source of feed for cattle and sheep, it must always be a beef and lamb producer can use to exploit grazed grass to its maximum well utilised. The aim of this chapter is to provide sound practical information, which potential. It is important to set realistic targets for your farm using historical turnout dates, housing dates and stock weight gains.

These will depend principally on soil type and location. For example steers grazing good grass leys on free draining soils should gain at least 200 kg live weight during a minimum 6-month grazing period. Unfortunately due to poor grazing management many steers only gain in the region of 100 kg during the grazing period.

Good grazing management is achieved through balancing the grass supply with cattle/sheep demand irrespective of which grazing system is used.

Beef

Key components of efficient grassland utilisation

- **Turn out cattle early when the sward cover of the combined silage and grazing area is 2,000 kg DM/ha**

There is now a considerable body of research evidence, which indicates that economic benefits can be achieved from the early turnout of cattle.

For example work at AFBI, Hillsborough has found that turning out continental sired forward steers (>425 kg) in mid-March (destined for slaughter in August), rather than early May resulted in the early group producing 23 kg more carcase weight per head.

The successful early turnout of cattle requires planning, which may include the grazing of a proportion of the area to be harvested for silage. Where this is the case, the silage area should be grazed no later than the first week in April and grazed down no further than 1,800 kg DM/ha.

If these guidelines are followed any reduction in silage yield should be less than 10%. Such a reduction in the yield of first cut silage is offset by the lower requirement for silage due to the earlier cattle turnout.

Turning out cattle early is key to good sward management

- **Cattle stocking rates should start low at turnout, peak quickly in April/May and gradually reduce into the autumn**

A well managed grazing system is dependant on a combination of good planning and accurate grass cover measurements. Table 10 provides a guide to potential stocking rates during the grazing season.

This information can be used to determine the approximate area required for grazing when making grassland and grazing management plans.

Table 10. The approximate number of cattle grazed over the season on a productive grass sward receiving 200 kg N/ha.

Stock carried /ha	March	April-June	June-August	September-October
Suckler cow plus calf	2	3.5	3	2
400 kg store	2	5	3	2
320 kg store	3	6	4	2
250 kg store	4	8	5	3

As stated above it is best to turn stock out early, even where ground conditions are marginal. The alternative is a late turnout leading to high grass covers requiring high stocking rates to utilise grass efficiently. In such a situation should ground conditions deteriorate then utilisation and animal performance both suffer.

To facilitate an early turnout:

- Keep group size small
- During wet weather subdivide the grazing paddocks into smaller blocks and move cattle daily to avoid poaching

Beef cattle should be offered blocks of grass on a daily basis when ground conditions are difficult

Grazing systems

Continuous Stocking System

This is a low-cost, low-labour system and is ideal at the start and end of the grazing season when grass growth is low. However, in the absence of a grass buffer and regular grass cover assessments, an over-supply of grass may occur which can result in poor quality grass later in the season.

A grass buffer is where approximately 1/3 of the grazing area is closed off at turnout. This may be one or two entire fields, which can either be cut for silage or grazed depending on grass growth. This approach gives good grass control up to first cut after which the grazing area is extended to include silage aftermaths.

This approach to set stocking, known as Block Buffer Grazing (BBG), does mean that the majority of the area must be suitable for silage making. Grass cover targets for a continuous stocking system are shown in Table 11.

Table 11. Target grass covers over the season for beef cattle grazing on a continuous stocking system

Grazing period	Sward height (cms)	Average Grass cover (kg DM/ha)
Turnout *	5	2000
Up to July	6	2100
Mid August - Mid September	10	3100
Late Oct - mid November	6	2100

***** includes grazing and accessible silage areas

Whilst it is more difficult to effectively manage a continuous stocking system than a rotational system, it can, when well managed, produce high individual animal performance and high live weight gains per hectare.

Studies at AFBI, Hillsborough, over a 20-year period have indicated that a continuous grazing system with a buffer area available if required, consistently produced live weight gains from April to September/October of 1.2 kg/head/day with young bulls, 1.1 kg/head/day with steers and 0.95 kg/head/day with heifers.

Rotational systems

Rotational grazing is the most suitable grazing system for matching grass supply with animal demand. It has a number of advantages over set stocking:

- More grass is produced and potentially more live weight gain is produced per hectare
- It can lead to savings in fertiliser
- It is easier to match grass supply to demand
- Areas of surplus grass can be identified and removed as silage *
- It is less likely to allow unpalatable grazing areas to develop
- A leader follower system is easily integrated with rotational grazing

Note * Surplus silage can be fed back if grass supply falls or cattle have to be housed during wet weather.

Although rotational grazing systems are more expensive to set up than a continuous stocking system, they are easier to manage. Grass cover targets (Table 12) lead to more precise control of grazed grass in rotational systems.

In turn it is possible to use grass covers to determine the supply of grass and by estimating the demand of the cattle (2.5% of live weight) a grass budget can be calculated to determine more precisely if grass supply is outstripping demand.

Work at CAFRE, Greenmount Campus, found that well managed rotational or BBG systems can lead to seasonal steer gains of up to 1.2 kg/head/day.

Table 12. The grass covers relating to the management of a rotational grazing system for growing/finishing cattle (kg DM/ha)

Entry to paddock in March/April at:	3000
Remove paddock and cut for silage when:	>4000
Up to end of July graze down and exit at:	1500
August onwards graze down and exit at:*	1600

***** For early grass the following grazing season do not graze below 1,500 kg DM/ha

Rotational grazing in practice

Tables 13 and 14 below show the results from a CAFRE technology project in Fermanagh involving 600 cattle on 19 farms. Cattle daily live weight gains were measured and output per hectare for an entire grazing season calculated.

Table 13. Suckling calf performance at grass over a 3-year period on Fermanagh farms

	Range	Average	Target
Daily live-weight gain (kg/head)	0.8 – 1.16	1.07	1.1
Overall gain (kg/head)	162 – 242	211	220
Grazing days	202 – 209	204	200

Table 14. Weanling cattle performance at grass over a 3-year period on Fermanagh farms

	Range	Average	Target
Daily live-weight gain (kg/head)	0.7 – 1.10	0.83	0.9
Overall gain per (kg/head)	131 – 211	163	180
Grazing days	150 – 221	194	200

All the farms practiced some form of rotational grazing and the results showed excellent performance even though there was a wide range between individual farms.

On farms where weanlings were stored at 0.5 – 0.6 kg/head/day over the winter and turned out to leafy swards, average gains in excess of 0.9 kg/head/day were achieved over the grazing season.

Swards were grazed tightly, fertilised and rested for at least three weeks between each grazing. Where there was a build-up of grass the surplus was removed for silage, which provided additional winter-feed and maintained the quality of the grazing sward.

Feeding concentrates to cattle at pasture

Research consistently indicates that there is no response in the performance of well grazed, growing or finishing beef cattle (even continental cross-bred bulls of very high growth potential) to concentrate supplementation over the main grazing season from early April until September or October.

However, it has been shown that there is a benefit of feeding 3 kg of concentrates/head/day to cattle from late August until slaughter, if they have the potential to finish at grass thus saving expensive housing and winter feeding.

The level of concentrate fed will depend on grass quality, grass availability and the breed, fat cover and sex of the cattle in relation to the target finishing date.

Grazing suckler cows

Spring-calving suckler cows lose condition after calving and it is important that they have adequate grazing over the summer to ensure they reach a target condition score of 3 before weaning in the autumn.

However, it is important to achieve a balance between maximising calf performance and ensuring that cows maintain optimum body condition.

To ensure high levels of cow and calf performance grass covers of 2600-2900 kg DM/ha should be maintained

The results presented in Figure 15 demonstrate that maintaining a sward around 8-9cm in height (cover of 2,600 – 2,900 kg DM/ha) ensures that high levels of cow and calf performance can be obtained.

When sward height is reduced to 5 - 6cm in height (1,900 kg DM/ha to 2,100 kg DM/ha), calf performance will suffer unless calves have access to additional grazing or creep feed.

Cows grazed as tight as this will lose significant amounts of live weight which can have an adverse impact on fertility.

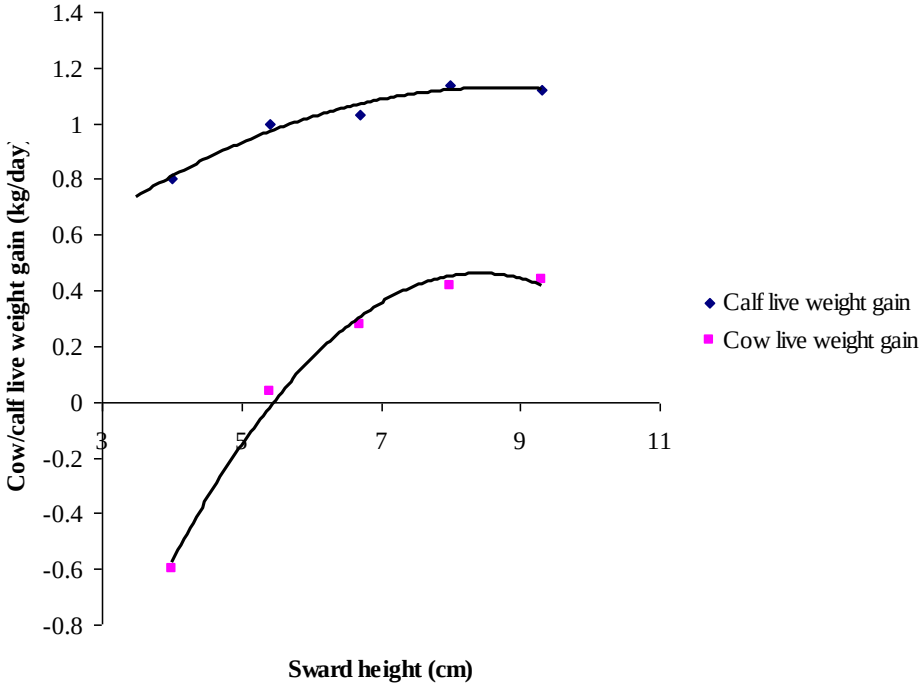

Figure 15. Effect of sward height (cm) on performance of suckler cows and their calves

Lamb

Effective grassland management is key to efficient lamb production. Maximising the period at grass reduces feed and labour costs. Therefore, this section will concentrate on managing the outdoor lambing flock.

Grazing the ewe

Pre-mating period

Achieving a good condition score in breeding ewes at mating is a major factor in maximising the number of lambs produced per ewe put to the ram. Consequently, grazing during the period from weaning to mating should be geared to **achieve a target condition score of 3-3.5.**

Post weaning to 1 month pre-mating

Ewes in low body condition score (2.5 and less) require good grazing (2,250 to 2,650 kg DM/ha) for 6 to 10 weeks.

Ewes in good body condition score (3-3.5) should be grazed to maintain body condition score (1,950 kg DM/ha).

Over-conditioned ewes (body score 4 plus) should be separated off and grazed tightly (1,650 kg DM/ha) well in advance of the breeding season.

Mating period

Mature ewes, which are in the correct condition score at mating, should be fed to maintain live weight over the mating period. Offering grazing ewes swards of 1,700-1,900 kg DM/ha will ensure they maintain condition and helps maximise ovulation rates.

Ewes which do not reach mating in the optimum body condition score (i.e. 2.5 or less) will respond positively to an increased level of feeding and should be offered swards of 1,900-2,300 kg DM/ha).

Early pregnancy (month 1)

The level of feeding during the first month of pregnancy has little effect on the reproductive performance of mature ewes in good body condition score. However, ewe lambs and hoggets are sensitive to level of nutrition with conception rates reduced by high levels of feeding during this period.

On the other hand, very low levels of feeding in young ewes during early pregnancy results in ewes struggling to attain satisfactory weights and body condition at lambing.

Overall, during the first month of pregnancy feeding should aim to maintain body condition with mature ewes and replacements grazing swards as low as 1,500 kg DM/ha).

Mid-pregnancy (months 2-3)

During the second and third months of pregnancy, some weight loss is desirable in mature ewes with body score 3.5 - 4 at mating. Swards can be grazed to 1,500 kg DM/ha during this period of time, to enable ewes to lose up to 0.5 of a body condition score.

This provides the basis for optimal development of the placenta leading to the production of healthy lively lambs and good maternal behaviour.

Overfeeding in mid-pregnancy results in over fat ewes during late pregnancy increasing the risk of twin lamb disease, prolapse and lambing difficulties.

In contrast to fit mature ewes, young ewes and ewes which are body score 2.75-3 at mating are vulnerable to under-nutrition during mid-pregnancy and so it is necessary to ensure that these ewes are fed to maintain body condition score during mid-pregnancy, achieved by grazing swards of 1,700-2,100 kg DM/ha.

During the winter months in systems where grass is allocated on a daily basis, 1.8 kg grass DM should be allocated per ewe per day, as utilisation rates tend to be only about 40%.

Late pregnancy (months 4 and 5)

There is a steep increase in the energy and protein requirements of ewes in late pregnancy. However, research has shown that good quality grazing can meet the demand of multiple-bearing ewes in late pregnancy without the need for supplementary feeding.

During the last 2-months of pregnancy, they should graze swards of 1,700-1,900 kg DM/ha. If ewes are scanned, singles may be grazed tightly with target sward covers of 1,500-1,700 kg DM/ha.

In practice, ewes can be moved onto lambing areas 4-6 weeks pre-lambing corresponding to early-mid March. These swards will have previously been rested for 2-4 months and should have a cover of 1,500 - 1,650 kg DM/ha.

High grass covers of 2,000 kg DM/ha and more have been found to increase lamb birth weights by 0.5 kg and consequently increase lambing problems. Stocking density at this time will vary from 10 to 17 ewes per hectare depending upon ground and growing conditions.

In systems where grass is allocated on a daily basis, grass allocations of 1.3-2.2 kg DM/ewe/day are appropriate for multiple bearing ewes, depending on ewe body condition score and grazing conditions.

Grazing the ewe and lamb

It is important to be realistic when setting targets for finishing lambs, both in terms of slaughter live weight and the number finished off grass alone.

Ewes and lambs should have access to high quality leafy grass present in swards of 1,600 – 2,100 kg DM/ha

Seasonal conditions can have major effects on lamb growth rates, so it is best to plan several lamb finishing options rather than being forced to sell large numbers of store lambs or purchase excessive quantities of concentrates.

The following outlines the pasture management required to maximise the proportion of lambs finished off grass alone.

Grassland management

Grassland management is the key to maximising lamb performance. Target growth rates for lambs on grass-based systems are 250-280 g/day to weaning at 16 weeks (300 g/day during April and May, reducing to 210 g/day in June and July).

After weaning growth rates tend to be closer to 150 g/day. To achieve these growth rates short leafy, dense pastures must be established and maintained. Grass swards should be maintained within a band from 1,600 kg DM/ha to 2,100 kg DM/ha for grazing throughout the year.

Recent research work examining sheep-only grazing systems has indicated that lamb growth rates can be reduced by 15% if sward covers are maintained at 2,850 kg DM/ha rather than 1,800 kg DM/ha. Long grass is less digestible and lambs will not grow as well as on short leafy swards.

Foot problems also increase on pastures with high grass covers. Surplus grass should be made into silage in May or June, ready for winter feeding.

Grass budgeting as detailed in a previous chapter aids grassland management decisions and was shown at the CAFRE, Greenmount Campus to deliver cost savings and/or additional silage production which increased margins by up to £4 per lamb grazed.

The basic principle of grass budgeting is matching grass supply with grass demand. To keep it as simple as possible it should be based on a holistic farm approach in regard to grassland area and stock requirements.

Offering store lambs leafy grass swards in the autumn will improve lamb growth rates, and reduce days to slaughter and the purchase of expensive concentrates

To determine grass demand the live weight of sheep should be multiplied by 3.5%.

The lamb producer, through use of the plate meter can develop the skill of assessing grass dry matter cover by eye. Skilled lamb producers can recognise minimum covers of 1,600 kg DM/ha and covers of over 2,100 kg DM /ha.

With this skill the lamb producer knows when sheep need moved to maintain optimum animal performance or when an area needs to be removed for silage or be grazed by additional stock to avoid the build up of poor quality material in the sward.

Grass/clover swards for beef and sheep

A grass/clover sward fertilised with 50 kg N/ha can sustain a similar output to that from a grass sward fertilised with 200 kg N/ha. Therefore clover can reduce the costs of producing beef and lamb. It also can reduce the carbon footprint of beef production.

Data for a dairy origin steer system showed that replacing a pure grass sward receiving 150 kg N/ha with a grass/clover sward receiving no fertiliser reduced the carbon footprint in terms of kg carcase weight by almost 20%.

In addition, high clover content swards reduce worm burden, increase trace element availability, lose quality more slowly than grass, contribute to greater herbage intake and up to 25% higher live weight gain in lambs.

However, grass/clover swards must be carefully managed to ensure sustained high levels of herbage production.

Where grass/clover swards have been established using the plough rather than a surface cultivation (min-till) method, the stock carrying capacity could be reduced by as much as 50% until the nitrogen reserves and soil consolidation improves again.

In spring it is important to encourage grass growth with up to 50 kg N/ha in the form of slurry, farmyard manure or fertiliser. Recent sward assessment work on farms has confirmed the view that the target should be an average clover content over the season of around 30% in the dry matter.

To achieve a level of 30% in the dry matter, the following targets of percentage ground cover of clover should be met:

- 20 – 30% ground cover early in the growing season
- Approximately 40% ground cover midway through the growing season
- Peak of 50-60% ground cover in the latter half of the growing season

Grass/clover swards should be grazed continuously, with the average grass/clover cover for the grazing area being maintained around 2,100 kg DM/ha from April to June.

The area should then ideally be rested from grazing for at least three weeks during July/August.

To ensure that clover does not die during the winter the sward should be grazed well in late autumn ideally by sheep to a grass/clover cover of 1,500-1,700 kg DM/ha.

Grass/clover swards need to be grazed down to a cover of 1,500-1,700 kg DM/ha in late autumn

Mixed grazing of cattle and sheep

Sheep are very selective grazers while cattle have a low degree of selectivity. On the other hand, sheep tend to graze grass around dung pats, whereas cattle often reject this grass.

Consequently in several experiments, grazing cattle and sheep together has resulted in better individual animal performance, higher output of live-weight gain per hectare and better utilization of swards.

Results from a range of experiments indicate that grazing cattle and sheep together can improve the growth rates of both, with the greatest

improvements likely to be observed at a ratio of 3 ewes and lambs to 1 steer.

Performance benefits of up to 15% have been observed in the growth rate of cattle and up to 45% (0.16 vs. 0.23 kg/day) in the growth rate of suckling lambs. Consequently, grazing cattle and sheep together rather than separately tends to increase total live weight gain/hectare by about 10%.

Mixed grazing cattle and lamb can improve animal performance if grass covers are allowed to become heavier than recommended

However these benefits are generally only observed where grass covers have not been controlled.
Recent research has shown that where grass swards are managed to ensure that high quality grass is available to the stock throughout the grazing season, i.e. weekly sward covers are maintained between 1,600 to 3,000 kg DM/ha, there are no benefits in terms of output/ha from mixed grazing.

But grazing cattle and sheep together can also help reduce poaching during wet weather, because even though the overall stocking rate is the same, the number of cattle grazing/hectare is lower than when cattle are grazed alone.

Grazing cattle and sheep together can also help to reduce the burden of parasitic worm larvae on the pasture because the number of either sheep or cattle grazed/hectare is lower than if they are grazed separately, and the economically important nematode worms of cattle and sheep are specific to that species.