Introduction
A dairy cow must eat a balanced diet with enough energy, protein, fibre, water, minerals and vitamins to cover her own maintenance and growth as well as milk production and the needs of a growing foetus. Quantity and quality are important.

1. What are the feed requirements of the milking cow?
2. What are the feed requirements of the dry cow?
3. How do I optimise my feed costs?
4. What forage options are available to me?
What are the feed requirements of the milking cow?

SPRING

A cow will reach her highest daily milk output 6-8 weeks after calving but will only reach her highest intake of dry matter 10-12 weeks after calving. The cow will use energy from her fat reserves (‘off her back’) to make up the energy deficit for several weeks. However, if the cow loses too much body condition in early lactation, it can reduce her chances of getting back in calf again.

Cows calving onto a grass-based diet will eat a total dry matter intake (DMI) of 8-10kg DM (grass + concentrates) in week one after calving. Intake will increase by 0.75-1.0kg DM every week until they reach peak intake at 16-18kg DM during week 10-12 of the lactation.

In spring, the aim is that the cow should graze a high amount of quality grass with appropriate supplementation. When less than 8kg of grass dry matter per cow is available, the deficit should be made up with a forage e.g. grass silage, as well as concentrate. This will ensure the cow is getting enough fibre. Stop feeding silage when enough fresh grass is available.

Key fact

Intake drives performance in the spring calving herd.

<table>
<thead>
<tr>
<th>Intake (kg DM/cow/day)</th>
<th>Estimates of intake</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Milking cow indoors on grass silage + meals</td>
</tr>
<tr>
<td></td>
<td>Winter milk indoors using grass silage and an alternative forage (maize silage)</td>
</tr>
<tr>
<td></td>
<td>Grazing cow (peak intake)</td>
</tr>
<tr>
<td></td>
<td>7-15</td>
</tr>
<tr>
<td></td>
<td>15-19</td>
</tr>
<tr>
<td></td>
<td>19-23</td>
</tr>
</tbody>
</table>

Winter milk herds
Decrease supplementation rates by 1–2kg if using a blend of forages - grass silage plus maize silage or whole crop cereal silage. 10kg of fodder beet is equivalent to 2kg ration, but balance for protein.

Key performance indicator

The milking cow should receive adequate feed to optimise milk solids production and keep body weight loss to less than 0.5 BCS between calving and breeding.

Checklist

Which factors can cause low dry matter intake?

- Lack of protein
- Low dry matter forage
- Overestimation of grass supply
- Low digestibility forage
- Poor access to drinking water
- Over-conditioned cows
- Overgrazing conditions
- Overestimation of grass supply

Checklist

How do I know if an animal’s dry matter intake is low?

1. Excessive body weight loss
2. Low milk yields
3. Low milk solids
4. Poor fertility
5. Metabolic diseases

Key risk

If body condition loss in early lactation is 0.5 BCS or greater, cow fertility will suffer.
Key risk
There is no grass available for grazing. This applies to winter feeding for autumn calving herds and in severe situations where no grazed grass is available in spring. The following supplementation rates apply:

<table>
<thead>
<tr>
<th>Kg concentrate/cow/day</th>
<th>75%</th>
<th>70%</th>
<th>65%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silage DMD (%)</td>
<td>Dry + well preserved</td>
<td>Supplement (27 litres)</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supplement (32 litres)</td>
<td>8.5</td>
</tr>
</tbody>
</table>

Increase by 1-2kg if silage is wet and/or poorly preserved

Targets for total diet composition for winter milk dairy cows

<table>
<thead>
<tr>
<th>Lactating Cow</th>
<th>Early-peak</th>
<th>Mid-late</th>
<th>Dry cow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter intake</td>
<td>21.0</td>
<td>16.0</td>
<td>11.0</td>
</tr>
<tr>
<td>(kg/day)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy UFL (per kg DM)</td>
<td>0.95-1.0</td>
<td>0.85-0.9</td>
<td>0.75</td>
</tr>
<tr>
<td>Fibre (min): NDF (%)</td>
<td>32</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ADF (%)</td>
<td>21</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Starch (max)</td>
<td>22</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Oil (max)</td>
<td>5-6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Protein PDI (g/kg DM)</td>
<td>105-110</td>
<td>95</td>
<td>70</td>
</tr>
<tr>
<td>Crude protein (%)</td>
<td>17</td>
<td>15-16</td>
<td>13</td>
</tr>
<tr>
<td>Mineral profile (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ca</td>
<td>0.8</td>
<td>0.7</td>
<td>0.4</td>
</tr>
<tr>
<td>P</td>
<td>0.4</td>
<td>0.35</td>
<td>0.3</td>
</tr>
<tr>
<td>Na</td>
<td>1.7</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Mg</td>
<td>0.3</td>
<td>0.25</td>
<td>0.28</td>
</tr>
</tbody>
</table>

1 peaking at 38-40kg milk

How to
Manage supplementation at grass in spring

• Supplementation rates will be dictated by cow production level and grass availability.

• Grass budgeting is an important decision support tool in deciding on a supplementation strategy.

Supplementation required
= Cow requirements for energy - grass energy intake.

Rule of thumb
Six to eight weeks after calving 13kg DM of grass plus 3.5 kg as fed concentrates will deliver a peak yield of 1.8-1.9kg milk solids (28 litres/6 gallons). If less grass is available, more supplements will be needed. If output is lower, then supplementation rates can be reduced (see diagram). As intake capacity increases, the cow will gradually reach peak intake of 16-18kg of grass dry matter.

Rule of thumb
• An increase of 1% in grass digestibility will increase dry matter intake by 0.3-0.4kg DM and milk yield by 0.25 litres.

Supplementation rates for a spring calving herd

Spring (Target peak yield = 1.8-1.9kg milk solids) High yield cows

Scenario 1
13kg DM grass, no grass silage + 3.5kg concentrates

Scenario 2
12kg DM grass, no grass silage + 4.5kg concentrates

Scenario 3
8kg DM grass + grass silage + 6kg concentrates

Spring (Target peak yield = 1.5-1.6kg milk solids) Medium yield cows

Scenario 1
14kg DM grass, no grass silage + 1kg concentrates

Scenario 2
12kg DM grass, no grass silage + 2kg concentrates

Scenario 3
8kg DM grass + grass silage + 4kg concentrates

Increase supplementation rates by 1-2kg as milk solids production increases by 0.3-0.4kg/day.
Feeding the Dairy Cow

Key fact

Energy, not protein or minerals, is the most limiting nutrient in dairy production systems. If animals are not milking as well as expected, or milk protein is low or cows are losing excessive condition, energy is the first nutrient to check. Check the total dry matter intake of the animal as well as the quality (i.e. energy content) of the forages/feeds used.

Digestive upsets

Build up concentrate levels gradually to reduce the risk. Pay particular attention to first calvers when feeding high concentrate levels.

Insufficient energy in the cow’s diet

Insufficient energy in the milking cow’s diet can result in low milk protein, low milk yields, poor fertility, poor immunity – susceptibility to disease and metabolic disorders including ketosis etc. – as well as loss of body condition.

Not enough protein

1. In early spring – the level of protein in spring grass is high, but the quality may not be adequate for the freshly calved cow.

2. In mid-summer – during a drought situation when grass becomes stemmy, protein levels in the grass can drop and may limit production.

3. Examples of low protein feeds are forage maize, whole crop cereal silage, fodder beet and low protein concentrates such as citrus pulp. Balance these with high protein feeds to ensure adequate protein in the animal’s diet.

Too much protein?

Excessive protein can result in excessive body weight loss as the cow metabolises the extra protein. Avoid feeding high protein diets during the breeding season.

Magnesium deficiency

Dairy cows are at high risk of grass tetany (staggers) particularly on lush grass rich in potassium and nitrogen in cold, wet, conditions. It can also occur on autumn grass. Cows need to be supplemented with 30g of magnesium (or 60g of calcined magnesite) per day - during the high risk period.

Cows can’t get quick access to water

Dairy cows can drink more than half of their water needs within a few hours of milking. Cows can drink quickly - up to 14 litres (3 gallons)/minute. It is important that the infrastructure and water flow rates adequate to meet the demands of the herd. See also Grazing Infrastructure.

Minerals and vitamins

Get the mineral status of your grazed grass checked regularly so that you get the correct mineral formulation to meet the needs of the herd.

Checklist

Minerals for the milking cow

1. Ensure that the inclusion rate of magnesium matches the requirements of the cow during the tetany period for different feeding rates.

2. Check that the inclusion rate of trace elements is adequate to meet the requirements of the cow.

The table below presents typical supplementation rates of trace elements for milking cows. The lower end of the range is for routine use and the higher levels are for stock at risk of severe deficiency.

Checklist “What the animal needs to get per day” (in mg)

<table>
<thead>
<tr>
<th>Trace Elements</th>
<th>Copper</th>
<th>Selenium</th>
<th>Iodine</th>
<th>Cobalt</th>
<th>Manganese</th>
<th>Zinc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>150-400</td>
<td>3-5</td>
<td>12-50</td>
<td>5-10</td>
<td>335-415</td>
<td>335-750</td>
</tr>
</tbody>
</table>

3. If concentrate feeds are being removed from the diet in early lactation, an alternative method of mineral supplementation should be used.
Methods of magnesium supplementation include:

- pasture dusting
- low feeding rate carrier concentrate feed
- water application

Buckets and licks are not recommended for milking cows as intake is too variable.

**Checklist**
Ensure cows have adequate water

How much a cow will drink depends on milk yield, feed dry matter and weather. Water should always be clean.

### Water use/cow/day (litres)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Water Use (litres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry cow</td>
<td>50</td>
</tr>
<tr>
<td>Milking cow (15 litres milk)</td>
<td>70</td>
</tr>
<tr>
<td>Milking cow (28 litres milk)</td>
<td>90</td>
</tr>
<tr>
<td>Milking cow (42 litres milk)</td>
<td>140</td>
</tr>
</tbody>
</table>

**Methods of mineral supplementation**

<table>
<thead>
<tr>
<th>Cost (cents/cow/day)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ration (1.5–2 kg carrier)</td>
<td>35-46</td>
</tr>
<tr>
<td>Pasture dusting magnesium</td>
<td>13-20</td>
</tr>
<tr>
<td>Drinking water (commercial products)</td>
<td></td>
</tr>
<tr>
<td>Mg only</td>
<td>15</td>
</tr>
<tr>
<td>Mg + TE</td>
<td>22</td>
</tr>
<tr>
<td>TE only (I, Cu, Se, Zn)</td>
<td>13</td>
</tr>
<tr>
<td>Drinking water (added directly)</td>
<td>c. 7-10</td>
</tr>
<tr>
<td>Magnesium sulphate flakes</td>
<td></td>
</tr>
<tr>
<td>Tablets in the water</td>
<td>4-7</td>
</tr>
<tr>
<td>Boluses</td>
<td>€5-6/bolus x 2</td>
</tr>
</tbody>
</table>

1 concentrate of €230/t
Feeding the Dairy Cow

BREEDING/MAIN GRAZING SEASON

During the breeding season, it is essential to ensure that the nutrient intake of the cow is adequate to meet the needs of the cow and doesn’t fluctuate. Grazed grass will provide adequate protein for the breeding cow.

The aim is to achieve high cow performance from an all-grass diet. There should be no need for supplements if grass supply and grazing conditions are suitable. Many herds reach peak yield in early May.

Rule of thumb
- Milk yield will drop on average by 2.5%/week (10%/month) from peak yield.

Checklist
For adequate feeding during the breeding/main season

1. Aim for a herd average body condition score of 2.9 at the beginning of the breeding season.
2. Ensure cows are gradually gaining weight.
3. Avoid fluctuations in dry matter/energy intake. Under good grazing conditions, the energy and protein needs of the cow during the breeding season can be met from grass only at a production level of 1.8–1.9kg milk solids per day. Supplement with 2–3kg concentrates during poor grazing conditions but stop when conditions improve. Concentrates should not be used as substitute for good grassland management.
4. Avoid high protein supplements (more than 18%) during the breeding season.
5. Mineral supplementation during the breeding season will depend on individual herd circumstances. Iodine should be fed to cows throughout the breeding season and mineral analysis of forage and blood will help to identify any other deficiencies.
6. All the common metabolic conditions (including milk fever, ketosis, displaced abomasum, fatty liver etc.) will have a negative impact on fertility.

Key fact
Concentrate supplementation is not economic for animals with low genetic merit for milk production in the main grazing season.

AUTUMN

Key objectives in the autumn are: to maximize the amount of grazed grass in the cow’s diet and to ensure that the farm is closed up correctly to allow for adequate grass the following spring. Every 1kg DM grass/ha left on the paddocks in early November will result in 1.6kg DM grass/ha available for grazing in spring.

Key fact
Keeping cows at grass in the autumn time is worth over €1 per cow per day.

The feed value of grass drops significantly in the autumn. However, the milk solids output of the cow is also lower and her needs are significantly reduced.

Autumn - Why supplement?

1. Supplementation will reduce demand for grass and help build grass for autumn grazing season.
2. It maintains milk lactose levels and reduces the risk of penalties.
3. It maintains milk production, provided the quota is not limiting.
4. It increases cow body condition before drying off.
Late lactation feeding

The response to feeding concentrates with autumn grass is 1 litre of milk for every 1kg concentrates fed. In most situations this is economical except where milk price is low and concentrate price is high or in a year where there is an oversupply of milk (i.e. over quota).

If grazing full-time, 2-3kg of a high-energy low-protein concentrate is adequate.

If cows are indoors on grass silage (68-70 DMD), 3-4kg of concentrates (UFL = 0.94+, CP = 18%) will support 10-12 litres of milk (0.7-0.9kg milk solids).

What are the feed requirements of the dry cow?

Cows should have an eight-week dry period in preparation for the next lactation. This may need to be extended if cows are in very poor condition. During the dry period the cow’s diet must be managed to ensure she calves down and begins the next lactation in the correct ‘body-condition’. If the cow is too fat or too thin at calving, subsequent milk production and fertility will suffer. Nutrition-related problems around calving such as milk fever and retained cleanings can also have significant effects on subsequent production in the herd.

Key Fact

Thin cows need a longer dry period to prepare for the next lactation

<table>
<thead>
<tr>
<th>Expected calving date</th>
<th>Length of dry period</th>
<th>8 weeks</th>
<th>10 weeks</th>
<th>12 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 1</td>
<td>Dry off date</td>
<td>Dry off date</td>
<td>Dry off date</td>
<td></td>
</tr>
<tr>
<td>Feb 8</td>
<td>Nov 30</td>
<td>Nov 16</td>
<td>Nov 2</td>
<td></td>
</tr>
<tr>
<td>Feb 15</td>
<td>Dec 7</td>
<td>Nov 23</td>
<td>Nov 9</td>
<td></td>
</tr>
<tr>
<td>Feb 22</td>
<td>Dec 14</td>
<td>Nov 30</td>
<td>Nov 16</td>
<td></td>
</tr>
<tr>
<td>Mar 1</td>
<td>Dec 28</td>
<td>Dec 7</td>
<td>Nov 23</td>
<td></td>
</tr>
</tbody>
</table>

How to Ensure cows have correct body condition score at calving

<table>
<thead>
<tr>
<th>Body condition score at calving</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
</tr>
</tbody>
</table>

- Check the body condition score of the herd at least 14 weeks before the beginning of the calving season (typically mid-October for a spring calving herd).
- Cows should be dried off at body condition score 3.25 – which is the condition that they should calve down in.
- Where there is variation, batch cows according to body condition score and calving date and feed accordingly.
- Aim to feed grass silage of 68% DMD for the dry cow.
- If cows are underconditioned, allow a longer dry period and feed 1-3kg of a low protein supplement e.g. rolled barley.
- Cows who need to put on 0.5 BCS will do so over an 8-10-week dry period on 68% DMD silage + 1-2kg concentrate feeds. If silage quality is poor (60-65% DMD), the dry period should be extended and/or supplementation rates increased. To gain 1.0 unit of BCS, cows will require 12-14 weeks dry on 68% DMD silage + 2-3kg concentrate feed.

<table>
<thead>
<tr>
<th>Silage DMD</th>
<th>BCS 2.5 (12-14 weeks dry)</th>
<th>BCS 2.75 (8-10 weeks dry)</th>
<th>BCS &gt;3.0 (8 weeks dry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;72</td>
<td>Silage +1kg meals</td>
<td>Silage ad-lib</td>
<td>Silage Restricted</td>
</tr>
<tr>
<td>68-72</td>
<td>Silage +2kg meals</td>
<td>Silage +1kg meals</td>
<td>Silage ad-lib</td>
</tr>
<tr>
<td>64-68</td>
<td>Silage +3kg meals</td>
<td>Silage +2kg meals</td>
<td>Silage +1kg meals</td>
</tr>
</tbody>
</table>

For example, if cows have a body condition score of 2.5 at drying off, they should be dry for 12–14 weeks. If silage quality is 68–72 DMD, they should be offered silage ad lib and 2kg of a low-protein concentrate e.g. rolled barley.
Feeding the Dairy Cow

- Avoid overconditioning cows. This can be a problem with late calving cows with a long dry period or where excellent quality silage is available. If necessary, dilute the silage with a low energy feed such as straw.

- There is no advantage in feeding additional protein (with grass silage) to cows during the dry period, except where low protein feeds such as straw, maize silage, whole crop cereal silage and fodder beet are used in significant quantities.

**Rule of thumb**

Every condition score (~50 kg) below target at calving results in the cow milking 450 litres less during the next lactation and having reduced fertility.

**Key risk**

I am short of silage

Feeding the minimum amount of roughage and concentrates can be more economical than buying expensive silage. Feeding the cow 20kg grass silage plus 5kg straw plus 3-4kg concentrates will maintain dry cows and put on 0.2-0.3 BCS.

1. Concentrates to balance hay and straw should contain high levels of crude protein (18-20%).

2. Ensure adequate feeding space so that all animals can feed at the same time.

3. Introduce concentrates slowly.

4. Feed twice daily if above 3kg per day.

5. A supply of clean water is essential.

**Feeding pre-calver minerals**

Feed minerals to all dry cows for 4-6 weeks pre-calving. Fixed rate feeding is best. Free choice supplementation e.g. mineral buckets is not reliable as intake is variable. Ensure there is adequate feeding space for all animals to eat at the same time. Spread minerals across the silage and do it twice a day.

**Checklist**

**What a dry cow mineral should supply**

The table below presents a typical pre-calver mineral diet for dry cows. For example: The dry cow mineral should supply 20-25g of magnesium to meet the cow’s magnesium requirement during the dry period. The mineral should also supply 4-5mg selenium.

<table>
<thead>
<tr>
<th></th>
<th>% inclusion in the mineral diet (%)</th>
<th>Supply in 100g feeding rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Phosphorous</td>
<td>0-4</td>
<td>0-4</td>
</tr>
<tr>
<td>Sodium</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Magnesium</td>
<td>20-25</td>
<td>20-25</td>
</tr>
<tr>
<td>Trace elements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>4,000</td>
<td>400</td>
</tr>
<tr>
<td>Selenium</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>Iodine</td>
<td>500</td>
<td>50</td>
</tr>
<tr>
<td>Cobalt</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>Manganese</td>
<td>1,000</td>
<td>100</td>
</tr>
<tr>
<td>Zinc</td>
<td>5,000</td>
<td>500</td>
</tr>
</tbody>
</table>

**Key Risk**

**Inadequate mineral intake pre-calving**

Inadequate mineral supplementation during the dry period can cause problems with perinatal calf health as well as problems with cow health. These include clinical and sub-clinical milk fever, retained cleanings, low dry matter intake, ketosis, displaced abomasums and subsequent fertility problems.

Always check that the:

1. specification of the pre-calver mineral meets the major and trace element requirements of the herd.

2. feeding rate is correct.

3. minerals are fed twice daily.
How to Feed brassica crops (kale, rape etc.) in the field

1. Estimate the amount of fresh matter offered to the herd each day (i.e. the size of the break). Unless you have an accurate way of estimating yield, it is trial and error in allocation. Start with a small allocation and build up gradually.

2. While research has shown that kale can be fed at 100% of the diet, this requires a very high level of management. Feed at least 20% of the dry matter intake as grass silage or straw.

3. Brassicas must be strip-grazed.

4. Crop breaks should be long and narrow rather than short and wide, so that all cows can have access to the fresh break and trampling is kept to a minimum.

5. Adapt animals gradually to brassica crops over at least one week.

6. Ensure that fencing is very secure as poisoning can occur if animals overgraze/gorge on the crop.

7. Feed a quality mineral high in iodine and copper.

8. Crops should be grazed out before flowering; flowering brassica crops are poisonous. Aim for the final grazing to be completed before mid-March.

9. Feeding brassica crops in frosty conditions is not recommended, so feed only when the frost has thawed.

10. For milking cows, brassicas should not exceed 40% of the total dry matter intake as there is a risk of milk taint.

How do I optimise my feed costs?

The feeding system

1. Keep feeding systems simple.

2. Limit the feed categories on the farm to 3-4 e.g. grazed grass, grass silage and concentrates.

3. Feeding systems that require the use of straight ingredients, alternative forages and wet feedstuffs will increase the variable and fixed costs on the farm. They also change the focus from maximizing cheap grass utilisation on the farm.

Grass

1. Learn to budget grass – this will provide the confidence to know when there is enough grass available to meet the requirement of the cow without supplementation.

2. Maximise grass utilisation – aim for 70%+ of the feed budget of the cow to come from grazed grass.

3. Calve cows to grass to minimize the utilization of expensive conserved forages and concentrates.

4. Build up grass for autumn grazing and minimise the length of the winter period.

Supplementation strategy

1. Use concentrate feeds strategically:
   a. to fill gaps in grass supply, particularly during spring and autumn
   b. during the breeding season when grazing conditions are poor or grass supply is limited. Be prepared to remove the supplement when grass supply and intake are adequate
   c. by using concentrates and/or high quality surplus bales (conserved during the main grazing season) to fill the gap in autumn when grass supply falls.
2. Trace elements are important for fertility but there is no need to feed an extra 400-500kg concentrates per year to deliver them. Separate out the requirement for minerals and supplements from the need for energy and protein.

3. Low milk fat/protein. In most cases the economic response to feed products etc., is very poor. In most cases a significant drop in milk protein is due to grass quality. Improve grazing management skills. It’s cheaper than buying in supplements. Cows can have low rumen pH at grass and still be healthy. Don’t overreact to short-term drops in milk fat.

4. At high stocking rates (3.0 LU/ha) additional feed will need to be imported to bridge gaps in grass supply, particularly at the ‘shoulders’ of the year.
   a. A concentrate mix fed through the parlour is the least labour intensive.
   b. The use of alternative forages such as maize silage can be very labour intensive and incur high fixed costs.
   c. Weigh up the relative value of the feed as well as the labour and fixed costs attached to feed-out.

Buying supplements

1. Know the nutrient requirements of the cow.

2. Energy is the most limiting nutrient in dairy production systems. Buy your concentrate feeds based on energy content.

3. Protein is important but concentrate feeds should be purchased on the basis of energy content firstly and then protein. High protein does not automatically mean good quality.

4. Low cost is the aim but this does not mean that the cheapest option is best. Low energy or imbalanced feed ingredients can be poor value on an energy basis.

5. Fancy supplements used in concentrate feeds are generally unnecessary and are no substitute for good feeding management.

6. Shop around for concentrate feeds – there is often large variation in price between suppliers.

### What forage options are available to me?

Grazed grass is our cheapest feed and should make up as much of the cow’s diet as possible. Forages such as whole crop forage maize, whole crop cereal silage, fodder beet or other wet feeds can have only a limited role in spring calving herds, except at high stocking rates. At high stocking rates their use will be decided by their value relative to concentrate feeds. Fixed costs, as well as variable costs tend to increase where alternative feeds are used. Brassica crops may have a role to play in drier parts of the country to reduce winter feed and housing costs.

### Annual feed budget for a spring calving cow

Target production: 400-450kg milk solids per cow per year

<table>
<thead>
<tr>
<th>Forage Type</th>
<th>Amount DM/ha</th>
<th>Value (% of Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grazed grass</td>
<td>14.0</td>
<td>3.9 t DM (74%)</td>
</tr>
<tr>
<td>Grass silage</td>
<td>6.0</td>
<td>1.0 t DM (19%)</td>
</tr>
<tr>
<td>Concentrate feeds</td>
<td>1.0</td>
<td>0.35 t DM (7%)</td>
</tr>
</tbody>
</table>

### Key performance indicator

A 10% increase in grazed grass in the feeding system will reduce the cost of milk produced by 2.5 cent/litre.

The relative cost of grass, silage, and concentrate feeds
### Key fact

Grass-based systems are more robust in times of price volatility. High input systems can generate more profits at a high milk price but are more exposed to the risk of lower profits at lower milk prices.

<table>
<thead>
<tr>
<th>FORAGES</th>
<th>Grazed grass</th>
<th>Grass silage 1st cut</th>
<th>Maize Silage</th>
<th>Whole crop cereal silage</th>
<th>Brassica crops (kale, rape, fodder beet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilisable yield potential t DM/ha</td>
<td>12-15</td>
<td>5-6</td>
<td>12-15</td>
<td>11-12</td>
<td>Kale 6.5-9.5 Fodder beet 8.5-10.5 Rape 2.5-4.0</td>
</tr>
<tr>
<td>Typical feeding value UFL</td>
<td>0.9-1.08 (75-85 DMD)</td>
<td>0.72-0.76 (65-68 DMD)</td>
<td>0.75-0.80</td>
<td>0.75-0.80</td>
<td>1.05-1.12</td>
</tr>
<tr>
<td>Crude protein %</td>
<td>16-28</td>
<td>11-12</td>
<td>7-9</td>
<td>7-9</td>
<td>Can constitute up to 60-80% of DMI of the dry cow.</td>
</tr>
<tr>
<td>Intake potential Dry cows kg DM</td>
<td>12-15</td>
<td>10-12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milking cows</td>
<td>8-10 kg DM (one) week post calving, increase by 1kg DM / week until peak at 16-18kg DM</td>
<td>8-10 kg DM as sole forage, decreases as grazed grass intake increases</td>
<td>Alternative forages will increase total dry matter intake by 15-20%, compared to grass silage only</td>
<td>Inclusion in milking cow diet should be restricted to 20% of DMI</td>
<td></td>
</tr>
<tr>
<td>Role in spring calving herds</td>
<td>Constitute 70% of feed budget at SR = 2.5</td>
<td>Primarily used for dry cows, utilisation in the diet of the milking cow should be minimised/eliminated</td>
<td>Limited use, except with high stocking rates on the grazing platform and/or fragmented farms or autumn calving herds</td>
<td>Suitable on free draining soils. Grazing in the field can reduce feed costs as well as housing costs</td>
<td></td>
</tr>
</tbody>
</table>

* Rolled Barley has a UFL of 1.0
Introduction
With concentrated prices expected to remain high, they must be used prudently.

1. What should I look out for in concentrate mixes?
2. How do I investigate nutrition related problems?
Feeding the Dairy Cow

What should I look out for in concentrate mixes?

How to
Choose the concentrate mix that is right for you

1. Energy is the most limiting nutrient in dairy diets - always check the energy content of the concentrate. The energy density of concentrate mixes for high levels of performance should be 0.94 UFL/kg or greater as fed.

2. Check the protein content of the concentrate. This will vary with type of animal, stage of lactation and the base forage being offered. Always balance the protein content of the concentrate with the protein content of the forage.

3. Unless feeding minerals separately, check that minerals are included in the concentrate mix. Check that the feeding rate of the concentrate mix supplies the correct daily amount of minerals, e.g. calmag inclusion to match feeding rate during the high tetany risk period.

4. In buying concentrates the nutrient content (i.e. energy, protein, minerals, fibre) is more important than the individual ingredient composition. Always buy concentrates on the basis of nutrient content.

5. If using straight ingredients, it is important to check that these are correctly balanced for all nutrients, particularly minerals.
Checklist

Getting value for money

1. Always ask for information on the nutrient content of the concentrate i.e. energy, protein, minerals and fibre.

2. Shop around – there can be a lot of variation in price but always ensure that price differentials are not explained by variations in nutrient content i.e. compare like with like.

3. The cheapest concentrate mix may not be the best value. Consider the value of the feed based on its feeding value relative to its cost.

4. High protein concentrate mixes don’t necessarily have high energy content. The energy content of a 14% CP concentrate mix could be higher than an 18% CP concentrate mix.

5. Don’t assume that straight ingredients are better value than concentrate mixes. Always check the price of buying straights (and home mixing), relative to buying a standard concentrate mix.

6. Only buy from appropriately licensed suppliers.

Key fact

Calculating the relative cost of different feeds can be difficult. Teagasc has an interactive calculator on its website www.teagasc.ie where the price of barley and soya can be entered and the relative value of different feeds is calculated automatically.

Rule of thumb

Rolled barley has a UFL of 1.00. All other feeds are expressed relative to barley. For example, soya hulls has a UFL of 0.88, which is 88% of the value of barley, on an energy basis.
### Feeding the Dairy Cow

#### Common ingredients

<table>
<thead>
<tr>
<th>Energy feeds</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley</td>
<td>High starch, risk of acidosis at high feeding rates, do not feed at high rates in grazing concentrate mixes</td>
</tr>
<tr>
<td>Wheat</td>
<td>High starch and rapidly digestible, higher risk of acidosis than with barley or maize, high substitution rate at grass</td>
</tr>
<tr>
<td>Maize grain</td>
<td>High starch but slowly digestible, risk of acidosis less than barley or wheat</td>
</tr>
<tr>
<td>Citrus pulp</td>
<td>Good source of digestible fibre and sugar, suitable supplement at grass</td>
</tr>
<tr>
<td>Beet pulp</td>
<td>Good source of digestible fibre, high energy, suitable supplement at grass</td>
</tr>
<tr>
<td>Soya hulls</td>
<td>Good source of digestible fibre, moderate energy content, suitable supplement at grass</td>
</tr>
<tr>
<td>Wheat feed (pollard)</td>
<td>By-product from flour processing, low energy feed</td>
</tr>
<tr>
<td>Feed Type</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Soyabean meal</td>
<td>The best quality protein feed, high in by-pass protein, not necessary in a grazing situation unless cost competitive</td>
</tr>
<tr>
<td>Molasses</td>
<td>Useful for binding pelleted concentrates, reducing dust and improves palatability of concentrate mixes. Typical inclusion of 3-6% in the concentrate mix</td>
</tr>
<tr>
<td>Protein Feeds</td>
<td></td>
</tr>
<tr>
<td>Maize distillers grains</td>
<td>High energy, moderate protein, high oil which can affect milk fat if percentage of total unprotected fat in the diet exceeds 6%</td>
</tr>
<tr>
<td>Maize gluten feed</td>
<td>Moderate energy, moderate protein, variable quality</td>
</tr>
<tr>
<td>Rapeseed meal</td>
<td>High protein, a good source of rumen degradable protein, palatability issues at high inclusion rate</td>
</tr>
<tr>
<td>Palm kernel meal</td>
<td>Low energy feed; limit its use in high energy mixes</td>
</tr>
<tr>
<td>Sunflower meal</td>
<td>Low energy feed, high protein content but protein is of poor quality</td>
</tr>
</tbody>
</table>
Rule of thumb
1 kg DM of grass is the equivalent of 1 UFL/kg DM. Concentrate mixes will have a UFL varying from 0.85–0.95 UFL/kg as fed (or 0.98–1.09/kg DM). Target energy density for high quality concentrate mixes is 0.94 UFL/kg as fed, depending on the quality of the ingredients used.

How do I investigate nutrition related problems?

1. Excessive body condition loss
   1. Low dry matter intake (see checklist for factors causing low dry matter intake).
2. Inadequate supplementation.
3. Poor quality supplement.
5. Inadequate trough space indoors.
7. Cows overfat at calving.
8. Disease.

2. Low milk protein
   • Cows may not be genetically capable (see EBI score) of producing high milk protein.
   • Low energy intake limits protein digestion in the rumen and limits milk protein production. Low energy intake can be due to:
     - inadequate dry matter intake due to a limited supply of grass, low grass digestibility, overestimation of grass supply and poor grazing conditions.
     - grazing high pre-grazing covers of grass (>1,600 kg DM/ha), resulting in low digestibility, low energy grass
     - poor quality forages e.g. low digestibility silage.
   • Stage of lactation – milk protein % dips 4-6 weeks after calving due to dilution (i.e. peak milk yield dilutes the % of fat + protein). This is most notable where compact calving was achieved. Always calculate the total production of milk solids, milk protein % may have dropped but total kg of milk solids production may be high.
   • Mean calving date – late calved cows tend to have lower milk protein in mid-season.
   • High levels of oil in the complete diet will depress intake and consequently milk protein. This is only likely to be a problem in indoor diets.
   • Ingredient type – high energy feeds such as grass will stimulate milk protein production. In indoor feeding systems, maintaining starch levels at 20-25% of total intake will help maintain milk protein levels.

3. Low milk fat
   Insufficient fibre in the diet is the most common cause of low milk fat. What might cause low milk fat:
   • cows grazing low covers of lush grass with little fibre. (Providing cows with a source of fibre such as straw or hay may help. Don’t overreact to a short-term drop in milk fat content.)
   • high levels of concentrate feed with grass of low fibre content
   • high levels of cereal/rapidly degradable carbohydrates in the concentrate feed (Grazing concentrate mixes should be based on a high fibre ingredients such as pulps and hulls.)
4. Low milk lactose

As milk yield declines, so too does milk lactose. Low milk lactose is generally a problem in late lactation.

- Dry the herd off when production averages less than 8-9 litres. Dry off any cow producing less than 6.5 litres/day.

- Where grass quality and/or grazing conditions are poor, feeding 2-3kg of concentrates helps maintain milk yield and consequently lactose levels.

- High somatic cell count results in low lactose content, irrespective of stage of lactation.

5. Milk fever (clinical/sub-clinical) — Always consult your veterinarian about treatment of these diseases

Clinical milk fever is easily diagnosed with the classical ‘downer’ collapsed cow, but sub-clinical milk fever is more difficult to diagnose. Signs of sub-clinical milk fever include slow, difficult calvings, retained cleanings, low dry matter intake and uterine infections.

To reduce the risk of milk fever (clinical & sub-clinical):

- Avoid having cows at a condition score greater than 3.5 (or less than 2.5) as they are at higher risk of both types of milk fever. Late calving cows are at greater risk of being over-conditioned due to the long dry period.

- Watch the age profile of the herd. Milk fever is more prevalent in 3rd calvers and older cows.

- Ensure animals have adequate feeding space (2ft/0.6m per cow).

- Offer cows fixed rate minerals. Fixed rate feeding of minerals is most accurate.

- Supplement with 15-25g/day of magnesium. Check the pre-calver mineral to ensure the feeding rate is correct.

- Avoid high potassium levels in the base forage. High potassium levels in grass silage, due to excessive spreading of slurry on silage ground in late spring can limit the uptake of magnesium from the gut, increasing the risk of milk fever.

Treatment: Inject, as soon as possible, with a bottle of calcium under the skin. If it’s a particularly bad case of milk fever, injection into a vein may be necessary but this should be left to a veterinarian as it can cause sudden death if not carried out properly.

Retained cleanings

Retained placenta is when the foetal membranes fail to separate from the womb of the cow within 24 hours of calving. Cows with retained cleanings are at higher risk of developing metritis, ketosis and mastitis and are at increased risk at subsequent calvings.

This can be prevented by:

- having cows fit (BCS = 3.25), but not fat calving down.

- ensuring the diet is correctly balanced for minerals, particularly magnesium and trace elements. (Iodine and selenium have an important role to play in reducing the risk of retained cleanings. Supplement with 60mg and 5mg of iodine and selenium, respectively.)

- reducing the risk of clinical and sub-clinical milk fever.

Treatment: Do not intervene unless the cow is running a high temperature. Use of washouts etc. can have a negative effect on reproductive performance. If the cow is running a high temperature, she may need to be treated with antibiotics and anti-inflammatories. Get the cow to cycle as soon as possible, conception rate after 1st heat will be poor.

Ketosis

Ketosis occurs when energy intake is not adequate to meet the requirements of the cow and she mobilises fat to meet her energy requirements. (Continued overleaf)
Feeding the Dairy Cow

Prevent by:

• having cows at BCS 3.25 at calving.
• maximising dry matter intake after calving.
• minimising cow stress at turnout to grass.
• avoiding sudden changes in the diet - increase concentrate intake slowly after calving, avoiding acidosis problems.

Treatment: A quick-acting glucose supplement is required immediately. Intravenous administration of a dextrose solution by a veterinarian is effective in the short-term, but follow-up treatment is essential if relapses are to be avoided. Drenching with propylene glycol or glycerine has longer term effects. It also has the benefit of ease of administration. Treatment should be continued for two to four days. Several commercial compounds contain propylene glycol and glycerine.

Displaced abomasum (DA)

Displaced abomasums occur when the rumen fill is not adequate to keep the abomasum in place and it ‘flips over’. Left DA is the most common.

Prevented by:

• ensuring gut fill is maximised within 10 days of calving i.e. adequate intake
• ensuring there is enough fibre in the diet
• avoiding sudden changes in diet – e.g. turnout to grass immediately after calving in poor grazing conditions
• feeding a maximum of 4kg concentrates in one feed
• avoiding milk fever problems around calving. Cows with clinical or sub clinical milk fever are more prone to DA’s
• limiting concentrate feeds to 60% of the total dry matter intake of the cow in winter herds

Treatment: Displaced abomasum can be treated using treatments such as rolling the cow, altering the diet and treating concurrent disease, but failure and recurrence rates are quite high. Surgical correction is very successful for displaced abomasum but is expensive.

Pica

Pica includes persistent licking, chewing or eating of wood (fence posts, tree-bark, sticks, wood partitions), soil (dirt, clay, stones), rags, bones etc.

Possible contributory factors include:

• energy or protein deficiency – check the diet for energy and protein supply
• lack of fibre - if fibre shortage is suspected, feed extra roughage (some straw or hay).
• mineral deficiency - ensure there are no underlying mineral deficiency problems (P, Na, Cu, Co etc).

Treatment: The provision of an additional supply of energy, protein or long fibre (e.g. straw) may help to alleviate the problem. If minerals are the cause of the problem, supply additional minerals in the feed or through water, or boluses.

How to

Diagnose a mineral deficiency problem.

• Establish the symptoms of the problem.
• Analyse all feeds used on the farm for mineral status (major and trace elements).
• Calculate the mineral intake of the animal from forage and concentrate feeds. Compare cow requirements to supply from the diet.
• If needed, analyse blood samples (preferable to milk samples) to establish the mineral status of the animal. Samples should be taken at the time of the problem.
### Database of feed ingredients used in dairy concentrate mixes (Analysis/kg DM) (See list of terms overleaf)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>DM (%)</th>
<th>Crude protein (%)</th>
<th>Crude fibre (%)</th>
<th>PCE (g)</th>
<th>ME (MJ)</th>
<th>Energy (UFL)</th>
<th>Calcium (%)</th>
<th>Phosphorus (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley (rolled)</td>
<td>86.0</td>
<td>11.3</td>
<td>4.8</td>
<td>74</td>
<td>103</td>
<td>1.16</td>
<td>0.06</td>
<td>0.39</td>
</tr>
<tr>
<td>Beans</td>
<td>86.0</td>
<td>28.6</td>
<td>9.2</td>
<td>166</td>
<td>102</td>
<td>1.18</td>
<td>0.13</td>
<td>0.64</td>
</tr>
<tr>
<td>Beet pulp unmolassed</td>
<td>88.1</td>
<td>10.0</td>
<td>20.4</td>
<td>64</td>
<td>110</td>
<td>1.14</td>
<td>0.76</td>
<td>0.09</td>
</tr>
<tr>
<td>Citrus pulp</td>
<td>87.5</td>
<td>6.9</td>
<td>13.3</td>
<td>46</td>
<td>91</td>
<td>1.14</td>
<td>1.7</td>
<td>0.11</td>
</tr>
<tr>
<td>Cottonseed exp</td>
<td>91.5</td>
<td>38.8</td>
<td>19.0</td>
<td>263</td>
<td>201</td>
<td>0.86</td>
<td>0.28</td>
<td>1.07</td>
</tr>
<tr>
<td>Fat (vegetable)</td>
<td>98</td>
<td>-</td>
<td>-</td>
<td>140</td>
<td>120</td>
<td>2.91</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Maize grain</td>
<td>86.0</td>
<td>10.1</td>
<td>2.7</td>
<td>83</td>
<td>120</td>
<td>1.22</td>
<td>0.06</td>
<td>0.28</td>
</tr>
<tr>
<td>Maize distillers</td>
<td>89.0</td>
<td>29.9</td>
<td>10.0</td>
<td>200</td>
<td>134</td>
<td>1.16</td>
<td>0.2</td>
<td>0.75</td>
</tr>
<tr>
<td>Maize gluten feed</td>
<td>86.5</td>
<td>23.5</td>
<td>9.0</td>
<td>158</td>
<td>125</td>
<td>1.04</td>
<td>0.18</td>
<td>0.88</td>
</tr>
<tr>
<td>Molasses cane</td>
<td>73.5</td>
<td>6.1</td>
<td>-</td>
<td>32</td>
<td>68</td>
<td>1.00</td>
<td>1.2</td>
<td>0.09</td>
</tr>
<tr>
<td>Oats</td>
<td>87.4</td>
<td>11.1</td>
<td>13.5</td>
<td>74</td>
<td>84</td>
<td>1.03</td>
<td>0.12</td>
<td>0.38</td>
</tr>
<tr>
<td>Palm kernel exp.</td>
<td>89.0</td>
<td>16.4</td>
<td>23.8</td>
<td>131</td>
<td>143</td>
<td>0.96</td>
<td>0.33</td>
<td>0.65</td>
</tr>
<tr>
<td>Palm kernel ext.</td>
<td>86.6</td>
<td>19.7</td>
<td>26.8</td>
<td>157</td>
<td>171</td>
<td>0.93</td>
<td>0.31</td>
<td>0.72</td>
</tr>
<tr>
<td>Peas</td>
<td>85.6</td>
<td>24.6</td>
<td>6.0</td>
<td>149</td>
<td>102</td>
<td>1.20</td>
<td>0.12</td>
<td>0.48</td>
</tr>
<tr>
<td>Wheat feed (pollard)</td>
<td>88.1</td>
<td>18.4</td>
<td>9.9</td>
<td>115</td>
<td>90</td>
<td>0.87</td>
<td>0.07</td>
<td>1.4</td>
</tr>
<tr>
<td>Rapeseed meal</td>
<td>86.4</td>
<td>39.1</td>
<td>13.5</td>
<td>254</td>
<td>151</td>
<td>1.05</td>
<td>0.72</td>
<td>1.09</td>
</tr>
<tr>
<td>Soya hulls</td>
<td>87.0</td>
<td>11.9</td>
<td>40.3</td>
<td>77</td>
<td>107</td>
<td>1.01</td>
<td>0.43</td>
<td>0.18</td>
</tr>
<tr>
<td>Soyabean meal</td>
<td>86.4</td>
<td>55.7</td>
<td>5.2</td>
<td>396</td>
<td>269</td>
<td>1.18</td>
<td>0.38</td>
<td>0.71</td>
</tr>
<tr>
<td>Sunflower meal</td>
<td>88.6</td>
<td>27.8</td>
<td>32.9</td>
<td>179</td>
<td>100</td>
<td>0.66</td>
<td>0.42</td>
<td>1.01</td>
</tr>
<tr>
<td>Urea</td>
<td>95</td>
<td>287.5</td>
<td>-</td>
<td>1472</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wheat (rolled)</td>
<td>86.6</td>
<td>11.2</td>
<td>2.6</td>
<td>77</td>
<td>106</td>
<td>1.16</td>
<td>0.05</td>
<td>0.41</td>
</tr>
<tr>
<td>Wheat caustic</td>
<td>75.0</td>
<td>11.2</td>
<td>2.6</td>
<td>77</td>
<td>106</td>
<td>1.16</td>
<td>0.05</td>
<td>0.41</td>
</tr>
</tbody>
</table>

### Database of commonly used forages/wet feeds (Analysis/kg DM)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>DM (%)</th>
<th>Crude Protein (%)</th>
<th>Neutral Detergent Fibre (%)</th>
<th>Energy (UFL)</th>
<th>Calcium (%)</th>
<th>Phosphorus (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass (autumn)</td>
<td>18.6</td>
<td>20.7</td>
<td>45.0</td>
<td>0.98</td>
<td>0.69</td>
<td>3.50</td>
</tr>
<tr>
<td>Grass (spring)</td>
<td>16.4</td>
<td>21.0</td>
<td>42.0</td>
<td>1.06</td>
<td>0.69</td>
<td>3.50</td>
</tr>
<tr>
<td>Grass (summer)</td>
<td>17.2</td>
<td>20.5</td>
<td>45.0</td>
<td>1.01</td>
<td>0.69</td>
<td>3.50</td>
</tr>
<tr>
<td>Grass silage 64% DMD</td>
<td>24.0</td>
<td>11.5</td>
<td>55.0</td>
<td>0.71</td>
<td>0.69</td>
<td>3.50</td>
</tr>
<tr>
<td>Grass silage 68% DMD</td>
<td>24.0</td>
<td>11.5</td>
<td>46.1</td>
<td>0.76</td>
<td>0.69</td>
<td>3.50</td>
</tr>
<tr>
<td>Grass silage 72% DMD</td>
<td>24.0</td>
<td>11.5</td>
<td>46.1</td>
<td>0.81</td>
<td>0.69</td>
<td>3.50</td>
</tr>
<tr>
<td>Hay</td>
<td>85.0</td>
<td>9.9</td>
<td>66.0</td>
<td>0.69</td>
<td>0.70</td>
<td>2.80</td>
</tr>
<tr>
<td>Maize silage 25% starch</td>
<td>32.0</td>
<td>8.5</td>
<td>48.0</td>
<td>0.80</td>
<td>0.20</td>
<td>2.00</td>
</tr>
<tr>
<td>Whole crop cereal silage, fermented</td>
<td>45.0</td>
<td>9.0</td>
<td>55.0</td>
<td>0.80</td>
<td>0.20</td>
<td>2.40</td>
</tr>
<tr>
<td>Whole crop cereal silage, processed</td>
<td>75.0</td>
<td>14.0</td>
<td>55.0</td>
<td>0.80</td>
<td>0.20</td>
<td>2.40</td>
</tr>
<tr>
<td>Straw/barley</td>
<td>88.0</td>
<td>3.8</td>
<td>84.4</td>
<td>0.44</td>
<td>0.38</td>
<td>0.90</td>
</tr>
<tr>
<td>Sugar beet</td>
<td>23.2</td>
<td>5.0</td>
<td>19.5</td>
<td>1.15</td>
<td>0.28</td>
<td>1.70</td>
</tr>
<tr>
<td>Potatoes</td>
<td>20.0</td>
<td>10.8</td>
<td>13.3</td>
<td>1.20</td>
<td>0.12</td>
<td>2.40</td>
</tr>
<tr>
<td>Fodder beet</td>
<td>19.0</td>
<td>8.0</td>
<td>13.6</td>
<td>1.12</td>
<td>0.26</td>
<td>1.80</td>
</tr>
<tr>
<td>Kale</td>
<td>14.0</td>
<td>16.0</td>
<td>25.0</td>
<td>1.05</td>
<td>2.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Rape</td>
<td>13.0</td>
<td>22.0</td>
<td>25.0</td>
<td>0.91</td>
<td>0.90</td>
<td>0.50</td>
</tr>
</tbody>
</table>
Feeding the Dairy Cow

Key terms

**UFLs** (Unite forragere lait) the energy in feed and forage are expressed in UFLs.

**Crude protein**: expressed as a percentage (%).

**PDI**: Protein digestible in the intestine (expressed as g/kg of dry matter), a better measure of protein as it reflects the quality of the protein.

**PDIN**: Measures the PDI which can be produced from the available N.

**PDIE**: Measures the PDI which can be produced from the available energy.

**Macro minerals**: The main minerals - including calcium, phosphorus, magnesium, sodium, potassium and sulphur. These are measured in g per head per day or g per kg diet DM.

**Trace elements**: Copper, selenium, iodine, cobalt, zinc and manganese. These are measured in mg per head per day or mg per kg diet DM.

**Dry matter intake (DMI, kg DM)**: this is the weight (kg) of feed material consumed, excluding the moisture it contains.
Introduction
Excellent silage will support animal performance over the winter and reduce concentrate costs. Choosing the right time to harvest the grass and minimising the loss of feed value are the key goals when making silage.

1. What is meant by digestibility?
2. How do I make high DMD silage?
3. What influence do grass varieties have?
4. How do I ensure good preservation?
5. How do I maximise yield per hectare?
6. How much silage does my herd need?
What is meant by digestibility?

The higher the digestibility (DMD) of a grass silage, the more efficiently animals will use it and the greater the amount of milk or meat they will produce. Grasses with a lot of stem, seed-heads or dead vegetation are much less digestible than those with a greater proportion of leaf. The importance of highly digestible silage is greater when the price of concentrates is high.

How do I make high DMD silage?

1. High yielding ryegrass crops are easier to manage, especially when varieties in the sward have similar heading dates; it’s easier to identify exactly when to cut. Ryegrasses naturally have high levels of sugar and preserve easily.

2. Avoid old or dead herbage accumulating at the base of a crop as it can reduce digestibility by 5-6% units – this means that a crop that should have been 75% DMD would be 69-70% DMD instead.

3. Take full account of the mineral and slurry nitrogen applied for early grazing and silage because excess nitrogen can cause heavy-yielding crops to lodge in wet windy weather. The DMD of a normal crop of grass would be expected to decline by about 3 percentage points per week in late May/June (e.g. 78%-75%). A lodged crop lying under wet conditions can decline by up to 9 percentage points (e.g. 78%–69%) during the same week.

4. Monitor the silage fields from late April and book the contractor in time, monitoring weather forecasts. Intermediate-heading ryegrasses are at around 75% DMD when their first seed heads start to peep from the grass plants but geographical location, soil type, sward type and previous management will alter the optimum harvest date.

5. Control weeds such as docks - even leafy docks in silage only have a digestibility of around 65% DMD.

What influence do grass varieties have?

1. Late-heading ryegrasses can be harvested eight days later than intermediate-heading varieties, with both types of crops having similar yield and ensilability. The later heading crops will have slightly higher digestibility. There is more flexibility in harvest dates with the later heading crop as its rate of digestibility decline at this stage is slightly slower than for intermediate-heading ryegrasses.

2. Once the categories of ryegrass are identified, select varieties mainly on yield (spring, autumn and annual) and persistence. If independent information is available on grass digestibility or sugars, consider these after the above. Select grass varieties from the recommended list of varieties for Ireland produced by the Department of Agriculture, Food and the Marine.

3. If reseeding, invest the effort in seed-bed preparation, sowing, etc., that such a long-term investment warrants.

How do I ensure good preservation?

Poorly preserved silage could lose up to 5% units of DMD and have low intake characteristics. Therefore:

1. Only attempt to wilt a crop if it will be genuinely drying while on the ground. A successfully wilted crop will preserve properly.

2. If using an additive, ensure the full rate of an appropriate product is applied evenly.

3. Harvest the grass free of contamination by dirt.

4. Fill the silo quickly and seal perfectly (or wrap bale perfectly) in order to achieve the air-free conditions that are necessary for good preservation and to prevent mould growth.

5. Ensure any effluent can quickly escape from the silo and is safely collected.

Pit management

1. Seal grass carefully beneath 2 sheets of black 0.125mm polythene.

2. Cover completely with a layer of car tyres, placed edge-to-edge. Seal the edges with a layer of sandbags, silt, etc.

3. As the silage sinks in the silo during the following week or two, check the plastic seal to ensure air is not getting.

4. Inspect the plastic cover frequently and immediately repair any damage.

Manage the silage appropriately during feedout to prevent heating losses, as any such losses will reduce silage digestibility.
How do I maximise yield per hectare?

1. Minimise soil compaction during silage making, slurry and fertilizer spreading, grazing, etc.

2. Ensure appropriate soil P, K, and pH levels. Soil test each field once every four years.

3. Apply a total of 125 kg N/ha from the combined input of inorganic fertilizer (e.g. CAN, urea, etc.) and slurry.
   - If rolling the silage fields in spring, complete the job before the grass starts to elongate, as late rolling can crush the stems and impair growth.
   - Decide on the amount of silage needed and the land required to deliver it. It is wise to have a modest surplus of silage in reserve.

4. Apply a total of 100 kg N/ha from a combined input of inorganic fertilizer and slurry for second cut silage.

How much silage does my herd need?

This will depend on:

- Number of cows.
- Length of winter.

100 cows x 150 days x 10 kg DM = 150 t dry matter

At a yield of 5 t/ha for first cut, this will require the equivalent of 30 ha of first cut silage. Second cut yield will typically be 80% of first cut yield.

Table 1. Grass yield and digestibility

<table>
<thead>
<tr>
<th>Harvest date</th>
<th>1 May</th>
<th>8 May</th>
<th>15 May</th>
<th>22 May</th>
<th>29 May</th>
<th>5 June</th>
<th>12 June</th>
<th>19 June</th>
<th>26 June</th>
<th>3 July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (t DM/ha)</td>
<td>2.92</td>
<td>3.99</td>
<td>4.98</td>
<td>5.96</td>
<td>6.79</td>
<td>7.82</td>
<td>8.48</td>
<td>8.93</td>
<td>9.50</td>
<td>9.83</td>
</tr>
<tr>
<td>DMD%</td>
<td>79.9</td>
<td>77.9</td>
<td>77.5</td>
<td>76.6</td>
<td>74.6</td>
<td>69.2</td>
<td>67.9</td>
<td>64.3</td>
<td>63.5</td>
<td>58.2</td>
</tr>
</tbody>
</table>

Silage yields and digestibilities (DMD) will be lower than these values.

Estimated monthly feed requirements for various stock categories

<table>
<thead>
<tr>
<th>Stock Category</th>
<th>tonnes fresh weight/month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Cows</td>
<td>1.65</td>
</tr>
<tr>
<td>In-calf heifers/550-660 kg store</td>
<td>1.35</td>
</tr>
<tr>
<td>200-250 kg weaning</td>
<td>0.7</td>
</tr>
<tr>
<td>400-450 kg store</td>
<td>1.25</td>
</tr>
</tbody>
</table>
Introduction
Grazed grass is, and will continue to be, the cheapest animal feed for milk production in Ireland. Your land’s ability to produce grass is your primary competitive advantage over other EU dairy farmers. To optimise profitability, producers must maximise the proportion of grazed grass in their cows’ diet.

1. What are the key factors in relation to grassland management?
2. How should I manage spring swards?
3. How should I manage mid-season swards?
4. How should I manage autumn swards?
5. Which grassland management tools are available to me?
6. How should I manage reseeding?
Managing your Grass

What are the key factors in relation to grassland management?

**Key performance indicator**

A grazing season of 300+ days will maximise your profitability and competitiveness

- Grass budgeting is an essential tool in achieving a 300 day grazing season.
- Increase farm profitability by increasing the proportion of grazed grass in the dairy cow’s diet.
- Graze paddocks to a low post grazing height in early spring to condition swards for subsequent grazing rotations.
- On/off grazing is one strategy to increase the proportion of grazed grass in the cow’s diet during periods of wet weather.

**Key fact**

Increasing the proportion of grazed grass in the diet of a dairy cow by 10% reduces costs of production by ca. 2.5 cent/litre

**How to**

Maximise the proportion of grazed grass in your herd’s diet

1. **Extend the grazing season in early spring and late autumn**
   - Close paddocks from 5-10 October.
   - Close the farm in rotation.
   - Target 60% of paddocks closed by 1-7 November.
   - Don’t regraze closed paddocks.
   - Target a closing farm cover of 550kg DM/ha.
   - Use on/off grazing during periods of challenging weather.

2. **Ensure your cows’ calving pattern is matched to the start of the grass growing season**
   - Begin calving at the onset of grass growth. Typically this should result in most calves being born between 10 February and 1 March (six weeks before ‘magic day’).
   - Target an opening farm cover of 600-700kg DM/ha.

3. **Match your stocking rate to the growth potential of your swards**
   - Ensure perennial ryegrass dominates all swards.
   - Target farm DM production of 14/15t DM/ha.
   - Stock the farm to its grass growth capability. e.g. 5t grass dry matter consumed per cow, grass yield 14t/ha = 2.8 cows/ha.

4. **Maximise the productivity of your swards through improving soil fertility**
   - Soil sample one fifth of the farm each year. If there has been no sampling for many years consider getting the whole farm sampled.
   - Apply P, K and lime as recommended.

5. **Maximise the productivity of your swards through timely re-seeding**
   - Reseed in spring if possible.
   - Target a 60-day turnaround time from seeding to first grazing.
   - Ensure that recommended list varieties are used.
   - Use a post-emergence spray at the two-leaf regrowth stage.
   - Graze the sward for the first time at 600-700 kg DM/ha.

6. **Make use of farm grass cover measurement and grass budgeting**
   - Feed concentrates/high quality silage when short of grass.

7. **Ensure that farm infrastructure is sufficient to fully utilise the grass grown**

8. **Feed concentrates/high quality baled silage when short of grass.**
You must be able to estimate herbage mass in each individual paddock on the farm and use this information to achieve both short daily and medium term (weekly and monthly) targets that are critical to the success of the system. Such skills can be learned from advisors, through farm discussion groups and through practice and self-training. (See also end of this chapter).

Table 1. Target pasture covers for a spring calving herd stocked at 2.5 LU/ha.

<table>
<thead>
<tr>
<th>Month</th>
<th>Stocking rate (on grazing area) (LU/ha)</th>
<th>Growth (kg DM/day)</th>
<th>Target average farm cover (kg DM/ha)</th>
<th>Target cover per cow (kg DM/cow)</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 15</td>
<td>2.5</td>
<td>9.0</td>
<td>661</td>
<td>264</td>
<td>Cows out to grass by day</td>
</tr>
<tr>
<td>Mar 15</td>
<td>2.6</td>
<td>37.6</td>
<td>880</td>
<td>342</td>
<td>Cows out full-time</td>
</tr>
<tr>
<td>May 10</td>
<td>4.2</td>
<td>88.2</td>
<td>800</td>
<td>190</td>
<td>Supply exceeds demand</td>
</tr>
</tbody>
</table>

From June to August, farm cover should be maintained at 150-170kg DM per cow

<table>
<thead>
<tr>
<th>Month</th>
<th>Stocking rate (LU/ha)</th>
<th>Growth (kg DM/day)</th>
<th>Target average farm cover (kg DM/ha)</th>
<th>Target cover per cow (kg DM/cow)</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug 15</td>
<td>2.5</td>
<td>65.0</td>
<td>775</td>
<td>310</td>
<td></td>
</tr>
<tr>
<td>Sept 1</td>
<td>2.5</td>
<td>51.0</td>
<td>1100</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>Sept 15</td>
<td>2.5</td>
<td>37.1</td>
<td>1125</td>
<td>450</td>
<td>Peak cover achieved</td>
</tr>
<tr>
<td>Oct 1</td>
<td>2.5</td>
<td>30.0</td>
<td>1075</td>
<td>430</td>
<td></td>
</tr>
<tr>
<td>Oct 15</td>
<td>2.5</td>
<td>26.8</td>
<td>950</td>
<td>380</td>
<td>First paddock closed</td>
</tr>
<tr>
<td>Nov 1</td>
<td>2.5</td>
<td>15.0</td>
<td>700</td>
<td>280</td>
<td>Supplement introduced</td>
</tr>
<tr>
<td>Nov 15</td>
<td>2.5</td>
<td>8.5</td>
<td>600</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>Nov 22</td>
<td>2.5</td>
<td>2.7</td>
<td>550</td>
<td>220</td>
<td>House by day and night</td>
</tr>
</tbody>
</table>
Managing your Grass

2 How should I manage spring swards?

Early spring grass is extremely digestible and high in crude protein. To capitalise on the benefits of grazed grass, dairy cows should be turned out to pasture directly after calving, ground conditions permitting. The main objectives of spring grazing management are (1) to increase the proportion of grazed grass in the diet of the dairy cow and (2) to condition swards for subsequent grazing rotations.

How to

Ensure maximum grass intake in spring

- Farm cover at turnout should be approximately 600-700kg DM/ha, depending on mean calving date – an earlier calving date equates to higher animal demand and the need for a higher opening cover.

- Aim to offer 0.8–1.0 tonne grass DM/cow from turnout until the end of the first rotation – this is achievable on farms where animals are turned out early.

- Grazed grass and concentrate can be the sole feeds with such a system. This allows grass silage to be completely removed from the diet post-calving.

- During the first grazing rotation a daily herbage allowance of 10–13kg DM/cow/day with 2-4kg DM of concentrate should be offered, this achieves the twin objectives of achieving a high milk solids yield while maintaining sward quality.

- From early April onwards (i.e. second rotation) daily herbage allowance must be increased in line with herd requirements to achieve high animal production performance.

How to

Ensure first-rotation swards are able to yield well in subsequent rotations

- The available grass supply should be budgeted so that the first grazing rotation finishes between 4-10 April.

- Post-grazing height should be maintained at 3.5-4cm during the first rotation to ensure pasture quality is high during subsequent rotations.

- Early grazed swards (Feb/Mar) have similar grass growth potential as later grazed swards (Apr), but are capable of sustaining higher milk solid yields and grass intake in subsequent grazing rotations due to higher sward quality.

- Excessive pasture damage should be avoided.

How to

Manage grazing during wet weather

- Use on/off grazing.

- Allow cows two three-hour grazing periods post-milking and after grazing move cows to stand-off area (without feed).

- Silage supplementation is not necessary.

- Provide sufficient grass allowance during wet periods.

Alternatives

- Allowing cows to graze by day and then return to housing at night.

Recent research carried out in Teagasc Moorepark has shown that animals adjust their grazing behaviour – grazing more when they have limited access to grass so milk production is not reduced.
How should I manage mid-season swards?

**Mid-season sward management**

The primary objective during the main grazing season is to maximise animal performance from an all-grass diet while at the same time maintaining pasture quality. In general, from late April onwards, grass supply is not restricted on farms. Improvement of pasture quality offers the potential to achieve further increases in animal performance from pasture.

**How to**

**Maintain high quality in the mid-season period**

- Rotation length should be approximately 18-21 days.
- Cows should be offered an all-grass diet.
- Target pre-grazing yields between 1,300 - 1,600 kg DM/ha with high leaf content.
- Graze to 4-4.5cm post-grazing sward height.
- Remove grass surpluses as round bale silage (see chapter on high quality bales).
- Keep topping to a minimum as it is very labour intensive and delays pasture regrowth. On average one round of topping, to a height of <4.5 cm, should suffice from mid-May to late June. If you are new to pasture management, consult with an adviser if you are unsure when topping should be carried out.
- Mid-season pasture quality can be improved by alternating paddocks that have been grazed with those that have been harvested for first and second cut silage.

**Key performance indicator**

**Use later heading grass cultivars**

Later heading cultivars are one of the main tools to produce milk efficiently during the main grazing season and maintain high sward quality.

**Key facts**

**The influence of grass quality on intake and performance**

- For each one-unit increase in organic matter digestibility (OMD), grass dry matter intake (GDMI) is increased by 0.20 kg.
- A one-unit OMD increase will allow an increase of 0.24 kg milk/cow/day.
- Green leaf content is directly related to grass digestibility. A 5.5% change in leaf content is equal to a one-unit change in digestibility.
- Poorly managed swards can fall to 60% leaf during the reproductive (stemmy) period.
- Well grazed swards (grazed to 4.0 – 4.5 cm) will contain high (80%+) leaf levels in the mid-grazing horizon (4 to 10 cm). This is the grazing horizon which has greatest influence on the grass intake achieved by the dairy cow.
Managing your Grass

Rule of thumb

Target grazing grass covers of 1,300–1,600kg DM/ha and a rotation length of 18–21 days is a good rule of thumb to maintain grass quality and cow performance in the May to July period.

How to

Top paddocks

Generally on farms topping is carried out from the middle of May onwards.

- Top to 4.5cm (removing the tall grass from dung pats).
- Swards mechanically topped to 4.0–4.5cm will support higher milk yields (up to 2 kg/cow/day).
- Removing surplus grass (paddocks >1,800kg DM/ha) as round bale silage will reduce the need for pasture topping.

Table 2. Expected milk production performance from well-managed pasture through lactation.

<table>
<thead>
<tr>
<th>Month</th>
<th>Milk Yield (kg/cow/day)</th>
<th>Milk Fat (%)</th>
<th>Protein (%)</th>
<th>Milk Solids*</th>
</tr>
</thead>
<tbody>
<tr>
<td>February</td>
<td>18.3</td>
<td>4.54</td>
<td>3.48</td>
<td>1.47</td>
</tr>
<tr>
<td>March</td>
<td>25.4</td>
<td>4.41</td>
<td>3.27</td>
<td>1.95</td>
</tr>
<tr>
<td>April</td>
<td>26.9</td>
<td>4.03</td>
<td>3.36</td>
<td>1.98</td>
</tr>
<tr>
<td>May</td>
<td>25.0</td>
<td>3.88</td>
<td>3.39</td>
<td>1.82</td>
</tr>
<tr>
<td>June</td>
<td>22.0</td>
<td>3.90</td>
<td>3.38</td>
<td>1.60</td>
</tr>
<tr>
<td>July</td>
<td>20.4</td>
<td>3.91</td>
<td>3.48</td>
<td>1.51</td>
</tr>
<tr>
<td>August</td>
<td>18.8</td>
<td>4.05</td>
<td>3.59</td>
<td>1.44</td>
</tr>
<tr>
<td>September</td>
<td>17.3</td>
<td>4.28</td>
<td>3.75</td>
<td>1.40</td>
</tr>
<tr>
<td>October</td>
<td>15.2</td>
<td>4.56</td>
<td>3.97</td>
<td>1.30</td>
</tr>
<tr>
<td>November</td>
<td>11.2</td>
<td>4.95</td>
<td>4.21</td>
<td>1.03</td>
</tr>
<tr>
<td>December</td>
<td>8.6</td>
<td>4.89</td>
<td>3.90</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Herd mean calving date 24 February

* Total kg milk solids per day.

Key Target

Milk yields of 25kg/day and 3.40% protein can be achieved with daily grass grass allowances of 17–19kg DM/cow while grazing to 4.0-4.5cm during the May/July period.

How should I manage autumn swards?

Autumn grassland management largely determines the supply of grass available for grazing during the following spring and as a result the grazing season actually begins in autumn.

The two main objectives of autumn grazing management are (1) to maximise the proportion of grazed grass in the diet of the dairy cow, and (2) to finish the grazing season with the desired farm grass cover, ensuring sufficient grass for early turnout the next spring. Grassland budgeting is essential to ensure that these objectives are achieved. Usually from mid-August onwards, the entire farm is available for grazing. Building up grass covers to prolong the grazing season into the October/November period is necessary on dairy farms in order to maintain animals at grass in late autumn, when cow demand outstrips grass growth/supply.

How to

Manage autumn pastures

- Build average farm covers by increasing rotation length to more than 35 days from mid-September. Options for building grass covers include: increasing supply (N supply, more growing area) and reducing demand (reducing stocking rate, introducing bale silage, concentrates).
- Highest average farm cover should be achieved in mid to late September at which point a farm cover of up to 1,125kg DM/ha is achievable.
- Last rotation should commence on 5-10 October – every paddock grazed from this date onwards should be closed i.e. not grazed again.
How to

Manage autumn closing

- Every day delay in closing from 15 October reduces spring grass supply by 15kg DM/ha.
- In more northerly regions closing may begin earlier to compensate for lower subsequent autumn and early spring growth.
- Target post-grazing residuals of 4.0cm during the last rotation to encourage winter tillering.
- Do not regraze paddocks unless the farm is well above the closing cover target.
- Be flexible - graze the lower grass covers in wet weather (this also applies during wet weather in early spring).
- Close some drier paddocks earlier to allow early spring grazing.
- Close at least 60-65% of the farm by the end of the first week of November.

Key performance indicator

Closing cover target is 550kg DM/ha for farms stocked at 2.5 cows/ha in late November

In situations where grass supply is limiting or pasture quality is extremely poor, supplementation of autumn pasture may be an option.

Which grassland management tools are available to me?

Key grassland management tools

Spring rotation planner

The spring rotation planner is used to divide the farm up into weekly portions and can help take the guess work out of planning the first grazing rotation.

Data needed:

- date you want to turn out your animals
- date when you think you are growing enough grass to supply all the grass you need (i.e. supply = demand; magic day).

The spring rotation planner will not tell you if you are feeding the cows enough grass – you will have to gauge this by walking your paddocks and assessing the level of grass supply.

The spring rotation planner is a simple tool and if used properly it ensures that:

- sufficient grass is grazed early enough to allow time for regrowth for the second rotation.
- A wedge-shaped grass supply is created, ensuring a continuous grass supply during the 2nd rotation.

How to

Decide whether to supplement at grass

- This decision must take into account milk quota limitations, supplement price and level of grass supply on the farm.
- The target for grazing herds should be to graze day and night up to the time of ceasing grazing in late November. Where this is not possible, supplementation is an alternative.
- In studies carried out at Teagasc Moorepark, no milk production benefit was observed when low or moderate levels of good quality grass silage (72% DMD) were added to the diet of the late lactation dairy cow (mid-September to late-November).
- Supplementing cows at grass with beet pulp-based concentrates during the same period resulted in a good milk yield response at a low (1-2kg) level of feeding (1.0kg milk/kg concentrate DM) and a moderate milk yield response at a higher level (3-4 kg) of concentrate feeding (0.72kg/kg DM).
Managing your Grass

Rule of thumb

Dry farms
- Turnout in early to mid-February
- 30% of the farm grazed by 1 March
- 66% of the farm grazed by 17 March
- 100% of the farm grazed by 1-5 April

Heavy farms
- Use the above percentages, but operate approximately one week later

Pasture wedge

What is the grass wedge?

During the mid-season period the farm must be walked at least once a week and farm cover details collated. The information must then be used to make critical decisions about the quantity of feed available to the herd. The ‘pasture wedge’ is a simple method used to interpret this data. A profile of the paddocks DM/ha from highest to lowest is set out on a graph. The pasture wedge visually illustrates the breakdown of the pre-grazing yield distribution on the farm. A line is superimposed onto the graph calculated from the intended herd demand, rotation length and grazing residual.

Figure 1 represents a farm which is on target with its pre-grazing yield profile, as the paddocks have a stepped profile and are almost all on the pre-grazing target line. Figure 2 shows the opposite situation, with all pre-grazing yields below target; this farm is in a deficit grass supply. Decisions will have to be made on how to overcome the deficit of grass.

Figure 1. Grass supply normal, pre-grazing cover on target line

Figure 2. Grass supply in deficit, pre-grazing cover well below target line

Continuous measurement of farm cover and reaction to prevailing grass growth and weather conditions needs to be applied. The key process is using the data captured to make the right decisions. Using farm cover, kg DM/cow and ‘pasture wedge’ technology, grazing decisions are more easily made.
**Key fact**

Controlling mid-season pre-grazing yields, converting high quality grass into milk solids adds €150/ha profit.

**60:40 Autumn rotation plan**

The autumn rotation planner is a tool to help extend the grazing season into late autumn and if followed, will ensure that paddocks are set up correctly for grazing the following spring. The 60:40 plan is based on having proportions of the farm closed by certain dates. These dates will vary slightly across the country and depend on soil type and the amount of grass that is likely to grow over the winter months.

The objectives of the autumn rotation planner are:

- to keep grass in the diet of the dairy cow for as long as possible.
- to set up paddocks for grazing the following spring.

The simple rule is:

**Dry Farms**

- Start closing 10 October.
- 60% of the farm grazed by 1st week of November.
- Remaining 40% grazed by 1 December.

**REMEMBER:** Once a paddock is closed, it should not be regrazed.

**Example**

Below is an example for a 20ha farm where closing starts on 10 October and housing date is 1 December.

<table>
<thead>
<tr>
<th>60%</th>
<th>40%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grazed</strong></td>
<td><strong>Grazed</strong></td>
</tr>
<tr>
<td>24 Days</td>
<td>28 Days</td>
</tr>
</tbody>
</table>

**How to**

**Measuring the grass on your farm**

Maintaining a constant supply of high quality green leafy grass can be easily achieved by walking paddocks weekly and measuring the amount of grass on the farm. Poor grazing management leads to fluctuation in pre-grazing yields, with problems of not enough or too much grass on the farm.

**Measuring/estimating the quantity of grass in each paddock**

**Method 1:**

The first method uses a quadrat and shears. Once you become confident at estimating the quantity of grass in the paddock you can start to estimate it by eye (eyeball) it.

- A 0.5m x 0.5m quadrat is placed in an area that is representative of the amount of grass in the paddock.
- Knock water off the grass before cutting if wet.

<table>
<thead>
<tr>
<th>Farm size</th>
<th>Closing date</th>
<th>20ha</th>
<th>10 October</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date 60% is grazed</strong></td>
<td><strong>Date all cows housed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of days from start to 60% date</strong></td>
<td><strong>Number of days from 60% date to housing date</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of days</strong></td>
<td><strong>Date</strong></td>
<td><strong>Hectares to be grazed (b ÷ a) x 7</strong></td>
<td><strong>Hectares per week</strong></td>
</tr>
<tr>
<td>24 (a)</td>
<td>28 (c)</td>
<td>(0.6 X total area)</td>
<td>(0.4 X total area)</td>
</tr>
<tr>
<td>(b ÷ a) x 7</td>
<td>(d ÷ c) x 7</td>
<td>3.5</td>
<td>2</td>
</tr>
</tbody>
</table>
Managing your Grass

- The grass within the quadrat is cut to between 3.5 and 4cm.
- The following equation is used to calculate the DM yield in the paddock:
  \[
  \text{Weight of grass (kg) } \times \text{grass DM\% } \times 40,000 = \text{kg DM/ha in the paddock}
  \]

**Example:**
Grass cut within the quadrat weighs 200g (0.200 kg) (Remember to subtract the weight of the empty bag)
Grass DM\% = 16\% (0.16)
0.200 kg x 0.16 x 40,000 (there are 40,000 quadrats in a hectare) = 1,280 kg DM/ha

**Guide to: Estimating Grass Dry Matter % (DM)**

<table>
<thead>
<tr>
<th>Weather</th>
<th>Grass DM%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2 days continuous rain</td>
<td>14 – 15</td>
</tr>
<tr>
<td>3-4 days continuous rain</td>
<td>12 – 13</td>
</tr>
<tr>
<td>Mixed sunshine and rain showers &amp; second rotation</td>
<td>16 – 17</td>
</tr>
<tr>
<td>1st rotation in spring/drier weather</td>
<td>18 – 19</td>
</tr>
<tr>
<td>Over a week of continuous sunshine &amp; high temperatures</td>
<td>20 – 21</td>
</tr>
<tr>
<td>Drought conditions</td>
<td>22 – 23</td>
</tr>
</tbody>
</table>

- DM will be higher if there is more dead (yellow) material at the base of the sward.
- DM will be lower if the sward is green and leafy.
- DM is usually two – three units higher in the afternoon than the morning.
- Refer to ‘Grass watch’ in the Irish Farmers Journal every week to get an idea of growth rate and DM figures in your area. Regional growth rates are also available from your local Teagasc office.

**Rule of thumb**

To convert weight of grass (in grammes) to paddock cover kg/DM/ha multiply by

<table>
<thead>
<tr>
<th>DM%</th>
<th>12.5</th>
<th>15.0</th>
<th>17.5</th>
<th>20.0</th>
<th>22.5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>
• This can be completed on the Table below (example in the first line):

<table>
<thead>
<tr>
<th>Paddock</th>
<th>DM yield (kg DM/ha)</th>
<th>Area (ha)</th>
<th>Total Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1400</td>
<td>X 1.8</td>
<td>X</td>
</tr>
</tbody>
</table>

X =

Sum the next two columns (A) (B)

To calculate farm cover:

• Divide the sum of the quantity of grass on the farm by the total area
  e.g. 10,000kg (grass on the farm) ÷ 20ha = 500kg DM/ha.

How should I manage reseeding?

RESEEDING PASTURES

Checklist

Reasons to reseed

• It is very difficult to achieve high grass yields and high animal performance in pastures which do not have a high proportion of perennial ryegrass (PRG).
• Many Irish fields have large levels of old permanent pasture and insufficient PRG in the sward.
• High PRG swards can produce three tonnes more DM/ha than old permanent pasture.
• Old permanent pastures with low levels of PRG give a 25% poorer response to nutrients than PRG swards.
• The majority of the difference in DM yield between high PRG swards and old permanent pasture swards is accounted for up to mid May.
• A low proportion of perennial ryegrass in the sward is costing dairy farmers €300/ha in loss of DM production during the growing season.
• Pastures with <65% perennial ryegrass should be reseeded.

Key facts

• High PRG swards will yield an additional 10kg of grass dry matter per kg of nitrogen used compared to old permanent pastures.
• High PRG swards allow 8% higher milk output per hectare compared to old permanent pasture.

Alternatives

Spring or autumn reseeding?

Spring reseeding

• A spring reseed will produce as much grass dry matter in the year of establishment as old permanent pasture.
• Establishing clover in a spring reseed is more reliable than autumn due to the stability of soil temperatures in late spring.
• The sward will return to production faster following spring reseeding compared to autumn reseeding.
• It is possible to ‘turnaround’ the sward in 60 days.

Key fact

Cultivations can begin 7–10 days after spraying off the old sward.

Reseeding cost

Reseeding is a costly but worthwhile investment – see indicative cost in Table 4. Newly reseeded swards should last for at least 8–10 years.

Table 4. Conventional method reseeding costs (estimates)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost (£/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray</td>
<td>20</td>
</tr>
<tr>
<td>Glyphosate application pre-cultivation</td>
<td>16</td>
</tr>
<tr>
<td>Ploughing (30)/Till &amp; sowing (one pass)(30)</td>
<td>60</td>
</tr>
<tr>
<td>Fertiliser (2 bags x 10:10:20)</td>
<td>37</td>
</tr>
<tr>
<td>Fertiliser spreading</td>
<td>10</td>
</tr>
<tr>
<td>Levelling</td>
<td>10</td>
</tr>
<tr>
<td>Rolling</td>
<td>10</td>
</tr>
<tr>
<td>Grass seed</td>
<td>50</td>
</tr>
<tr>
<td>Total Costs (excl. sprays)</td>
<td>213</td>
</tr>
<tr>
<td>(ex-post emergence sprays – depends on what farmers choose to use)</td>
<td>€526/Ha</td>
</tr>
<tr>
<td>Post emergence herbicide sprays</td>
<td>€10-30/acre</td>
</tr>
</tbody>
</table>
Managing your Grass

How to Choose varieties

- Combine three to four varieties of differing traits to obtain good seasonal DM production (spring/autumn) and high sward density.
- In a silage mix, high overall DM production and density are the key targets. Silage mixes should not be used where swards are used mainly for grazing.
- A small range in heading dates (e.g. 7-10 days) is preferable to shortening the heading period. All varieties will head, however some have a greater tendency to head and continue to re-head, which is not desirable in a grazing sward.
- There are two recommended lists available in Ireland, from DAFM and AFBI www.agriculture.gov.ie, afbini.gov.uk.
- There is little to be gained from sowing less than 3kg of individual varieties within seed mixes.

Clover

- Clover should be incorporated into grazing swards, as it can reduce fertiliser costs mid-season, and left out of swards designed for intensive silage harvests. At stocking rates below two livestock units/ha clover has a major role to play.
- Small leaf varieties are lower yielding, but more persistent than large leaf varieties and vice versa, while medium-leaf varieties are intermediate in terms of yield and persistency.
- In grazing swards, small and medium leaf clover varieties are recommended in combination with late heading perennial ryegrass varieties.
- Take care with the larger leafed clovers as their aggressive growth habit dominates swards over time. Varieties with high yield potential and good grazing persistence at both high and low nitrogen levels should be used.

How to Create a grass seed mixture

- No single grass variety has all the desired agronomic traits and a grass seed mix can address this. Within the first 11 months after sowing, the cultivar hierarchy will be established.
- Only grass cultivars which have been tested on recommended lists (DAFM or AFBI) should be used in mixes.
- Ensure spring and autumn production, mid-season DM production is consistent across varieties and a more flattened grass supply is advantageous (more grass in spring and autumn and less surplus mid-season).
- Ensure sward quality – better than the average value.
- Choose varieties with a narrow range of heading dates.
- Adequate ground cover is a major requirement on wetter soils.

Key points

- 3-4 varieties in a mix.
- Sow 14–15kg per acre/(36kg/ha).
- Post-emergence spray is crucial.

Grazing specific mixtures

- 33% tetraploid.
- Late heading.
- Select varieties with high spring growth to extend the grazing season.
- Medium or large leaf clovers have a role at low stocking rates.

Silage ground

- Increase tetraploids to 40%.
- Choose intermediate heading varieties.
- Avoid clover on silage ground.

See also Appendix on the Pasture Profit Index at the end of the manual.
High-Quality Round Bales of Silage
by Abigail Ryan

Introduction
Making high-quality bales is a tool to manage grass during the main grass growing season. Removing grass surpluses as round bales helps to keep grass in the cow milking area at the desired rotation length of 18-21 days during the summer and provides a high-quality supplement for feeding during periods of grass shortage.

1. What is the difference between the high-quality bale and the conventional bale of silage?
2. When should you feed your cows these high-quality bales?
What is the difference between the high-quality bale and the conventional bale of silage?

The high-quality bale is grass cut and baled after 21–30 days growth during the April to August period. They are generally cut at a cover of 2,000 to 2,800kg DM/ha. The high-quality bale can be fed to the cow during her lactation. These high-quality bales will not cause a drop in milk solids. The grass regrowths will appear a few days after the bales are removed. The cow will have high-quality grass ready to be eaten again on this paddock in 18 to 21 days. An ordinary silage bale consists of grass harvested after a longer growing period (35–42 days) and is used for winter feed when the cow is dry.

When should you feed these high-quality bales?

- Periods of poor grass growth when grass is in short supply: this can be in cold weather, or prolonged periods of dry weather.
- During very wet weather these high-quality bales will increase the dry matter in the cow’s diet.
- Bales can be fed in early spring with grass instead of pit silage or meal if there is a shortage of grass; it will increase milk solids.
- They can be fed in late lactation with grass instead of pit silage; this also keeps milk solids higher than if they were being fed pit silage.

Tips on the management of the high-quality bale of silage.

<table>
<thead>
<tr>
<th>Cut the bale</th>
<th>Store the bale</th>
<th>Feed the bale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don’t cut the grass if it has a cover &lt;1,800kg DM/ha as it can be difficult to rake into a bale and the bales will be very saggy.</td>
<td>Mark the high-quality bales in your storage area so you will know them from the ordinary bales of silage.</td>
<td>The average weight of the bale is 200-240kg DM. One bale would give 50 cows 4kg DM/cow approx. Weigh your bale to get an estimate of the weight.</td>
</tr>
<tr>
<td>To increase the quality of the bale, cut the silage in the afternoon and leave to wilt for 24 hours in dry weather.</td>
<td>Don’t open more bales than you require as they will go ‘off’ quickly.</td>
<td>Bales can be fed in a ring feeder in the collecting yard or in the yard as cows leave the parlour. If your feeding area is close to the parlour then the bales can be placed here and the cows can eat them before returning to the paddock.</td>
</tr>
<tr>
<td>Yield usually 3–4 bales/acre. Aim to have 100–150 high quality bales per 100 cows each year (surplus to winter feed)</td>
<td>They can be fed back to cows after three weeks.</td>
<td>Reintroduce the strip wire if feeding high amounts of these bale: (1) to ration the grass (2) to make sure the cows are not wasting the grass.</td>
</tr>
</tbody>
</table>
Table 1. Cost of producing high-quality bales in mid-season. (Estimates)

<table>
<thead>
<tr>
<th>Costs</th>
<th>€/bale including all costs</th>
<th>€/bale excluding fertilizer &amp; land charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertiliser</td>
<td>7.0</td>
<td>0</td>
</tr>
<tr>
<td>Cutting</td>
<td>8.0</td>
<td>8</td>
</tr>
<tr>
<td>Tedding</td>
<td>4.0</td>
<td>4</td>
</tr>
<tr>
<td>Baling &amp; wrapping</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Land charge</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Total costs</td>
<td>37</td>
<td>24</td>
</tr>
<tr>
<td>/t</td>
<td>55</td>
<td>36</td>
</tr>
<tr>
<td>/t DM</td>
<td>183</td>
<td>120</td>
</tr>
</tbody>
</table>

Table 2. Relative cost of supplement options

<table>
<thead>
<tr>
<th>Costs</th>
<th>Cost /t DM</th>
<th>Energy Content UFL/kg DM</th>
<th>Cost per €/1,000 UFL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentrate (€250/t)</td>
<td>247</td>
<td>1.10</td>
<td>261</td>
</tr>
<tr>
<td>Citrus (€220/t)</td>
<td>253</td>
<td>1.16</td>
<td>218</td>
</tr>
<tr>
<td>Forage Maize</td>
<td>157</td>
<td>0.80</td>
<td>196</td>
</tr>
<tr>
<td>Baled silage (including full costs)</td>
<td>183</td>
<td>0.87</td>
<td>210</td>
</tr>
<tr>
<td>Baled silage (excl. fertiliser &amp; land charge)</td>
<td>120</td>
<td>0.87</td>
<td>138</td>
</tr>
</tbody>
</table>