Grassland Farmer of the Year 2018
Regional Winner
Farrell’s Farm, Kilmessan, Co. Meath
Tuesday 26th March 2019
Grass10 Campaign: The Role of Grazed Grass

Grazed grass is the cheapest and most widespread feed for ruminant production systems in Ireland. Grass enables low-cost animal production and promotes a sustainable, green, and high quality image of milk production across the world. Recent industry reports (Food Harvest 2020 and Food Wise 2025) have highlighted the important role grass can play in an expanding milk production industry. Through a combination of climate and soil type, Ireland possesses the ability to grow large quantities of high quality grass and convert it through the grazing animals into high quality grass based milk and meat products.

Our competitive advantage in milk production can be explained by the relative cost of grass, silage and concentrate feeds. Therefore, increased focus on grass production and efficient utilisation of that grass should be the main driver for expansion of the livestock sector. An analysis of farms completing both grassland measurement in PastureBase Ireland and a Profit Monitor demonstrated increased profit of €173/ha for every 1 tonne DM/ha increase in grass utilised. It should be noted that issues such as environmental sustainability (carbon footprint, nutrient use efficiency, etc.) are also improved by increased grass utilisation.

Future growth in the pasture based milk production in Ireland will depend on an effective grass-based system. However, Irish farmers are not using grass to best effect and there is thus a need to (1) increase grass production and (2) ensure efficient utilisation of that grass.
Introduction and welcome to the Farrell Farm

Farm: 140 ha

Home: Mostly in one block with a public road dividing the land.

The milking platform is 100ha and is split by a public road.

A recent development has been contract rearing out of the replacements which has freed up all of the land for milk production.

Milk is supplied to Glanbia.

Background

Peter Farrell is the 3rd generation to farm at Kilmessan; his father David started farming at Kilmessan in 1950’s and concentrated on winter milk production, beef and sheep enterprises. The farm over time concentrated on dairying with Friesian bulls being brought to beef. The beef unit while back then was further out from the parlour now is adjacent to the new parlour and with a few minor alterations acts as an ideal calf shed.

Historically, the farm was mainly involved in liquid milk production.

Peter Farrell returned farming in 2009 and in 2016 completed the Nuffield Scholar programme. The study concentrated on milk price volatility and risk management. Peter found this to be an excellent learning opportunity and has given many presentations on this topic.

Peter has a degree in Engineering and completed the green cert programme with Teagasc in 2011.

Farm History: Dairying

The farm has grown in recent years with the leasing of land that was adjacent to the existing farm. Production per cow was always high as the farm concentrated on liquid milk production. However the stocking rate has increased in recent years, coupled with freeing up more land through contract rearing and the herd maturing has seen a substantial increase in solids produced per ha.

There is considerable work done in achieving as high as possible 6 week calving rate; this stood at 89% in 2018 and Peter contributes this to achieving a high solids per ha.

The table below shows how production has evolved over recent times:
<table>
<thead>
<tr>
<th>Cow Numbers:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td><strong>Cows</strong></td>
</tr>
<tr>
<td><strong>Farm Stocking Rate (LU/ha)</strong></td>
</tr>
<tr>
<td><strong>Milk Solids/cow</strong></td>
</tr>
<tr>
<td><strong>Milk Solids (kg)/Ha over Whole Farm</strong></td>
</tr>
</tbody>
</table>

The expansion in cow numbers in recent years has seen the yard being transformed with new cubicle sheds being built and a new 24 unit parlour completed in 2015. The old yard now accommodates the dry cows and some of the replacement heifers. Both yards combined form one compact yard that has excellent cow flow throughout.

**Grass Management**

The farm was a monitor farm under the Glanbia joint programme for 3 years from 2013 to 2015. We began measuring grass in 2011 and have continued to do so ever since.

We walk the farm weekly and twice a week in times of high growth. Growth rate, average farm cover and pre-grazing yield are the key figures we use when making decisions.

The weekly farm cover measurement is printed on a white board and located on the wall in the Dairy. The covers and decisions are also uploaded onto a farm what’s app group. This is an essential piece of equipment as all members of the family can clearly view the grass supply on the farm every week and the next paddocks to be grazed.
The farm has all been reseeded over the last 10-15 years and now the policy is to identify the lowest producing paddocks from PastureBase software and to reseed these paddocks.

**Grass Grown (tonnes/Ha):**

<table>
<thead>
<tr>
<th>Year</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>t/Ha</td>
<td>13.5</td>
<td>12.7</td>
<td>15.0</td>
<td>15.3</td>
<td>15.3</td>
<td>15.5</td>
<td>12.8</td>
</tr>
</tbody>
</table>

**Discussion Groups**

Peter is an active member of the Bó na Boinne discussion group and is also a member of the monitor farm discussion group. Derek Fletcher is another key member of the team and is a member of the Dunshaughlin discussion group.
Current Grazing Performance on Dairy Farms

Currently, it is estimated that about 8 tonnes grass DM/ha is utilised nationally on dairy farms (Dillon, 2016). There are major improvements required in areas of pasture production and utilisation. Data from the best commercial grassland farms and research farms indicate that the current level of grass utilised can be increased significantly on dairy farms (greater than 10 t DM/ha utilised – i.e. 14 tons DM/ha grown and 75% utilisation rate).

It is important to recognise that improvements in the level of soil fertility, grazing infrastructure and level of reseeding are in achieving higher levels of grass production and utilisation. However to achieve greater change in the level of grass utilised, farmers will need to upskill their grazing management practices. This means regular measurement of grass cover, using specialised grassland focused software to analyse grass production and, making and implementing grazing management decisions. These are key drivers to increasing grass production on the farm. New technologies are now available which make grass cover assessment and the decision making process much easier.
**Grass10 Campaign**

Grass10 is a new four-year campaign recently launched by Teagasc to promote sustainable grassland excellence. The Grass10 campaign will play an important part in increasing grass growth and utilisation on Irish grassland farms, thereby improving profitability at producer level and helping to ensure the long term sustainability of Irish beef, dairy and sheep production. Significantly, it can provide the platform or framework to enable various industry stakeholders to collaborate for collective action. Given the current performance in terms of grass growth and utilisation, the need for ‘collective action’ should be clear.

**Objective**

The objective of the campaign is to achieve **10 grazing's/paddock/year** utilising **10 tonnes** grass DM/ha. In order to achieve this objective, we will need to achieve significant changes in on-farm practices, specifically:

1. Improved grassland management skills
2. Improved soil fertility
3. Improved grazing infrastructure
4. Improved sward composition
5. Increased grass measurement and usage of PastureBase Ireland

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**Grass grown**

10 grazings x 1,400 kgDM/ha  
= 14 t DM grown/ha

**Soil fertility**  
pH >6.3; P & K ≥ Index 3

**Sward type/reseeding**

**Management incl. measurement**

**Infrastructure**

**Animal Performance**

**Reduced Supplementation**

**Utilisation rate**  
75%

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**10 t DM grass utilised**

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Grass10 Grassland Excellence for Irish Livestock
Grassland Farmer of the Year Competition

With 2017 designated the Year of Sustainable Grassland, and a proven link between increased grass utilization and increased profitability, the Department of Agriculture, Food & the Marine, in collaboration with numerous industry stakeholders including Teagasc, launched a competition as part of the Grass10 initiative to find the Grassland Farmer of the Year. Teagasc research indicates that grass utilisation can be increased significantly on farm.

With this background Grass10 has launched a grassland competition to recognise those farmers who are achieving high levels of grass utilisation in a sustainable manner. Practises used by these famers to increase grass production and utilisation, include soil fertility management, sward renewal, grassland measurement and improving grazing infrastructure.

*The objective of the Grassland Farmer of the Year Competition is to promote grassland excellence for all Irish livestock farmers.*

*The Farrell Family are Regional winners of the Grassland Farmer of the year Competition 2018.*

*Congratulations!!!!!*
Grassland Management

PastureBase Ireland: Technologies to assist grassland management

Technologies which enable data-informed decision-making on the farm can help to increase farmers’ confidence and greatly improve grassland management. Huge leaps have been made in developing decision support tools to improve resource farm efficiency, profitability and sustainability. The primary objective of most of these tools is to increase the information available to assist in farm-management decision making as well as to collect and collate large amounts of data in a centralised database.

Teagasc launched PastureBase Ireland (PBI) – an online grassland management decision support tool – in January 2013 and Grass10 will see the roll-out of the new PastureBase Ireland website as a key component of the campaign. Upon entering data from their own farm (e.g. grass measurements), the platform provides real-time and customised grassland management advice to the farmer to assist their decision-making. These reports are developed in such a way that allows farmers to benchmark their individual farm with farm in their discussion group or in their region. The data accumulated to date indicate that PBI participating farms have achieved improvements in grass DM production and grazing management.

PastureBase Ireland is informing us that farmers need to have a good control of current grass supply in order to manage grass well. Grass cannot be managed correctly without knowledge of farm cover, grass demand and grass growth. The crucial point on any farm is utilising the feed resource produced on the farm.

The average number of grass measurements by the finalists was 35 per year. This shows that the farmers are constantly monitoring grass growth and supply which enables them to graze grass at the right cover which in turn allows them to grow more grass as re-growths are faster. The table below outlines the average grazing performance of the Farrell farm.
Grazing performance of Farrell farm

<table>
<thead>
<tr>
<th>Grazing Performance</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass production (t DM/ha)</td>
<td>15.5</td>
<td>12.8</td>
</tr>
<tr>
<td>No. grass measures completed/yr</td>
<td>34</td>
<td>37</td>
</tr>
<tr>
<td>No. of grazings/events per PDK/year</td>
<td>10.7</td>
<td>8.7</td>
</tr>
<tr>
<td>Days at grass</td>
<td>305</td>
<td>280</td>
</tr>
</tbody>
</table>

The average number of grazings being achieved was 11 including the paddocks cut for silage as well as grazing. Maximising the number of grazing’s achieved on each paddock is a very effective method of increasing farm grass utilisation. Every extra grazing/paddock achieved increases annual grass DM production by 1.5 t DM/ha PastureBase Ireland enables the farmer to keep track of grass growth per paddock, the number of grazing’s per paddock and the quantity of grass being consumed at each grazing. This highlights poor performing paddocks and deficiencies in grazing management.

Farm Performance

The Farrell family are farming about 140ha of land of which about 75% is leased. Since 2008 the herd size has increased from 100 cows to 350+ cows today. In 2018, a stocking rate of 2.7 LU/ha was carried on the whole farm.

This focus of output and profit on this farm is stemmed from high grass utilisation. The Farrell’s plan to feed 750kgs meal/cow in 2019 similar to 2017 levels (1480kg/cow in 2018) and the rest of the herds’ diet was made up of grazed grass and grass silage. The farm sold over 500kgs milk solids/cow to Glanbia in 2018 or over 1200kgs milk solids/ha from the whole farm.

As with high grass utilization good herd genetics has also a role to play in the high performance of this farm. The herd EBI of this herd is about €125. The six week calving rate has hovered around 85-90% over the last few years. Compact calving is key to profitability where the Farrell’s can get high numbers of cows to grass early in the spring, which increases the value of milk sales and reduces feed costs. Getting high volumes of cows out to grass in February is first key step to achieving ten rotations. Having very good grazing infrastructure in place is essential to maximise the amount of grass eaten on the farm.
Soil Fertility Management

Good productive soils are the foundation of any successful farming system and key for growing sufficient high quality grass to feed the herd. Therefore, the management of soil fertility levels should be a primary objective of every farm. A recent review of soils tested at Teagasc indicates that the majority of soils in Ireland are below the target levels for pH (i.e. 6.3) or P and K (i.e. Index 3) and will be very responsive to application of lime, P & K. On many farms sub-optimal soil fertility will lead to a drop in output and income if allowed to continue. Teagasc is highlighting 5 steps for effective soil fertility management.

1. Have soil analysis results for the whole farm (soil sampling every 2 years).
2. Apply lime as required to increase soil pH up to target pH for the crop
3. Aim to have soil test P and K in the target Index 3 in all fields
4. Use organic fertilisers as efficiently as possible
5. Make sure the fertilisers used are properly balanced

For those farmers aiming to improve soil fertility on their farms, following these 5 steps provides a solid basis for success.
Phosphorus (P)

The proportion of soils tested with low soil P fertility (i.e. P Index 1 and 2) has increased to approximately 62%. This overall trend reflects the soil P fertility status on many farms, and indicates a serious loss in potential productivity. Recent research has shown that soils with P index 3 will grow approximately 1.5 t dry matter (DM)/ha per year more grass than soils with P Index 1. Most of the DM yield response in these experiments took place in spring and early summer.

Potassium (K)

Soil analysis also shows that the trend in soil K status, across dairy and drystock enterprises, broadly mirrors that for P. Despite no legislative limits on K fertilisers, K usage dropped in line with P fertiliser applications. Consequently soil test results indicate a sharp increase in soils with low K status between. Over half of the soil samples tested by Teagasc had very low to low soil K status (i.e. K Index 1 or 2)

Increasing Soil Nutrient Availability-Lime

Lime is a soil conditioner and corrects soils acidity by neutralising the acids present and allowing the micro-organisms and earthworms to thrive and break down plant residues, animal manures and organic matter. This helps to release stored soil nutrients such as nitrogen (N) phosphorus (P) potassium (K) sulphur (S) and micro-nutrients for plant uptake. In addition, ryegrass and clover swards will persist for longer after reseeding where soil pH has been maintained close to the target levels through regular lime applications.

Liming acidic soils to correct soil pH will result in the following:

- Increased grass and crop production annually
- Increase the release of soil N by up to 60 units N/acre/year
- Increase the availability of soil P and K and micronutrients
- Increase the response to freshly applied N, P & K as either manures or fertiliser

Ground limestone is the most cost effective source of lime and can be applied throughout the year when the opportunity arises. Lime is the foundation of soil fertility and is a primary step to take when correcting soil fertility.
Investing in Grazing

In order for expansion to be successful, there will be a requirement for significant investment on many farms. The available capital for this investment will be scarce as expansion happens and continues. Therefore, investment on farm should be prioritised at areas that increase efficiency and reduce the exposure of the business to external shocks such as lower price of product or higher price of inputs etc. All investments that give the highest returns should be prioritised.

Every ton of additional grass eaten by the grazing animal will add €180/ha additional profit to a dairy farm. Therefore it is important that investment in grazing is prioritised to give the maximum return. The table below summarises the potential return on investment for different investments in a dairy farm business. Bottom Line: The level of return to these investments is high because it is investing in grazing. These investments will either enable the farm to grow more grass or lengthen the grazing season or both.

<table>
<thead>
<tr>
<th>Investment</th>
<th>Cost</th>
<th>Impact</th>
<th>Annual Return (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase soil P &amp; K levels</td>
<td>P &amp; K application of 20 and 50kg/ha</td>
<td>+1.5 t DM/ha/year grass growth</td>
<td>152</td>
</tr>
<tr>
<td>Reseed full farm in eight year cycle</td>
<td>€650/ha</td>
<td>+ 1.5t DM/ha/year grass growth</td>
<td>96</td>
</tr>
<tr>
<td>Improve grazing infrastructure</td>
<td>€1,000/ha for roads, fencing and water</td>
<td>+ 1.0 t DM/ha/year grass eaten/utilised</td>
<td>58</td>
</tr>
</tbody>
</table>
The need for reseeding

As grass is our main feed during the main grazing season, and the primary source of winter forage in the form of grass silage, the low level of reseeding must be addressed. Reseeding must be combined with managing, and where necessary increasing, soil fertility. Ireland will continue to increase milk production and the focus on efficient production of this milk is critical to maintain our industry competitiveness. Teagasc have developed a national grassland database (PastureBase Ireland), and the initial results show that there is huge capacity on Irish farms to grow more grass. The objective of this handbook is to outline the key points in grassland reseeding and to ensure farmers making the investment in renovating grassland get the best possible result.

Why reseed?

Productive grassland farms must have perennial ryegrass dominated swards. Recent Moorepark research shows that old permanent pasture produces, on average, 3 t DM/ha per year less than perennial ryegrass dominated swards. Old permanent pasture is up to 25% less responsive to available nutrients such as nitrogen than a perennial ryegrass dominated sward. Reseeding is a highly cost effective investment. With regular reseeding the grass growth capacity of the farm can be increased substantially and the annual return of investment is large.
Objectives of reseeding are to create swards that:

1. Increase the overall productivity of the farm
2. Increase grass quality
3. Are responsive to fertiliser - at least 10 kg DM/kg N applied
4. Allow higher animal output - 8% higher milk output per hectare relative to permanent pasture
5. Increase grass utilisation
6. Reduce silage requirement
7. Increase the productivity of the farm (carry a higher stocking rate)
8. Can allow clover to establish

Reseeding Checklist

- Identify paddocks for reseeding (poorer performing paddocks; low perennial ryegrass content)
- Soil test and lime
- Sowing date
- Method of reseeding
- Spray off paddock
- When cultivating - prepare a good seed bed
- Choose appropriate grass cultivars
- Sowing rate
- Roll
- Slug and other pests
- Control weeds early
- Graze at 2 leaf stage
- Avoid poaching and over grazing

Cultivation techniques

How paddocks are prepared for reseeding depends on soil type, amount of underlying stone and machine/contractor availability. There are many different cultivation and sowing methods available. All methods, when completed correctly, are equally effective.

Key points

- Spray off old sward
- Graze sward tightly or mow to minimise surface trash
- Apply lime
- Choose a method that suits your farm
- Soil test
- Firm fine seedbed with good seed/soil contact is essential
- Roll after sowing
Cultivation techniques

<table>
<thead>
<tr>
<th></th>
<th><strong>Do’s</strong></th>
<th><strong>Do not's</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ploughing</td>
<td>Shallow plough. Develop a fine, firm and level seedbed</td>
<td>Plough too deep (&gt;15 cm). Cloddy, loose seedbed</td>
</tr>
<tr>
<td>Disking</td>
<td>Graze tight, apply lime. 3-4 runs in angled directions</td>
<td>Forward speed too fast - rough, uneven seedbed</td>
</tr>
<tr>
<td>One-pass</td>
<td>Graze tight, apply lime. Slow forward speed at cultivation</td>
<td>Forward speed too fast – rough, patchy seedbed</td>
</tr>
<tr>
<td>Direct drill</td>
<td>Graze tight, apply lime and slug pellets. Wait for moist ground conditions (slight cut in ground)</td>
<td>‘Trashy’ seedbed - no seed/soil contact. Use when ground is dry and hard</td>
</tr>
</tbody>
</table>

Variety choice

The DAFM publish the recommended list, showing the Pasture Profit Index values and agronomic values of the evaluation on the same table (see https://www.teagasc.ie/crops/grassland/pasture-profit-index/).

The Recommended List has evaluated varieties across years and sites and is the only evidence available of the potential performance of grass cultivars in Ireland. Using varieties not on this list is basically poor decision making, as is buying grass seed on price. The varieties you use on the farm, will be there for 8-12 years, choosing to use cheap mixes, with non-recommended varieties will increase the chances of those varieties failing to perform on the farm.

When the decision to reseed is made, the next major decision is selecting the most appropriate grass variety or varieties. The first thing to consider is the primary target use of the field. Is it predominantly grazing or is it generally used as a silage paddock? How much tetraploid should be used? A balance between quality, dry matter productivity and sward density is generally what must be achieved.
The key traits in a seasonal grass based production system are:

- High quality
- High seasonal production
- Good persistency score

Differences between diploid and tetraploid varieties

<table>
<thead>
<tr>
<th>Tetraploid varieties</th>
<th>Diploid varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tall upright growth habit</td>
<td>Prostrate growth habit</td>
</tr>
<tr>
<td>Create more ‘open’ sward</td>
<td>Create a denser sward with less “open” spaces</td>
</tr>
<tr>
<td>Higher digestibility value</td>
<td>Generally lower digestibility and yield</td>
</tr>
</tbody>
</table>

Combining diploids and tetraploids in a mixture will create a dense, high quality sward – ensure you select varieties which express high performance in the key traits. Increasing the proportion of diploids on heavier soils is recommended to create better ground cover. However, tetraploids should be used on heavy soils. Choosing all dense varieties will compromise DM production and grazing utilisation.

Key points when formulating a grass mixture

- Decide what the end use is – **grazing or silage** – formulate based on this
- Focus on the key traits increase the proportion of the varieties with the key traits
- Minimum of 3 kg of an individual variety
- There should be no more than three to four variety in a grass mix
- Sow 35 kg/ha (14 kg/ac) of seed
- Less than 7 days range in heading date between varieties

Grazing specific mixtures

- Varieties exhibiting high seasonal (Spring and Autumn) PPI values
- Varieties with high quality sub index values
- Use 40-50 per cent tetraploid varieties in mixtures on dry soils
- Use 15-20 per cent of highly persistent tetraploids on heavy soils
- Small/Medium leaf white clovers for dairy cows/cattle, small leaf white clovers for sheep
Silage specific mixtures, e.g. 2-cut system

- Varieties which have high silage sub index values
- High level of tetraploid (40%)
- Ensure proximity of heading dates
- Avoid low silage sub index diploids and poorly persistent tetraploids

Choosing the right white clover cultivar

White clover is used in grazed grassland. White clover cultivars are categorised by leaf size.

Small leaf white clover
- Lower yielding
- More persistent
- Tolerant of tight grazing, e.g. sheep grazing

Medium leaf white clover
- Intermediate for yield and persistency
- Suitable for cattle grazing

Large leaf white clover
- Higher yielding
- Aggressive and can dominate a sward

Small leaf white clovers are recommended for sheep grazing and medium leaf white clovers for dairy or beef cattle grazing.

In general to establish a sward with >25% white clover, which is the level required for an animal production benefit, 4 kg white clover seed/ha (1.5 kg/ac) should be included in the seed mix.
**Management of Reseeded Swards**

It takes about 11 months for a new sward to establish and settle down; therefore the management of the reseed in this period is important.

**Management of New Reseeds**

<table>
<thead>
<tr>
<th></th>
<th>Do’s</th>
<th>Do not’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 8 weeks</td>
<td>Graze at 2-3 leaf stage</td>
<td>Graze at high cover (&gt;1400 kg DM/ha)</td>
</tr>
<tr>
<td></td>
<td>Spray weeds before grazing</td>
<td>Do not harvest for silage</td>
</tr>
<tr>
<td></td>
<td>Nitrogen and P &amp; K</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slug pellets (if required)</td>
<td></td>
</tr>
<tr>
<td>Second grazing onwards</td>
<td>Graze at 1,200 - 1,600 kg DM/ha (6-8 cm)</td>
<td>Allow high covers to develop</td>
</tr>
<tr>
<td></td>
<td>Re-spray weeds if necessary</td>
<td>Graze in really dry or wet conditions</td>
</tr>
<tr>
<td>Autumn</td>
<td>Keep grazing at 1,200 - 1,600 kg DM/ha</td>
<td>Overgraze or poach</td>
</tr>
<tr>
<td></td>
<td>Graze off well before first winter (&gt;4 cm)</td>
<td>Apply excessive slurry</td>
</tr>
<tr>
<td></td>
<td>Light slurry application</td>
<td></td>
</tr>
<tr>
<td>Second year</td>
<td>Ensure the new sward receives adequate nitrogen</td>
<td>Overgraze or poach</td>
</tr>
<tr>
<td></td>
<td>Monitor soil P and K status</td>
<td></td>
</tr>
</tbody>
</table>
Graze the new reseed as soon as the plants do not pull out of the ground. Plants will normally be 6 – 8 cm high. It is especially important that autumn reseeds are grazed before the first winter.

The first grazing does not have to be completed by the main grazing herd, calves or young stock may be a better option, particularly during poor grazing conditions.

All the benefits of reseeding can be lost after sowing due to:

- Poor soil fertility - poor establishment and tillering
- Grazing at high grass covers or cutting for silage – tiller/plant death
- Weed infestation (especially docks) – loss of ground cover
- Pest attack (frit fly, leatherjackets and slugs) – tiller/plant death

Tillering

- Tillering is the production of new grass plants by the main grass plant established from the seed
- The process of grass tillering is critical for successful sward establishment
- Tillering helps reduce the space available for weeds
- To encourage tillering:
  - Apply 40 kg N/ha 3-4 weeks after sowing
  - Graze the reseed when it is about 6-8 cm high
  - Continue to graze the reseed in the first year of production
  - Avoid cutting the new reseed for silage in the first year (if possible)
Weed Control

- Weeds in new reseeds are best controlled when the grass is at the 2-3 leaf stage
- Docks and chickweed are the two most critical weeds to control in reseeds
- High populations of other weeds such as fat hen, charlock, redshank, and mayweed can cause problems.
- It is essential to control docks and chickweed at the seedling stage and this is achieved by applying a herbicide before the first grazing
- To achieve the best lifetime control of docks in a sward, eradicating the dock at seedling stage in a reseed is the best opportunity
- Herbicide choice for dock control will depend on the presence of clover in the reseed (see Herbicide Guide)
- Chickweed can be a problem particularly where regular grazing is not expected to take place (silage fields), therefore herbicide choice is important
- You should consult your local adviser or merchant representative for correct herbicide choice
- Remember to keep the prescribed cross-compliance records and follow the instructions on the product label

Seedling dock
**Reseeding Investment**

Reseeding is one of the most cost effective investments that can be made on a grassland farm.

<table>
<thead>
<tr>
<th>Projected costs</th>
<th>€/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spraying</td>
<td>10</td>
</tr>
<tr>
<td>Glyphosate (Gallup 360) (Round-up (2 litre/acre)</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 × 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>60</td>
</tr>
<tr>
<td>Post emergence herbicide sprays</td>
<td>30</td>
</tr>
<tr>
<td>Spraying</td>
<td>10</td>
</tr>
<tr>
<td><strong>Costs (ex-post emergence sprays)</strong></td>
<td><strong>253</strong></td>
</tr>
</tbody>
</table>
**Useful Links**

National Recommended List - sources


Teagasc [http://www.teagasc.ie](http://www.teagasc.ie)
Ireland has a very favourable climate for growing its largest crop, grass. To achieve grass growth potential, fertiliser nitrogen (N) is a key input. However, fertiliser nitrogen also plays a role in gaseous N losses and water quality. The Irish government has committed to reduce national losses of both ammonia and the potent greenhouse gas nitrous oxide (Figure 1) while achieving good status for all waters. In relation to gaseous emissions agriculture accounts for 33% of national GHG emission and 98% of ammonia emissions and as a consequence is under the spotlight to reduce emissions. The use of protected urea nitrogen fertiliser is the largest single avenue currently open to Irish agriculture to meet these commitments to reduce GHG and ammonia emissions.

Understanding protected urea and how it works

What is protected urea?
 Protected urea is urea which is treated with an active ingredient called a urease inhibitor. The urease inhibitor can be either a) coated onto the outside of the fertiliser granule or b) incorporated into the urea granule melt during manufacture.

How does a urease inhibitor work and what role does it play in stopping ammonia loss?
 Urease is the enzyme which catalyses the conversion of urea to ammonium. It is during this conversion that ammonia gas is lost from untreated urea (Figure 2). A urease inhibitor
blocks the active site of the urease enzyme. This moderates the rate at which urea converts to ammonium. In so doing ammonia loss is reduced to low levels.

Figure 2. Conversion of nitrogen forms and N loss avenues

Won’t a slowing of the conversion from urea affect the availability of N for the grass crop? No, because the conversion of protected urea to ammonium begins as soon as the fertiliser granule starts to melt. The urease inhibitor moderates the rate at which the urea-N converts to ammonium. The result is that the conversion occurs over period of a few days rather than a few hours, as would be the case with conventional urea. Remember, when fertiliser N is applied to soil its aim is to supply the grass or crop with N over a period of days to weeks rather than hours.

Are there different urease inhibitors used to manufacture protected urea? What are they? Yes, the following products are recognised as acting effectively as urease inhibitors: a) NBPT b) 2-NPT, c) NBPT+NPPT. Teagasc has conducted research with all three inhibitor options, most extensively with NBPT and NBPT+NPPT.

Are these approved for use in Ireland? Yes, these active ingredients are approved for use by the European Chemicals Agency through the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) process.

Can I spread protected urea throughout the growing season? Yes, you can spread protected urea across the growing season at times when you would otherwise spread calcium ammonium nitrate (CAN) or unprotected urea. This may potentially simplify the fertiliser spreading programme on the farm and setting up of fertiliser spreader for only 1 straight N product each year.

Protected urea effects on production

Will using protected urea reduce yields?
No, published Teagasc trials (Figure 3) have shown that protected urea consistently yields as well as CAN in Irish grasslands with no difference in annual production between the two fertilisers.

![Summary of 30 application timings at 3 sites over 2 years](image)

**Figure 3. Summary of total annual grass dry matter yield (kg/ha) for CAN and protected urea evaluated across 2 growing seasons (2 years) on three soils (locations)**

**Will using protected urea reduce efficiency?**

No, published Teagasc trials conducted in different areas of Ireland have shown that the nitrogen recovery efficiency of protected urea and CAN are consistently the same (Figure 4).
Summary of 30 application timings at 3 sites over 2 years

Figure 3. Summary of N recovery (off take kg/ha N) for CAN and protected urea evaluated on 30 occasions (application timings) conducted across the growing season on three soils over two years.

Is protected urea cost effective?
Is protected urea more costly?
On 14 March 2019 the following costs detailed in Table 1 were quoted. These costs show protected urea to be less costly than CAN while performing just as well in terms of yield (Figure 2) and N recovery efficiency (Figure 3). Bear in mind that fertiliser costs fluctuate but always make the cost comparison on the basis of cost per kg N for straight N products Table 1. Prices in € per tonne fertiliser and € per kg N delivered for the three main fertiliser N types available as per 14 March 2019

<table>
<thead>
<tr>
<th>Fertiliser N product</th>
<th>N content (%)</th>
<th>Cost per tonne (€)</th>
<th>Cost/kg N (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>46%</td>
<td>391</td>
<td>0.85</td>
</tr>
<tr>
<td>Protected urea</td>
<td>46%</td>
<td>437</td>
<td>0.95</td>
</tr>
<tr>
<td>CAN</td>
<td>27%</td>
<td>284</td>
<td>1.05</td>
</tr>
</tbody>
</table>
Does protected urea reduce Emissions?
Does protected urea reduce loss of the potent greenhouse gas nitrous oxide?
Yes, published Teagasc trials have shown that protected urea has 71% lower nitrous oxide emissions than CAN (Figure 4).

![Figure 4. Effect of fertiliser N selection on emissions of the potent greenhouse gas nitrous oxide (N₂O)](image)

Does protected urea reduce loss of Ammonia?
Yes, based on published Teagasc research protected urea has comparable ammonia loss to CAN and ammonia loss is reduced by 79% compared to urea (Figure 5).
Is there potential for protected urea to reduce nitrate loss to water?
Yes, during periods when leaching occurs nitrate present in the soil is vulnerable to leaching loss. Protected urea does not deliver N directly as nitrate to the soil, therefore reducing the risk of nitrate losses occurring with rainfall post fertiliser application. Reduced ammonia loss compared to urea will also reduce the risk of ammonia N being deposited from the atmosphere onto sensitive habitats or into sensitive water bodies.

Summary
Use of protected urea can reduce agricultural greenhouse gas emissions and ammonia emissions while maintaining yield and saving cost.

Table 2. Relative greenhouse gas and ammonia emissions from three N fertilisers