The Beef Carbon Navigator
Improving carbon efficiency on Irish beef farms

The Farm Carbon Navigator was developed by Teagasc and Bord Bia as an advisory tool to support the roll out of Origin Green at farm level.

www.qas.bordbia.ie
Agriculture accounts for approximately 30% of Irish greenhouse gas production with most of the remainder being contributed by the transport and domestic sectors. Ireland is committed to reduce GHG emissions by 20% by 2020.

- Agricultural emissions are in steady decline and are 9% lower than 1990.
- The Irish grass based beef production systems are relatively carbon efficient.
- The three main greenhouse gasses from agriculture are:
  
  **Methane** - From rumen fermentation and slurry storage. Methane is 25 times more potent than carbon dioxide. It accounts for almost 2/3 of agricultural GHGs.

  **Nitrous Oxide** - From organic and chemical nitrogen fertiliser and excreted N. It is 300 times more potent than carbon dioxide. It accounts for almost 1/3 of agricultural emissions

  **Carbon Dioxide** - Associated with the use of fossil fuels for energy and the manufacture of fertiliser. It accounts for a relatively small proportion of agricultural emissions

With the expected increase in cow numbers and dairy output post 2015 the industry faces a challenge to reduce its carbon footprint.

While agricultural GHG emissions are difficult to reduce farmers who adopt a number of practices and technologies can significantly improve efficiency, improve profitability and lower GHG emissions.
Slurry Management

Increases beef efficiency reduces GHG footprint and increases income

Reductions in agricultural emissions per unit of output can be achieved by improving farm efficiency. The Beef Carbon Navigator focuses on the 6 win-win efficiency measures that reduce GHG emissions and increase profit.

- Longer grazing season
- Lower age at first calving
- Increased Calving Rate
- Improved Growth Rate
- Improved nitrogen use efficiency
- Improved slurry management

The Beef Carbon Navigator is linked to the Bord Bia BLQAS database and data required for the completion of the current values is mostly captured by the BLQAS auditors during their inspection visits. This is used to assess the performance of the farm against peers. It rates performance from poor to excellent as shown in the graphic. The orange bar reflects current performance.

Working with an adviser you can set targets for improvement. The Carbon Navigator estimates the % reduction in enterprise GHG emissions that will result from the achievement of the targets. While the individual amounts for each measure may seem small the overall impact can be very significant. The final column shows the financial benefit from reaching the target.

Achieving Targets A key aspect of the programme is the advice on what the farmer needs to put in place to achieve the targets. This is set out in a pre-populated page highlighting the key actions in respect of each of the measures.
The Carbon Navigator report compares your farm performance with other similar farms and highlights the potential impact on income and GHG emissions of reaching the targets set.

<table>
<thead>
<tr>
<th>Overall Impact</th>
<th>GHG Change</th>
<th>€ Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-16.9%</strong></td>
<td>+€5,654</td>
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</table>

<table>
<thead>
<tr>
<th>Year 2013</th>
<th>Current</th>
<th>Target</th>
<th>Chart</th>
<th>GHG Change</th>
<th>€ Benefit</th>
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<tbody>
<tr>
<td><strong>Grazing Season-Suckler Cows</strong></td>
<td></td>
<td></td>
<td></td>
<td>-1.9%</td>
<td>+€809</td>
</tr>
<tr>
<td>Turnout Date</td>
<td>01 Apr</td>
<td>20 Mar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing Date</td>
<td>01 Nov</td>
<td>10 Nov</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Grazing Season-Yearlings/followers</strong></td>
<td></td>
<td></td>
<td></td>
<td>-1.4%</td>
<td>+€798</td>
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<td>20 Mar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing Date</td>
<td>01 Nov</td>
<td>10 Nov</td>
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<td></td>
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<tr>
<td><strong>Age at First Calving</strong></td>
<td></td>
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<tr>
<td>Age at first calving (months)</td>
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<td>24.00</td>
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<td><strong>Calving Rate</strong></td>
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<tr>
<td><strong>Live Weight Performance</strong></td>
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<td>System Lifetime live weight per day of age (g)</td>
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<td>Steers and Heifers 830.00</td>
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<td></td>
<td></td>
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<tr>
<td><strong>Nitrogen Efficiency</strong></td>
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<td>Total CAN and equivalent N in Compounds (t)</td>
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<td>Total urea used (t)</td>
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<tr>
<td>Total concentrate fed (t)</td>
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<td>Output kg beef live/ha</td>
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<td>600.00</td>
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<tr>
<td><strong>Slurry Spread Timing</strong></td>
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<td>-2.7%</td>
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<tr>
<td>% in Spring % Summer following 1st cut % Later in Summer Application method</td>
<td>20</td>
<td>40</td>
<td>20</td>
<td>60</td>
<td>30</td>
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<tr>
<td>20</td>
<td>60</td>
<td>0</td>
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Extended Grazing

How a longer grazing season lowers the Carbon Footprint

Increasing the grazing season length lowers GHG emissions in two ways

Grazed grass in the early and late grazing season is a higher quality more digestible feed than grass silage leading to improvements in animal productivity as well as reductions in the proportion of dietary energy lost as methane.

The shorter housing season leads to reduced slurry methane (CH4) and nitrous oxide (N2O) emissions from storage. Energy use from spreading is also reduced.

It is estimated that for every 10 Day Increase in Grazing season there is a 1.7% reduction in GHGs and profit is increased by €25 / Cow or €1,000 in a 40 cow herd.

Increasing Grazing Season Length on your Farm

Based on your location and soil type you may have an opportunity to extend your grazing season by improving your grassland management.

- Effective autumn grassland management with attention to minimising damage and achieving correct closing covers is essential for spring growth.

- Early nitrogen is essential for early grass.

- Ensure soil fertility is good—sample your soil and apply fertiliser accordingly.

- Carefully manage early spring grazing, limiting grazing time in wet conditions.

- Monitor grass covers and adjust to ensure good quality grass available to animals at all times.

Excellent grassland management is the key to the profitability and sustainability of Irish beef farms. Sharing experiences in a beef discussion group is the most effective way to improve skills.
Age at First Calving

How a younger age at first calving lowers the Carbon Footprint

The average age at first calving for replacement heifers on Irish suckler herds is 30.5 months while the top 10% of herds achieve an average figure of 26 months. This indicates that there is significant scope for improvement in the vast majority of farms.

- Higher age at first calving increases the lifetime emissions burden of the cow and emissions per kg of beef produced.
- The increased emissions are from enteric fermentation, feed energy and manure management.

The impact of age at first calving is to increase GHG emissions by 0.3% for each month that first calving is greater than 24 months of age. The economic impact of lowering age at first calving by one month is estimated at €50 per cow.

Improving Age at First Calving on your farm

- Replacement heifers need to achieve a high weaning weight by achieving a daily live weight gain of 1.1-1.3kg/day up to weaning.
- They need to gain at 0.6 – 0.7kg/day over the first winter and go to grass early in spring to have them at the correct bulling weight.
- Ideally heifers at bulling should be at 60% of their mature weight.
- With 2 year old calving the selection of an easy calving bull is critical. The objective is to avoid calving difficulty, deliver a live calf and to ensure heifers go back in calf.
- Choose breeding heifers from the best cows in the herd, that were sired by bulls with strong maternal traits and were born early in the calving season.
How a higher calving rate reduces the Carbon Footprint

It is stating the obvious that in any year every cow that does not produce a calf reduces the profitability and increasing the carbon footprint of the rest of the herd. The national average calving rate for suckler cows is approximately 0.83 calves per cow per year.

- Non productive cows continue to produce almost the same emissions and incur the same costs as a producing cow.
- Poor fertility and a protracted calving season also increase work load.

**For a 40 cow herd improving the calving rate by 5% will increase the profitability of the herd by €1720 and reduce GHG emissions by 4%.**

Improving the Calving Rate on your farm

Achieving a consistently high calving rate involves good performance across a wide variety management practices. It begins with having a written plan in place, knowing your current performance and setting targets. The plan should define the calving period and set down clear objectives for calving interval and mortality and work towards achievable targets over a 3 year period. It should focus on:

- Ensuring that cow condition score is appropriate at calving and breeding.
- Reduce calving difficulty particularly through sire selection and feeding management.
- Ensure that your bulls are fertile and in good condition to meet their demands.
- Implement an effective herd health plan including dosing and vaccination regimes and quarantining of purchased animals.
- Use records and reports (ICBF) to identify cows with poor productive performance and cull if necessary.
Improved Growth Rate

How improved growth rates reduce the Carbon Footprint

Achieving higher growth rates leads to a higher final weight at finishing and/or lower finishing age. This means more beef relative to the length of time the animal is on the farm producing emissions. Specifically, per Kg beef it leads to:

- Lower enteric fermentation.
- Lower emissions associated with slurry storage and spreading.
- Lower emissions related to dung and urine.

The impact of increased weight gain on GHG emissions is estimated at 1% per 100g increase in lifetime average daily gain for beef cattle systems. The economic impact is estimated at €63 for an increase of 100g /head day.

Increasing Growth Rate on Your Farm

Set target growth rates for your animal groups and track performance by weighing. Achieving optimal growth rates requires that you achieve a balance between output and cost for your system. However, there are a number of general principles:

- The cheapest feed is grass. Good grassland management can deliver high levels of production of quality grass at all times.
- Make high quality silage and supplement with meals to achieve target winter performance.
- Keep animals healthy through a planned approach to dosing, vaccinations and biosecurity.
- Use a high genetic merit terminal sire.
- Where appropriate to your circumstances bull beef systems are significantly more carbon efficient than steer systems.

Being part of a beef discussion group is the best way to improve performance from your beef herd and increase income.
Nitrous oxide (N2O) is a greenhouse gas which has almost 300 times more global warming potential than CO2. It is lost to the atmosphere from the breakdown of organic and chemical fertiliser. The higher the proportion of fertiliser that is absorbed by plants the lower the losses to the environment.

- Improving nitrogen efficiency leads to improved utilisation of N by plants and lowers losses to the air and water.
- The timing and method of slurry application has a significant effect on N utilisation.
- Increasing the proportion of clover in the sward reduces the requirement for Chemical N.
- Urea requires less energy (and CO2) to manufacture than CAN.

A reduction in N fertiliser of 10Kg per Ha will reduce farm GHG emissions by 1% and improve income by €10 / Ha.

Increasing N efficiency on your Farm

- Increased use of clover in swards reduces the amount of N fertiliser used.
- Match N application to grass growth.
- Ensure that other elements of soil fertility are optimised. Utilisation by plants of N will be reduced if P or K levels or pH are too low.
- Manage grazing effectively. Focusing on high levels of grass production and utilisation lead to increase beef output per unit of N applied.
- Applying urea early in the year when conditions are appropriate reduces the GHG emissions associated with fertiliser manufacture and cost.
How slurry management lowers the Carbon Footprint

Moving slurry application from summer to spring application and the use of low-emission application methods can significantly reduce emissions.

- **Spring application reduces emissions following land spreading due to the more favourable weather conditions (cool, low sunlight) at that time of year.**

- **Storage losses are reduced due to the shorter storage period.**

- **Reduced Ammonia losses increases the fertiliser replacement value, reduces fertiliser N and associated manufacture and spreading emissions.**

- **Low emissions application technologies such as trailing shoe lead to reduced ammonia losses and increases the fertiliser replacement value of slurry.**

**A 20% shift to spring application can reduce farm GHGs by 1.3% while a shift to trailing shoe can lead to a reduction of 0.9%.**

**Improving Slurry utilisation on your Farm**

Get better value from your slurry and reduce GHG emissions

- **Increase the proportion of slurry used in spring.**

- **Ensure that slurry is spread in appropriate conditions:- on a cool, still day and, if possible, avoiding direct sunlight by applying in the evening.**

- **Factor in the N value of slurry and reduce chemical N accordingly.**

- **Do not apply chemical N for 2 weeks after slurry.**

- **If possible use band spreading or trailing shoe.**
Sustainability and the marketing of Irish Beef

Sustainable production is becoming a key part of the business strategies of leading supermarkets, foodservice customers and manufacturers. This has seen them set out 5-10 year plans with ambitious improvement targets. Such customers are heavily dependent on their suppliers to achieve many of these targets. This offers opportunities for suppliers with strong sustainability credentials.

Ireland is very well placed in this regard. Ireland enjoys a strong international reputation as a source of natural, high quality food in the marketplace. In relation to sustainability, research from the EU Commission shows our livestock sector performs very well with Irish milk production the most carbon efficient in Europe with beef in the top five.

This is a great starting point. However, increasingly customers are asking us to prove our sustainability credentials and show how we are improving over time. This led Bord Bia to launch the Origin Green Sustainability Programme in 2012. The programme, which is the first of its kind at a national level anywhere in the world, aims to prove our credentials at both farm and food manufacturing level.

Farms are a key element of Origin Green. This has seen Bord Bia roll out sustainability programmes for both beef and dairy through our Quality Assurance infrastructure. To date more than 65,000 farm assessments have been undertaken. This allows us credibly market the sustainability credentials of Irish farms in export markets.

While collecting information is important to identify any potential for improvement, being able to demonstrate how we are striving to be as good as possible is vitally important. This led to the launch of the Teagasc/Bord Bia Carbon Navigator. The Navigator is designed to help farmers engage with practical measures that can improve on farm profitability while at the same time enhancing environmental performance.
Using the Carbon Navigator

### Beef Carbon Navigator Input Sheet

**Farmer & Plan Details**

<table>
<thead>
<tr>
<th>Herd Number</th>
<th>Farmer Name</th>
<th>County &amp; Region</th>
<th>Soil Type</th>
<th>Area Farmed (Ha)</th>
<th>Plan Year</th>
<th>Av. no. of Suckler Cows</th>
<th>Av. Livestock Units young stock</th>
</tr>
</thead>
</table>

### Grazing Season

**Suckler Cows**

<table>
<thead>
<tr>
<th>Turnout Date</th>
<th>Housing Date</th>
<th>Current</th>
<th>Target</th>
</tr>
</thead>
</table>

**Young Stock**

<table>
<thead>
<tr>
<th>Turnout Date</th>
<th>Housing Date</th>
<th>Current</th>
<th>Target</th>
</tr>
</thead>
</table>

### Age of First Calving

<table>
<thead>
<tr>
<th>Age of First Calving (Months)</th>
<th>Current</th>
<th>Target</th>
</tr>
</thead>
</table>

### Calving Rate

<table>
<thead>
<tr>
<th>Calving Rate (Calves/Cow/Year)</th>
<th>Current</th>
<th>Target</th>
</tr>
</thead>
</table>

### Live Weight Performance

<table>
<thead>
<tr>
<th>System (Steers and Heifers or Steers and Bulls)</th>
<th>Lifetime liveweight gain per day of age</th>
<th>Current</th>
<th>Target</th>
</tr>
</thead>
</table>

### Nitrogen Efficiency

<table>
<thead>
<tr>
<th>Total CAN (or equivalent compound N) (T)</th>
<th>Total Urea (T)</th>
<th>Total Concentrate FED</th>
<th>Output-Kg beef/Ha</th>
<th>Current</th>
<th>Target</th>
</tr>
</thead>
</table>

### Slurry Spreading

<table>
<thead>
<tr>
<th>% in Spring</th>
<th>% in Early Summer (After 1st cut silage)</th>
<th>% in Late Summer/Autumn</th>
<th>Application Method (Splash Plate, Trailing Shoe or Band)</th>
<th>Current</th>
<th>Target</th>
</tr>
</thead>
</table>

'Sustainable beef’ production protects our environment and protects the income of beef farmers. Your Teagasc beef adviser can assist you in assessing your potential to become more carbon efficient.