‘Carbon Navigator’
decision support tool

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Outline

- Objective
- Implementation and Partnership
- Impact
- Future
Increased Efficiency
Cost Negative
WIN - WIN

Marginal Abatement Cost Curve (LCA)

2012

Abatement potential (Mt CO₂eq)

- Measures based on increased efficiency
- Measures based on Land-use change
- Measures based on technological interventions
The initial objective of the project

- To raise awareness amongst professionals
- To put GHG mitigation on farmer’s agenda
- To provide a pathway for improved carbon efficiency, reduced emissions and profitability
- To support the marketing of Irish dairy and beef produce
A Partnership Approach

- Teagasc – Agricultural and Food Development Authority
  - Agricultural and Food Research
  - Education
  - Advisory Services

- Bord Bia – Food Marketing Organisation
  - Marketing of Food – Green Credentials
  - Quality Assurance Schemes
  - Adding Sustainability

Farmer Contact – 70% of farmers
The Carbon Navigator

- On-line
- Simple
- Focus on practice change and impact – not emissions level
- Adviser operated
- Linked to National Data Sets
To raise awareness

To support ‘conversation’

To indicate impact for emissions and income

To provide direction – How to implement on farm

To persuade

To reinforce efficiency improvement messages
### Year 2014

<table>
<thead>
<tr>
<th>Grazing season length</th>
<th>Current</th>
<th>Target</th>
<th>Chart</th>
<th>GHG change</th>
<th>€ benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnout Date - Part Time</td>
<td>10/Mar</td>
<td>01/Mar</td>
<td><img src="chart1.png" alt="Grazing Season Chart" /></td>
<td>-2.9%</td>
<td>+€4590</td>
</tr>
<tr>
<td>Turnout Date - Full Time</td>
<td>20/Mar</td>
<td>15/Mar</td>
<td><img src="chart1.png" alt="Grazing Season Chart" /></td>
<td>-2.9%</td>
<td>+€4590</td>
</tr>
<tr>
<td>Housing Date - Part Time</td>
<td>01/Nov</td>
<td>07/Nov</td>
<td><img src="chart1.png" alt="Grazing Season Chart" /></td>
<td>-2.9%</td>
<td>+€4590</td>
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<td>Housing Date - Full Time</td>
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<table>
<thead>
<tr>
<th>EBI</th>
<th>Current</th>
<th>Target</th>
<th>Chart</th>
<th>GHG change</th>
<th>€ benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBI</td>
<td>85</td>
<td>115</td>
<td><img src="chart2.png" alt="EBI Chart" /></td>
<td>-6.0%</td>
<td>+€3900</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nitrogen Efficiency</th>
<th>Current</th>
<th>Target</th>
<th>Chart</th>
<th>GHG change</th>
<th>€ benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking rate (Kg N / Ha grass)</td>
<td>160.00</td>
<td>160.00</td>
<td><img src="chart3.png" alt="Nitrogen Usage Chart" /></td>
<td>-1.7%</td>
<td>+€1045</td>
</tr>
<tr>
<td>Chemical N used (Kg N / per Ha) : Urea</td>
<td>20.00</td>
<td>50.00</td>
<td><img src="chart3.png" alt="Nitrogen Usage Chart" /></td>
<td>-1.7%</td>
<td>+€1045</td>
</tr>
<tr>
<td>Ammonium N</td>
<td>140.00</td>
<td>110.00</td>
<td><img src="chart3.png" alt="Nitrogen Usage Chart" /></td>
<td>-1.7%</td>
<td>+€1045</td>
</tr>
<tr>
<td>Import (+) or Export of Org Manure N/Ha</td>
<td></td>
<td></td>
<td><img src="chart3.png" alt="Nitrogen Usage Chart" /></td>
<td>-1.7%</td>
<td>+€1045</td>
</tr>
<tr>
<td>Meal feeding Kg / Cow</td>
<td>600.00</td>
<td>600.00</td>
<td><img src="chart3.png" alt="Nitrogen Usage Chart" /></td>
<td>-1.7%</td>
<td>+€1045</td>
</tr>
<tr>
<td>Milk output / cow (Kg milk solids)</td>
<td>400.00</td>
<td>420.00</td>
<td><img src="chart3.png" alt="Nitrogen Usage Chart" /></td>
<td>-1.7%</td>
<td>+€1045</td>
</tr>
</tbody>
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<tr>
<th>Slurry Spread Timing</th>
<th>Current</th>
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<th>Chart</th>
<th>GHG change</th>
<th>€ benefit</th>
</tr>
</thead>
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<tr>
<td>% in Spring</td>
<td>40</td>
<td>60</td>
<td><img src="chart4.png" alt="Manure Management Chart" /></td>
<td>-1.2%</td>
<td>+€154</td>
</tr>
<tr>
<td>% Summer following 1st cut</td>
<td>60</td>
<td>40</td>
<td><img src="chart4.png" alt="Manure Management Chart" /></td>
<td>-1.2%</td>
<td>+€154</td>
</tr>
<tr>
<td>% Later in Summer</td>
<td>0</td>
<td>0</td>
<td><img src="chart4.png" alt="Manure Management Chart" /></td>
<td>-1.2%</td>
<td>+€154</td>
</tr>
<tr>
<td>Application Method</td>
<td>Splash Plate</td>
<td>Splash Plate</td>
<td><img src="chart4.png" alt="Manure Management Chart" /></td>
<td>-1.2%</td>
<td>+€154</td>
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<tr>
<th>Energy Efficiency</th>
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</thead>
<tbody>
<tr>
<td>Plate Cooler Present</td>
<td>✔️</td>
<td>✔️</td>
<td><img src="chart5.png" alt="Energy Efficiency Chart" /></td>
<td>-1.0%</td>
<td>+€1268</td>
</tr>
<tr>
<td>Average Temperature of Milk after Plate Cooler</td>
<td>20.0</td>
<td>14.0</td>
<td><img src="chart5.png" alt="Energy Efficiency Chart" /></td>
<td>-1.0%</td>
<td>+€1268</td>
</tr>
<tr>
<td>Variable Speed Vacuum Pump</td>
<td></td>
<td>✔️</td>
<td><img src="chart5.png" alt="Energy Efficiency Chart" /></td>
<td>-1.0%</td>
<td>+€1268</td>
</tr>
<tr>
<td>Method of Water Heating</td>
<td>Electricity</td>
<td>Oil</td>
<td><img src="chart5.png" alt="Energy Efficiency Chart" /></td>
<td>-1.0%</td>
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**Potential impact of meeting all targets**
-12.9% +€10957
Grazing Season Length:
Early nitrogen is essential for early grass. Spread 1.5 bags of urea from mid-February weather permitting.
Manage soil fertility - sample your soil and apply P, K and lime as required.

EBI:
Choose a panel of 5 high EBI bulls that compliment your herd. For most farmers fertility is the main weakness that needs to be improved.
Focus on your heifers - breeding heifers to carefully selected high EBI bulls is the fastest way to improve herd EBI and profitability.
Order sufficient straws, e.g. 55 straws per 10 heifers required.

Nitrogen efficiency:
Use urea, especially early in the season.
Try treated urea on a portion of the farmer for late spring, early summer applications.

Slurry Spreading:
Join GLAS selecting Low Emissions Spreading Option

Energy Use:
Make sure your plate cooler is working effectively. Measure the temperature of your milk entering your bulk tank and make sure it is not being pumped through too quickly.

Other Actions:
Plant Trees around the farmyard
Plant a double line of Alder west of the Cubicle House
Plant individual or small groups of native trees around the perimeter of the farmyard
Coppice Hedgerow at the top of the lane field
Use of Carbon Navigator

- Initially optional use by advisers
  - Use in training
  - Limited use with individual farmers (~1000 farmers per annum)

- Inclusion in Agri-environmental and KT Schemes
  - Mandatory Tasks
  - Work with adviser to plan
  - Follow up included (limited)
  - 25,000 Beef Farmers
  - 10,000 Dairy Farmers
Dairy Farms – How can we reduce Agricultural GHGs

- Better slurry and fertiliser management
- Longer Grazing season
- Improved Genetics
- Increased N Efficiency
- Improved Energy Efficiency
Footprint \times \text{Activity} = \text{Total emissions}

Dairy Output +60%
Did we Save the Planet ???

Achieved significant improvement in Footprint

But
Cattle account for 88.7% of methane emissions and 90% of N\textsubscript{2}O emissions
Irish cattle numbers (‘000)

December data from DAFM-AIM
Annual Fertiliser Sales in Ireland 1975-2018

000 tonnes

Source: DAFM
GHG emissions (no mitigation)

Source: FAPRI-Ireland Model
MACC – Agricultural Abatement

Marginal Abatement Cost Curve for agriculture for 2021-2030 (direct methane and nitrous oxide abatement). Values are based on linear uptake of measures between the years 2021-2030.

Technical Measures highlighted
Land-use measure

- Grassland Management: 262 kTCO$_2$e
- Water Table Management (Organic soils): 444 kTCO$_2$e
- Cover Crops: 107 kTCO$_2$e
- Straw incorporation: 60.5 kTCO$_2$e
- Forestry: 2100 kTCO$_2$e

Abatement Cost €/tCO$_2$e vs Potential kTCO$_2$e saving/year
Energy

### Farm energy saving
- Wood biomass: 759 ktCO\(_2\)-e
- Biomass (Heat): 176 ktCO\(_2\)-e
- SRC Biomass (Electricity): 196 ktCO\(_2\)-e
- Anaerobic Digestion: 224 ktCO\(_2\)-e
- Biogas (Electricity): 150 ktCO\(_2\)-e
- Biodiesel (OSR): 269 ktCO\(_2\)-e
- Bioethanol (Beet): 29.8 ktCO\(_2\)-e

### Abatement Cost: €/tCO\(_2\)-e
- Farm energy saving: 29.5 ktCO\(_2\)-e

### Potential ktCO\(_2\)-e saving/year
- Wood biomass: 759 ktCO\(_2\)-e
Ammonia MACC

- Total achievable reduction is 22.5 t NH$_3$
- Cost varies from 41-78M per annum depending on how landspreading measures are implemented
Summary of Key of Measures 2019

GHG

- Dairy EBI
- Nitrogen Use Efficiency
- NBPT Treated Urea
- Low Emissions Slurry
- Forestry & Woodland
- Energy Efficiency

Ammonia

- Nitrogen Use Efficiency
- Urea Stabilisers
- Low Emissions Slurry

Sustainable Fertiliser Programme
Carbon Navigator 2

- Massive Industry Challenge
- Mitigate or Cut
- Awareness no longer the focus
- Too Big to Ignore – 34% of Total emissions
- Carbon Navigator 2 – Part of Toolkit
Carbon Navigator 2

- Urgency for farmers driven by
  - Multinational Food Companies → Dairy Co-ops
  - Government & EU Regulation & Support
  - National Climate Action Plan
  - Citizens and NGOs and Press
  - Threat to reduce numbers

- Partnership Approach
Carbon Navigator 2

- Integrated tool across sustainability challenges
  - GHG and Ammonia
  - Water Quality
  - Biodiversity
- Focus on current status of practice adoption on Farms
- Broad range of measures from MACC
- Target setting
- Focus on realistic number of measures
- Quantification of Impact
- Advice for Implementation
- Structured Follow up