Pathway to Climate Neutral Farming Systems

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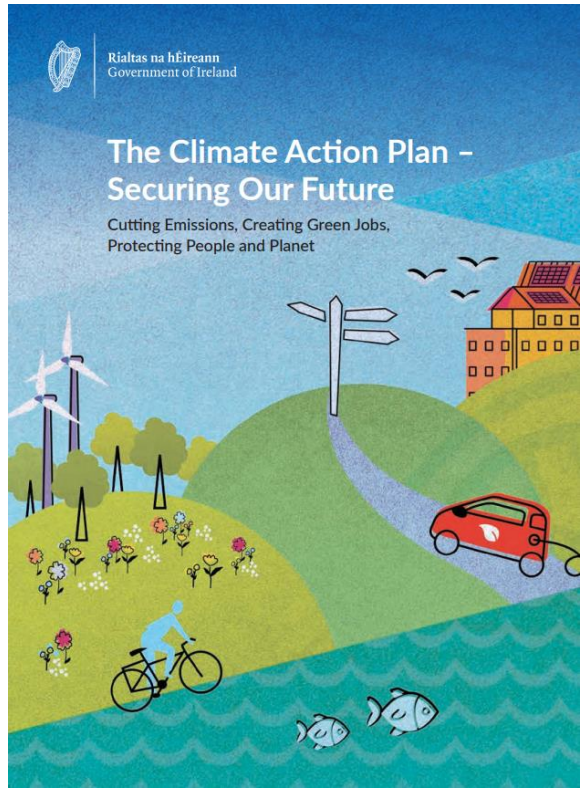
Irelands contribution to the EU's Green Deal is the Climate action Plan

- 51% reduction on GHG by 2030 relative to 2018
- Climate Neutral Economy by 2050



Climate Neutral Economy

a sustainable economy and society where greenhouse gas emissions are balanced or exceeded by the removal of greenhouse gases

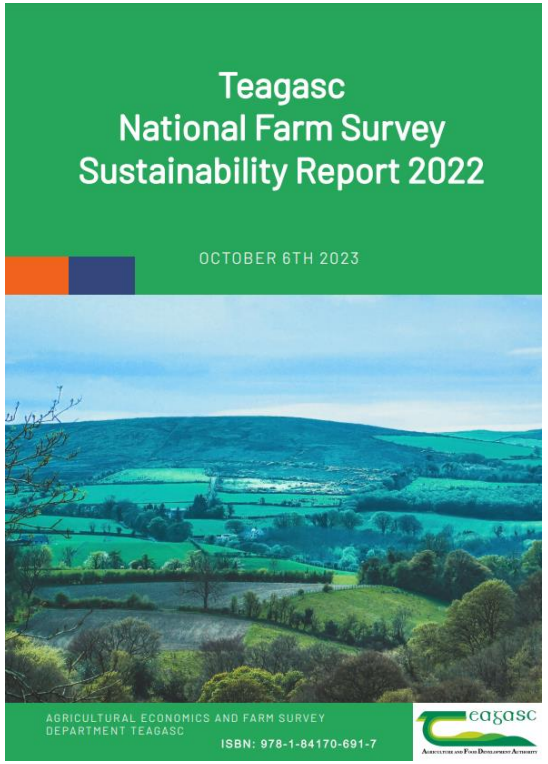
Objective

To investigate pathways to Climate Neutrality for common Irish farms (beef, dairy, sheep, and tillage)

Teagasc sustainability report

The Teagasc National Farm Survey (NFS) is a nationally representative sample of farms from across Ireland

Part of the European Union's Farm Accountancy Data Network (FADN)



Farm Type	Dairy	Cattle	Sheep	Tillage Average	Tillage No Livestock
Sample No. in 2022	262	333	106	73	27
Population Represented	15,323	48,227	13,979	6,246	2,393
Total GHG emissions (t CO2eq/ha)	**9.6**	**4.6**	**3.5**	**2.1**	**0.8**

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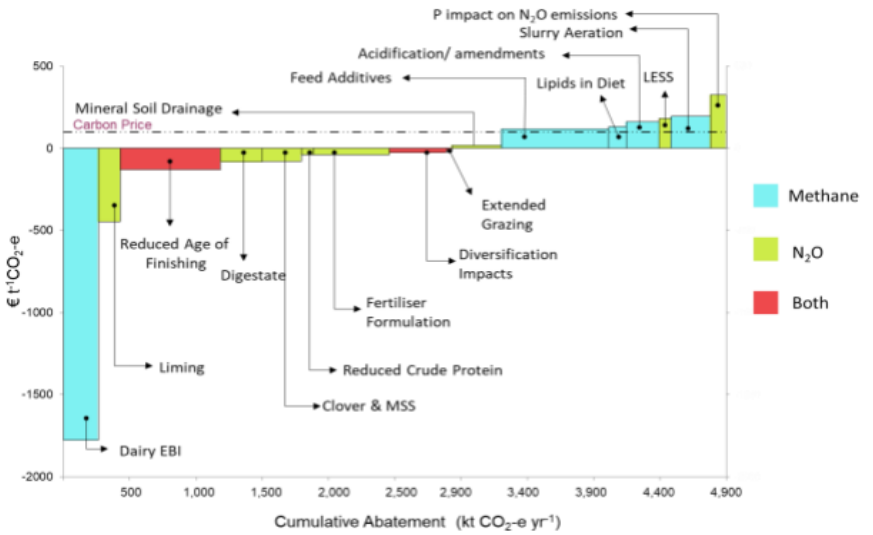
Teagasc Marginal Abatement Cost Curve (MACC)

- Identify the most cost-effective pathway to reduce GHG emissions and enhance carbon sequestration

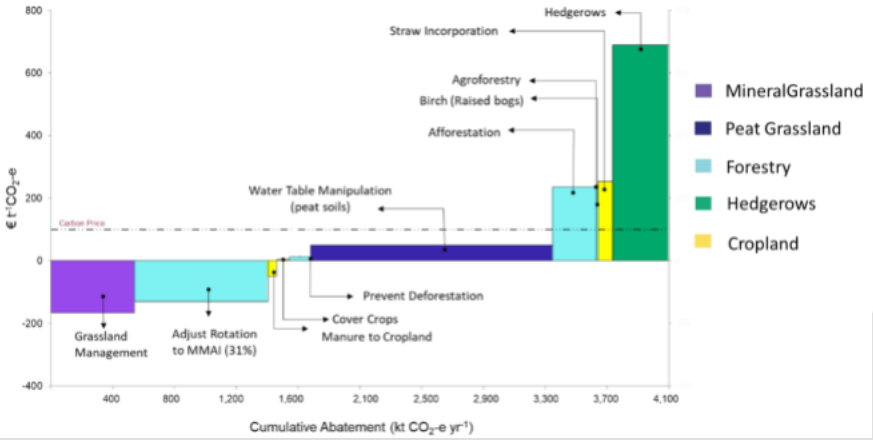
- Assists stakeholder to assess the abatement potential and cost/benefit of mitigation measures

- Measures must be:
  - Applicable to Ireland
  - Scientific peer reviewed
  - Available activity data

Agriculture MACC graph



LULUCF MACC graph



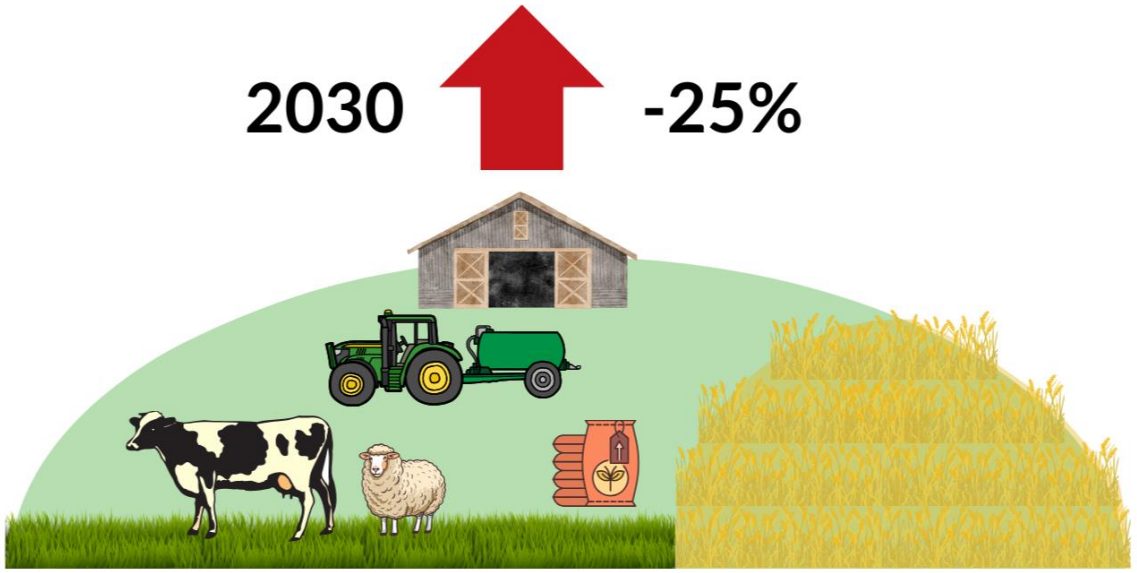
Applying MACC at farm level

- Dairy – Progressive, high stocking rate dairy farm
- Beef – Low input suckler-to-weanling farm
- Sheep - Prolific lowland sheep farm
- Tillage – With and without livestock

System boundary

In the national GHG inventory agricultural GHG emissions are sourced from:

- Enteric fermentation
- Manure management
- Grazing
- Fertiliser
- Lime
- Fuel



Evaluated on a territorial basis

System boundary

In the national GHG inventory agricultural GHG emissions are sourced from:

- Enteric fermentation
- Manure management
- Grazing
- Fertiliser
- Lime
- Fuel

Agricultural emissions are spread over a number of sectors

- LULUCF, Energy

Climate neutrality achieved across economy, not individual sectors.

Evaluated on a territorial basis

System boundary

Biogenic methane is the dominant GHG emission from Ireland's agricultural sector

- 74% agricultural emissions

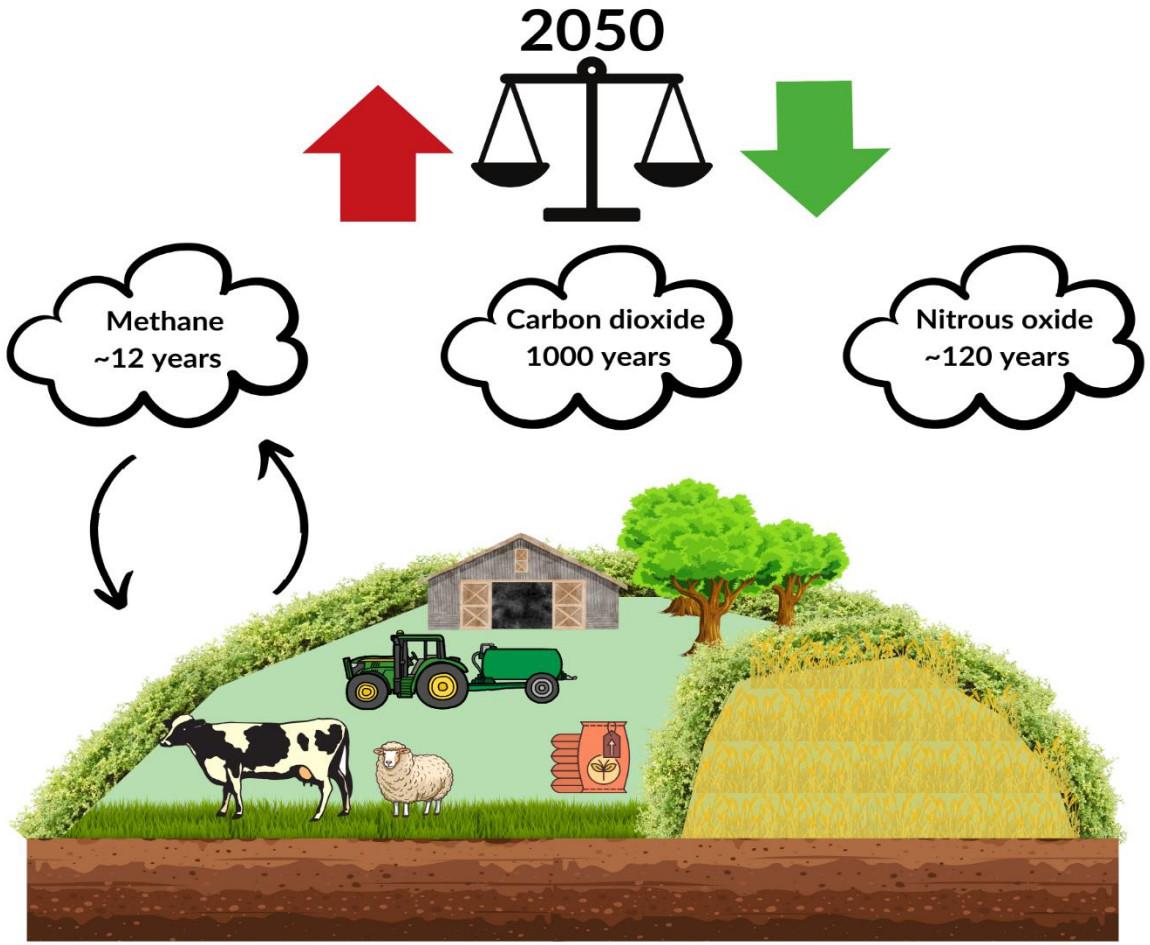
Biogenic methane acts different than other long lived gases - flow vs stock

Alternative methodology that reflects short lived nature of biogenic methane

Split gas approach

- Reduce Biogenic methane to prevent any additional warming

- Balance long lived GHG with C removal



Evaluated on a territorial basis

Scenarios

1. **Gross**
   - GHG emissions produced by the **Baseline** and **With Measures** systems
   - Mitigation measure based on Teagasc MACC
2. **Net**
   - GHG emissions produced and sequestered through soils and hedgerows by the **With Measures** systems
3. **Split**
   - Acknowledge the circular nature of biogenic methane
   - Reduce methane to a degree that no additional warming is caused
   - Climate neutrality achieved by balancing residual GHG emissions with C removal

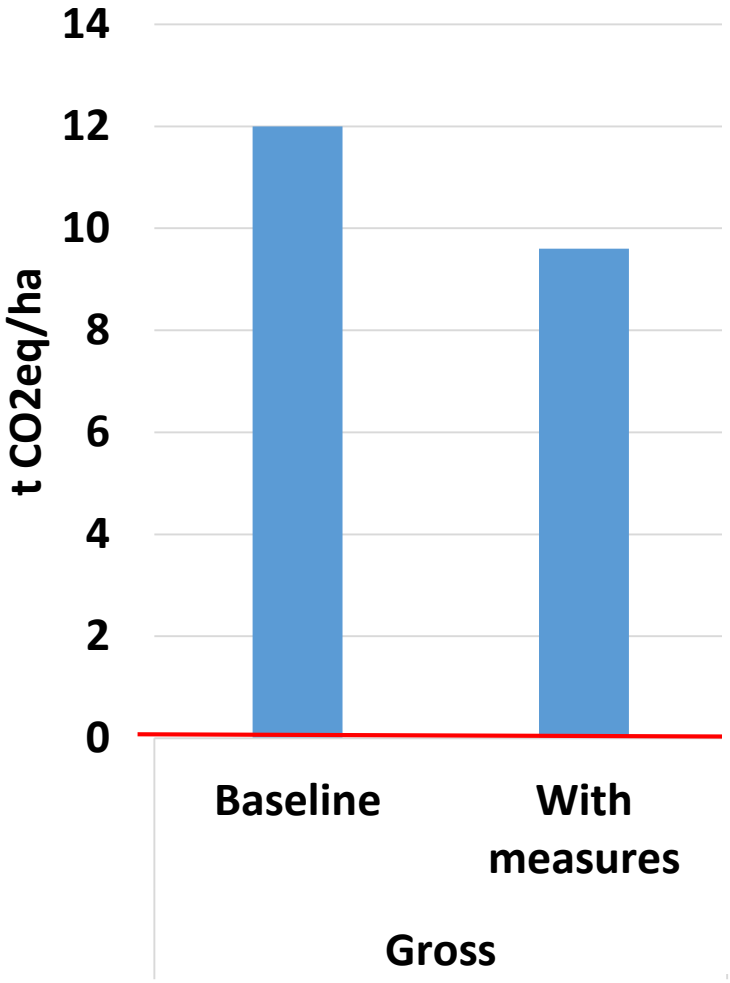
Tillage case study

Dairy case study

Gross Scenario
Mitigation measures include
- EBI
- Fertiliser type and quantity
- Feed additive
- Slurry additive
- Concentrate feed
- Renewables

Net Scenario
Including C sequestration from:
- Grassland
- Hedgerows

Split Scenario
Reduce methane to prevent further additional warming
Long lived GHG balanced by C removal

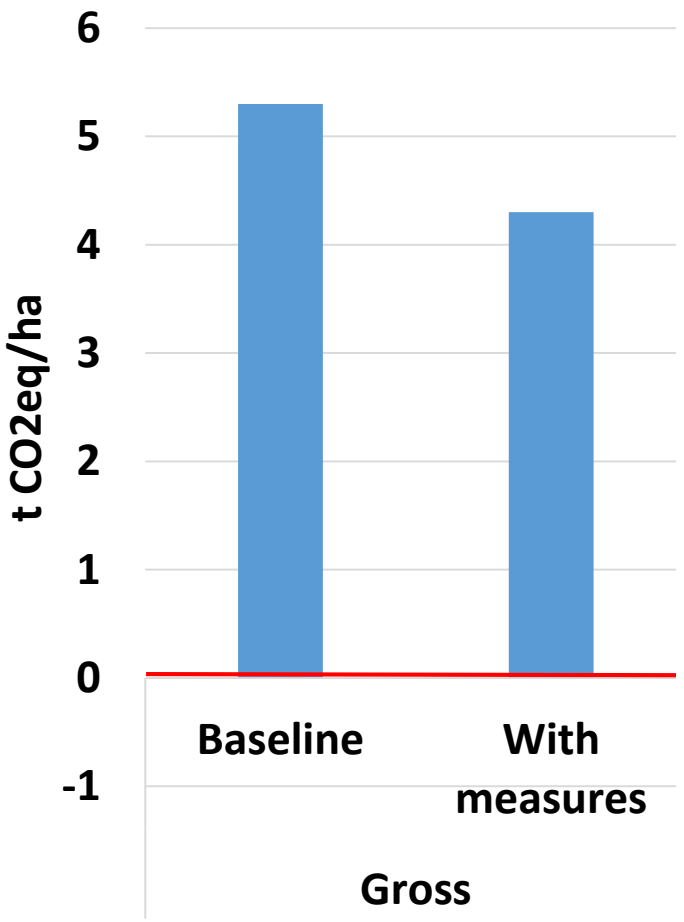


Beef case study

Gross Scenario
Mitigation measures include
- Fertiliser type and quantity
- Slurry additive
- Silage quality
- Concentrate feed
- Renewables

Net Scenario
Including C sequestration from
- Grassland
- Hedgerows

Split Scenario
Reduce methane to prevent further additional warming
Long lived GHG balanced by C removal

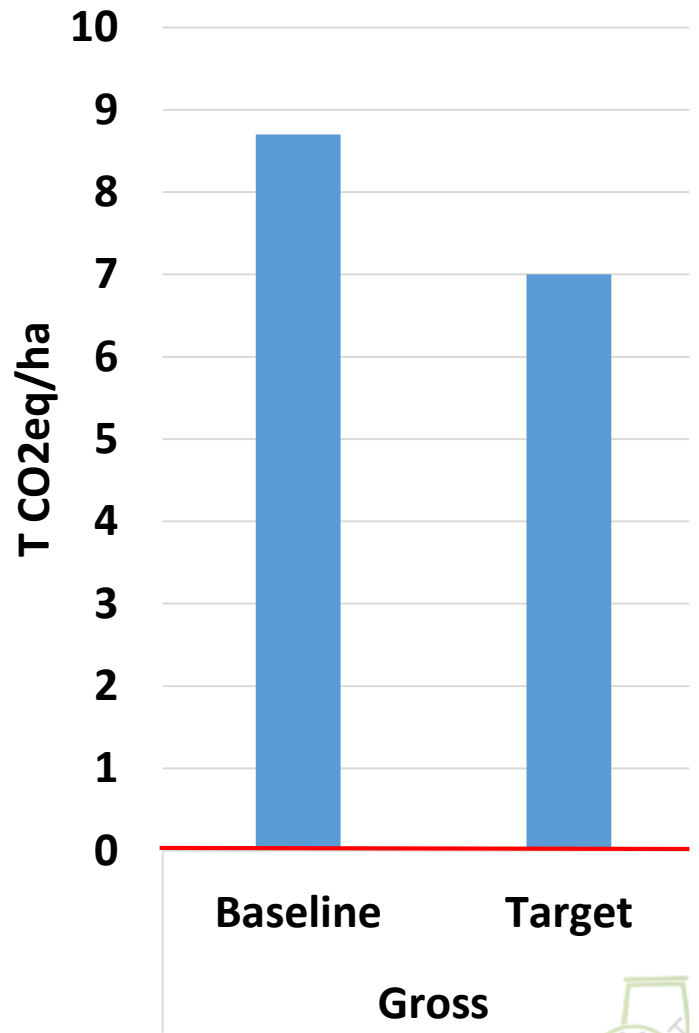


Sheep case study

Gross Scenario
Mitigation measures include
- Fertiliser type and quantity
- Concentrate feed
- Age at finishing
- Age at lambing

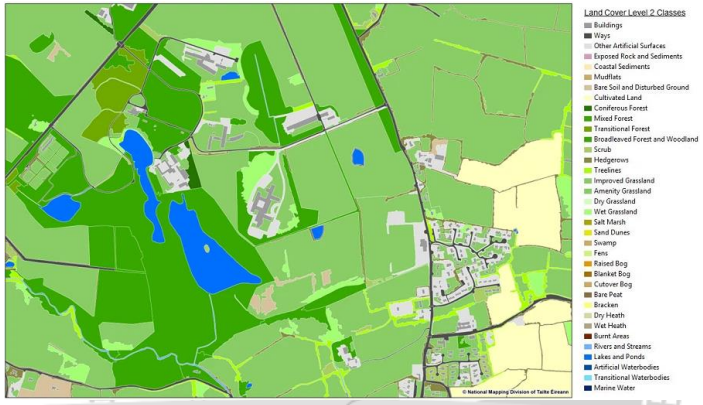
Net Scenario
Including C sequestration from
- Grassland
- Hedgerows

Split Scenario
Reduce methane to prevent further additional warming
Long lived GHG balanced by C removal



Further research

1. Further R&D of mitigation measures
2. Continued research on grassland C sequestration
   - All scenarios were on mineral soils
   - Inter annual variation
3. Farm level soil mapping
4. Current study is farm level – sector wide assessment
5. Further discussion on how to approach methane



Take home messages

- Mitigation and removal measures are available, high adoption rate required
- Carbon removal activities need to be encouraged
- A split gas approach acknowledges the circular nature of biogenic methane
- Concerted effort across all sectors will be required to achieve neutrality, GHG emissions is one of many indictors