‘Carbon-neutral livestock farming’:
Mirage or Horizon Point?




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Food Security & Sustainability

Global Challenges

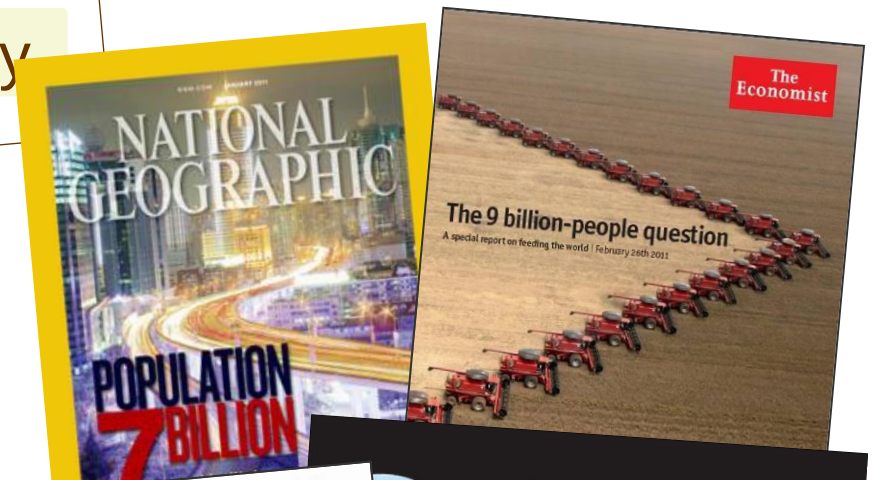
Food Security 2050:

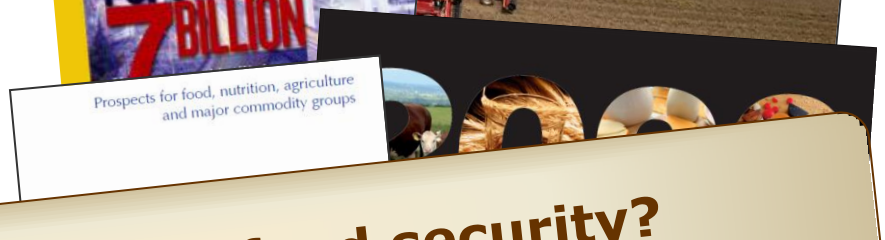
- Population 9bn
- Dietary shift
- Food demand up 60% by 20

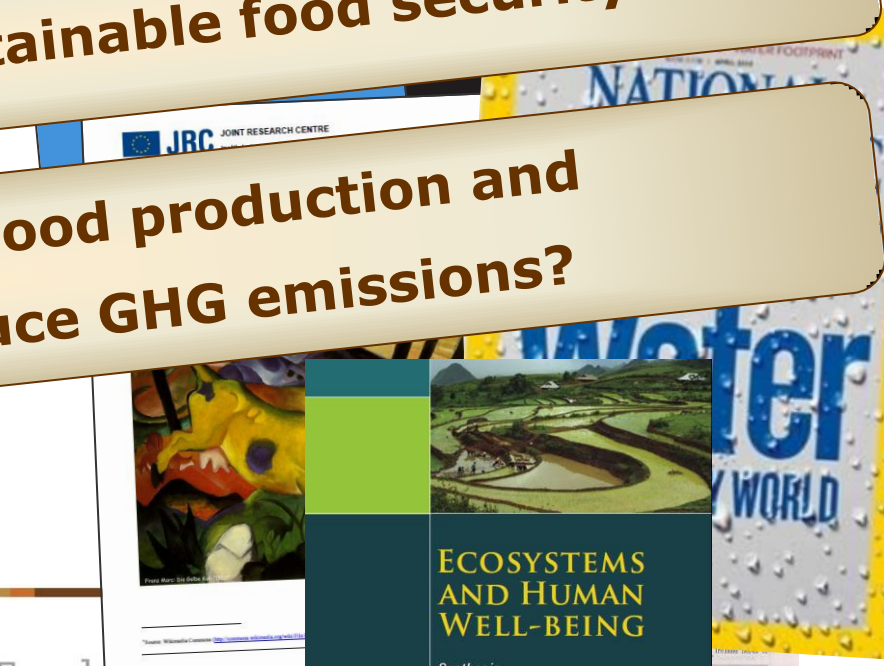
How can we achieve sustainable food security?

How can we increase food production and at the same time reduce GHG emissions?

- Biodiversity







Ireland as a microcosm

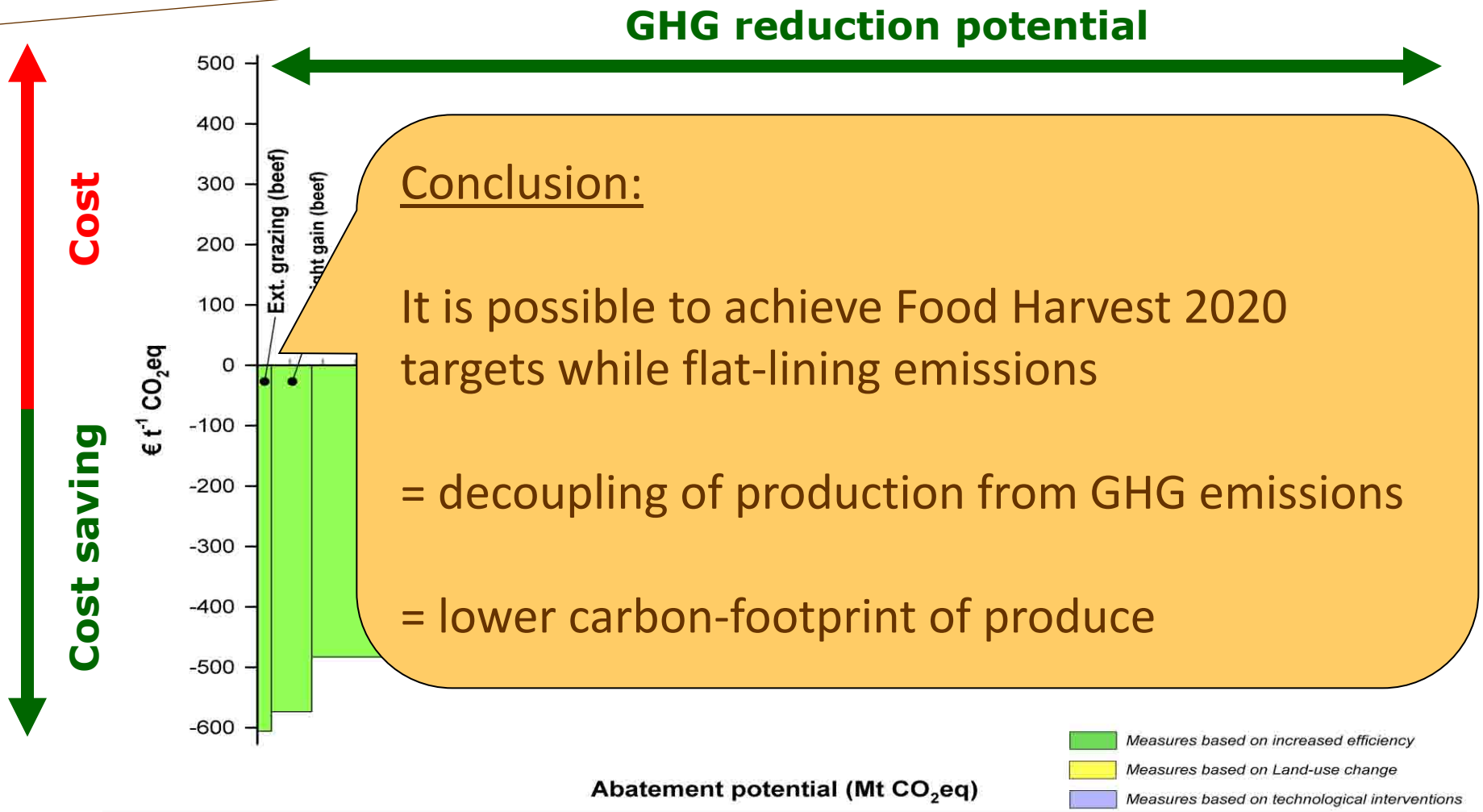
Agricultural policy

- Dairy: milk production +50%
- Beef: output value +20/40%
- Targets for sheep, pigs, energy crops, forestry, marine

Greenhouse gas policy

- Framework for new climate change legislation:
  Two reports (Min of Env):
  "*Interim*": 2020
  "*Final*": 2050

Towards 2020: MACC (IPCC)



Conclusion:

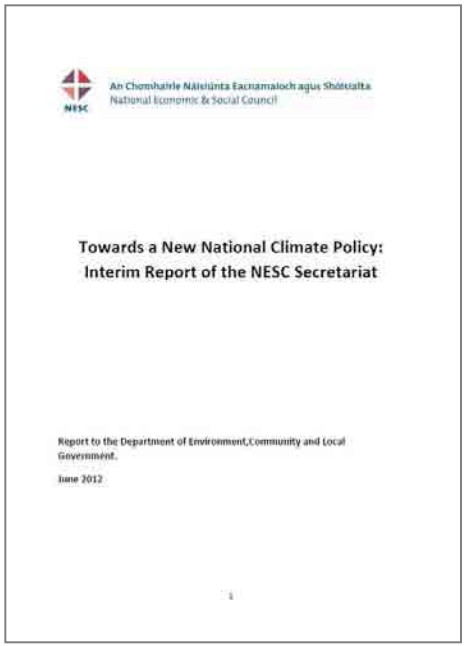
It is possible to achieve Food Harvest 2020 targets while flat-lining emissions

= decoupling of production from GHG emissions

= lower carbon-footprint of produce

Policy outcomes

Min of Env 2020 report


An Chomhairle Náisiúnta Eacnamaíoch agus Shóisialta
National Economic & Social Council

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Interim Report of the NESC Secretariat

Report to the Department of Environment,Community and Local Government.

June 2012

- MACC accepted as basis for vision and target for 2020

Min of Env 2050 report

- Need to expand our ambition…
- Need more than flat-lining emissions?

Why is it so difficult to further reduce agricultural emissions?

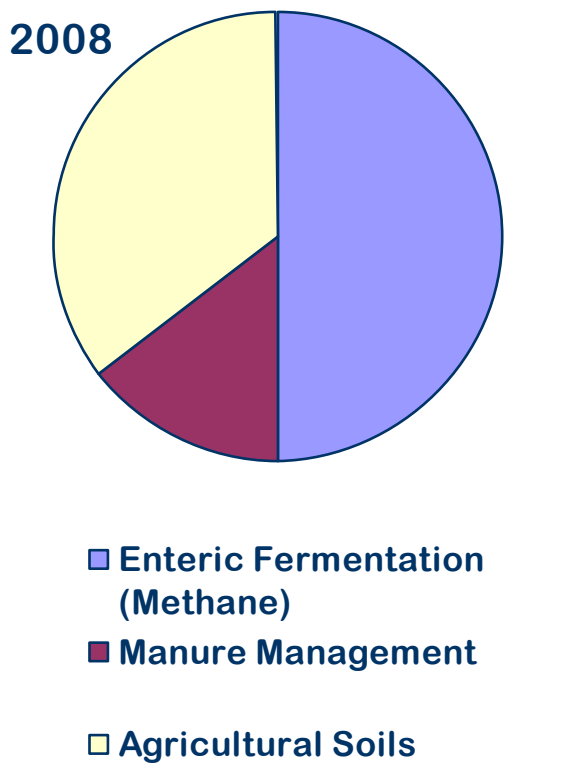
Three reasons!

Reason 1: methane

Livestock emissions dominated by methane

- Half of all agricultural emissions in Ireland
- Methane emissions = evolutionary solution by bovines to expel hydrogen
- Very difficult to mitigate
- Some progress with breeding / vaccines
- Scope = limited

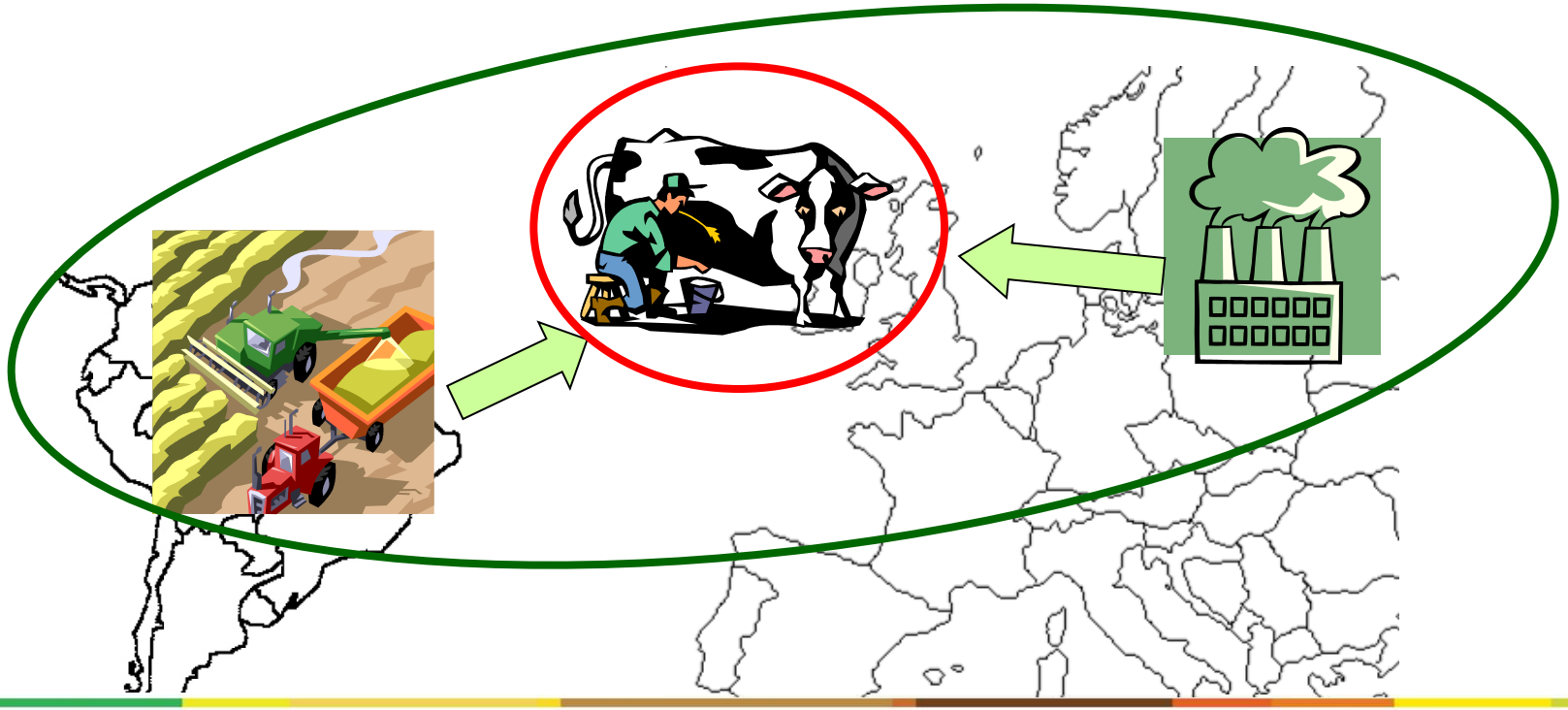
Source: EPA



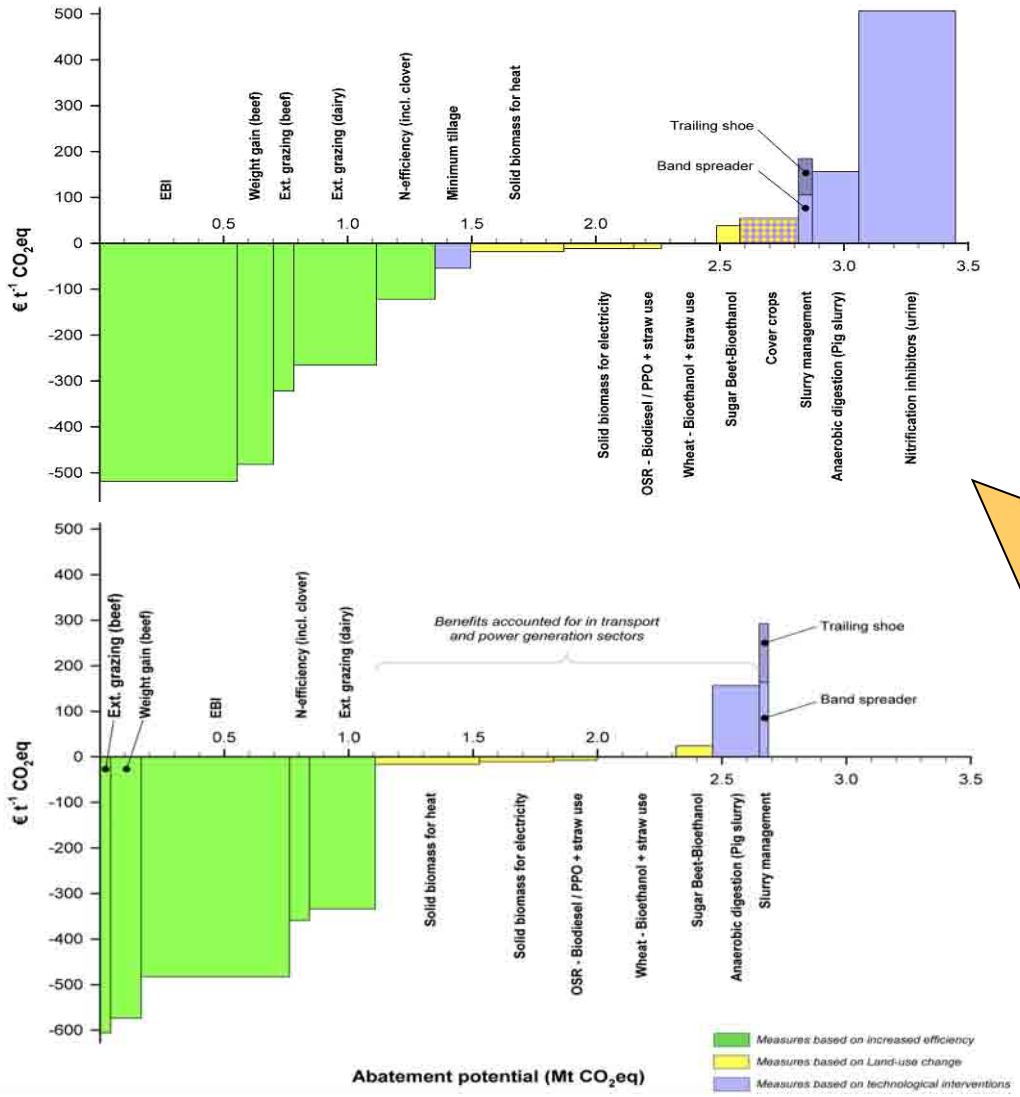
Reason 2: Metrics

Accounting methodologies

- **Inventory methodology (IPCC)**: "accountable potential"
- **Life Cycle Assessment (LCA)**: "real abatement potential"



Reason 2: Metrics

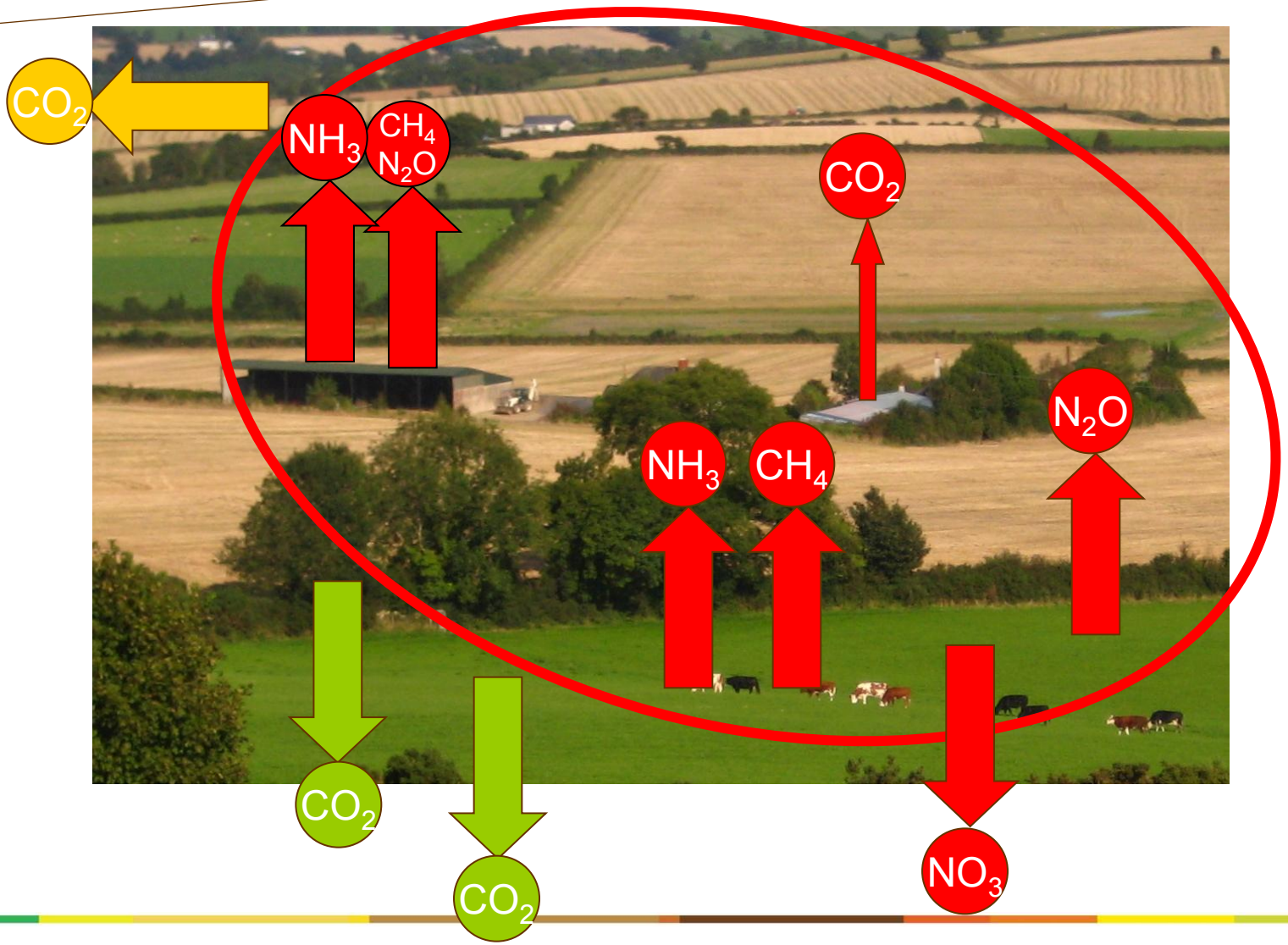


'Scientific' abatement potential = 2.5 Mt CO_2eq

Only 1.1 Mt CO_2eq can be captured in agricultural GHG inventory

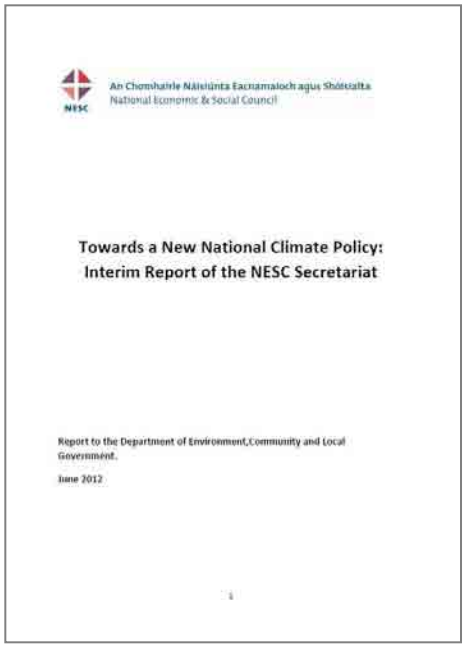
= less than 50%

Reason 3: Emissions *v.* offsetting



Policy outcomes

Min of Env 2020 report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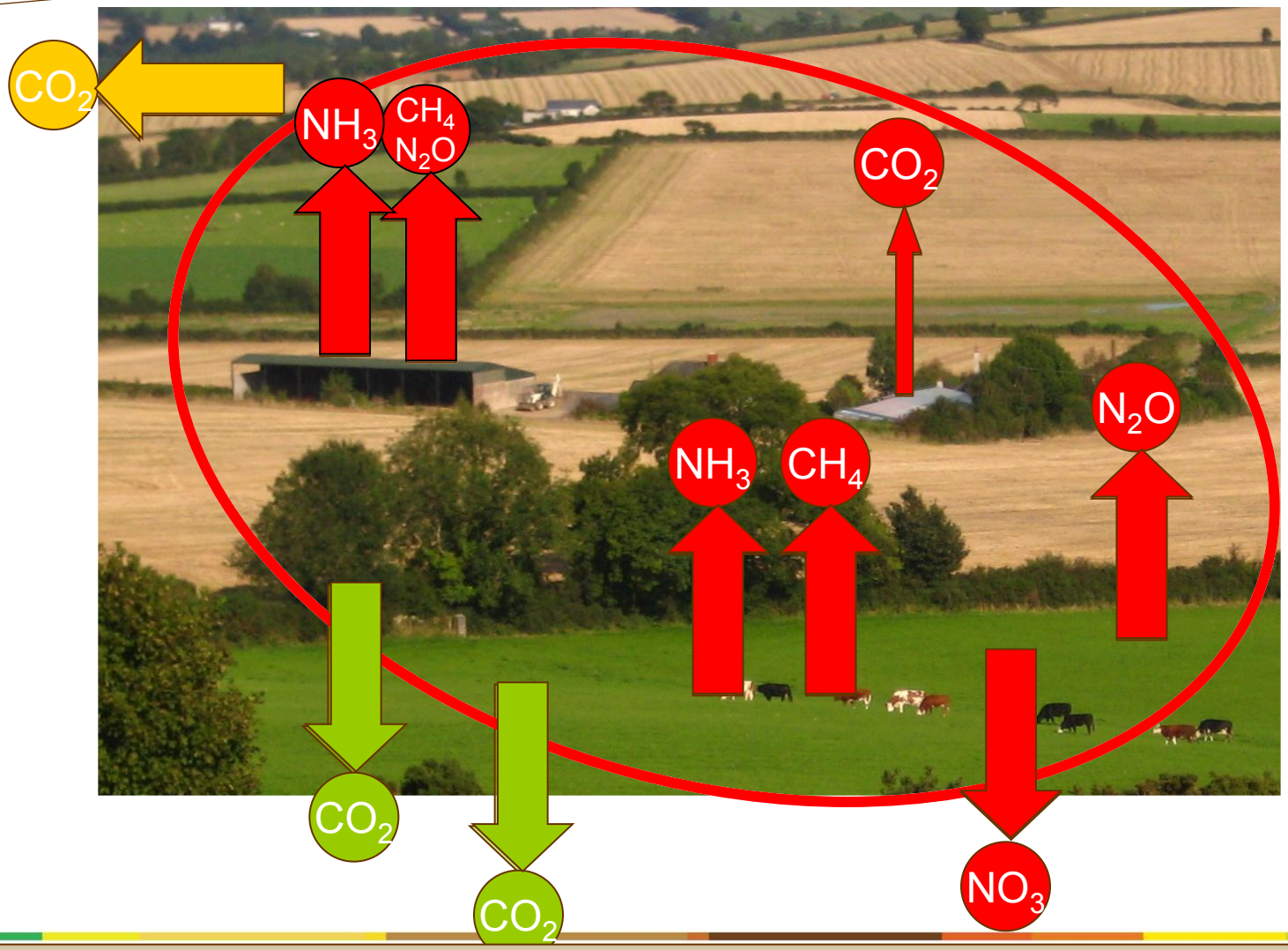
- Need to expand our ambition…
- Why is it so difficult to achieve further reductions in agricultural emissions?
- **"Thinking for ourselves": beyond IPCC metrics**
- **New concept: C-neutral agriculture**

What does carbon neutrality mean?



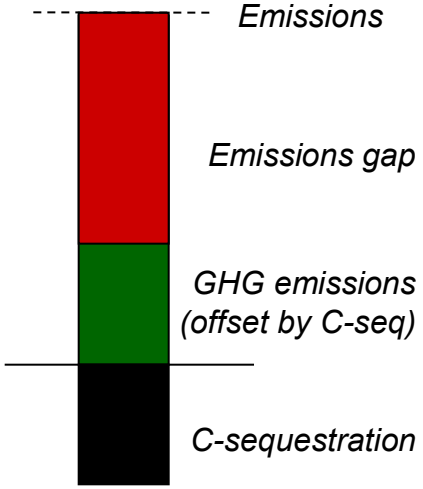
No baseline year. Instead: instant snapshot

Scoping study on C-neutrality

Scoping study:

- How useful is 'carbon-neutral agriculture' as a concept?
- How achievable is full or partial carbon neutrality by 2050
- Two steps:
  1. *identify "emissions gap"*
  2. *assess pathways to close the emissions gap*

Scenario 0:
BAU
(no mitigation)



2050 model:

22.2 Mt CO_2eq

16.7 Mt CO_2eq

5.5 Mt CO_2eq

-5.5 Mt CO_2eq

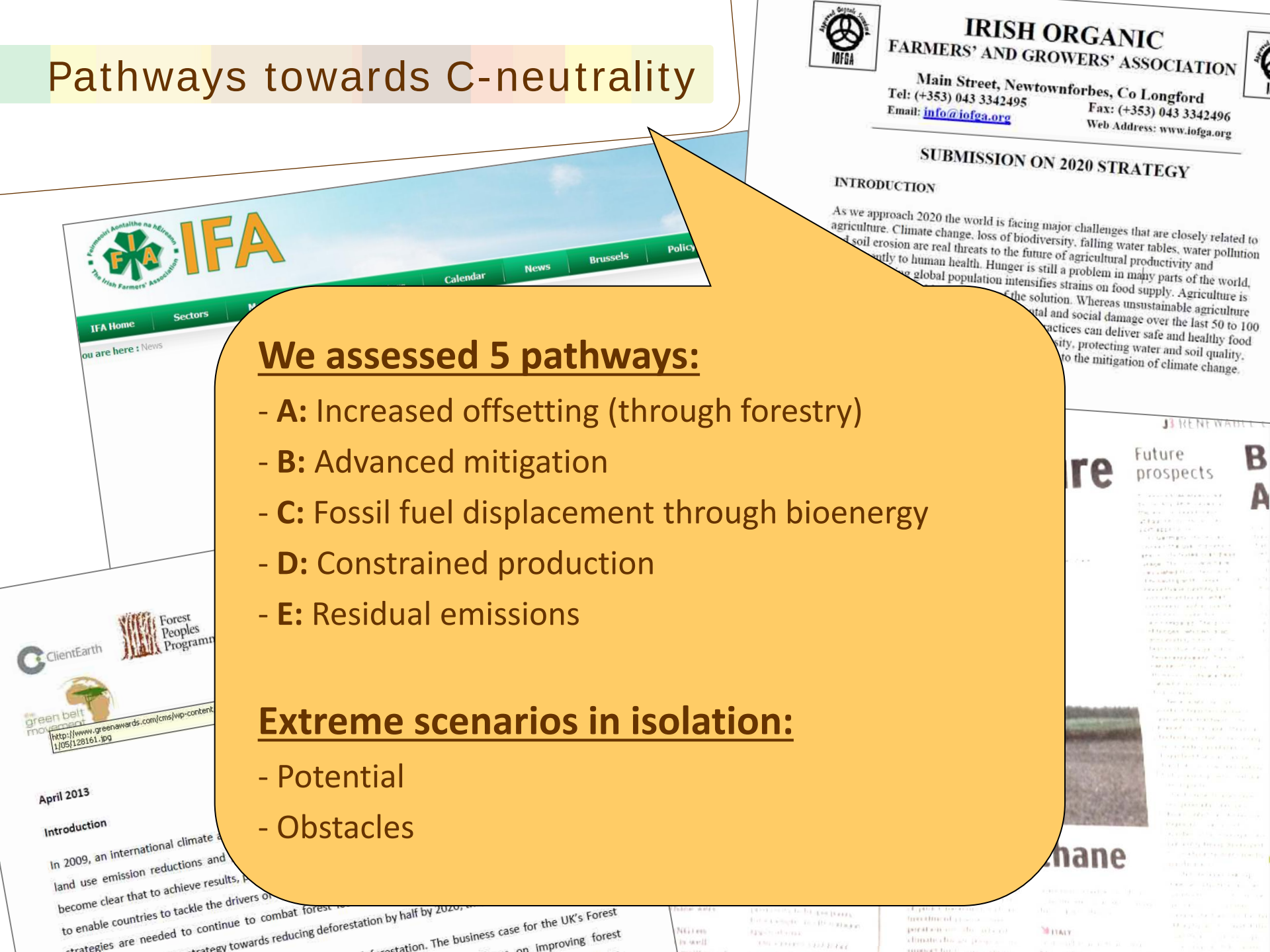
Pathways towards C-neutrality

We assessed 5 pathways:

- **A:** Increased offsetting (through forestry)
- **B:** Advanced mitigation
- **C:** Fossil fuel displacement through bioenergy
- **D:** Constrained production
- **E:** Residual emissions

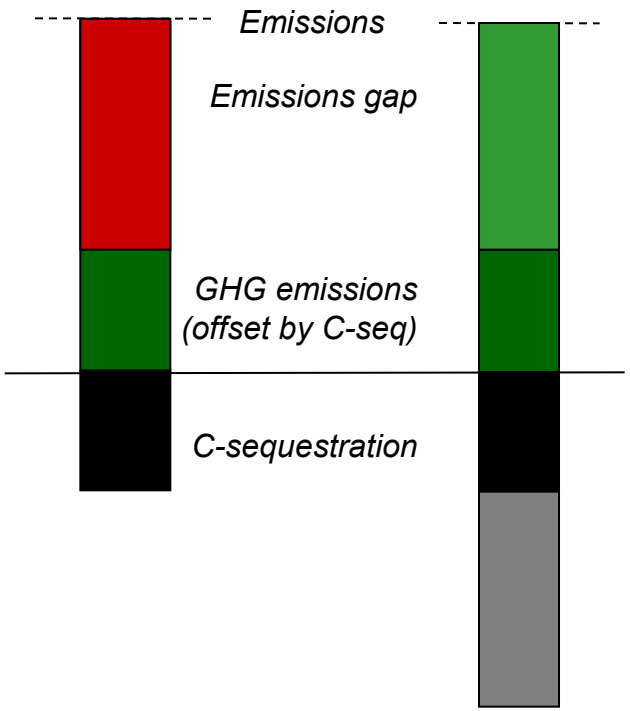
Extreme scenarios in isolation:

- Potential
- Obstacles



Pathway A: Increased offsetting

Scenario 0: BAU (no mitigation)	Scenario A: 'Increased offsetting'



Approach

Increased afforestation

Potential

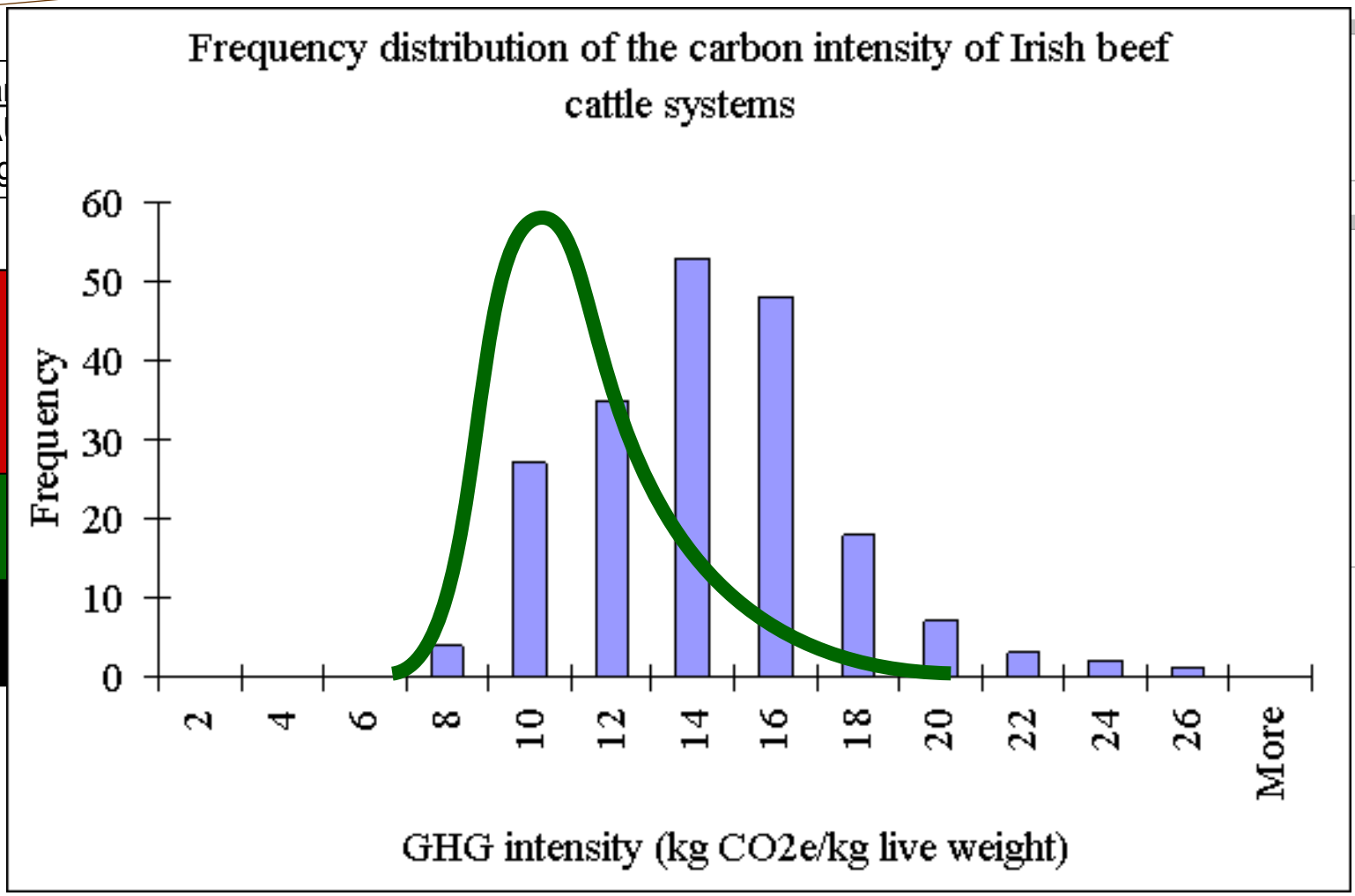
- Can close 66% of gap by 2050
- Technically feasible:
  - *Achieved in past*
  - *Land available*

Obstacles

- Requires immediate incentivisation
- Impacts on other sustainability indicators?
- Scenario post-2050?

Pathway B: Advanced mitigation

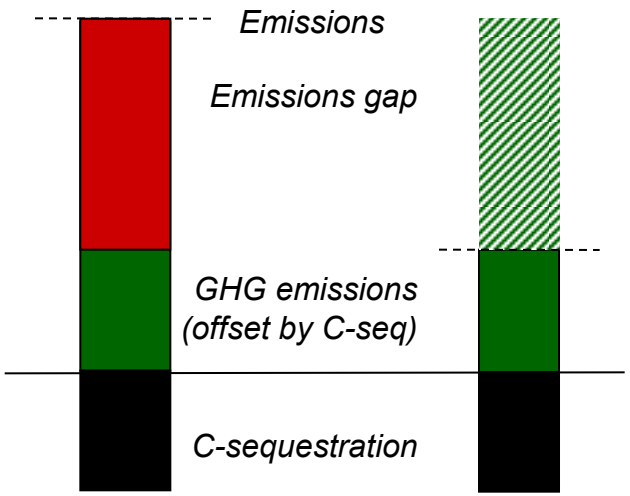
Scenar
BA
(no mitig



Pathway B: Advanced mitigation

Scenario 0:
BAU
(no mitigation)

Scenario B:
'Advanced mitigation'



Approach

Science & technology

Potential

- Implement existing knowledge
- 10-years research (MACC): 1-2 Mt CO_2eq
- Research pipeline: promising new options
  - *e.g. sexed semen*

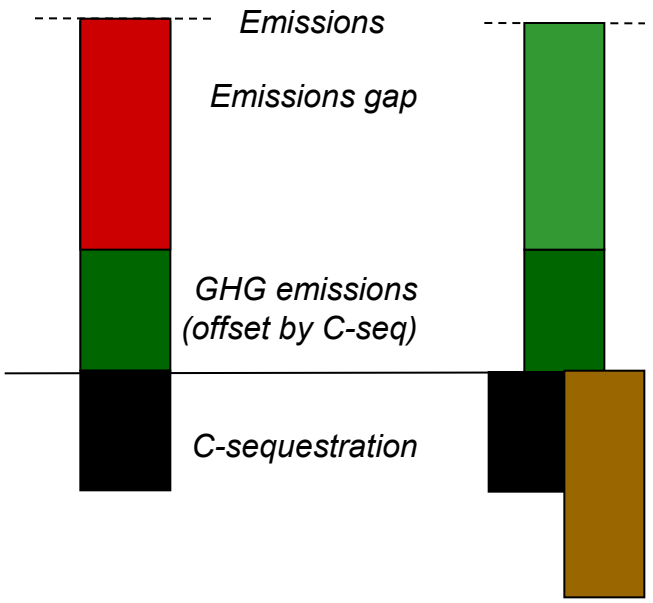
Obstacles

- Diminishing returns?
- Increasing costs?

Pathway C: Fossil fuel displacement

Scenario 0:
BAU
(no mitigation)

Scenario C:
'FF
displacement'



Approach

Produce biomass for thermal heat demand

Potential

- In theory: large potential
- Can close up to 66% of emissions gap
  - *Bioenergy crops*
  - *Anaerobic digestion of surplus grass*

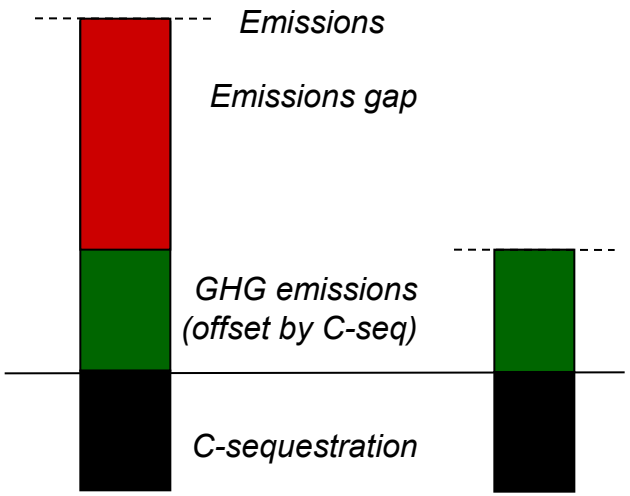
Obstacles

- Bioenergy crops require land use change
- Capital costs / infrastructure
- Double-accounting between sectors?

Pathway D: constrained production

Scenario 0:
BAU
(no mitigation)

Scenario D:
'constrained production'



Approach

Reduce suckler herd (least profitable sector)

Potential

- Potential is relatively small:
- 20% reduction in agricultural GHG emissions requires:
- 67% reduction in suckler cow herd

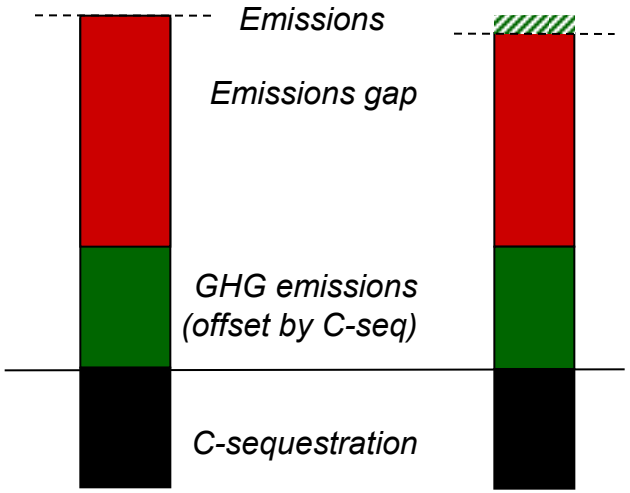
Obstacles

- Implications for food security?
- Potential for carbon-leakage?
- Under-utilisation of land?

Pathway E: 'Residual emissions'

Scenario 0:
BAU
(no mitigation)

Scenario E:
'residual
emissions'



Approach

- Implement MACC measures
- Then accept residual emissions

Potential

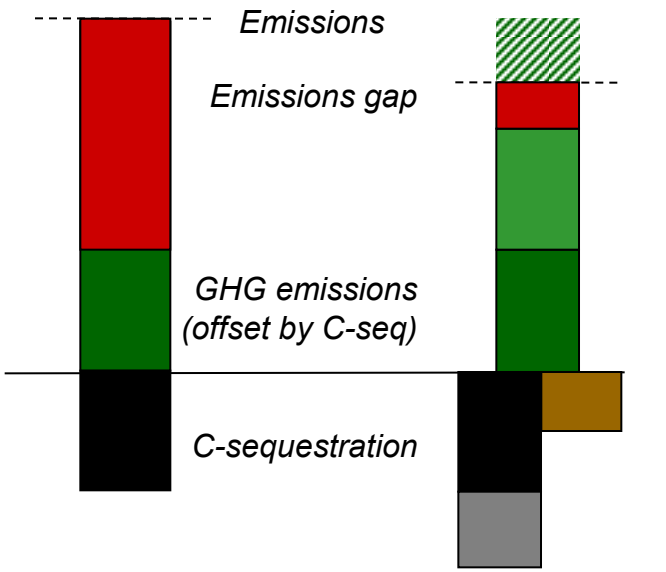
- Partly valid:
  - 'no electric cow'
  - 'produce food where it can be produced most efficiently'

Obstacles

- Will result in more onerous targets for other sectors
- Could be confused with complacency

Pathway F: 'Mosaic of solutions'

Scenario 0: BAU (no mitigation)	Scenario F: 'Mosaic of solutions'



But....

Incentivise multiple pathways

- Accelerated afforestation only works if started now
- Biofuel & advanced mitigation will make trajectory more realistic
- Reduced suckler activity: already included in baseline projections
- Some residual emissions can be justified

2050+

?

Take-home messages

Follow the follow-up on Twitter: **@RogierSchulte**

Concept of C-neutral Agriculture:

- Radically diversifies the menu of options for agriculture to reduce net emissions…
- Allows for more synergy between Food Security and preventing Climate Change
- Window of opportunity: current UNFCCC negotiations on Ag
- Likely to suit some countries better than others, depending on existing and potential land use.

Feasibility

- 'Mosaic of solutions' likely to achieve more than single pathways
- Early start ("now") essential to achieve progress by 2050
- Full carbon-neutrality may not be achievable ≠complacency
  Use C-neutrality as a 'horizon point'
- Potential conflict with other aspects of sustainability (e.g. GMO, biodiversity, animal welfare)
  = hard choices required