

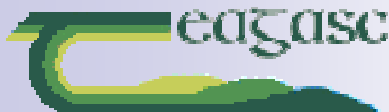
The Economic Impact of Herd Reduction to Achieve GHG Reductions

**James Breen, Trevor Donnellan, Kevin Hanrahan,
Cathal O'Donoghue**

Teagasc Rural Economy Research Centre

Corina Miller, Alan Matthews

Trinity College Dublin



Teagasc GHG Conference

RERC

Overview

- **Context**
- **Single Sector Analysis**
- **Multi-Sector Analysis**
- **Conclusions**



Context

Debate

- **Reduce 20% of Greenhouse Gas Emissions**
- **What if all non ETS sectors including Agriculture have to reduce emissions by 20%**

Issues

■ Incidence of Emissions

- Production or
- Consumption

■ Carbon Leakage and Global Food Security

■ On-farm mitigation measures

- Relatively low stocking rate → more intensive agriculture combined with new forestry
- However cannot currently offset land use changes against agricultural emissions

Marginal Abatement Cost

- **As Economists we focus on first changing factors that have the lowest cost – using a concept known as Marginal Abatement Cost (MAC)**
- **At this conference we will hear about technological measures to reduce GHG emissions**

Y Axis - Marginal Abatement cost per mtCO₂e

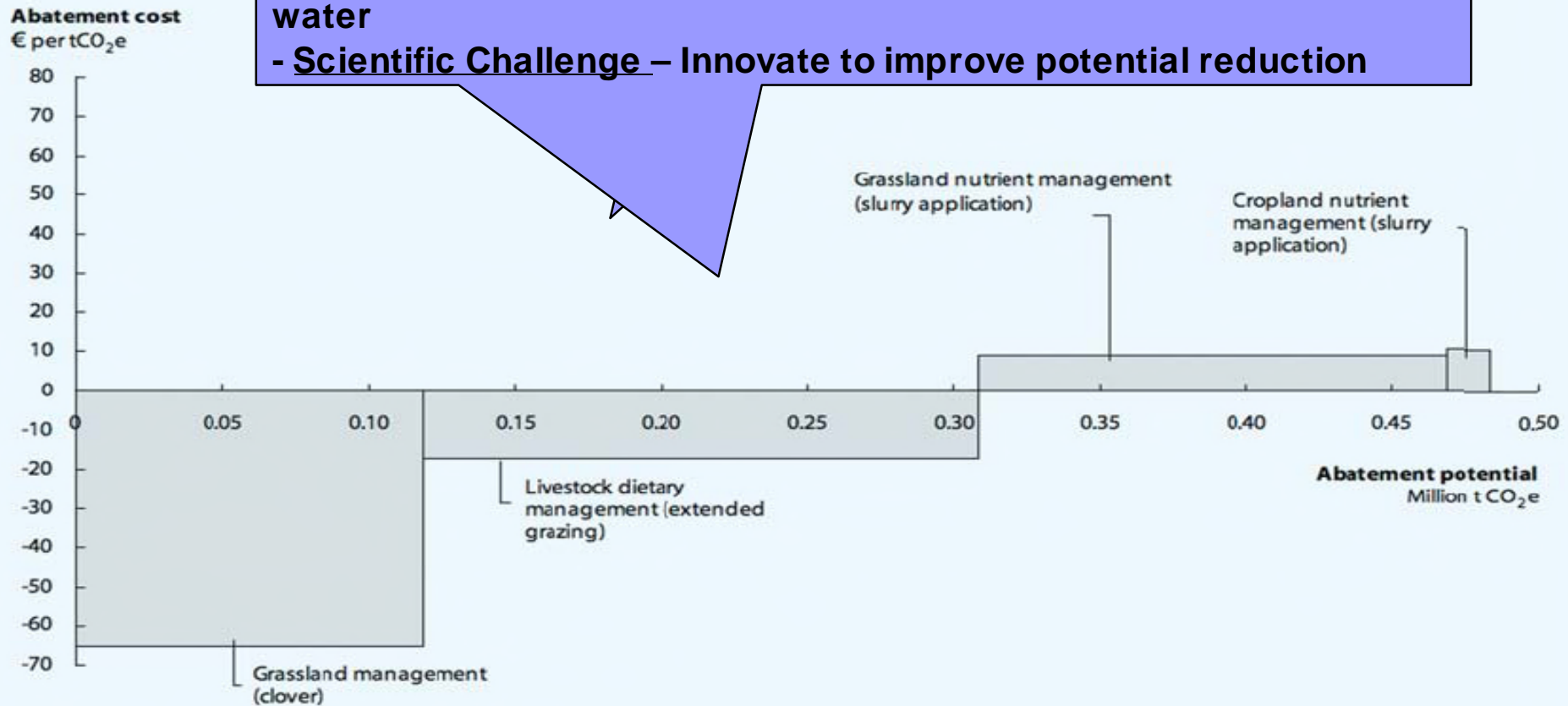
X Axis – Potential Abatement mtCO₂e

20% of CO₂e E

McKinsey-SEI

- Some measures have negative MAC (Clover), Extend the Grazing Season and improved Grassland Management – ie save money not cost by making change.
- Some have positive MAC (Nutrient Management) – however other environmental benefits from improved nutrient management ~ water
- **Scientific Challenge** – Innovate to improve potential reduction

(Agriculture)



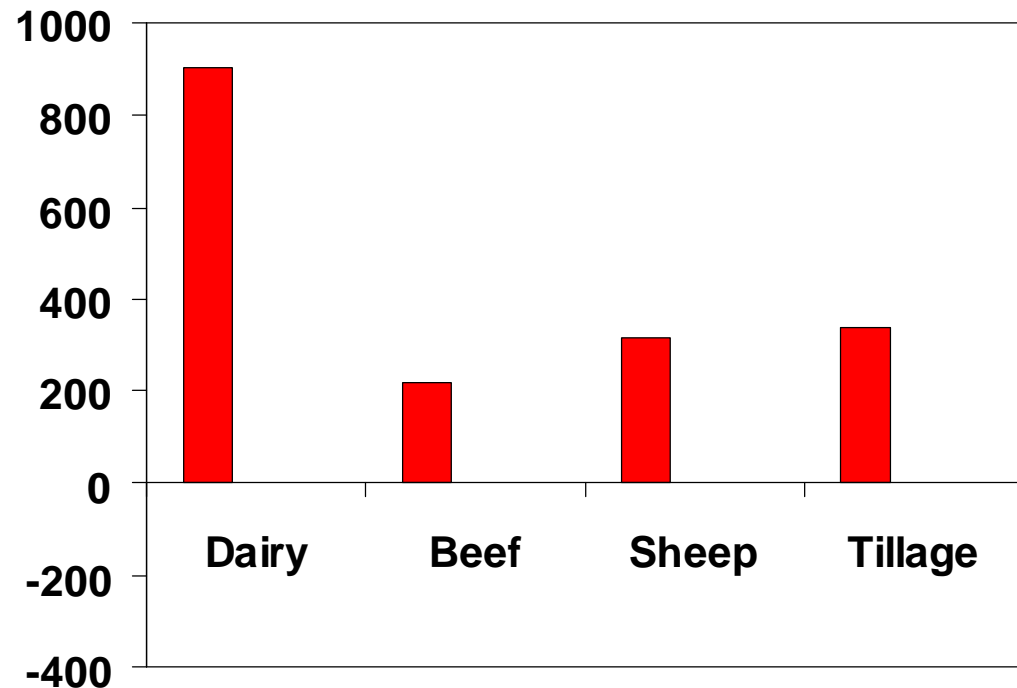
Source: McKinsey-SEI



Income per Hectare by Sector

(National Farm Survey 2008)

- **However proposals in public debate to cut the size of the national herd to achieve the reduction**
 - Here we will consider a reduction in the herd sufficient to reduce GHG's by 20%
 - In considering the economics of reducing the national herd to meet GHG reductions, like the MAC, the most economically efficient strategy is to focus the reduction on the least profitable sectors

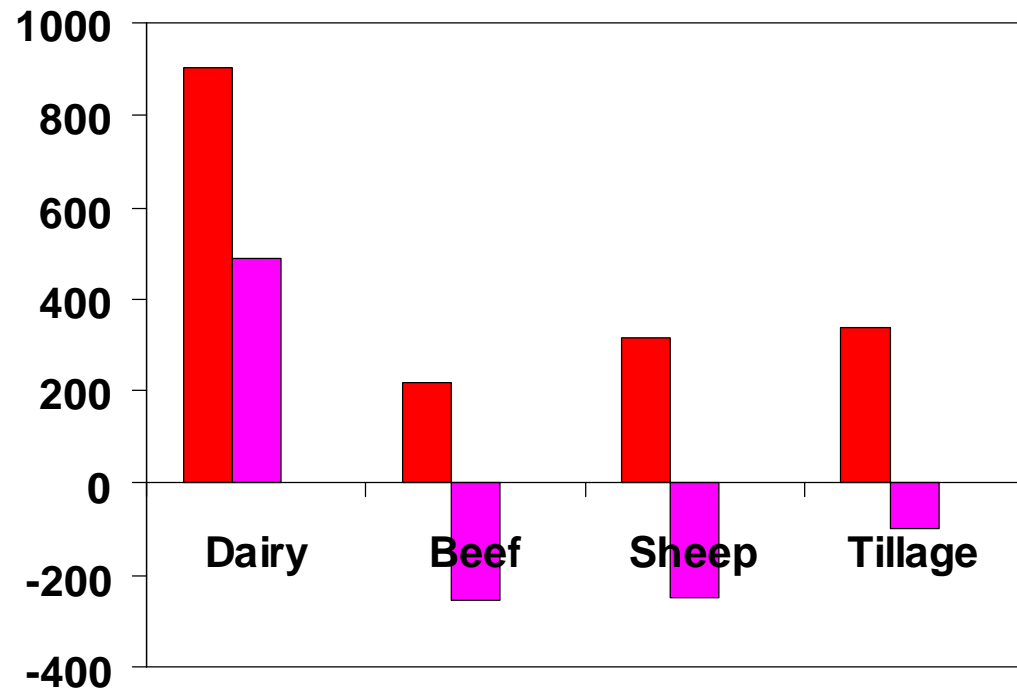


■ Income ■ Market ■ Cash

Income per Hectare by Sector

(National Farm Survey 2008)

- **However proposals in public debate to cut the size of the national herd to achieve the reduction**
 - Here we will consider a reduction in the herd sufficient to reduce GHG's by 20%
 - In considering the economics of reducing the national herd to meet GHG reductions, like the MAC, the most economically efficient strategy is to focus the reduction on the least profitable sectors

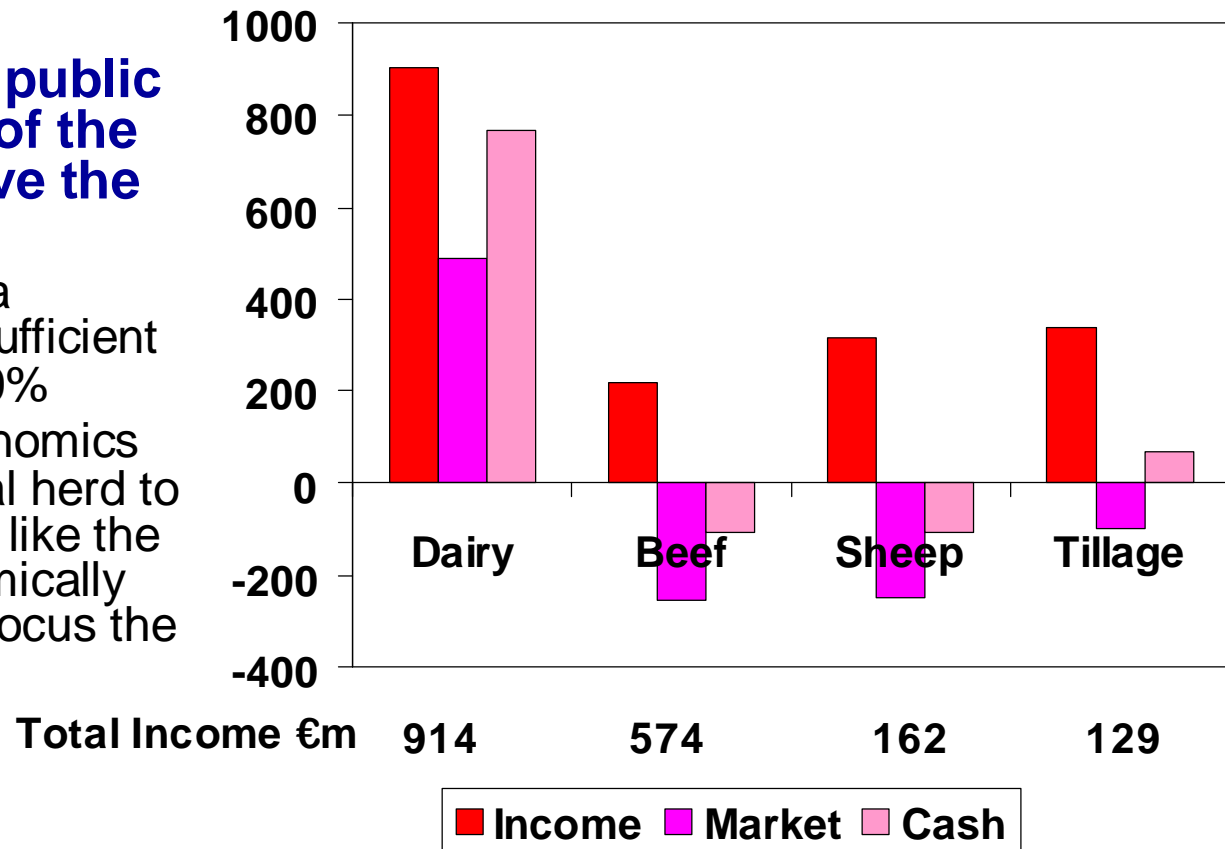


■ Income ■ Market ■ Cash

Income per Hectare by Sector

(National Farm Survey 2008)

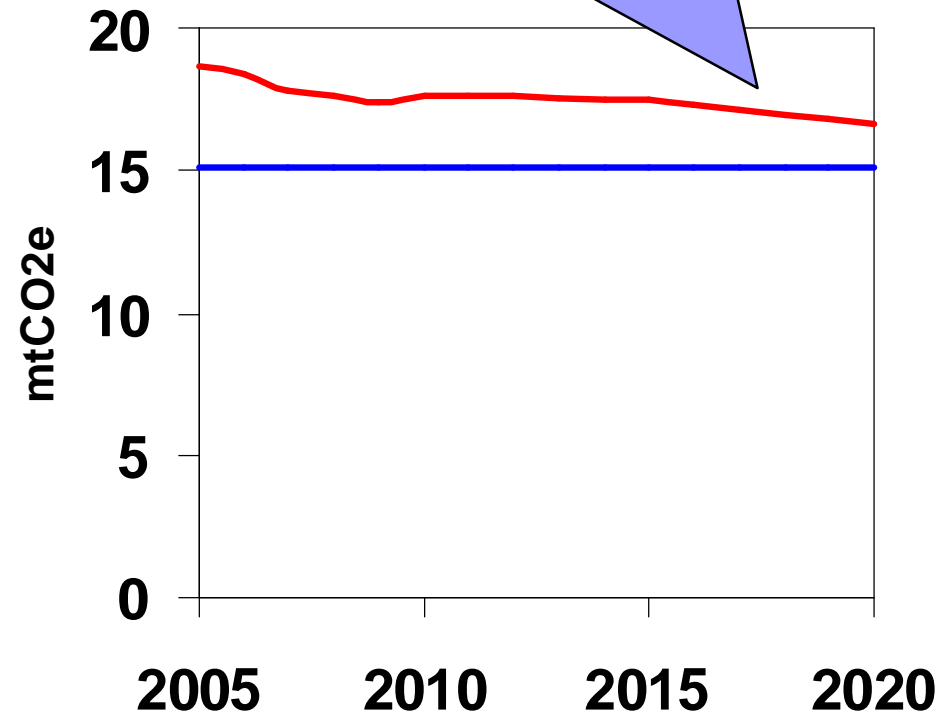
- However proposals in public debate to cut the size of the national herd to achieve the reduction
 - Here we will consider a reduction in the herd sufficient to reduce GHG's by 20%
 - In considering the economics of reducing the national herd to meet GHG reductions, like the MAC, the most economically efficient strategy is to focus the reduction on the least profitable sectors



FAPRI-Ireland Analysis

Reference GHG emissions decline due to expected decline in Cow numbers over time

- Teagasc's FAPRI-Ireland Model used to project Agricultural Output
- Reference Scenario
 - Milk Quota increased and removed in 2015
 - No WTO



— Reference GHG Emissions mtCO2e
 — Target GHG Emissions mtCO2e



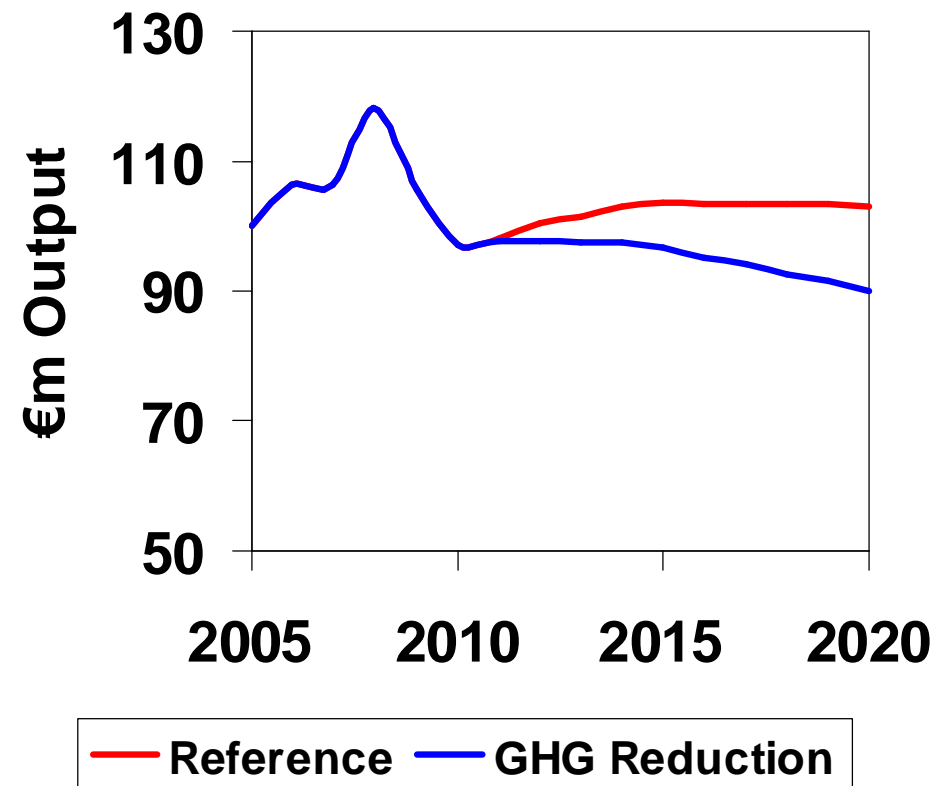
Beef Output had to decline by €183m to reach GHG targets by 2020

FAPRI ~~Interim~~ Analysis

■ Emissions Reduction Strategy

- 20% reduction on GHG emissions in 2005 by 2020
- Via Reduction in Beef Cattle
- No consideration has been given to the mechanism (carbon taxes, carbon quota, etc.) that might achieve the GHG reductions
- As beef #'s decline to achieve the 20% reduction target land becomes available for other purposes. → Ignored here

Beef Output



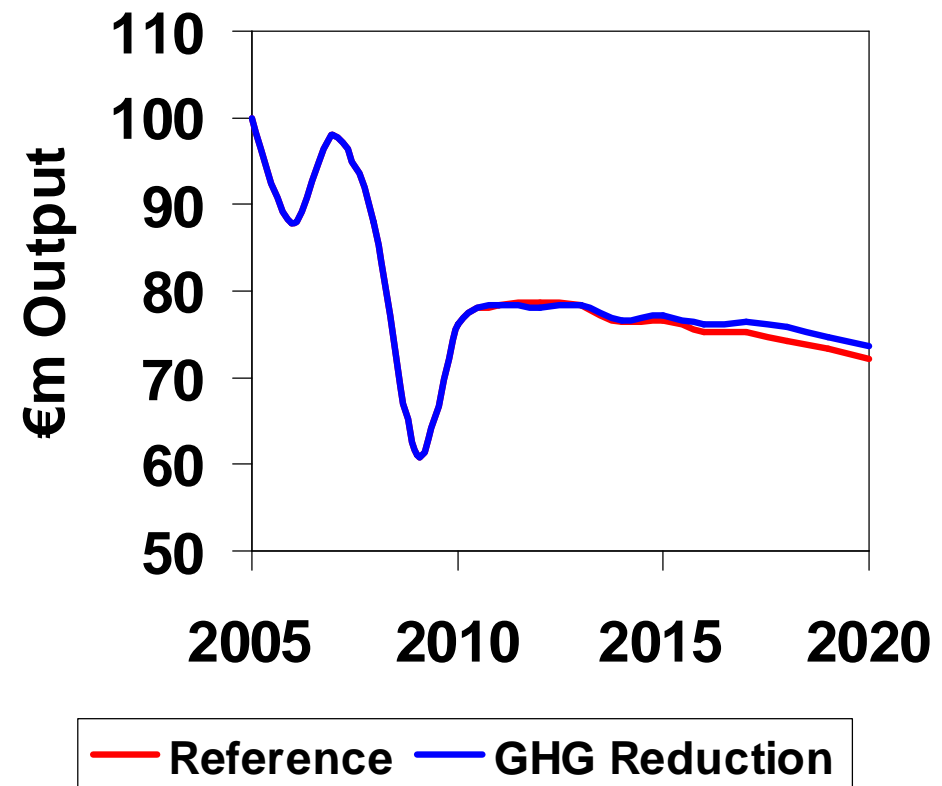
FAPR

However as margins in Beef are negative so that Farmers use subsidy to support farm enterprise, which are decoupled from production, operating surplus for sector would rise by €45m

■ Emissions Reduction Strategy

- 20% reduction on GHG emissions in 2005 by 2020
- Via Reduction in Beef Cattle
- No consideration has been given to the mechanism (carbon taxes, carbon quota, etc.) that might achieve the GHG reductions
- As beef #'s decline to achieve the 20% reduction target land becomes available for other purposes. → Ignored here

Sectoral Operating Surplus



However the Food Supply Chain is wider than the production of Agricultural Output


Food Supply Chain

Agricultural
Outputs

The Cattle Sector has a negative margin, because it spends so much in inputs (Feed, Fertiliser, Vets, Overheads etc) → Largely from Rural Economy → Very High Local Multiplier

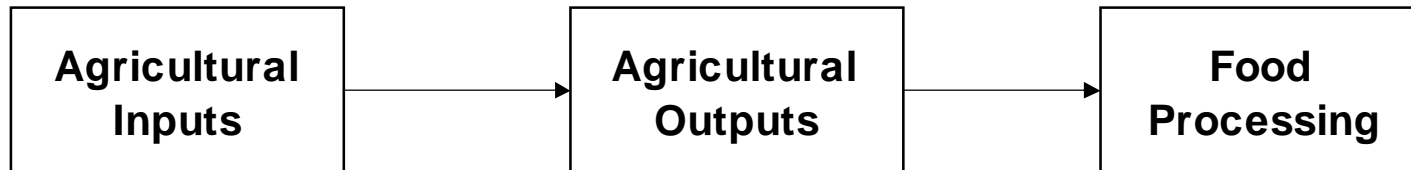
Food Supply Chain





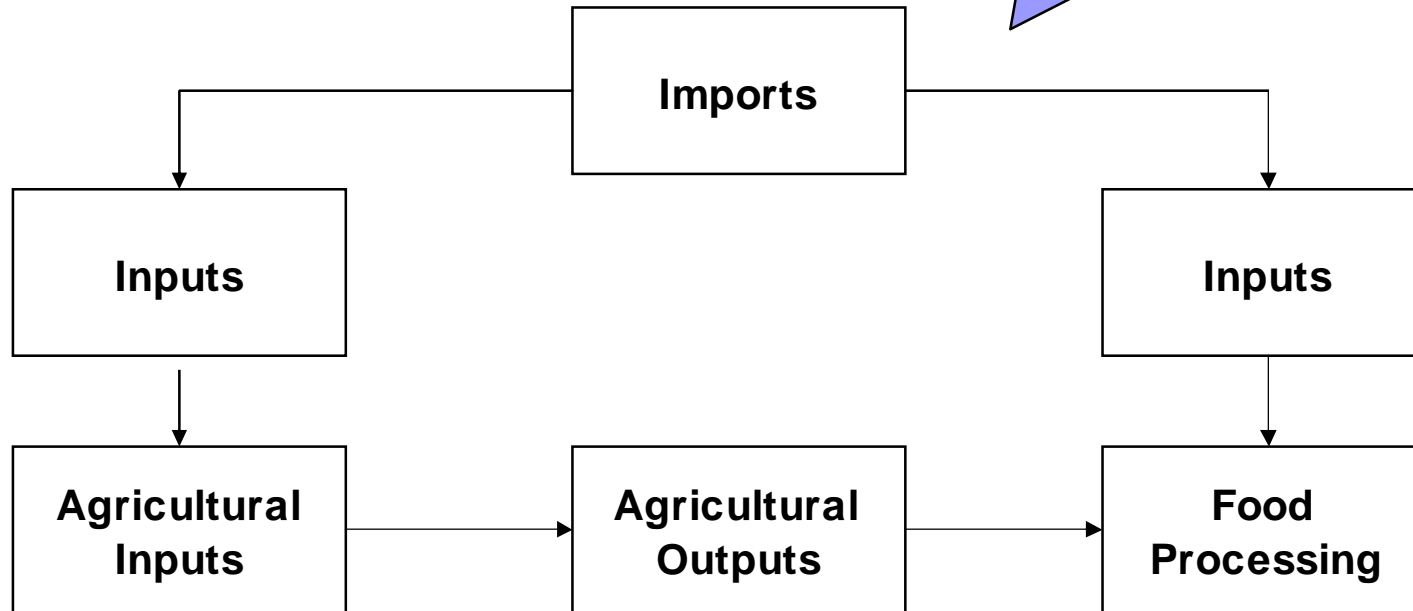
It is also the primary input into the (profitable) Food Processing Sector

Food Supply Chain



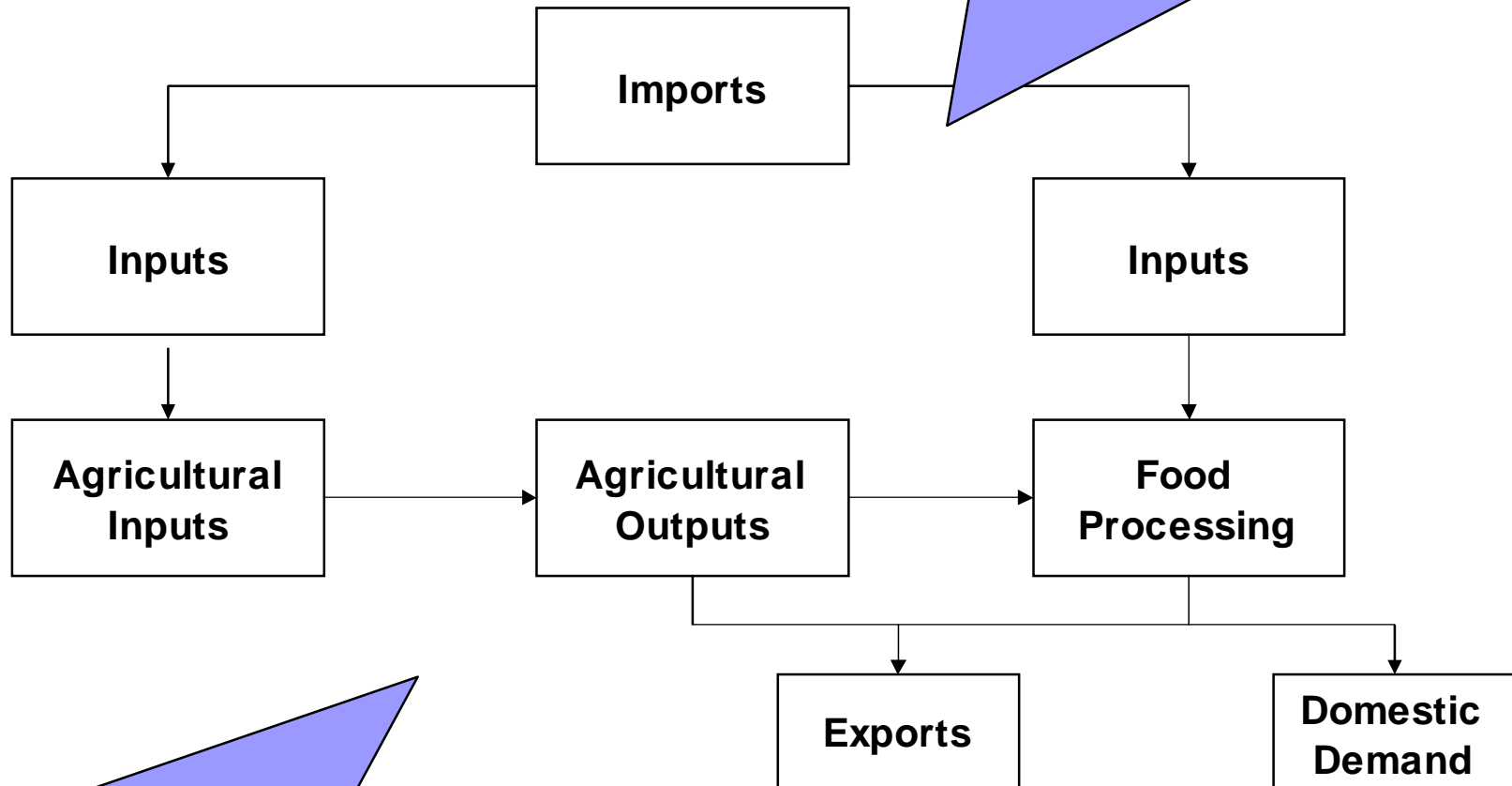
All of these components of the supply chain themselves have inputs (and also some imports) generating what we call multipliers

Food Supply Chain



Food

- The Beef Processing Sector exports the vast bulk of the output from the sector
- The Cattle Sector in addition exports a small proportion as live animal exports
- Generating Export Earnings



- Given largely Irish ownership with limited repatriated profits, with better domestic connectivity and so fewer imports, agri-food and bio-economy sector a major source of net export earnings
- Although 16% of exports, 32% of net earnings (Riordan, 2008)

Profits from the Economic Sectors generate returns in terms of Labour Income, Profit and Dividends for the Household Sector

Food Supply Chain

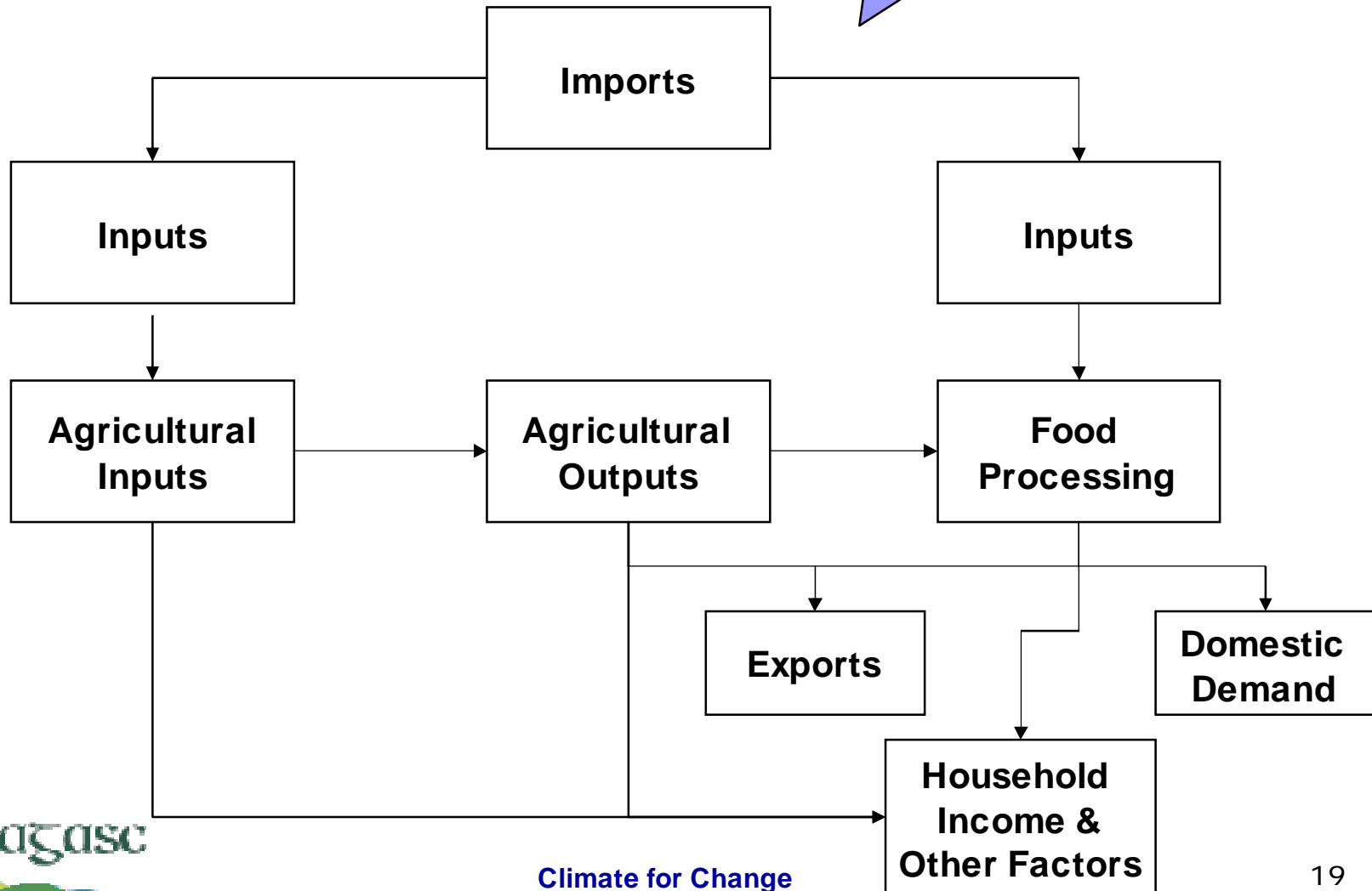


IMAGE Impact Analysis

■ IMAGE Model

- Developed by TCD partially funded and assisted by Teagasc
- Model linkages between Agriculture and Other Sectors
- First analysis of the model → still work in progress

■ However robust conclusion

- A reduction in cattle of circa €180m
- Reduces Beef Processing Sector value by about €570m plus indirect impacts via multiplier of about €25m.

Sectoral Operating Surplus

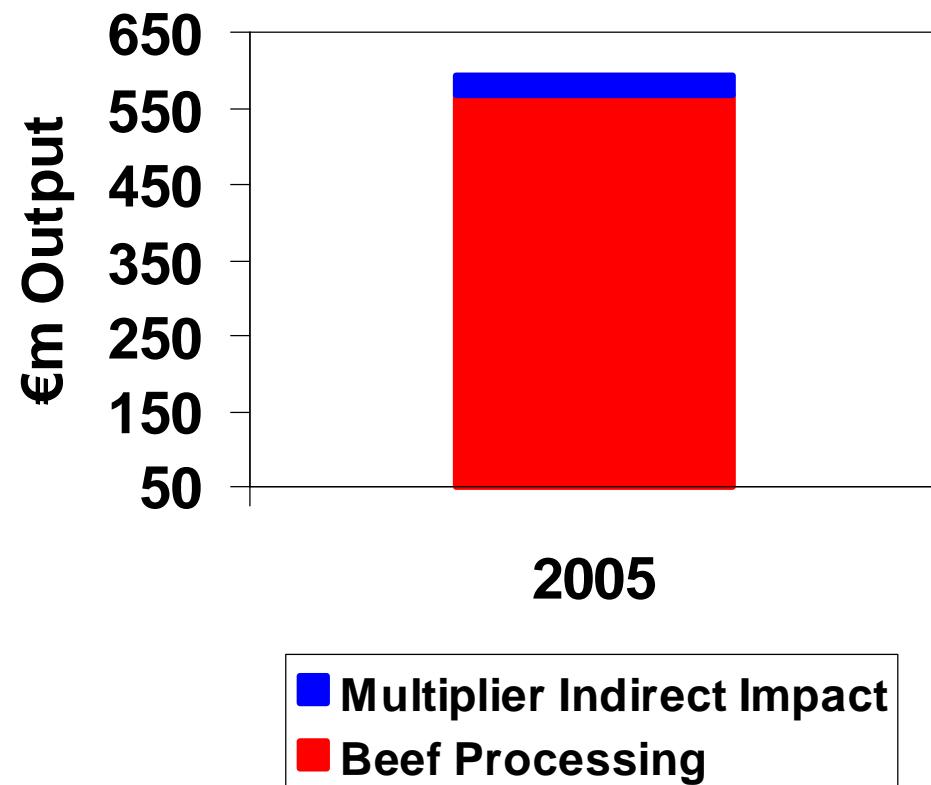
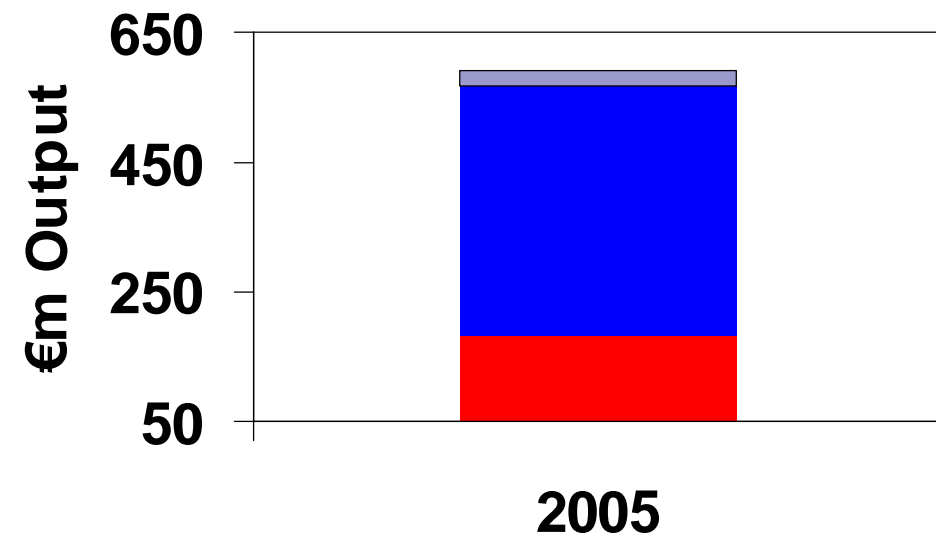


IMAGE Impact Analysis

- Of the total impact of about €600m to reach GHG totals
 - The loss to the Processing sector and related inputs and employment is greater than Cattle Sector
 - Much of the Loss to the Cattle Farming Sector can be passed on to suppliers to Cattle

Sectoral Operating Surplus

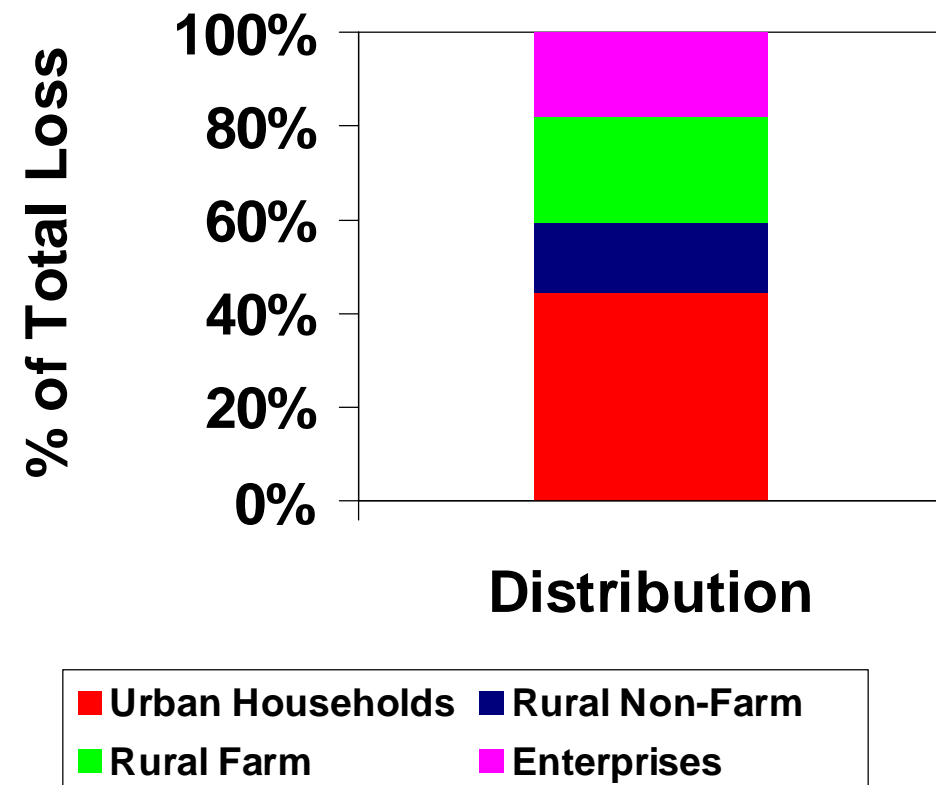


Distribution by Household/Enterprise Type

■ Dividing Loss by Household and Enterprise Type

- The majority of the loss is incident on Urban households (including small towns) due to lost employment and profits etc
- Next biggest hit is on Farm Households, but mainly for suppliers of Cattle Sector
- Enterprises and other Rural Non-Farm Households

Distribution of Loss



Conclusion

- Reducing cattle herd to facilitate GHG reduction has a small abatement cost on Cattle farmers
- But major knock on impact on national and local economy
- Given increasing pressure to produce food due to growing world population and increasing wealth, reduction in Ireland may result in increase in food production elsewhere and/or increases in food prices
- Concentrate first on low hanging fruit
 - Improved management practices
 - Improved technologies

Marginal Abatement Cost (Economy)

And target the many options where negative or low marginal abatement costs exist

