# The European Commission's science and knowledge service

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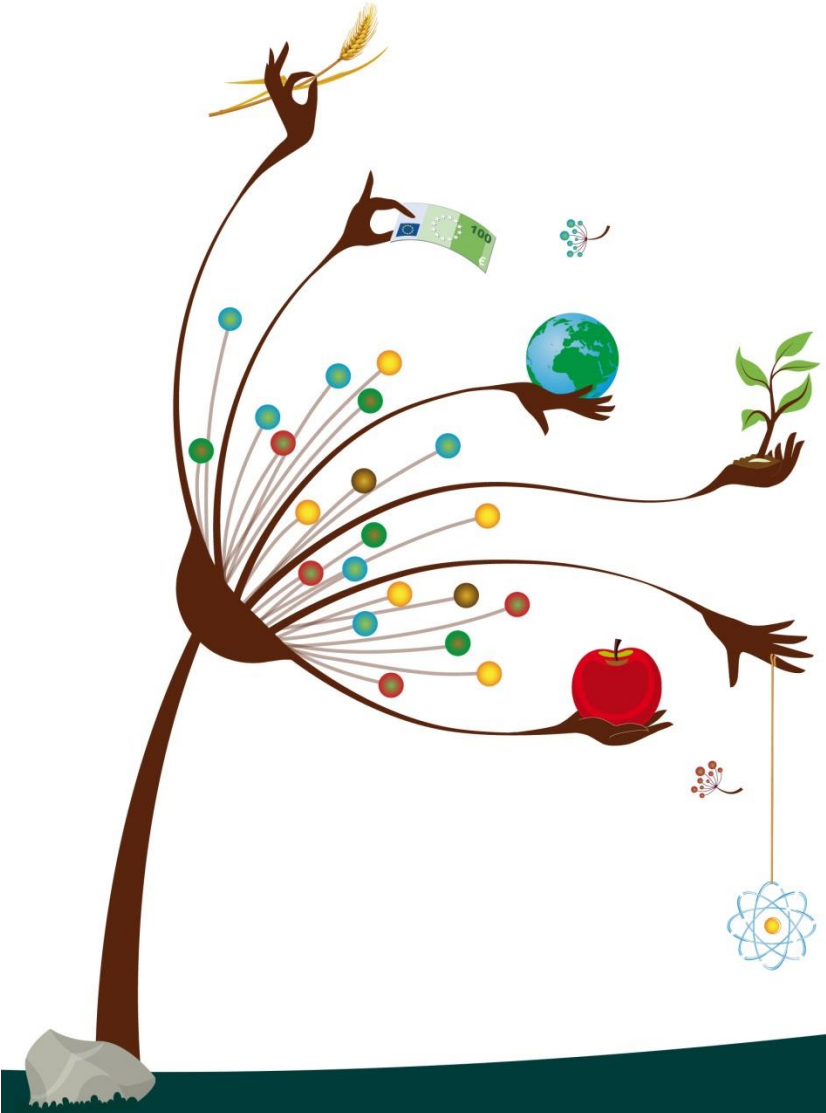

# IMPACT OF CLIMATE CHANGE MITIGATION ON EU AGRICULTURE

**Vladimír Šucha**

**6 December 2016**
**Brussels**

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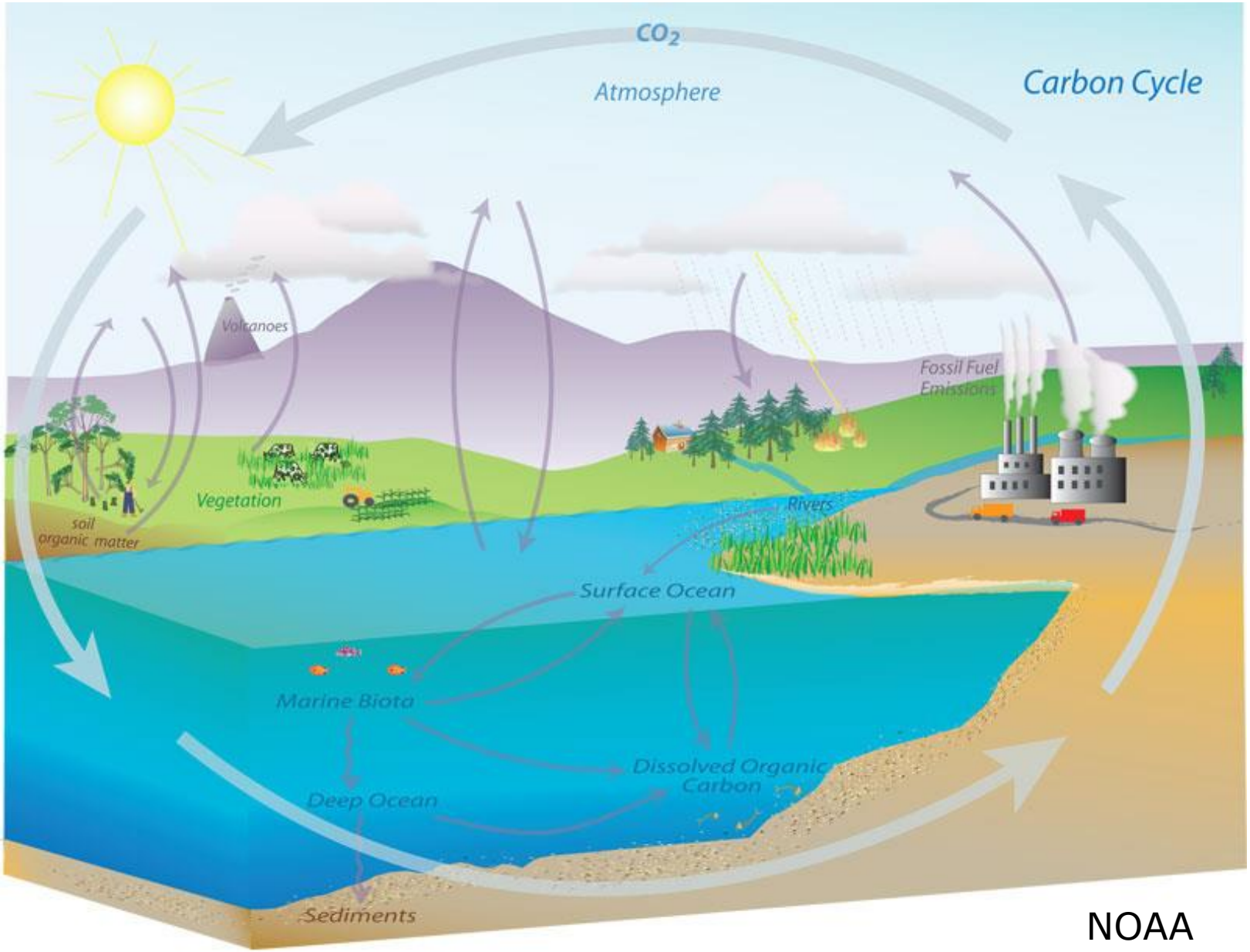
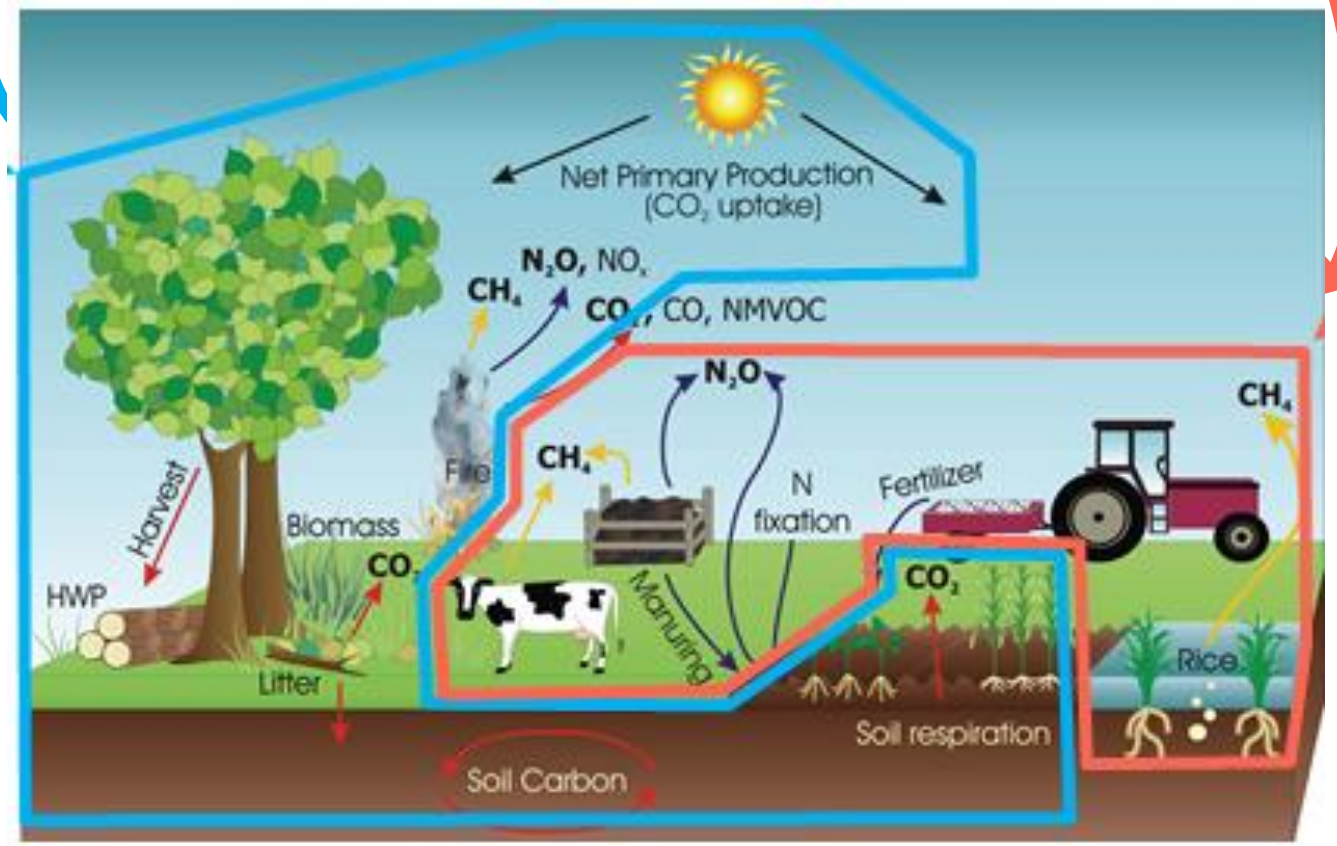

$CO_2$
Atmosphere
Carbon Cycle
Volcanoes
Fossil Fuel Emissions
Vegetation
soil organic matter
Rivers
Surface Ocean
Marine Biota
Dissolved Organic Carbon
Deep Ocean
Sediments

NOAA

# Land use includes LULUCF and agriculture

Land Use, Land Use Change and Forestry (**LULUCF**): mainly $CO_2$

**AGRICULTURE *non-*$CO_2$** ($CH_4$, $N_2O$)




Source: adjusted from IPCC, 2006

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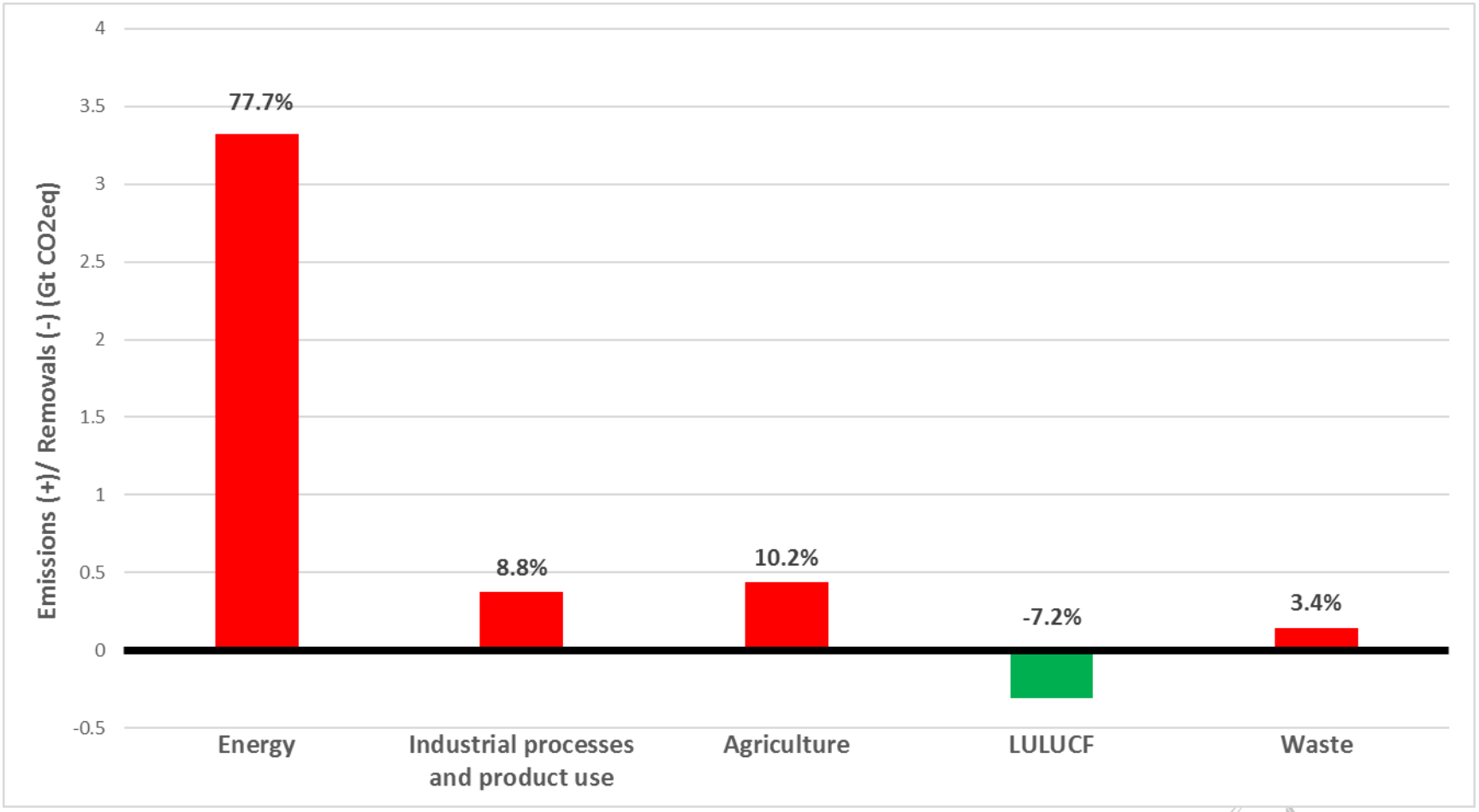
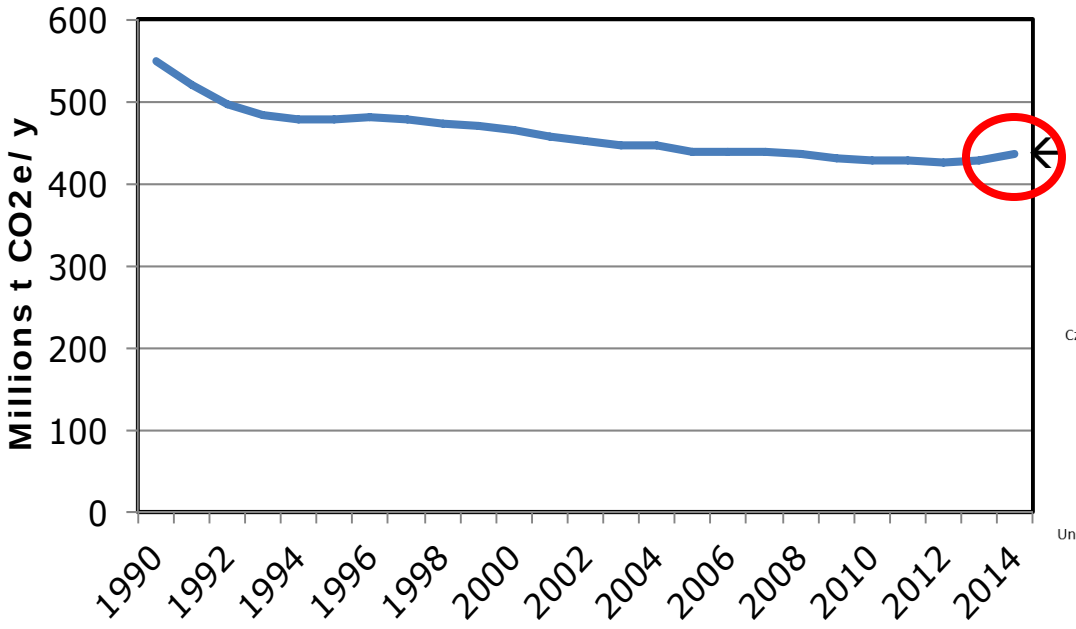
# Emissions and removals in the EU – all sectors (2014)



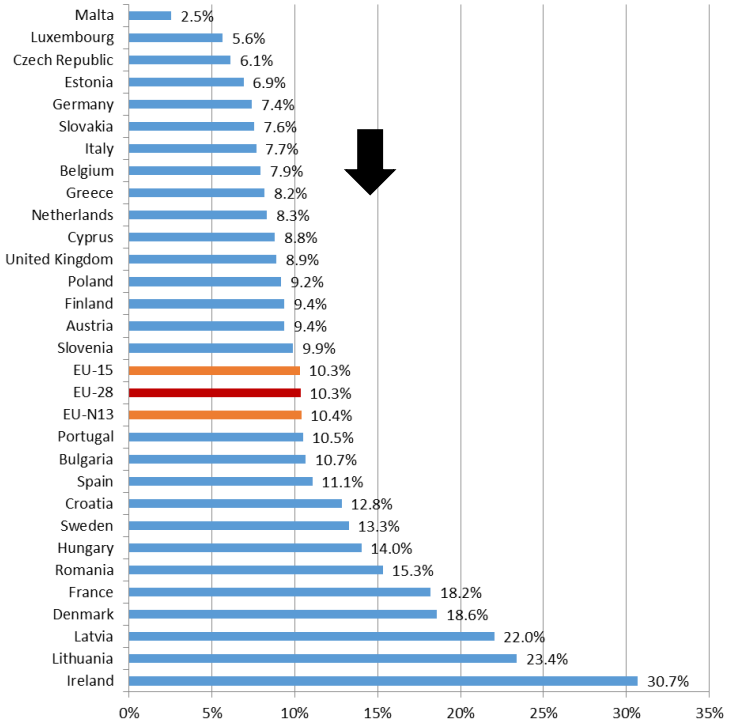

Source: EU GHG Inventory 2016

# Agriculture GHG emissions in the EU, 1990–2014: -21%




Source: EU GHG Inventory 2016

10% of total EU GHG emissions, varying widely across countries




But: In 2030 EU agricultural emissions are projected to decrease by only 2.3% compared to 2005

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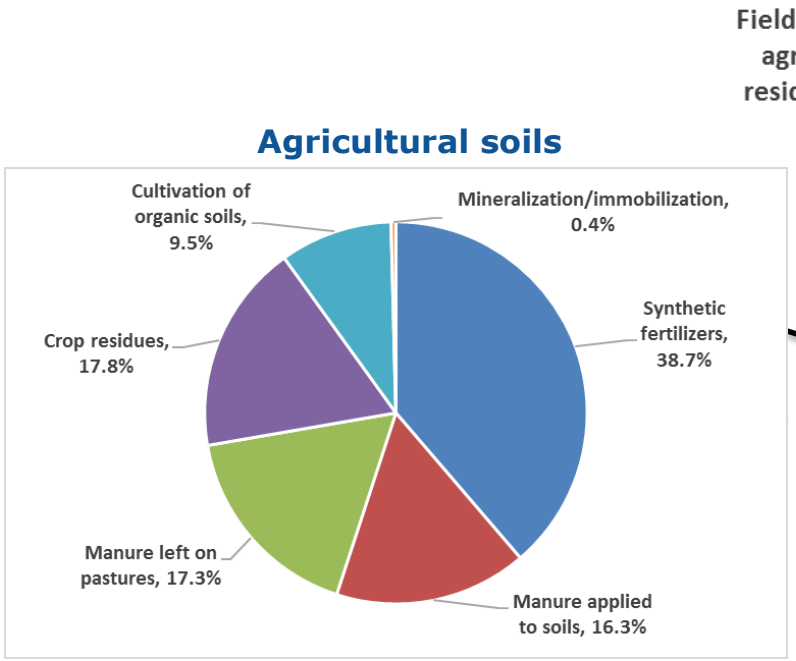
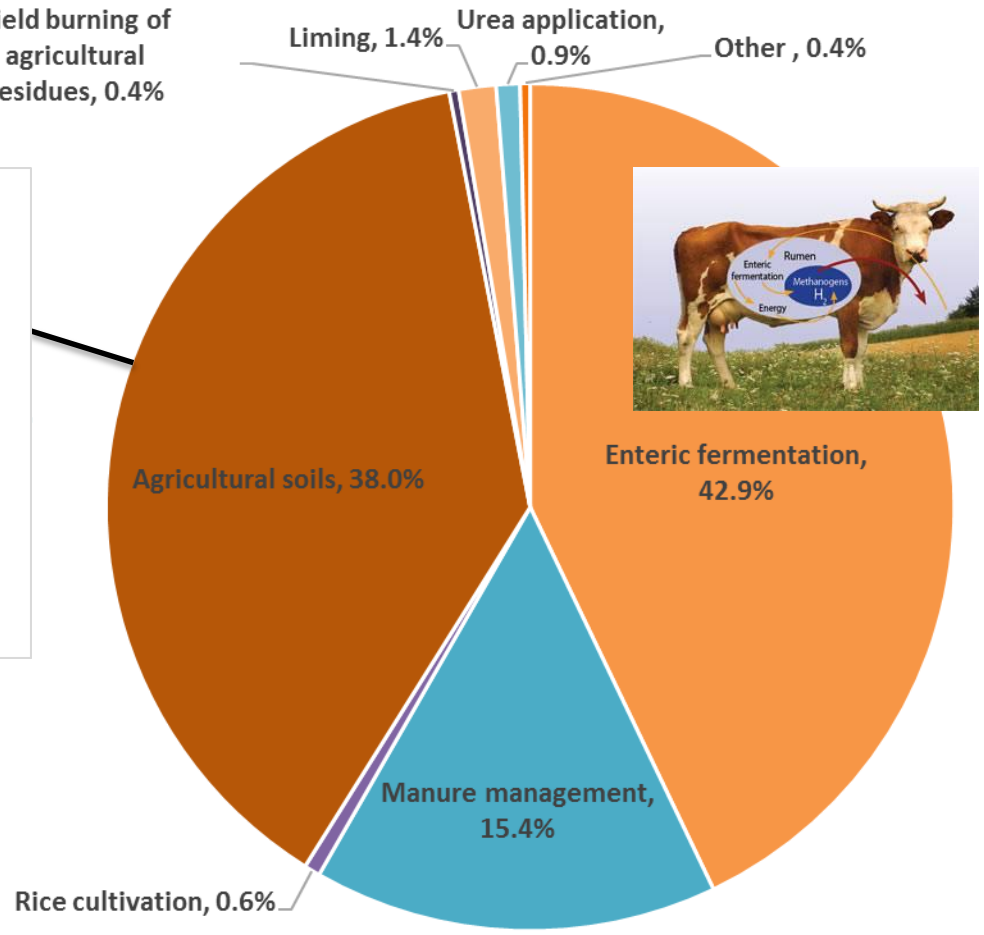
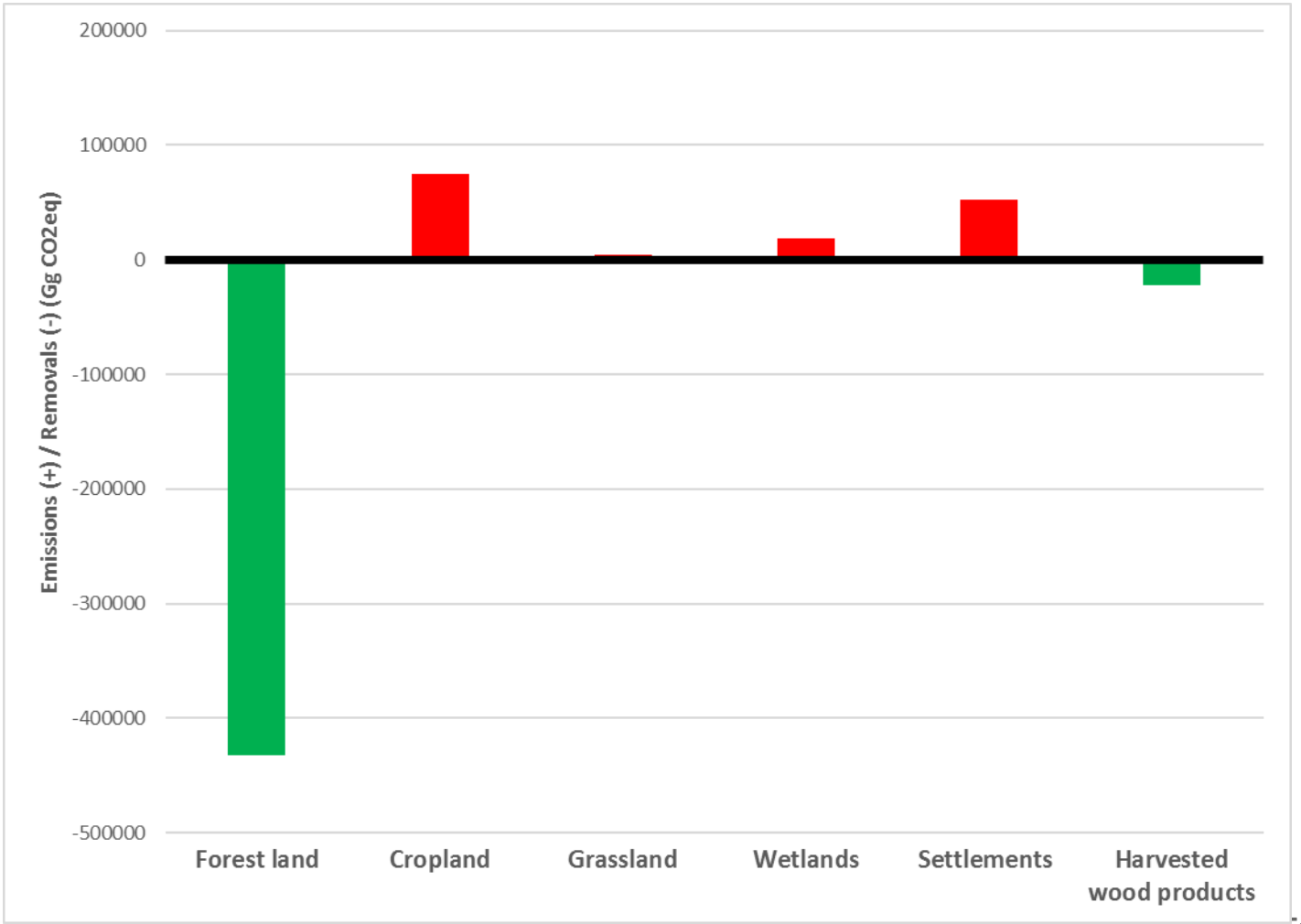
# Agriculture emissions in the EU (2014)



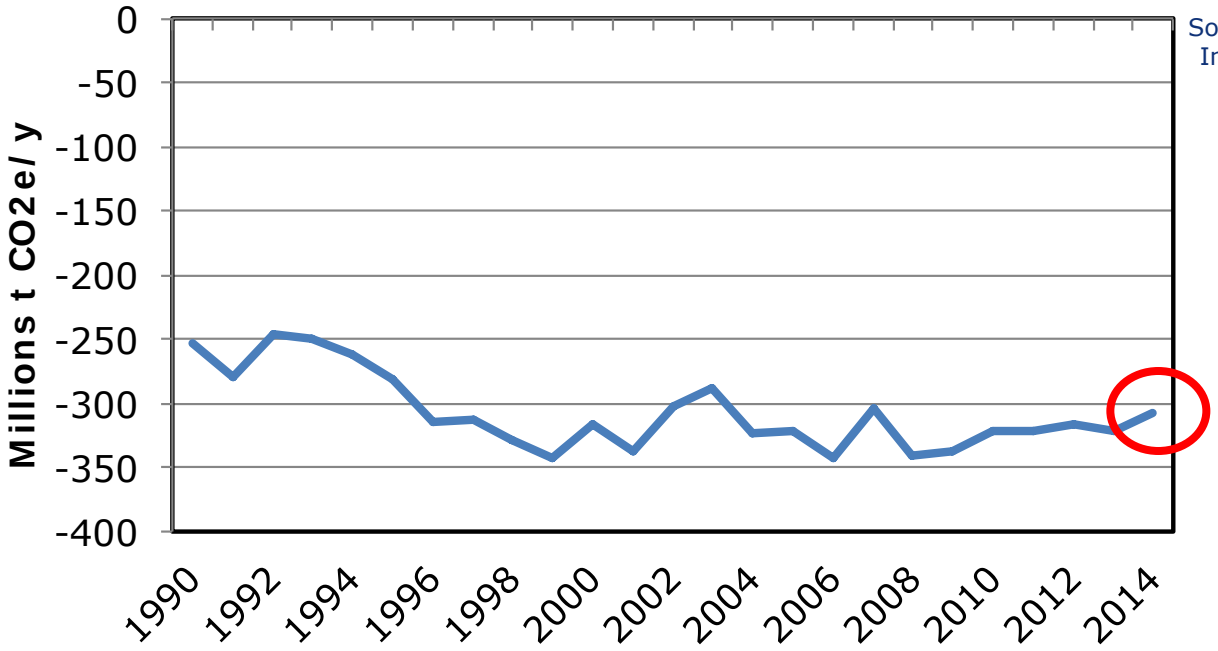



# LULUCF emissions and removals in the EU (2014)




Source: EU GHG Inventory 2016

# $CO_2$ removals from LULUCF in the EU, 1990–2014




Source: EU GHG Inventory 2016

← offsets 7% of total EU emissions

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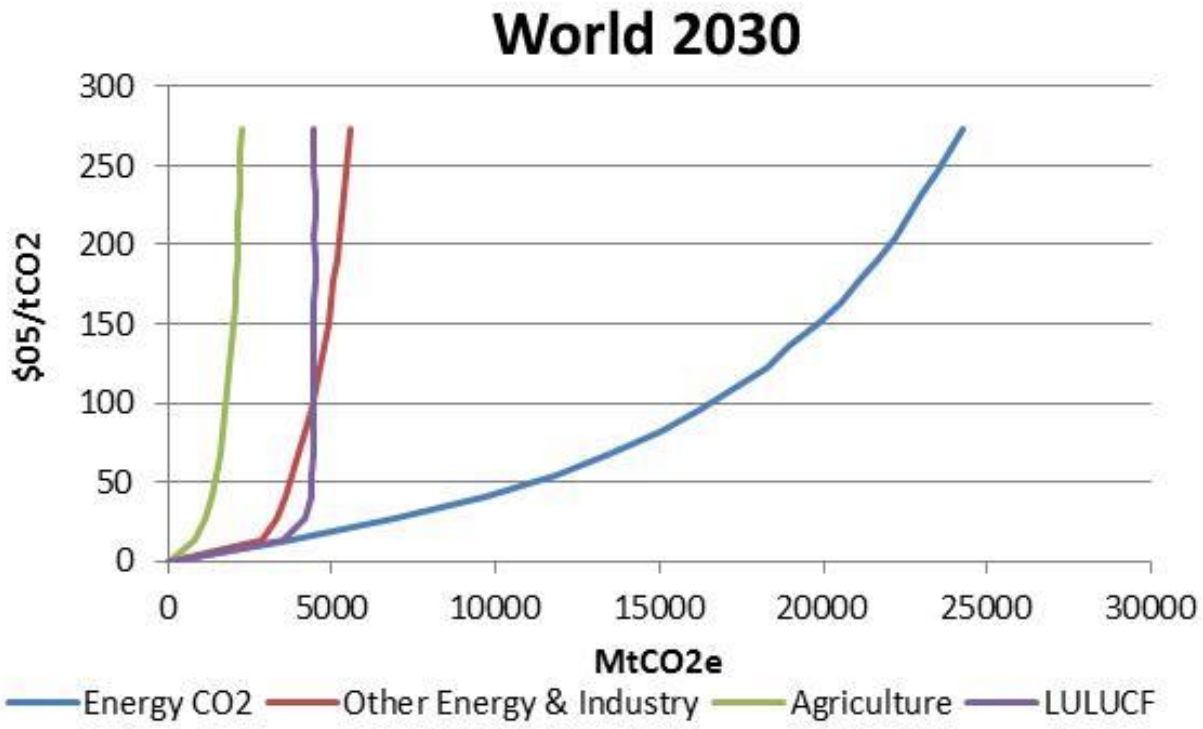
# Costs of mitigation are higher in the agriculture sector than in other sectors

***Marginal abatement costs with respect to the no-policy scenario***




***Source: JRC Report Global Energy and Climate Outlook (2016)***

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# Economic assessment of GHG mitigation policy options for EU agriculture

- Evolution of agriculture non-$CO_2$ GHG emissions
- Technological mitigation options
- Possible market effects and costs
- Assess the role of CAP budget


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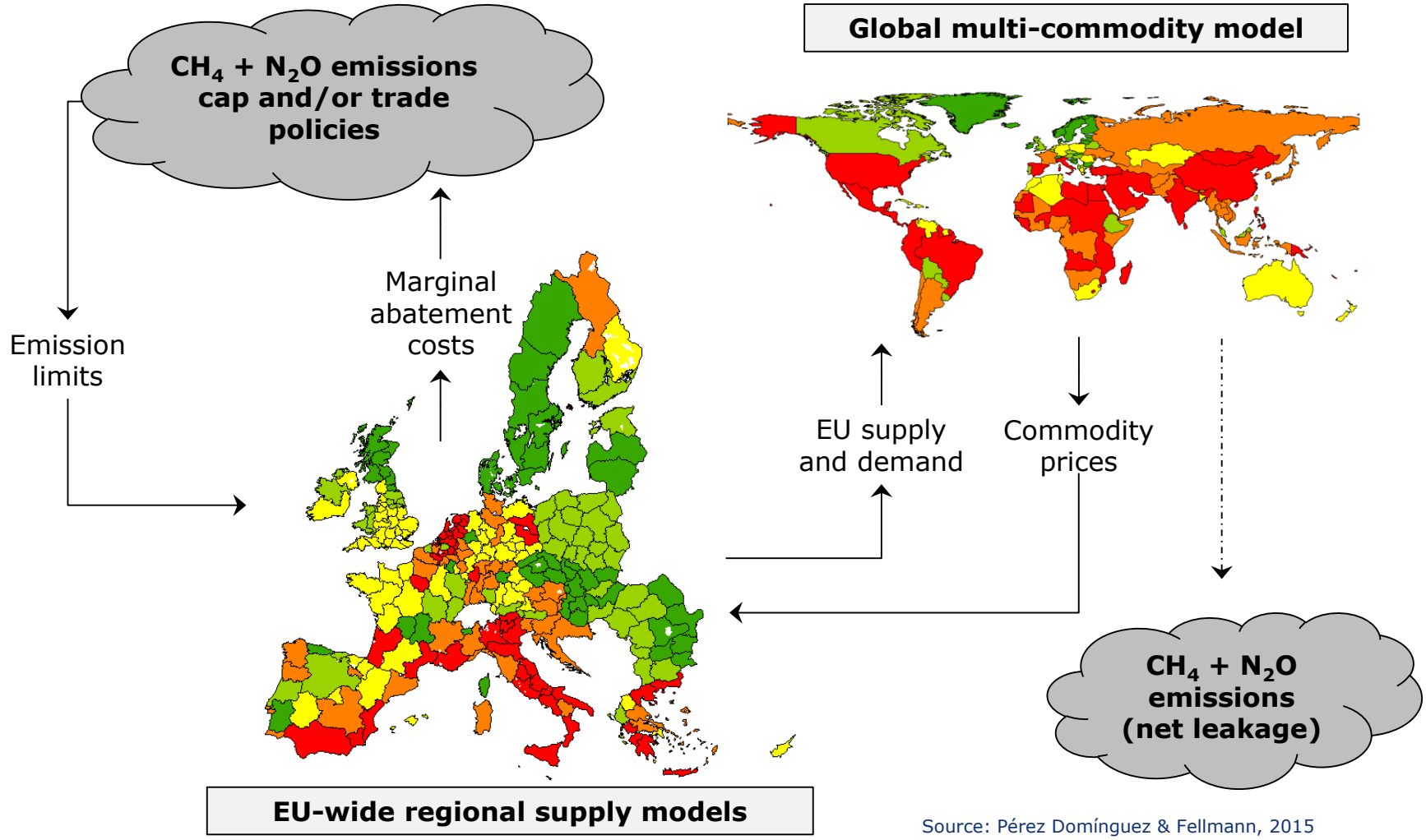
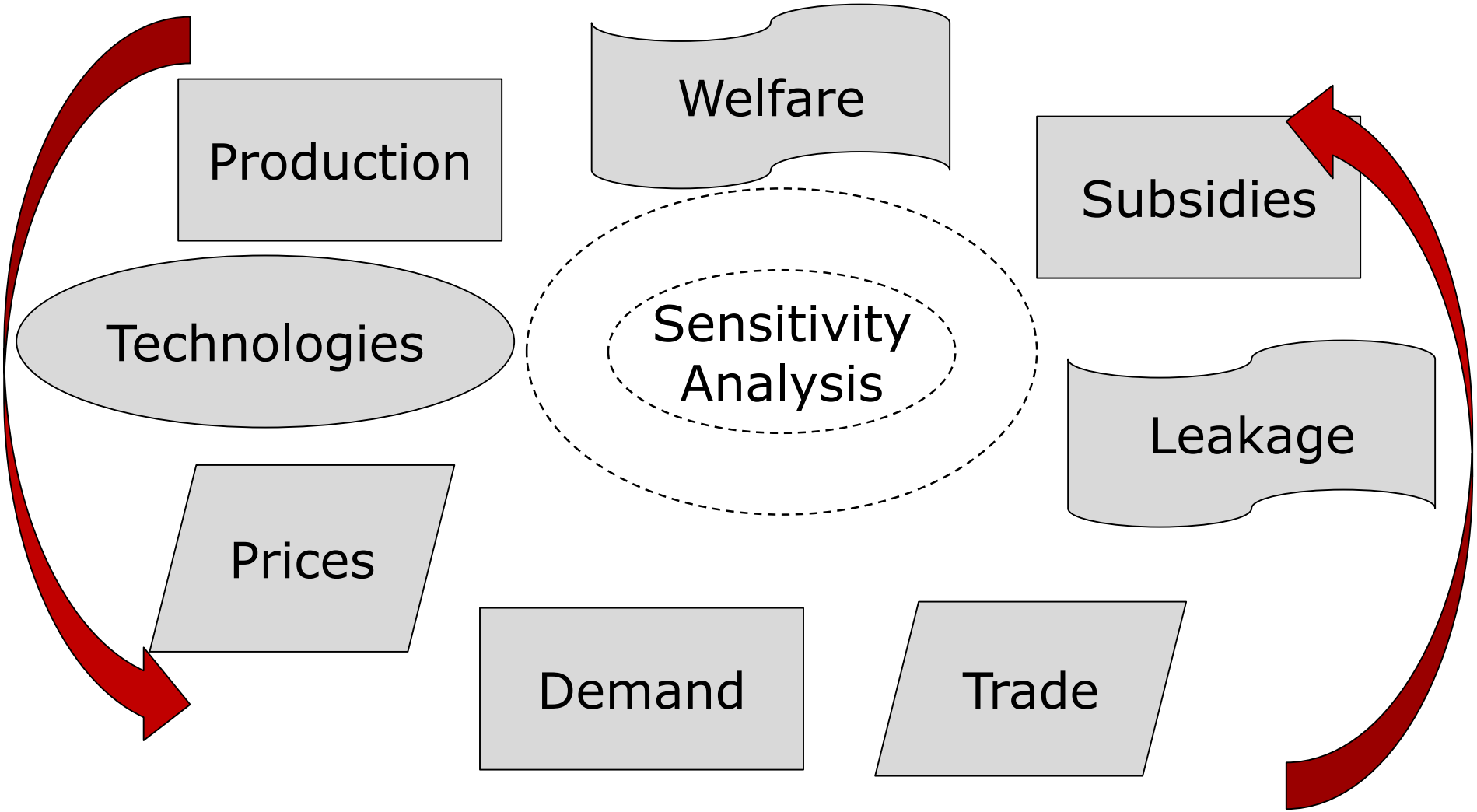
# Methodology: CAPRI model structure




Source: Pérez Domínguez & Fellmann, 2015

# Main results: outline



# ECAMPA: 2 scenarios with a mitigation target for EU agriculture

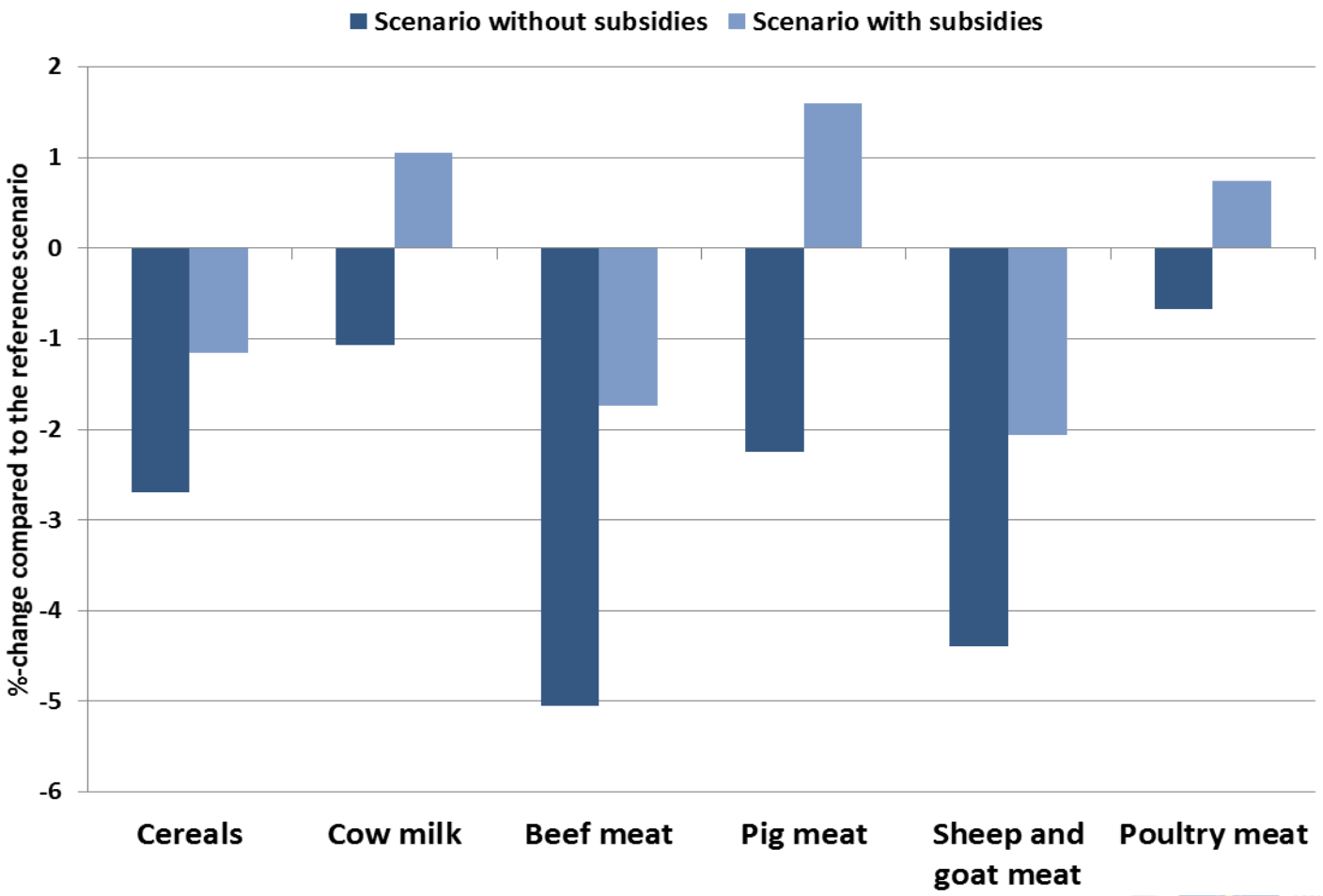
| Scenario | Emission reduction target | Subsidies for the adoption of mitigation technologies |
|---|---|---|
| Scenario 1 | 15% | |
| Scenario 2 | 15% | 80% |

- Livestock: anaerobic digestion, changes in feed composition, breeding programs to increase milk yields of dairy cows and ruminant feed efficiency

- Crops: Increased efficiency of (mineral) N-fertilisation, set-aside of organic soils, others

*Scenarios 15% mitigation target*

# EU production: ruminant meats most affected

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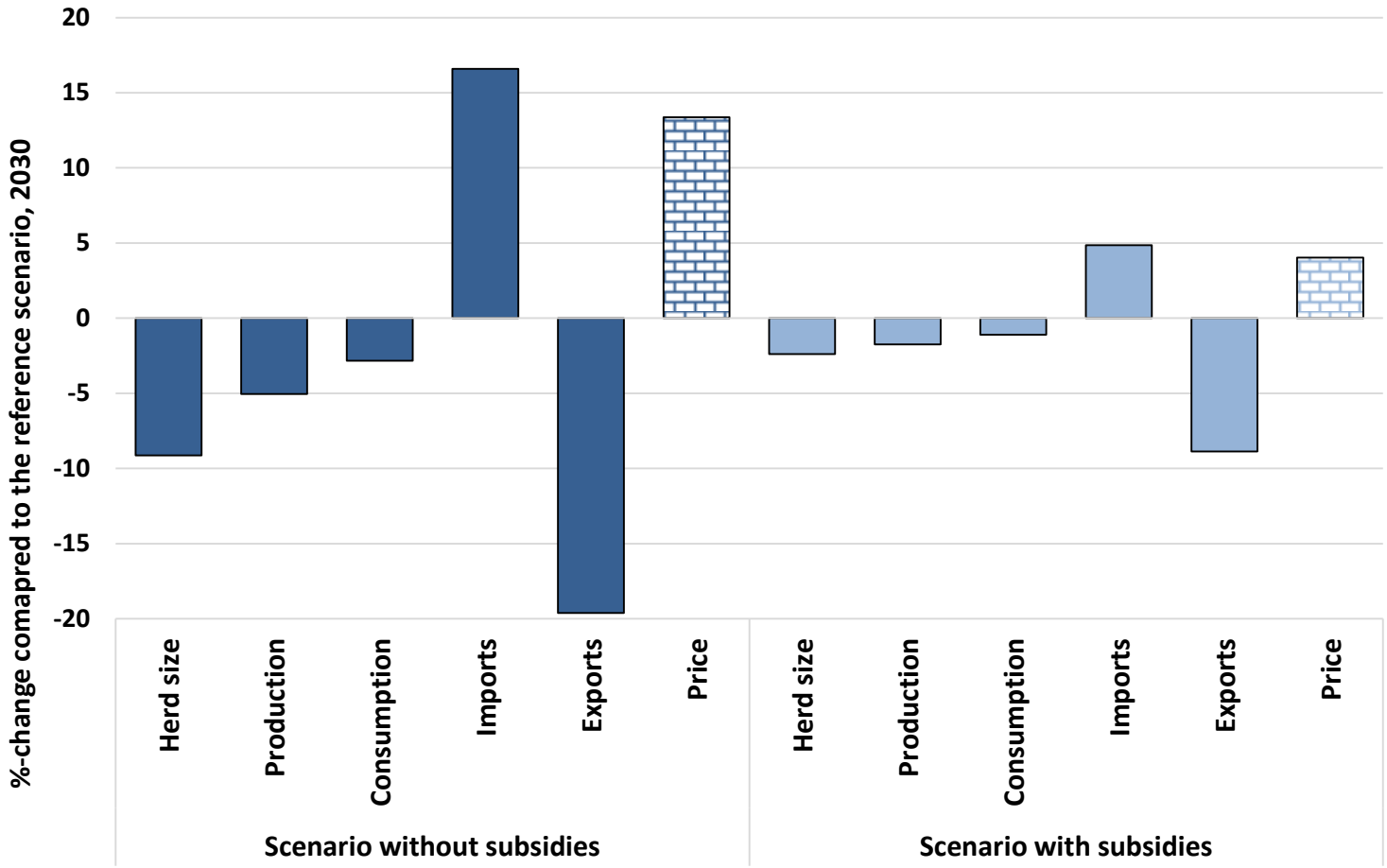
# Subsidies smoothen effects for EU beef market balances and prices

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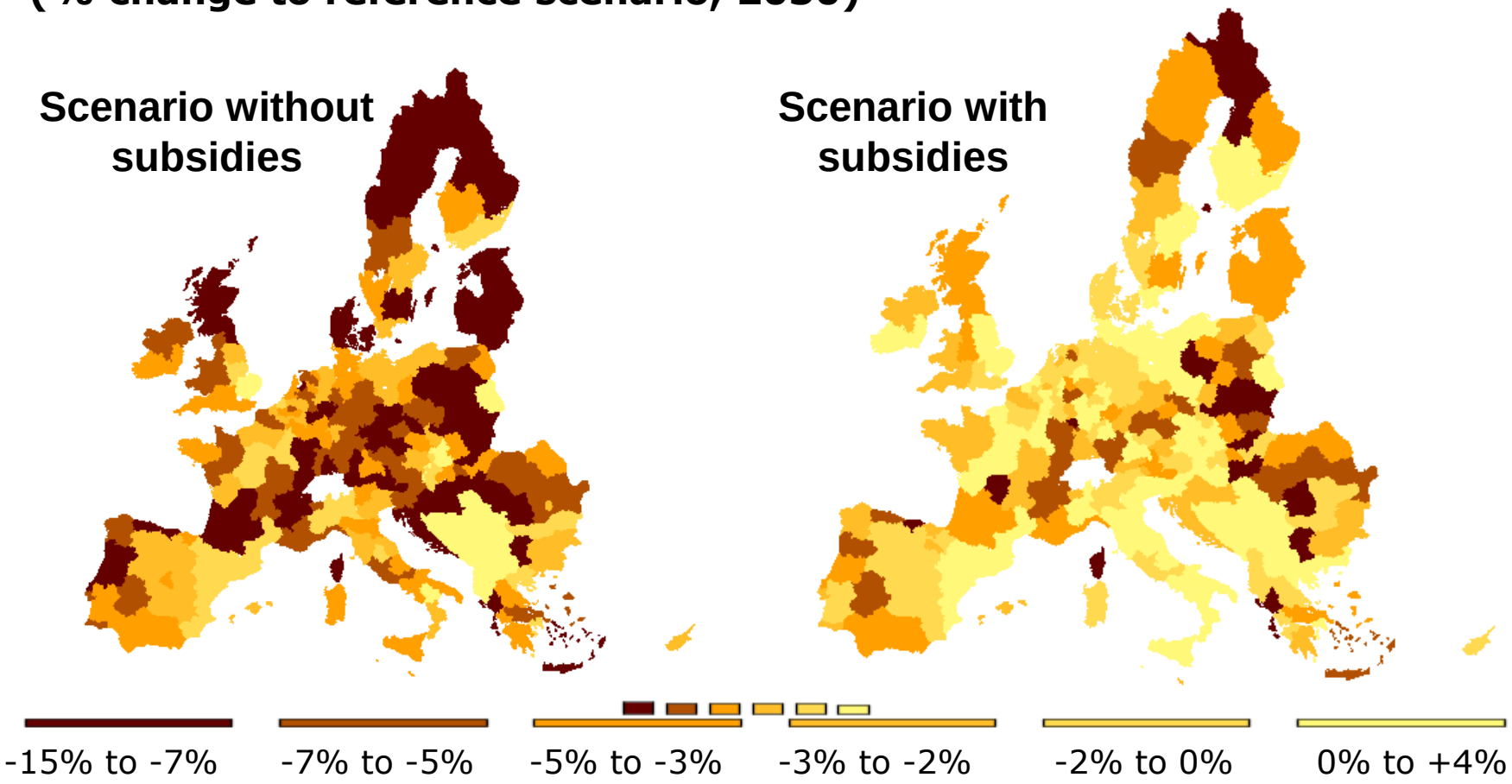
# *Scenarios 15% mitigation target*

## EU beef production impacts

**(% change to reference scenario, 2030)**

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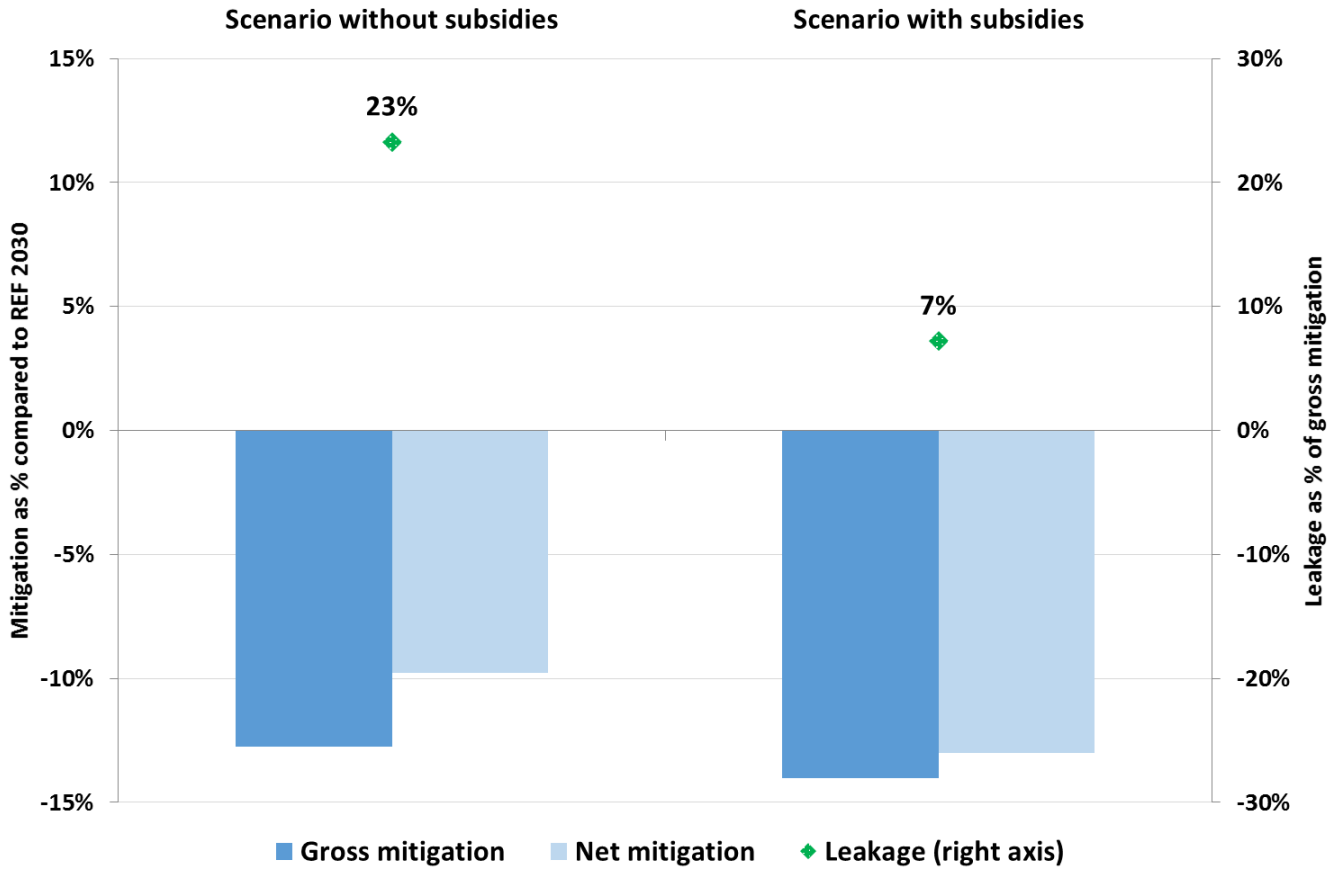
# *Scenarios 15% mitigation target*

## Emission leakage not negligible

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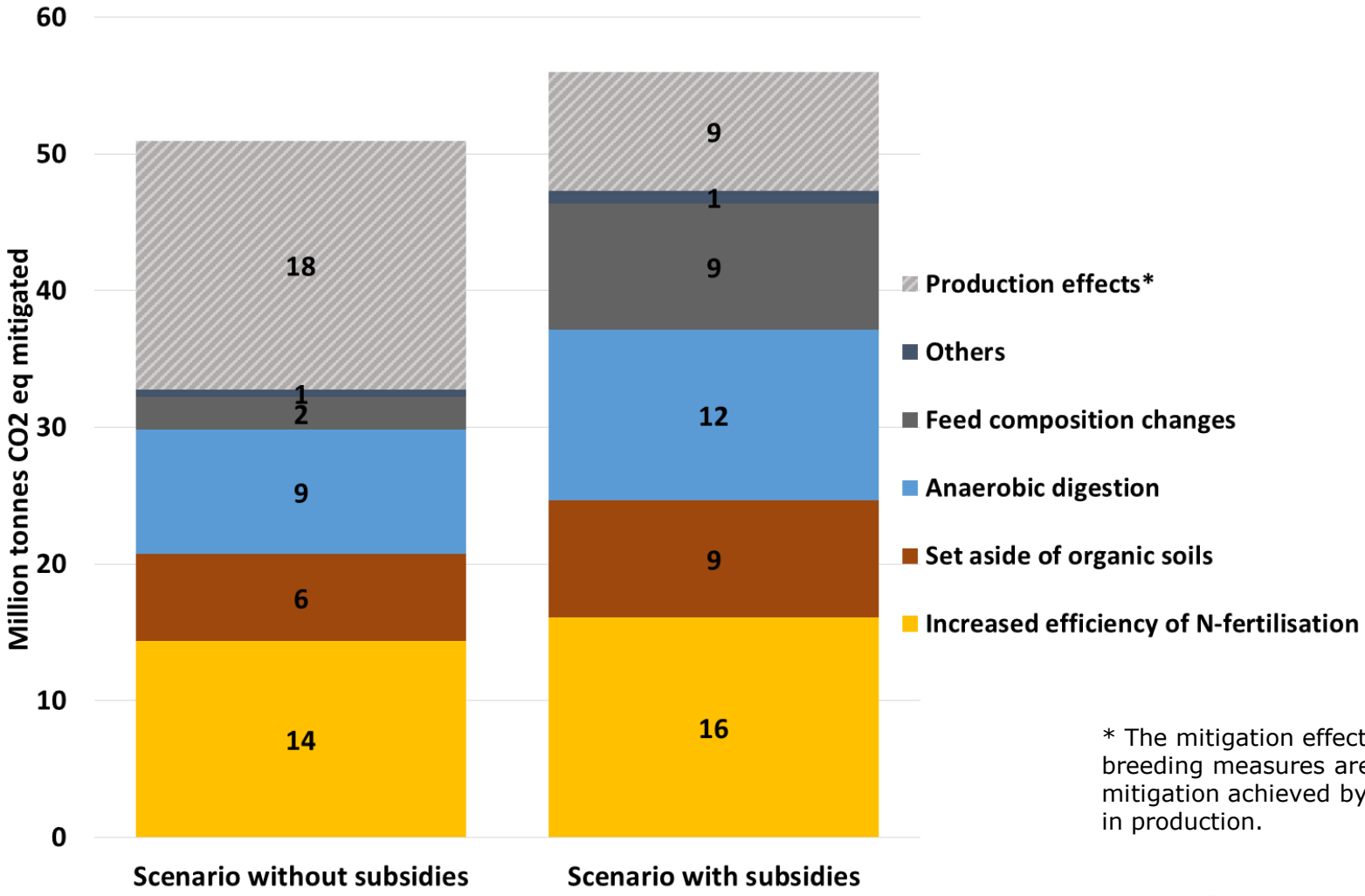
# Overall mitigation achievement and contribution by technology




* The mitigation effects linked to breeding measures are added to mitigation achieved by changes in production.

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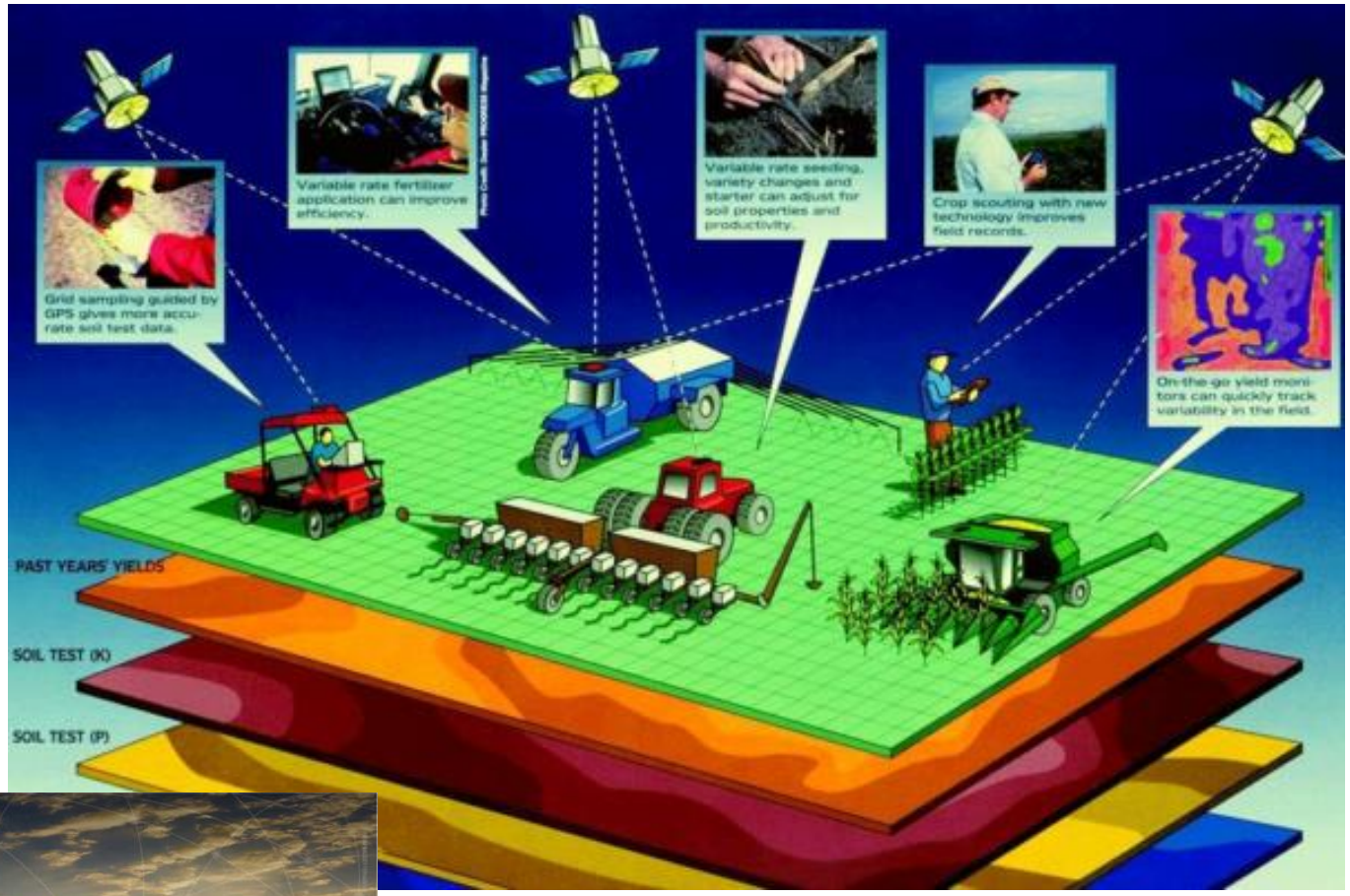
# Win-win mitigation options?

# Precision farming

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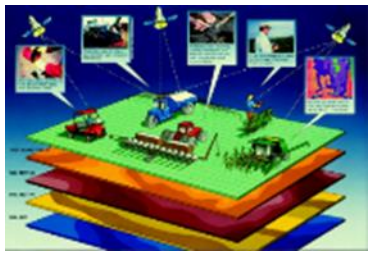
# Co-benefits



Sensors

GALILEO

cornerstone

GSAA

GNSS

Tablet

E-signatory

Photo Via GSM

**IACS GIS (LPIS) Administration system**

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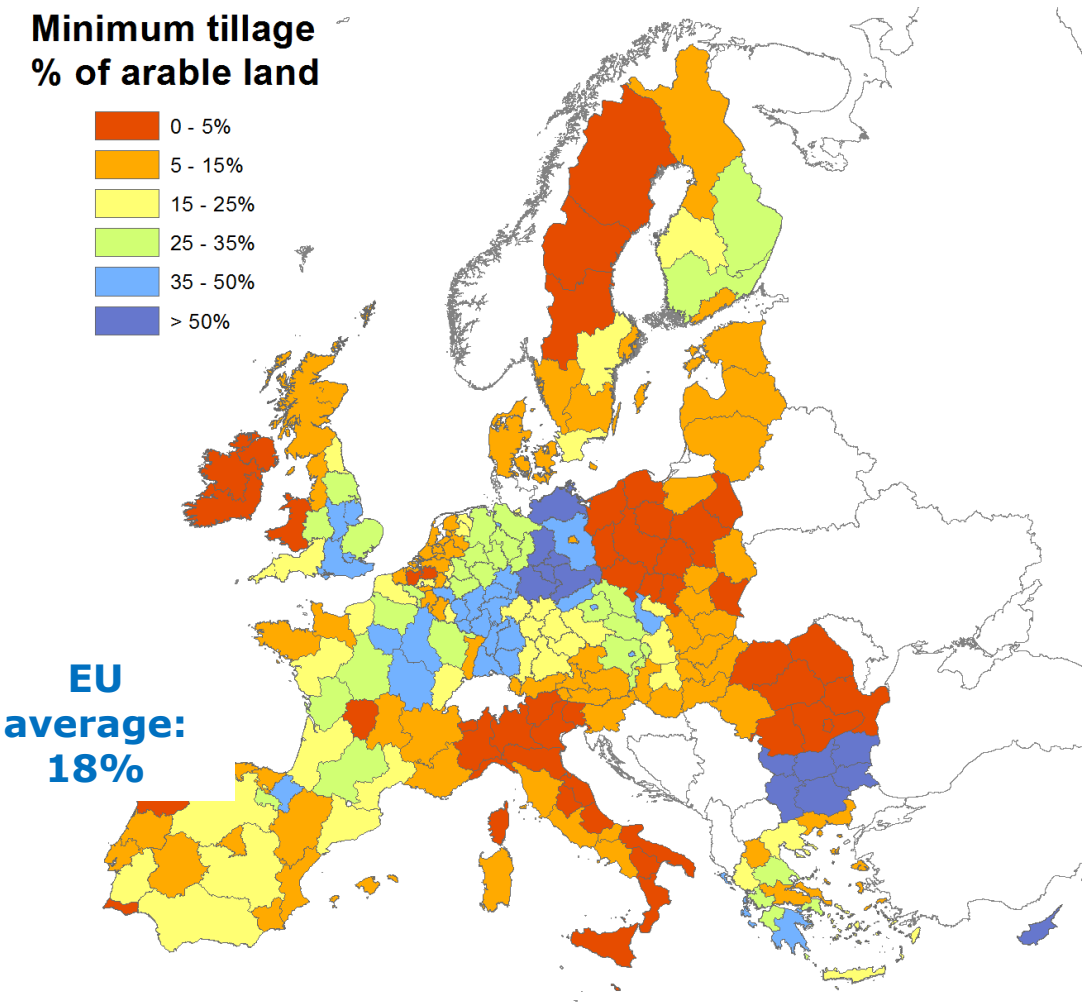
# Conservation agriculture: reduced soil tillage




Environmental benefits

- Decrease GHG emissions
- Reduce soil erosion = less nitrogen runoff and water pollution
- Increase biodiversity

Economic benefits = cost savings

- Less N-fertilization needed
- Less field operations needed = fuels and labour reductions

Source: Sánchez et al. (2016)

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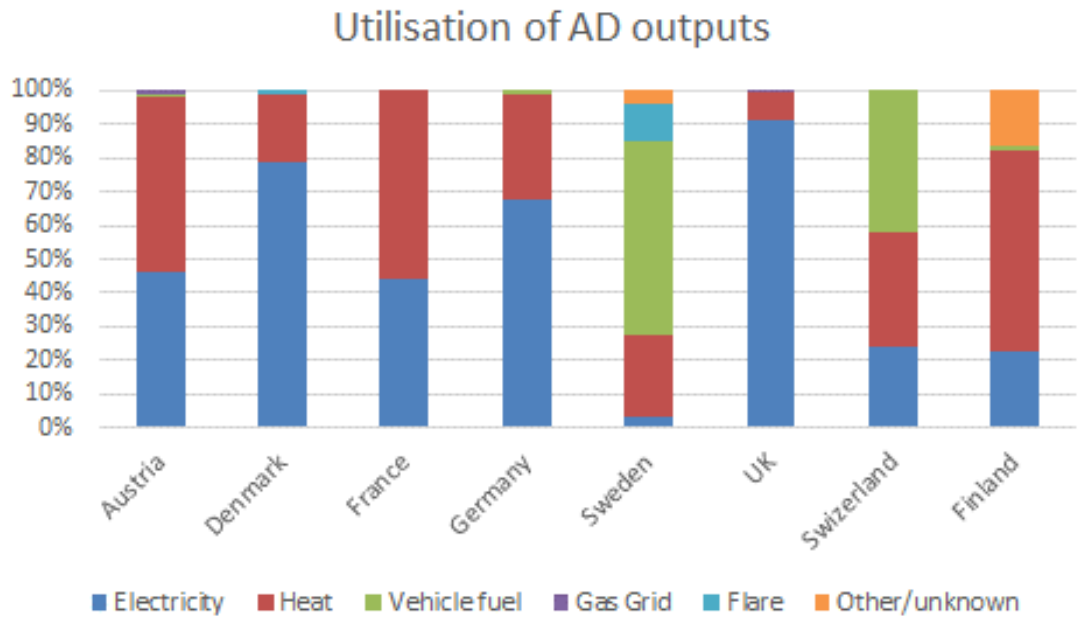
# Win-win mitigation options?

## Biogas produced from anaerobic digestion has multiple uses




Source: Jones (2016), based on National Reports, IEA Task 37, Berlin, 2015.

Environmental benefits

- Decrease GHG emissions
- Environmental friendly energy supply
- Better use of waste and residues from the farm
- More efficient use of nitrogen from manure

Economic benefits

- Less N-fertilization needed
- Diversifying farmers income

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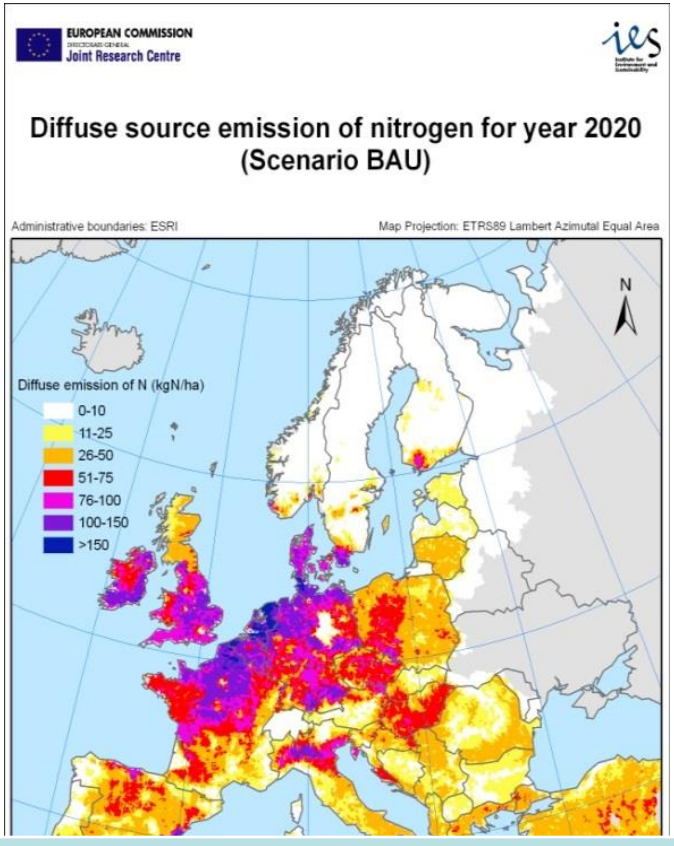
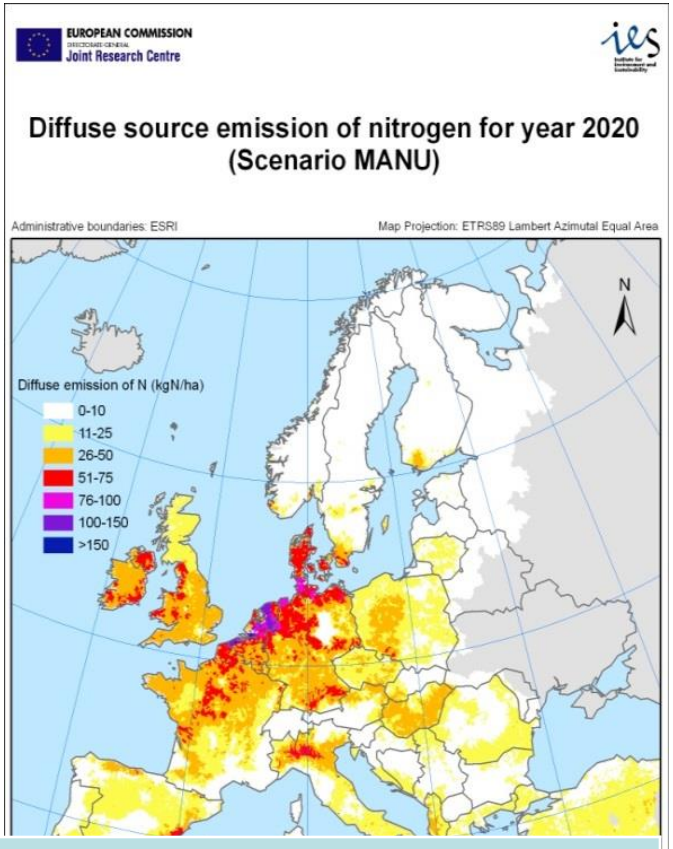
# Scenarios for nitrogen diffuse sources in 2020




***Source: JRC 2014***

| Business As Usual | Manure management |
|---|---|
| **manure + synthetic fertilizers:** | **manure + synthetic fertilizers:** |
| **18.5 $10^6$ 1000 t** | **8.2 $10^6$ 1000 t (-55%)** |
| **Nitrogen loads to seas** | **Nitrogen loads to seas** |
| **4.9 $10^6$ 1000 t** | **3.2 $10^6$ 1000 t (-35%)** |

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# Knowledge gaps on mitigation technologies

- **Assess territorial mitigation potential of the most promising technologies and practices**

- **Better understand farmers' behaviour regarding the adoption of mitigation options**

# Number of actors in the industrial sectors

- **Energy industries (~ 3 000)**
- **Production and processing of metals (~ 2 700)**
- **Mineral industries (~ 5 700)**
- **Production of chemicals (~ 5 000)**
- **Waste management industries (~ 4 600)**

# Number of actors in the agricultural sector

- **The number of farms in the EU over 10 million**
- **Each farmer is a potential decision-taking agent when it comes to adopt or not a technology**
- **Over 1/3 of them over 65 and more than ½ of the active farmers over 55**

# Conclusions

- **GHG mandatory reduction targets for agriculture sector show significant production effects, especially in the EU livestock sector**
- **Risk of leakage - decrease in domestic production offset by production increases outside EU**
- **Adverse effects are significantly reduced by subsidies to trigger adoption of technologies and practices**
- **Territorial efficiency of technologies and practices should be better understood**
- **Farmers' behaviour should be factored into the policy**
- **Special attention should be given to possible win-win options**

# The European Commission's science and knowledge service

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# Thank you for your attention

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