Climate change - The European context

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Our climate is warming – recent assessment

Figures from the 2013 IPCC WG 1 report
Worldwide CO2 concentrations – recent figures
"Warming of the climate system is unequivocal and some observed changes are unprecedented on time scales of decades to millennia. Changes have been widely observed on land, in the oceans and in the atmosphere. The human influence on climate is clear." IPCC AR5 WGI, 2013
Agriculture

Impacts +

Adaptation

Mitigation/carbon sink

Emissions GHG -

Biomass production (bionergy, biomaterials) +

Green growth

Climate change

Mitigation/carbon sink

Emissions GHG
Outline

1. Background information:
   - agriculture's GHG emissions
   - EU climate policy framework
2. What is mitigation?
3. What is adaptation?
1. Background information on:
   - agriculture's GHG emissions and carbon sequestration
   - EU climate policy framework
**Phyto**

**Indirect Energy**

**Direct Emissions**

**Indirect Emissions**

- **Electricity**
  - Energy (CO₂)
- **Effluents**
  - (CH₄/N₂O)
- **Fuel**
  - Gas
- **Livestock food**
  - CO₂
- **Mineral fertilizer (N)**
  - CO₂, N₂O
- **Equipment**
  - (CO₂)
- **Agricultural Soils (N₂O, CO₂)**
- **Other Fertilizer**
  - (CO₂)

**Direct Energy**

- **Fuel**
- **Electricity**
  - Energy (CO₂)
- **Livestock food**
  - CO₂
- **Mineral fertilizer (N)**
  - CO₂, N₂O
- **Equipment**
  - (CO₂)
- **Agricultural Soils (N₂O, CO₂)**
- **Other Fertilizer**
  - (CO₂)
Emissions inventory for sector "Agriculture", EU-27, 2010

- CH4- Enteric Fermentation: 33%
- CH4 - Manure management (storage): 10%
- CH4 - Rice Cultivation: 1%
- N2O - Manure (housing, storage): 6%
- N2O - Agricultural Soils (fertilizers, grazing animals): 51%
- CH4, N2O Manure: 18%

80,3 Mt from croplands (source) and 12,3 Mt (sinks) from grasslands

- CH4 - Manure management (storage); 8%
- CH4 - Enteric Fermentation; 26%
- N2O - Agricultural Soils (Fertilisers); 41%
- CO2 - Energy; 7%
- CO2 - Cropland, grassland; 12%
- N2O - Manure management (storage); 5%
Agricultural GHG emissions in MS (without LULUCF), 2011

1.000 t of C2 eq.

EU-27: 10%
Changes in EU-27 GHG emissions by sector, 1990–2011

- Total emissions: -18%
- International aviation and maritime transport: -34%
- Waste: -23%
- Agriculture: -28%
- Industrial processes: -28%
- Energy: -24%
- Transport: 19%
Change of agricultural GHG emissions in MS (%)

Livestock emissions – a "hotspot"

Carbon release is faster than sequestration

Source: INRA (France)
EU climate policy - key policy instruments

GHG Target in 2020: -20% compared to 1990

-14% compared to 2005

EU Emissions Trading System (ETS)
-21% compared to 2005

Effort sharing Decision
Non ETS sectors (transport, buildings, waste, agriculture)
-10% compared to 2005

27 Member State targets stretching from -20% to +20%

CH₄ and N₂O from agriculture included
CO₂ from LULUCF NOT included
Looking beyond 2020: roadmap 2050

80% domestic reduction in 2050 is feasible:
- With currently available technologies,
- With behavioural change induced by prices
- If all economic sectors contribute to a varying degree & pace

Milestones for agriculture:
- 25% in 2020
- 36% to -37% in 2030
- 40 to -50% in 2050
MFF 2014-20: financing climate action

- **Integration approach** – using all EU funds
- **Objective** - At least 20% of EU budget 2014-20 to be spent on action over climate change – core element of "greening" the EU budget
- Specific **earmarked** contributions only for some EU funds, for other funds, relevant contribution
- **Climate tracking** - giving an indicative estimate of spending related to climate change (mainstreaming)
- Art. 8 of Common Provisions Regulation: method will be set in the implementing act
2. What is mitigation?
Mitigation – concept

- Broadly, agriculture can contribute to mitigation by:
  - ▼ direct emissions from farm operations (CH4 and N2O)
  - ▼ CO2 emissions by improving farm "energy profile" (efficiency, on-farm use of renewable energies)
  - Improve CO2 balance of farmland soils by protecting or expanding carbon sinks
  - ▼ CO2 from fossil fuel use in other sectors by supplying feedstock for bioenergy and industrial applications

- Measures with highest mitigation potential:
  - *Increase production efficiency (fertilizer, resource use)*
  - *Improving manure and slurry management (storage, application)*
  - *'Waste to worth' (anaerobic digestion for animal waste – biogas)*
  - *Grassland management (improving livestock "carbon footprint" and carbon sink)*

- Actions which improve resource efficiency are positive for climate (reduce direct and indirect emissions)

- Synergies with soil protection (erosion), water quality (nitrates), air quality (ammonia)

- High mitigation potential variability in systems and management practices: potential depends on baseline climates, soil types, farm production systems

- Large uncertainties
Coûts de la tonne de CO₂ évité pour l'agriculteur et potentiels d'atténuation

(année 2030, France métropolitaine)

Source: Quelle contribution de l'agriculture française à la réduction des émissions de GES?, INRA (France), July 2013
Tackling climate change through livestock

**Emissions**

- Methane ($CH_4$)
- Nitrogen monoxyde ($N_2O$)
- Carbon dioxide ($CO_2$) (energy)

**Sinks**

- CO$_2$
- Grassland

**Renewal**

- Effluent management
- Nutrition
- Biogas

**Fertilization management**

- Legumes
- Fuel
- Electricity

**Global nitrogen management**

- Livestock food
- Mecanisation
- Tractor tuning
- Autocons.

**Nutrition**

- Renewable
- Effluent management

**Biogas**

- Livestock food
- Mecanisation
- Tractor tuning
- Autocons.
3. What is adaptation to climate change?
EC policy framework on adaptation

- **White Paper on 'Adapting to climate change: towards a European framework for action'** (April 2009)

- **EU Adaptation Strategy** (April 2013)
  
  - **General aim**: enhancing Europe’s resilience to the impacts of climate change
  - **Specific objectives**:
    - Enhancing the knowledge base and widening access to information
    - Mainstreaming adaptation into EU policies, strategies and programmes
    - Capturing the potential of the market, market-based instruments and the private sector
    - Support to and facilitation of collaboration, exchange of knowledge and good practice examples, etc. between MS, regions, cities...
  
  - **Agriculture** is a vulnerable sector – the strategy draws on CAP for providing adaptation support
    - Climatic changes will lead to a **variety of risks** which call for adaptation responses
    - make the key measures within RDPs more **climate resilient** and
    - dedicate funds **directly** for adaptation
Arctic
Temperature rise much larger than global average
Decrease in Arctic sea ice coverage
Decrease in Greenland ice sheet
Decrease in permafrost areas
Increasing risk of biodiversity loss
Intensified shipping and exploitation of oil and gas resources

North-western Europe
Increase in winter precipitation
Increase in river flow
Northward movement of species
Decrease in energy demand for heating
Increasing risk of river and coastal flooding

Mountain areas
Temperature rise larger than European average
Increase in glacier extent and volume
Decrease in mountain permafrost areas
Upward shift of plant and animal species
High risk of species extinction in Alpine regions
Increasing risk of soil erosion
Decrease in ski tourism

Coastal zones and regional seas
Sea-level rise
Increase in sea surface temperatures
Increase in ocean acidity
Northward expansion of fish and plankton species
Changes in phytoplankton communities
Increasing risk for fish stocks

Central and eastern Europe
Increase in warm temperature extremes
Decrease in summer precipitation
Increase in water temperature
Increasing risk of forest fire
Decrease in economic value of forests

Mediterranean region
Temperature rise larger than European average
Decrease in annual precipitation
Decrease in annual river flow
Increasing risk of biodiversity loss
Increasing risk of desertification
Increasing water demand for agriculture
Decrease in crop yields
Increasing risk of forest fire
Increase in mortality from heat waves
Expansion of habitats for southern disease vectors
Decrease in hydropower potential
Decrease in summer tourism and potential increase in other seasons
Climate change – Possible impacts on EU agriculture

▲ Floods risk
▲ Hotter and drier summers
▲ Sea levels
▲ Risk crop pests, diseases
▲ Crop, forage yields
▼ Animal health, welfare

▼ Water availability
▲ Risk drought, heat spells
▲ Risk soil erosion
▼ Growing season, crop yields
▼ Optimal crop areas

▼ Summer rainfall
▲ Winter storms, floods
▲ Length growing season, yields
▲ Suitable farmland
▲ Pests, diseases risks

▲ Winter rainfall, floods
▼ Summer rainfall
▲ Risk drought, water stress
▲ Soil erosion risk
▲ Yields, range of crops

Source: own elaboration
Adaptation & risk prevention

► Adaptation to CC is broader than ‘risk prevention/risk management’ –
  ▪ aims to enhance resilience of: economic sectors and systems (infrastructures, agriculture, forestry) and environmental resources (biodiversity, soil, water)
  ▪ has a long-term perspective vs short/medium-term for 'risk prevention'

► Over the coming years, it may require changes in: production patterns and methods, farm structures and strategies, with investments and costs

► Possible adaptive solutions – examples
  ▪ Adapting timing farm operations (planting, sowing)
  ▪ Technical measures (frost protection, ventilation systems, livestock housing)
  ▪ Soil management (rise water holding capacity, organic matter)
  ▪ Better adapted and more resilient crop varieties (less water intensive)
  ▪ More effective pest and disease controls
  ▪ Improving efficiency of water use and irrigation equipment
  ▪ Protect and build "green infrastructure" (hedgerows, floodplains, wetlands)

► "Best" approach to cope with uncertainties – build resilience
  ▪ Prioritise no-regret actions
  ▪ Protecting natural environment base on which agriculture takes place
  ▪ "Synergetic" actions
  ▪ Improve adaptive capacity
Looking into the future

- Farmers need to face the **climate challenge** - reduce farm-level GHG emissions, and adapt and manage risks
  - In a context of rising of global food demand, increasing input prices
  - Environmental constraints (water, soils, biodiversity) intensified by climatic change

- Agriculture's carbon footprint is reducing but the sector needs to **strengthen efforts** towards mitigation – EU climate policy framework 2030

- The **CAP 2020** offers a range of tools for incentivising the adoption of mitigation and adaptation action within the wider context of sustainable food production (but has also its limits)

- "Voluntary" approach needs to **address barriers** to action:
  - **Technology** solutions - improve farming methods and develop solutions
  - Encourage **behavioural** changes
  - Improve **measuring tools** at different levels – GHG inventories, LCA, farm-level GHG assessment tools

- Identifying **climate policy instruments** for farming sector is a key task

- **Global context** – international climate agreement (2015)
«Making European agriculture more climate friendly and climate resilient is not a choice, but a serious need and obligation. The proposal for the new CAP will help farmers to better deal with climate change challenges »

Jerzy Plewa, DG of DG AGRI, April 2013