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Options for European agriculture: mitigating and adapting to climate change; maintaining and restoring biodiversity

Based on a Study 1 of the STOA project 'Technology options for feeding 10 billion people'

Prepared by IEEP, BIO, Ecologic, and IVM

12 September 2013, STOA Panel, European Parliament

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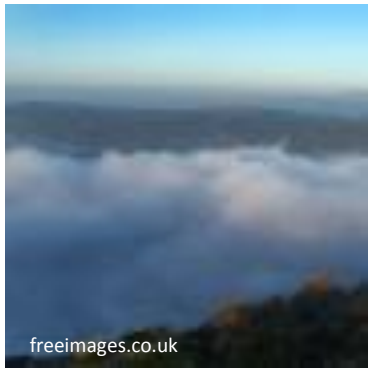
Study 1 Outline

- **Study context and scope**
- **Climate change and agriculture**
  - Impacts of climate change on EU agriculture
  - Impacts of EU agriculture on climate
  - Management actions for mitigation and adaptation
- **Biodiversity and agriculture**
  - Impacts of EU agriculture on biodiversity
  - Why biodiversity losses matter
  - Management actions for biodiversity in agriculture
  - Bee and pollinator decline
  - Plant genetic resources for food and agriculture
- **Impacts of specific cropping systems**
  - Biofuel feedstocks
  - GM crops
- **Recommended options for action**



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Interactions climate change /agriculture

- Impacts of climate change on EU agriculture
  - Northern Europe: longer growing cycle, less frost; however also heat waves, storms, extreme events
  - Southern Europe: 5-10% decrease in yields by 2030, reduced water availability, fire risk, pests and diseases

- Impacts of EU agriculture on climate change
  - GHG emissions from agriculture and land use (manure & fertiliser, energy use, livestock, unsustainable soil practices)
  - Maintaining soil carbon sinks (impermanent, depending on soils types and management)

Why biodiversity loss matters

Soil functions

- soil biodiversity huge and unknown
- decomposition – 'litter transformers'
- nutrient cycling – 'chemical engineers'
- soil structure – 'ecosystem engineers'
- pests and diseases – 'biological regulators'

Natural biological control

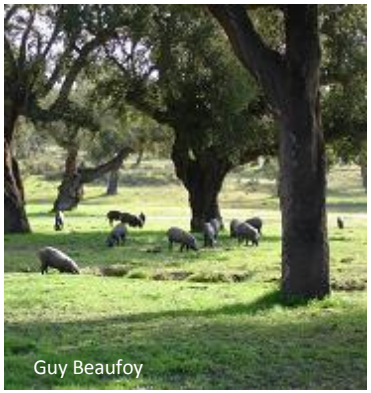
- 'natural enemies' – predators, parasitoids
- need refuges, alternative prey & flowers

Pollination

- needed for crop production
- pollinator decline
- honeybee losses
- genetic resources
- adaptation potential


citrusimage.com


bumblebeeconservation.org


Guy Beaufoy

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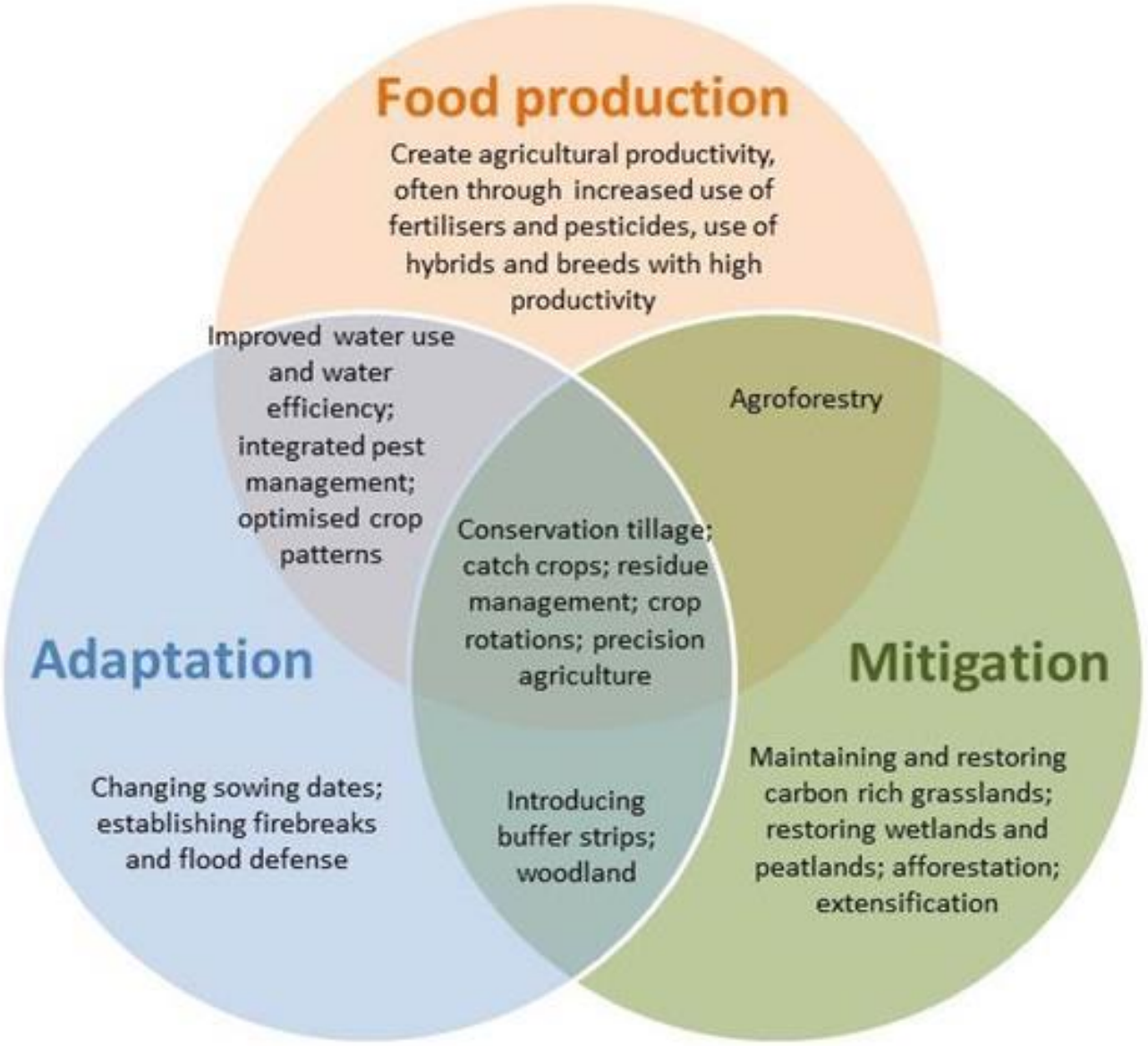
Management actions for mitigation & adaptation

- Synergies
- Trade-offs
- Costs varied
- Barriers to
- uptake



Four key areas for improvement identified

1. **Provide incentives** for climate resilient and biodiversity-friendly farmland management;
2. **Constrain unsustainable practices** through policy mechanisms **;**
3. **Implement options to maximise climate resilient agriculture that benefits biodiversity** through the CAP and through the new EU-level mechanisms to support innovation;
4. **Reduce the external impacts** of European agriculture and biofuel imports.

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incentives for climate resilient and biodiversity-friendly farming

- Promote actions that have benefits for climate change adaptation and mitigation and avoid significant biodiversity damage, and that may be taken up by farmers as a result of the economic benefits:
  - Help farmers identify and take appropriate actions
  - Public funding should help overcome barriers

- Strengthen the protection and management of s
  natural agricultural habitats and the economic v
  the farming systems that maintain them:
  - Invest both in traditional management and new appro
  - Use the new CAP framework for High Nature Value an
    farming, increase advice

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incentives for climate resilient and biodiversity-friendly farming

- Develop policy measures that recognise the substantial ecosystem services supplied by semi-natural farmland and farming systems;

- Provide well-designed, targeted and monitored agri-environment schemes on farmland that provide co-benefits for biodiversity and climate change adaptation:
  - Require adapted soil and crop management;
  - Limited areas may be taken out of highly productive use (flower strips, rewetting of peat lands etc);
  - Planning at landscape scale.

Constrain unsustainable practices through policy

- Ensure compliance with the Nitrates Directive and other EU legislation that reduces nitrogen emissions;
- Push for ambitious pesticide reduction targets and full implementation of integrated pest management;
- Use CAP cross-compliance requirements to ensure protection and management of farmland elements that benefit biodiversity and climate change adaptation.

Implement options maximise climate resilient agriculture that benefits biodiversity in CAP /innovation policy

- Ensure that innovation investment targets areas of greatest potential and knowledge gaps, combining yield improvement with sustainability objectives;
- Set out environmental safeguards, research and evaluate the possible negative impacts of new technologies;
- Ensure Europe's genetic resources for food and agriculture are better used and conserved;
- Provide increased direct funding for research on tackling the multiple factors causing honeybee losses and wild pollinator decline.

reduce external impacts of imports

- Increase the EU's efforts to reducing global biodiversity loss through actions to reduce the environmental footprint of the EU's food, feed and biofuel imports:
  - E.g. the EU's active engagement in international initiatives to develop global environmental principles for food, fibre and energy production
  - Increase domestic production of animal feed
  - Fund research

- Encourage consumer demand for environmentally sustainable food:
  - effective voluntary and private environmental certification schemes and products, education and awareness campaigns

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IEEP's website:

work on agriculture, biodiversity, bioenergy and biofuels

http://www.ieep.eu/

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The study context

- Demand for food to rise by 70% by 2050 (FAO)
- Population growth and economic development – mainly Africa & Asia
- EU food demand stable/declining – but demand for animal feed, demand for biofuel feedstocks
- Environmental deficit of EU agriculture
- Impacts of climate change
- **'Sustainable intensification'** – producing more from same land while *reducing* negative impacts & *increasing* natural capital & ecosystem services

The study scope

- EU agriculture:
  - crop and livestock production
- Global agriculture:
  - biofuel feedstocks imported to EU
- Technology options:
  - broad range – basic to high tech

- Not included:
  - global biodiversity impacts of EU food imports (eg bananas)
  - transport, processing and marketing of food
  - biofuels from non-land based feedstocks
  - dietary change or other demand-side scenarios

Management actions for mitigation & adaptation

- Analysis of the 64 potential climate change measures according to their impact on agricultural productivity

Contribution to climate change response	Impact on agricultural productivity			
	Positive	Uncertain or variable	Negative	Total actions
Mitigation only	4	2	0	6
Adaptation only	8	11	0	19
Co-benefits for mitigation and adaptation	11	21	7	39
Total actions	23	34	7	64

GM crops and biodiversity

- how is GM crop breeding different
- current and possible future GM crops in the EU
- evidence of current impacts outside the EU
- possible future impacts and mitigating actions in the EU

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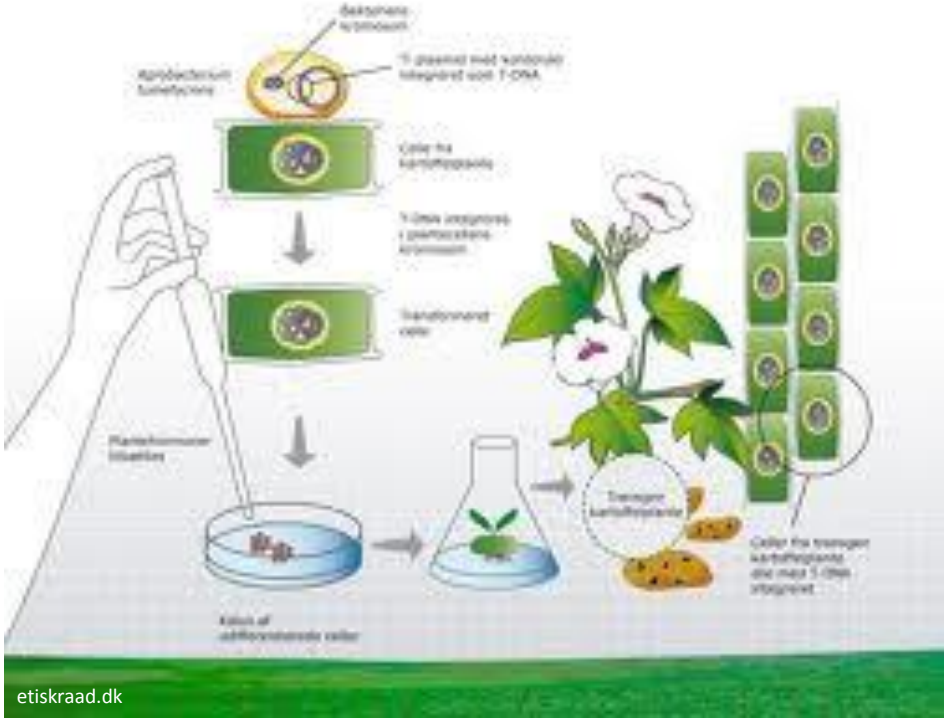
GM crops and biodiversity

- how is GM crop breeding different
- what is biological novelty
- new breeding technologies that might be GM



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GM crops and biodiversity

- current and possible future GM crops in the EU
  - current: MON810 Bt maize and starch-modified Amflora potato
  - future novel traits: nutrient profiles, industrial products, stress tolerance
- evidence of current impacts
  - herbicide tolerance & weed populations
  - insect resistance & pesticide use
  - gene flow – oilseed rape, Bt maize, GM grass
- possible future impacts and mitigating actions in the EU
  - local evidence and monitoring capacity
  - gene flow – oilseed rape, wheat, sugarbeet, trees, grasses

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