Land use change contribution to European climate and energy policies: bioenergy crops and forest expansion

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EU 2020 targets and land use

- EU 2020 targets:
  - 20 % of GHG reduction, compared to 1990 levels (30%)
  - 20% renewable energy
  - 10% biofuels in transport

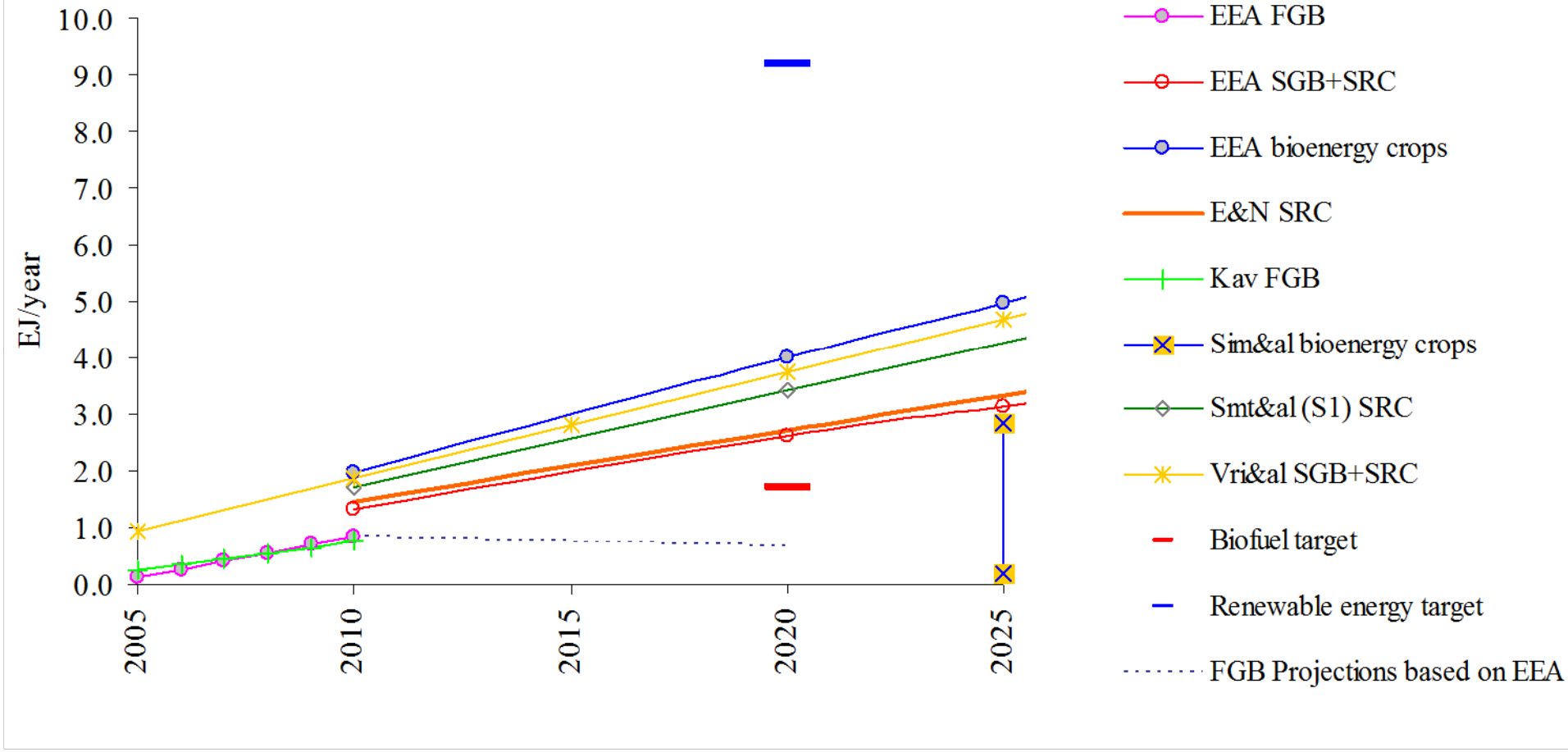
- Land use alternatives considered:
  - Bio-energy crops
  - Forest expansion

Bio-energy crops

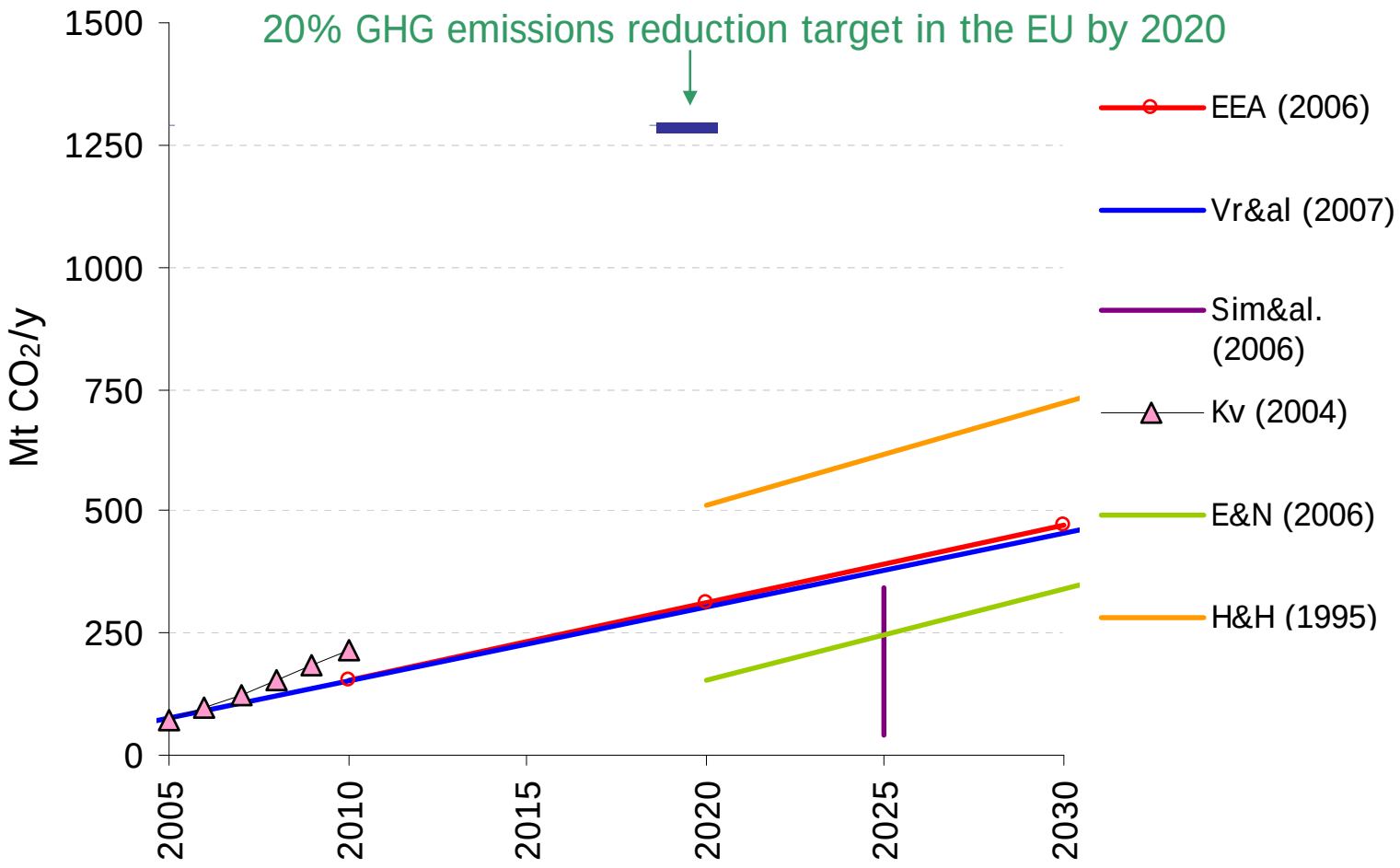
Motivation 1

- What is the potential contribution of bioenergy crops produced *in Europe* (EU-25) to the 2020 targets ?
- How dependent are our projections on second generation biofuels actually hitting the market by 2020 ?
- Would we need to cover all of Europe with bio-crops?

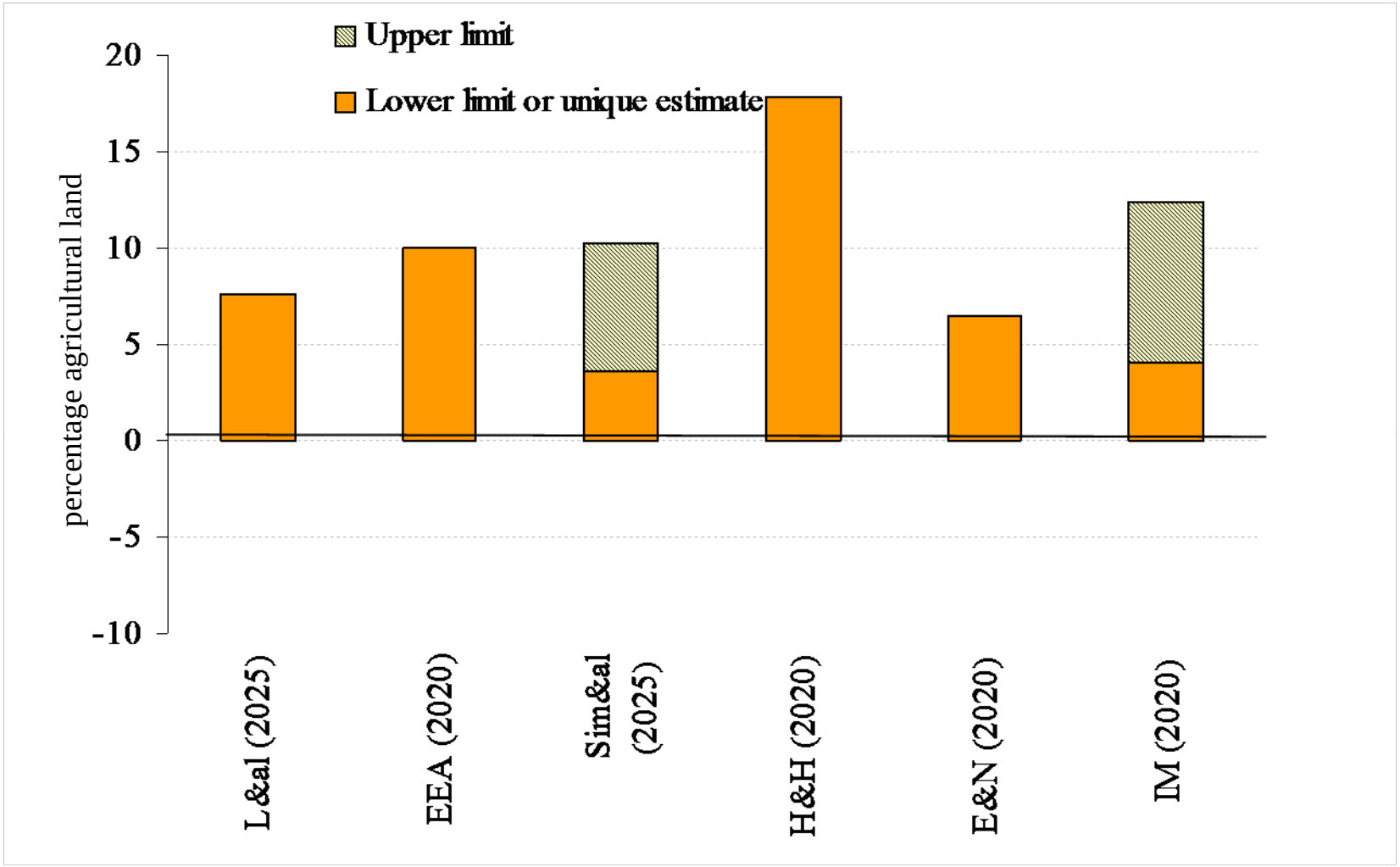
Bio-energy crops and the 20% renewable energy and the 10% biofuel targets



Bio-energy crops and the 20% GHG target



Land demand for bio-energy crops by 2020



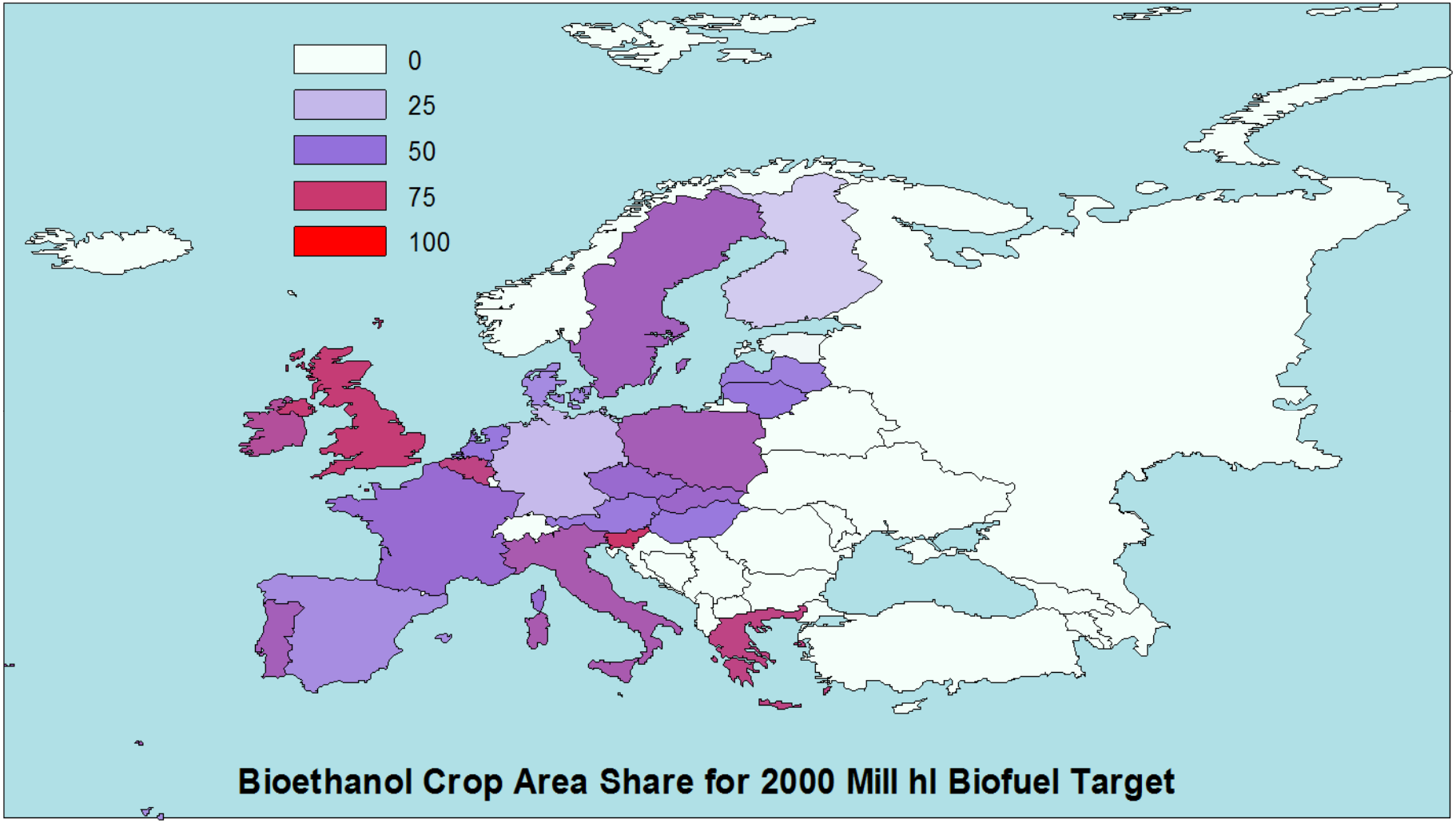
EUFASOM

- EUFASOM is a partial equilibrium model focusing on Europe that describes resource allocations for the agricultural and forestry sectors over a specified number of optimization periods.

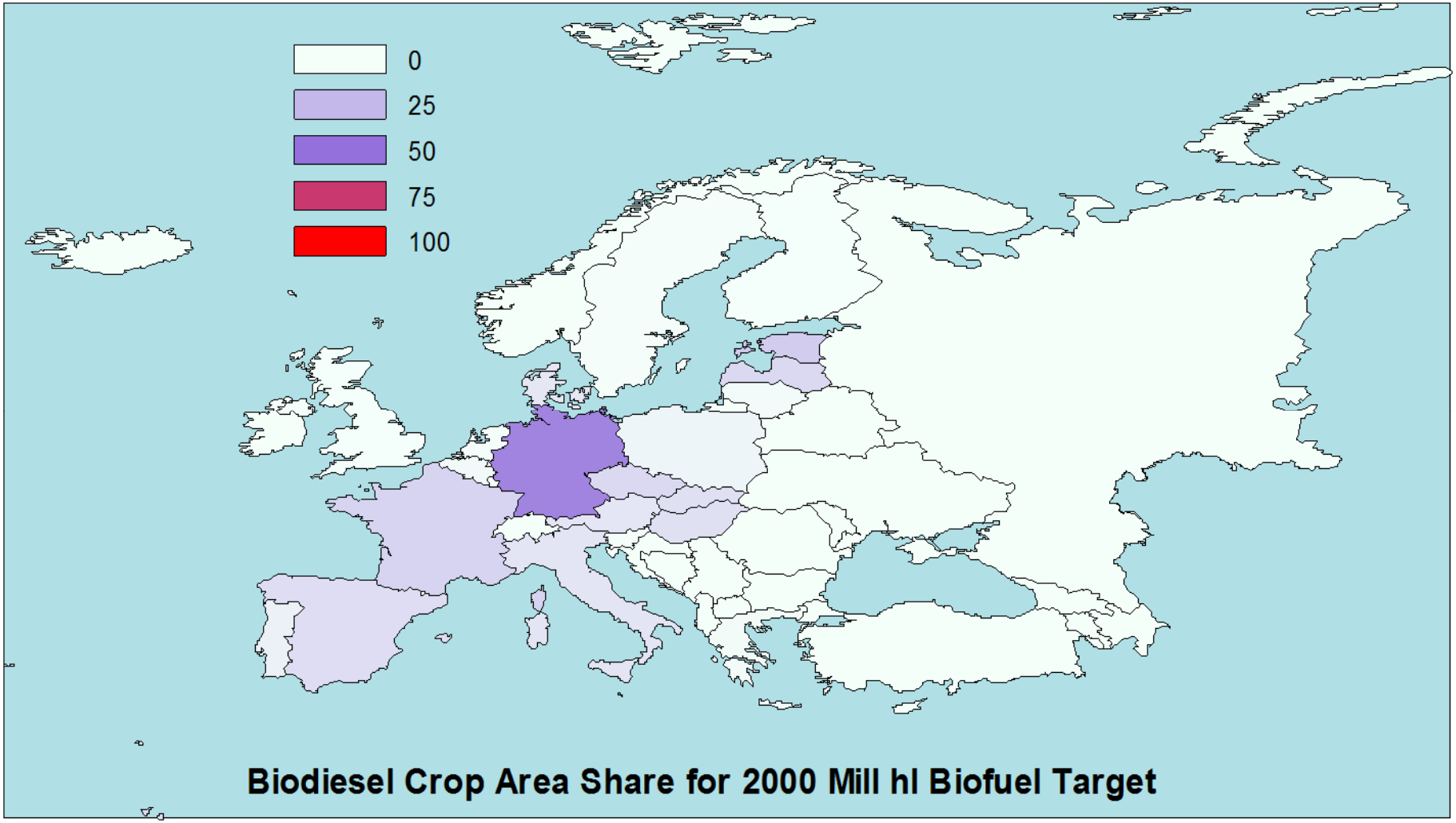
- Land is allocated to maximize marginal profitability of all endogenous agricultural and forestry land uses.

- The model output consists of equilibrium market prices of goods, yields and trade quantities of the goods covered in the model.

EUFASOM: Bioethanol in the EU (7-8 EJ)



EUFASOM: Biodiesel in the EU (7-8 EJ)



Key messages 1

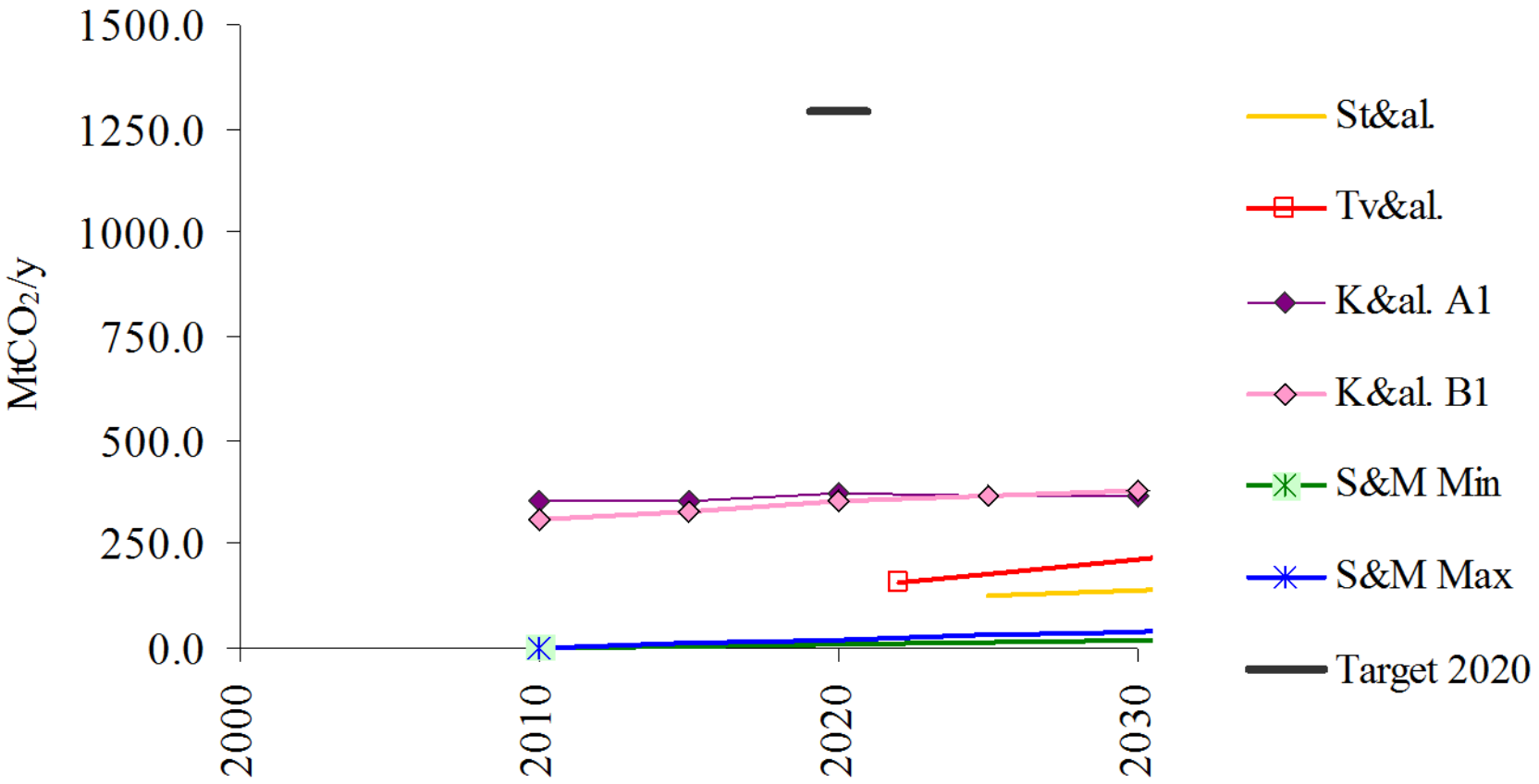
- What is the potential contribution of bioenergy crops produced *in Europe* (EU-25) to the 2020 targets ?
  - *They could cover all our bio-fuel target*
  - *They could cover a significant share of the renewable and the GHG target.*
- How dependent are our projections on second generation biofuels actually hitting the market by 2020 ?
  - *Totally. It would therefore be better to frame the target focusing only on second generation biofuels.*
- Would we need to cover all of Europe with bio-crops?
  - *Well, at least a significant share of our agricultural land.*

Forest expansion

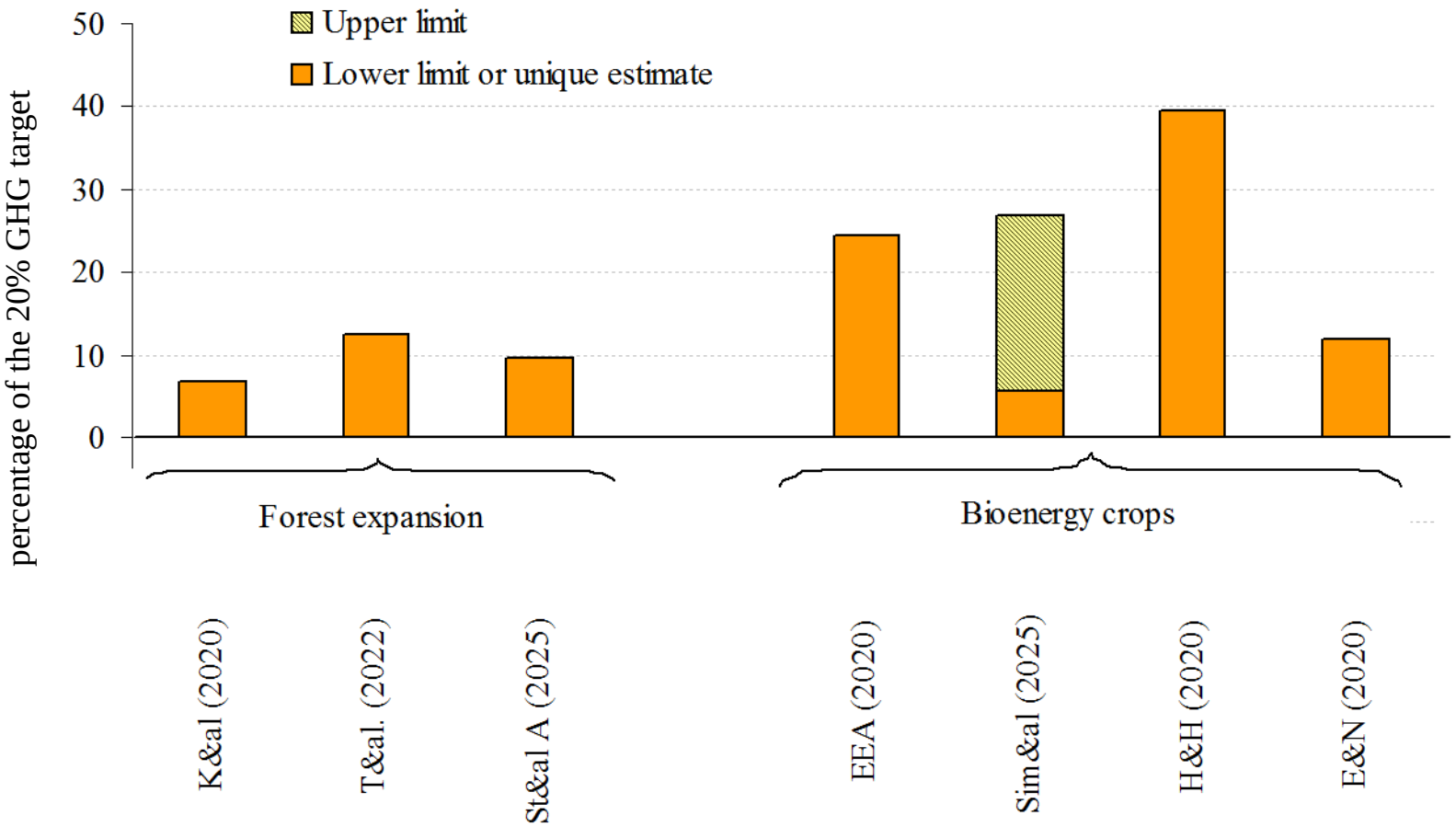
Motivation 2

- What is the potential contribution of forestry alternatives *within Europe* to the 2020 targets ?
- Are the new incentives encouraging species that are not compatible with biodiversity conservation ?
- Assuming that we are interested in biodiversity-scenic values, how should we promote reforestations ?

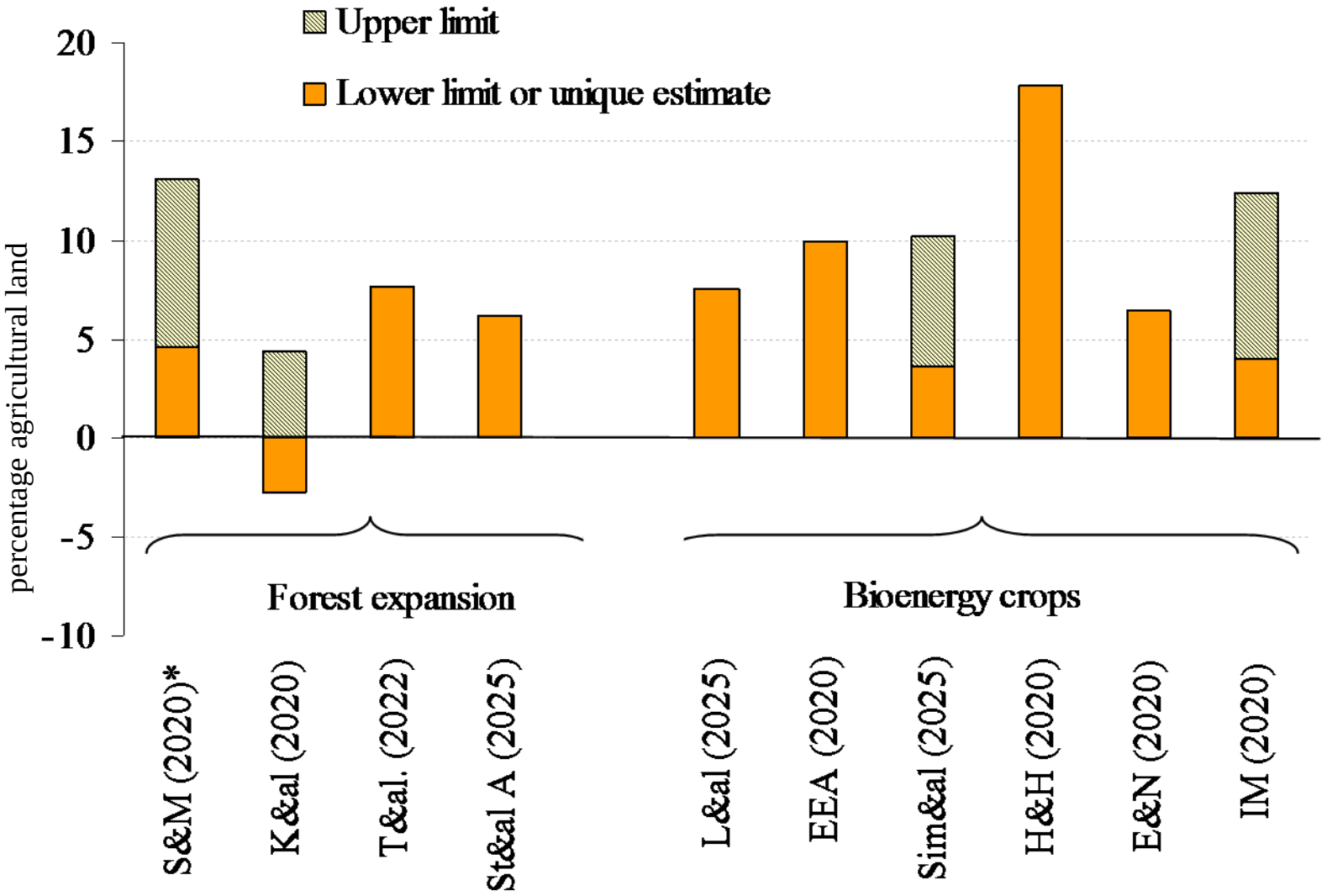
Forest expansion and the 20% GHG target



Percentage of the 20% GHG target covered by forest and bio-energy crops expansion



Land demand for forest and bio-energy crops expansion



UNFCCC-Kyoto-Marrakech

- LULUCF alternatives within the UNFCCC-Kyoto-Marrakech framework are:
  - **Afforestation**
  - **Reforestation**
  - Deforestation
  - Forest management
  - Revegetation
  - Cropland management
  - Grazing land management

UNFCCC - CBD

- The ultimate objective of the UNFCCC is to achieve the ‘stabilization of greenhouse gas concentration in the atmosphere … within a time-frame sufficient **to allow ecosystems to adapt** naturally to climate change’.

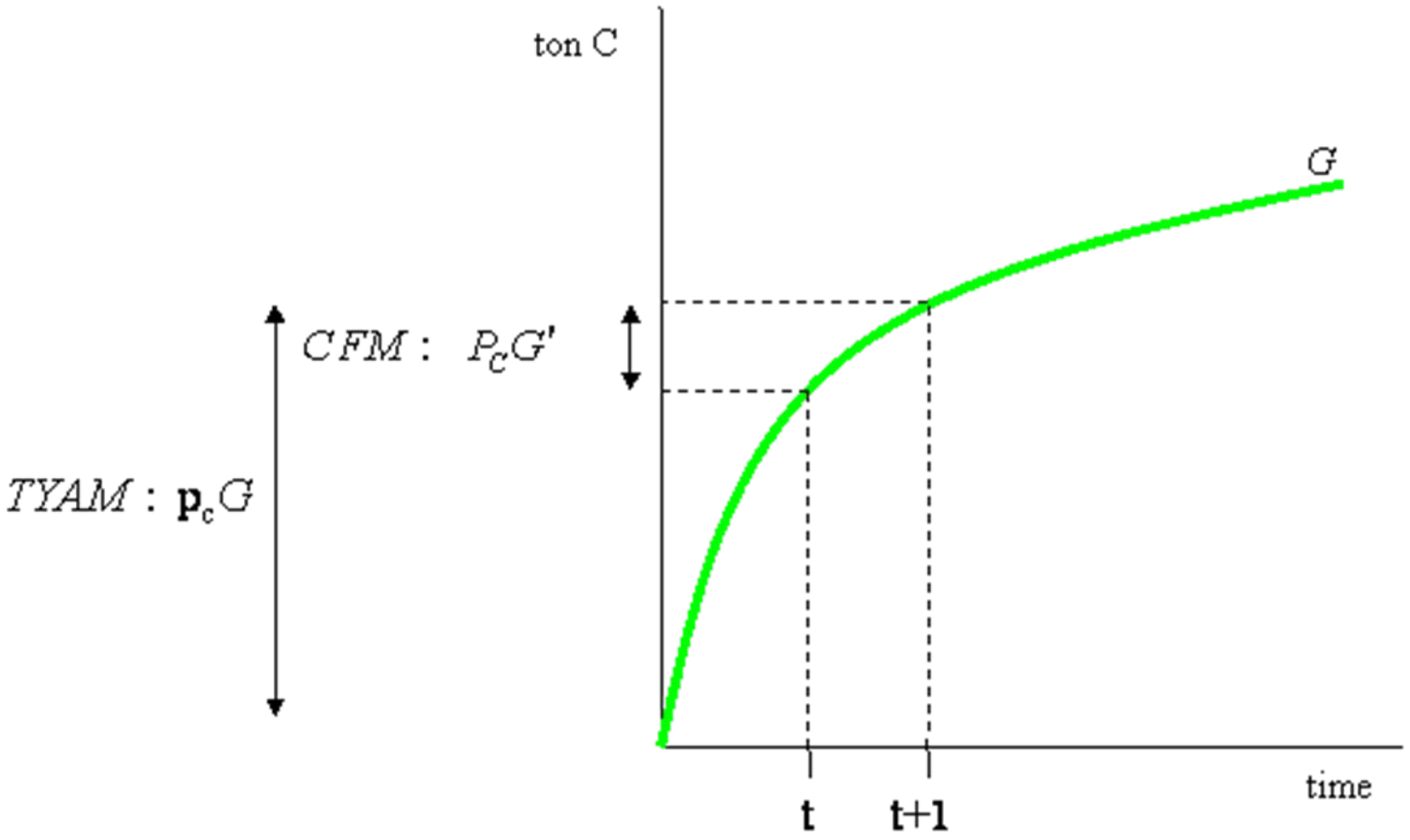
- The first goal of the CBD is the conservation of biological diversity on earth, understood as the variety of plants, animals, micro-organisms, their habitats, and ecosystem levels.

Carbon accounting methods

- **Carbon Flow Method**.
  - The forest owner gets paid when carbon sequestration takes place and pays when carbon is released

- **Ton Year Accounting Method**.
  - The forest owner gets paid each year (a smaller amount) as long as the carbon is sequestered.
  - The amount to be paid is estimated as a fraction of carbon price, taking into account the cumulative radiative forcing of an emission of one CO_2 ton over 100-years.

CFM vs TYAM

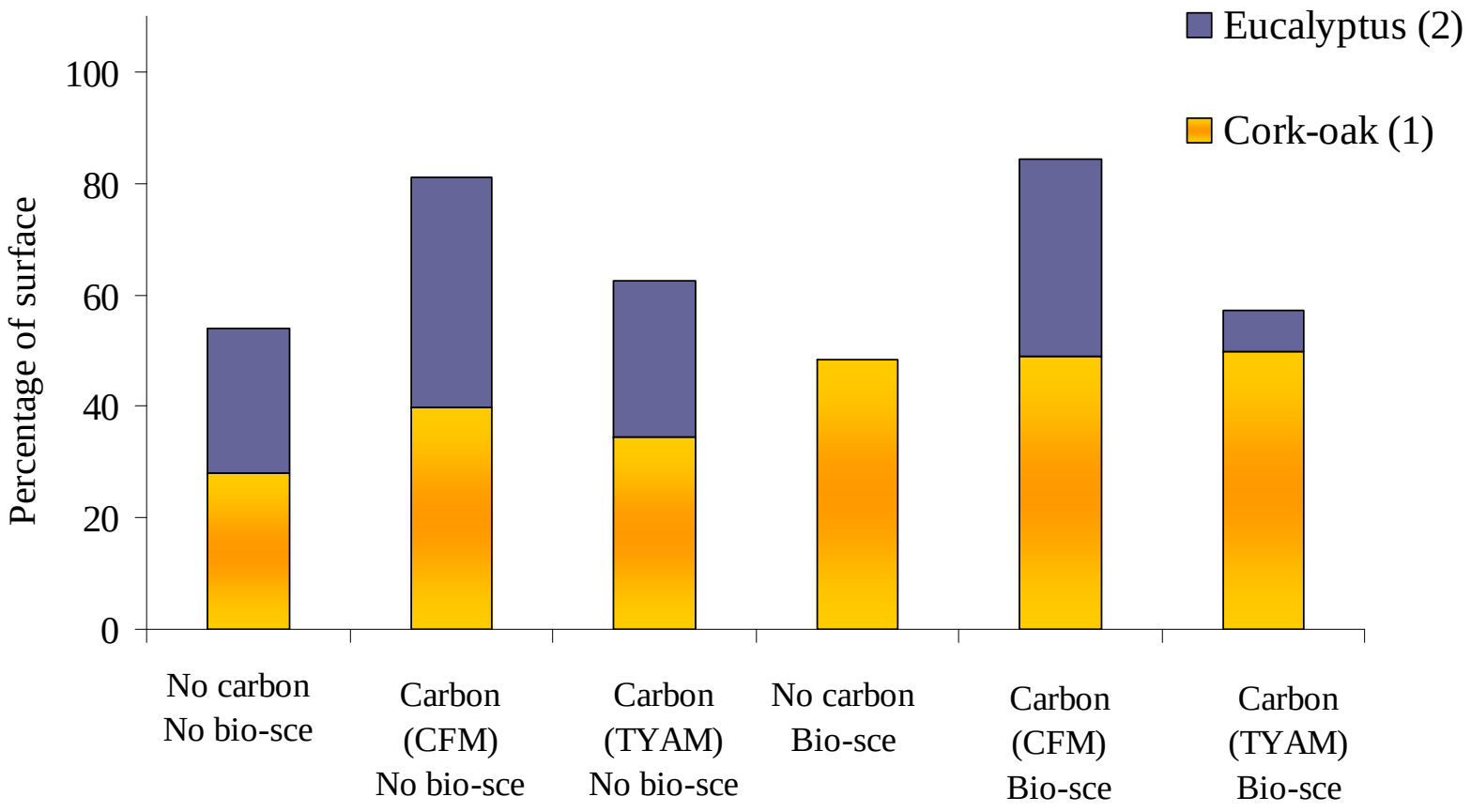


Case-study: Alcornocales Natural Park

Cork-oaks

Eucalyptus plantations

Reforested surface with cork-oaks and eucalyptus by internalizing different environmental values



Data for a carbon price of 14 €t/CO_2 and a discount rate of 5%.

Key messages 2

- What is the potential contribution of forestry alternatives *within Europe* to the 2020 targets ?
  - *They could cover a relevant share of the GHG target.*

- Are the new incentives encouraging species that are not compatible with biodiversity conservation?
  - *Not necessarily, but incentives for carbon sequestration will have a significant impact on species selection.*

- Assuming that we are interested in biodiversity-scenic values, how should we promote reforestations?
  - *Paying for standing carbon and not for growth is probably better.*

Thank you for your attention

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• Caparrós, A., Cerdá, E., Ovando, P., Campos, P., 2007. Carbon sequestration with reforestations and biodiversity scenic values. FEEM WP 28.2007. *Environmental and Resource Economics* (revise and resubmit).

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