Contributions of the Spanish Council for Scientific Research (CSIC, Madrid, Spain) to the Transust.Scan project

Policy implications

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Policy implications for land use

- **Contribution C1**: Effects of partial and total carbon and biodiversity-scenic values internalization on land use decisions.
- **Contribution C2**: Effects of biological and physical carbon sequestration functions on the time path and implementation of carbon sequestration.
- **Contribution C3**: Potential contribution of forest and bioenergy crops expansion to carbon abatement portfolio.

C3: Potential contribution of forest and bio-energy crops expansion to carbon abatement portfolio

- We surveyed studies applied to Europe that analyse carbon emission mitigation alternatives involving the use of land.

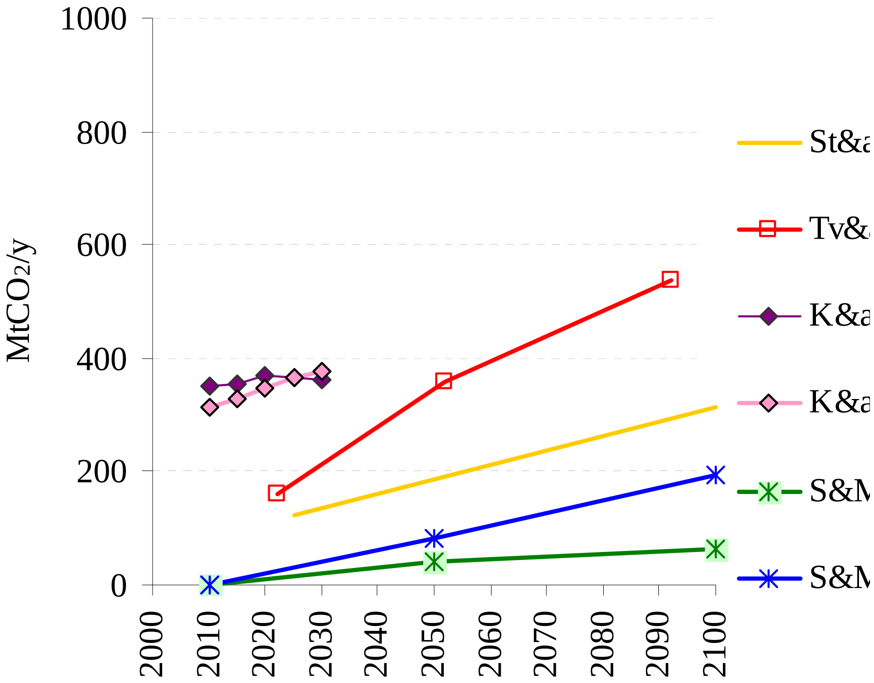
- The variety of alternatives include land use changes, forest management and bioenergy production.

- We approximate the aggregate amount of carbon offsets that can be achieved through these alternatives, and their potential contribution to the goals proposed by the European Union for the years 2020 and 2050.

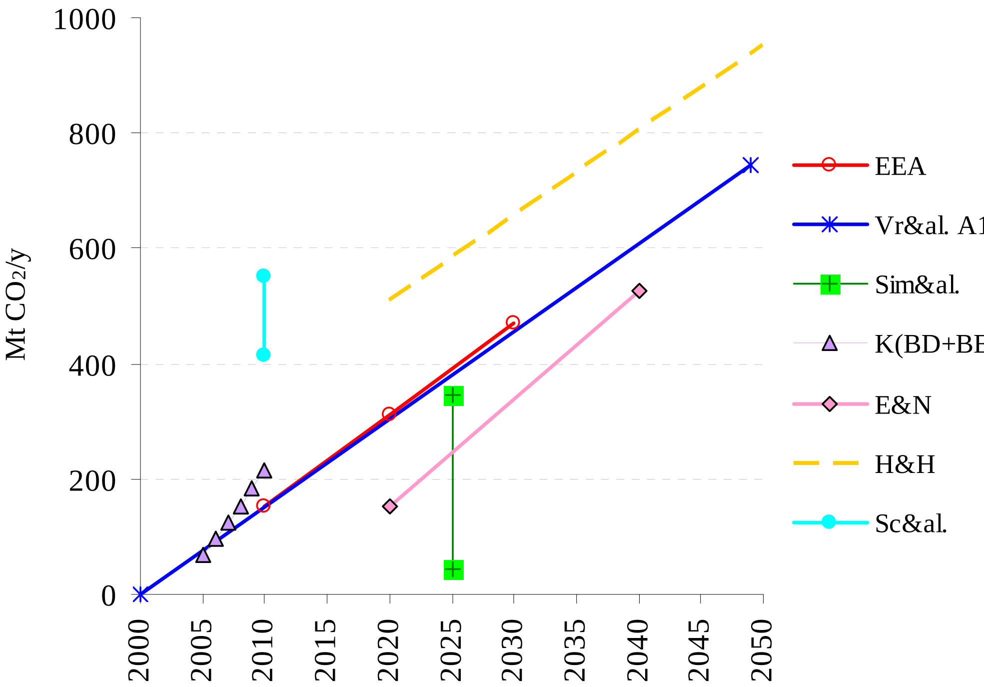
- Finally, we analysed to what extent the results offered by the surveyed studies take into account the fact that land is a finite resource.

C3: Potential contribution of forest and bio-energy crops expansion in the EU-25

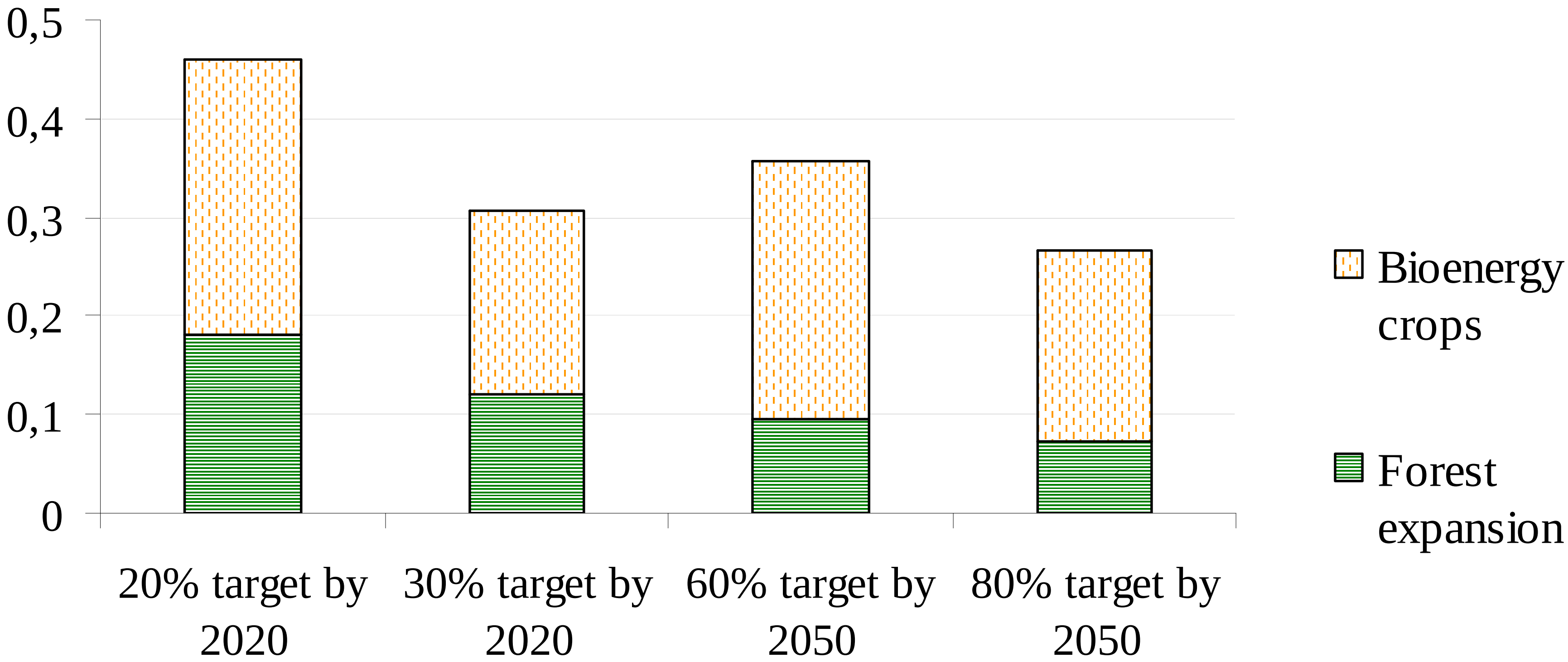
Forest expansion



Bioenergy crops



C3: Potential contribution of forest and bioenergy crops expansion to the EU-25 GHG emission reduction targets

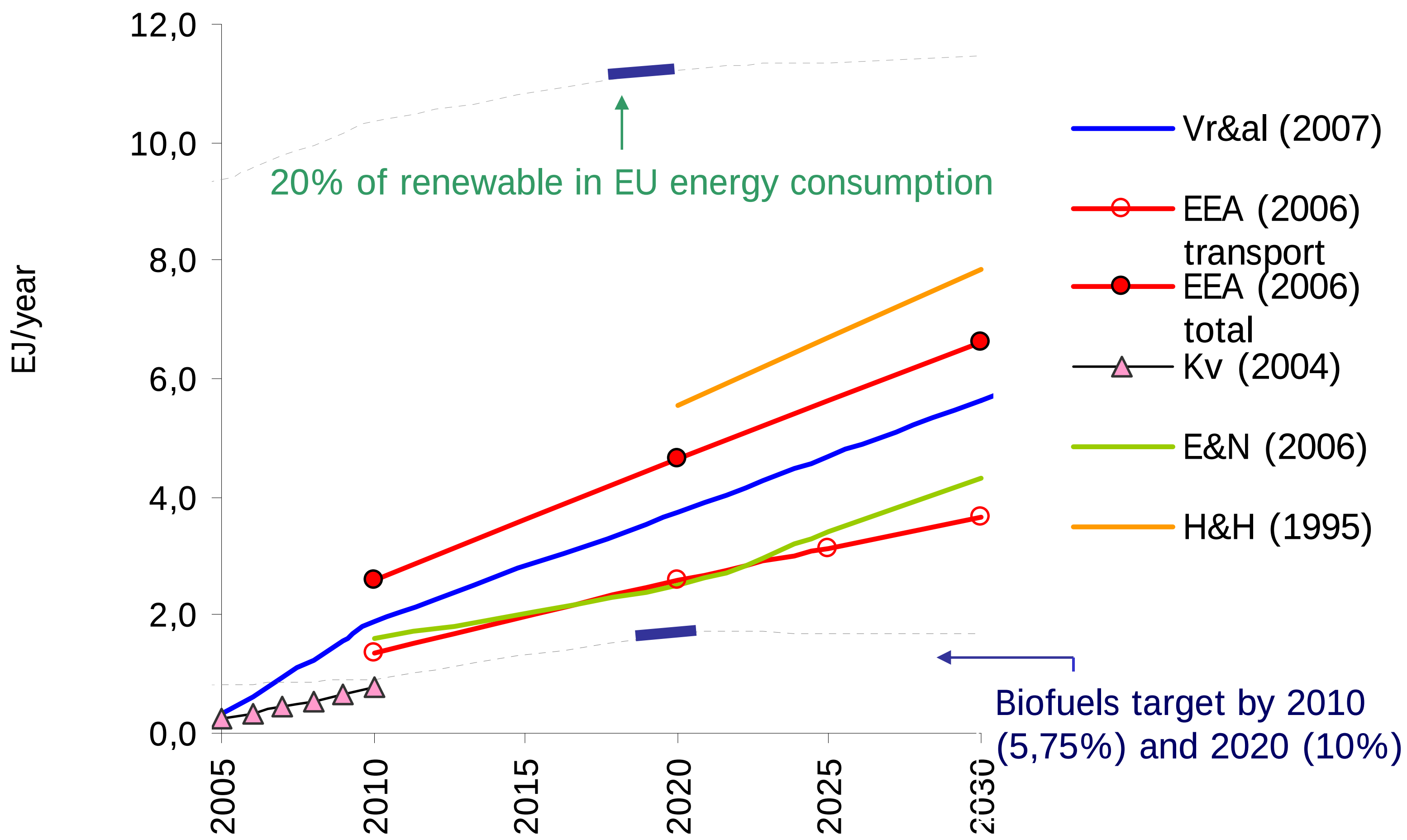


Biofuels and Renewable targets

- The EU mandatory target of 20% renewable energy by 2020 includes a 10 % biofuels target for transport, subject to:
  - Production being sustainable,
  - second-generation biofuels becoming commercially available and,
  - the Fuel Quality Directive being amended accordingly to allow for adequate levels of blending.

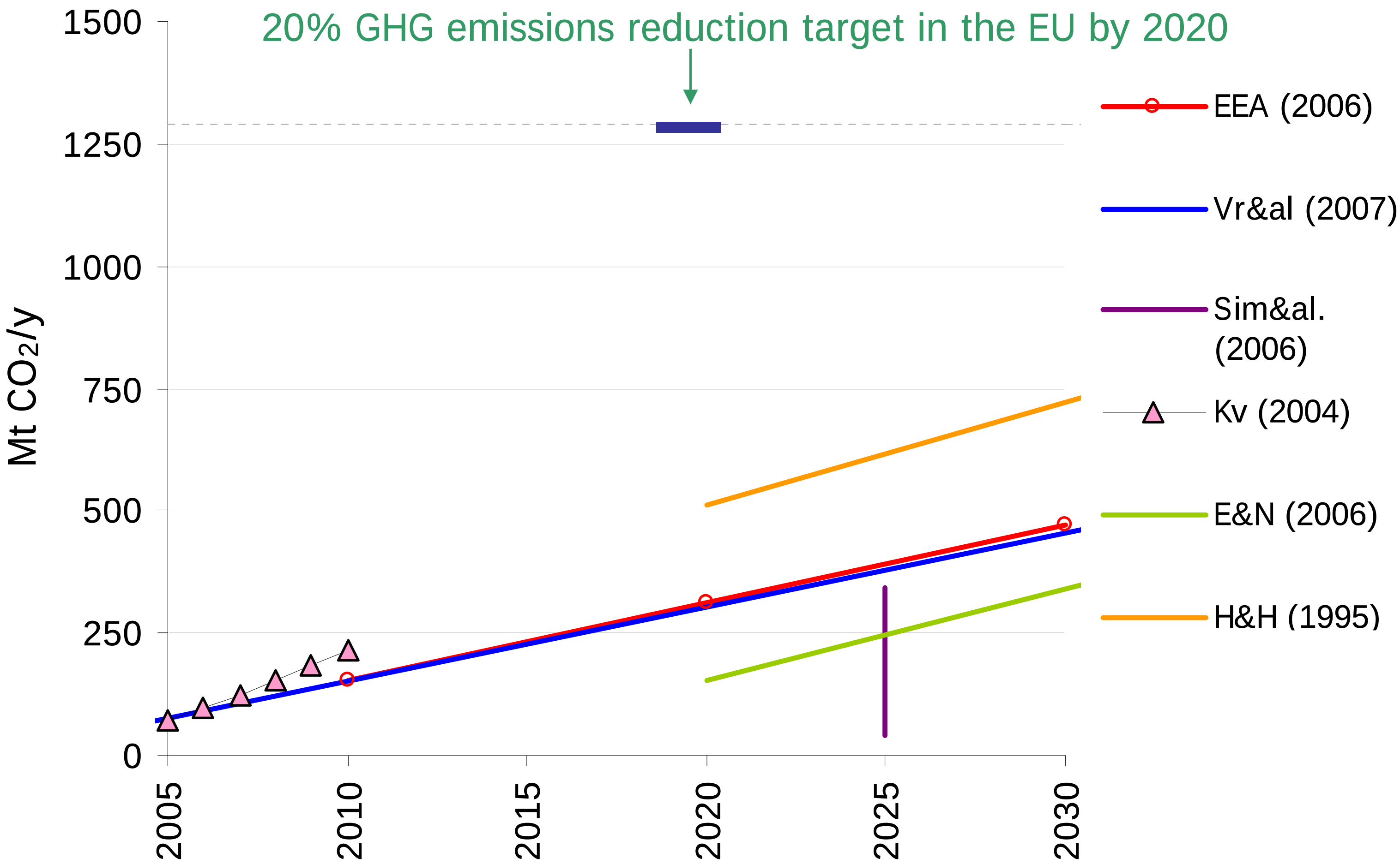
- Specific conditions:
  - Minimum greenhouse gases saving of 35%,
  - ban on the conversion areas with high carbon stock or a high biodiversity value.

Potential contribution of biofuels in the EU-25 to renewable and biofuels targets by 2020

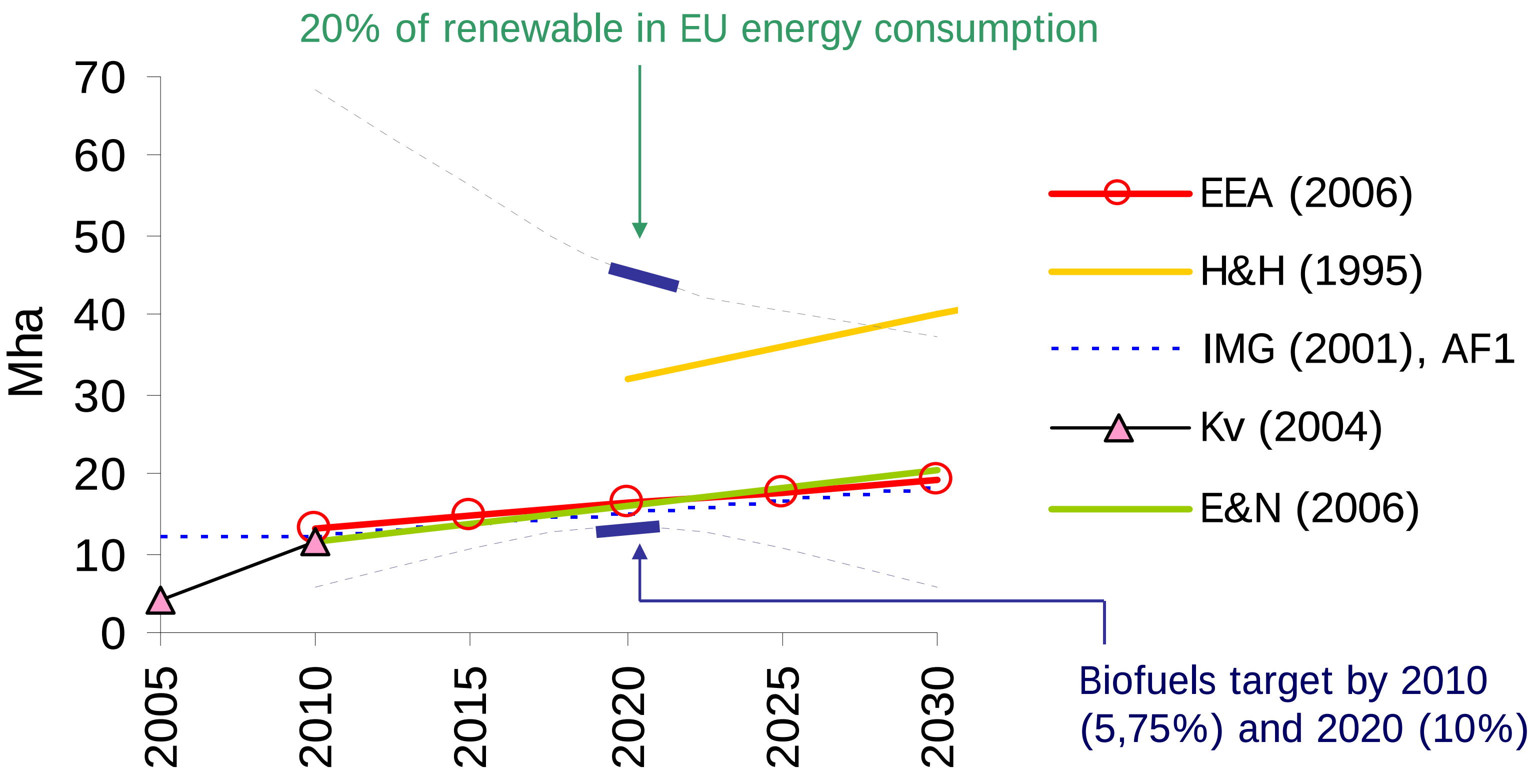


Final Energy demand in the EU-25 by 2020: **Total=** 1,238.0 MtOE or 56 EJ **Transport=** 405,5 MtOE or 17 EJ

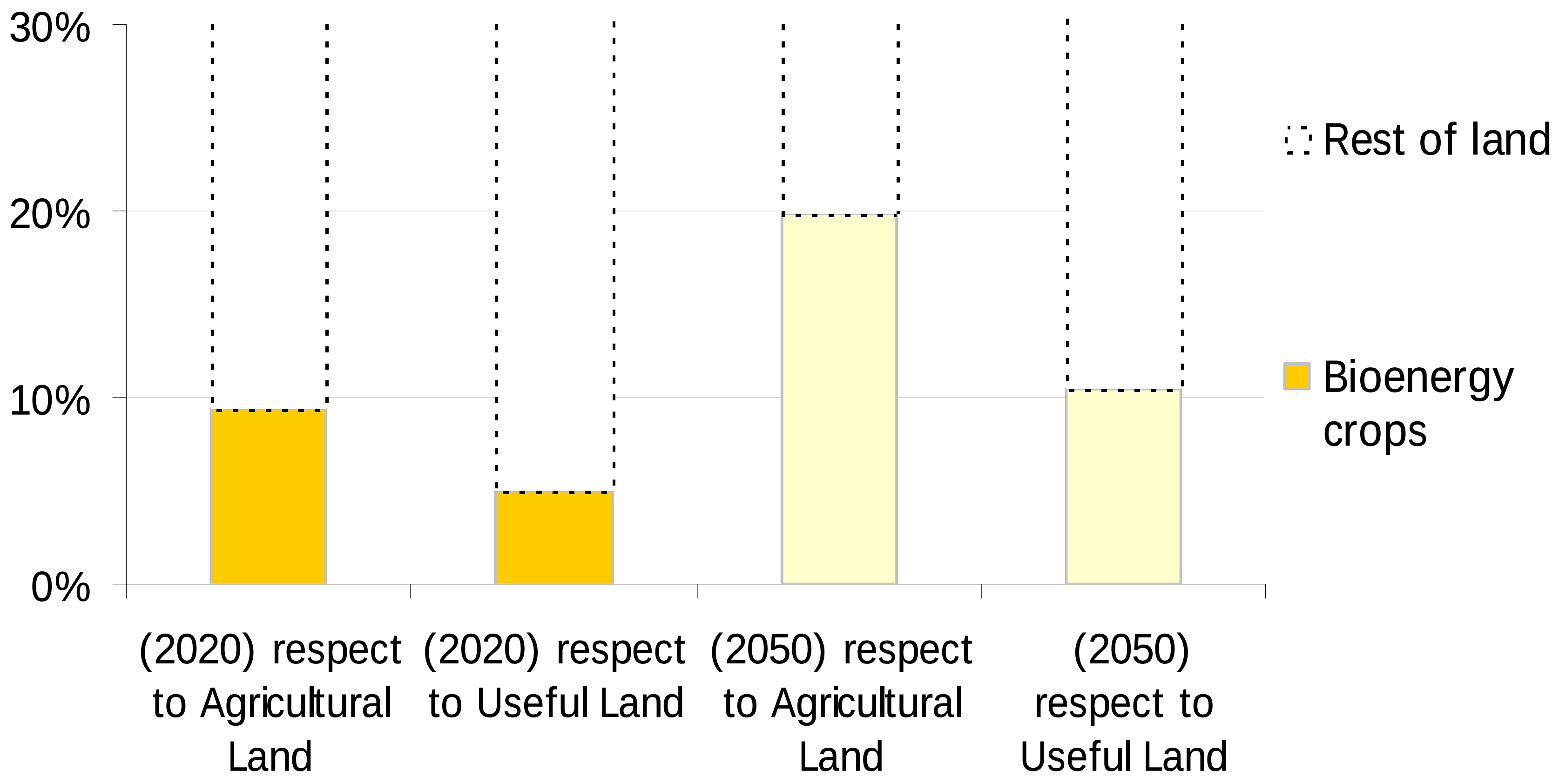
Potential contribution of bio-energy crops in the EU-25 to GHG reduction target by 2020



Land demand for bio-energy crops in the EU-25



Land demand for bio-energy crops in the EU-25 by 2020 and 2050



C3: Limitations and further research needs

- Most studies analyse some land-based GHG mitigation options but not all the competing alternatives

- The next steps should compare the potential of bioenergy crops and the expansion of forest cover, allowing competition amongst these (and other) uses of the finite land resources.

- Co-benefits (and co-costs) and decision making inertia should also be included in the analysis.

Thank you for your attention

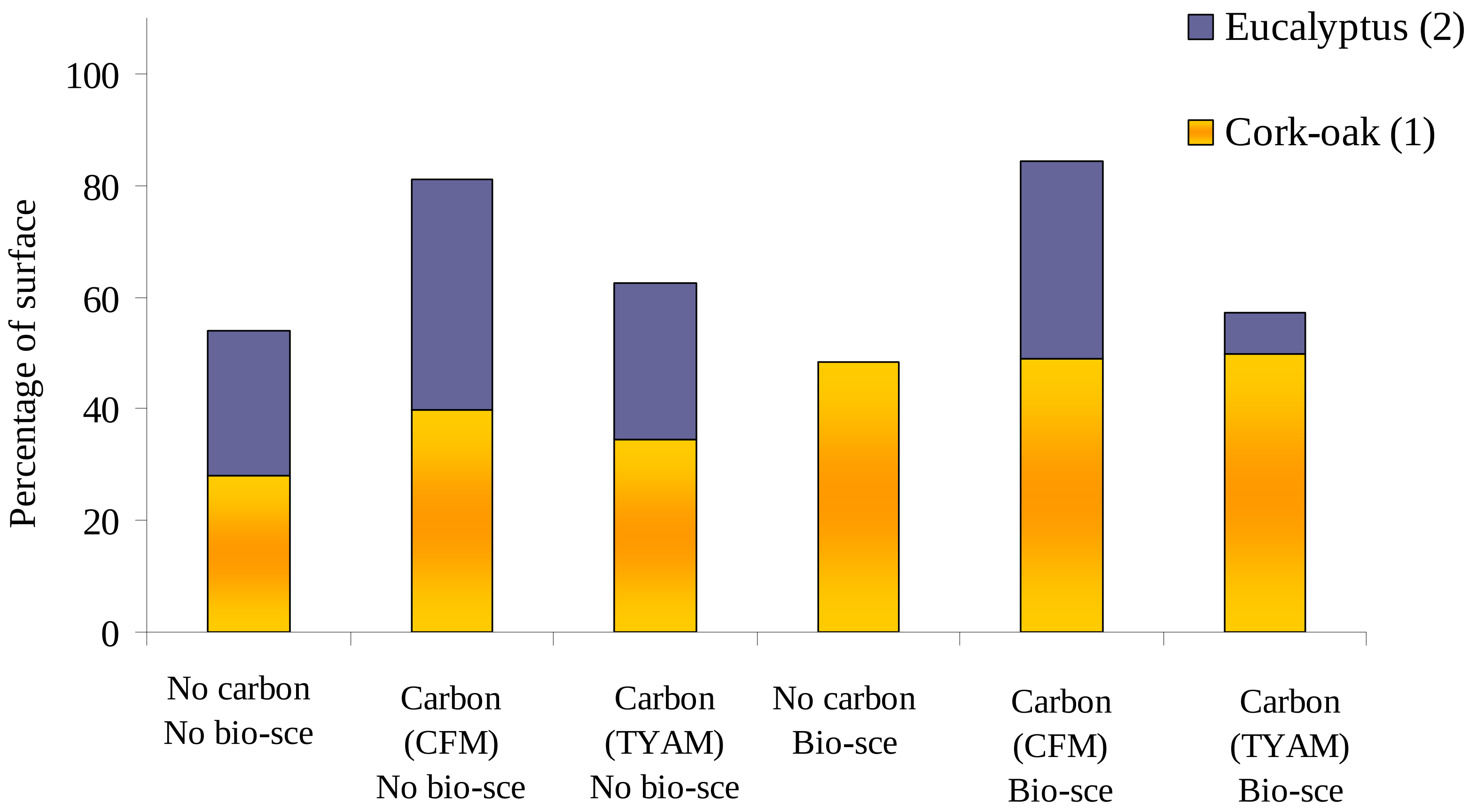
C1: Results

Our results suggested that:

- Considering only CO_2: **CFM fosters reforestations with fast growing** species, which may adversely affect biodiversity-scenic values (measured using *choice experiments*)

- When biodiversity-scenic values **are not fully internalized** by markets, it may be better to use a **more conservative method like the TYAM**.

C1: 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%.

C2: Effects of biological and physical carbon sequestration functions on the time path and implementation of carbon sequestration.

- CSIC has developed an optimal control model (focussed on reforestations) to analyse the **effect of different biological sequestration functions** on the time path and implementation of carbon sequestration, considering that **trees sequester** (and retain) **carbon for long periods at varying rates**.

C2: Main Results

- When one of the efficient methods is implemented, the Social Planner (and the landowner) **will continuously change the species used for the reforestations**, except at the steady-state, where actually no reforestations take place.

- The tendency is to **use slower and slower growing species** as the land available for reforestations becomes scarcer, the last reforestations will be done with very slow growing species so that **carbon sequestration programs will continue to have an impact** on climate change **long after** the last reforestations are done.

Future. Research niches I

- **For the USA,** Stavins (1999) or Lubowski, Plantinga and Stavins (2006), LPS, present the only applications that
  - “investigates the cost of forest-based carbon sequestration by analyzing econometrically micro-data on revealed landowner preferences “
  - And then “simulate landowner responses to sequestration policies.

- This method that avoids assuming that landowners maximize commercial income. As LPS put it:

Research niches II

"In theory, there are a number of reasons why landowners' actual behavior regarding the disposition of their lands might not be well predicted by ''engineering'' or ''least-cost'' analyses:

- land-use changes can involve irreversible investments in the face of uncertainty,
- landowners may want to retain options for future land-use decisions;
- there may be non-pecuniary returns (for example, esthetics, and recreation) to landowners from forest uses of land, as well as from agricultural uses;
- liquidity constraints or simple ''decision-making inertia'' may mean that economic incentives affect landowners only with some delay;
- and there may be private, market benefits or costs of alternative land uses of which an analyst is unaware."

Research niches III

- LPS do not integrate biofuels in the analysis.

- LPS do not explicitly include ancillary benefits.

- For **Europe,** there is no application of this type …

Thank you for your attention

References

Ericsson, K., Nilsson, L.J., 2006. Assessment of the potential biomass supply in Europe using a resource-focused approach. *Biomass Bioener*. 30, 1-15.

European Environmental Agency (EEA), 2006a. How much bioenergy can Europe produce without harming the environment. EEA Report No 7/2006. Hall, D.O., House, J.I., 1995. Biomass energy in Western Europe to 2050. *Land Use Policy* 12 (1), 37-4.

IMAGE-Team, 2001. *The IMAGE 2.2 Implementation of the SRES Scenarios. A Comprehensive Analysis of Emissions, Climate Change and Impacts in the 21st Century*. RIVM CD-ROM publication, 481508018. National Institute of Public Health and the Environment, Bilthoven.

Kavalov, B., 2004. *Biofuels potential in the EU. Report for the Institute for Perspective Technological Studies*. European Commission Joint Research Centre. Report EUR 21012 EN.

Mantzos and Capros, 2006. *European energy and transport – Trends to 2030 - Update 2005*. European Communities, Brussels.

Sims, R. E. H., Hastings, A., Schlamadinger, B., Taylor, G., Smith, P., 2006. Energy crops: current status and future prospects. *Global Change Biol*. 12 (11), 2054–2076.

Vries, B.J.M., van Vuuren, D.P., Hoogwijk, M.M., 2007. Renewable energy sources: Their global potential for the first-half of the 21st century at a global level: An integrated approach. *Energ. Policy* 35, 2590–2610.