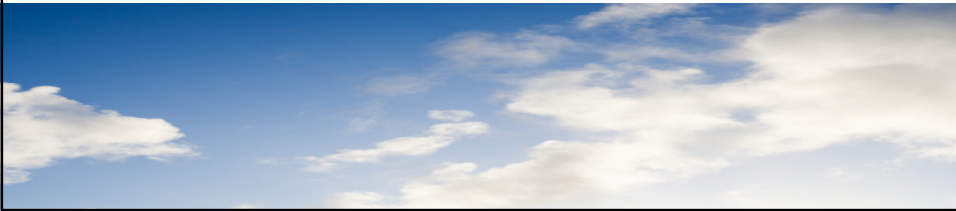


## Evaluating the impacts of ILUC

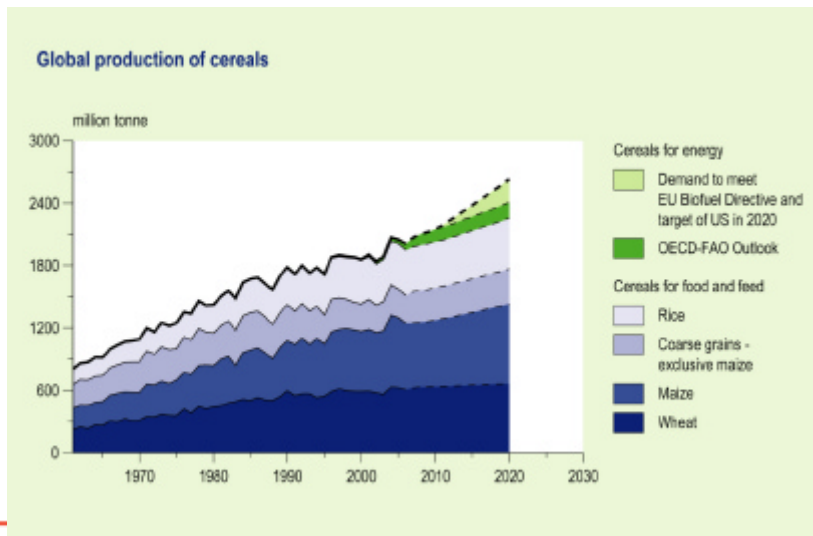
IEA Bioenergy, May 12<sup>th</sup>, Rotterdam

Bas Eickhout



## Biofuels are additional to increasing food and feed market

2



## Impacts can be complex

3

- Direct impacts can be addressed by sustainability criteria (see: EU directive on renewables)
- Displacement of existing or future agriculture is also possible: not addressed in current criteria
- And through competition of natural resources price impacts are also possible

## Cramer criteria

4

- GHG balance
- Biodiversity
- Competition with food
- Environment (soil, water, air)
- Welfare
- Wellbeing (social effects)

Most of these aspects mentioned in European policies;  
however, only at the production level

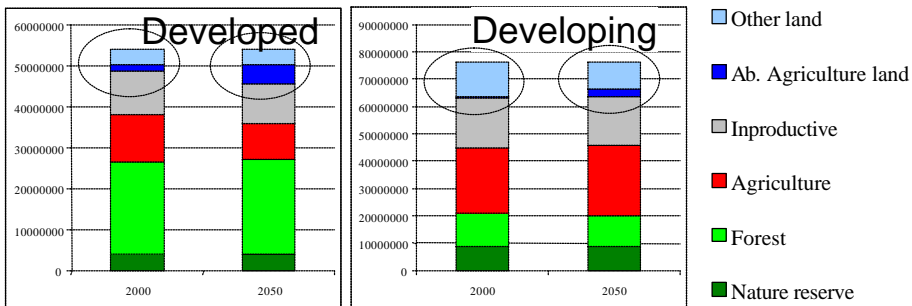
## Science is not capable to assess the potential size of indirect effects

5

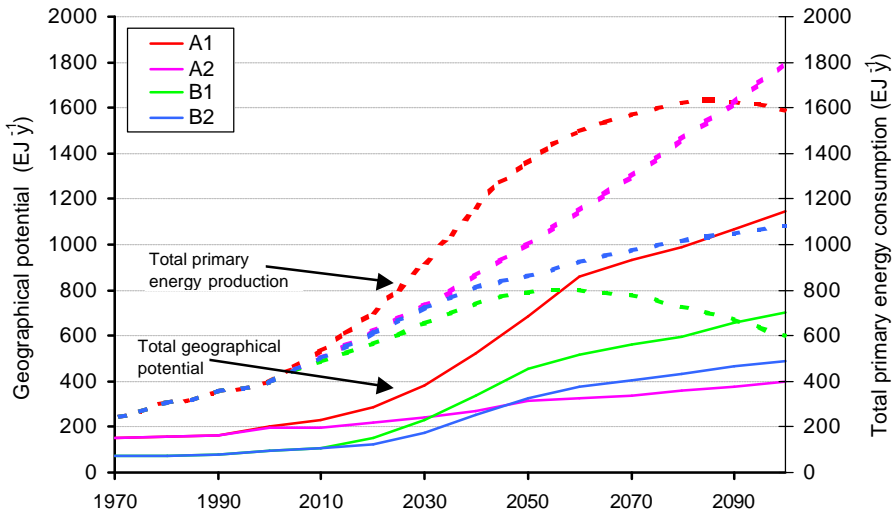
- Existing potential studies assume no indirect impacts
- Agro-economic studies do not consider sustainability criteria; usually poor in land use change impacts
- Peter Witzke will say more on these models

## An example of a potential study with the IMAGE model

6

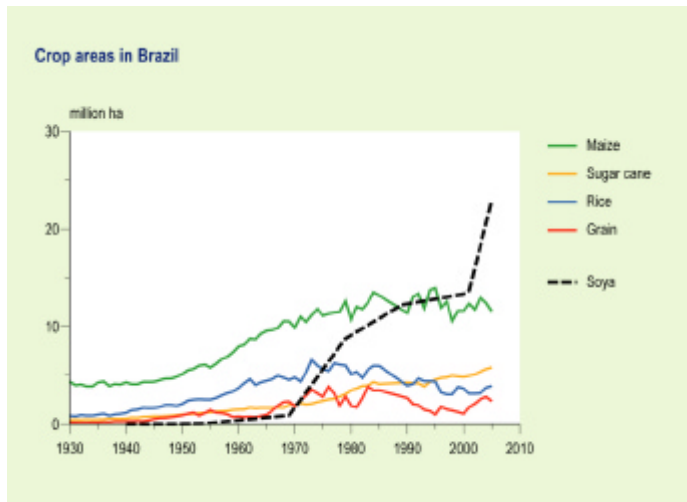


## Resulting in long-term potentials on bioenergy vis-à-vis energy demand



Source: Hoogwijk et al., 2005

## However, rate of change is crucial when indirect effects are considered



Source: MNP, 2008

## Therefore...

9

- Monitoring of macro impacts is an important aspect (mentioned often by Dutch Ministry of Environment)

## Biophysical monitoring (1/3)

10

- Land cover *versus* land use
  - Satellites indicate the change in land cover; not in land use
- National statistics are crucial
  - FAO is the primary source for agricultural and forestry statistics.
- Water use: only few statistics available

## Biophysical monitoring (2/3)

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- Impacts on carbon
  - Large uncertainties in land use emissions
  - Using UNFCCC initiatives is logical, although non-Annex I countries data are scarce
  
- Biodiversity
  - Definition unclear
  - Very few data, certainly not up-to-date (example Red List Species)

## Biophysical monitoring (3/3)

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- In other words?
  - Many data available at national level, but often debated
  - Balanced image only possible through the combination of satellites, national statistics and local knowledge
  - Locally, radar images can provide additional information; for add-on analyses
  - Impacts on water use and biodiversity remain uncertain in the near future

## Socio-economic monitoring (1/2)

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- National statistics FAO and IEA available
  - Volumes, prices, trade, productivity
- However, for specific data on bioenergy additional sources are needed. Examples:
  - Global BioEnergy Partnership etc.
  - Commercial sources like F.O. Licht
  - Country data, for example from the US

## Socio-economic monitoring (2/2)

14

- Also here: analyses at the country level are necessary to assess the impact of bioenergy
  - Examples exist from, amongst others, Copernicus Institute
- Societal consequences: globally unavailable and therefore, highly dependent on case studies:
  - Until now, few examples exist outside Brazil

## However: additional data cannot replace models

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- ‘**Causality** and **valuation** questions, taken together, ask for a model-based, scenario-oriented approach, in cooperation with producer countries and including multi-stakeholder dialogues.’

## Modeling bioenergy: In search for the holy grail

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- What are the impacts of blending obligations?
- What is the effect on availability and prices of other commodities?
- What are the land-use consequences?
- What happens to the GHG balance?



## Two worlds meet

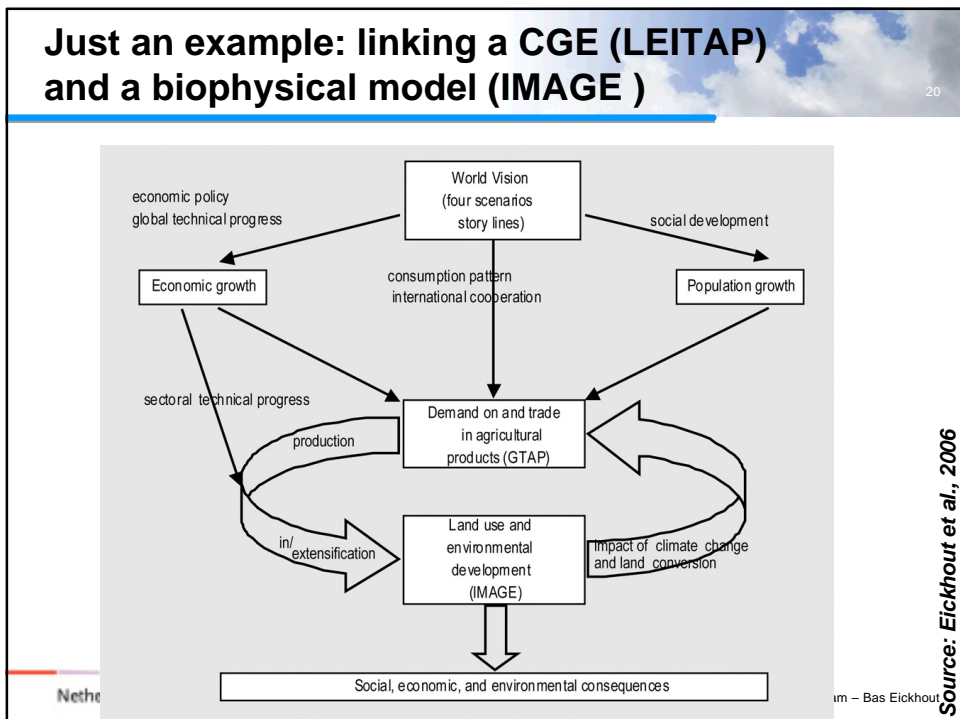
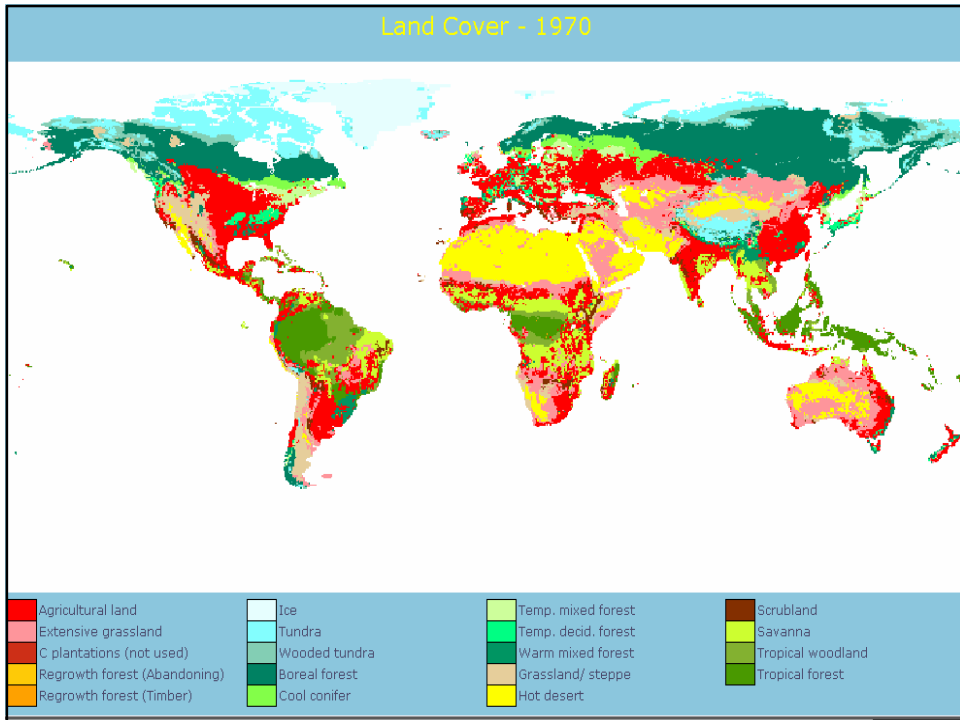
17

- Most economic models have been ignoring land-use issues
- Biophysical models are poor in capturing economic mechanisms

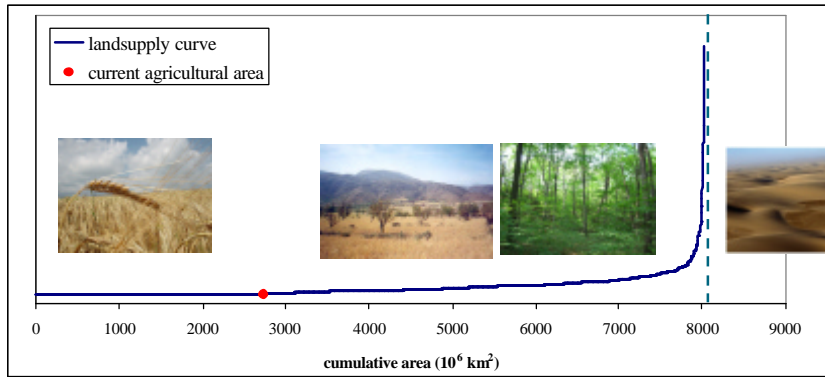
## Biophysical models

18

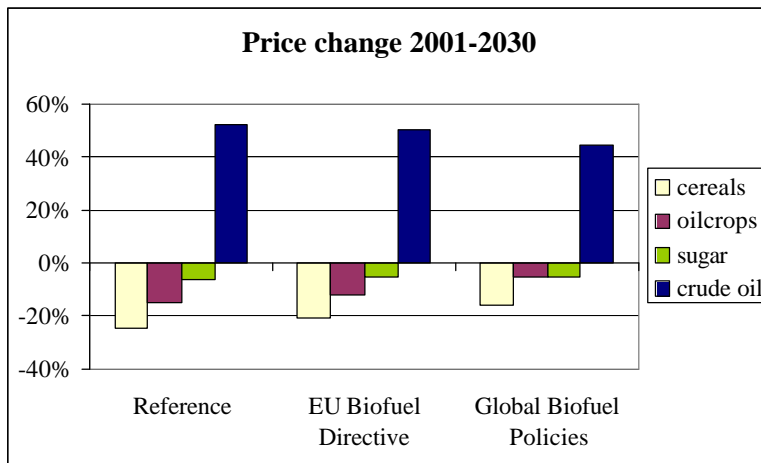
- Able to capture impacts on land use, GHG balance and biodiversity



# Applying a land supply curve

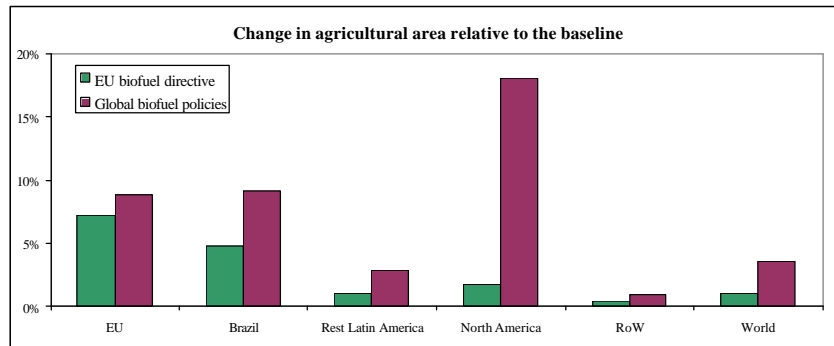


# Combination delivers price impacts



## And land use impacts

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## And impacts on emissions

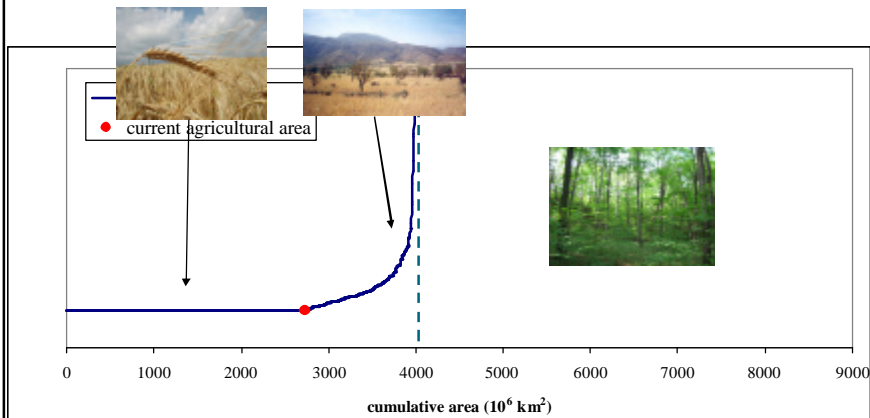
24

|      | Fossil energy CO <sub>2</sub> Reference | Fossil energy CO <sub>2</sub> Global BF | Difference fossil energy CO <sub>2</sub> | Diff. fossil energy CO <sub>2</sub> , no secondary effects * | Additional Land use emissions | Net difference |
|------|---|---|--|--|-------------------------------|----------------|
|      | [Pg C y <sup>-1</sup> ]                 |   |  |  |                               |                |
| 2010 | 8.55                                    | 8.48                                    | -0.07                                    | -0.10  | 0.40                          | <b>+0.33</b>   |
| 2020 | 10.74                                   | 10.64                                   | -0.1                                     | -0.13  | 0.57                          | <b>+0.47</b>   |
| 2030 | 13.57                                   | 13.49                                   | -0.08                                    | -0.17  | 0.21                          | <b>+0.13</b>   |

\* Expected reduction in fossil energy emissions based on blending percentage only.

## But no sustainability criteria are implemented yet. Next step

25



## And detailed regional impacts lack

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- Combination of three worlds is needed
  - Global CGE model to assess global impacts; by addressing trade issues and impacts on economy
  - Global Integrated Assessment Model to assess impacts on GHG balance and biodiversity
  - Regional Partial Equilibrium model to assess agricultural opportunities and impacts
  
- More on the models by Peter Witzke

**Thank you for your attention**

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