Indirect land use change – key questions arising from the literature review

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Stakeholder consultation meeting

Brussels, 26th October 2010

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I Why a literature review?

To identify the key questions that we (as policy makers) need to understand in proposing a way forward

II The modelling process

- Indirect land use change is invisible
- It will never be possible to point at a piece of land in one place and say that its deforestation was caused by the use of crops from another place for biofuels
- à Assessment of indirect land use change has to use models

Modelling approach

- Define a **baseline scenario** (e.g. EU biofuel use in 2020 will be at the same level as 2008)

- Define a **policy scenario** (e.g. 8.6% share of road transport fuel from biofuels from crops in EU in 2020)

- Calculate the **change in land carbon stocks** under each scenario; the difference between them is the **land use change impact** of the policy scenario

- Compare the land use change impact with the **greenhouse gas savings** from replacing fossil fuels with biofuel

Steps in modelling process (oversimplified)

1) Demand for biofuels

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2) Increase in total demand for (particular) crops

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3) Increase in area used for crop production

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4) Decrease in area under other (particular) land covers

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5) Loss of soil and above-ground carbon stocks

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6) Carbon stock loss is added to GHG emissions in biofuel production to give GHG cost of policy

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7) GHG cost is compared to avoided GHG emissions from fossil fuel production and use (GHG benefit of policy)

III Key questions from the literature review

1) Questions concerning demand for biofuels

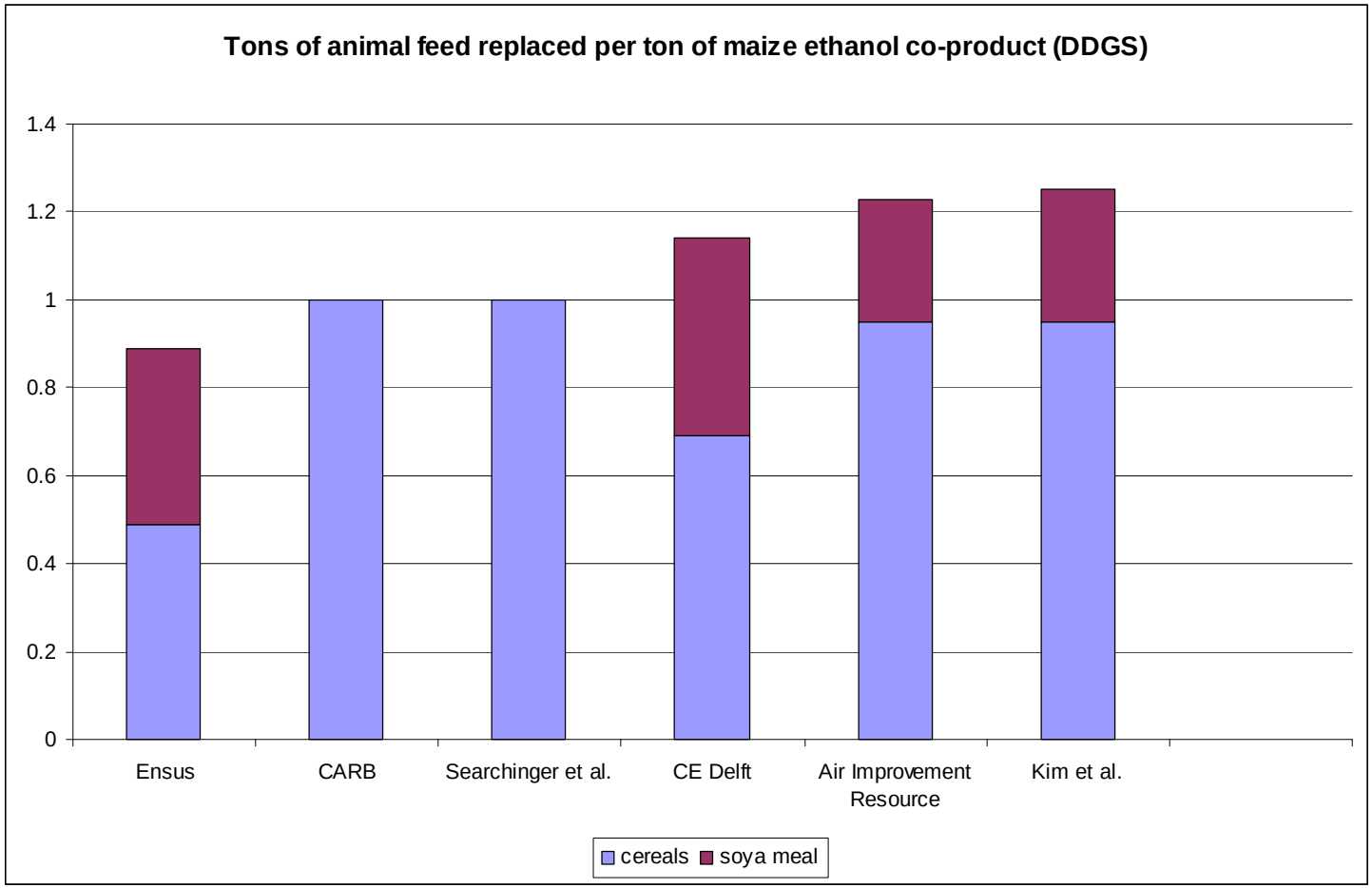
- IFPRI (at the request of the Commission) modelled three scenarios. The highest was "8.6% share of land using biofuels" – adding **16.8 Mtoe** of biofuel (of which **35% biodiesel**) in 2020 compared to 2008.

- 21 National Renewable Energy Action Plans (grossed up to EU27) suggest that Member States plan to add **15.9 Mtoe** of biofuel (of which **70%** biodiesel)

- What effect from this higher biodiesel share?

2) Questions concerning demand for crops

Most biofuels have an animal feed co-product. Studies disagree on what is replaced (cereals or soya) and how much. In different studies, taking into account co-products reduces the estimated land requirement by 8 to 64%. What ratios to use? (Higher ratios mean a lower demand for additional crops.)



3) Questions concerning increase in cropped area

- If increased demand causes yields to grow, less extra land will be needed. All the models assume that the **rate of technological progress** is uninfluenced by changes in demand. Is that justified?

- There seems to be no empirical evidence on **yields of converted land**. Nevertheless, most models assume these are significantly lower than already-cropped land (25% to 66% less). What is the effect of this assumption? Is it justified?

- About a third of the increase in “area harvested” comes from increased **cropping intensity** on existing cropland (Millennium Ecosystem Assessment). It seems that the studies incorrectly treat this as land use change rather than yield increase. What impact does this have on the results?

- The **CIS** countries (Russia, Ukraine) have high potential (abandoned cropland, low yields). What would happen if this potential is realised? (In the models, it is not.)

4) Questions concerning land types converted

- Most acts of deforestation have multiple drivers (e.g. logging + cropland) (see e.g. Geist and Lambin). The models assume that deforestation is caused only by the successor crop., They do not take into account "**avoided deforestation**" due to the logging that accompanies cropland expansion. What would be the effect of including this?

- Some regions (e.g. EU) have **cropland abandonment**. Biofuel demand will slow this down. As a result, opportunities for afforestation will be lost. Most models treat these "lost forests" as fully mature (IFPRI: 50% mature). But the EU's standard approach is to spread emission effects over 20 years. What would be the effect of a different approach?

- The **EU sustainability scheme** for biofuels limits the land types from which they can come. Why do all models assume these restrictions will have no impact? How should they be modelled?

4) Questions concerning land types converted (cont.)

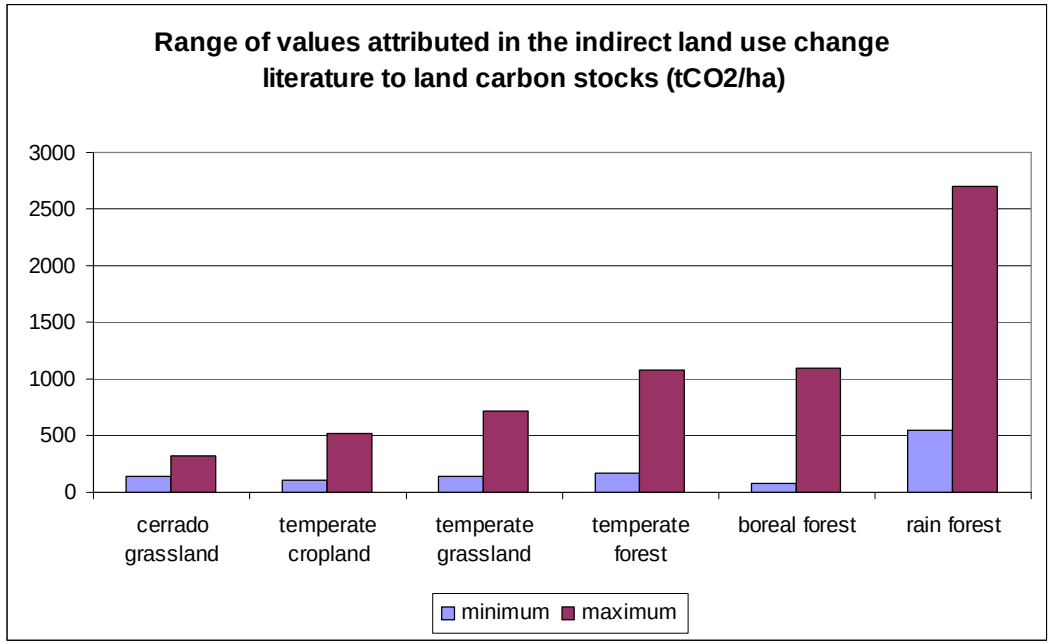
- The area of land covered globally by **nature protection areas** is growing by 1.8% a year. The models fail to take this into account ("freezing" the area covered). What would be the effect of a different assumption?

- Does the land use effect depend on **where the (same) feedstock comes from**? Only one study (Kløverpris et al.) asks this question. It concludes that land use change for wheat from the US is 12 times the land use change for the same quantity of wheat from China (intermediate impacts for wheat from Denmark and Brazil).

- How does the **livestock** sector work? In particular, is it correct to assume (as many models do) that the conversion of grazing land to sugar cane near Sao Paolo (Brazil) leads to the conversion of forest to grazing land in the Amazon?

5) Questions concerning carbon stock losses

- There are big differences in **carbon stock** values used: which are justified?



- The conversion of **peatland** causes worse carbon losses than any other land type. Most models ignore this. What would be the effect of taking it into account?

6) Questions concerning GHG cost of the policy

- The EU sustainability scheme for biofuels sets a **minimum threshold** for their GHG savings. The models assume this has no impact. Is this justified?

7) Questions concerning GHG benefit of the policy

- All studies assume that biofuels replace a "present-day average" **fossil fuel**. In the literature there is consensus that the long-term marginal source would be a "non-conventional source" with higher emissions. This would be equivalent to reducing the land use change impact by about 30%. Should the marginal source of fossil fuel be used as a comparator? What is it?

- Studies that analyse the impact of EU biofuel policy do not take into account the benefits from **non-land-using biofuels** whose use is induced by the policy

(Note: the modelling exercises provide little support for the view that the land use change impact of biofuel policy is "**non-linear**" – that is, that it rises sharply with the volume of biofuel consumed.

Instead, it appears that the land use change impact does not vary much with the volume of biofuels used.

Otherwise, further questions would arise.)

IV Critical questions for biodiesel

Why do most models suggest that the land use change impacts of some or all types of biodiesel are greater than those of ethanol? In IFPRI the key assumptions seem to be:

- The vegetable oil market is like a single global pool (so it does not really matter for the land use impact what type of vegetable oil is used)
- EU yields will be lower in 2020 than 2008; CIS yields will grow very slowly; additional demand for vegetable oil will instead mostly be met from Southeast Asia (palm oil) and Brazil (soya)
- Co-product markets are not global, instead they are local and quickly saturated; so rape seed and sunflower co-products do not do much to offset the land use effect of demand for their oil
- This is reinforced by the fact that the co-product substitution rates used are "imperfect"

What difference would different assumptions make?

Thank you

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