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Economic and Monetary Affairs

Employment and Social Affairs

**Environment, Public Health
and Food Safety**

Industry, Research and Energy

Internal Market and Consumer Protection



**Proceedings of the
Workshop on
"Biofuels and Indirect
Land Use Change"**

WORKSHOP



DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT A: ECONOMIC AND SCIENTIFIC POLICY

Workshop on Biofuels and Indirect Land Use Change

Brussels, 25 January 2012

PROCEEDINGS

Abstract

Expecting the release of the European Commission's impact assessment on "indirect land use change (ILUC) related to biofuels and bioliquids on greenhouse gas emissions and addressing ways to minimize it", the Coordinators of the ENVI Committee requested the organisation of a workshop on this issue. The workshop consisted of different presentations and an exchange of views with Members and established experts in the area of the biofuels and ILUC. This report summarises the presentation, discussions and conclusions.

This document was requested by the European Parliament's Committee on Environment, Public Health and Food Safety

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LIST OF ABBREVIATIONS

AEBIOM	European Biomass Association
C	Carbon
CARB	California Air Resources Board
CCS	Carbon Capture and Storage
EBB	European Biodiesel Board
EC	European Commission
EEA	European Environment Agency
ENVI	Committee on the Environment, Public Health and Food Safety
EP	European Parliament
FAO	Food and Agriculture Organization of the United Nations
FQD	Fuel Quality Directive
GHG	Greenhouse Gas(es)
IEA	International Energy Agency
IFPRI	International Food Policy Research Institute
ILUC	Indirect Land Use Changes
JRC	EC Joint Research Centre
LCA	Life Cycle Analysis or Life Cycle Assessment
LUC	Land Use Changes
MEP	Member of the European Parliament
NREAP	National Renewable Energies Action Plans
RCA	Responsible Cultivation Area
RED	Renewable Energies Directive

EXECUTIVE SUMMARY

Background

Expecting the release of the European Commission's impact assessment on "indirect land use change (ILUC) related to biofuels and bioliquids on greenhouse gas emissions and addressing ways to minimize it", the Coordinators of the ENVI Committee requested to organize a workshop on this issue.

Aim

- The workshop was meant to bring together up-to-date presentations from science and policy, taking into account different views
- It should allow exchange of views with Members and established experts in the area of biofuels and ILUC.
- Given the interest in the issue, the workshop was open to the public.

1. PART 1: HOW TO ASSESS THE IMPACT OF ILUC

1.1. Welcome and Introduction

MEP *Sabine Wils* welcomed the participants, and mentioned that the 2nd part of the workshop will be moderated by MEP *Bas Eickhout* instead of MEP *Richard Seeber* who had another obligation. She thanked the podium participants for coming and made brief introductions of the panellists.

She underlined that biofuels can be a relevant element of European policies to address climate change in the transport sector, but global effects such as land grabbing in so-called developing countries, and indirect effects are not addressed adequately in the current policies, though. She pointed out that:

- ILUC receives more and more attention, and the RED requires the EC to act, but the Commission has ignored this successfully so far.
- The popular view that biofuels are CO₂ neutral is not valid anymore, as many studies show. Some of the authors of these studies are present in the today panel.
- Most of the biofuels have larger GHG emissions than currently attributed to them, and the ambitions of EU climate policies must be strengthened, and loopholes of regulations must be dealt with. Only real GHG emissions should be accounted for.
- Her personal view is that biofuels are an excuse to avoid changes in the automotive industry, the overall transport infrastructure and our mobility behaviour.

As an example of other negative trade-offs of bioenergy she mentioned competition for land, e.g. land rents in Germany due to the biofuel boom became so high that agriculture does not longer pay off. She concluded that we do not need monocultures for biofuels, but a multi-faceted, ecologically oriented agriculture is needed which conserves soils and delivers on climate protection also in farming.

1.2. Summary of the 2011 EP study "Indirect land use change"

Uwe Fritsche thanked the organizers for making this workshop possible and for inviting him to very briefly present the results of the ILUC study carried out for the EP and published in February 2011 (see Section 6.1). He started explaining the general concept of displacement, that ILUC occurs outside of the system boundaries, and is an issue for all new land use. Due to its non-local character, ILUC cannot be monitored, only modelled.

Still, it can be controlled, reduced, offset and (in the long-term) eliminated. It must be noted that LUC from bioenergy is comparatively small still, but overall LUC represents approx. 20% of global GHG emissions. He presented the principle approach to quantify ILUC, and showed the three ILUC studies prepared for the EC which were critically reviewed in the EP study, with the following findings:

- There is a broad variation of ILUC emissions, and ILUC effects show significant impact on GHG balance of biofuels.
- Current science allows a quantitative approximation for GHG emissions from ILUC, differentiated for various biofuels, and should be applied following the precautionary principle.
- The high share of biofuels needed to fulfil the 10% target increases ILUC; other renewable transport options will contribute far less due to economic restrictions until 2020.

- Stricter policies on land use and bioenergy support could achieve significant GHG savings – but at higher cost. Thus, the market will not deliver on its own to reduce ILUC.
- In the US, regulation (RFS2, CARB) already includes quantitative ILUC values. The EC Report (COM (2010)811) did not properly reflect US rulemaking on ILUC.
- The study concluded with reflection on ILUC policy options presented by the EC (see additional slides in Section 6.1), and recommended a combination of options 3 and 4, i.e. feedstock-specific ILUC factors as an “umbrella” but further incentives for ILUC mitigation, including use of degraded land, residues and wastes, and increasing land productivity, following the concept of « responsible cultivation areas ».

He concluded in arguing that all incremental use of fertile land implies ILUC, and indirect LUC of bioenergy is the direct LUC of agriculture. The real world knows only direct LUC, and one must distinguish between analytical (science) vs. regulatory (policy) approaches for indirect effects. An ILUC factor is meant as a proxy for regulation (EU, US...). In the long-term, strengthening the climate convention to account for direct emissions from all LUC from all sectors would eliminate any ILUC.

1.3. The EC's impact assessment on ILUC

Hans van Steen (DG ENER), speaking also on behalf of DG CLIMA, started saying that when he accepted the invitation under the given title the expectation was that he would present the Impact Assessment on ILUC – but as this work is not completed yet, he cannot do so.

Thus, he presented the current state of the Commission's work on ILUC, and the key results of the 2011 IFPRI study to highlight “what we know” (see Section 6.2).

The EC's December 2010 report on ILUC concluded that ILUC can reduce the GHG benefits of using biofuels, but many uncertainties and limitations remain which could significantly impact on the results. Thus, there is on-going discussion, and it is challenging to find agreement on a policy option that strikes the right balance.

The background of this are four studies launched by the EC in 2009, with a further update of the IFPRI report, and updates by JRC, using their “spatial allocation methodology” on the IFPRI results. The EC had consultations with stakeholder in 2009 and 2010, and the JRC held a modelling workshop with ILUC experts. All the reports are available online¹, the Commission is transparent in its doings and has not hidden any data.

He then explained some detail of the IFPRI 2011 study and its key results:

- It is a significant improvement over the earlier version, taking into account now the NREAPs, and some better modelling.
- To bring ILUC into perspective, one has to compare the overall land use for agriculture, forest etc. with the land used for biofuels by 2020 which shows that a rather small portion of global cropland will be affected. This will impact on e.g. primary forests, but less than often expected.
- The overall ILUC will eliminate approx. 70% of direct GHG savings from biofuels, i.e. only 17% savings remain. Still, biofuels would save emissions compared to fossil fuels even when ILUC is included.

¹ For IFPRI and other studies see http://ec.europa.eu/energy/renewables/studies/land_use_change_en.htm, for reports and consultation http://ec.europa.eu/energy/renewables/biofuels/land_use_change_en.htm

- There are large differences in estimated ILUC between sugars, cereals and vegetable oils.
- ILUC is a serious concern, but significant uncertainties remain – IFPRI listed 25 sources of uncertainty.

A key finding is that for biodiesel, GHG emissions from LUC are dominated by palm cultivation on peatland (for palm oil), and conversion of forests (other biodiesel), while for ethanol, GHG emissions are significantly lower – this is a very significant result.

From that, a clear hierarchy between ethanol and biodiesel in terms of ILUC estimates can be derived, which is inverse to the market shares of diesel and gasoline. The next steps of the EC's work on ILUC will be

- the finalisation of Impact Assessment
- an agreement on appropriate response, and
- the preparation of proposals for amending legislation (RED and FQD).

He closed the presentation indicating that he is ready to discuss ILUC, but not able to tell any details on the way forward.

1.4. Analysing Environmental Aspects of Bio-Energy Production

Jan-Erik Petersen (EEA) started his presentation (see Section 6.3) with the issue of how to compare different bioenergy systems, intending to widen the perspective to address broader issues, and report from on-going work. He pointed out that (agricultural) land use not only affects GHG emissions, but also nutrient cycles (N, P), water and ecosystems (biodiversity), and not only impacts locally or in Europe, but globally. He showed the environmental issues of energy cropping – and agriculture in general - along the life-cycle which concern air and GHG emissions, carbon sinks, water quality and quantity, soils, and ecosystem resilience (e.g. biodiversity, natural pest control etc.). Thus, changes in the agricultural system resulting from biofuel and bioenergy development must be considered with care for those impacts.

He then referred to ILUC as an issue of spatial scale and system boundaries and argued for a global, cross-sectoral view also addressing not only bioenergy, but also other renewables which use land (wind, solar...), as there are alternative uses for biomass (materials etc.). There are also different cropping systems, e.g. perennials which might perform better for many impacts.

As this is a complex issue, it requires combining various tools for an adequate analysis. All tools have weaknesses and strengths, and there is not one “right” tool.

The overall resource efficiency of bioenergy must address a broad range of issues, but as a proxy one can use the cost-efficiency of GHG reduction, i.e. the cost of reducing one tonne of GHG emissions. Based on illustrative figures presented, biofuels perform rather low in that regard. This is more detailed in a study to come out soon, giving also more focus on resource efficiency in general. He concluded that in order to inform decision makers on public investments, there are key requirements:

- A better base of reliable and targeted data and tools is needed for adequate advice
- The interactive impact of national policies on global resources needs consideration, as other countries also introduce biofuel policies (e.g. China, US), i.e. the global context is not constant

- There is a need to combine various analytical approaches, and to consider interactions between different sectors
- Sufficient capacity for integrated analysis must be created/maintained
- Knowledge transfer and extension to producers and stakeholders is needed.

He closed arguing that the ILUC discussion is complex, but many data is available.

The analysis of national (or EU) policy in isolation is not adequate given the global market. There is also a need to reflect on other biomass uses (materials...), and to think about possible alternatives for biofuels, reflecting on the reason for biofuel targets. Here, ILUC is surely an issue, but one has to reconsider the reasons for policy which are going beyond GHG. He indicated an on-going study on resource-efficient biomass potential use in the EU which will give more insight, and is expected to be released in summer 2012.

1.5. Existing methodologies and best practices on assessing ILUC

Luisa Marelli (EC DG JRC) started her presentation with a brief explanation on how to “measure” ILUC (see Section 6.4). It is important to understand that this means to compare scenarios for e.g. the year 2020 with and without biofuel policies.

Then she focused on modelling works and discussing uncertainties in the models, and highlighted the outcomes of the JRC model comparison. During 2010 and 2011 the Commission mandated IFPRI to analyse the impact of the EU biofuels mandate and possible changes in EU biofuels trade policies on global agricultural production and the environmental performance (GHG emissions) of the EU biofuel policy.

A key consideration is that more biofuels will result in higher agricultural prices which then impacts on additional land use, but also on e.g. intensification of agricultural production, shifts in diets, and changes in food and feed demands. All this has to be modelled adequately, for which several models and approaches exist.

Building on results of the economic model, GHG emissions from the estimated land use change were calculated by the JRC and by IFPRI with two different methodologies, showing that emissions induced by increased land demand are relevant (36 g CO₂/MJ from JRC analysis in the scenario where projections from NREAPs are assumed), and that in general ethanol crops have lower ILUC impacts than oilseeds/biodiesel crops. IFPRI and JRC methodologies gave similar results, although the models are very different.

Biomass-related GHG emissions mainly depend on the fraction of deforestation, and the values of the two studies for this « driver » are quite similar. Further high impacts have emissions from peat drainage which account for approx. 50% of total EU biofuels ILUC emissions, and the JRC has used more updated values for this than IFPRI. An important further result is that even *if* forest conversion would be prevented globally, the GHG emissions from ILUC if EU biofuels are still significant – nearly 50 % of the emissions would remain in case no cropland would come from former forests.

To better understand how different models calculate increased land use change due to biofuels policies, the JRC launched in 2010 a survey committing various agro-economic modellers to work out net crop area changes due to similar biofuel scenarios. For each model, the JRC worked out how increased crop demand is made up of contributions from increase in yield, credits from by-products use and reduction in food and feed consumption.

Furthermore, she showed that even if deforestation would be halted (i.e. no conversion of forests to cropland), ILUC emissions could be about halved, but would still be significant.

She pointed out that ILUC models assume a price feedback which reduces food demands (and respective GHG emissions). Thus, potential ILUC effects are dampened by this assumption, and would be much higher if constant food demands would be assumed. It should be questioned whether biofuels should benefit from people eating less.

Next she compared results of US and EU studies of ILUC, and found that newer US results match EU findings. The uncertainty analyses carried out in the US, and by IFPRI, indicate that under all circumstances of data variation, ILUC is positive, i.e. above zero.

Her final point was that change of land use to grow biofuel crops may also result in other environmental impacts than GHG emissions. For example, according to a preliminary estimation of the JRC, land use changes to cropland will cause a decrease in the Mean Species Abundance values, which are indicators of losses in biodiversity.

She summarized her presentation as follows:

- There is no scientific support for believing ILUC as zero
- Even with uncertainties ILUC is above zero for all biofuel feedstocks
- For EU biofuels, most of the land use changes will occur outside the EU
- The ILUC results of models would be higher if they did not benefit attribute reduced food and feed demand to biofuels, thus reducing their indirect GHG emissions
- ILUC is not only GHG emissions: the impact on biodiversity could be potentially high
- US legislation (EPA, CARB) is already accounting for ILUC.

1.6. Q&A for Part 1

Vittorio Prodi (MEP) remarked that we cannot effort to switch to biofuels unless there is better data – there is a priority for food/feed, and biofuels should focus on residues and wastes. For example, there is 1 t of residues per hectare. Furthermore, there should be more consideration on e.g. H_2 (to be used in fuel cells) and pyrolysis. There should also be a consideration of contaminated soils for biomass feedstock production, as e.g. Italy has 3% of land being contaminated. Thus, we should test energy crops growing there, using bioenergy to pay for the reclamation without compromising food production.

Bas Eickhout (MEP) asked Hans van Steen to explain how the change of the biodiesel/ethanol split affects the findings of the new IFPRI study. He further asked to what extent affects the IFPRI findings regarding the differences of ILUC for biodiesel and ethanol the policy considerations of the Commission. He also asked the three scientists on the panel what they see as the three key uncertainties in models, data, and scenarios, based on their experiences with ILUC work over the last years.

Ariel Brunner (Birdlife Europe) made the observation that according to Luisa Marelli, all models include food savings and asked her if this would translate into “very poor people skipping dinner”? He further asked Hans van Steen and the scientists on the panel whether the comparison of land shares associated with ILUC to the global land area is fair, as current EU GHG emissions are some 16% of global emissions, and the share of EU transport is 15% of that, and biofuels substitute 10% of that?

Hans van Steen agreed with Vittorio Prodi, soils are a scarce resource, that why he showed the land shares for biofuels to show how much of the land will be used to meet the RED targets. He also agrees with the point made on contaminated land, and refers the “bonus” of 29 g CO_2 /MJ in the RED GHG calculation for biofuels from such lands. He further agreed that residues and wastes are important, especially as so-called 2nd generation biofuels produced from residues and wastes perform much better in terms of GHG emissions, as they do not imply ILUC. With regard to his slide showing global land use shares, he argued that it is correct, as the figures reported are the exact additional land use associated with the RED renewable transport target. At the same time, the Commission expects other type of land uses to expand 20 times more than that. Regarding the question of *Bas Eickhout*, he answered that the update of the IFPRI study now reflects the 2020 fuel mix better, based on NREAPs, so that the biodiesel share increased, and the respective average ILUC emissions increase, compared to the earlier results. Concerning the differences in the biofuel ILUC performance, this key result is naturally being thought over and discussed in the Commission, but no details can be given in the moment.

Jan-Erik Petersen responded to the questions not directly, and referred to *Luisa Marelli* for the uncertainty issue. He pointed out that the translation of environmental, technology and energy systems research into the real world, i.e. the sectors and people working on bioenergy systems and who are not only doing this for money – remains unclear with regard to the overall strategy and policy instruments for steering biofuels and bioenergy development toward the most efficient and environmentally compatible direction. There are lessons to be learnt from agro-environment policies and other areas which have not sufficiently been translated into the bioenergy debate. There are big knowledge gaps in this translation, also regarding the social dimension. Regarding the question of land use shares, he argued to look into alternatives, determining the best use of resources including land. We should not confine ourselves to individual areas such as biofuels, but have a broader view. He hopes that EEAs work contributes to that.

Luisa Marelli answered that uncertainty is the key issue of recent work with the result that if different models using the same scenarios, same key assumptions and by-product use, convergence can be achieved. The key uncertainty is in the assumptions made for yields, especially on abandoned, marginal, unused new land. Wrong assumption on these factors could even result in “negative” GHG emissions. The other issue is the substitution of oil seeds and cereals. Regarding the fuel mix in the new IFPRI study, this is based now on the NREAP projections. It was expected that this would bring the emissions up, but actually it reduced the emissions, because IFPRI assumed higher yields and a higher substitution of low-yielding crops such as vegetables by high-yielding cereals. Regarding the question of food consumption impacts, she agreed that this was the message she wanted to give in the sense that all models assume food demand reductions due to price increases, and no policies are in place to prevent this. This impact will be higher in developing countries. As we cannot accept this, hopefully policies will prevent this effect, but then the ILUC factors would be higher.

Uwe R. Fritzsche remarked that regarding food security of poor people, one has to consider that today's malnourished people do not have (enough) money to pay for food, so that a higher price will make not much of a difference for them. But there will be a distributive effect moving currently not so well nourished people into the food-insecure area. On the other hand, there will be a change in the diet, switching from meat to vegetables and cereals. This is something the FAO is working on. Thus, we surely have to consider not only indirect land use effects, but also food security impacts. In that, we also have to tradeoff the higher income generated by higher food prices, and by exports which would not have been possible otherwise. So it is a rather complex issue, and FAO is working on an analytical framework for that. The answer is not clear at the moment. He agrees on the convergence of models, as researchers exchange and improve data and methods, but there is a fundamental uncertainty in data on trade. For example, the best GTAP model uses the database for 2007, and the one which is publicly available uses 2005 data. This means that all biofuel policies which came out after 2005 and influenced the markets of agro-commodities are not yet reflected in the databases. From the macroeconomic modeller's viewpoint, we don't know yet what happened in those years – we're driving blind. There is another uncertainty with regard to system boundaries: the models look complex, but the relations they model are rather simple. They miss integration of e.g. the interactions Jan-Erik Petersen mentioned such as biomaterials. Furthermore, macroeconomic models have performed badly over the last 20 years in making accurate projections. We should not require the models to be accurate in making projections, but use them as analytical tools to distinguish between two scenarios – as that is what they can do. Finally, there is the issue Mr. Prodi raised and we're trying to make this an issue for a long time: there is unused, underused and degraded or contaminated land which is not in competition with food or feed, and this should be the priority to cultivate any bioenergy and biofuel feedstock. But the regulation we have does not reflect this – the meagre 29 g of CO₂/MJ which were referred to by Hans van Steen does not give a market signal at all. It costs about 30 to 50 % more to grow something on those lands, and there is no economic compensation for that. The 29 g bonus does not translate into an incentive, as we have a threshold system in the RED. In that sense, we do not have the regulatory system in place that would award low-ILUC feedstocks, but we should have that. The US system used in California gives an incentive to reduce ILUC, and translates this into a higher market share. The EU system does not.

2. PART 2: ROUNDTABLE ON ILUC CHALLENGES

Bas Eickhout (MEP and Member of ENVI Committee) chaired the roundtable, and skipped the introduction of the speakers for sake of discussion time.

He underlined that from the previous session there seems to be a clear message from science on what ILUC is about, and now the question is how to deal with that.

He wondered that maybe the partners around the table could find some compromises which then the Commission might draw into its impact assessment and draw conclusions based on that.

2.1. The EU bioenergy industry view on ILUC

Kjell Andersson (Svebio and AEBIOM) presented the biomass industry view (see Section 6.5). He started with some remarks on Sweden where bioenergy with 32% of end energy is the largest energy source already, with positive land use impacts. But there are also nearly 900,000 hectares of un- or underutilized farmland that could be used for bioenergy.

Then he made the following key points:

- According to the IEA, the “door” to achieve the 2° C climate goal closes in 2017, i.e. near-term GHG reductions are needed
- The share of LUC in global CO₂ emissions was reduced over the last years to approx. 10 % due to an increase in fossil and cement emissions, and reduced deforestation/LUC
- The uncertainty range of ILUC model results for biofuels is large, newer studies show lower figures.
- LUC figures on deforestation are derived from the past, but recent changes (e.g. lower figures in the Amazon) are not considered.
- Using marginal land to sequester carbon by e.g. growing trees, would change the landscape and its biodiversity, and would not allow substituting fossil fuels. Furthermore, other aspects such as rural development would be affected negatively.
- There is unused marginal land in EU, and beyond, and yield response data of models differ. Thus, current modelling cannot be a sound base for policy, as the science is yet immature.
- AEBIOM recommends to handle LUC where it occurs, and to work together on mitigation alternatives, as ILUC is always direct LUC occurring somewhere else. Regulation should focus on what farmers can directly influence.
- There seems to be a Hegelian situation with bioenergy: in earlier times, bioenergy was seen as a solution for many issues, but currently the antithesis seems to prevail saying that bioenergy is bad. Hopefully this will evolve to a synthesis where a compromise can be found that is working and brings us forward, because we need to address the 2°C goal for climate change, and this is urgent.

2.2. Indirect land use change – a view from IEA Bioenergy

On behalf of *Göran Berndes* (IEA Bioenergy Task 43/Chalmers University), *Uwe R. Fritsche* (IEA Bioenergy Task 40/Öko-Institut) presented G. Berndes’ slides (see Section 6.6) with the following key points:

- The contribution of bioenergy to climate change mitigation needs evaluation from many viewpoints reflecting a balance between near-term targets and the long-term objective (2°C target for 2050). Otherwise, development of policies and incentive structures might create situations where the most economically rational way of managing land is very different from how land management is best developed in response to prospective demand for food, bioenergy and other biomass products considering the ultimate requirements of a far reaching energy system transformation. Adding landscape level considerations to complement project level indicators and metrics is one important step, but also additional perspectives are needed.
- The concept of 'GHG emissions space' which focuses on accumulated emissions up to a given year is relevant in relation to temperature targets, since peak warming appears being insensitive to CO₂ emissions trajectories, i.e. the exact shape of Carbon (C) fluctuations associated with bioenergy systems is not relevant. E.g., it does not matter whether C in forest residues is emitted early after extraction for energy or is emitted decades later when left in the forest to decay. What matters is whether forest bioenergy systems are part of a changed forest management paradigm that results in systematic decreases or increases in the forest C stocks.
- Long-rotation forest management represents a special case, which is associated with C emissions and sequestration taking place at different times during forest rotation. This leads to mitigation trade-offs between bioenergy extraction and the alternative to leave the biomass in the forest, where biogenic C is emitted later when the biomass decays.
- Active forest management can ensure that increased biomass output need not take place at the cost of reduced forest C stocks (but biodiversity is an issue).
- At present, fossil energy infrastructure is expanding rapidly around the world, and given the typical lifetime of many decades for fossil energy plants this implies considerable claims for future GHG emission space. The recent years' bioenergy LUC debate paid too little attention to the question how promotion of bioenergy affects the larger development of energy and associated systems, i.e., the rate at which coal power plants are built to meet growing electricity demand, directions and size of investments (R&D into coal based liquid fuels and unconventional oil vs. bioenergy vs. other renewables), and institutional capacity building, policy development, and learning in relevant areas – including land management and the protection of natural ecosystems.
- Bioenergy and its influence on C flows need to be evaluated within the larger context of energy system transformation and adaptation in agriculture and forestry to a prospective situation where bioenergy and other renewable energy sources contribute substantially to primary energy supply – and where climate change influences conditions for biomass production.
- Future LUC rates will depend on the willingness of national governments to protect forests and other natural ecosystems – and the effectiveness of legislation and other measures to reduce deforestation. Strict focus on the climate benefits of ecosystem preservation may put undue pressure on valuable ecosystems that have a relatively low carbon density. While this may have a small impact in terms of climate change mitigation, it may impact negatively on, e.g., biodiversity and water tables. Similarly, soil C losses associated with land use may have limited influence on GHG balances but might be a large concern in relation to soil productivity.

- Policy measures implemented to minimize negative impacts of LUC should be predictable and based on a holistic perspective recognizing bioenergy's strong interconnectedness with food and fibre, and the multiple drivers of LUC. One need to acknowledge that LUC for bioenergy can lead to positive effects, that ILUC of bioenergy has direct causes that can be addressed, and also that conversion of natural ecosystems into high-yielding plantations might in some places represent an attractive response to climate change, despite leading to near-term LUC.

2.3. Views of the EU Environmental NGOs on ILUC

Nuša Urbancic (Transport & Environment, T&E) started saying that she cannot speak for all environmental NGOs, as there is diversity in this community. She remarked on the previous speakers that there seems to be a domination of Swedish speakers, and from her work over the last years she finds the Swedish positions to be different from the rest of the world. This might come from the fact that the average Swede has more land per person than an average person in other countries, but globally, land is a scarce resource, and this should be recognized when talking about using land for bioenergy.

She also pointed out that for the atmosphere there is no difference whether carbon is coming from fossil or biogenic sources, it is the same molecule having the same impact on global warming. So the question is to what extent we can afford to emit carbon from bioenergy, and what will be the payback period.

Focussing on biofuels and ILUC, she emphasized that T&E is neither in favour nor against biofuels as such, T&E wants to support biofuels which reduce GHG emissions. For that, correct carbon accounting is needed, and ILUC is a critical, missing piece of the puzzle in that. She also appreciates that ENVI still follows ILUC and respective science, as this was a key issue put in the RED and FQD by the EP in 2008. T&E is happy to see the EP putting pressure on the Commission to tackle with ILUC in an appropriate and science-based manner.

Land use is key to bioenergy and biofuels – we're not talking about land for e.g. wind energy, as wind energy takes much less land. Science has improved substantially since 2008. There is more known now about food prices and food security impacts which is the other side of the same coin.

Furthermore, uncertainty is largely overstated – it is like talking about GHG emission from transport and making one graph in which emissions from hybrid cars, airplanes etc. and then saying there are big differences which means uncertainty in the emission which we can't legislate. There is also empirical evidence, as data from the FAO on the EU trade balance shows that e.g. as EU rapeseed is more used for biofuels since several years, the rapeseed exports to India and China have decreased. There is more palm oil imported to the EU for food production. This clearly speaks against those claiming that if we use only biofuels from within the EU, everything would be fine. As agricultural markets are connected, everything the EU does has a global impact.

She referred to the emerging scientific consensus on ILUC that it is significant and has to be addressed by feedstock-specific ILUC factors, as the JRC workshop in November 2011, the EEA Scientific Advisory Board report, and a letter signed by 200 US scientists show. This underlines that ILUC factors are appropriate means for policy, and the other options presented by the Commission such as increasing the thresholds might even have negative impacts on ILUC.

Regarding the latest IFPRI study which the Commission will use for its ILUC impact assessment, T&E considers it as a good but “conservative” one, as it overestimated yields, and not adequately addresses peatland, and if the food demand is kept constant, the ILUC emissions would go up by 20%. This is an important issue the EU policymakers should know about. The clear result regarding higher ILUC emissions from biodiesel means that with most of the future increase in EU biofuels projected in the NREAPs to come from biodiesel, reaching the 2020 target will have detrimental impacts on land use.

Other aspects of land use change are food price increases and other social impacts. The FAO recently warned against using edible crops for biofuels, and another report linked land grabbing in Africa to biofuel policies.

In talking about ILUC one should keep in mind that the biofuel sector was created by policy, and so it is up to policy to take responsibility and fix such problems. There is the opportunity now to go for real GHG reductions, and there are biofuels which do that.

The ball is now back with the Commission, and it is up to them to come up with a sensible proposal that would address ILUC would also help investors and biofuel companies to steer in the right direction.

2.4. Q&A for Part 2

Bas Eickhout asked the audience to come forward with ideas, proposals or recommendations how to get a bit further, as the ILUC debate is here for a couple of years, and we know that the science is progressing and will continue to be progressing, but at the same time, policy-makers need to take a step. We heard from “no” to “yes” to ILUC, and maybe we have got some people in the audience who can help find some middle ground.

Isabelle Maurizi (EBB): Regarding compromise and proposals - the EBB has been involved in the discussion and asked for incentives instead of a “punitive approach” which EBB sees as more appropriate, given the uncertainties around ILUC.

A representative of the Government of Argentina, and a representative of the German Biofuels Producers seconded this view, and the latter referred to biofuels replacing the most dirtily fossil fuels such as diesel from tar sands, as they are the most expensively produced fuels. This should be considered.

Roby Blake (FoE Europe): He emphasized the non-GHG implications of biofuels, such as land grabbing which displaces communities from their livelihood, access to water etc. With 60% of land grabbing in Africa being attributed to biofuels, and the recent joint report of the World Bank, FAO, IMF and OECD calling for scrapping biofuel targets due to the negative food security impacts, as well as the biodiversity implications, there is much to be considered in the ILUC discussion.

Ian Basquet (Research Center Henry Tudor): Besides the global debate, regional impacts need to be researched. This would allow reducing the uncertainty, and might underline possible benefits for small communities stemming from specific bioenergy and biofuel developments. Second, with food waste becoming more of an issue, and including this might give more options.

Dan Peters (Ecofys): There is uncertainty in ILUC modelling, and the Commission is likely to base its decision on ILUC on the IFPRI study, but it is important to look to mitigation and reduction options, focussing on known low-ILUC options. A methodology to demonstrate low ILUC risk biofuel exists and should be taken into account in the policy decision.

Kriton Arsenis (MEP): If the industry is not ready to accept that there is a need to differentiate between “good” and “bad” biofuels, public support for all biofuels might be endangered. ILUC would be a means to make this differentiation, and ensure support.

3. WORKSHOP CONCLUSIONS

Bas Eickhout as chair asked the panel for one-minute concluding sentences as “take home” messages.

Kjell Andersson: There are problems, but those are not biofuel problems. There is e.g. peatland conversion in Indonesia, and deforestation in Brazil. If these problems were resolved, the GHG balance of biofuels would improve. Thus, one should work on those problems, and not regulation biofuels.

Nuša Urbancic: The ILUC debate includes a grandfathering clause needed to secure existing investments, but a clear signal where future bioenergy investments should go is needed. Incentives for low-ILUC do not work, as investors say. There is a need to translate ILUC into a decisive form.

Uwe R. Fritsche: He underlined what was recommended in the 2011 study for the EP – start with an ILUC factor, and adjust it over time. Use a mixed approach which favors low-ILUC feedstocks, but bans high-ILUC ones. As the EU invested massively in biorefineries, why not significantly investment jointly in European low-ILUC projects to give incentives and clear signals?

The Chair concluded that the “middle ground” has not been found yet, but there seems to be movement in that direction. The Commission might take home some of these messages, especially to address protection of vested interest, and give clear signals for the future. Science has made progress, but there is still the question whether incentives will be enough.

Therefore, if an ILUC factor is considered and low-ILUC risk production could be exempted from that if evidence is provided, this might be an incentive. One might also bring in regional and local information from different countries such as Argentina, Brazil and Indonesia. This should give some direction for the further consideration and decision-making. The solution is left to the Commission now – the discussion has been long enough now, the arguments have been presented and recirculated, and the time is right for the EC proposal. This is probably the best conclusion at the current state.

The Chair thanked the EP Policy Department and ENVI Secretariat for working on the issue and organizing the workshop, and the interpreters for staying longer. With that, he closed the workshop.

4. WORKSHOP AGENDA

European Parliament Policy Department A-Economy & Science
Committee on the Environment, Public Health and Food Safety (ENVI)

Workshop on Biofuels and Indirect Land Use Change

Wednesday 25 January 2012 - 15:00 - 17:30
European Parliament, József Antall (JAN) 4Q2

15.00 *Welcome by MEP Sabine Wils, Member ENVI Committee*

Part 1: How to assess the impact of ILUC

- 15.05 Summary of the study "Indirect land use change" published by the EP PolDep A February 2011; *Uwe R. Fritsche, Öko-Institut*
- 15.15 The EC's impact assessment on ILUC; *Hans Van Steen, DG Energy, European Commission*
- 15.30 Analysing the environmental aspects of bio-energy production; *Jan-Erik Petersen, EEA*
- 15.50 Existing methodologies and best practices on assessing ILUC; *Luisa Marelli, EC DG JRC*
- 16.10 Q&A, open discussion

Part 2: Roundtable on ILUC challenges

- 16.30 *Introduction to the roundtable MEP Bas Eickhout, Member ENVI Committee*
- 16.35 The EU bioenergy industry view; *Kjell Andersson, AEBIOM*
- 16.45 Indirect land use change – a view from IEA Bioenergy; *Göran Berndes, Chalmers University & IEA Bioenergy Task 43 (presented by Uwe R. Fritsche, IEA Bioenergy Task 40/Öko-Institut)*
- 16.55 Views of the EU Environmental NGOs; *Nuša Urbancic, T&E*
- 17.05 Q&A, open discussion
- 17.25 Conclusions by the Chairman
- 17.30 End of workshop

5. SHORT CVS OF WORKSHOP PARTICIPANTS

5.1. Kjell Andersson, European Biomass Association (AEBIOM)

K. Andersson has a degree in journalism from Stockholm College of Journalism, and a MA degree in history and political science from Stockholm University. From 1973-1987, he worked as a journalist and assistant editor of Land (weekly magazine published by the Swedish Farmer's Federation). From 1987-2001, he was communications director at the Swedish Centre party. Since 2003 he works at Svebio (Swedish Bioenergy Association) in Stockholm as information director and policy advisor, and acts as chairman of AEBIOM's working group on sustainability.

5.2. Göran Berndes, Chalmers University/IEA Bioenergy Task 43

G. Berndes is a physicist and Associate Professor at the Department of Energy and Environment at Chalmers University of Technology, Sweden. His work integrates land use strategies and energy systems development in response to climate, energy and other policies put in place to guide the development.

He is international leader of Task 43 (Biomass feedstocks for energy markets) within IEA Bioenergy, and is also a member of several other international expert groups. He was lead author of the recent IPCC Special Report on Renewable Energy and Climate Change Mitigation and is contributing author of the IPCC Fifth Assessment Report.

5.3. Uwe R. Fritsche, Öko-Institut (Institute for Applied Ecology)

U. Fritsche studied applied physics at the Technical University Darmstadt, Germany, and works since 1984 as a scientist at Oeko-Institut where he headed the Energy & Climate Division in Darmstadt until 2010. Currently he is concerned with institute-wide research on system analysis and sustainable resources. He is an expert in material-flow and life-cycle analysis of energy, biomass/food, and transport systems, coordinating work on the institute's core model and database GEMIS.

In the 1990ies, he worked with the World Bank on environmental issues of energy, and since 2000, contributes to the European and global sustainable energy discussion, especially regarding biomass. Since 2007, his work focuses especially on GHG emissions from land use change related to biomass. He works with his team on national, European, and global sustainability standards and criteria for bioenergy together with EEA, FAO and UNEP as well as CI, IUCN, and WWF, among others. He is German National Team Leader for IEA Bioenergy Task 40, and contributes to the Global Bio-Energy Partnership (GBEP), leading the workstream on indirect effects.

5.4. Luisa Marelli, Joint Research Center Ispra (JRC)

L. Marelli has been official of the European Commission, Joint Research Center, since 2003, where she started working in the European Reference Laboratory for Air Pollution, in support to Air Quality validation and implementation of particulate matter monitoring systems

Since 2008, she has been responsible for the JRC research programs on biofuels (Biofuels Coordinating Action). Research activities of the group develop on the analysis and testing of sustainability of biofuels production and use, such as direct and indirect land use changes

and related GHG emissions, impacts on biodiversity, pressure on tropical forests, life cycle GHG emissions from biofuels production, compatibility with vehicle and energy efficiency, development of second generation biofuels. She is responsible of internal and external communications of the Biofuels Coordinating Action, to establish and maintain contacts and information exchange with customers DGs of the Commission, external delegations, identified stakeholders etc. She is also a member of the Scientific Committee of the JRC Institute for Energy and Transport.

5.5. Jan-Erik Petersen, European Environment Agency (EEA)

J-E. Petersen studied biology, agroecology and public law at the universities of Bayreuth and Kiel (Germany), and in 1998 received a PhD in political science on the implementation of EU agri-environment schemes in Spain from the University of East Anglia, Norwich (UK). He worked as International Liaison Officer for the central office of ADENEX (a nature conservation organization in Spain) from 1992-1994. After his PhD he became a Research Fellow at IEEP London, working as analyst on agri-environment policy, nature conservation, rural development and eastern enlargement of the EU from 1997-2001.

In 2011, he joined the EEA as Project Manager for Agriculture and Environment, responsible for developing EEA analysis in the area of agriculture and environment, including the development of EU agri-environment indicators and EEA bioenergy analysis. Since 2009 he is Head of Group for Major Integrated Assessments at EEA, , coordinating EEA-wide projects, such as the EU state-of-the-environment report 2010 and the EEA indicator review process.


5.6. Nuša Urbancic, Transport & Environment (T&E)

N. Urbancic is T&E's specialist on fuels and electrification since 2008. A Slovene, she worked previously in Greenpeace's EU unit on the renewable energy campaign.

She has also worked as a journalist and translator and at the French economic mission to Slovenia.

6. WORKSHOP PRESENTATIONS

6.1. Presentation of Uwe Fritsche, Öko-Institut






Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

Summary of the study

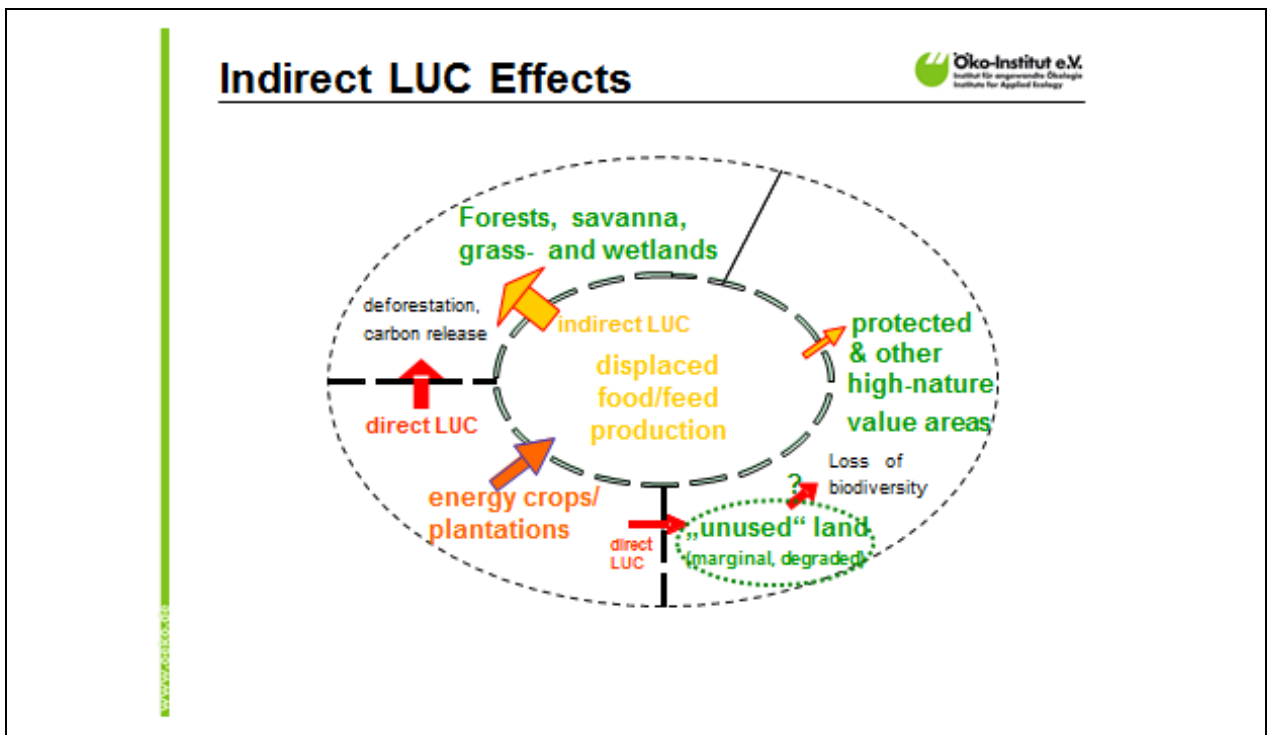
Indirect Land Use Change and Biofuels

Study requested by the ENVI Committee of the EP

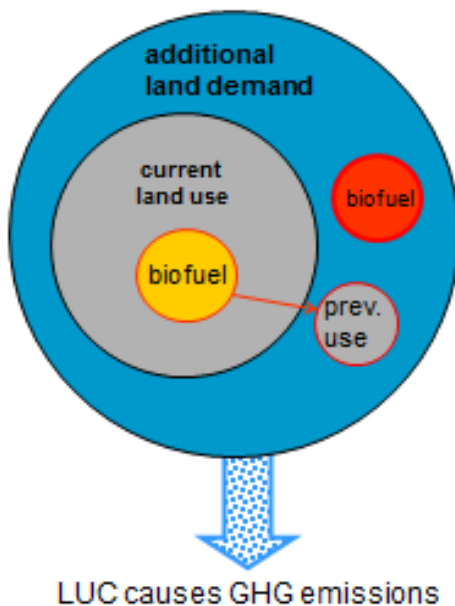




Uwe R. Fritsche, Kirsten Wiegmann
Oeko-Institut, Energy & Climate Division

presented at the EP ENVI Workshop on
Biofuels and Indirect Land Use Change
Brussels, 25.1.2012

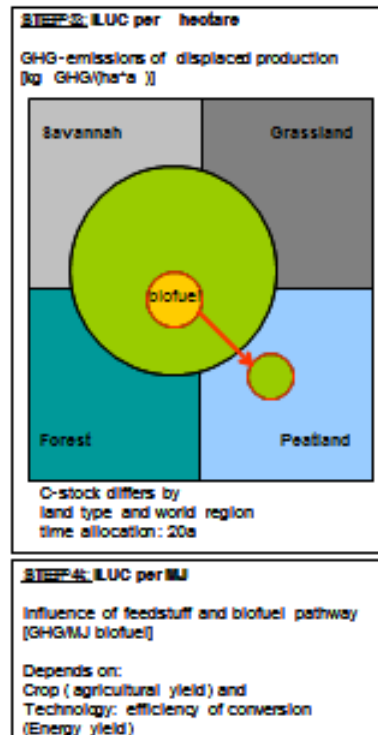
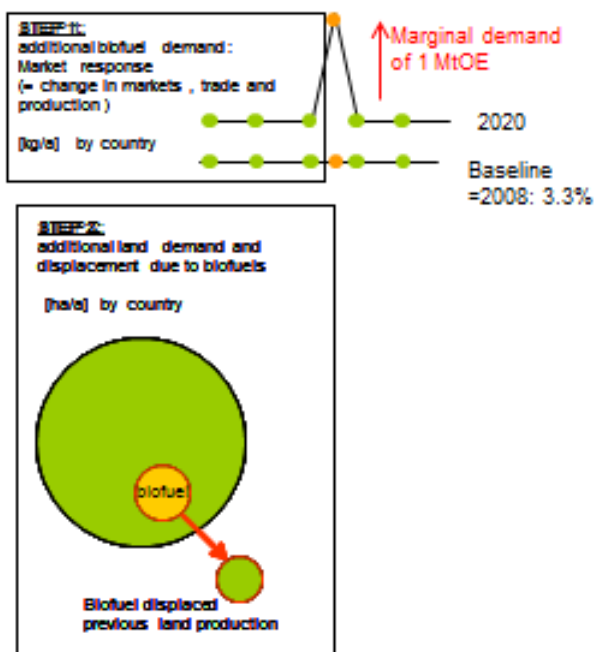


What is ILUC ?



- ILUC occurs outside system boundaries
→ for all new land use
- Non-local character
→ modelling instead of monitoring
- ILUC can be controlled, reduced, offset and (long-term) eliminated
- LUC from bioenergy small, but overall LUC approx. 20% of global GHG emissions

ILUC calculation



The EC 2010 Studies

IFPRI study

- GE-modell
- 3 trade scenarios
- Sensitivity analysis mandate level

JRC-IE study

- Comparison of 6 agro-economic (PE) models
- scenario for several feed stocks
- Same base assumptions

JRC-ipts study

- Comparison of 3 agro-economic (PE) models
- 2 trade scenarios
- Sensitivity analysis: yield growth

Best available
scientific evidence

Goal of studies:

- Valid quantitative approximation of ILUC emissions
- Decomposition of the influence of model parameters

→ Model intercomparison & scenario analysis

Results of EC modelling studies

LUC:

- Differences of models > differences of scenarios
- LUC occurs
 - * in Brazil and EU (JRC-ipts & IFPRI)
 - * in Brazil, other LA, US, ID/MY, other Asia (JRC-IE)

Quantity of ILUC-emissions:

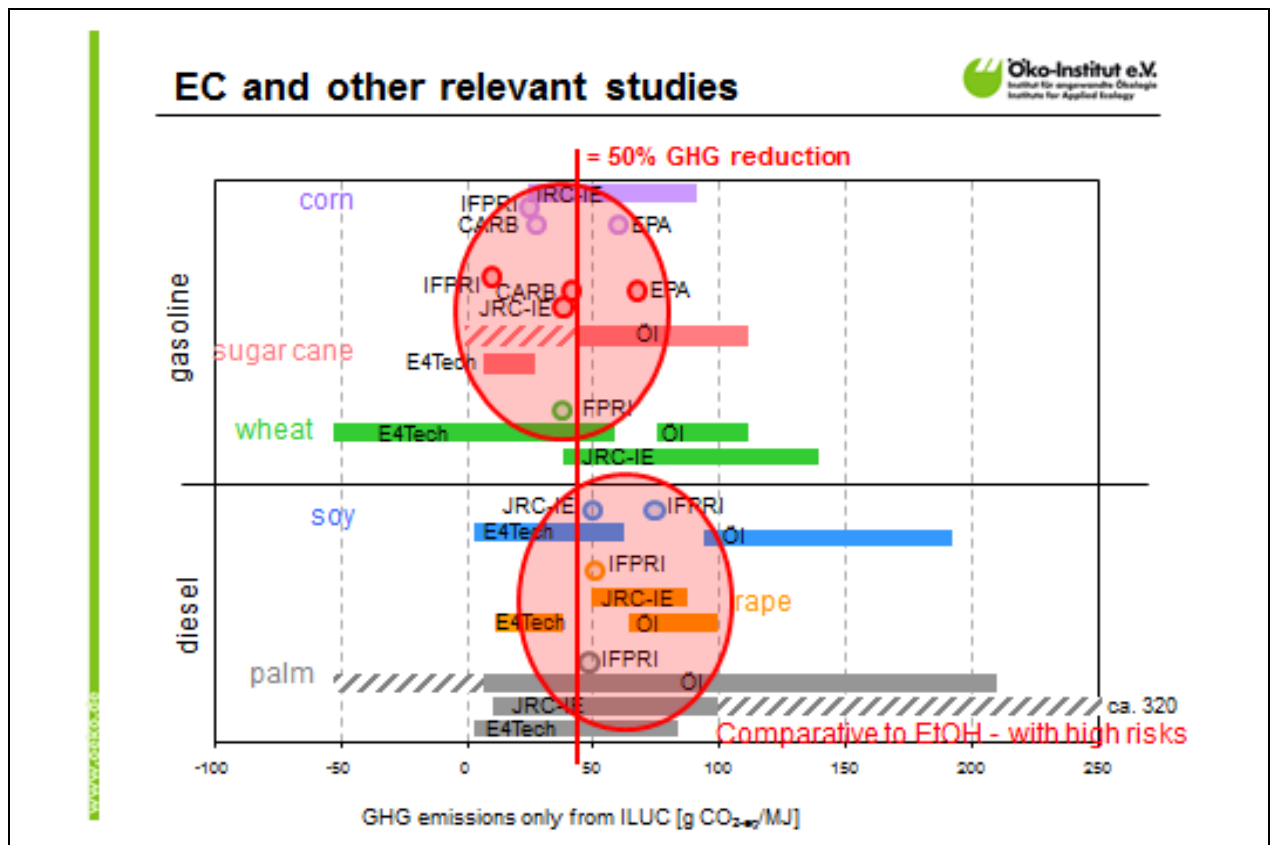
- Wide range: 20-80g/MJ (IFPRI) and 30-350g/MJ (IE, ipts)
- but quantitative approximation

Quality of ILUC-emissions:

- ILUC affects significantly biofuel GHG balance
- depends on model parameters for C release:

- * marginal yield of new crop land
- * previous land use
- * C-stock of LUC-involved land

→ region
→ crop/feedstock

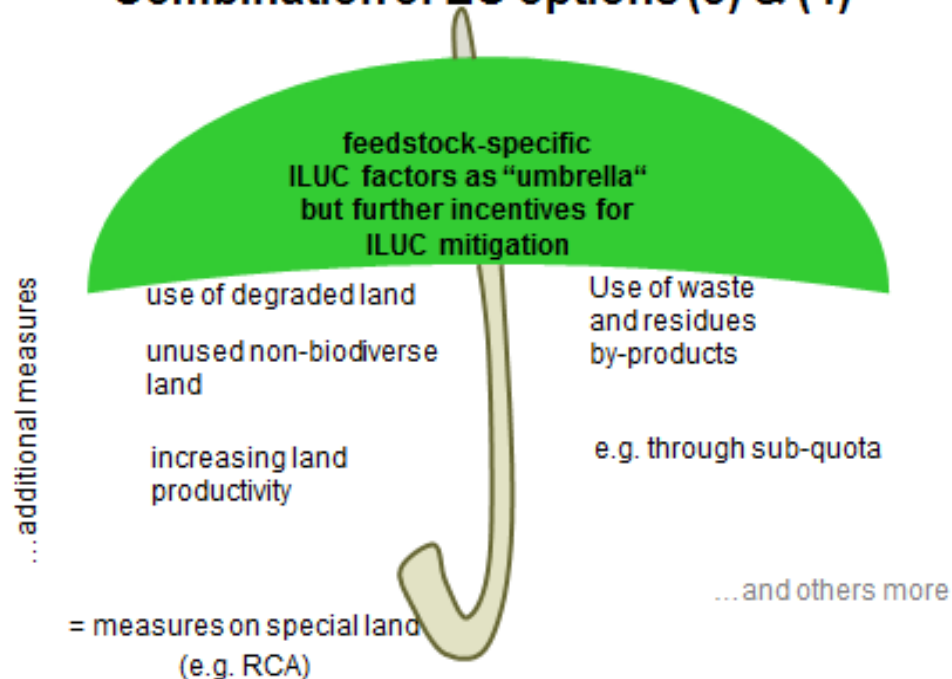


Key Findings of EP Study

1. Broad variation of ILUC emissions...but:
ILUC effects show significant impact on GHG balance of biofuels.
2. Current science allows quantitative approximation for GHG emissions from ILUC, differentiated for various biofuels → precautional approach!
3. High share of biofuels in 10% target increase ILUC impacts; other renewable transport options comparatively low due to economic restrictions until 2020
4. Stricter policies on land use and bioenergy support could achieve significant GHG savings – but at higher cost
5. Already US regulation (RFS2, CARB) include quantitative ILUC values. EC Report (COM (2010)811) did not properly reflect US rulemaking on ILUC
6. First reflection of EC policy options (see next slide)

Recommended ILUC Policy

Combination of EC options (3) & (4)



Summary on Indirect LUC

- **All** incremental use of fertile land imply ILUC
- indirect LUC of bioenergy = direct LUC of agriculture/forestry
- real world only knows direct LUC
- **Distinguish between** analytical (science) vs. regulatory (policy)
- **iLUC factor** = proxy for **regulation** (EU, US...)
- Long-term: strengthen **climate convention** to account for direct emission from **all** LUC from **all** sectors



Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

More Information on ILUC...






www.oeko.de/service/bio

u.fritsche@oeko.de

ADDITIONAL SLIDES (NOT SHOWN)



Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

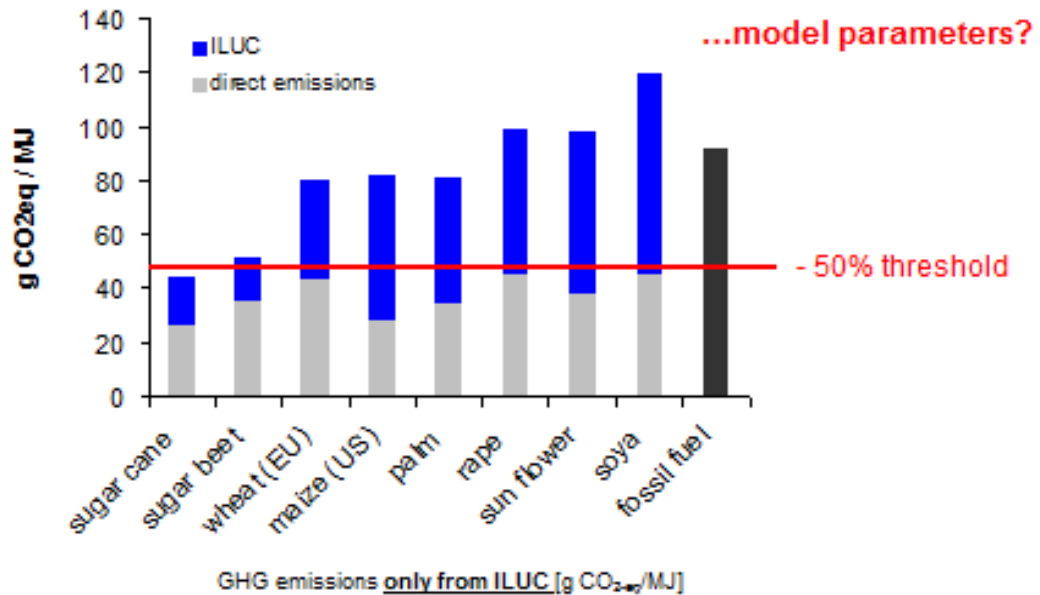
Other indirect effects

- direct impact on biodiversity (e.g. destruction of habitats)
- use of carbon-rich land (C release, e.g. peatland)
- intensification of agricultural production
 - additional GHG emissions
 - additional impact on biodiversity
- social impacts (land rights, food prices, access to water)

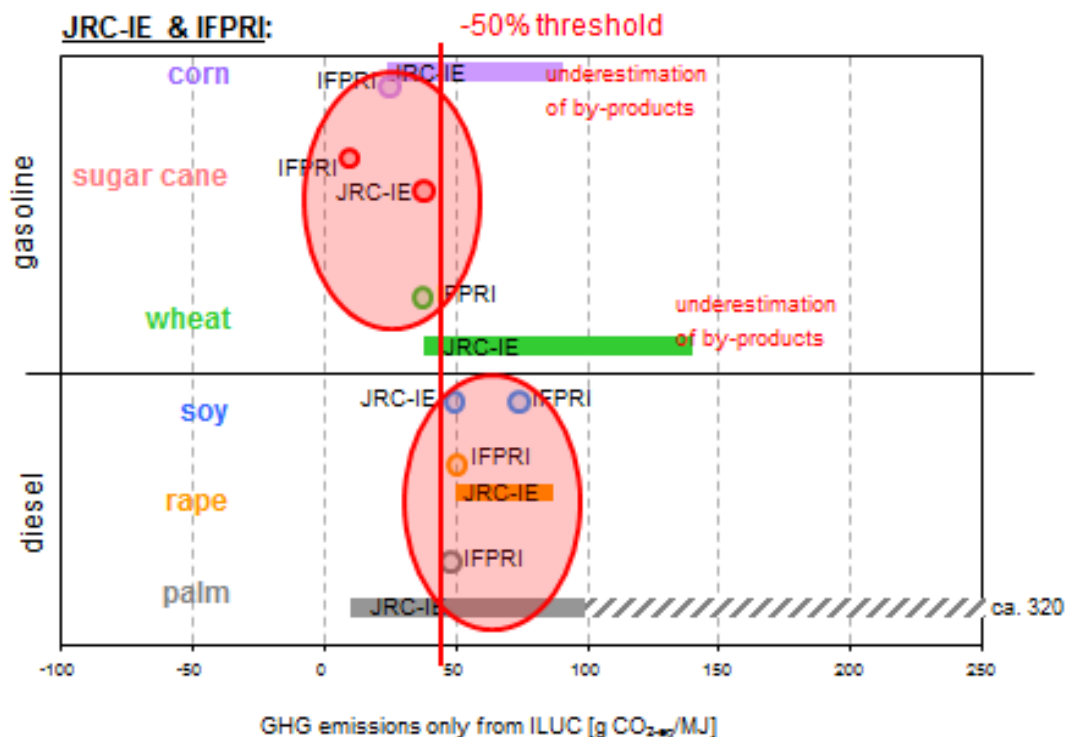
Quantitative results

IFPRI: direct & ILUC emissions

ILUC has significant risk to reduce GHG saving potential of biofuels



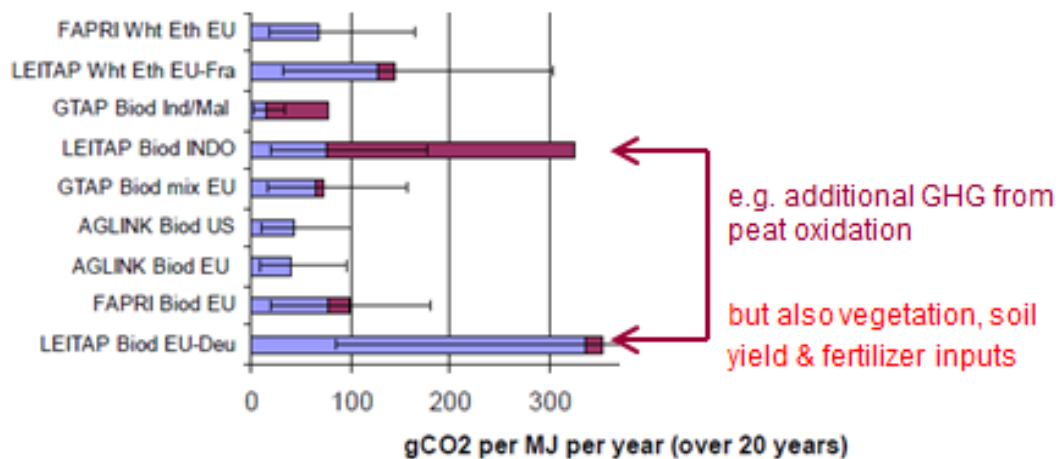
1. Feed stock - range



2. Location

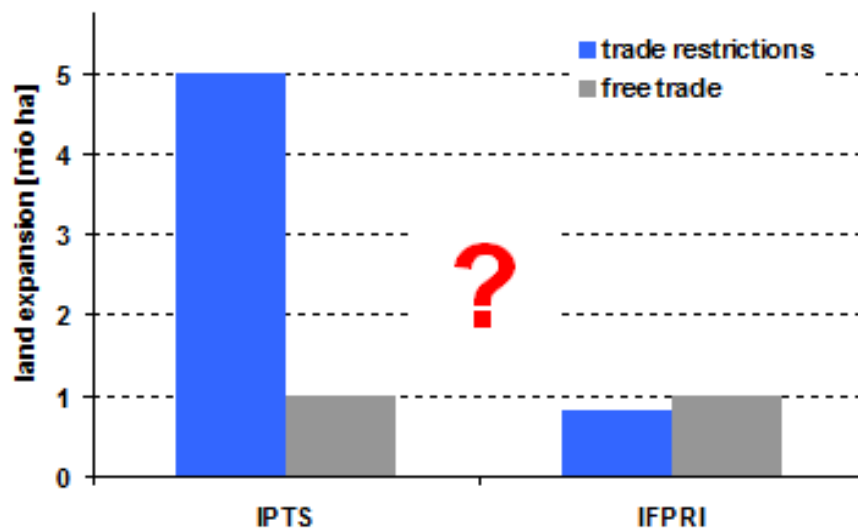
JRC-IE study:

GHG emissions from ILUC with \emptyset -soil carbon release: 40t/(ha*a) in 20a



3. Influence of trade policy

JRC-IPTS & IFPRI: ! Results in land (ha)

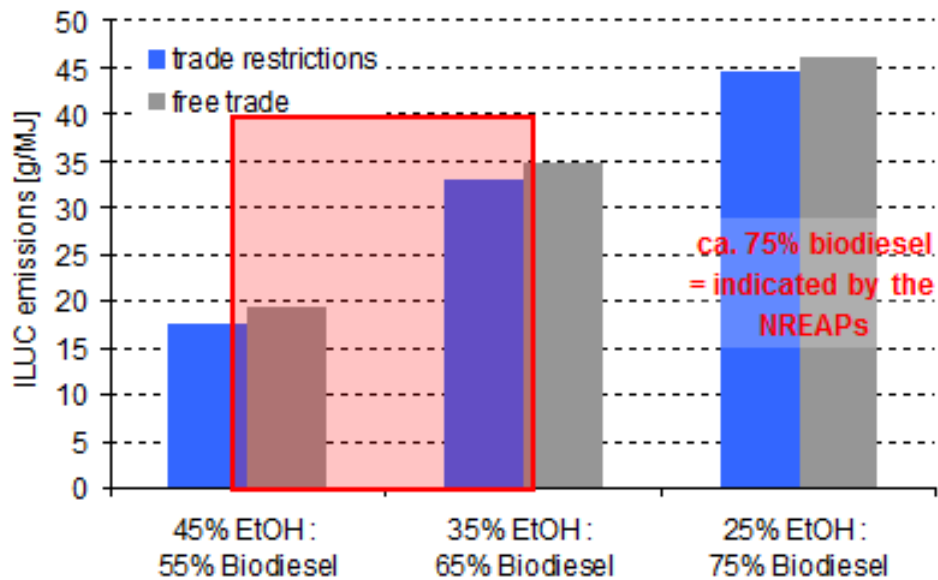


Mandate: 8.5% biofuels
Fuel split: 65% → 53% biodiesel

5.6% biofuels
55% biodiesel for both scenarios

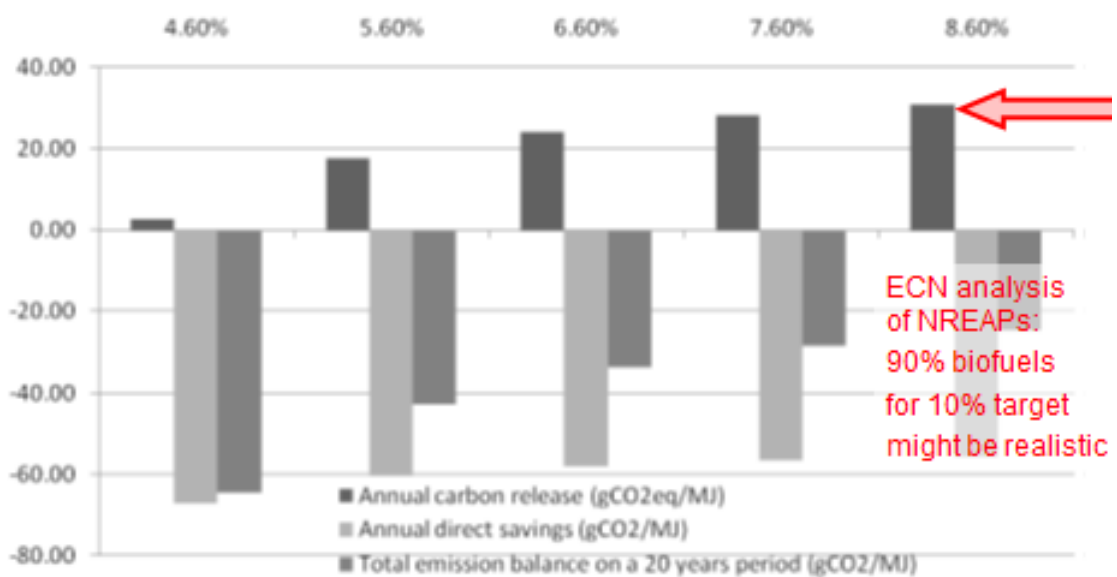
4. Fuel split

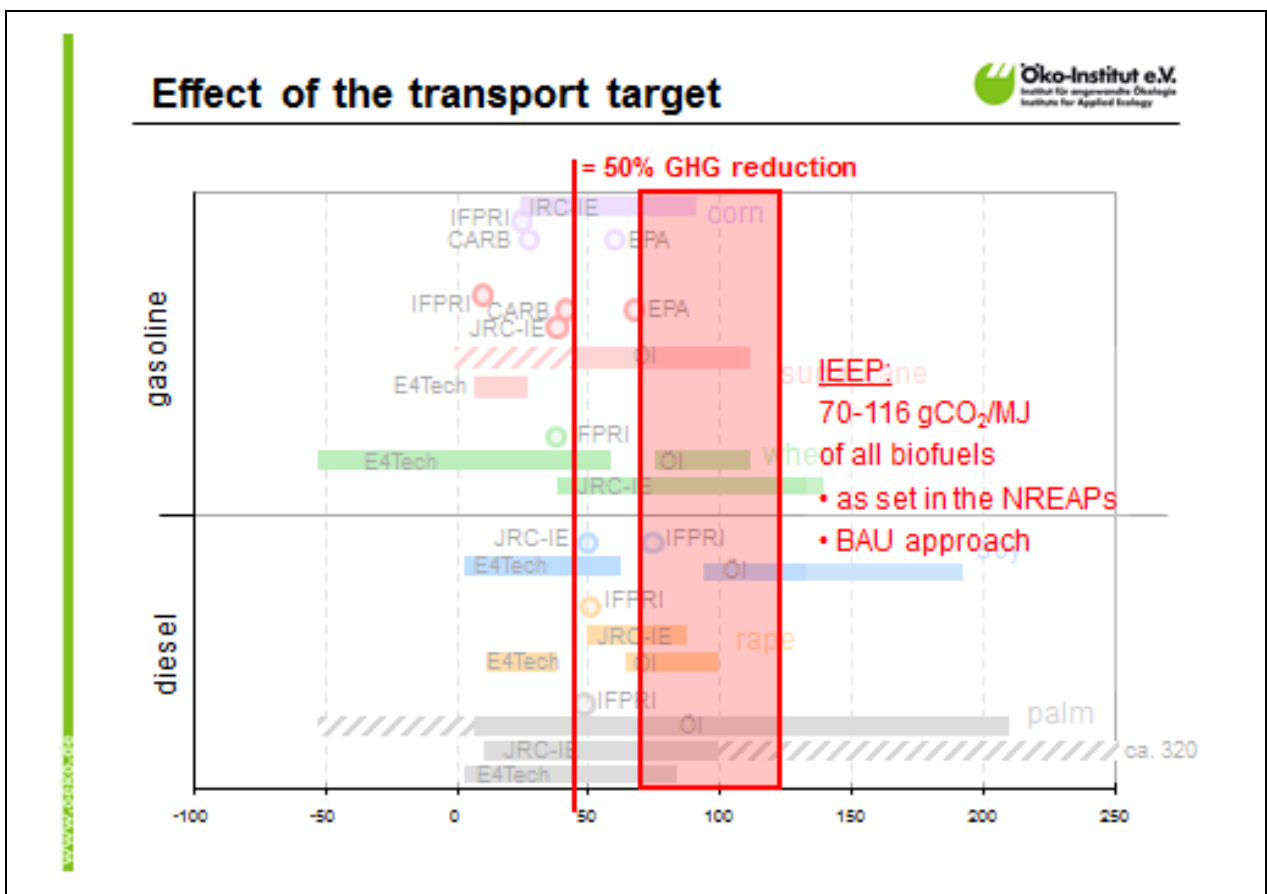
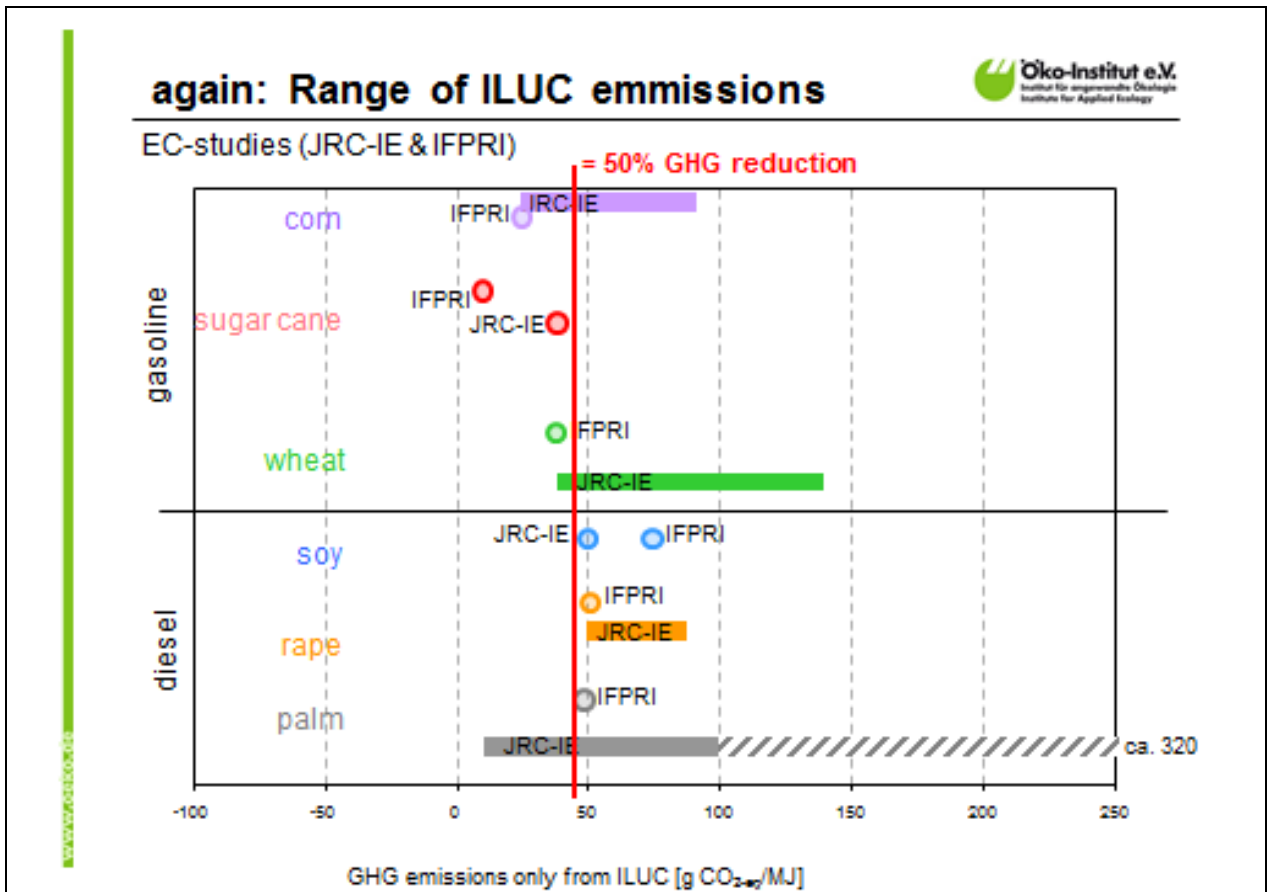
IFPRI study: Results in GHG-emissions from ILUC (g/MJ)



3. Mandate level

IFPRI study: Results in GHG-emissions from ILUC [g/MJ], BAU scenario - with (only) 55% biodiesel





(1.) Policy Options

Take no action for the time being, while continuing to monitor

- broad variation in the model results
= core problem for their application into the RED

BUT

- Option (1) ignores the evident GHG-impact of ILUC from biofuels
- Valid quantitative approximation for GHG emissions from ILUC can be differentiated for various biofuels
- ILUC monitoring (100% tracking) is impossible
(better: monitoring of scientific progress → regular updates!)

(2.) Policy Options

Increase the minimum GHG saving threshold for biofuels:

No safe option:

- No differentiation for various biofuels by means of ILUC impact despite the results of the 3 EC studies
- Increase pressure to cultivated feedstocks on arable land
→ **might lead to additional displacement and ILUC !**
- No incentive for the more expensive but low/zero-ILUC-options:
 - * fuels from degraded land
 - * 2nd generation fuels from residues (and wastes)

(3.) Policy Options

Introduce additional sustainability requirements on certain categories of biofuels:


- Vague in its formulation
- No quantitative approach is presented

(4.) Policy Options

Attribute a quantity of GHG emissions to biofuels reflecting the estimated indirect land use impact:

- Represents the quantitative approach toward GHG emissions from ILUC as recommended in this analysis, but an indication about the order of magnitude of ILUC impact by feedstock is missing.
- Due to the broad variation of ILUC results, periodical improvements of data and best available science (modelling) needs to be implemented.
- A concrete methodology for emissions from carbon stock changes caused by ILUC should be implemented.
- Further research should be undertaken concerning influencing factors of indirect effects (social & biodiversity) and ILUC assessment of 2nd gen. biofuels of residues (c-stock, displace)

6.2. Presentation of Hans van Steen, EC DG ENER



Indirect land-use change
emissions

- what do we know?

Hans van Steen - Head of Unit,
European Commission, DG Energy C1



Content

Current status on ILUC in the Commission

- **Commission work on ILUC**

The IFPRI-report

- **Uncertainties**
- **Results**



Current status on ILUC

The December-report on ILUC concluded:

- ***ILUC can reduce the GHG-benefits of using biofuels***
- ***But a number of uncertainties and limitations remain which could significantly impact on the results***

Discussions ongoing: Challenging to find agreement on a policy option that strikes the right balance



Commission work on ILUC

The Commission launched 4 studies in 2009

- ***Further update of the IFPRI-report launched last year***
- ***Updates by JRC, using their "spatial allocation methodology" on the IFPRI-results***

Consultation with stakeholder in 2009 and 2010

Modelling workshop with ILUC-experts held by JRC

All reports available online





The IFPRI-report

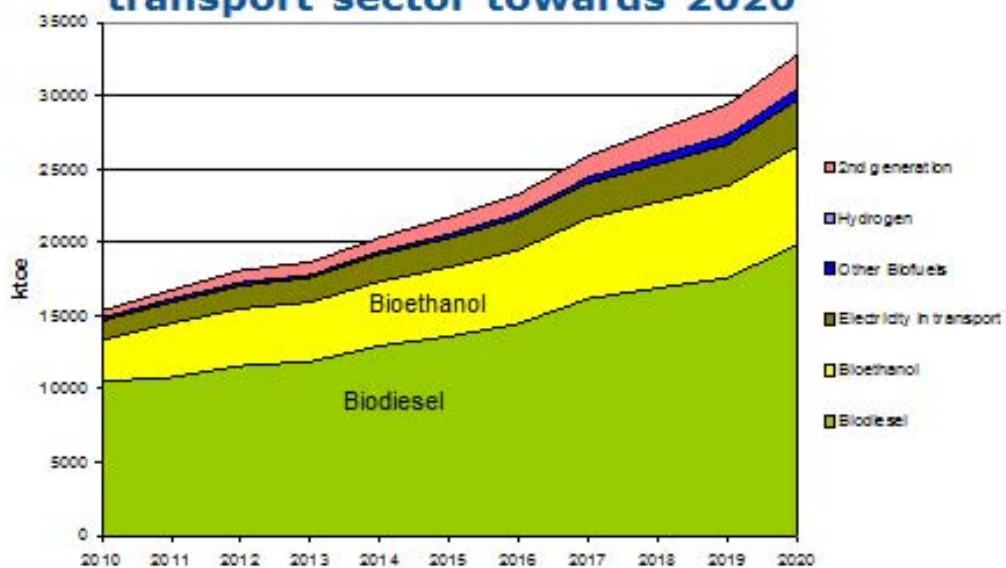
Finalised and published in October 2011

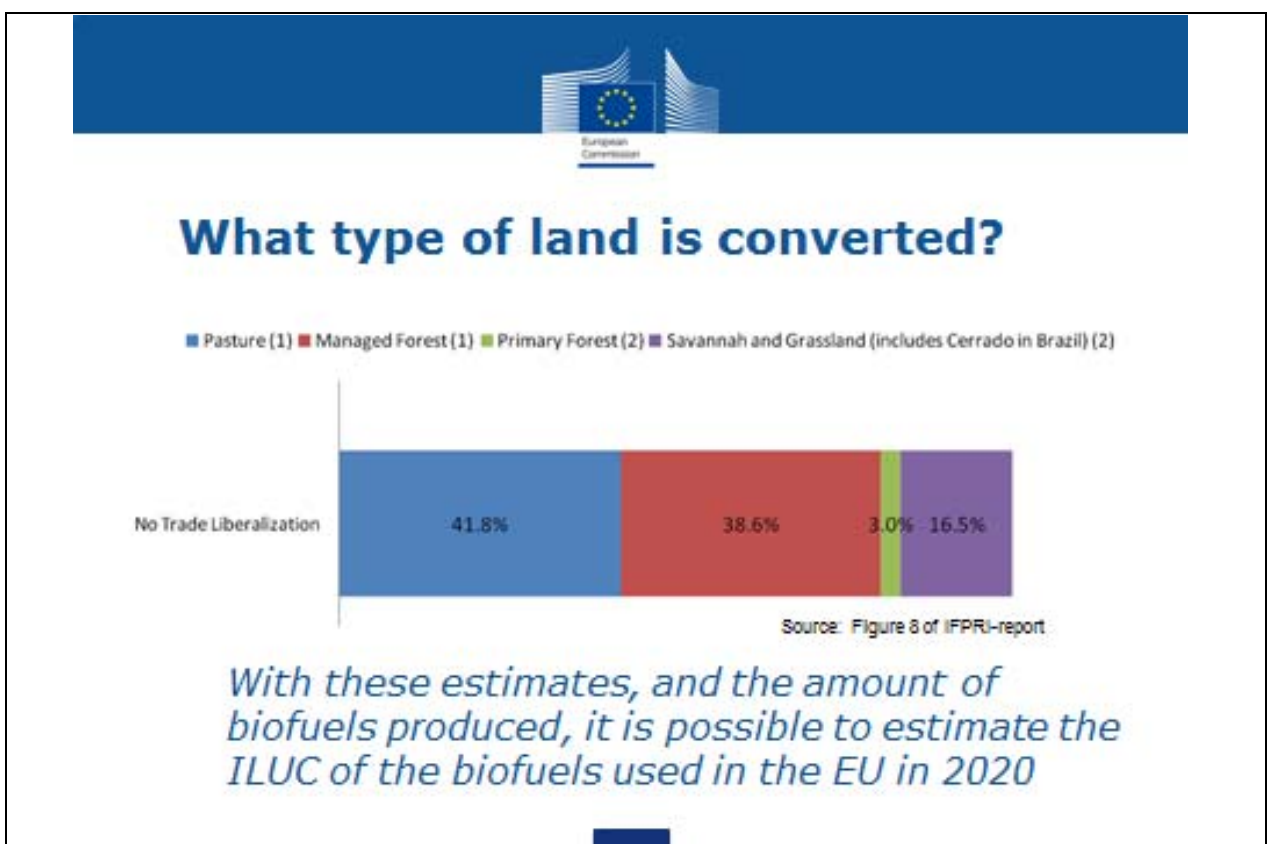
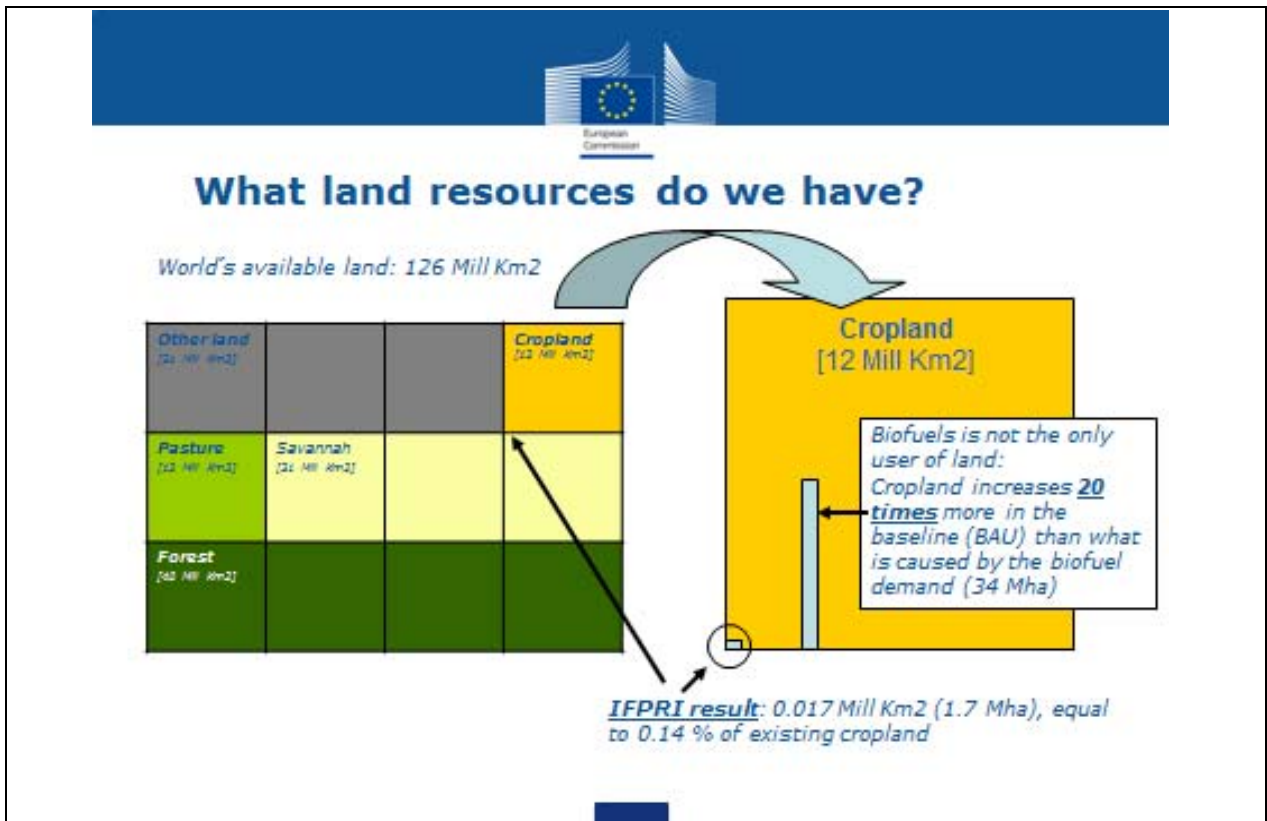
Updated and improved compared to the report published last year, some changes:

- Biofuel demand as set out in the NREAPs
- Improved representation of co-product markets
- Peat land emissions
- Food demand (less elastic)
- Uncertainty analysis



NREAPs: Technology breakdown in the transport sector towards 2020







IFPRI-study findings

Overall ILUC is estimated to eliminate around 70% the direct savings offered by biofuels, leaving biofuels with 17% savings

- **i.e. Biofuels still saves emissions compared to fossil fuels also when the ILUC is included**

Large differences in estimated ILUC between sugars, cereals and vegetable oils

ILUC is a serious concern, but significant uncertainties remains

- **Includes as list of 25 sources of uncertainty**



Some of the listed uncertainties

Crop yields in the baseline and in scenarios

- **How does yield reacts to price?**
- **Yield on new land?**

Substitution among vegetable oils

- **To what extent can substitution take place?**

The livestock sector/availability of pasture

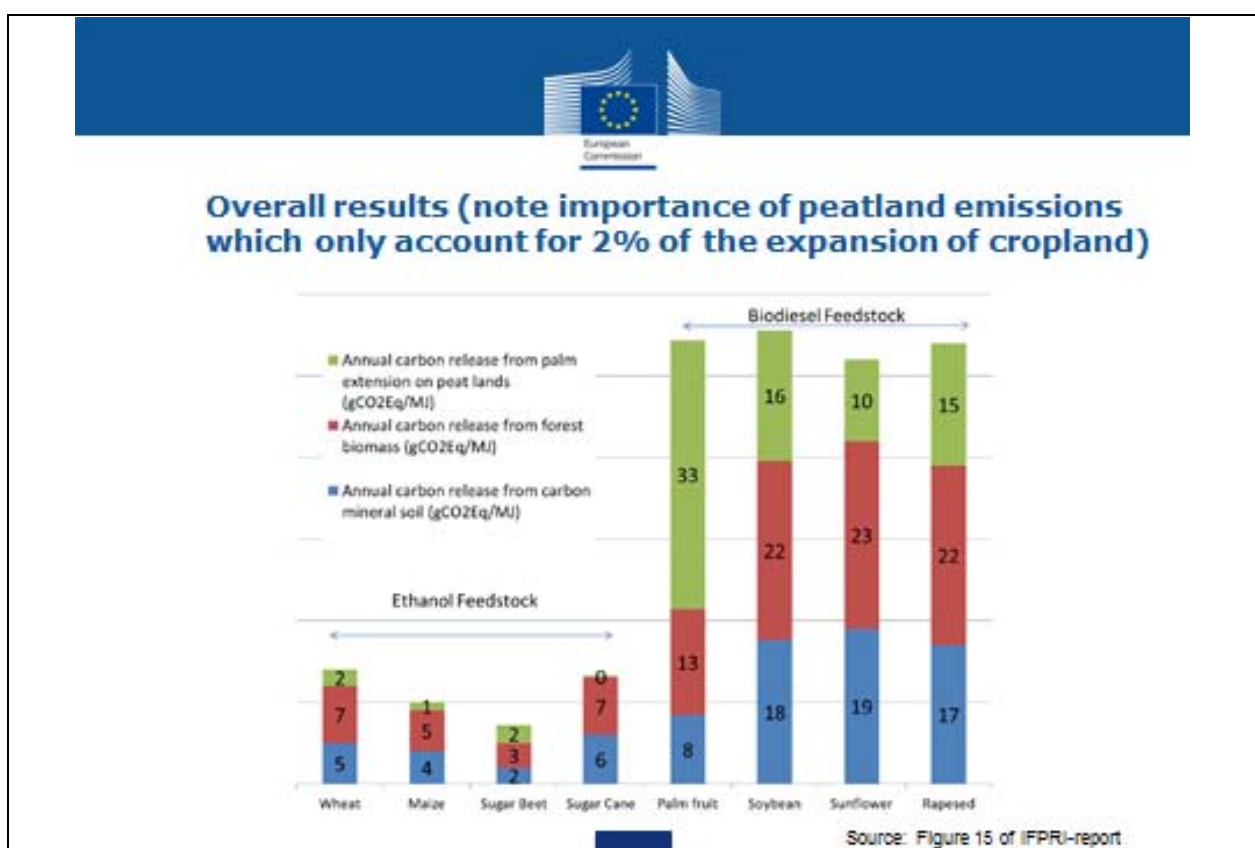
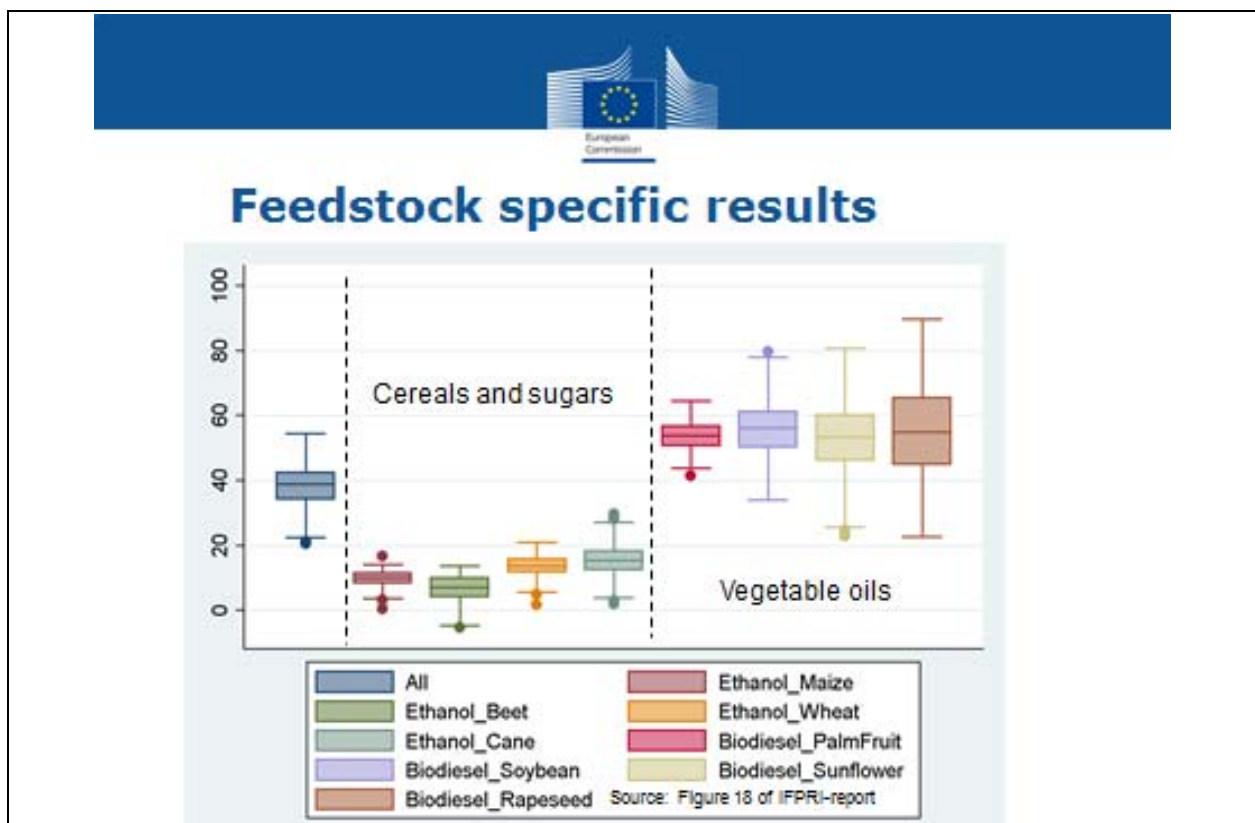
- **Will intensification take place?**

Land governance

Emissions from palm oil planted on peatland

Global agricultural policies towards 2020







Conclusions of the IFPRI-report

- **ILUC is a serious concern**
- **Significant uncertainties remain**
- **A hierarchy between ethanol and biodiesel in terms of ILUC estimates**



Next steps

- **Finalisation of Impact Assessment**
- **Commission to agree on appropriate response**
- **Proposal(s) for amending legislation**





Thank you for your attention.

The IFPRI report and other studies are available here:

http://ec.europa.eu/energy/renewables/studies/and_use_change_en.htm

Reports and consultation by the Commission on ILUC available here:

http://ec.europa.eu/energy/renewables/biofuels/and_use_change_en.htm

6.3. Presentation of Jan-Erik Petersen, EEA

Analysing environmental aspects of bio-energy production

Workshop in European Parliament, 25/01/2012



Jan-Erik Petersen, EEA

1

European Environment Agency



Approach to presentation

- 1) Introduction
- 2) Environmental issues
- 3) Final considerations

2

European Environment Agency



Two different bioenergy systems – which one is more 'sustainable'?

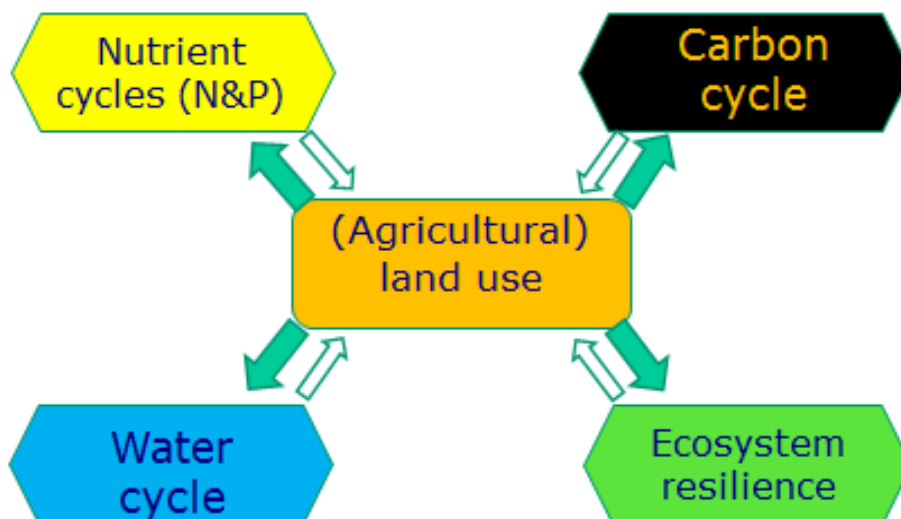


Source: www.redbrd.edu

European Environment Agency



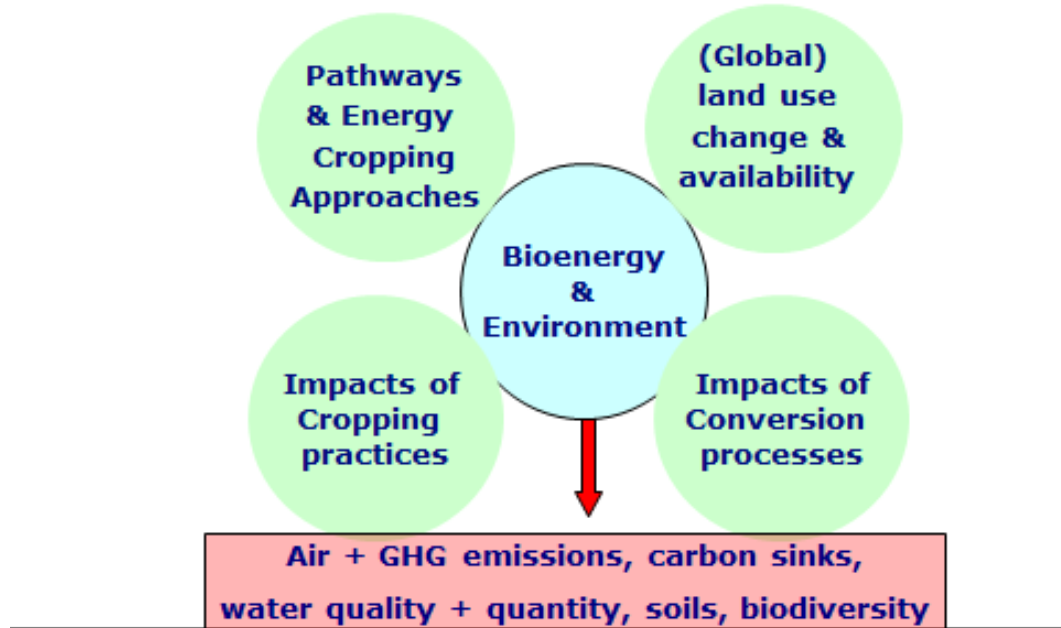
Land use impact on natural cycles



European Environment Agency



Environmental issues of energy cropping

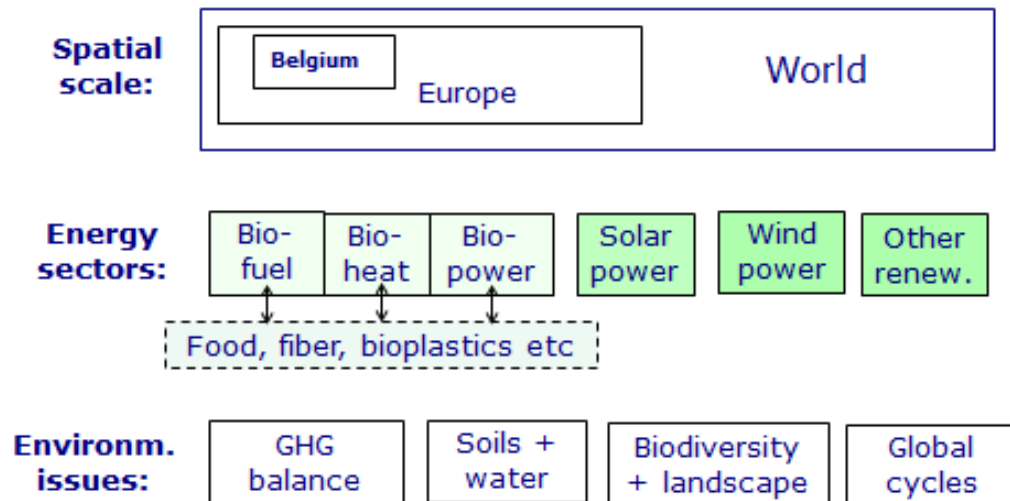


5

European Environment Agency



The question of system boundaries



European Environment Agency



What tools do we have?

Analytical tools:

- Life cycle analysis
- Agro-economic modeling
- Satellite and field observations
- Scenario analysis

Weaknesses:

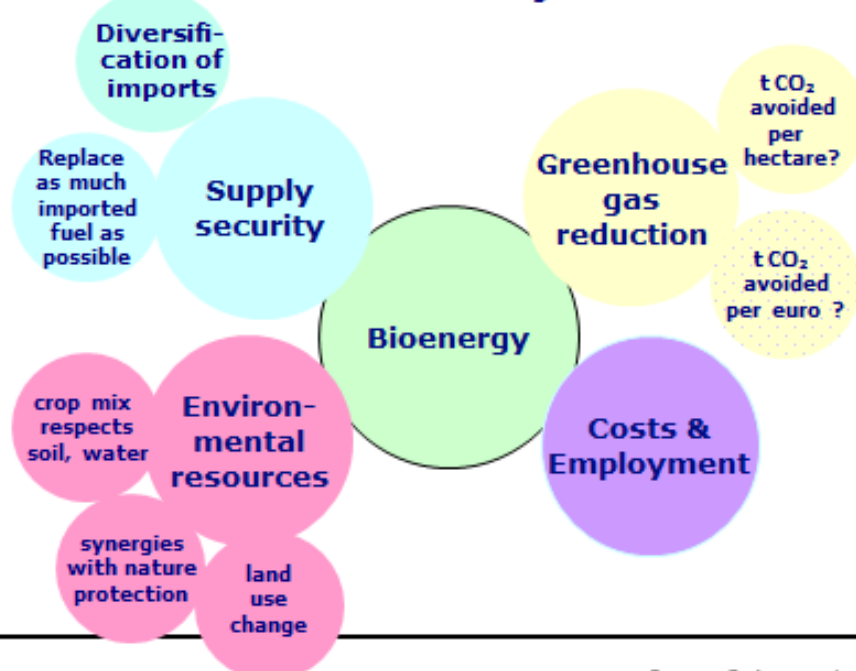
- *Indirect land use effects*
- *Environmental impacts & low spatial resolution*
- *Analysis of economic drivers & outlooks*
- *Assumptions and system boundaries*

=> Need to combine different approaches !

European Environment Agency



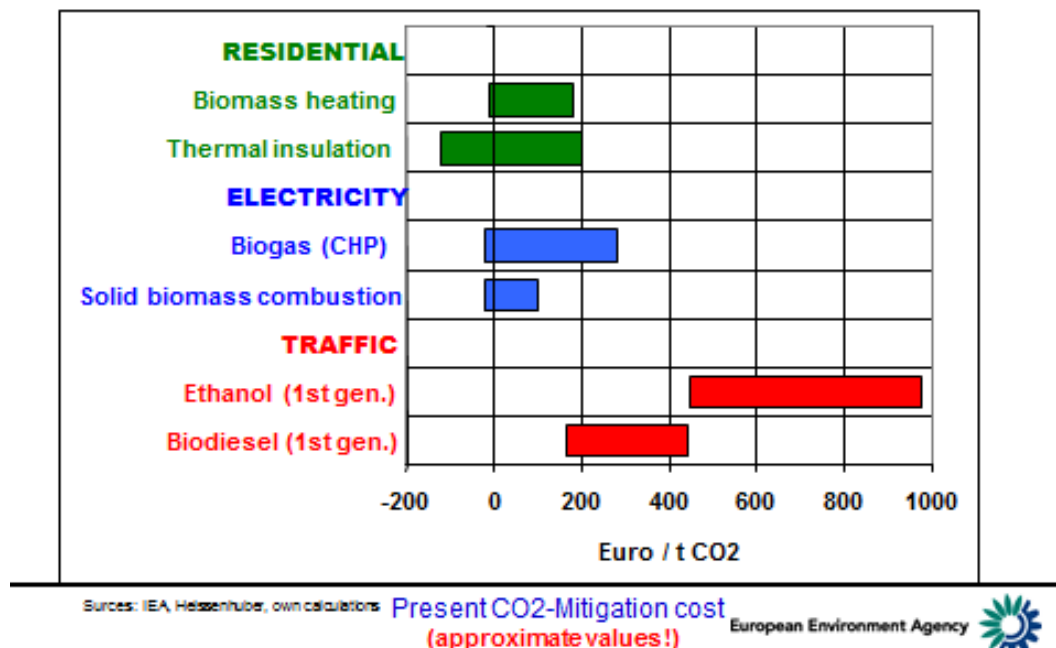
Resource efficiency of biomass



European Environment Agency



Estimates of cost-efficiency for different bioenergy pathways



What public investments to make?

Developing a
better basis for
(policy) decisions:





- ❖ Development of suitable global data sets on land use and farming systems
- ❖ Consider the interactive impact of national policies on global resources
- ❖ Need to combine various analytical approaches & consider interactions between different sectors
- ❖ Create/maintain sufficient capacity for integrated analysis
- ❖ Knowledge transfer and extension to producers and stakeholders

Thank you for your attention !

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www.eea.europa.eu

6.4. Presentation of Luisa Marelli, EC DG JRC




Existing methodologies and best practices on assessing ILUC



Luisa Marelli

European Commission – DG Joint Research Centre (JRC)

Institute for Energy and Transport



EP, 25 January 2012



How to measure ILUC?

There is only one reality
So you cannot know what *would* have happened without biofuels

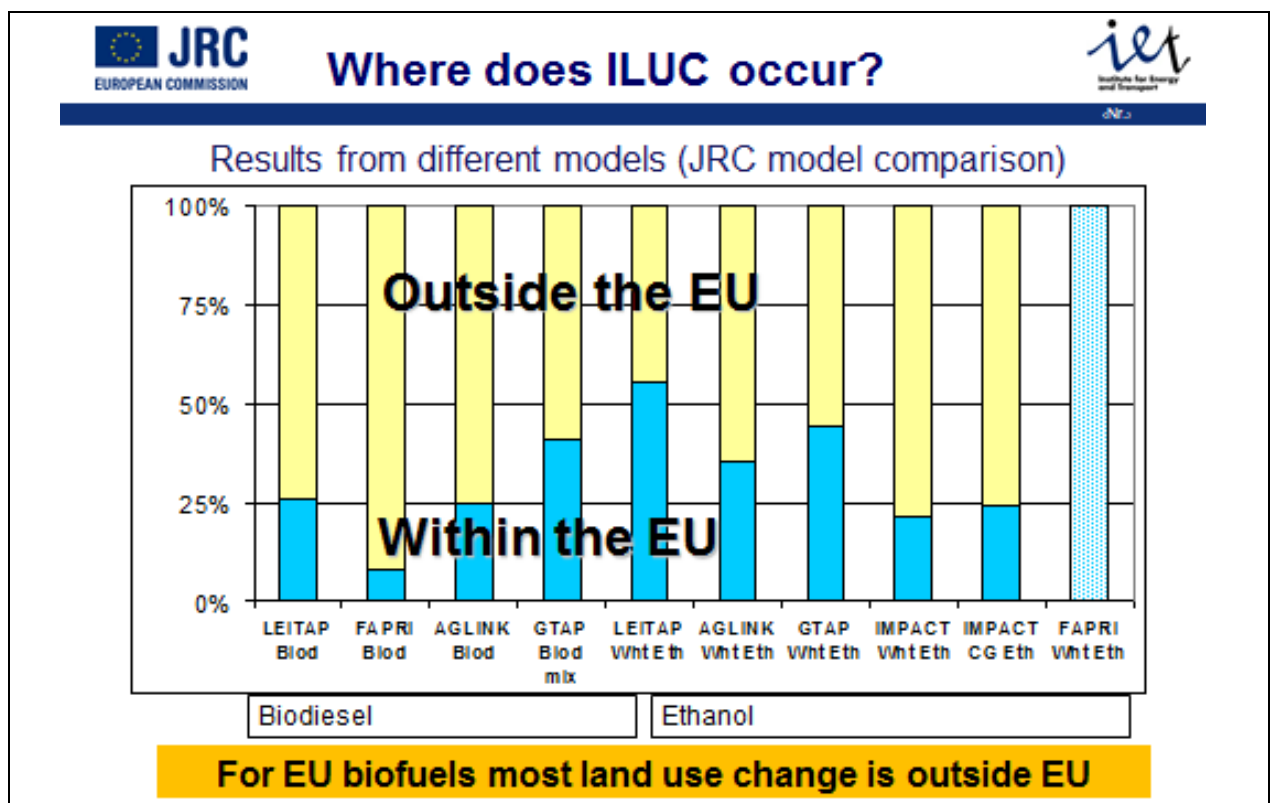
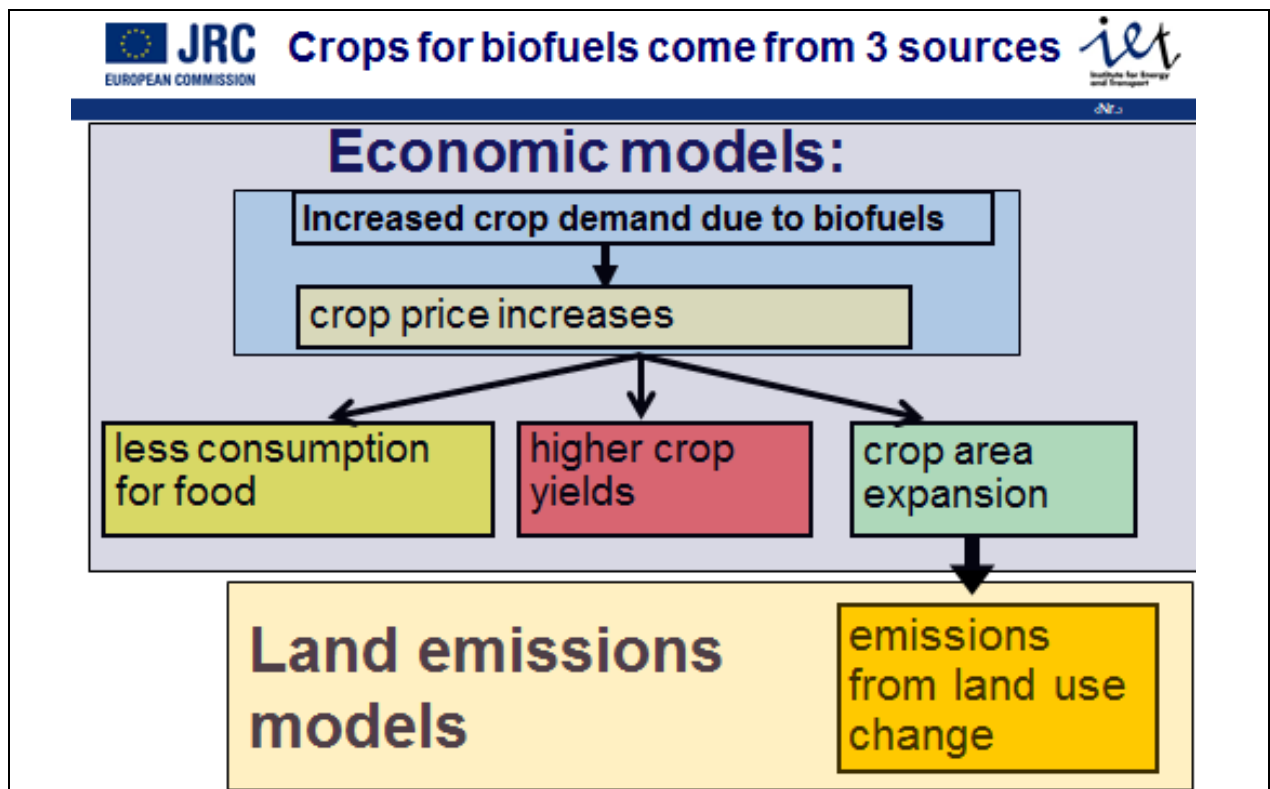
ILUC cannot be measured directly..... ➡ **Agro-economic models are used**

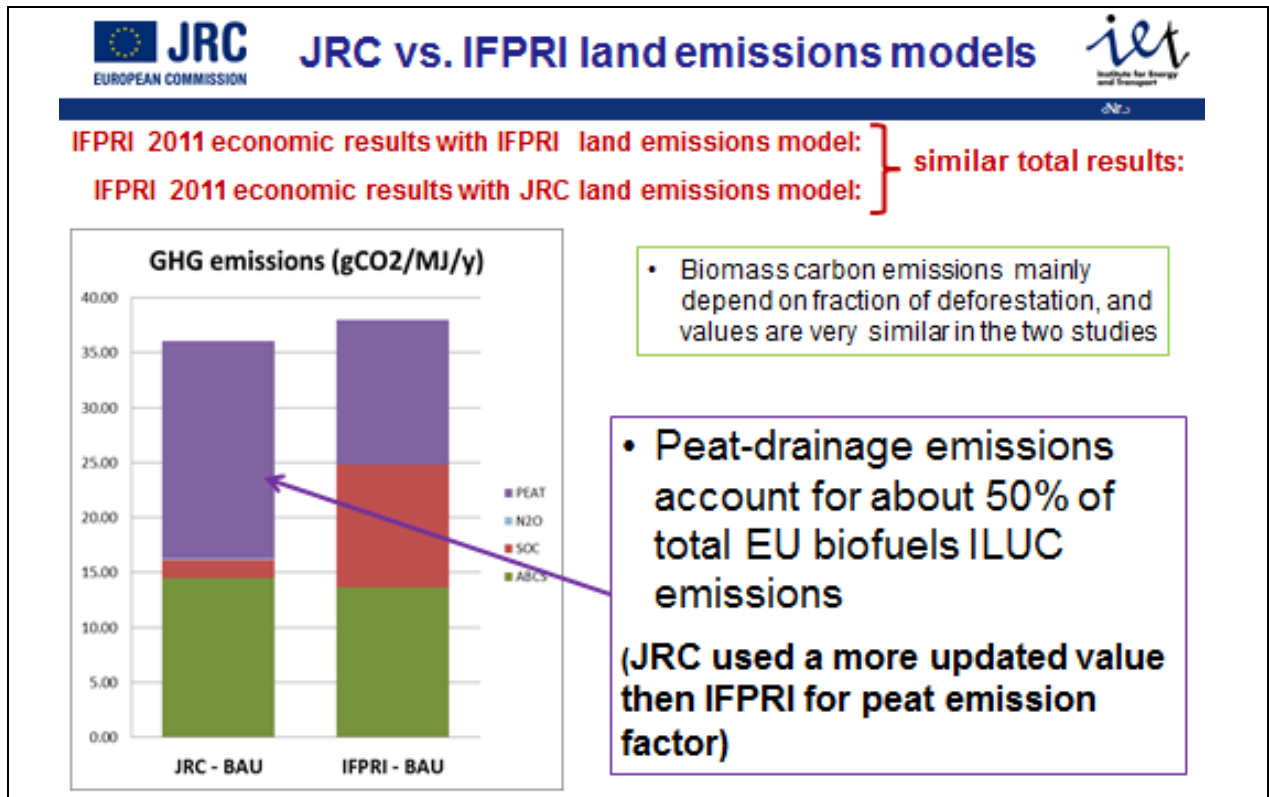
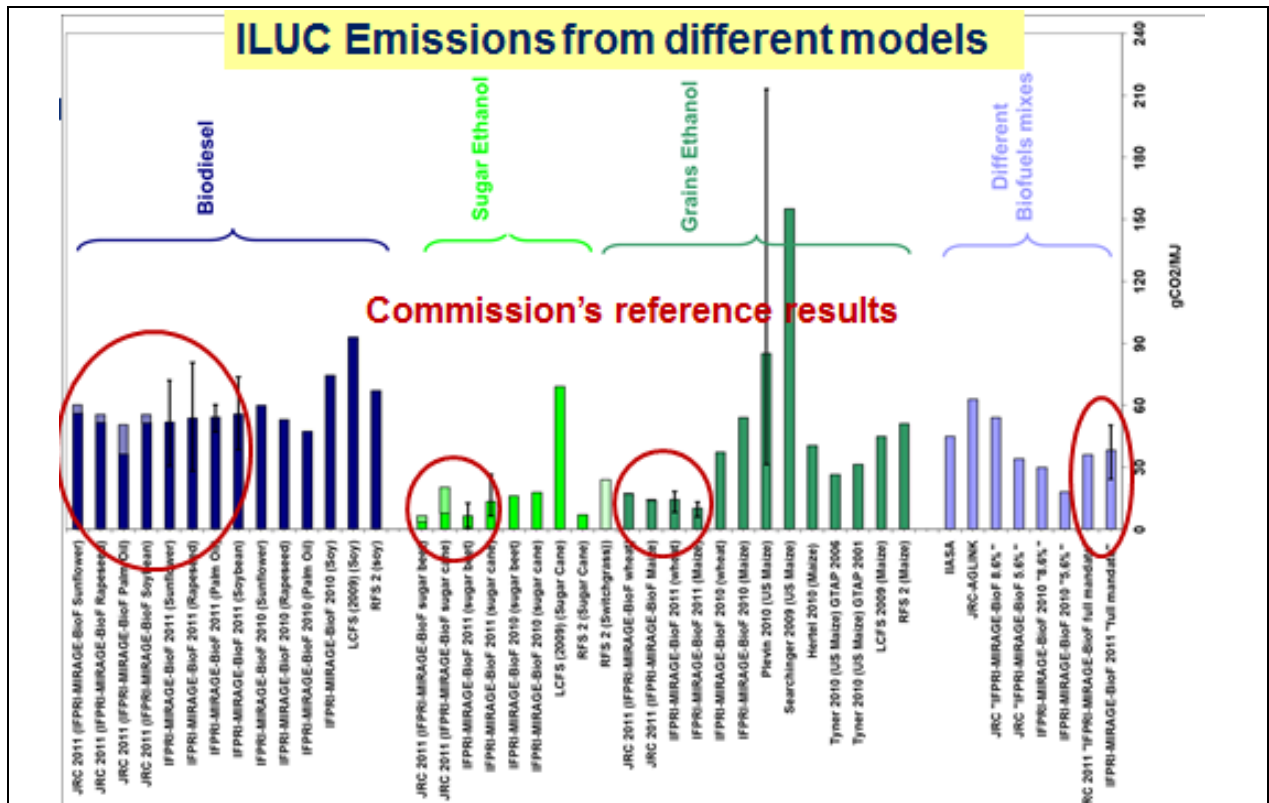
2020 “Policy” Scenario with extra biofuels

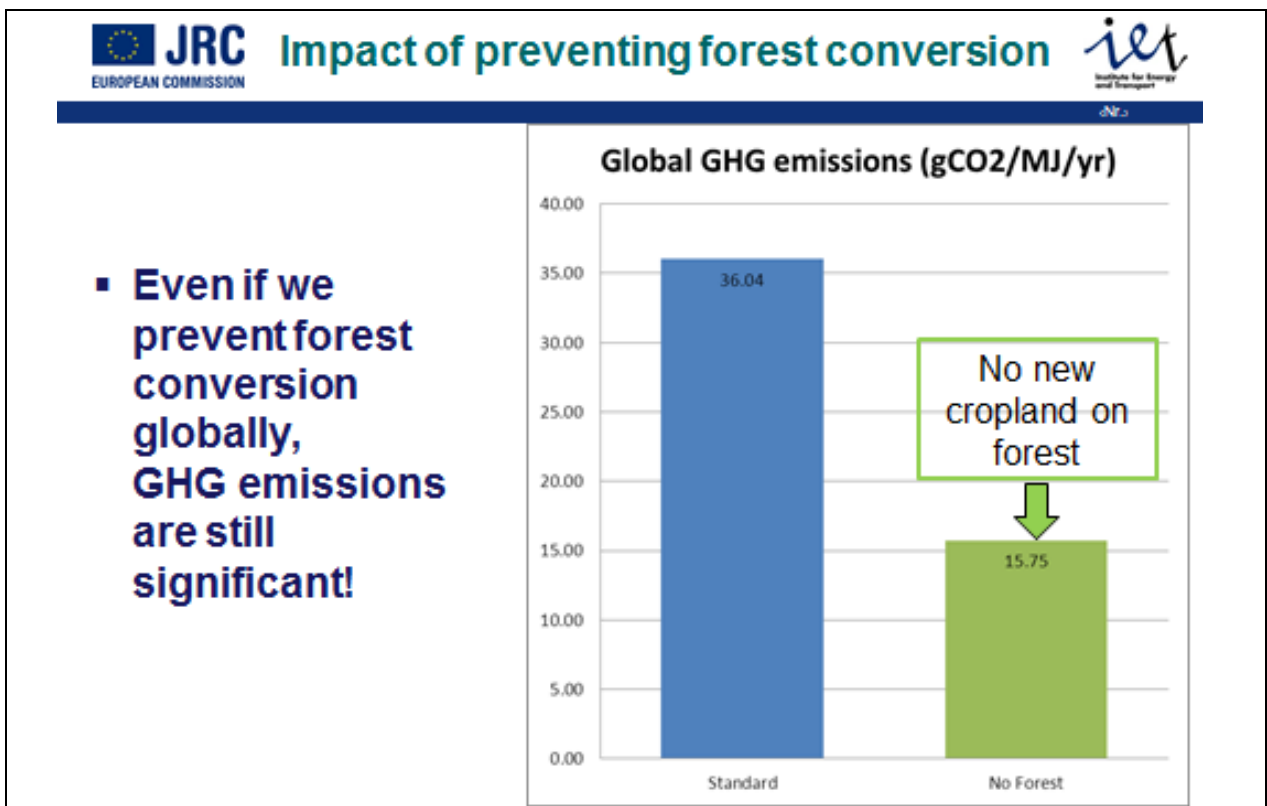
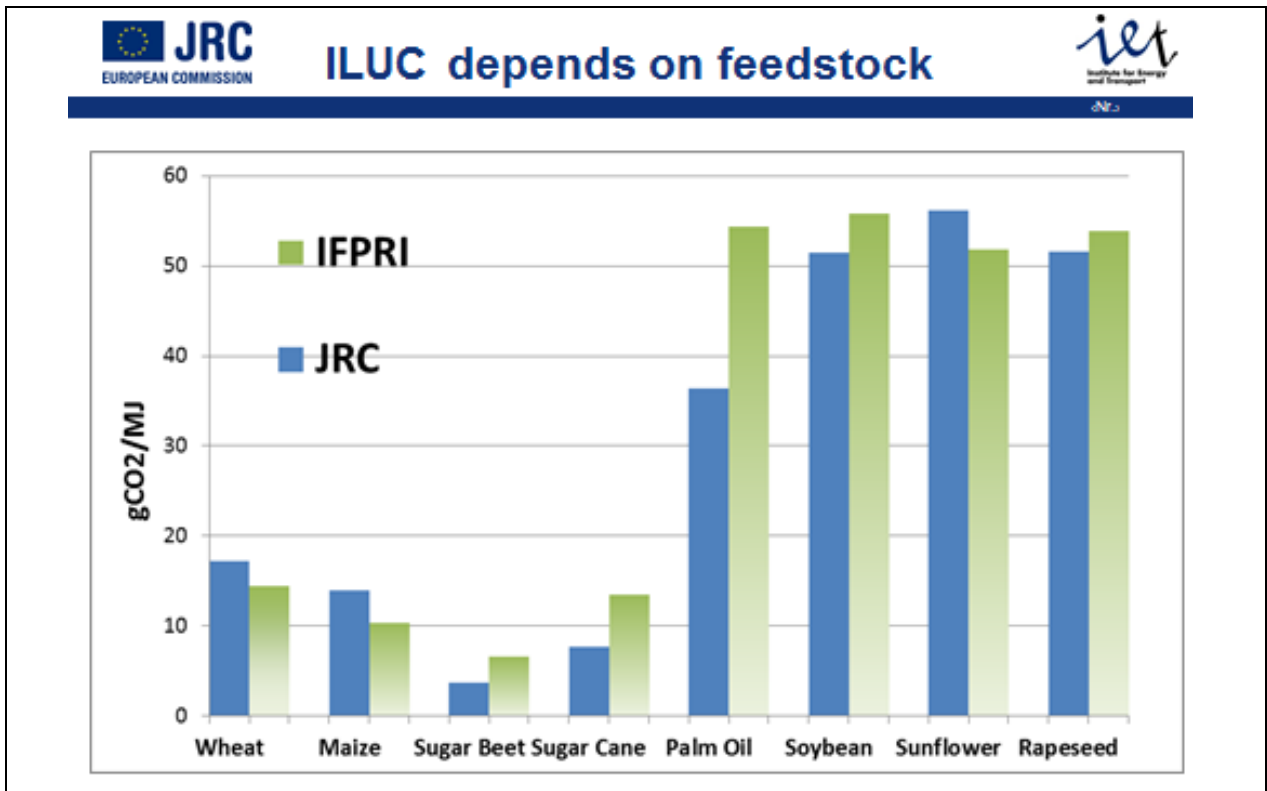
Compared with

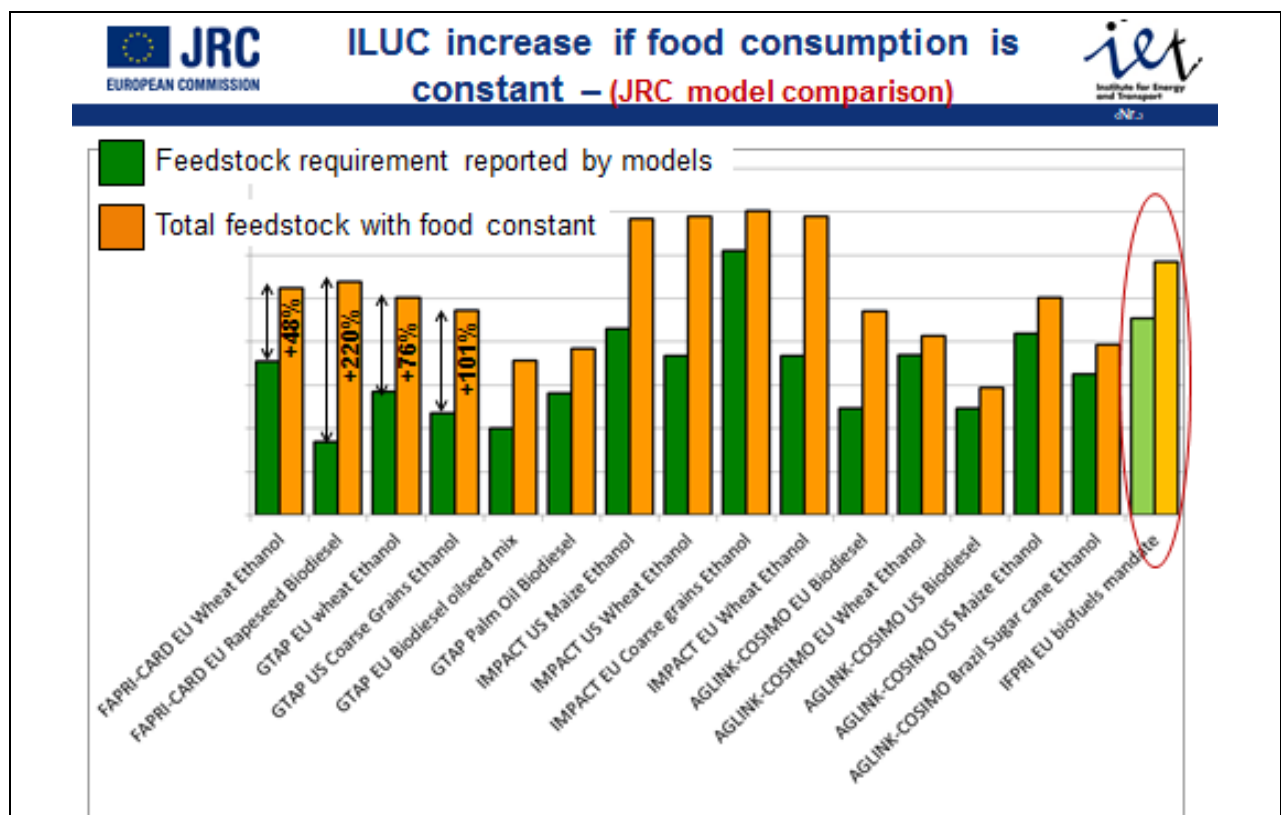
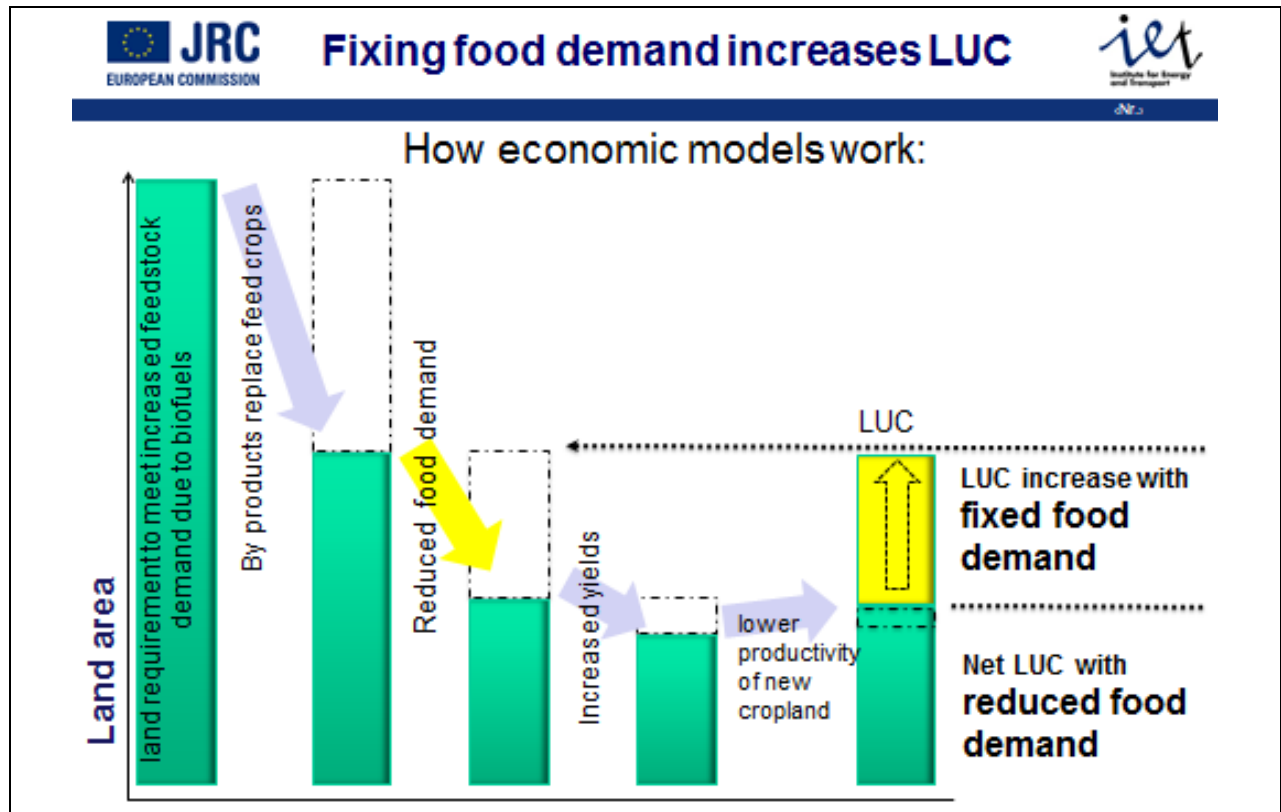
2020 “Baseline” scenario without extra biofuels

Models do not compare differences between NOW and 2020





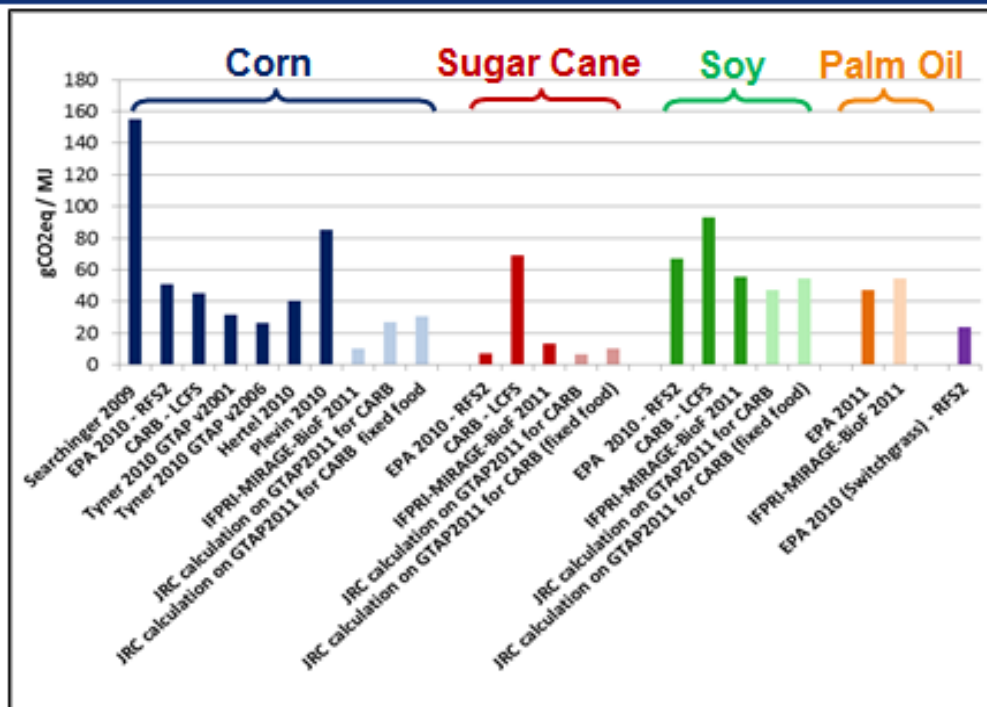




- **All economic models analyzed incorporate iLUC savings from reduced food demand**

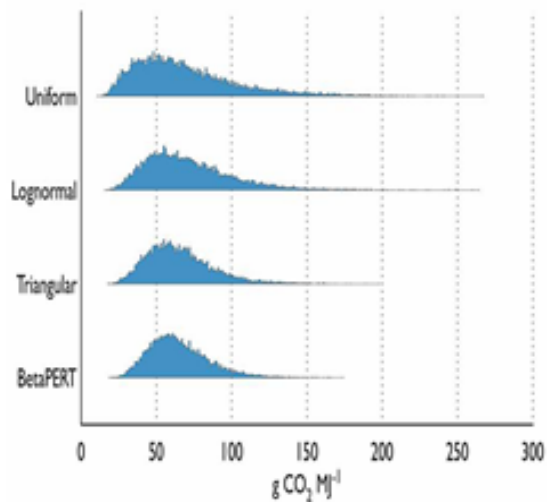
So.....

- **Either remove this “iLUC credit” from a reduction in food demand,**
- **OR accept that part of the biofuels “benefit” is people eating less**

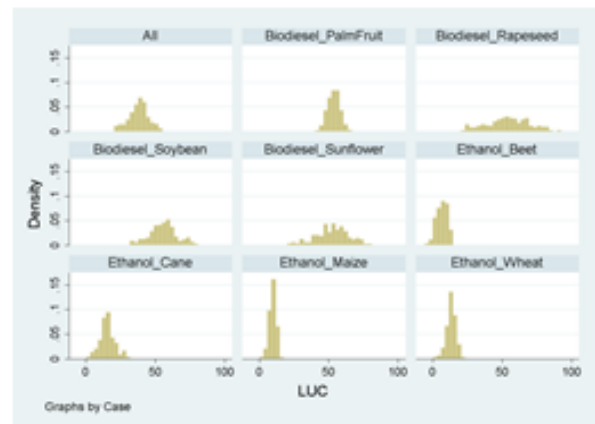


Frequencies distribution on ILUC emissions

US Corn ethanol [Plevin et al, 2010]

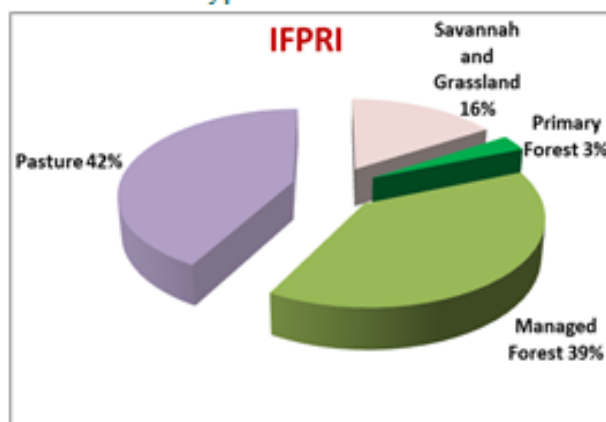


IFPRI, 2011



Impacts on biodiversity

1. IFPRI says ILUC happens on these land types:



➡ 2. JRC roughly estimated change in species abundance:

Results

On the land converted by ILUC,
an average there may be up to ~85% loss of biodiversity

1. **There is no scientific support for believing ILUC = 0**
2. **Even with uncertainties ILUC is above zero for all biofuel feedstocks: values ranging from ~10 to ~90 gCO_{2eq}/MJ, according to feedstock type (more according to US studies)**
3. **For EU biofuels most ILUC occurs outside the EU**
4. **The ILUC results of models would be higher if they did not gain savings from reduced food and feed– Implications for GHG**
5. **ILUC is not only GHG emissions: the impact on Biodiversity could be potentially high.**
6. **Other legislations are already accounting for ILUC (e.g. EPA, CARB).**

**THANK YOU FOR YOUR
ATTENTION**

All JRC studies available at:

<http://re.jrc.ec.europa.eu/bf-tp/index.htm>

ADDITIONAL SLIDES

Backup/supporting material

4. Estimation of total biodiversity loss:

$$\text{Biodiversity Loss (\%)} = \frac{[\sum_i (MSA_i * \%_i)] - MSA_{ca}}{\sum_i MSA_i * \%_i}$$

Where: MSA_i = Mean Species Abundance of land use type i
 $\%_i$ = % of land conversion according to IFPRI scenario
 MSA_{ca} = Mean Species Abundance of cultivated area

$$\text{Biodiversity Loss} = \frac{0.68 - 0.1}{0.68}$$

RESULTS: This rough estimation shows that the land use change foreseen by IFPRI may lead to a decrease in MSA index of ~85% **on the converted land**

N.B. this is a preliminary estimation of the potential risks for biodiversity. More work foreseen for 2012.

1. In the most "ILUC negative" scenario, E4tech assume that EU wheat will come from abandoned land in EU.

But all economic models show that most crop area expansion caused by EU ethanol demand would be **outside** EU + it's unclear how E4tech concluded that EU cropland would be abandoned in the baseline

2. That land would otherwise sequester carbon as it reverts to nature.

But E4tech underestimate the lost carbon sequestration on this land because of a reporting error by Winrock International

3. Furthermore E4tech worked out too small an area of EU abandoned land by assuming it has EU-average wheat yield

Historical data shows yields on abandoned EU cropland are much less than average EU yield

4. E4tech assume that most of the extra wheat in EU will come from **yield** increase and not from **area** increase. The ratio of extra yield to extra area is fixed (by historical precedence).

But they set no limit to how much yield can increase: if they would double the wheat demand, they would automatically almost double the wheat yield.

For EU wheat scenario E4tech get a 12% higher average wheat yield in EU, compared to baseline in the same year. That would require an incredible price increase due to biofuels, according to all published estimates of yield elasticity.

Looked at another way....E4tech roughly doubles the annual rate of yield increase in the EU ethanol scenario. This would mean at least double the rate of investment in farm improvements and research. That would only follow if the expected financial return would also more-than-double. That financial return is proportional to crop price, so the wheat price would have to more than double (due to EU ethanol) to make this possible.

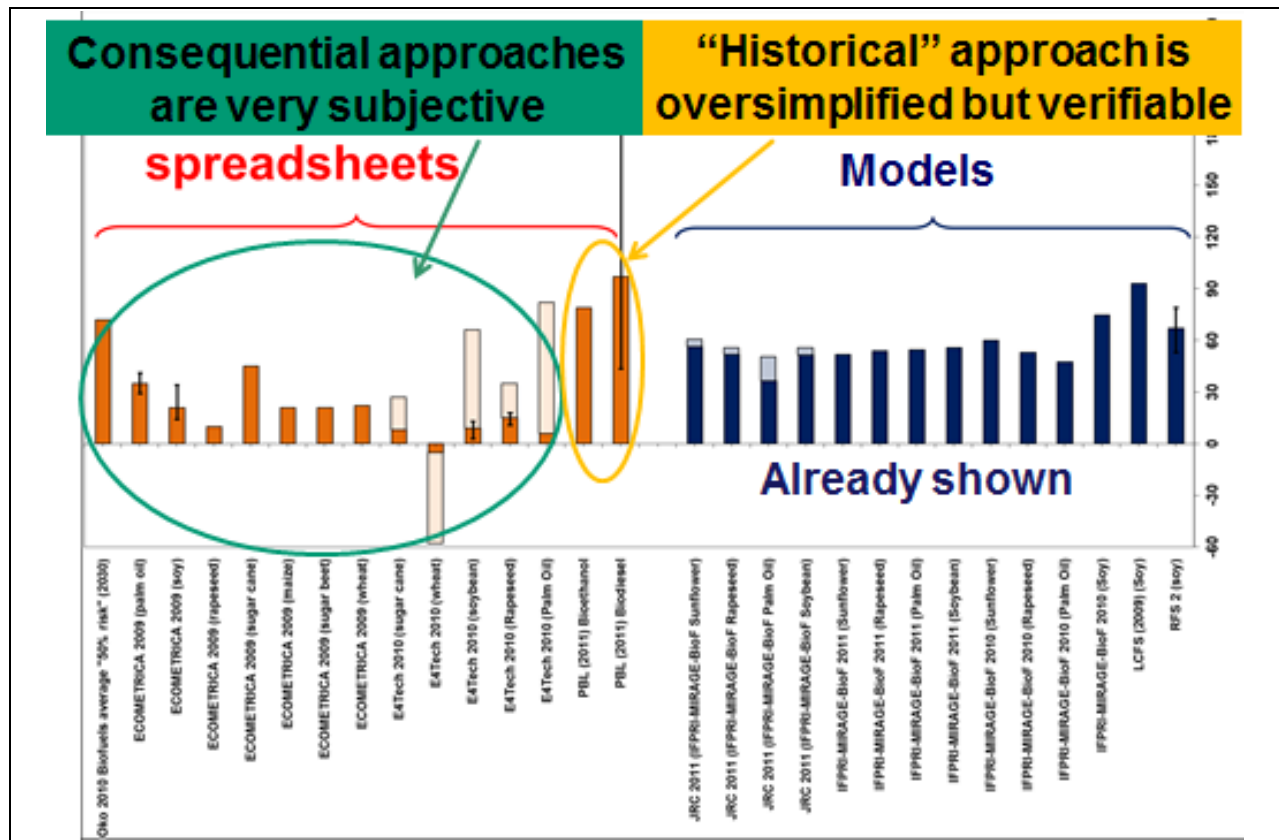
- the countries which lost most crop area 1997-2007 averaged ~65% of EU-average yield [according to EUROSTAT data]

- National data (UK 2004 farm survey) shows cereals yield on marginal UK farms is < 64% of UK average wheat yield.

- The worst field on a farm has on average 63% of the average farm yield. (English farm survey 2004)

$$0.65 \times 0.64 \times 0.63 = 0.18$$

Including any 2 of these 3 factors would more than double the amount of “abandoned land” required, and reverse the E4tech conclusion for EU-wheat-ethanol.



[Overmaars et al. 2011] (Netherlands Environment Assessment Agency PBL)

- for EU biodiesel from rapeseed/canola

- EU rapeseed energy-yield
 - Big range of by-product credits
- } tonnes of crops displaced

2 assumptions: crops displaced inside region
OR crops displaced in world (single world market)

Historical ratios $\frac{\Delta \text{yield}}{\Delta \text{area}}$ $\frac{\Delta \text{forest}}{\Delta \text{pasture}}$

Database of Carbon emissions from land use change

6.5. Presentation of Kjell Andersson, Svebio and AEBIOM

Industry view on ILUC

Kjell Andersson
Svebio and AEBIOM

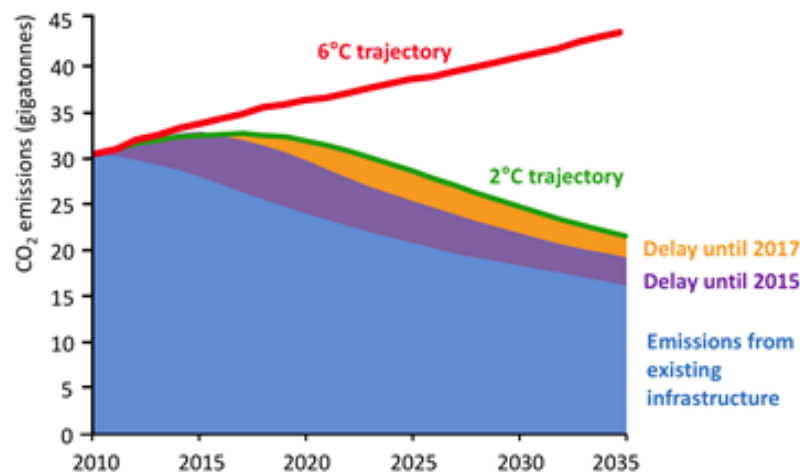


What I will talk about

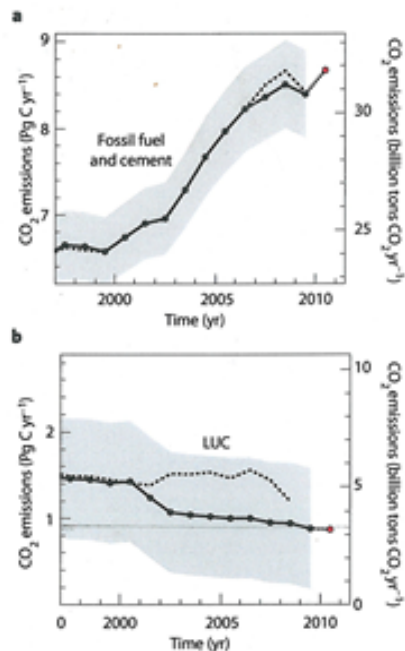
- Uncertainties and variations in ILUC numbers
- Land categories and land availability
- Using historical data to predict the future
- "Foregone sequestration" in Europe
- Yields and by-product
- Alternative paths forward
- What should EU do?



IEA: the door closes 2017 for the 2 degree climate goal



SVBIO
www.svbio.se

Global CO₂ emissions

Emissions from fossil fuel combustion and cement production have increased by more than 2 billion tonnes of coal per year since 2000, whereas the emissions from deforestation have decreased.

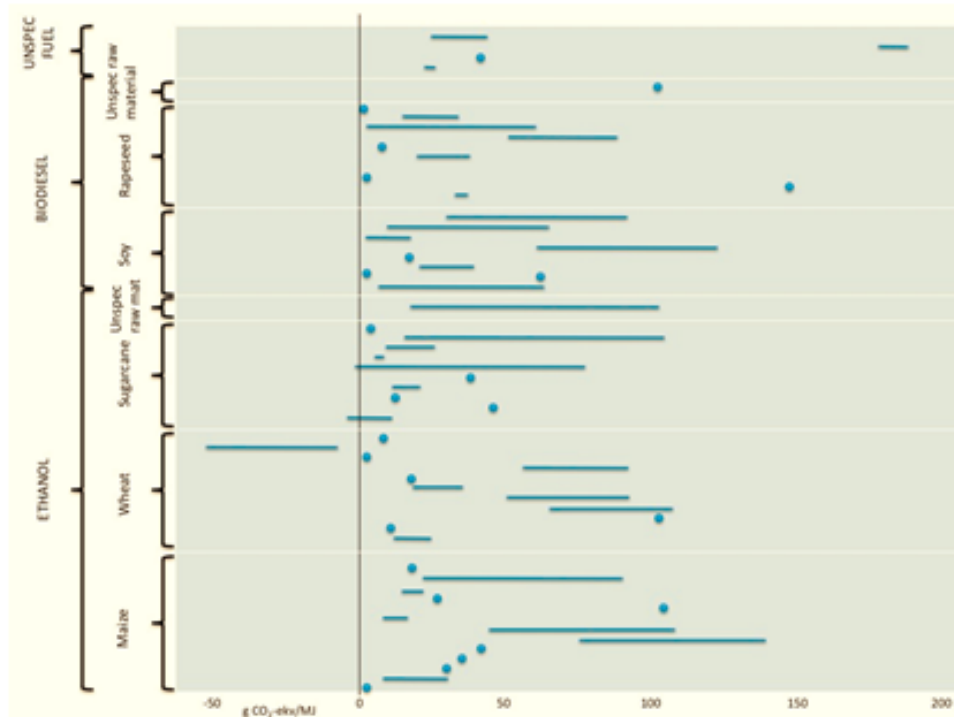
The share of anthropogenic emissions stemming from deforestation is today less than 10 percent (1 billion tonnes).

Source: Global Carbon Project, Friedlingstein et al, Nature Geoscience, November 2010.

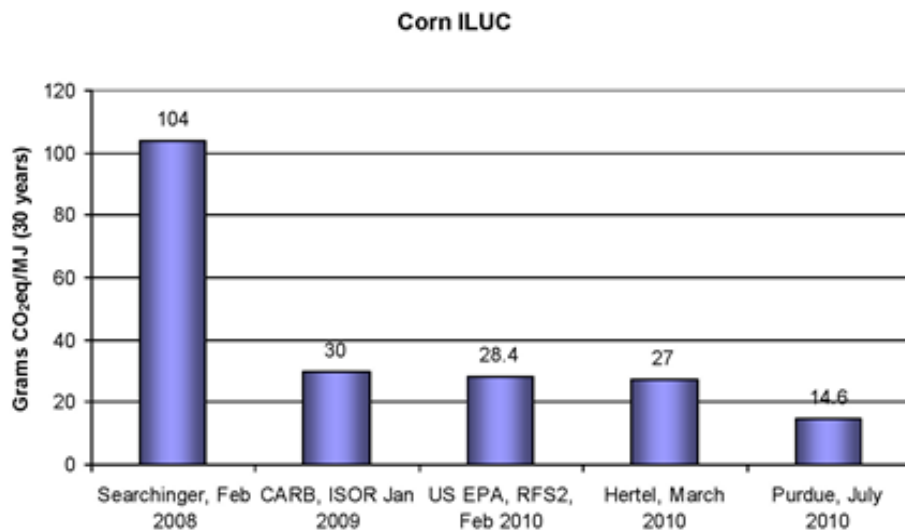
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Uncertainties in results – variations between studies (g CO₂eqv/MJ)

- Corn-ethanol 2 – 208
- Wheat-ethanol -53 – 176
- Sugarcane-ethanol -4 – 159
- Soy-biodiesel 1 – 188
- Rape-diesel 1 – 222



The ILUC numbers decreased with every new study



SVEBIO

www.svebio.eu

Land categories and land availability

- The models use a simplified set of land categories (cropland, grassland, forest, etc), but have no separate category for non-used arable land (abandoned land, fallow, set-aside).
- The models therefore overestimates the risk for converting forests to cropland.
- In the U.S. about one third of the arable land is not used in a fully productive way. In EU at least 10 million hectares of such land ("three Belgium"), and in East Europe much more.

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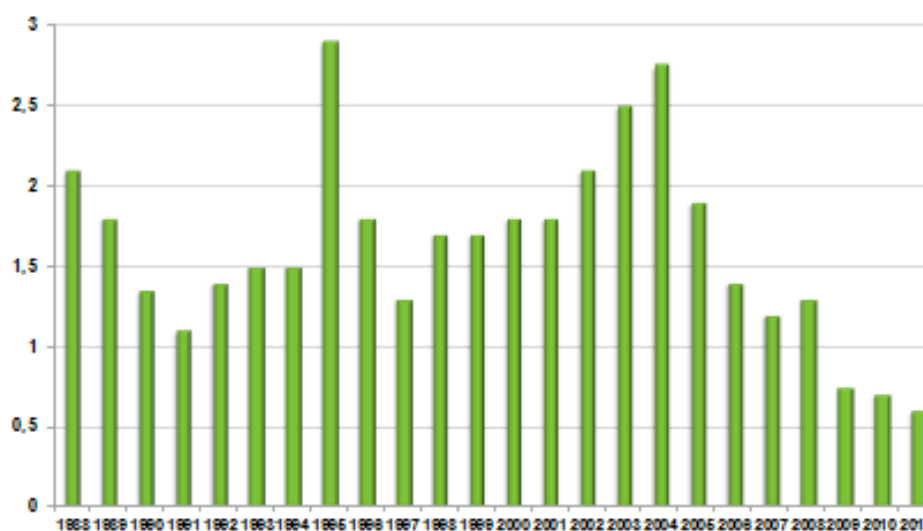
Using historical data to predict the future

- The models use historical data for a large number of relations (land conversion rates, yield increases, elasticities, etc)
- The assumption is: "what happened earlier will happen again in the coming years".
- But policy, economic and technical development may change these relations in a fundamental way.
- Example 1: Conversion from forest to cropland in Brazil is based on deforestation patterns 2001 – 2007. But deforestation has decreased drastically in the last years. Should Brazilian production in the future be penalised for bad policy in the past?
- Example 2: Sustainability criteria in RED will influence land use for biofuels in the near future. Shall we still base models and penalties on policies from before RED?

SVBIO

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Deforestation in Amazonas



Deforestation in Amazonas in Brazil, millions of hectares/year.
Source: INPE (www.obt.inpe.br)

SVBIO

www.svbio.br

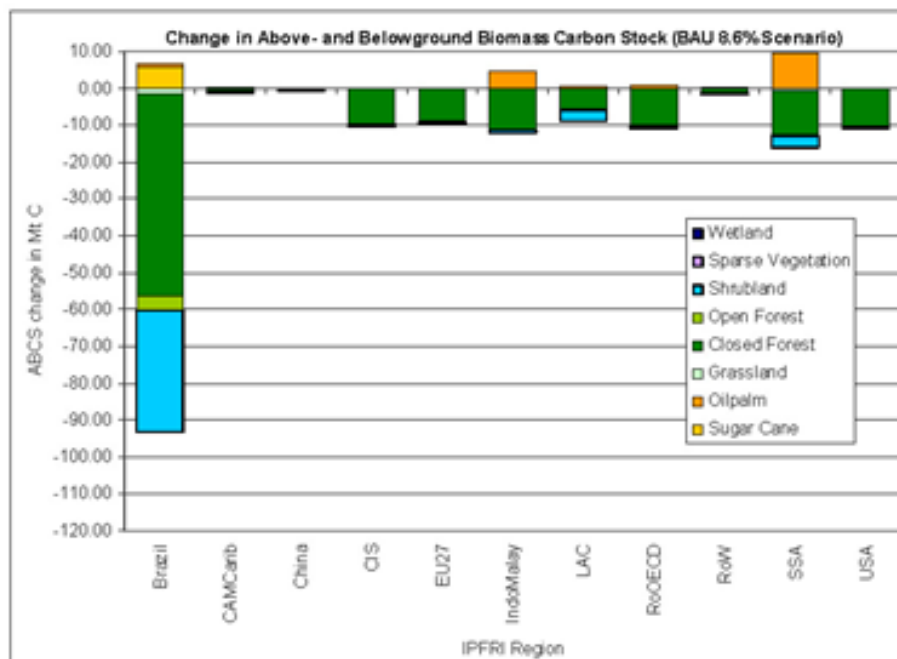
Foregone sequestration in Europe

- "Deforestation" occurring in Europe in the model results is not real deforestation but virtual deforestation, or "foregone sequestration".
- That is: when a farmer grows rapeseed for biodiesel he or she will be responsible for not letting the forest take over his or her fields and capture carbon. Does that make sense?
- Is the ideal that we shall not use our farmland to cultivate crops, but instead use it as carbon sink?
- Is this good rural development policy?

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Large emissions from forests in Brazil and Europe explain high ILUC-numbers from JCR-IFPRI



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Marginal lands in Europa – to use for farming, forestry and/or energy?



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Marginal lands in Europa – to use for farming, forestry and/or energy?



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Marginal farmland in central Sweden – better off as forest?



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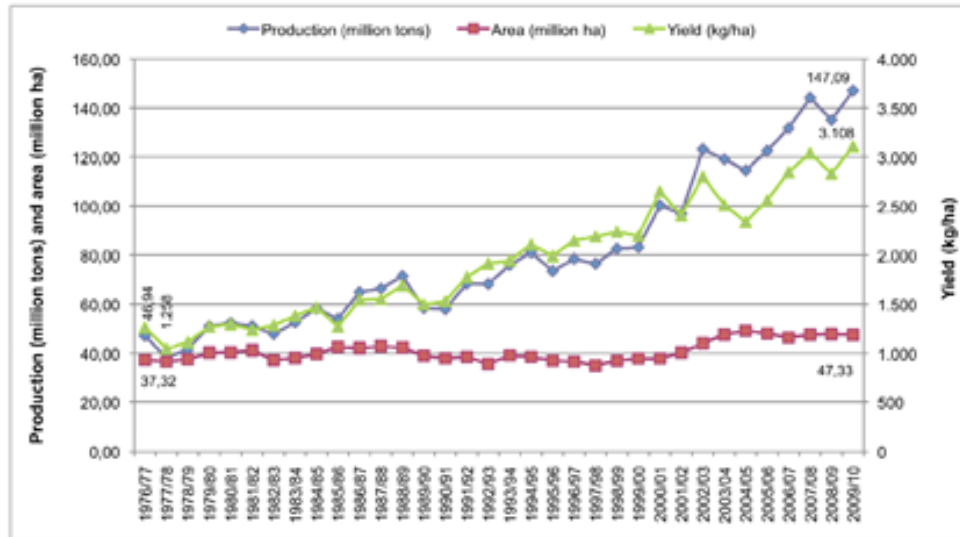
Yield responses vary greatly between models

- GTAP maize ethanol 43 %
- IFPRI-IMPACT corn ethanol 80 %
- IFPRI-IMPACT wheat ethanol 70 %
- FAPRI CARD EU wheat ethanol 15 %
- GTAP rapeseed biodiesel 40 %

The same is true for by-products – very big differences between models

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Grains: Production and Area (1975/2010)



Source: after CONAB.

Bertels Conference 2010 - Sweden, August 2010

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AEBIOM's position

- Land use change issues must be handled where the land use change occurs. ILUC is always dLUC somewhere.
- Modelling can not be used as basis for EU regulation – the uncertainties is too big.
- The "science of ILUC" is immature, and needs further development.
- Mitigation alternatives: land management policies and investment in agriculture to increase yields. Work together with producer countries.

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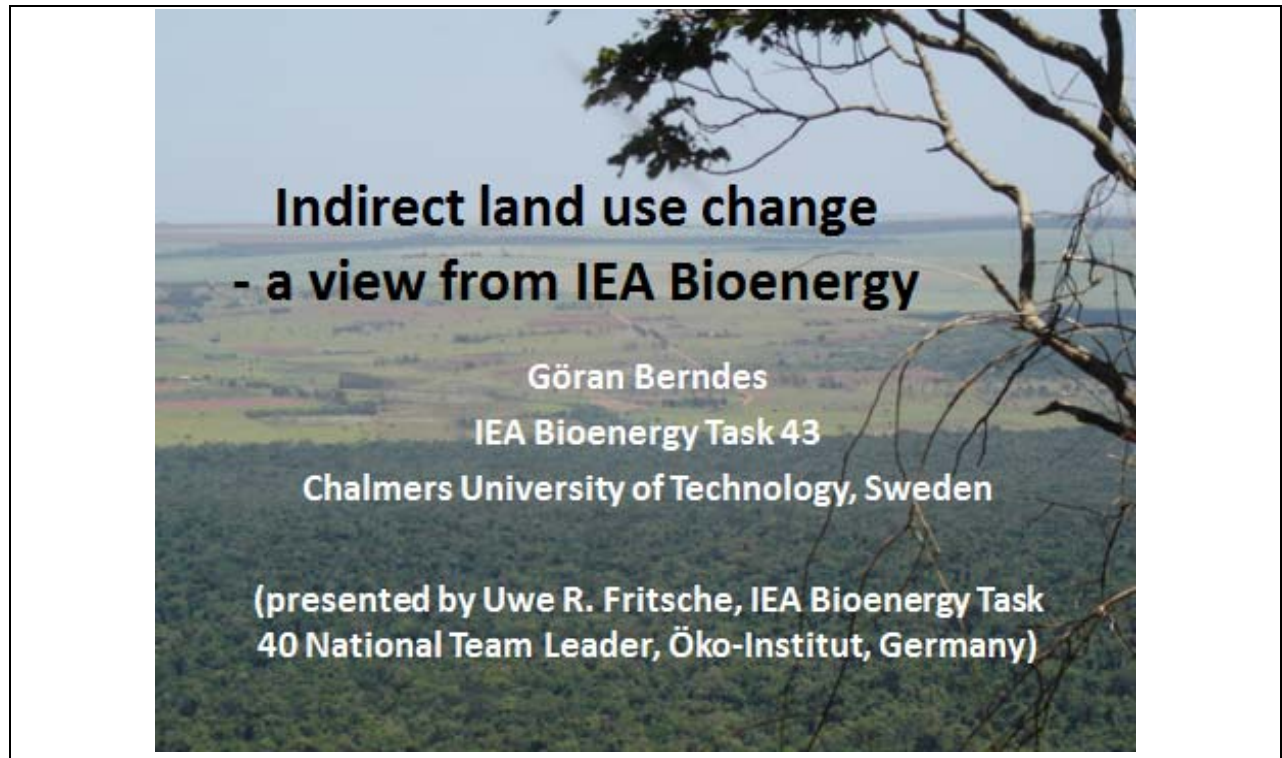
Policy recommendation

- "Take no action for the time being, while continuing to monitor" – this still holds
- NO to an ILUC-factor. Growers and fuel producers can not be held legally accountable for effects that they, by definition, have no influence over.

Thank you for your attention!

Kjell.andersson@svebio.se

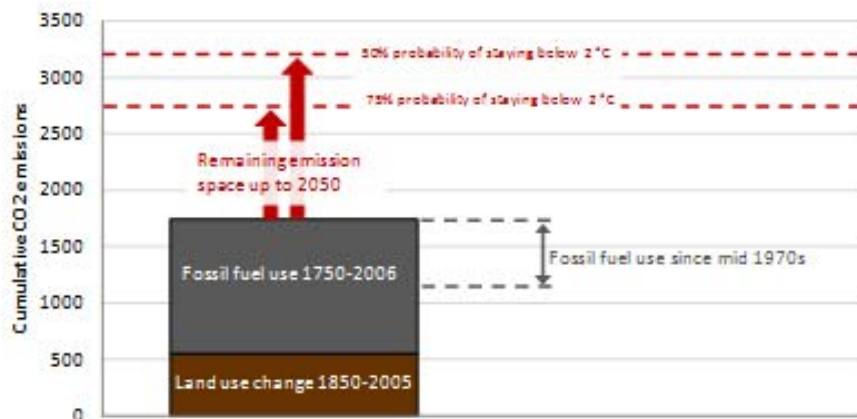
6.6. Presentation of Göran Berndes, IEA Bioenergy Task 43/Chalmers University, Sweden²



- Need to discuss bioenergy/LUC with regard to
 - longer term perspectives
 - 2°C target for 2050 (G8 and UNFCCC)
 - need for radical energy system transformation
- Incentive schemes and regulation mainly concerned with iLUC favor bioenergy systems with low iLUC risks but which are in other respects **inferior** (e.g. **overall** CO₂ reduction)
- Strict focus on climate benefits from ecosystem protection may lead to increased conversion pressure on valuable ecosystems that have low C density

² presented by Uwe Fritsche (IEA Bioenergy Task 40/Öko-Institut, Germany)

One critical strategic question is how society should use the "remaining space" for GHG emissions

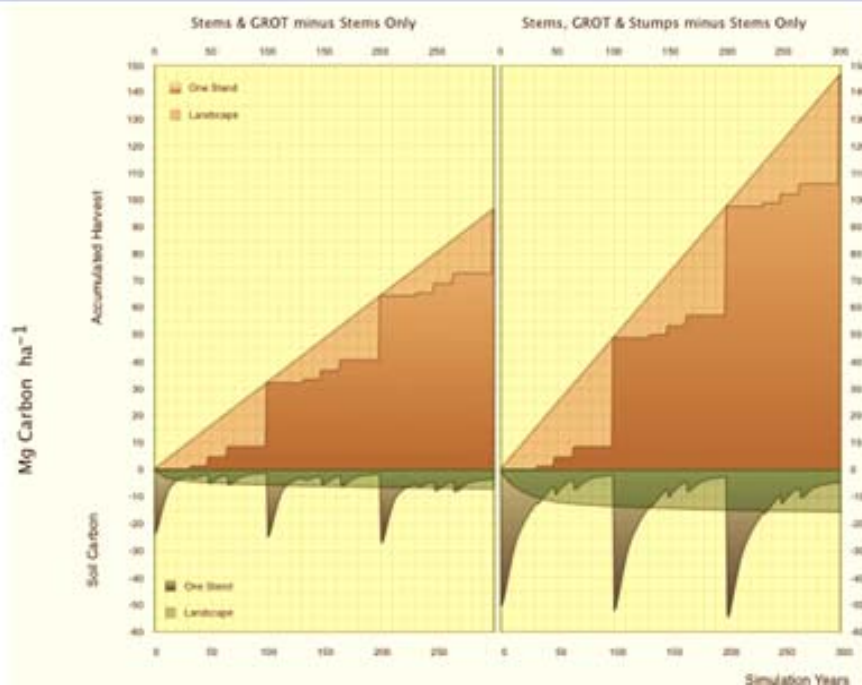


- One critical strategic question is how society should use the "remaining space" for GHG emissions
 - Some of the emission space might be required to develop a biomass industry capable of providing renewable energy & material services for the world in the **long-term**

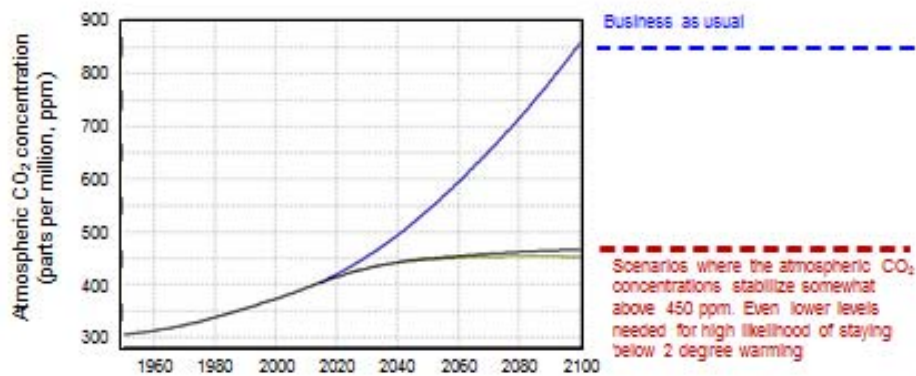


Forest bioenergy

- Forest bioenergy systems are associated with carbon emissions and sequestration that are not in temporal balance with each other.
- Evaluation systems that rely on narrow accounting and short time horizons fail to detect important features of forest bioenergy systems
- Active forest management can ensure that increased biomass output need not take place at the cost of reduced forest carbon stocks (but biodiversity is an issue)

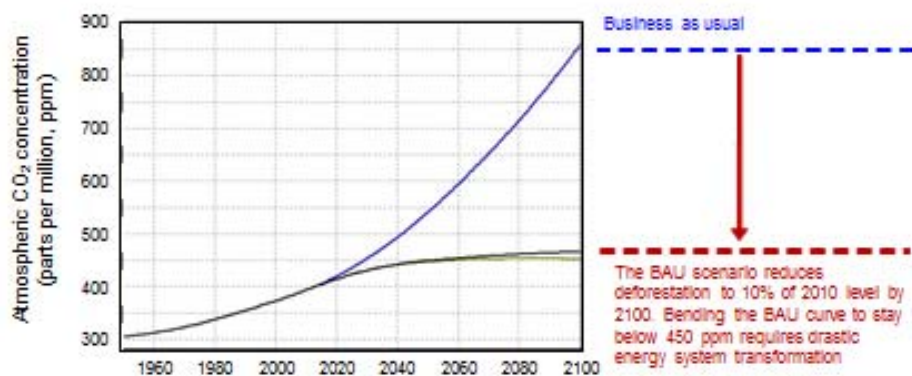


Stabilization of atmospheric CO₂ concentrations at levels proposed in relation to the 2-degree target requires **drastic changes** in the way the global energy system functions.



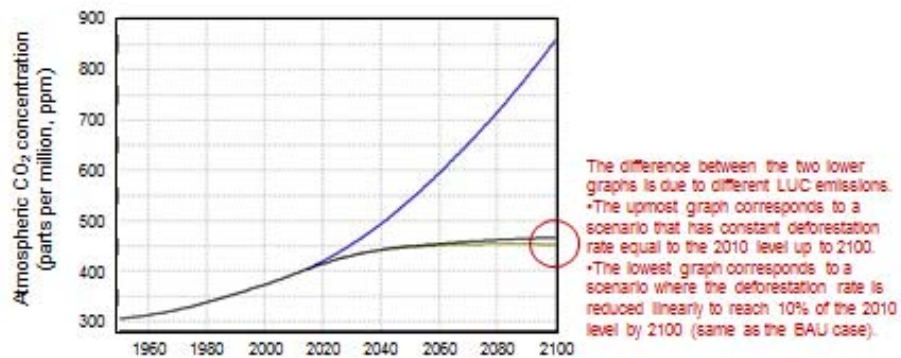
Source: Chalmers Climate Calculator

Stabilization of atmospheric CO₂ concentrations at levels proposed in relation to the 2-degree target requires **drastic changes** in the way the global energy system functions.



Source: Chalmers Climate Calculator

The effect of strongly reduced LUC emissions is **relatively small** compared to what is required for reaching such stabilization targets. But the lower the target the more important will LUC emissions be



DIRECTORATE-GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT ECONOMIC AND SCIENTIFIC POLICY **A**

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