elobio

Biofuel policies for dynamic markets

3rd ELOBIO stakeholder consultation

Report from the 3rd stakeholder consultation
Brussels, December 2009

Intelligent Energy Europe

3rd ELOBIO stakeholder consultation

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Executive summary

The ELOBIO research project aims to develop policies that will help achieve a higher share of biofuels in total transport fuel in a low-disturbing and sustainable way. The project strives to achieve:

- A clear vision on policy options with the least negative impacts on other markets in food, feed and ligno-cellulosic materials; a vision shared with and approved of by policy makers and by relevant market actors and other stakeholders.
- A reliable estimate of the potential and costs of biofuels, given the application of these low-disturbing policy measures.
- Improved models and tools to assess the relations between biofuels policies and the markets for food, feed and ligno-cellulosic materials.
- Improved models and tools to assess the impact of policy and market interactions on the allocation of biomass for the electricity, biofuels and heating/cooling sectors.

The workshop focused on the following issues identified as most important in view of the results of the modelling work and the responses from the stakeholders:

- Food security/prices: various effects on markets, co-products and land use, price volatility issues.
- Agricultural technology: productivity increases, crop price and productivity dynamics
- Environmental effects: sustainability criteria, land restrictions, carbon regulation, agricultural residues
- 1st and 2nd generation technology: commercialisation and risks, feedstock, support
- Biofuels policies: policies on feedstock, feedstock production, biofuels production technologies and biofuels markets

The outcome of the workshop is used for the selection and adjustments of policies and for the final policy recommendations of the project.

Eight stakeholders participated in the workshop and represented the different key interests to the biofuels issues. The main conclusions to be drawn from the discussions at the workshop concerned the different impact of food price increases and cultivation of energy crops in Europe compared to developing countries, the productivity increases in agriculture beyond the historic growth rate at around 1% per annum, and the farmers' willingness to grow new energy crops.

On one hand, there are great concerns among policy makers, researchers and NGOs about possible negative effects on vulnerable groups in developing countries. On the other hand, the agricultural sector - especially the one in Europe - sees some good opportunities for finally obtaining higher prices for their products as well as a larger market outlet spurred by the increasing demand for biomass and energy crops now and in the future. There are some worries among a part of the stakeholders that the weak governance of these countries imposes a risk of unfavourable land deals and a threat to the poor rural population. Some of the problems in this context have to do with smallholders' lack of formal land titles, which might cause their eviction from land for plantations. Other problems are smallholders' inability to assess and understand the economics of new energy crops such as jatropha.

Concerning productivity increases in agriculture beyond the historic growth rate stakeholders were optimistic. Higher prices for agricultural products could in itself be expected to facilitate new investments in technology development, which then would stimulate the growth rate. The big question was if this growth rate would also take off in developing countries, where yields have been particularly prone to stagnation during the last 40-50 years.

Finally, on the topic of farmers' willingness to grow new energy crops several participants had observed that there is a growing market with fairly high prices for biomass from e.g. willow in Sweden. However, farmers seem reluctant to adopt this crop in their cropping strategies - presumably because the crop is a perennial crop and thus more prone to risks in shifting prices over the years, but perhaps also out of lack of knowledge on yields and of how to manage this crop.

1. Introduction

The ELOBIO project

As the debate of "food versus fuel" has intensified in the wake of rising food prices in the past few years, the relevance of achieving a clear understanding of the complexity of the relationships between biofuels, agricultural markets and food markets is of ever greater importance. Stress in commodity markets, allegedly induced by biofuels, can become a major barrier to political and public support for biofuels, thus seriously hindering their further development without achieving stability on agricultural markets.

The main objective of the ELOBIO research project[1] is to develop policies that will help achieve a higher share of biofuels in total transport fuel in a low-disturbing and sustainable way. The key ingredient for such a policy mix is that it is understood and accepted by all stakeholders involved and affected by the development of biofuels. Therefore, the project will strive to achieve:

- A clear vision on policy options with the least negative impacts on other markets in food, feed and ligno-cellulosic materials; a vision shared with and approved of by policy makers and by relevant market actors and other stakeholders.
- A reliable estimate of the potential and costs of biofuels, given the application of these low-disturbing policy measures.
- Improved models and tools to assess the relations between biofuels policies and the markets for food, feed and ligno-cellulosic materials.
- Improved models and tools to assess the impact of policy and market interactions on the allocation of biomass for the electricity, biofuels and heating/cooling sectors.

The ELOBIO project, which is running over 30 months, is using several analytical tools such as an agro-economic model, expertise in agricultural commodity markets, and a biofuels pathway model. However, the project has been conceptualised in a way where stakeholder consultations in form of workshops play a central role.

Stakeholder consultation a key component

The purpose of the stakeholder consultation process is to obtain more in-depth and up-to-date insight and feedback from stakeholders directly affected by the development of biofuels and thereby make the modelling more broad-based, realistic, and legitimate for policy makers and key actors. The stakeholder consultation is an interactive process taking place throughout the project to ensure continuous feedback and has been conducted through three major inputs:

- First stakeholder workshop, defining and setting criteria (30 October 2008)
- E-mail questionnaire, exchange of preliminary results (June - Aug 2009)
- Second stakeholder workshop, identifying optimal policies (17 November 2009)

The workshop on 30 October 2008 was the first step in the stakeholder consultation process, aiming at having stakeholders reflect on existing policies and identifying key issues and mechanisms leading to

[1] The ELOBIO project is undertaken by seven European partners: ECN, VITO, IPIEO, CIEMAT, COWI, IIASA, and Chalmers University. For further details see www.elobio.eu

market disturbance. The results of the first workshop were used as an input into an economic model developed for the purpose (assessing potential and cost of proposed biofuels policies).

The preliminary results of the model-runs (indicating the impacts on food & feed markets as well as on ligno-cellulosic markets) were later reflected upon by the stakeholders in a questionnaire survey. The survey took place through the summer of 2009, and stakeholders responded on the methodologies applied and provided suggesting further improvements.

The 3rd and last stakeholder consultation took place as a workshop on the 17th of November 2009 in Brussels[2]. The purpose of the 3rd stakeholder consultation was to present the results of the project and obtain feedback and possible recommendations for low-disturbing policies.

[2] Invitation can be found as Appendix 1

2. The workshop

Objective

The objective of the 3rd stakeholder consultation was to discuss and get feedback from key stakeholders on the adjusted policies and findings based on the stakeholder responses gained from the questionnaire survey.

The workshop focused on the following issues identified as most important in view of the results of the modelling work and the responses from the stakeholders:

- **Food security/prices**: various effects on markets, co-products and land use, price volatility issues
- **Agricultural technology**: productivity increases, crop price and productivity dynamics
- **Environmental effects**: sustainability criteria, land restrictions, carbon regulation, agricultural residues
- **1st and 2nd generation technology**: commercialisation and risks, feedstock, support
- **Biofuels policies**: policies on feedstock, feedstock production, biofuels production technologies and biofuels markets

The outcome of the workshop will be used for the selection and adjustments of policies and for the final policy recommendations of the project.

Target group and participants

The *target group of the workshop* was the various players that are most affected by biofuels policies, and who have an interest in expressing their opinion on the issue. 63 relevant stakeholders, representing 50 organisations were invited to participate in the workshop, of which 16 participated in the 1st consultation workshop in 2008 and 11 had answered the questionnaire in the 2nd stakeholder consultation.

Eight stakeholders participated in the workshop along with 11 members of the ELOBIO team[3]. The background of the stakeholders was mixed, representing the margarine and plant oil industry, the farmer's and agricultural interests, biomass associations, the academic sector and NGOs. However, and unfortunately, no stakeholders from the ligno-cellulosic industry such as forestry, pulp and paper, and no stakeholders from the energy sector were present. This repeated the same pattern as was seen in stakeholder consultations 1 and 2.

The programme for the workshop entailed several presentations of the different preliminary results of the project, one extern speaker presenting the present state of affairs in EU agricultural and biofuels policies as well as group sessions during the afternoon with room for stakeholder discussions:

[3] See Appendix 6 for list of participants

Programme

Time	Activity
Morning session: Setting the scene	
9.30 - 10.00	**Registration and coffee**
10.00 - 10.10	**Introduction and welcome** - purpose and outcome of the workshop (Ayla Uslu, ECN)
10.10 - 10.25	**Viewpoints expressed in the questionnaire survey, and how to gather further viewpoints in afternoon sessions** - key issues of interest and introduction to afternoon sessions (Henrik Duer, COWI)
10.25 - 10.45	**Present state of affairs in EU agricultural and biofuels policies** - key issues and recent and expected initiatives (Andreas Pilzecker, DG Agri)
10.45 - 11.25	**ELOBIO results (1)** - impacts in food and feed markets (Fischer/Prieler, IIASA)
11.25 - 11.50	**ELOBIO results (2)** - impacts of the stationary sector on competition for food and feed production (Göran Berndes, Chalmers)
11.50 - 12.15	**ELOBIO results (3)** - risk profiles of 1st and 2nd generation biofuels and related cost impacts (Tjasa Bole, ECN)
12.15 - 13.15	**LUNCH BREAK**
Afternoon session: Feeding stakeholder viewpoints into the project	
13.15 - 14.15	**Group sessions:** - Division into 3 groups
14.15 - 14.30	**Reporting back to plenum** 5 min presentation from each group
14.35 - 14.50	**COFFEE BREAK**
14.50 - 16.00	**Group sessions:** - same 3 groups
16.00 - 16.15	**Reporting back to plenum** 5 min presentation from each group
16.15 - 16.25	**Wrap-up and comments on steps ahead** (Henrik Duer, COWI)

Key issues from presentations

The project coordinator Ayla Uslu, ECN, initiated the workshop with a brief introduction to the ELOBIO project process, which was followed by a presentation of the results and viewpoints gathered through the 2nd stakeholder consultation by Henrik Duer, COWI.

These introductions were followed by the key speakers according to the programme[4]:

Present state of affairs in EU agricultural and biofuel policies, Andreas Pilzecker, DG Agri

The presentation focused on key issues and recent and expected initiatives of the EU on the biofuel subject. Some of the key issues of the presentation are presented below:

- 10% target for RE in transport is the most important target, not from biofuels alone but also from other renewable energy sources, wind based electricity.
- 3.3% of fuels consumed in EU are biofuels at the moment.
- Best guess in the Commission now is 7% share of biofuels in 2020 (equivalent to 23 mtoe - or twice the amount now used).
- 2nd generation biofuels are counted twice, which is regarded a strong incentive to reach the target.
- 2nd generation biofuels is not a definition used by the Commission, the Commission prefers article 21 in the Renewable Energy Directive (2009/28/EC).
- 75% of biofuels in EU are produced on feedstocks from within the EU - the rest is imported.
- Energy crop premium, set-aside, and starch production aid abolished.
- Main driver of market is political targets.
- Sustainability scheme for other biomass due by end 2009.

Hereafter, the results of the various work packages of the ELOBIO project were presented, extracting the following key issues:

ELOBIO results 1: Impacts of biofuels expansion on food system indicators and land use, Günther Fischer, IIASA

The main findings of the IIASA modelling on the Agro Ecological Zone, AEZ, and the World Food System, WFS, models on various scenarios were presented, and their policy implications discussed. The key conclusions included:

- Strong increase in global demand for agricultural products is expected in the baseline projection, about 45% in 2030 and 70% in 2050 compared to 2000 due to population and economic growth.
- Expected increasing integration of agriculture, forestry and energy sectors through land competition for biomass.

[4] The presentations can be found as Appendices 2, 3, 4, 5, 6 and 7.

- Limited availability of additional high-quality land for 4F sectors; uncertainty regarding viability of using marginal land.

- Growing risks of yield damage due to extreme weather incidents; widespread negative climate change impacts after middle of century.

- Cereal prices are seen to increase with increasing biofuels production in scenarios compared to the prices in the baseline, up to 50% increase if 8% of global transport fuel is provided by 1st generation biofuels.

- This leads to declining demand for food and feed compared to baseline, and increasing agricultural production value, particularly in developed countries.

- Additional cultivated land area is utilsed as 1st generation biofuels production is increased and also additional forest areas are converted compared to baseline.

- The GHG emissions caused by land use change as 1st generation biofuels production increases more than outweighs the emission reductions obtained by substituting fossil transport fuels with biofuels for a number of years.

Policies are needed to encourage:

- Maintaining high potential land in good conditions to facilitate sustainable production.

- Promoting integrated cross-sector approaches to land use planning and regulation to minimize impacts/competition for land for food.

- Enabling market signals to guide efficient allocation of scarce resources.

- Applying strict sustainability criteria, regulation and monitoring to protect land and safeguard vital ecosystem services.

ELOBIO results 2: Impacts of the stationary sector on competition for food and feed production, Göran Berndes, Chalmers University of Technology

Göran Berndes addressed the likely impact of the use of biomass for energy in the stationary sector on the food sector, in view of the need to reduce CO_2 emissions in the energy sector and the expected increasing demand for biomass in the sector. The presentation focused on two key questions, namely:

- How large is the stationary sector's demand for biomass for energy?

- How much can it pay for the biomass?

The reflections and arguments concerning the *demand* for biomass included:

- Investment in new power generation capacity is required for replacing old capacity and for meeting growing demand.

- Emission reduction targets are assumed, namely 30% CO_2 emission reduction by 2020 and 85% by 2050.

- It makes a big difference to the demand for biomass for the stationary sector if CCS is applied on a large scale or not as significantly more biomass is needed in the absence of CCS.

- The magnitude of the potential demand for biomass is illustrated by the fact that 1000 TWh requires about 9 EJ of biomass at 40% conversion efficiency.

- For comparison EU25 current industrial roundwood consumption is around 6 EJ, EU25 cereals are 4-5 EJ and agricultural residue potential is 3-4 EJ.

The analyses of the *ability to pay* for biomass revealed that, depending particularly on the future CO_2 allowance price, the stationary sector will be able to pay a price for biomass that at least matches but most likely exceeds the price that farmers can get on growing cereals for the food and feed markets. This means that there will be an incentive to farmers to produce biomass for energy rather than food.

Conclusions:
The stationary sector is expected to demand large amounts of biomass (particularly in the absence of CCS), and is able to pay high prices. This emphasises the sensitivity to:

- the evolvement of other technologies
- CCS capacity
- CO_2 prices and RES-E credits.

ELOBIO results 3: Risk profiles of 1st and 2nd generation biofuels and related cost impacts (ECN)

Tjasa Bole presented the risk profiles of 1st and 2nd generation biofuels and related cost impacts, focusing on the short- and long-term:

In the short-term:

- We need to promote second generation biofuels to limit the impact on agricultural commodities.

- The cost of capital for 2nd generation is extremely high.

- Technology risk is a major barrier to 2nd generation's access to cheaper capital.

- There seems to be a need for substantial support if large-scale demonstration projects for 2nd generation technologies (e.g. European Industrial Bioenergy Initiative) are to be implemented.

- Expectations of finance providers on full commercialization of 2nd generation conversion technologies vary from 2 to 10 years.

In the long-term:

- 2nd generation technologies are very capital intensive compared to 1st generation. Even with the same price of capital (WACC) as 1st generation there will be a slower deployment rate. Therefore, there is a need to lower the capital intensity of 2nd generation.

- There are different policy options to lower the cost of capital for 2nd generation:
    - continuous R&D support to lower the capital intensity of the technologies
    - investment subsidies
    - government guarantees for loans to raise the level of available debt
    - soft loans
    - market-risk mitigating policies.

- If policies to stimulate 2nd generation biofuels are successful, simultaneous stimulation of forestry will be needed to ensure adequate wood supply (increasing market risk).

3. Stakeholder viewpoints

In the following, the key messages from the discussion are presented under four main headings:

Theme 1: Agricultural prices and food security

Theme 2: Agricultural productivity

Theme 3: Land use and GHG savings

Theme 4: Ligno-cellulosic feedstock for second generation biofuels technology

Theme 1: Agricultural prices and food security

Facilitator: What are the main concerns and reflections raised by the ELOBIO study, e.g. such as the price increases revealed by the study?

The reflections of each stakeholder have been summed up in the following:

- Oxfam: The price effects are a big issue for Oxfam and the number of poor people affected as highlighted by the ELOBIO study is worrying. The problem seems here to be structural, and not just a temporary phenomenon, which also questions the EU targets that are in place now. Affected poor people must be considered both at the macro level and at the micro level, and there is a need for being able to monitor this better. At the project level there is an amount of data that can be used. The problem needs to be taken into account at the macro level as well. It could be considered as part of the PRSP[5]-processes in developing countries. FAO and OECD are doing some work on this issue. Investor responsibilities must be considered as well.
- COPA-COGECA: There is not the same pressure on food prices now as there were two years ago, so it is not regarded a big problem. It should also be considered that it is important for farmers to have a fair playing field between the EU and the rest of the world.
- Copenhagen University: It is important to distinguish between the price level and price volatility. Increasing price volatility is very problematic, especially for farmers in Africa. Land use change is a problem, but this is not only a problem in relation to biofuels crops.
- COPA-COGECA: Biofuels crops are not believed to increase price volatility, but rather it is the other way around creating more flexibility for farmers.
- Copenhagen University: The problem is that the price of biofuels will be independent of the price of feedstocks, when using blending obligations - there will be no price signal to ensure less demand for biofuels when the feedstock price is high and vice versa.
- Chalmers: Does the paperwork and certification of biofuels crops have an excluding role in developing countries?

[5] PRSP - Poverty Reduction Strategy Paper. Such a paper describes a country's macroeconomic, structural and social policies and programmes to promote growth and reduce poverty, as well as associated external financing needs. PRSPs are prepared by governments through a participatory process involving civil society and development partners, including the World Bank and the International Monetary Fund (IMF) (WB, 2009).

- OXFAM: Many believe that it is a big conspiracy to keep them out of a market. But it has changed, more understanding towards these instruments. It does exclude some small farmers, no doubt. Almost half of the palm oil is produced by the small farmers with one-two hectares. Oxfam recommends setting up a process to discuss the certification issue to ensure realistic - and not too burdensome – requirements, because it is a different world in the developing countries.

Theme 2: Agricultural productivity

Facilitator: Can agricultural productivity be increased beyond 1%/annum and at the same time be sustainable?

- Oxfam: Yes, it is possible, but it does not happen because of various reasons. The example from Brazil shows that the changes are from cattle to soybeans to sugar, and this is not improving the productivity at all, in this respect land rights is a key issue.
- Copenhagen University: In the past 50 years where agricultural prices have been declining it is not surprising that productivity has not been larger. It will help if prices increase. This new situation is thus good for investments in agriculture, and this might facilitate an increase in productivity.
- Chalmers: Could we learn something from the Green Revolution? The Green Revolution obtained dramatic productivity increases in Asia, and it is important to look at the circumstances that made this possible - this was also very much about public money being spent on research and on developing new agricultural techniques. It is thus much more than price alone that matters.
- Oxfam: Yes, take the example of seeds. The farmers are not involved in the breeding of seeds in a way that solves the real problems.
- COWI: Concerning the Green Revolution and biofuels crops in developing countries, it is a problem that farmers are small and scattered, and that they lack access to key inputs such as know-how and improved seeds. Couldn't there be a larger role for involving producers' associations producing biofuels or outgrower schemes. Outgrower schemes have been practiced with various cash crops for a number of years, and this set-up has been used specifically on sugar plantations in many developing countries?
- Oxfam: Yes, but the problem is the bulky nature of many biofuels crops. However, the set-up of the outgrower-scheme is currently being used in Brazil for sugar production.
- IIASA: Yes, the outgrower schemes are used already to some extent in for example Brazil.

Theme 3: Land use and GHG savings

Facilitator: How to take land use change and indirect land use change into consideration in GHG accounting?

- Chalmers: What are the current reflections in DG TREN, and how can the concerns of DG TREN be quantified in terms of for example pay back time to land used for biofuels.

- DG TREN: We are very concerned about how land use changes will happen. The Commission is now working on a report on Indirect Land Use Changes (ILUC). The big question is how to reduce poor land use.

- Oxfam: Concerning biofuels production, ownership of land is very important in developing countries. Moreover, there have been examples of switching from cotton to jatropha (in Mali) because it was thought that biofuels crops would provide a good opportunity for better farm incomes. But it didn't work well (it takes 7 years for jatropha to mature).

- Copenhagen University: Shifting from cotton to jatropha or from food to other crops in Africa shouldn't necessarily be a problem if the opportunities for making an income increase.

- IIASA: Developing countries have already switched from being net food exporters to being net food importers, so in developing countries there would be more losers among farmers.

- DG TREN: DG TREN encourages all to think of the wider perspectives in terms of land use change. It is necessary to think of all types of crops and systems that can help facilitate a positive development path in developing countries.

Theme 4: Ligno-cellulosic feedstock for second generation biofuels technology

Facilitator: Can sufficient land be dedicated to ligno-cellulosic energy crops while at the same time safeguarding adequate food production?

- LRF: Biofuels can be good for many reasons and bad for many reasons. In the Swedish organisation there is some struggle between trying to get farmers to grow more CO2-efficient crops - for example willow. There is a good market for willow as an energy crop, because biomass is used to a great extent for heating, but farmers are reluctant to adopt this crop in their cropping strategies. Another thing not touched much upon today is the impact of trade.

- Chalmers: Why do the farmers in Sweden not grow the willow-crops if they are profitable? It seems that there are some obstacles, some risks in getting involved in this new crop.

- LRF: A big barrier is if the farmer looses his flexibility, so annual crops are preferred instead of perennials such as willow.

4. Conclusions

The main conclusions to be drawn from the discussions at the workshop are concerned with the different impact of food price increases and cultivation of energy crops in Europe compared to developing countries, the productivity increases in agriculture beyond the historic growth rate at around 1% per annum, and the farmers' willingness to grow new energy crops. The discussion at the workshop clearly pointed out that stakeholders see both implications as well as some opportunities in the results produced by the ELOBIO study, and these views were to a large extent reflected by the different positions of the stakeholders.

On one hand, there are great concerns among both policymakers, researchers and NGOs about any possible negative effects on vulnerable groups in developing countries, who would be most affected by any future food price increases according to the analysis. On the other hand, the agricultural sector

- especially the one in Europe - sees some good opportunities for finally obtaining higher prices for their products as well as a larger market outlet spurred by the increasing demand for biomass and energy crops now and in the future. Although these opportunities for the agricultural sector also exist in the developing countries, there are some worries among a part of the stakeholders that the weak governance of these countries imposes a risk of unfavourable land deals and a threat to the poor rural population. Some of the problems in this context have to do with smallholders' lack of formal land titles, which might cause their eviction from land for plantations. Other problems are smallholders' inability to assess and understand the economics of new energy crops such as jatropha, which in many cases turns out to be quite disappointing adventures rather than the new promising crops that some farmers had been told.

Concerning productivity increases in agriculture beyond the historic growth rate at around 1% per annum, stakeholders were optimistic that this growth rate should be possible to accelerate. One of the fundamental arguments was that higher prices for agricultural products would in itself facilitate new investments in technology development, which then would stimulate the growth rate. Again, the big question was if this growth rate would also take off in developing countries, where yields have been particularly prone to stagnation during the last 40-50 years. A discussion evolved around the Green Revolution, which had a large effect on agriculture in Asia, and on how a new similar revolution could take place.

Another interesting discussion emerged around the topic of farmers' willingness to grow new energy crops. Several participants had observed that there is a growing market with fair prices for biomass from e.g. willow in Sweden. However, farmers were reluctant to adopt this crop in their cropping strategies - presumably because the crop is a perennial crop and thus more prone to risks in shifting prices over the years, but perhaps also out of lack of knowledge on yields and how to deal with this crop.

Concluding, the workshop provided important input to the continued process of the ELOBIO project, thanks to the engaged and active participation of the stakeholders, which represented the different key interests in the biofuels issues.

Appendix 1 Invitation

9 October 2009

Stakeholder workshop 17 November 2009 in Brussels: *Developing innovative options for EU biofuels policy that reduces the impact on food and feed markets*

Dear invitee,

Increased demand for biofuels might have significant long-term impacts on several commodity markets. With the rising food prices in markets across the world in 2007-2008 attention was given to this issue and to adequate policies. In response to this the objective of the ELOBIO project is to *formulate efficient and low-disturbing policy options that enhance biofuels while minimizing the impacts on e.g. food and feed markets and biomass for power and heat.* In short, the ELOBIO project consists of the following activities (more info: www.elobio.eu):

- Review of current experiences with biofuels and other renewable energy policies and their impacts on other markets;
- Iterative stakeholder-supported development of low disturbing biofuels policies;
- Model-supported evaluation of these policies' impacts on food & feed and lignocellulosic markets;
- Assessment of selected optimal policies' impact on biofuels development, potentials and costs.

Three stakeholder consultations - this is the final one

The ELOBIO project had its first stakeholder workshop (reflecting on existing policies, defining problems of market disturbance, setting criteria) on 30 October 2008. The results of the first workshop were used as an input into a model assessing the impacts on food & feed markets. From June - September 2009 the preliminary findings of the model runs were provided to stakeholders, who in a questionnaire were asked to reflect on and evaluate the methodologies and assumptions applied. The policies, scenarios and assumptions applied in the modelling are being adjusted taking into account responses from stakeholders. The upcoming workshop is the third and final stakeholder consultation in which the adjusted policies and findings are presented and discussed.

Key issues to discuss at the workshop

The stakeholder workshop will focus on a number of issues, which we have identified as most important in view of the results of our work and the responses from the stakeholders, including:

- **Food security/prices**: various effects on markets, co-products and land use, price volatility issues
- **Agricultural technology**: productivity increases, crop price and productivity dynamics

- **Environmental effects**: sustainability criteria, land restrictions, carbon regulation, agricultural residues
- **1st and 2nd generation technology**: commercialisation and risks, feedstock, support
- **Biofuels policies**: policies on feedstock, feedstock production, biofuels production technologies and biofuels markets

Outcome of the workshop

The outcome of the workshop, in terms of key points gathered from the group work, will be used for the selection and adjustments of policies and for the final policy recommendations of the project.

The target group of the *workshop* is stakeholders, who represent the various players that are most affected by biofuels policies. The target group of the *ELOBIO project* is firstly DG TREN, and secondly more generally policy makers in the EU Commission.

Practicalities

The workshop will take place on 17 November 2008 in Brussels at the House of Cities, Municipalities and Regions (Square de Meeûs 1). To participate in the workshop, please register by email to Lillah Lucie Emmik Sørensen (lles@cowi.dk) no later than November 1st. For any further information on the workshop please contact Henrik Duer (+45-4597 2215) or Lillah Lucie Emmik Sørensen (+45 4597 12 07).

We would very much appreciate your participation in this workshop and look forward to seeing you in Brussels.

Sincerely yours,

Henrik Duer
ELOBIO Task Manager

Enclosed:
- Programme for workshop

Appendix 2 – Introduction and welcome

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Biofuel policies for dynamic markets

Stakeholder consultation

Ayla Uslu (ECN)
17 November 2009 - Brussels

Intelligent Energy Europe

Let's remember

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Biofuel policies for dynamic markets

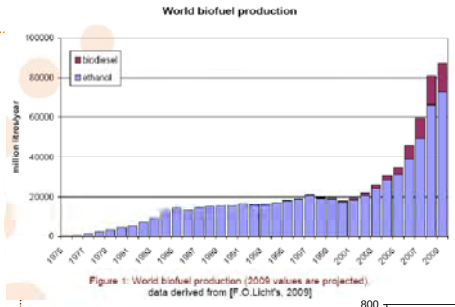
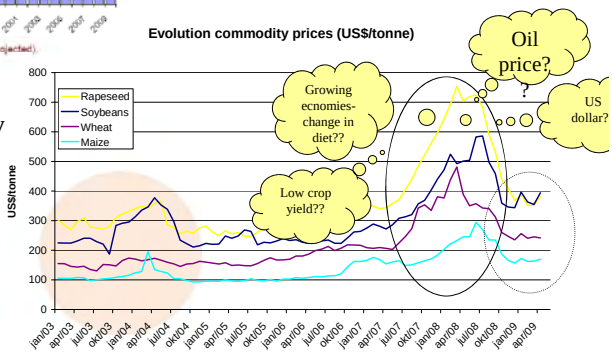


Figure 1: World biofuel production (2008 values are projected), data derived from [F.O.Licht's, 2008]


Secret report: biofuel caused food crisis

Exclusive Internal World Bank study delivers blow to plant energy drive

"It is a **crime against humanity** to convert agricultural productive soil into soil which produces food stuff that will be burned into biofuel."
Jean Ziegler UN Special rapporteur on the right to food, October 2007



Questions

- What were the implications of high product prices?
  - Different in developed and developing countries
- What will be the prices in the coming year?
- What role does and will biofuel be playing?
- What are the implications of diverting the focus to non food crops and residues ?
  - 2nd generation biofuels

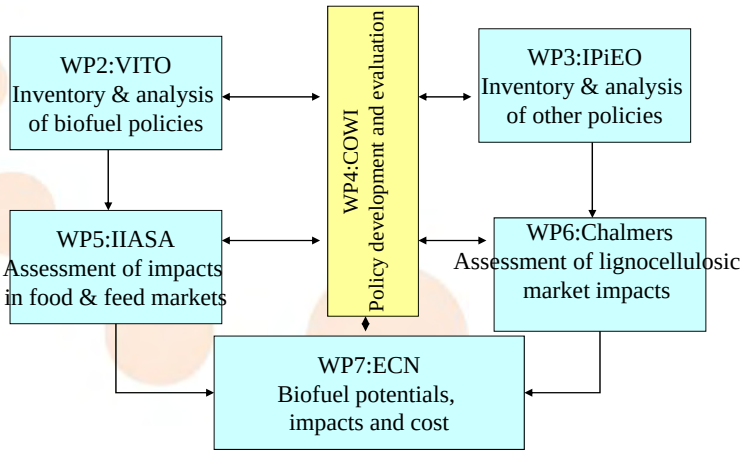
Lignocellulosic biomass as a focus

- Demand from
  - stationary energy sectors (heat and electricity)
  - wood using industry (saw mill, pulp and paper)
  - 2nd generation biofuel producers

Conflict for resources?

ELOBIO

Introduction of efficient and low-disturbing policy options that enhance biofuels while minimizing the impacts on e.g. food and feed markets and biomass for power and heat.



What is expected from you??

- **Share your innovative ideas!**
- **Update us with the recent developments in your sector.**

Thank you for your attention!

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Thank you for your attention!

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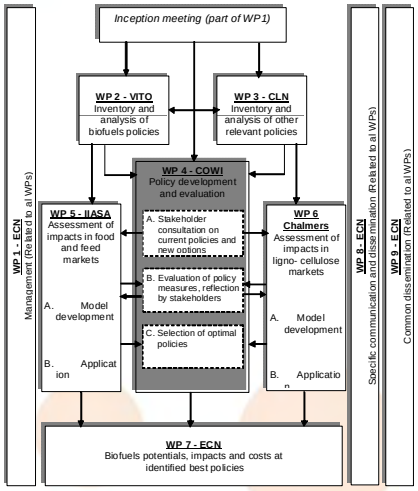
- UN debates global food cost rise, 26 January 2009 by BBC News: ***"Just because the issue of food prices has not been in the headlines recently it has not gone away….And many of factors that contribute to the rise …are still driving prices up….competition with biofuels for scarce land, worsening agri. productivity, ….."***

Appendix 3 – Viewpoints expressed in the questionnaire survey

Overall structure and approach



Stakeholder consultation process

1. **Stakeholder consultation: Workshop 30 October 2008, Brussels:**
   Engage with key stakeholders, asking them to provide relevant suggestions and questions to be analysed, and providing an opportunity to influence the project by feeding viewpoints into the process

2. **Stakeholder consultation: E-mail, June-September 2009**
   Presentation of the preliminary findings of the model runs to stakeholders, who in a questionnaire were asked to reflect on and evaluate the methodologies and assumptions applied.

3. **Stakeholder consultation: Todays workshop**
   The policies, scenarios and assumptions applied in the modelling has been adjusted taking into account responses from stakeholders and the findings are presented and discussed.
   The key points gathered from the group work will be used for the selection and adjustments of policies and for the final policy recommendations of the project on low disturbing policies

Issues and points raised in 2. stakeholder consultation

The issues raised:

Main categories	Subjects
1. Socio-economics	1. Impacts of first-generation biofuels on agricultural prices 2. Food security
2. Environment	3. Land use conversion
3. Technology	4. Agricultural technology – Growth in agricultural productivity 5. Second generation biofuels - Speed of introduction 6. Second generation biofuels and investment risks 7. Competition and synergies between the transport and stationary energy sectors and implications for the food and forest sector
4. Methodological policy issues	8. Overall methodological policy considerations

Responses to 2. stakeholder consultation

1. Socio-economics: Prices and food security

Topics and opinions

- Increasing prices are needed for increased productivity (2-3% p.a.), avoid price volatility
- Higher crop prices may not be bad to developing countries
- Crop residues prices may increase, effects of use of co-products from 1.st generation production
- Reduced protein feed prices could lead to increased meat production

Policies:

- Favor multipurpose crops which allow to switch between food and energy production
- Avoid competition between food and fuel
- No imports of agricultural commodities from countries where food security is endangered

2. Environment

- Productivity increases in agriculture (environmental damages, subsidies, intensive vs. extensive production)
- Marginal land (use of marginal land, have ecological functions, ensure biodiversity and utilization))
- Sustainability criteria (needed at international level, better than land use restrictions, food production as well)
- How stop deforestation? (sustainable forest production, reduced demand for agricultural land demand, governance issues)

Policy ideas

- Introduce sustainability criteria for both food and energy feedstocks production.
- Allow land conversions for biofuel feedstock production only when carbon payback time is 10 years or less, only allow biofuels with GHG balance > 30%
- “Polluter pays principle” to stop deforestation
- Tax meat consumption
- Key actors in the biofuel supply chains should refrain from sourcing from regions with high rates of deforestation

3. Technology

- Productivity increases in agriculture (stable increasing prices, sustainable productivity increase, above average 1%?)
- Second generation (feedstock must be available >10 years, financial incentives, time before introduction, infrastructure needed on processing and market, effect on food security including indirect LUC)
- Competition & Synergies between transport and stationary sector (2. Generation biofuels and stationary biomass users compete, transport sector more risky and complex)

Policy ideas

- Priority for heat and CHP (because of higher efficiency), use electricity for transport
- Incentives favouring 2. gen: General (CO2 tax etc.) versus targeted incentives for 2. Gen.
- Coordination and harmonization of EU biomass policies is required, especially between Renewable Energy directive, the Waste Directive and the draft IPPC (industrial pollution)
- Sharing of risk between early-moving businesses and the public

4. Methodological policy issues

- Don't say a priori 2nd gen. are better
- Avoid blending mandates because they tend to exacerbate price volatility
- Countercyclical mandates, i.e. a blending target that is high when feedstock prices are low and vice versa
- Sustainability criteria (should be a precondition, should be avoided as enforcement is impossible)
- Measures to shield the hungry and poor
- Include other options and technologies (Jatropha, solar energy)
- Apply precision farming

Time	Activity
Morning session: Setting the scene	
9.30 - 10.00	**Registration and coffee**
10.00 - 10.10	**Introduction and welcome** - purpose and outcome of the workshop (Ayla Uslu, ECN)
10.10 - 10.25	**Viewpoints expressed in the questionnaire survey, and how to gather further viewpoints in afternoon sessions** - key issues of interest and introduction to afternoon sessions (Henrik Duer, COWI)
10.25 - 10.45	**Present state of affairs in EU agricultural and biofuels policies** - key issues and recent and expected initiatives (Andreas Pilzecker, DG Agri)
10.45 - 11.25	**ELOBIO results (1)** - impacts in food and feed markets (Fischer/Prieler, IIASA)
11.25 - 11.50	**ELOBIO results (2)** - impacts of the stationary sector on competition for food and feed production (Göran Berndes, Chalmers)
11.50 - 12.15	**ELOBIO results (3)** - risk profiles of 1st and 2nd generation biofuels and related cost impacts (Tjasa Bole, ECN)
12.15 - 13.15	**LUNCH BREAK**
Afternoon session: Feeding stakeholder viewpoints into the project	
13.15 - 14.15	**Group sessions:** - Division into 3 groups
14.15 - 14.30	**Reporting back to plenum** 5 min presentation from each group
14.35 - 14.50	**COFFEE BREAK**
14.50 - 16.00	**Group sessions:** - same 3 groups
16.00 - 16.15	**Reporting back to plenum** 5 min presentation from each group
16.15 - 16.25	**Wrap-up and comments on steps ahead** (Henrik Duer, COWI)

Afternoon group work programme

- Each group: 1 rapporteur, 1 facilitator and 1 responsible for taking detailed notes
- List of key issues for discussion:
  - *General:*
    - consider which two things you find most striking
  - *Specific topics:*
    - Agricultural prices and food security - issues and policy option
    - Agricultural productivity – productivity growth and sustainability
    - Ligno-cellulosic feedstock for second generation biofuel technology – supply and markets
    - Environment - Land use and GHG savings
    - Risk and financing of second generation biofuels
- Please assess if the group covers some or all issues and report
- 16.00: Group reporting
- Wrap-up

Appendix 4 – Present state of affairs in EU agricultural and biofuels policies

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Present state of affairs in EU agricultural and biofuels policies

Andreas Pilzecker
European Commission, Directorate-General for Agriculture

European Commission
Agriculture and Rural Development

Biomass

- is the most important source of renewable energy
- is the only renewable source of carbon

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The EU aims at

- mitigating climate change
- increasing security of its energy supply

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EU climate and energy package

- 20 (30) % reduction of GHG emissions
- 20% share of renewable energy
- 20% increase in energy efficiency

By 2020

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RES-Directive

- 20% RE share
- 10% RE in transport
- No specific target for bioenergy
- Ensure sustainability

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Where are we with biofuels?

- 3.3% of fuels consumed in the EU are biofuels
- 10.0 Mtoe in 2008
- compared to 7.8 Mtoe in 2007

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Where are we with bioenergy?

- 88 Mtoe of biomass was consumed for energy purposes (primary energy consumption) within the EU-27 in 2006, representing an 8% increase from 2005
- In terms of final energy consumption, bioenergy accounted for about 7-8 % in 2008

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Where could we be in future?

- Projections using modelling by PRIMES and GreenX estimate that around 165-195 Mtoe of biomass would be used in 2020 to achieve the 20% renewables in primary energy target.
- The Environment Energy Agency (EEA) report of 2006 concluded that significant amounts of biomass can be theoretically available to support ambitious renewable energy targets: 235 Mtoe in 2020 is deemed feasible even if strict environmental constraints are applied

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Agriculture and Rural Development

Where could we be in future?

- The RE energy target for 2020 could be equivalent to about a 7% share of biofuels in total fuel consumption
- role of electricity and non land-based biofuels (counting rules in the RE Directive)
- in absolute terms: 23 Mtoe

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Agriculture and Rural Development

Non land-based feedstocks

- Recycled cooking oil and animal fats accounted for about 5% of EU biodiesel production in 2008 (more than palm oil)
- Share is still low but expanding
- Use of non-land based feedstocks (waste, residues) is encouraged by the double-counting rule in the Renewable Energy Directive
- Other non land-based biofuels (ethanol from cellulose, synfuel diesel etc) will become available
- Biogas from manure is also expected to play an increasing role as transport fuel
- But there is a sustainability issue! (Soil organic matter, nutrients blance, biodiversity, carbon stocks)

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The real challenge

- for EU agriculture and forestry is thus the renewable energy target, not the renewable fuel target
- there is an order of magnitude between these two (10:1) in terms of projected importance in 2020

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Concerns about increased use of biomass

- Forests: risks of overuse should be assured, all EU Member States have signed up to the Ministerial Conference on the Protection of Forests in Europe (MCPFE)
- Sustainability criteria in the RES-Directive and the Fuel Quality Directive (biofuels and bioliquids)
- Sustainability criteria for biomass for other energy?
- Competition with food production

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How to increase the use of biomass?

- RES-Directive: National Renewable Energy Action Plans
- EU Forestry Action Plan: necessary elements for national action plans.
- EU Standing Forestry Committee advocates Member States to develop a strategy on mobilisation and efficient use of wood.
- The Commission's Communication on innovative and sustainable forest based industries asks that Member States pay attention to the different uses of biomass when developing the national action plans.
- Research, Development and Demonstration
- Agriculture/Common Agricultural Policy

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The Common Agricultural Policy

- Since 1992 in a continued reform process
- European farmers are free to decide what and how much to grow – and for what purpose
- Farmers react to market signals
- Prices in the EU are close to world market level (grains, oilseeds), except for sugar

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Health Check of the CAP

Main policy questions:

- How to adjust to new market opportunities?
- How to simplify the policy?
- How to respond to new challenges?

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Health Check – Market orientation

- Examination whether/to what extent production-based (coupled) instruments still needed
- Energy crop scheme: Mandatory targets will stimulate demand and high prices encourage production
- Obligatory set-a-side: A tool for managing (limiting) supply, original purpose has lost its relevance

EU: Non-food cropland

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(Mio ha)	2004 (EU-25)	2005 (EU-25)	2006 (EU-25)	2007 (EU-27)
Non-food crops on set-aside land	0,5	0,9	1,0	1,0
Energy premium	0,3	0,6	1,3	1,9
Without specific support	0,8	1,6	1,4	1,7
Total	1,6	3,1	3,7	4,6

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EU land use for biofuels 2008/2009

- 1.2 mln ha for fuel ethanol from cereals
- 3.8 mln ha for RME biodiesel
- plus oilseeds for PPO, sunflower seed for biodiesel, sugarbeet, potatoes etc
- Total about 5.5 mln ha?

EU Self-Sufficiency in biofuels

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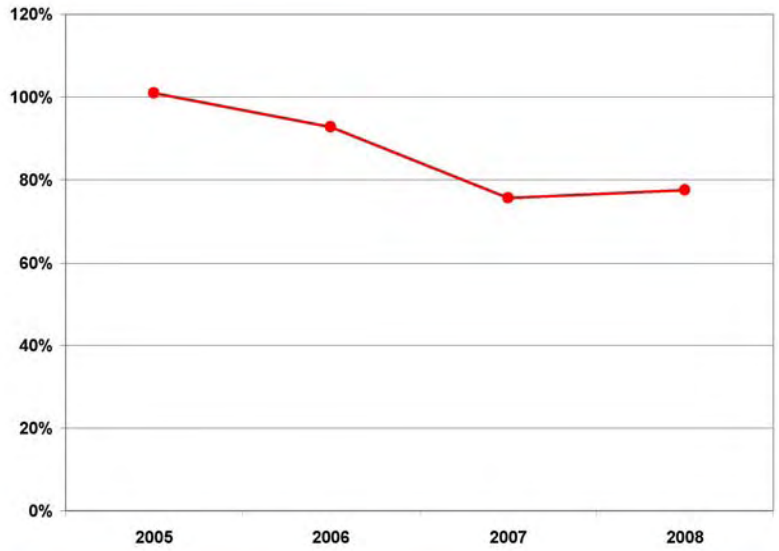

EU land use for two key biofuel feedstocks (mln ha)

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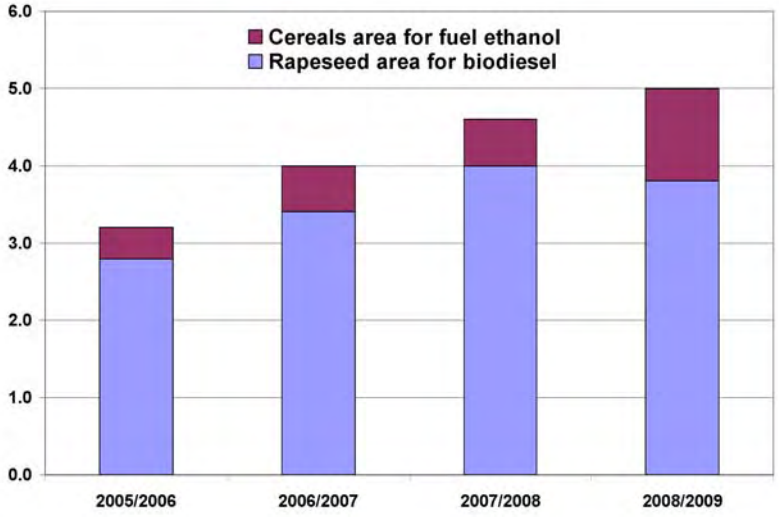

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Health Check: Energy Crop Premium

- Energy crop premium to be abolished
- very limited efficiency (equivalent to 15 €/t rapeseed, current market value is 250 €/t)
- Red tape = costs incurred by farmers
- provided about 2 Mtoe of bioenergy in its last year 2008/2009
- Main driver for production is the dynamic market development (due to political targets)

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Health Check: Compulsory Set-aside

- Abolish compulsory set-aside
- 3.7 million ha of compulsory set-aside, including about 1 million ha for non-food (2007)
- Half of the area came back into production

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CAP and EU arable land base

- The reform of the common market organisation for sugar: Sugar beet area is expected to stabilise at 1.6-1.7 mln ha, compared to 2.2 mln ha in 2005, before the start of the reform.
- Compulsory set-aside has been set to zero from 2008 onward, and has been abolished alltogether within the Health Check: This brought more than 2 mln ha back into cultivation
- In total, since 2006, policy reforms set free about the equivalent of half the area currently dedicated to biofuels production in the EU

CAP has set land free (mln ha)

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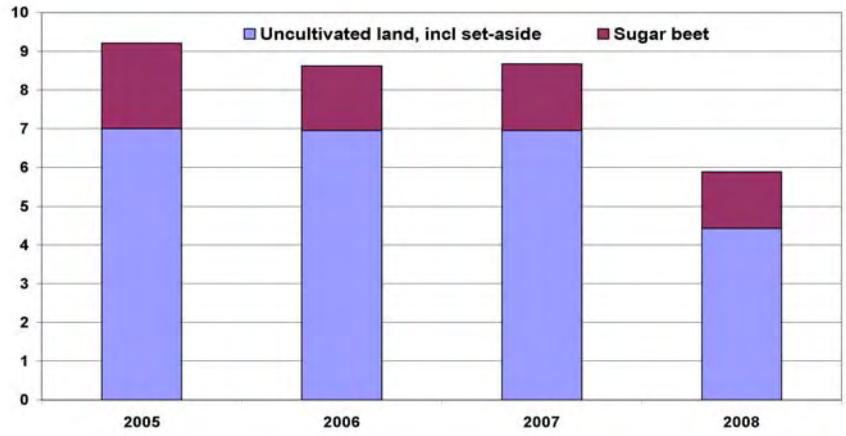

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Health Check

- Starch production aid abolished, for similar reasons as for the energy crop premium
- Intervention (obligatory purchase of grains to a guaranteed minimum price) is now limited to bread wheat only

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Rural Development Policy

- offers multiple possibilities for supporting the development of bioenergy:
- support to farmers for establishing perennial energy crops as raw material for bio-based products
- support for the development of infrastructures for processing of agricultural or forest biomass
- support for advisory services, training and information actions to disseminate knowledge on the bio-based economy and foster the development of activities
- encourages the cooperation between farmers, the raw materials processing industry and/or other parties through innovative approaches in developing new products, processes and technologies.
- The Health Check and the Recovery Package provide an additional funding of 4,4 billion EUR with which additional support for biomass projects can be financed.

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The reformed Common Agricultural Policy

- Provides for low-cost bio-based feedstocks (except sugar, ethanol)
- Increases the land base available
- Supports actions which increase biomass supply and use in rural areas through Rural Development policy
- Promotes innovation and new crops in RD policy

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Food versus Non-Food

- EU agriculture's first role is and will remain to produce food!
- The RE target for transport would require about 10-12 mln ha of EU arable land in 2020, much less than previous projections had expected.
- Recent CAP reforms bolster the impact on EU land use
- By-products soften the impact on third countries' land use
- Share of non land-based biomass sources will increase
- There is at least 4 mln ha of uncultivated arable land in the EU

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Next steps

- Sustainability scheme for other biomass: Report plus proposal by end 2009
- Transposition of RE Directive into national laws by December 2010
- Indirect Land Use Change: Report in 2010
- Communication on implementing the RE Directive by end of this year
- Report on RE Directive in 2012, plus corrective action

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Final conclusions

- Big uncertainty: Will EU biofuel production be able to hold its market share of about 77%? To what extent will EU biofuel production be based on domestic feedstocks?
- Pro: R&D leads to lower costs, to higher energy yields, to a broader feedstock base; reformed CAP leads to lower feedstock costs in the EU and increases land availability; anti-dumping measures
- Contra: Decreased border protection (WTO, EU-MERCOSUR agreement), tariff (re)classification, Argentina's differential export taxes

Appendix 5 - Presentation of ELOBIO results 1

Impacts of bio-fuel expansion on food system indicators and land use

Günther Fischer and Sylvia Prieler
Land Use Change and Agriculture Program
IIASA, Laxenburg, Austria.

ELOBIO 3rd Stakeholder Workshop
17 November 2009, Brussels

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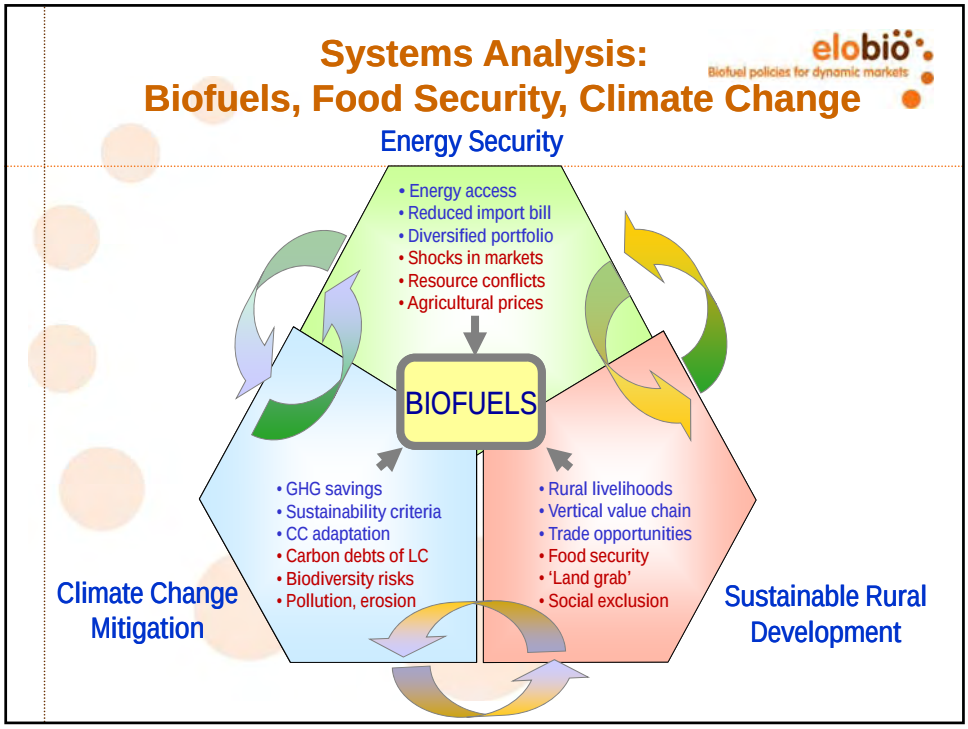
Outline

- Assessment framework of “Low disturbing biofuel policies” study
- Scenario assumptions
- Feedstock suitability assessment
- Impacts of biofuel expansion scenarios on food system indicators and resource use


Systems Analysis:
Biofuels, Food Security, Climate Change
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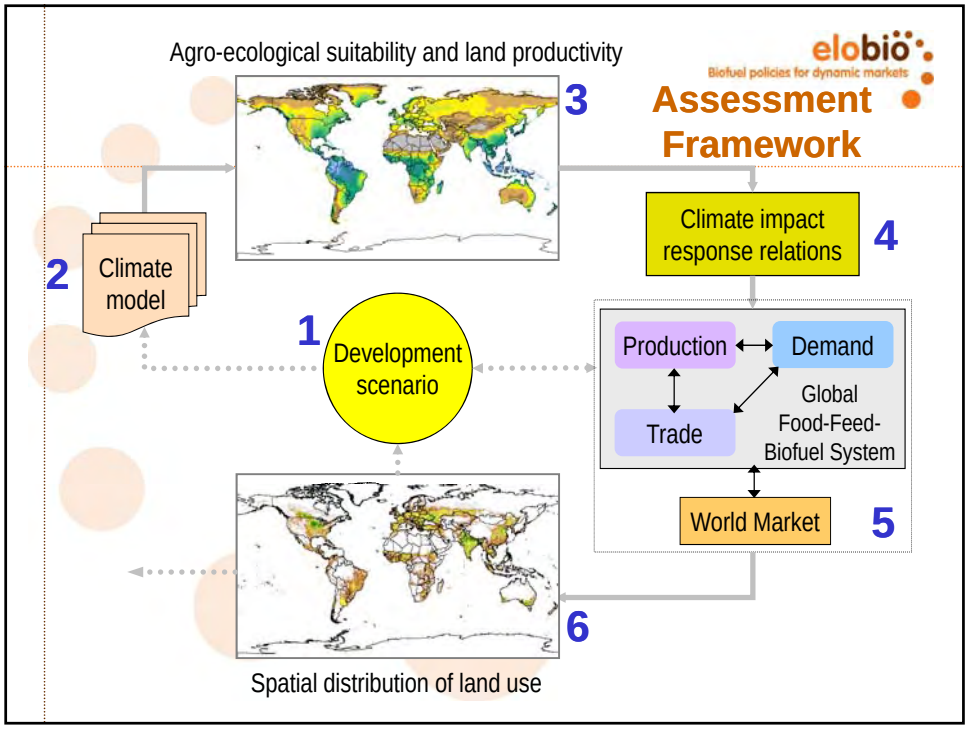
Energy Security
• Energy access
• Reduced import bill
• Diversified portfolio
• Shocks in markets
• Resource conflicts
• Agricultural prices
BIOFUELS
• GHG savings
• Sustainability criteria
• CC adaptation
• Carbon debts of LC
• Biodiversity risks
• Pollution, erosion
• Rural livelihoods
• Vertical value chain
• Trade opportunities
• Food security
• 'Land grab'
• Social exclusion
Climate Change Mitigation
Sustainable Rural Development


Agro-ecological suitability and land productivity
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Assessment Framework
3
2
Climate model
1
Development scenario
Climate impact response relations
4
Production
Demand
Trade
Global Food-Feed-Biofuel System
World Market
5
6
Spatial distribution of land use

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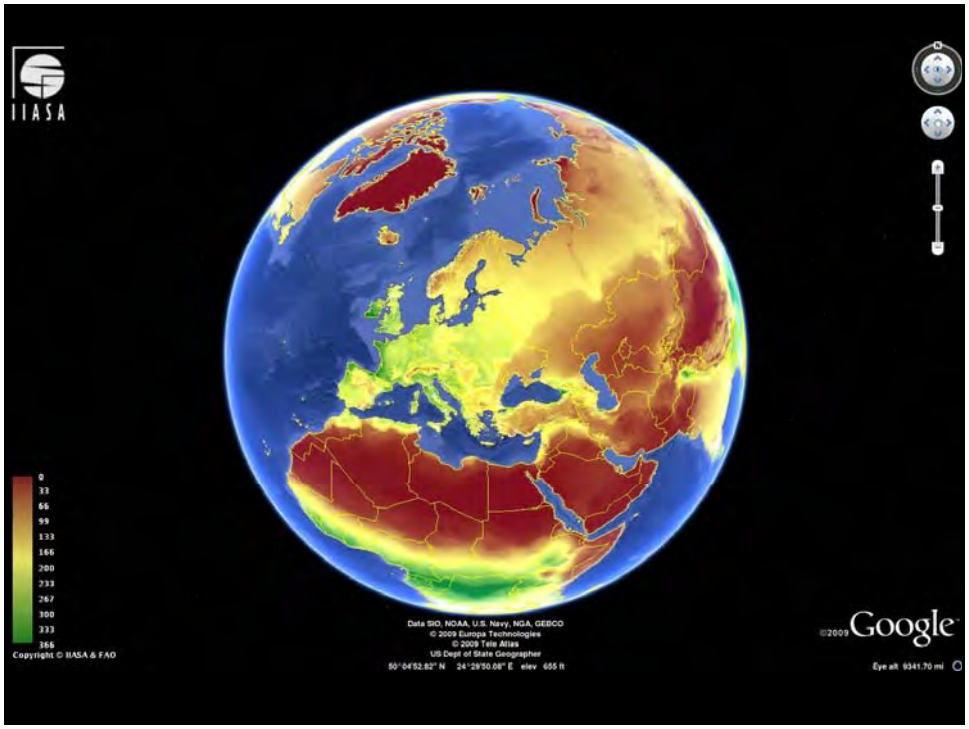
"Low disturbing biofuel policies"

Criteria for evaluation :

- Food security (Food insecure countries)
- Commodity price development (endogenous)
- Environment (Land use effects; Fertilizer use; GHG saving)
- Socio-economic (Rural income, Number of undernourished …)

Scenario simulations result in:

- Commodity price effects
- Land use effects
- Trade effects
- Agricultural income effects



Conceptual framework of Agro-ecological Zones methodology

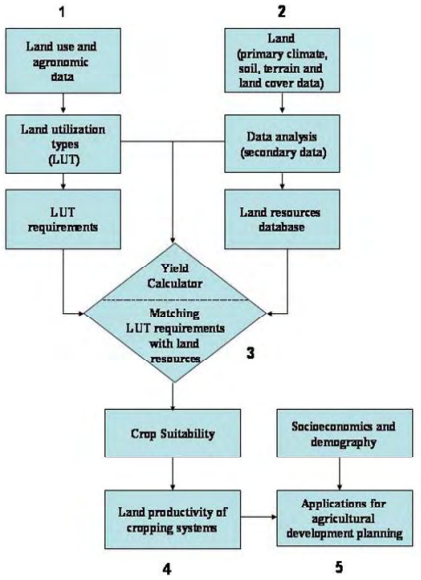
1. ***Land Utilization types (LUTs)*** - Selected agricultural production systems with defined input and management relationships, and crop-specific environmental requirements and adaptability characteristics. These are termed Land Utilization Types (LUT);

2. ***Land Resources database*** - Geo-referenced climate, soil and terrain data which are combined into a land resources database;

3. ***Crop biomass and yield and LUT requirements matching*** - Procedures for the calculation of potential yields and for matching crop/LUT environmental requirements with the respective environmental characteristics contained in the land resources database, by land unit and grid-cell;

4. ***Assessments of crop suitability and land productivity***, and

5. ***Applications for agricultural development planning***.



5

Bio-fuel Feedstocks

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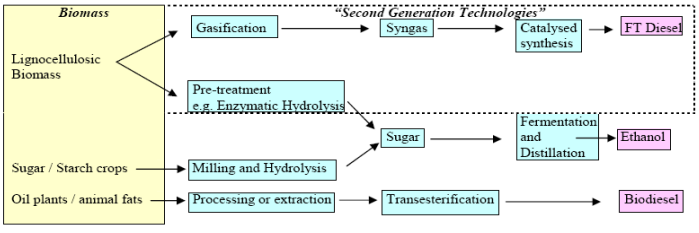
Feedstock groups:

- Oil crops
  Rapeseed; Sunflower; Soybean; Oilpalm; Jatropha
- Sugar crops
  Sugarcane; Sugar beet; Sweet sorghum
- Starch crops
  Wheat; Rye; Triticale; Maize; Sorghum; Cassava
- Herbaceous lignocellulosic plants
  Miscanthus; Switchgrass; Reed canary grass
- Woody lignocellulosic plants
  Poplar; Willow; Eucalyptus

Figure 1. Fuel production pathways



Source: adapted from BMU (2006) and Hamelinck and Faaij (2006)

Normalized agro-climatically attainable yield of rain-fed sugarcane

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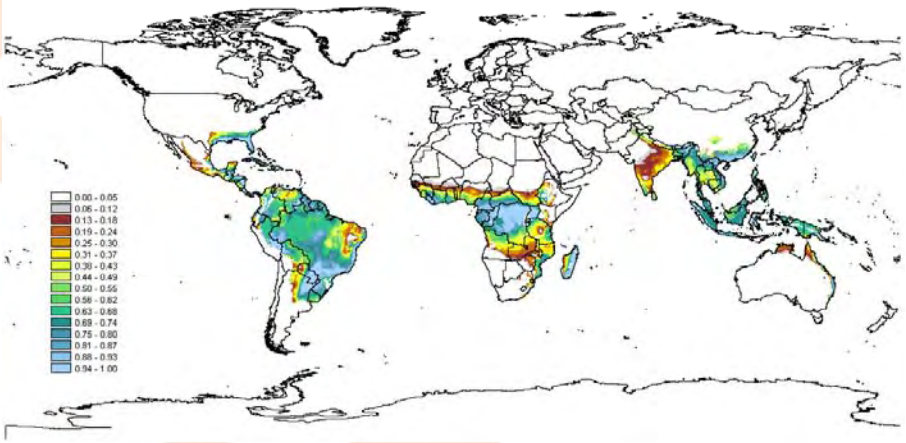

Note: Maximum attainable yields in this global map are about 15 tons sugar per hectare.

Suitability for rain-fed Jatropha production

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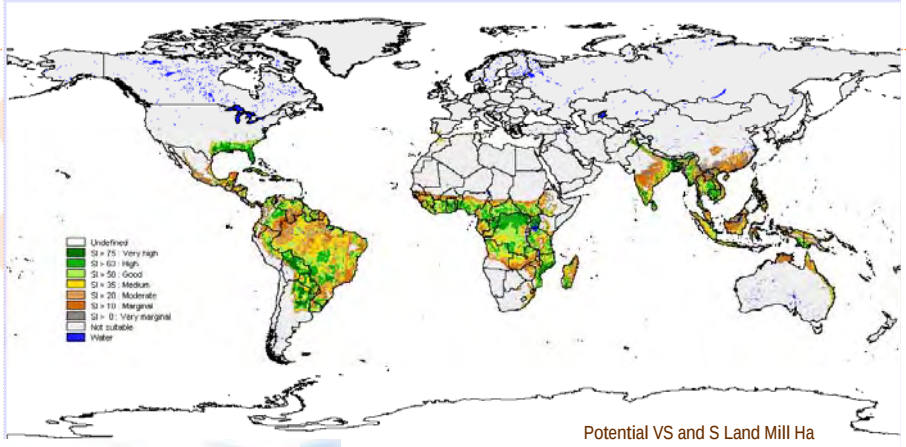
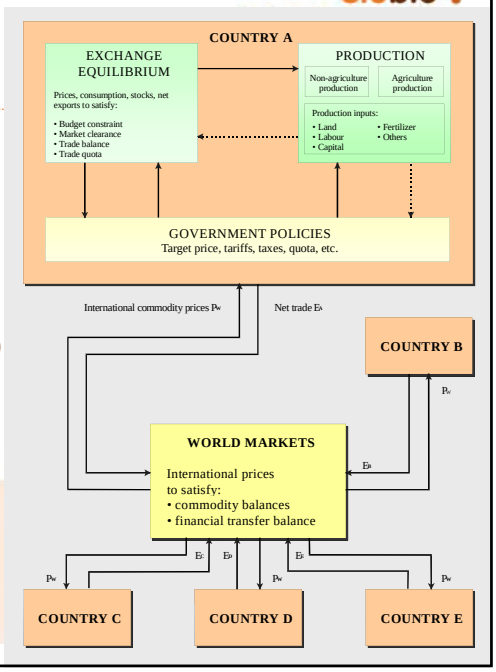


Potential VS and S Land Mill Ha

Jatropha	Developed	Developing
Current Land	17	286
Forests	28	348
Grasslands	6	264
Current Land	-	1.5

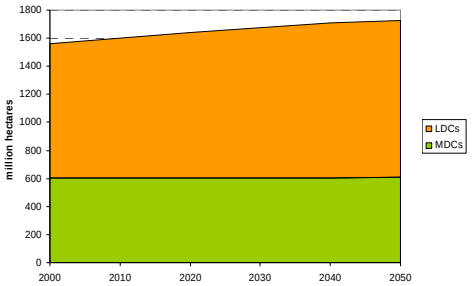
World Food System Model (WFS)

- NATIONAL models
  - 18 single country (US, Australia, Brazil, China, …)
  - EU-15, EU-12, Rest of Europe
  - 13 regional aggregates (e.g., African oil exporters; Africa medium income food exporters,...)
- WORLD MARKET EXCHANGE MODULE: links national models through trade, world market price, and financial flows

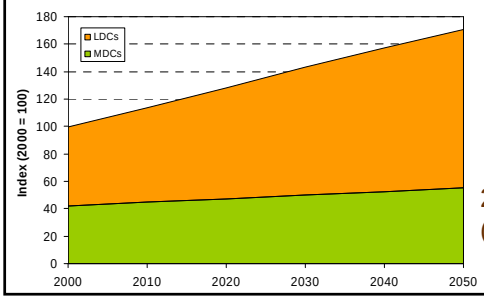


Food & Agriculture Outlook (Reference)

Growth of:	2000-2050
Population	50%
Arable land	11%
Cereal production	60%
Ruminant meat	65%
Other meat	80%
Agriculture	72%



1. Cultivated land, 2000-2050



2. Index of agricultural production (2000=100), 2000-2050

Source: LUC World food system simulations, IIASA (2009).

Final consumption of biofuels in the WEO scenario

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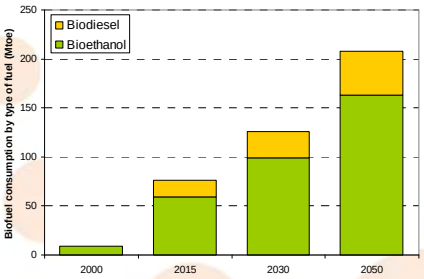
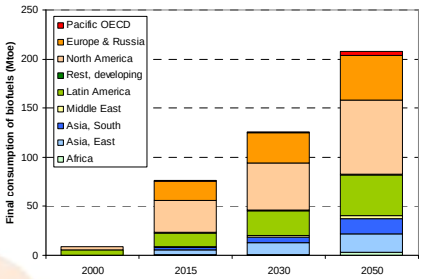
a) Consumption by type of biofuel



b) Consumption by region



Biofuels in 2020 and 2030

Million Tons Oil Equivalent

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	TARGET V1		TARGET V3	
	2020	2030	2020	2030
Developed Countries				
Transport Fuels	1505	1486	1505	1486
1st Generation Biofuels	113	146	79	87
2nd Generation Biofuels	5	32	39	91
Biofuels in Transport Fuel	8%	12%	8%	12%
Developing Countries				
Transport fuels	1174	1529	1174	1529
1st Generation Biofuels	72	112	69	94
2nd Generation Biofuels	0	4	2	22
Biofuels in Transport Fuels	6%	9%	6%	9%

United States, European Union, Japan, Canada, Australia ...
Brazil, China, India, Indonesia, Thailand, South Africa ...

Sensitivity Scenarios

First-generation biofuels assumed in sensitivity scenarios:

Scenario	Share in total transport fuels (percent)			1st generation biofuel consumption (Mtoe)		
	2020	2030	2050	2020	2030	2050
SNS-V1	2	2.5	3	54	76	106
SNS-V2	4	5	6	107	151	211
SNS-V3	6	7.5	9	161	227	317
SNS-V4	8	10	12	214	302	423

WFS Simulations of Biofuel Scenarios

Supply representation:

- Conventional agricultural commodities (1st generation) to be used are wheat, coarse grains, vegetable oil, sugar crops, root crops; -> conversion coefficients from WFS commodity to biofuel/energy equivalent;
- Energy demand portfolio (ethanol vs. biodiesel; 1st vs 2nd generation) prescribed as scenarios;
- Production of co-products -> input to feed/other markets;
- Impacts of biofuels on food and feed markets via competition for feedstocks, generation of co-products, price effects, and resource use;

Biofuels and Food Security

Mitigate Climate Change, Enhance Energy Security, Foster Rural Development

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RESULTS

Social, environmental, economic impacts and implications of biofuels developments on transport fuel security, climate change mitigation, agricultural prices, food security, land use change and sustainable agricultural development




Impacts of first-generation biofuels on agricultural prices

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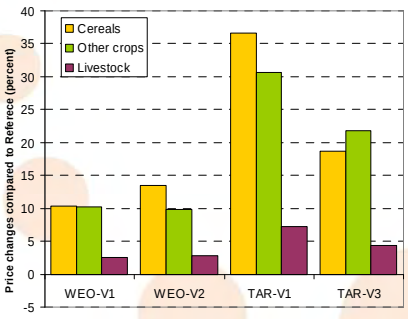
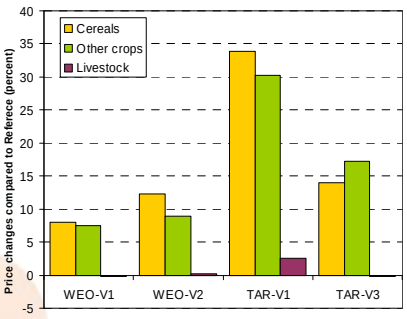
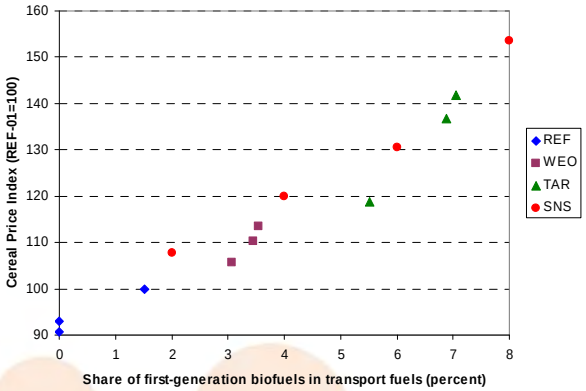
a) In 2020 (% change)



b) In 2030 (% change)



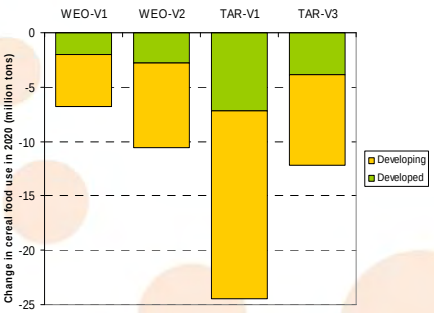
Cereal price index versus share of first-generation biofuels in transport fuels, in 2020



Note: SNS = sensitivity scenarios; TAR = scenario simulations based on mandates and indicative voluntary targets; WEO = simulations based on WEO 2008 projections of biofuel demand; REF = reference projections with constant, decreasing or no biofuel demand beyond 2008).

Change of cereal use relative to baseline REF-01, in 2020

a) Change in direct food use

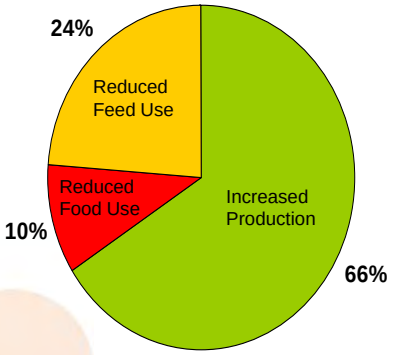


b) Change in feed use

Where do the cereals needed for biofuel production come from?

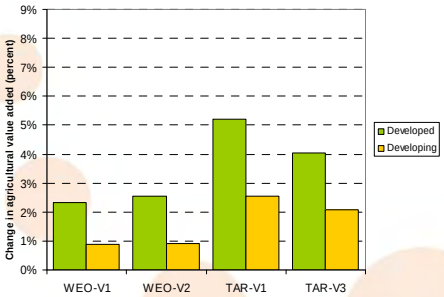
On average about two-thirds of the cereals used for ethanol production are obtained from additional crop production.

The remaining one-third comes from consumption changes. The reduction in direct cereal food consumption accounts for ten percent of the amount of cereals used for biofuel production, reduced feed use accounts for about a quarter.

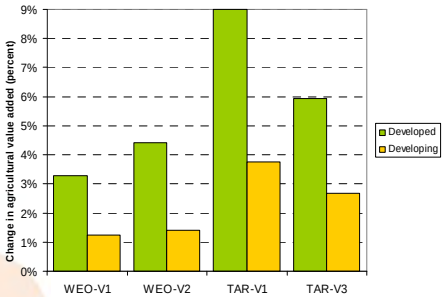


Change in agricultural value added relative to baseline REF-01

a) Percentage change in 2020



b) Percentage change in 2030



Additional use of cultivated land and harvested area in 2020 and 2030

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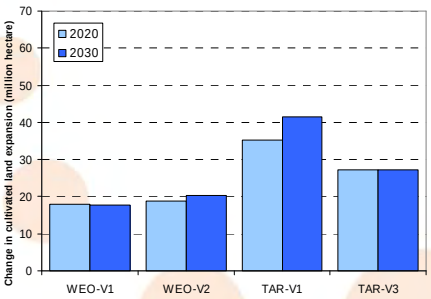
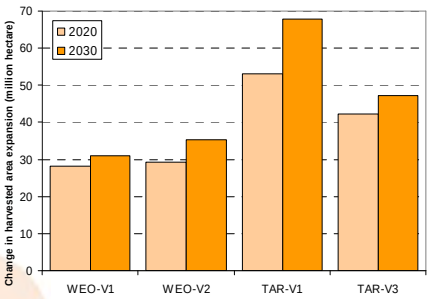
a) Additional cultivated land



b) Additional harvested area



Cultivated land use versus share of first-generation biofuels in transport fuels

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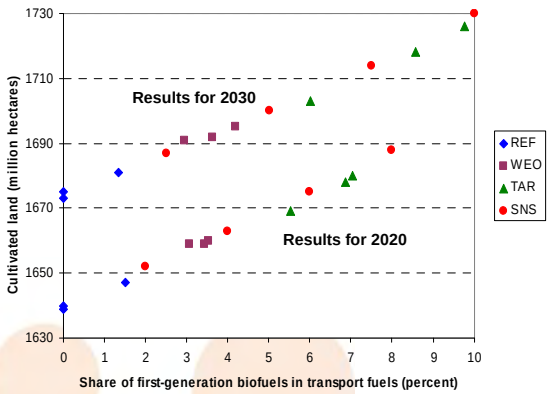


Agricultural Land Conversion

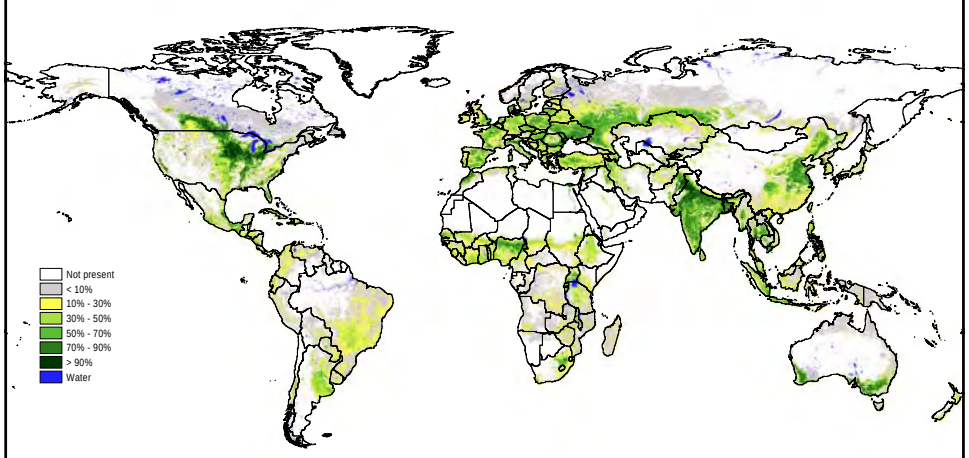
Develop a robust and flexible method for generating spatially detailed projections of agricultural land use, which:

- reflect assumed scenario context,
- make best use of available global data sets,
- take account of different land qualities and current distribution of ecosystems,
- respect protected areas and land use limitations,
- reproduce base-year land use distribution,
- allow to test policy alternatives, and
- are fully consistent with scenario simulations of aggregate world food system model.

Agricultural Land Conversion

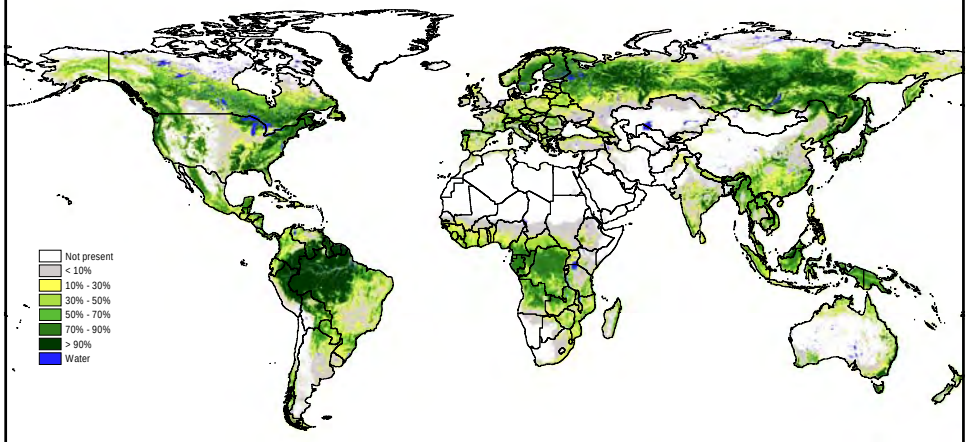
1. For each 10-year period, solve series of multi-criteria problems for 35 aggregate regions, subject to gross land demand and various constraints:
   - gross land conversion in period
   - resource availability (max. share available)
   - suitability for cropping; land productivity
   - legal land use limitations (i.e. protected areas)
   - ecosystem conversion suitability/propensity
   - land accessibility (distance from agricultural activities in period t-1).
2. Criteria depend on whether there is a gross increase (e.g., Brazil, sub-Saharan Africa) or gross decrease (e.g. Japan, Europe) of cultivated land.

Spatial Distribution and Intensity (percent) of Cultivated Land, year 2000

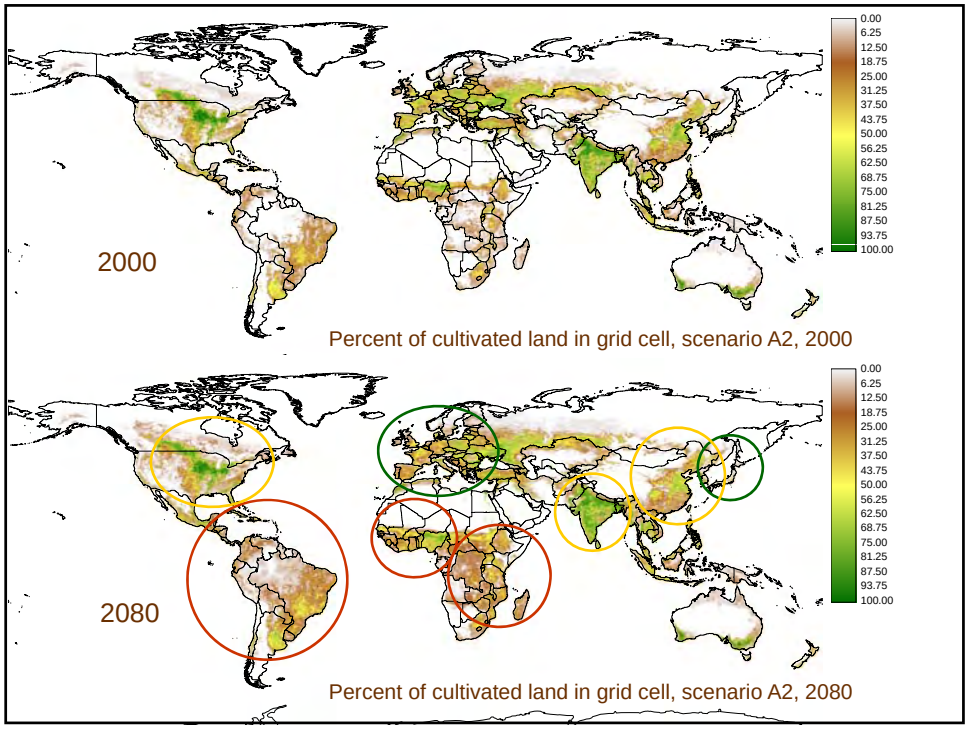


Note: calibration of GLC2000 class weights starts from estimated reference weights and is based on an iterative scheme to match national / sub-national statistics of year 2000 (FAO AT2015/2030 adjusted cultivated land).

Spatial Distribution and Intensity (percent) of Forests, year 2000



Note: calibration of GLC2000 class weights starts from estimated reference weights and is based on an iterative scheme to match national / sub-national statistics of year 2000 (FRA2000 and FRA2005).



Additional forest conversion in different biofuels scenarios

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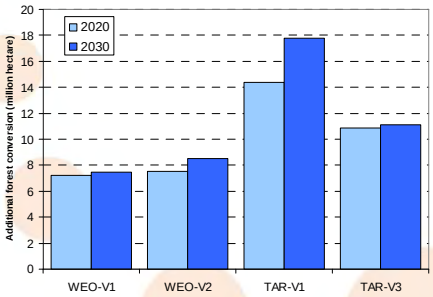
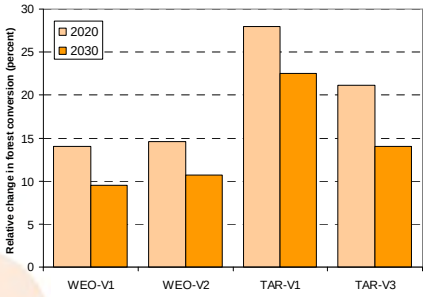
a) Additional forest conversion (Mha)



b) Relative increase of forest conversion (%)



Nitrogen fertilizer use in biofuel scenarios

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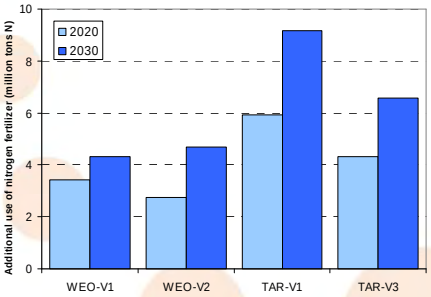
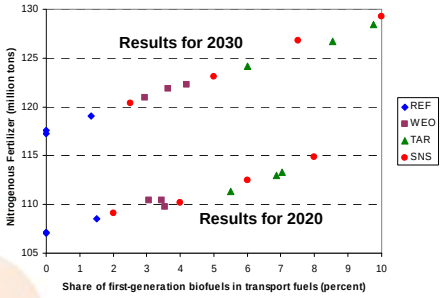
a) Additional use in 2020 and 2030



b) Fertilizer use vs. 1st generation biofuel share in transport



Large differences in GHG emissions ...

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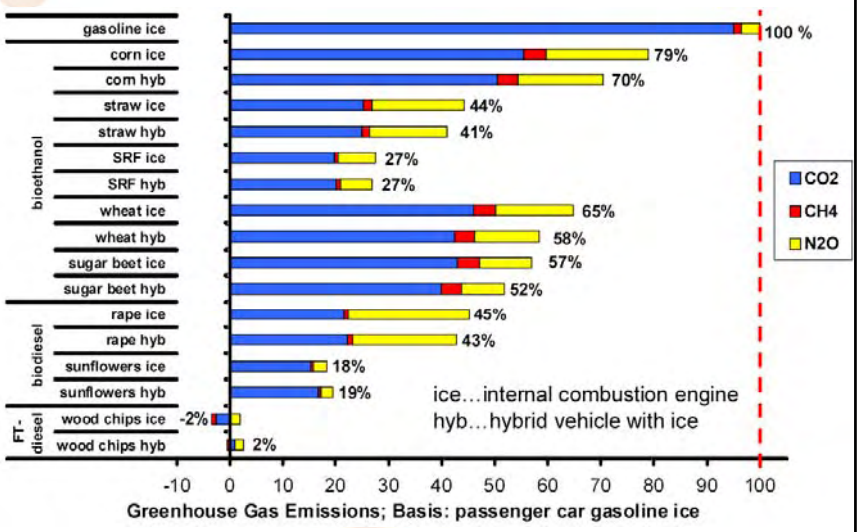
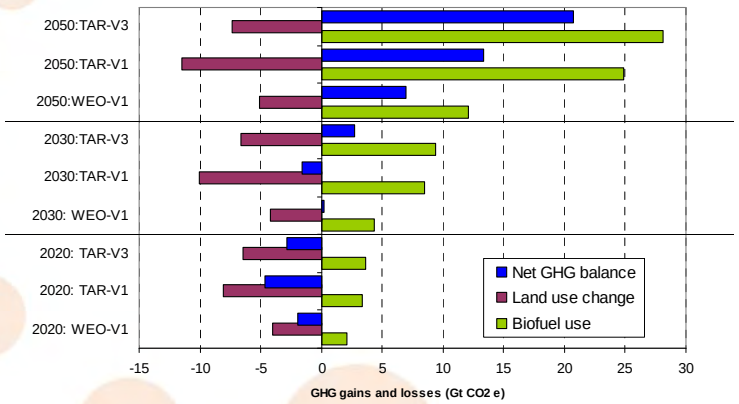


Net greenhouse gas savings achieved in selected biofuels scenarios



Note: computations for first-generation biofuels are based on greenhouse gas saving coefficients in Commission of the European Communities (2008) & IPCC Tier 1 approach for carbon losses due to land use changes (IPCC, 2006). For second-generation biofuels a greenhouse gas saving of 85 percent was used.

In summary …

- Strong increases in global demand for agricultural products, about 45 percent in 2030 and 70 percent in 2050 compared to 2000.
- Expected increasing integration of agriculture, forestry and energy sectors through land competition for biomass.
- Limited availability of additional high-quality land for 4F sectors; uncertainty regarding viability of using marginal land.
- Growing risks of yield damage due to extreme weather episodes; widespread negative climate change impacts after middle of century.

Policies to encourage …

- Maintaining high potential land in good conditions to facilitate sustainable production increases.
- Promoting integrated cross-sector approaches to land use planning and regulation to minimize impacts/competition for ‘food’ land.
- Enabling market signals to guide efficient allocation of scarce resources.
- Applying strict sustainability criteria, regulation and monitoring to protect land and safeguard vital ecosystem services.

Policy challenges …

- Renew and sustain efforts to enhance agricultural productivity.
- Protect the poor against impacts of rising and more volatile agricultural prices.
- Promote GHG-efficient technologies.
- Establish and encourage sustainability criteria and “best practice guides” for land use.
- Foster equitable partnerships; establish “new code of conduct”.
- Develop comprehensive and consistent national and global energy strategies.

Additional ELOBIO scenario analyses prompted by stakeholder responses …

- Impacts of yield gap reduction and growth of agricultural productivity
- Impact of biofuel co-product use on iLUC
- Impact of land use restrictions on food system indicators and GHG balance
- Impact of prioritizing crop residues and wastes as bio-fuel feedstocks
- Biofuels and food system volatility; system response to shocks.

Specific topics for discussion …

- Agricultural prices and food security – issues and policy options
- Agricultural productivity – growth and sustainability; implications for biofuel expansion
- Land use change, GHG savings, competition for resources

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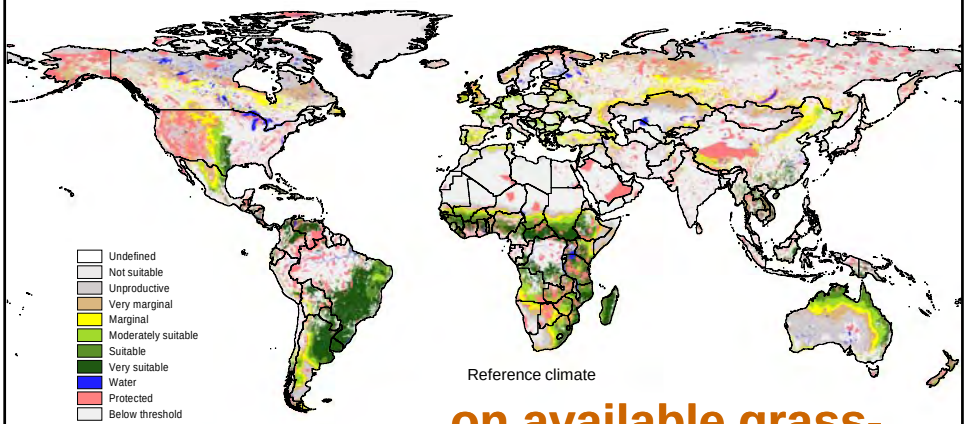
http://www.iiasa.ac.at/Research/LUC

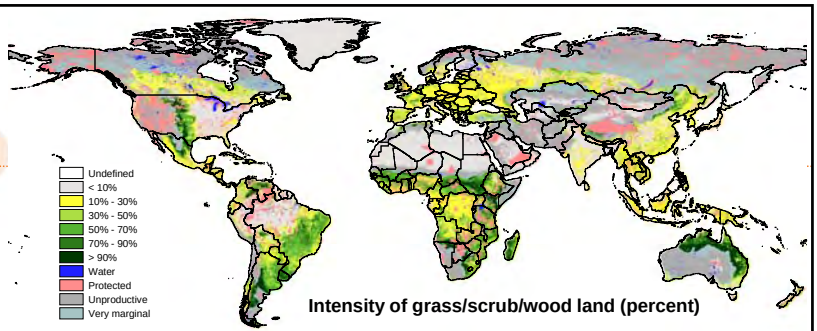
Climatic suitability for herbaceous and woody lignocellulosic plants …



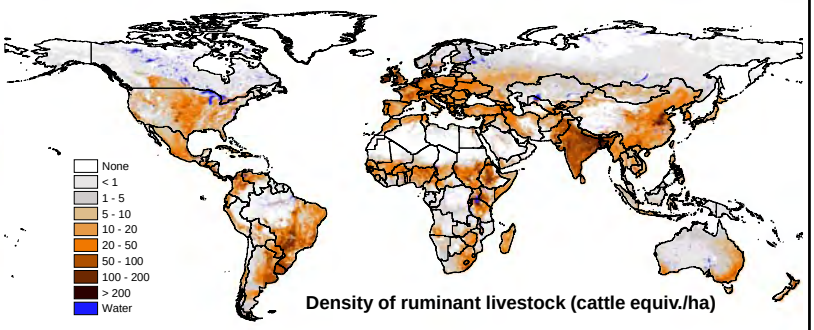
Reference climate

… on available grass-scrub-wood land

Source: GAEZ 2007, IIASA-LUC/FAO



Intensity of grass/scrub/wood land (percent)



Density of ruminant livestock (cattle equiv./ha)

Source: GAEZ 2007, IIASA-LUC/FAO and FAO, 2005.

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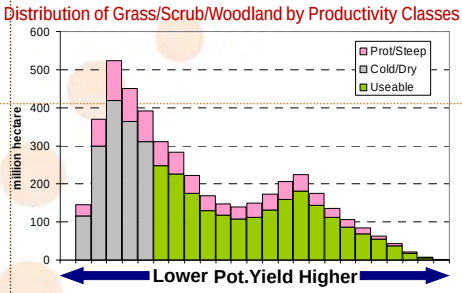
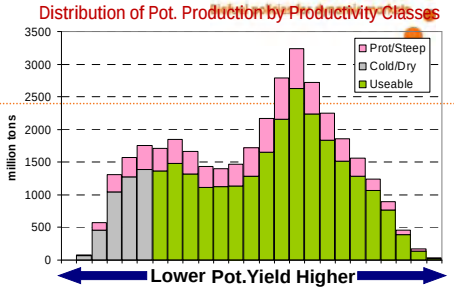
Distribution of Grass/Scrub/Woodland by Productivity Classes

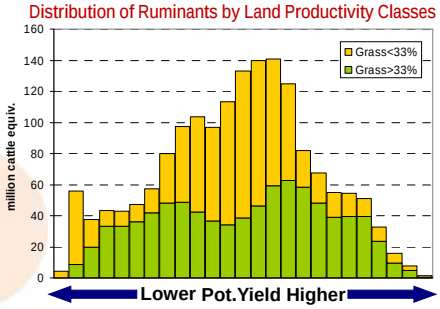


Distribution of Pot. Production by Productivity Classes



- The charts show the distribution of grass-scrub-wood-land areas and potential production by bio-productiviy class.
- Protected land and land with steep slopes is shown in red; Very low productive areas are indicated as grey.
- Number of cattle, sheep and goat is shown by bio-productivity class respectively for areas where grass/scrub/woodland cover exceeds 1/3 of total (green) and for less than 1/3 (yellow).

Distribution of Ruminants by Land Productivity Classes



Share of biofuels in final consumption of total transport fuels

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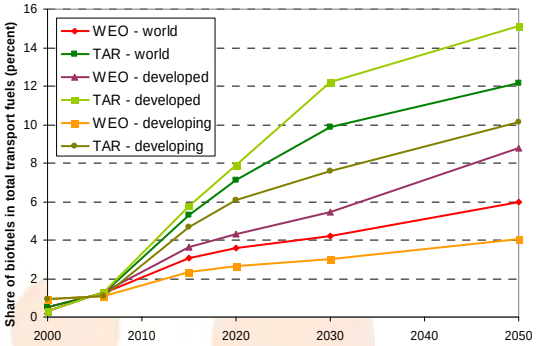
Share of biofuels by scenario and region :



Biofuel scenarios by type of technology and by broad regions

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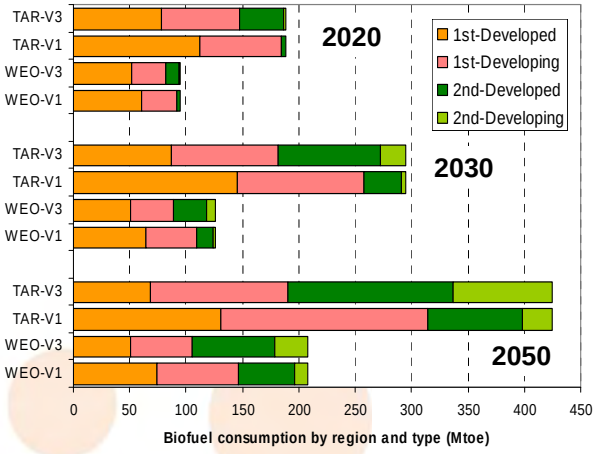

Final consumption of biofuels in the TAR scenario

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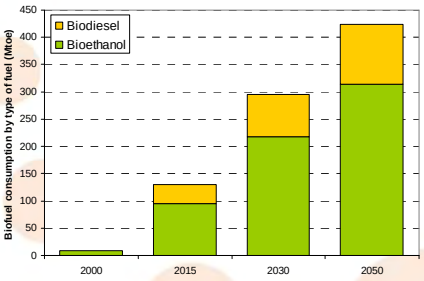
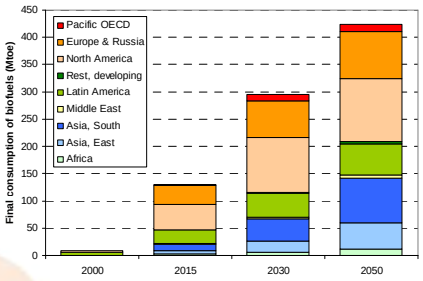
a) Consumption by type of biofuel



b) Consumption by region



Impacts of first-generation biofuels on agricultural prices in 2020

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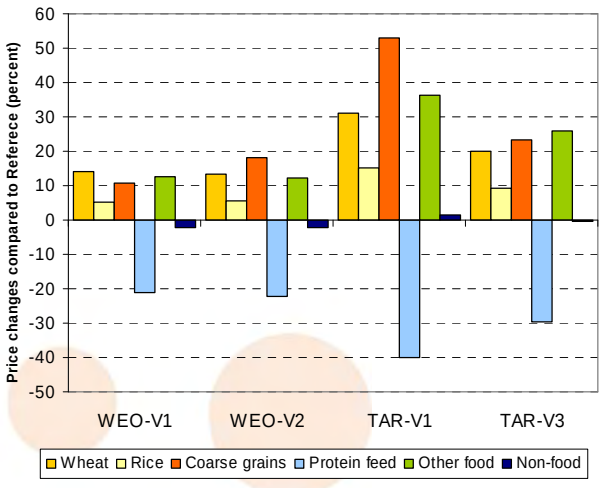
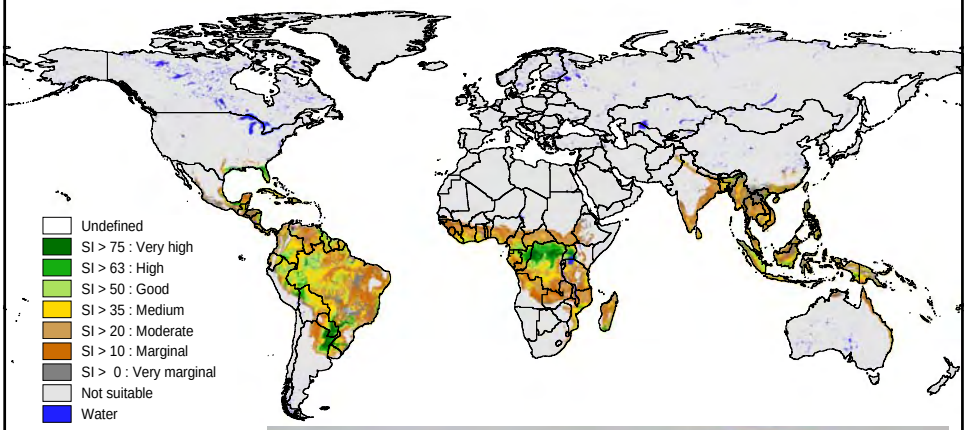
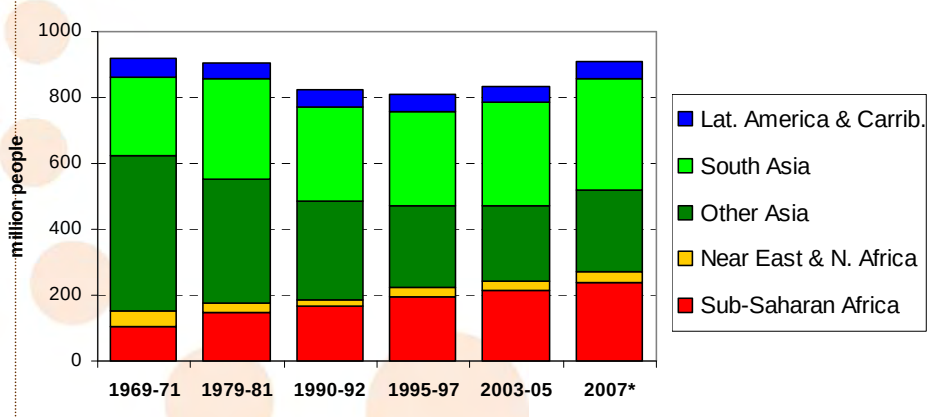


Suitability for rain-fed Sugar cane production, high input level



Potential VS and S Land
Current Land 135 Mill Ha
Forests 228 Mill Ha
Grasslands 87 Mill Ha
Current Sugarcane Land 22 mill Ha (Brazil + India 50%)

Historical trends in number of undernourished people, developing countries



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Risk of hunger in REF-01 and TAR-V1 scenarios

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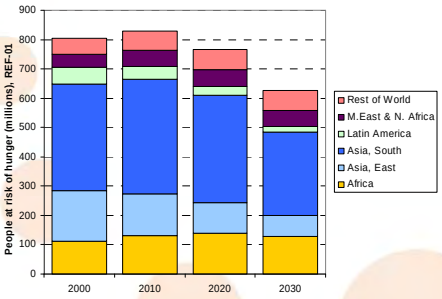
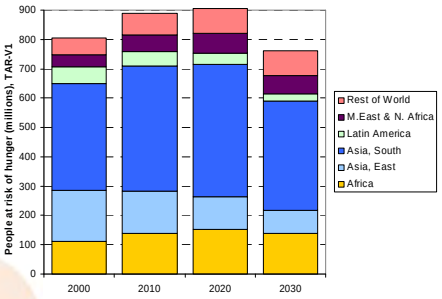
a) Scenario REF-01



b) Scenario TAR-V1



People at risk of hunger versus share of first-generation biofuels in total transport fuels

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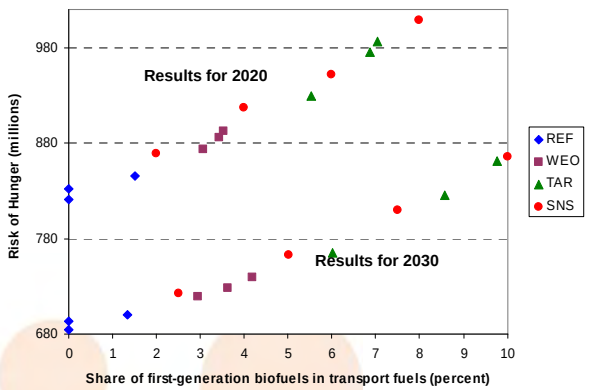
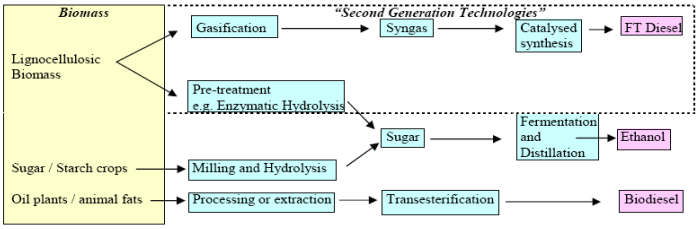


Bio-fuel Feedstocks

Feedstock groups

- Oil crops
  Rapeseed; Sunflower; Soybean; Oilpalm; Jatropha
- Sugar crops
  Sugarcane; Sugar beet; Sweet sorghum
- Starch crops
  Wheat; Rye; Triticale; Maize; Sorghum; Cassava
- Herbaceous lignocellulosic plants
  Miscanthus; Switchgrass; Reed canary grass
- Woody lignocellulosic plants
  Poplar; Willow; Eucalyptus

Figure 1. Fuel production pathways



Source: adapted from BMU (2006) and Hamelinck and Faaij (2006)

Role of biofuel feedstocks in global land use in 2007

	Cultivated Land	Total harvested area of six* major crops		Harvested area for biofuel use	
	Mill. Ha	Mill. Ha	%	Mill. Ha	%
N. America	230	75	33	11.4	5.0
Europe & Russia	305	24	8	7.2	2.4
Oceania	53	2	3	0.4	0.8
Asia	559	105	19	1.8	0.3
Africa	244	48	20	0.2	< 0.1
C. America	43	12	28	0.2	0.5
S. America	129	71	55	4.0	3.1
Developed	591	101	17	18.9	3.2
Developing	972	237	24	6.2	0.6
World	1563	338	22	25.1	1.6

*Sugar cane, maize, cassava, oil palm, rape, soybean.

Final consumption of biofuels in the TAR scenario

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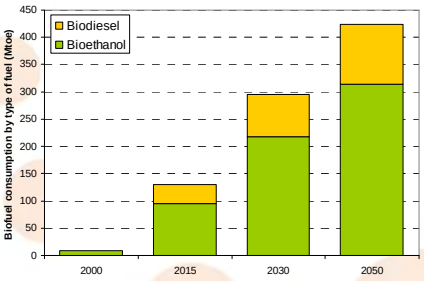
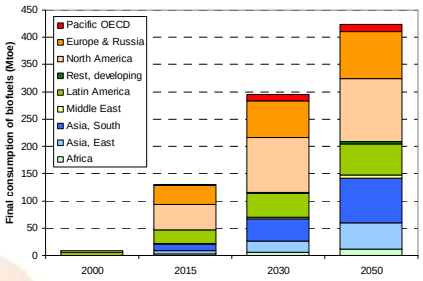
a) Consumption by type of biofuel



b) Consumption by region



Scenario variants for share of second-generation biofuels in total

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Scenario variant	Region	Assumed share of second-generation ethanol in total bioethanol (%)			
		2015	2020	2030	2050
WEO-V1, TAR-V1	United States	Starts	7.5	25	50
	Other OECD	None	Starts	12.5	33
	Russia	None	Starts	5	20
	Brazil/China/India	None	Starts	5	20
	Other developing	None	None	None	None
WEO-V2, TAR-V2	All countries	None	None	Starts	10
WEO-V3	United States	10	24	40	66
	EU-27	None	10	33	50
	Other OECD	None	10	33	50
	Russia	None	5	20	40
	China/India	Starts	5	20	40
	Other developing	0	0	10	20
TAR-V3	United States	10	35	55	70
	EU-27	10	31	47	67
	Other OECD	10	31	47	67
	Russia	Starts	10	33	50
	China/India	Starts	10	33	50
	Other developing	0	Starts	10	33

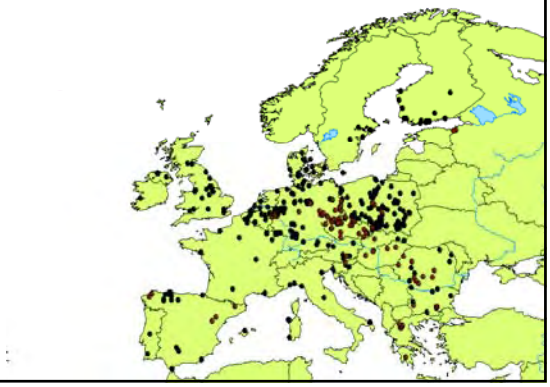
Appendix 6 - Presentation of ELOBIO results 2

Food sector impacts: stationary energy sector

Example of repowered power plant: FB boilers in Turow (Bogatynia), Poland

Food sector impacts: stationary energy sector

- How large is the stationary sector?
- How much can it pay for the biomass?



Food sector impacts: stationary energy sector

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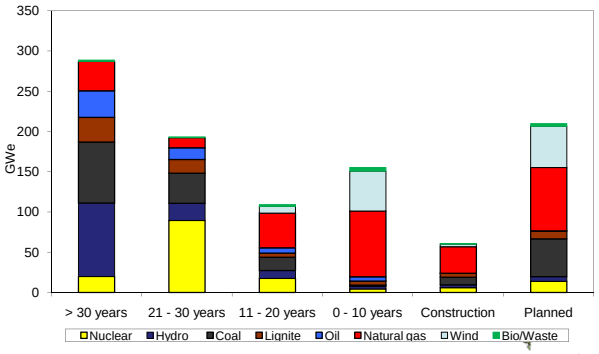

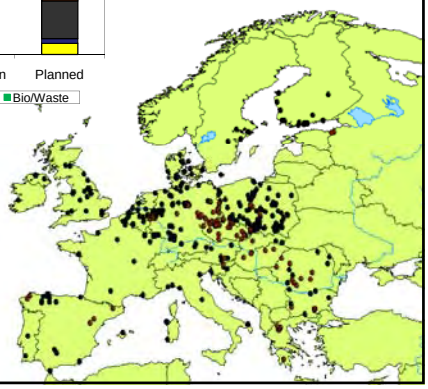

Food sector impacts: stationary energy sector

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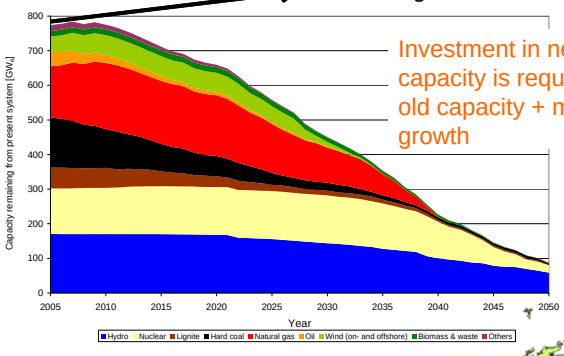
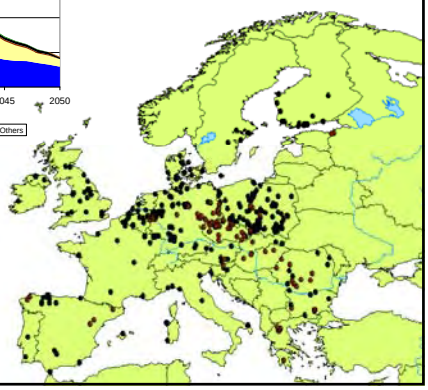
Demand growth?

Investment in new generation capacity is required for replacing old capacity + meeting demand growth





Food sector impacts: stationary energy sector

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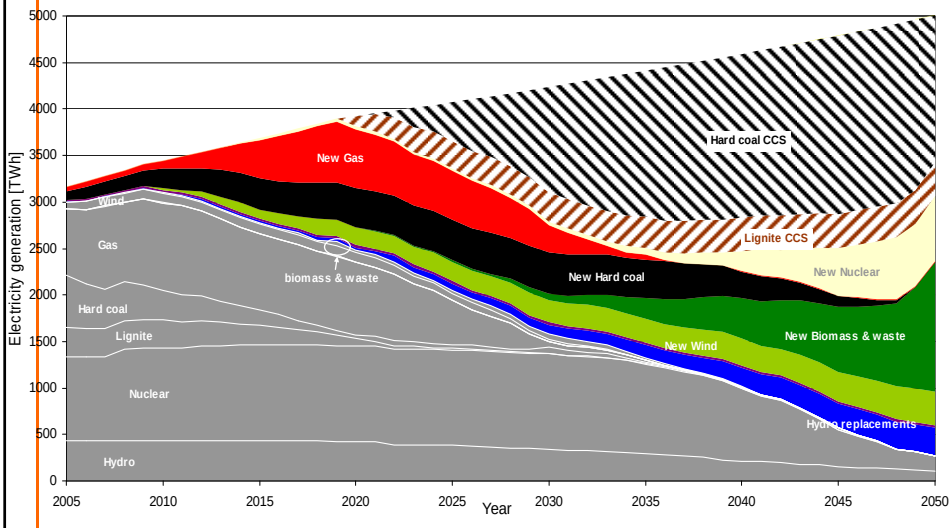
CCS – Pathway for EU-27 (plus Norway)

30% CO_2 emission reduction by 2020 and 85% by 2050



Food sector impacts: stationary energy sector

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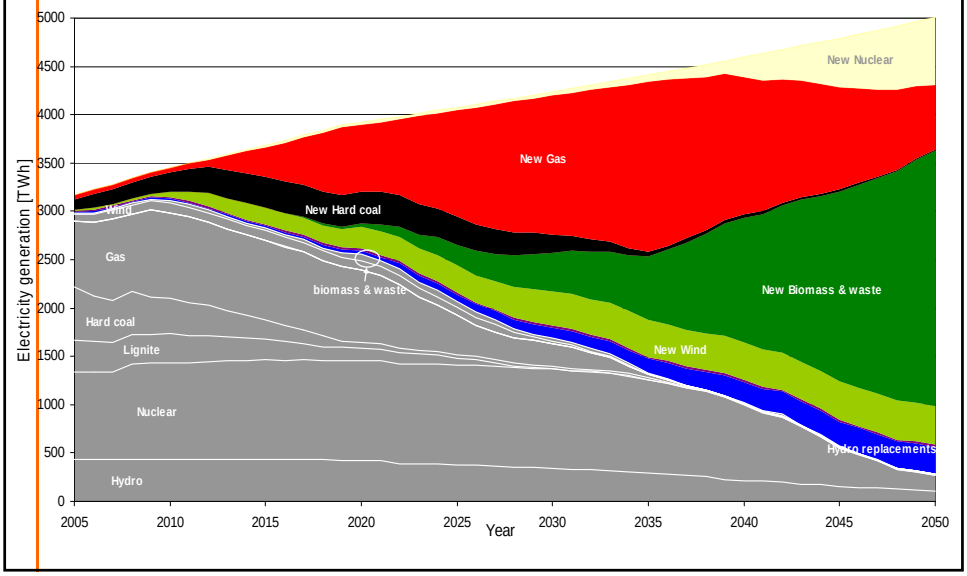
No CCS – Pathway for EU-27 (plus Norway)

30% CO_2 emission reduction by 2020 and 85% by 2050



Food sector impacts: stationary energy sector

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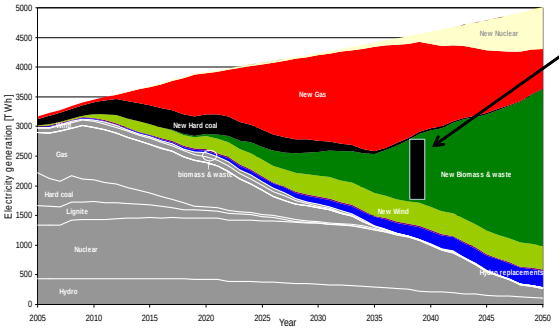
Magnitude implications…



1000 TWh requires about 9 EJ of biomass at 40% conversion efficiency

Comparison:
- EU25 ind. roundwood: ca. 6 EJ
- EU 25 cereals: 4-5 EJ
- Agri residue pot: 3-4 EJ
- 10 ton dm/ha on 60 Mha: 12 EJ

Food sector impacts: stationary energy sector

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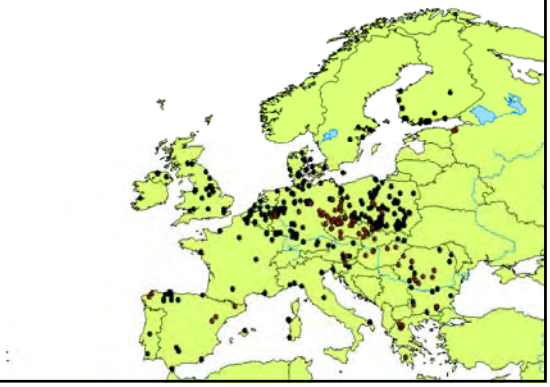
- How large is the stationary sector? LARGE!
- How much can it pay for the biomass?



Food sector impacts: stationary energy sector

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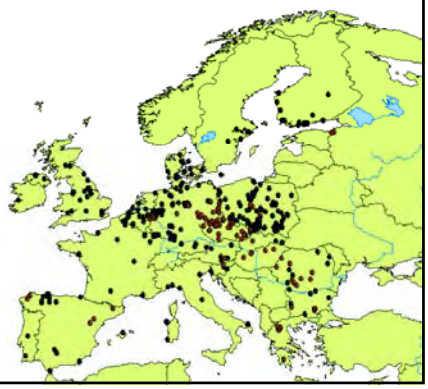
Paying capacity for biomass

•Calculation of paying capacity for biomass for prospective marginal biomass users in the stationary energy sector (condensing fossil power plants w/wo CCS)



Food sector impacts: stationary energy sector

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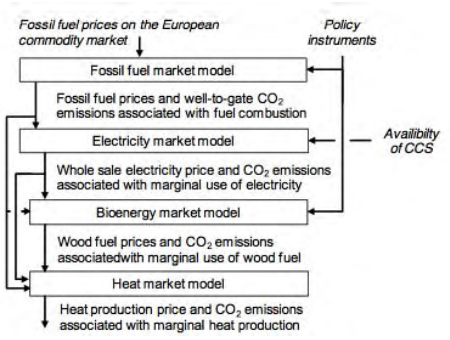
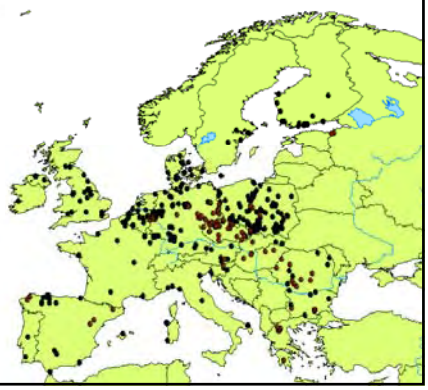
Paying capacity for biomass





Food sector impacts: stationary energy sector

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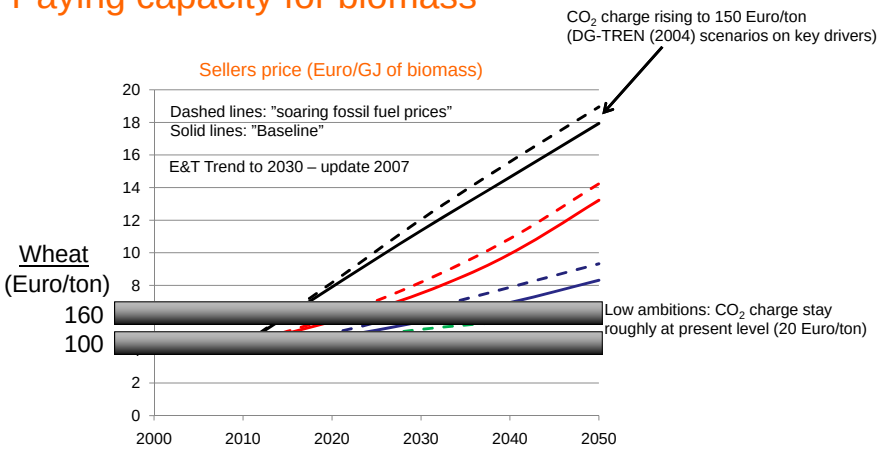
Paying capacity for biomass



Food sector impacts: stationary energy sector

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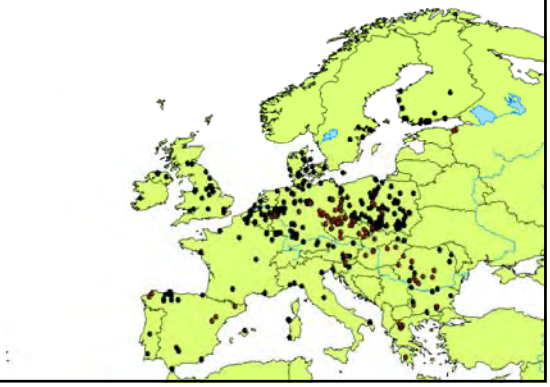
- How large is the stationary sector? LARGE!
- How much can it pay for the biomass? A LOT!



Food sector impacts: stationary energy sector

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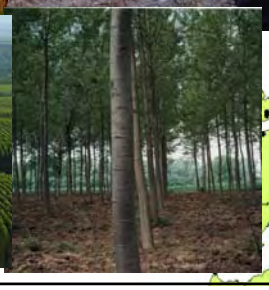

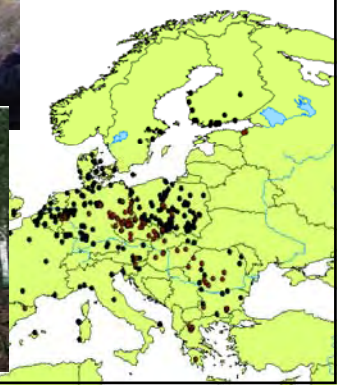

Food sector impacts: stationary energy sector

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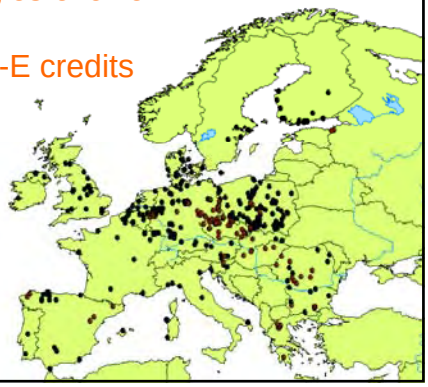
- How large is the stationary sector? LARGE!
- How much can it pay for the biomass? A LOT!

- Depends on how other technologies evolve
- CCS ramp up capacity crucial
- Sensitive to CO_2 prices and RES-E credits



Food sector impacts: stationary energy sector

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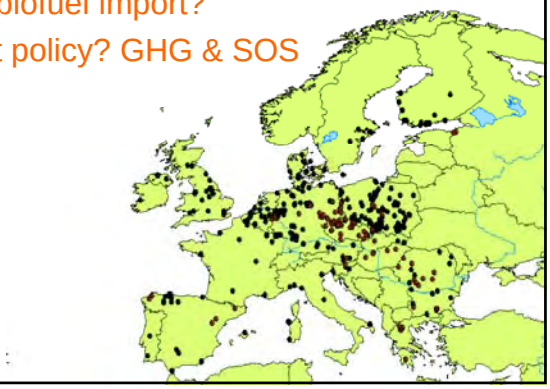
- Topics for discussion...
  - Stationary sector as early market – also long term market (policy for stationary energy influence biofuels)
  - Combine biofuel production with heat/power to capture synergies (efficiency requirements in policy)
  - Large scale biomass/biofuel import?
  - Reformulate transport policy? GHG & SOS
  - Regulate land use?



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Food sector impacts: stationary energy sector

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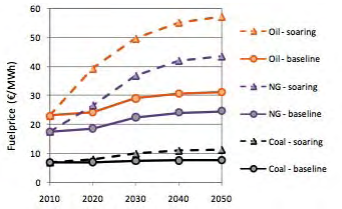
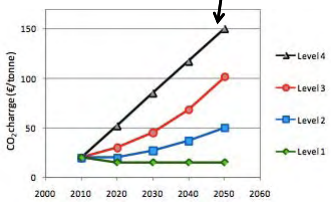
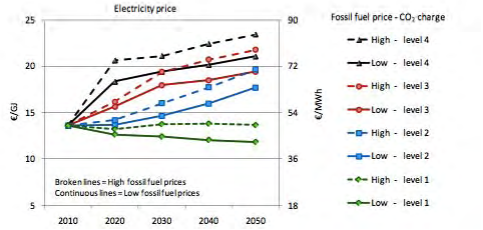
Paying capacity for biomass

E&T Trend to 2030 – update 2007



DG-TREN (2004) scenarios on key drivers





Food sector impacts: stationary energy sector

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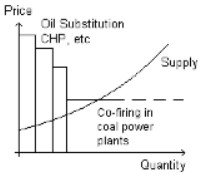
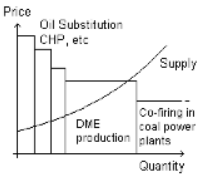
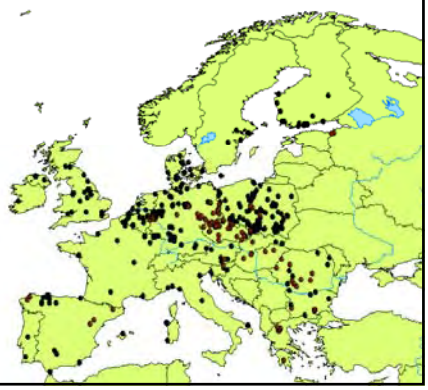
Marginal price setting biomass users







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Break-even wood chips cost for a willow grower (no risk premium in this table)

Wheat yield (ton/ha)	Wheat price (Euro/ton) 100	110	120	130	140	150	160
4	5,6	5,6	5,6	5,6	5,6	5,6	5,6 Euro/GJ
5	5,0	5,0	5,0	5,0	5,0	5,4	5,9
6	4,6	4,6	4,6	4,7	5,2	5,7	6,2
7	4,4	4,4	4,4	4,9	5,4	5,9	6,4
8	4,2	4,2	4,5	5,1	5,6	6,1	6,6
9	4,0	4,2	4,7	5,2	5,7	6,2	6,8
10	3,9	4,3	4,8	5,3	5,8	6,3	6,9
11	3,8	4,4	4,9	5,4	5,9	6,4	6,9

Appendix 7 - Presentation of ELOBIO results 3

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Risk and investment in 2nd generation biofuels

Tjaša Bole
Energy Research Centre of the Netherlands

Elobio stakeholder consultation

Brussels, November 2009

ECN

Intelligent Energy Europe

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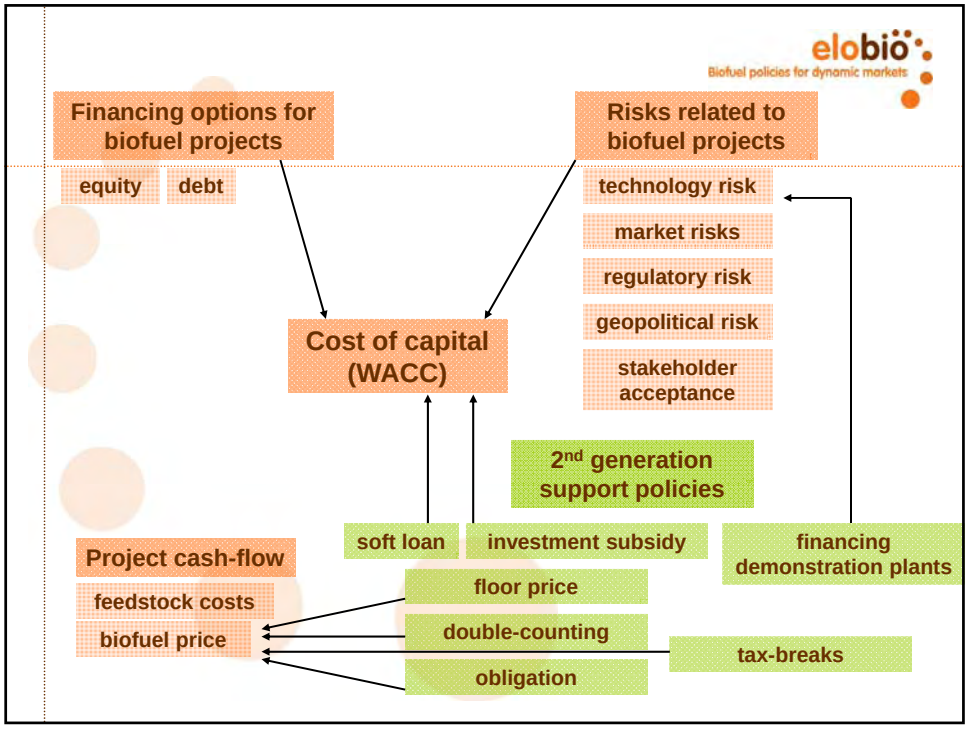
Presentation overview

- Risk and the cost of capital (and its impact on deployment of 2nd generation biofuels)
- Methodology
- Risk profiles of first and second generation biofuels
- Possible developments of cost of capital
- Impact of cost of capital on market penetration rates for 1st and 2nd generation biofuels
- Preliminary conclusions
- Limitations and further work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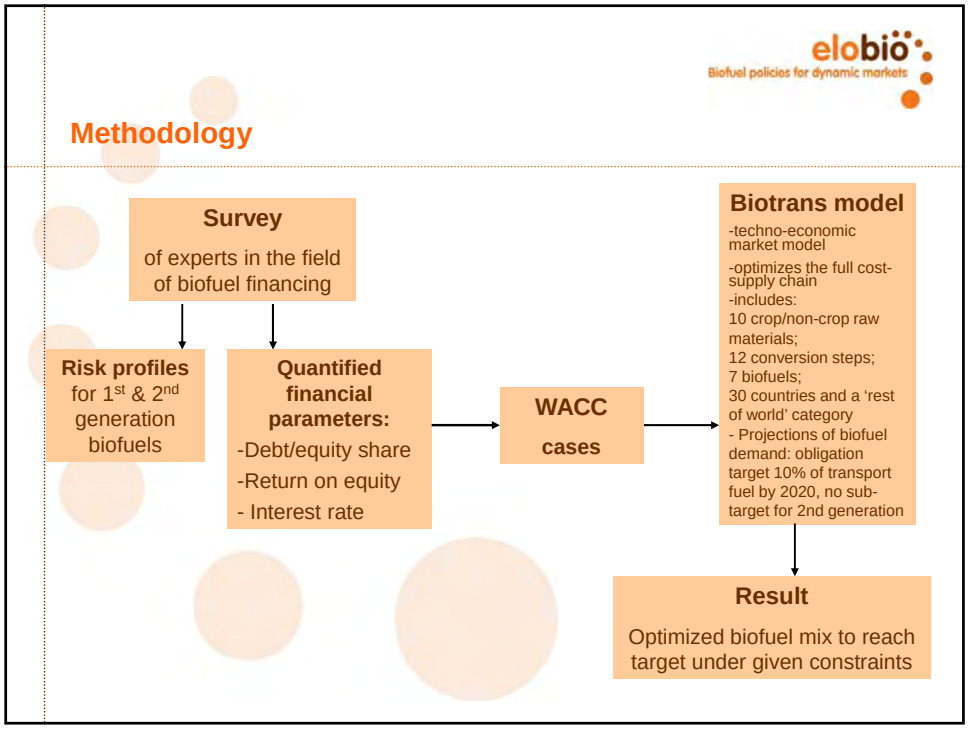
Financing options for biofuel projects
equity
debt
Risks related to biofuel projects
technology risk
market risks
regulatory risk
geopolitical risk
stakeholder acceptance
Cost of capital (WACC)
2nd generation support policies
soft loan
investment subsidy
financing demonstration plants
Project cash-flow
feedstock costs
biofuel price
floor price
double-counting
obligation
tax-breaks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Methodology
Survey
of experts in the field of biofuel financing
Risk profiles for 1st & 2nd generation biofuels
Quantified financial parameters:
-Debt/equity share
-Return on equity
- Interest rate
WACC cases
Biotrans model
-techno-economic market model
-optimizes the full cost-supply chain
-includes:
10 crop/non-crop raw materials;
12 conversion steps;
7 biofuels;
30 countries and a 'rest of world' category
- Projections of biofuel demand: obligation target 10% of transport fuel by 2020, no sub-target for 2nd generation
Result
Optimized biofuel mix to reach target under given constraints

Risks associated to biofuel projects and the related cost of capital

Risk Type	*1st generation*	*2nd generation*
Technology risk	Low-medium	High
Market risk	High	Medium
Regulatory/Policy risk	High	Medium
Geopolitical risk	Medium	Low
Stakeholder acceptance	High	Low

FINANCIAL PARAMETERS	1st generation	2nd generation
Short term		
Level of debt financing	50-80%	0%
Level of equity financing	20-50%	100%
Debt-service coverage ratio	1.3-1.8	n.a.
Interest rate	6,5-9%	n.a.
Required return on equity	15-20%	30%
Long term		
Level of debt financing	50-80%	50-80%
Level of equity financing	20-50%	20-50%
Debt-service coverage ratio	1.5	1.5
Interest rate	6-8%	6-8%
Required return on equity	15-20%	15-20%

assumptions

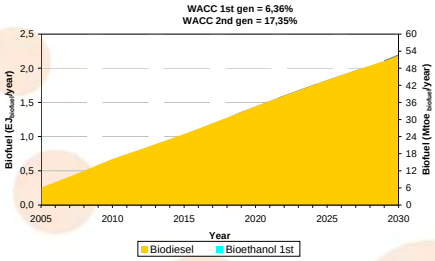
WACC cases

	Case description	*WACC 1st gen*	*WACC 2nd gen (long-term average)*
1	Low capital costs (CC) 1st gen, no support 2nd gen	6,36%	18,11%
2	High CC 1st gen, no support 2nd gen	13,15%	18,11%
3	Average CC 1st gen, low support for 2nd gen	10,94%	17,89%
4	Average CC 1st gen, medium support for 2nd gen	10,94%	17,89%
5	Average CC 1st gen, optimistic financing structure and high support 2nd gen	8,94%	15,25%

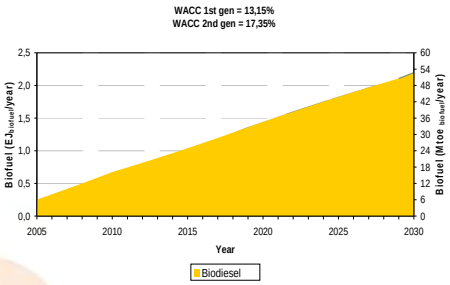
Support for 2nd generation:
- Investment subsidy
- Soft loan

Results – no intervention cases

Low capital costs 1st gen, high 2nd gen



High capital costs 1st gen, high 2nd gen

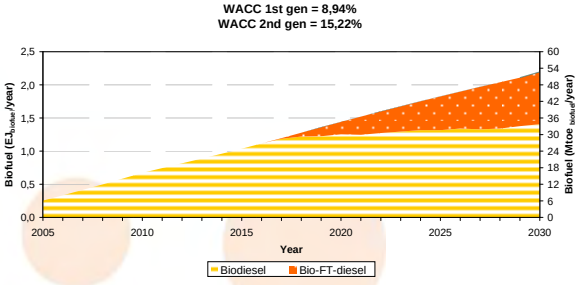


No additional support: no second generation on the market by 2020, even in the case of obligation!

Results – high policy support case

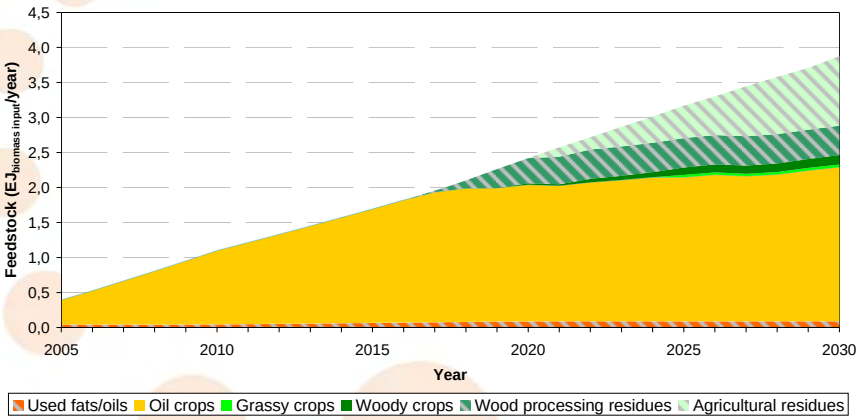
<u>High support for 2nd generation, optimistic financing structure for commercialized biofuels:</u>

- investment subsidy of 40% of total project investment cost throughout the period;
- after commercialization (after 10 years), then also soft loan (2 percentage point below market interest rate) to cover 40% debt (rest is equity at RoE = 15%)



2nd generation in total biofuel demand: 12% in 2020 and 35% in 2030

Resource base of biofuel mix under high policy support case



Potential demand for woody biomass (mainly residues):

0,5 EJ (roughly 100 million m3, back-of-the envelope calculation)

Wood resource balance 2005 for EU/EFTA 29 and future forecast

(in million m3)

	2005	2010	2020	2005	2010	2020	2020 (75%)	
Supply from forest & woody biomass outside the forest:								
Industrial Roundwood - JFSQ	377	389	417					**Material use:**
Industrial Roundwood*	26	26	26	214	213	212	212	Sawmill industry
Fuelwood - JFSQ	56	56	56	89	99	123	123	Panel industry
Fuelwood*	29	29	29	155	162	181	181	Pulp industry
Bark	12	12	12	6	6	6	6	Pellets, briquetts etc.****
Used logging residues	17	18	17	14	14	14	14	Other material use
Woody biomass outside the forest	13	13	13					
Supply by-products:								
Chips, particles & wood residues	122	122	120					**Energy use:**
Pulp production co-products**	72	75	84	343	481	738	620	Total energy use
Supply recovered wood:								
Recovered wood***	42	42	42					
Supply processed wood fuel:								
Processed wood fuel	6	6	6					
Total supply	775	791	825	821	976	1 274	1 156	**Total use**

* maximum difference unreported to JFSQ
** black liquor, tall oil, etc.
*** for material & energy use
**** processed wood fuel industry

Source: Mantau et al., 2007

- Energy use of wood will roughly double by 2020 (without counting specific demand for 2nd gen!):

  600-700 mio m3 (depending on role of wood in all renewables)

- Possible additional demand from second generation liquid biofuels:

  Cca 100 mio m3

→Increasing gap between wood supply and demand

→ Increased competition between forestry-based sectors

DATA LIMITATIONS!

Preliminary conclusions (I)

In the short-term:

- We need to promote second generation biofuels to limit impact on agricultural commodities

BUT

- The cost of capital for 2nd generation is extremely high.
- Technology risk is a major hurdle for 2nd generation's access to cheaper capital.
- We need much more support for large scale demonstration projects for 2nd generation technologies (e.g. European Industrial Bioenergy Initiative).
- Expectations of finance providers on full commercialization of 2nd generation conversion technologies varies from 2 to 10 years.

Preliminary conclusions (II) and policy recommendations

In the long-term:

- 2nd generation technologies are very capital intensive compared to 1st generation → slower deployment rate even in the case of same WACC.
  → need to lower the capital intensity of 2nd generation
- There are different policy options to lower the cost of capital for 2nd generation.
  - continuous R&D support to lower the capital intensity of the technologies
  - investment subsidies
  - government guarantees for loans to raise the level of available debt
  - soft loans
  - market-risk mitigating policies
- If policies to stimulate 2nd generation biofuels are successfull, simultaneous stimulation of forestry will be needed to ensure adequate wood supply (increasing market risk).

Limitations and next steps in analysis

Limitations of the analysis:

- Still small data sample.
- Model assumes unrestricted capital supply for projects meting the WACC requirements.
- Assumptions on commercialization timeline for 2nd generation matters (but not that much!)
- Projects implemented through corporate finance not accounted for.

Next steps:

- Develop a specific cash-flow model to evaluate the effect of market risk mitigating policies: biofuel floor price, tax incentives

Policy instruments to analyse

Policy	Value
affecting feedstock price	
non-food feedstock premium	45 eur/ha
affecting investment costs	
investment subsidy	40%-50% of investment costs
soft loan	2% points below market interest rate
affecting biofuel price	
tax break for 2nd generation (no tax break for 1st gen)	45 cents/l
double counting of 2nd gen	twice the difference between oil price and 1st gen price from 1st gen price
affecting overall profitability	
reduced corporate tax rate for 2nd generation producers	50% lower corporate tax compared to 1st gen producers

Other policy suggestions

?

THANK YOU FOR YOUR ATTENTION

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Appendix 8 - List of participants

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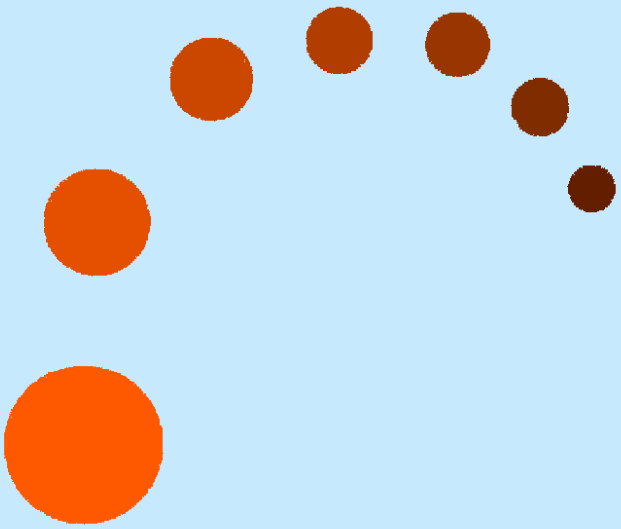

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