

Policy Paper 2 – February 2009

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Elobio: a very short introduction

I. The problem:

Increased demand for biofuels could have significant long-term impacts on several commodity markets. Current disputes on this issue (with rising prices in today's markets) require responsible policy.

II. The objective:

Formulation 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.

III. The activities:

- 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.

The Elobio Policy Paper series

In the course of the project (November 2007 – April 2010), the Elobio team will prepare a short series of Policy Papers presenting Elobio results and news in the context of the actual policy debate on biofuels. Key target audience are policy makers at the EU and EU member state level. Contributions will largely be based on (intermediate) results of the project.

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CHALMERS



Feeding the analysis:

Outcome of the first Elobio stakeholder workshop

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The ELOBIO project is meant to develop ideas and criteria for EU biofuels policy, aiming at minimising negative impacts on food, feed and lignocellulosic markets. The objective of the stakeholder workshop was thus to engage with key stakeholders, asking them to provide relevant suggestions and questions to be analysed, and consequently providing an opportunity for them to influence the project by feeding their viewpoints into the process. Their input will be used for the further modelling and analysis in the project.

27 people participated in the workshop, which was held on October 30 2008. Out of these participants, 12 people were stakeholders (industry and NGOs), 4 were invited EU officials from relevant DGs, and the remaining 11 people were from the ELOBIO team. The background of the 12 invited stakeholders was mixed, reflecting in a quite balanced way the whole production biofuels chain and affected industries.

Much in line with expectations, when launching an event engaging with stakeholders, a general observation from the discussions at the workshop was that *biofuels producers* are mostly interested in increased agricultural productivity, *farmers* are interested in good prices for their produce, and if those are right they will expand production, while *food producers* are mostly concerned with the competitiveness of their products in terms of increasing input prices.

Another general observation seemed to be that the stakeholders were well informed about biofuels and the context of biofuels. There was a fairly general agreement that biofuels only to a limited extent could be blamed for the recent price spikes in food markets (the most pronounced exception being maize). Otherwise, a range of other important factors were suggested to be contributing to the situation of recent price spikes, as outlined in a presentation by Institute of Food and Resource Economics of Copenhagen University. The overall picture of the different studies now available is that the future impacts of biofuels targets on agricultural commodity markets are still difficult to assess: impacts on food prices, effectiveness of sustainability safeguards, and impacts on developing countries depend on a number of complex factors that are still not well-understood. In any strategy, it was pointed out, this should be taken into account.

It also emerged from the workshop that stakeholders were quite capable of pointing out problems and opportunities. However, it was more difficult for stakeholders to come up with ideas for new less disturbing biofuels policies. They did, instead, provide useful feedback to the policies suggested by the Elobio team. In light of this, it is believed that the stakeholders can play a strong role in assessing the results of the analyses and model runs later in the project, during the planned 2nd and 3rd consultation rounds. The more precise specifications of the policy options feeding into the models will be done by the ELOBIO team by taking into account the relevant comments and suggestions.

Key research questions that emerged from the workshop:

- Agricultural development and productivity increases are a vital precondition for responsible biofuels development. The extent to which this will happen, partly in response to additional policies or higher feedstock prices, is a highly relevant question.

- The biofuels introduction rate is relevant as agriculture will need time to respond to this. It could be interesting to see whether this "response time" could be estimated and taken into account in policy making.
- Trade policies will also be a critical factor for the extent to which price signals will influence farmers in different regions. This is a point worth attention in the modelling activities.
- An accelerated introduction of 2nd generation biofuels is expected to reduce impacts on food and feed markets. It would be useful to obtain more quantitative insights into this effect. However, impacts on affected lignocellulosic markets would also be worth noting.
- For the introduction of 2nd generation biofuels (and for investments in biofuels in general), volatilities in feedstock and biofuels markets can strongly influence investment risks. It will be relevant to see how these volatilities affect investments in 1st and 2nd generation technologies, and how policies may be developed to reduce these risks, particularly for the 2nd generation.
- When performing overall analyses, it would be worthwhile also to analyse relatively extreme cases as an illustration.

Other concerns raised:

- An often overlooked advantage of using food crops for biofuels is that these crops can be directed to food consumption in the case of "price crisis". This cannot be done for non-edible oils such as *Jatropha*, or with woody crops for 2nd generation biofuels.
- Co-products are quite a relevant issue. 1st generation biofuels provide substantial amounts of protein feed, a feedstock in which the EU is for ca. 80% dependent on imports.
- How do we communicate better the facts (pros and cons) of biofuels to a non-expert audience (the public in general), so that non-experts are better informed about the merits of biofuels.

The EU renewables directive: Some first impressions in the Elobio context

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On December 17 last year, the European Parliament adopted the Renewables Directive, or a directive on the 'Promotion of the use of energy from renewable sources'. A milestone for the development of biofuels and other renewables, and possibly a landmark for EU policy in general. Particularly on biofuels, the directive is much more complex than its original proposal, issued beginning 2008. What are its main implications for biofuels, and for the way their indirect impacts (e.g. on commodity markets) will be addressed? How could Elobio work contribute to this all? This contribution is a short interpretation attempt, with some exegesis at places. Its main conclusion is that the directive contains several open questions on the impacts of indirect land use change, the effects on commodity markets, and the enhancement of 2nd generation biofuels. The foreseen results of Elobio can definitely contribute to the quality of the debate on these issues.

The renewables directive¹ defines a policy framework for all renewable options. Here, the focus is on biofuels. First, we describe the key elements in the directive relating to biofuels, sustainability and issues related to Elobio. Then we shortly discuss what the implications of the directive could be, and how the Elobio work can be relevant in its context.

The Renewables Directive: Essential biofuel ingredients in the recipe

In comparison with the original proposal for the directive, the text has been significantly expanded and modified on several essential places. The key parts for biofuels are as follows.

A target for renewable energy in transport, not for biofuels

A point to keep in mind is that the 10% target (art. 3.4) applies to all renewable energy used in transport, so including renewable electricity and renewable hydrogen. This was also the case in the directive proposal of January 2008, and even in the 'Biofuels directive' of 2003. However, it is questionable whether electricity and hydrogen will be able to provide a substantial share of these 10%:

- For electricity, the directives specifies that the calculations should take into account the average share of renewables in the electricity mix, and allows the renewable electricity share to be multiplied by a newly introduced factor of 2.5 to account for the better efficiency of electric propulsion compared to an internal combustion engine. The key uncertainty is the development rate of the plug-in hybrid and the all-electric vehicle. In a recent analysis, ECN projected several development pathways for electricity in transport (Hanschke et al. 2009), with penetration rates from several

¹: This paper was based on the text adopted by the Parliament on December 17, 2008 (see the still provisional edition at <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+20081217+SIT+DOC+WORD+V0//EN&language=EN>).

promises to maximally 2% of total energy demand for Dutch transport. Taking into account an ambitious 40% average share of renewables in total electricity production by 2020, applying the efficiency factor of 2.5, and assuming that a Western-European country such as the Netherlands would probably be a front-runner in electric propulsion, this leads to a maximum foreseeable share of renewable electricity in the target of ca 1% by 2020 in the EU27.

- For hydrogen, even the ambitious HyWays road map (Anonymous 2007) projects that hydrogen vehicles will amount to only 1 to 3 percent of the passenger vehicle fleet by 2020 (and none in the trucks segment); accelerated penetration is expected after 2020. Furthermore, the hydrogen applied will only partly be produced from renewable sources, coal and natural gas being the more conventional production routes on the short term. Assuming an identical efficiency factor of 2.5 for hydrogen, the renewable hydrogen share in the 10% target will probably not exceed 0.5% by 2020.

All in all, it is most probable that the bulk of the 10% target for renewables in transport will still have to come from biofuels, the main uncertainty being mid-term developments in electric propulsion.

The 10% target for renewables in transport is not the only factor affecting biofuels

Apart from the transport target, two other objectives may provide a driver for biofuels, while one may dampen it to lower levels:

- The overall 20% target for renewables has been differentiated among the member states (see Figure 1). Several countries (circled in red) have low 2005 shares for renewables but high targets for 2020, such as the UK, the Netherlands and Germany. These countries might face problems meeting this target with a mix of renewable power, heat and biofuels in which the transport sector only reaches to its 10% directive target, given e.g. the inherently low flexibility of the power generation sector and the difficulty that member states experience in further developing renewable heating and cooling. One of the options would be to increase the share of renewables in transport, particularly if sustainability issues relating to biofuels would appear to be manageable.
- The update of the Fuel Quality Directive also sets a 6% target for greenhouse gas emission reductions to fuel suppliers. As the minimum greenhouse emission limit for biofuels after 2017 will be 50 to 60% (see below), this corresponds to a maximum biofuels target of 10-12% when completely met by biofuels. So in short, this directive provides an additional driver for reaching a biofuels share close to 10%.
- On the other hand, the double-counting mechanism for 2nd generation biofuels and other biofuels based on residues and wastes (see below) may have a dampening effect on the ambition level: if the EU would be able to introduce a 20% share of these types in the total biofuels mix, an 8.6% biofuels share would suffice to meet the 10% target.

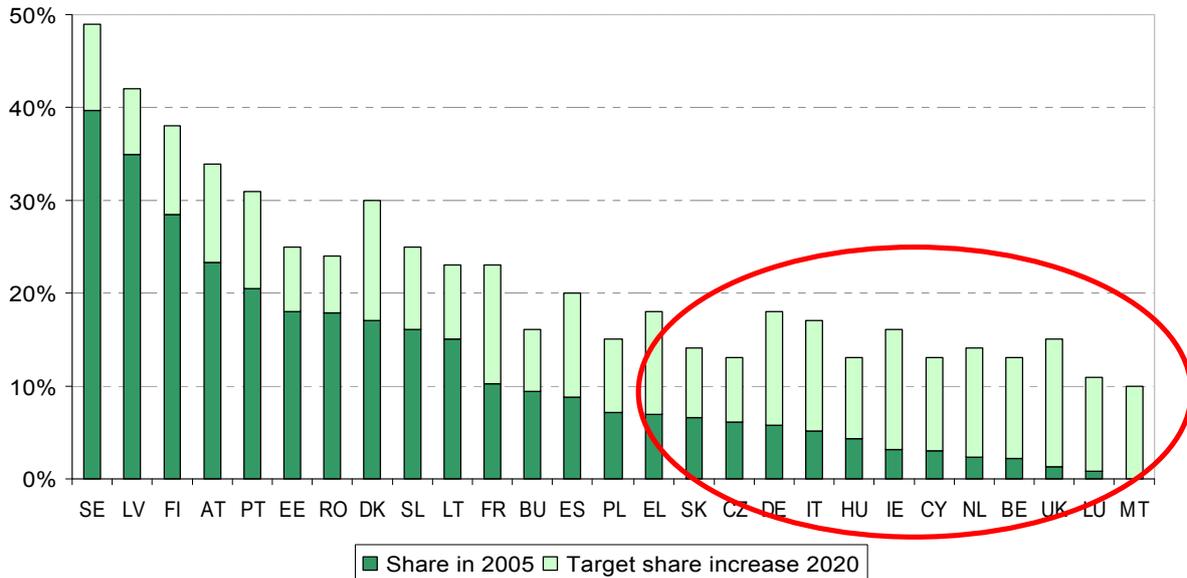


Figure 1: Allocation of the overall 20% objective for renewables among the EU member states.

The 'double-counting' stimulus for 2nd generation biofuels has been strengthened

The original directive contained the clause that fuel distributors would be allowed to double-count any contribution from biofuels produced from wastes, residues, non-food cellulosic material, and lignocellulosic material, providing a specific incentive for 2nd generation biofuels. In the final directive, this double-counting has been extended to the member states themselves: they can also double-count the contribution from these types of biofuels when administering their compliance with the 10% target for renewables in transport. This strengthens the incentive, as national governments now also benefit from it. Note that there is no double counting towards the overall national renewables targets.

The greenhouse gas emission reduction threshold becomes firmer over time

The original 35% greenhouse gas performance threshold in the directive proposal has been refined substantially in the final directive. The initial limits are still the same, but the required emission savings increase over time (art 17.2):

- Recently built installations should produce biofuels with a greenhouse gas emission reduction of minimally 35%. As the directive starts to apply when member states transpose it into their national policies, this criterion does not apply immediately. The official publication of the directive is foreseen in May 2009 (Deurwaarder 2009), after which member states have 18 months to implement it, so application can be expected by November 2010
- For installations that were already in operation by January 2008, this 35% threshold applies as of April 1 2013 (as in the original directive proposal)
- By 2017, then existing installations should produce biofuels with a greenhouse gas emission reduction of minimally 50%.
- Installation that start their production in 2017 or later need to meet a threshold of 60% greenhouse gas emission reduction.

The sustainability criteria related to direct impacts have largely remained the same

The original directive proposal already contained several exclusion criteria, which have remained intact, although somewhat refined (art 17.3 – 17.7):

- Biofuel feedstocks should not be cultivated on primary forests, Protected areas (unless taken harmlessly), internationally recognised nature protection areas or highly biodiverse grasslands
- The conversion of high carbon stock areas prohibited, such as wetlands, continuously forested areas and undrained peatlands
- EU cultivated biofuels should meet the ‘cross-compliance’ regulations in the Common Agricultural Policy

Next to these criteria, there are some reporting obligations on impacts on soil, water, air emissions, restoration of degraded land and social issues, [and the Commission will also report on social issues, including those relating to ILO conventions. Furthermore, the Commission will elaborate a proposal on sustainability requirements for non-biofuel energy applications of biomass by the end of end 2009.

Greenhouse gas emissions by indirect land use change: method development and monitoring

One of the more critical issues in the biofuels dossier is the emission of greenhouse gases due to indirect land use changes (see Figure 2). As biofuels lead to additional demand for feedstocks currently used in the food and feed sectors, new land may be taken into cultivation somewhere else in order to meet increased demand, also in such a way that this land use change is not directly attributable to biofuels production (Searchinger et al. 2008). The directive recognises this issue in several ways:

- It requires the Commission to review the impact of land use change and address ways to minimise it by the end of 2010. It urges the Commission to propose a methodology or factor for including these indirect effects into the greenhouse gas calculation methodology (art 19.6). The parliament should decide on this proposal in 2012 at the latest. However, if GHG reductions of specific biofuel production chains decrease because of an adaptation of this calculation method, installations built before the end of 2013 will remain exempt from this new calculation until 2017, provided that their original GHG performance was at least 45% by 2012.
- In bilateral agreements, the commission will pay attention to indirect land use change (art 18.4)
- Furthermore, there will be attention for (direct and indirect) land use change in both the national reporting (art 22.1h) and in the EU biannual reporting (art 23.1)

Impacts of biofuels on agricultural markets: More monitoring and reporting obligations

Another critical indirect effect (and one of the key issues that Elobio tries to address) is the impact of biofuels on commodity markets in agriculture and forestry. Here the directive does not provide a pathway for the development of a threshold or exclusion criterion, but sets several reporting obligations:

- In its biannual reporting, the Commission shall also address the impact of biofuels on the availability of foodstuffs at affordable prices and propose corrective actions, especially if evidence shows that biofuel production has a significant impact on food prices (art 17.7).

- In their national reporting, member states will also pay attention to impacts on commodity prices within their country (art 22.1h)
- The Commission will stay in continuous dialogue with producer countries and NGOs on impacts of biofuels on food prices (art 23.2)
- In additional reporting procedure by 2014 at the latest, the Commission shall provide a review of the impact of the implementation of the target on the availability of foodstuffs at affordable prices
- In the Commission's biannual monitoring and reporting years attention will also be paid to impacts of increased demand for biomass on biomass using sectors, seemingly referring to e.g. wood processing industries (art 23.5d)

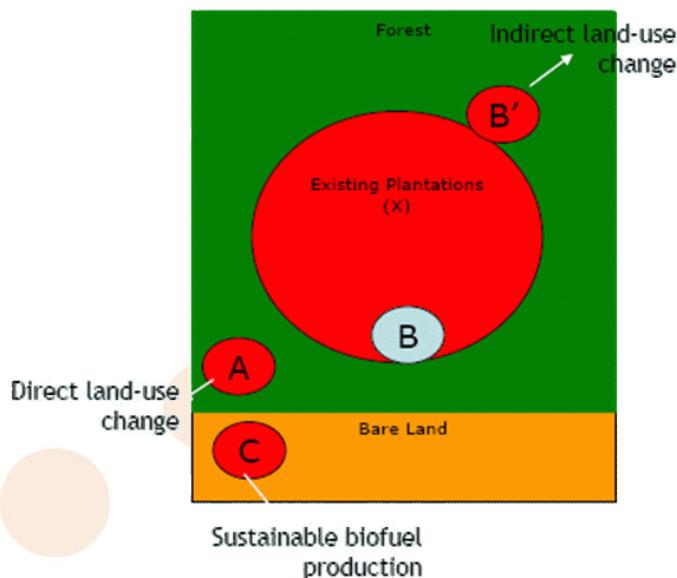


Figure 2: Direct and indirect land use change induced by biofuel feedstock production. (A) and (C) are direct land use changes; (B/B') is indirect land use change. Source: LowCVP.

Some thoughts on the directive and the relevance of Elobio for it

In Elobio we try to develop policies that on one hand provide sufficient incentives for the development of biofuels, while on the other hand minimising the negative impacts of biofuels on commodity markets. In this context, and also bearing in mind the key outcomes of the first stakeholder consultation (see earlier in this policy paper), some links can be observed.

Yes, indirect effects on land use and commodity markets will be a point of attention

The directive addresses indirect land use change and associated impacts on GHG emissions as well as impacts on commodity markets, merely by calling for monitoring and reporting. In this context the work in Elobio WP5 seems very relevant, as it incorporates the following analyses:

- The impacts of European (and global) demand for biofuels on agricultural commodity markets will be assessed. The World Food System Model is applied for several scenarios and policy strategies targeting different levels and types of biofuel deployment. Results include impacts on agricultural prices, value added of crop and livestock production, cereal demand and production and an indices for risk of hunger.

- Additionally, the impact of biofuels demand on key indicators of agricultural environmental impacts will be assessed. These comprise the magnitude of biofuel induced direct and indirect land use changes including an identification of areas in which the strongest land use changes would take place, and the increase in agricultural inputs (especially fertilizer).
- Furthermore, land cover changes are quantified according to a rule-based downscaling methodology, which allocates the results of the world food system simulations to the spatial grid of the natural resource database. This allows for a quantification of greenhouse gases emitted or sequestered by direct and indirect land-use/cover changes.

Yes, there are incentives for 2nd generation biofuels, but how effective will they be?

Two key incentives for 2nd generation biofuels can be distinguished in the directive: the increasing minimum levels of greenhouse gas emissions (up to 60% for new installations by 2017), and a double-counting rule for (amongst others) lignocellulosic biofuels. A 60% threshold clearly puts a challenge to conventional biofuel production chains, which currently show typical greenhouse gas emission reductions between 40% and 60%. Improvements in these values can be reached by e.g. optimization of cropping systems (particularly on N₂O emissions) and renewable process energy. An inclusion of indirect land use change impacts, however, might further substantiate the required improvements in greenhouse gas emission reduction. All in all, it is still difficult to estimate the impact of a 60% limit on 1st generation biofuels, but it seems improbable that it will lead to complete exclusion.

The double-counting incentive for 2nd generation (and other residue-based) biofuels has been in discussion already for quite a while. Again it remains difficult to assess the effect of this measure in practice. Two effects complicate the analysis:

- When it applies to a quota system for fuel distributors, 2nd generation biofuels become competitive if their additional price compared to fossils is less than twice the price difference between 1st generation biofuels and fossils. So, quite counter-intuitively, an increasing fossil fuel price decreases the competitiveness of 2nd generation biofuels (assuming constant prices of biofuels themselves)². This effect may be dampened by 1st generation biofuels being more dependent on fossil inputs than 2nd generation biofuels, their prices therefore also increasing with higher fossil oil prices, but at least this mechanism complicates an assessment of the impacts of the double-counting measure.
- One of the advantages of a biofuels obligation versus e.g. tax exemptions is that a separate market is being created for biofuels, setting them largely apart from the dynamics in the fossil energy market. This reduces a key risk factor for an investor in biofuels. However, with the double-counting mechanism, fossil prices do have an influence on the financial attractiveness of the option, thereby increasing the investors risk in both 1st and 2nd generation options.

The complexity of differences in risk profiles between 1st and 2nd generation biofuels, and the effects of different policy strategies thereon, will be addressed in Elobio WP7, and partly in WP6 as well. Outcomes will improve insights in the effectiveness of this double-counting mechanism as well.

²: For details see the REFUEL team response to the 2007 Biofuels Consultation in http://ec.europa.eu/energy/renewables/consultations/doc/2007_06_18_biofuels_non_org.zip

There's a lot of attention for indirect effects, but is there an emergency brake?

With its reporting and monitoring obligations, the directive generally breathes an atmosphere of prudent and careful development of biofuels. However, a clear and explicit 'emergency brake' mechanism is not present in the directive.

- As for indirect land use change, a methodology to include indirect land use change into the greenhouse gas calculations opens a possibility to act. As this method may be presented by 2010 (and decided upon in 2012 at the latest), this is the nearest-term element, but it does not touch upon effects on commodity markets.
- The 2014 reporting obligation (art 23.8) for the Commission lists a wide variety of issues, including indirect land use and impacts on commodity prices. However, the options for policy redefinition seem to be limited to the GHG standard of 35-50-60% that may affect indirect land use after the realisation of a methodology to include these in the GHG scores. How to exactly monitor biofuels' impacts on commodity markets, and how to act when they are affected by biofuels remains unclear. It also calls for a review of several impacts of biofuels 'with respect to' the biofuels target, but the possibility to revise the 10% target is not mentioned explicitly.
- In the biannual reporting commitment (art 17.7), it is mentioned that the Commission shall, if appropriate, propose corrective action, in particular if evidence shows that biofuel production has a significant impact on food prices. But the degrees of freedom for this corrective action remain open.
- More generally however, the Commission has a right of initiative: it can propose any measures it considers relevant, basically at any time, but obviously also on the basis of the two-yearly reporting moments.

So in short, there is no explicitly identified moment in which e.g. the height of the renewables target will be evaluated, but there are several elements that the commission can use to adapt (parts of) the directive when the situation calls for it.

The inherent trade-off between safeguards and complexity

A more general impression of the directive is its complexity, particularly on the biofuels side. On one hand this is a logical outcome of the necessity to pay respect to societal concerns about biofuels and their risks for undesired impacts. On the other hand the many conditions, including some issues that remain to be solved, such as the GHG accounting methodology for indirect land use change, create complexity and uncertainty, and thereby lead to new investment risks in the sector as a whole. Time will tell in which direction the coin will roll and how critical factors will develop. For example, the food prices that led to massive public outcry against biofuels last year have recently decreased rapidly without biofuels production having lowered significantly.

Conclusions

The RES directive contains several open questions in the fields of

- Indirect land use change impacts
- Effects of biofuels development on commodity markets
- The enhancement of 2nd generation biofuels.

Here, foreseen results of Elobio can definitely contribute to the quality of the debate. As mentioned earlier in this policy paper, issues raised at the Elobio stakeholder consultation will also be taken into account, thereby providing a modest additional link between industry stakeholders and NGOs and the commission.

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