European Commission Consultation on Indirect Land Use Impacts of Biofuels – October 2010

Background

Vireol Ltd are concluding their finance package for a bioethanol refinery at Great Coates Grimsby. The plant will be built and in operation by the first quarter of 2013 and will provide 200m litres of bioethanol (with a carbon saving of 66% - source Imperial College assessment) and 175,000 tonnes of high protein animal feed in the form of Dried Distillers Grains & Solubles. The plant will use c 500,000 tonnes of feed grade wheat in its production process.

Working with the REA, Vireol has been a significant contributor to work in the area of indirect land use change (ILUC) and in conjunction with Imperial College has developed a model of feedstock usage to help in planning to meet the Renewable energy directive (RED) target at the same time as minimizing potential impacts from ILUC.

Executive Summary

Within the biofuels sector the area of ILUC is arguably one of the most contentious topics. To this end a significant amount of work has been carried out both by the EU and other bodies examining how best to approach this subject. Much of the work carried out to date has been focused on developing an approach based on macro-economic models. However, in many respects these models have a number of limitations and it is questionable as to whether an approach that is both acceptable to stakeholders and workable can ever be achieved by adopting this methodology in isolation.

It is important to recognize that within the RED it is acknowledged that there is a need to develop and include an approach to respond to the effects of ILUC and the process needs to be based on a "concrete methodology", as detailed within section 85 of the introduction to the directive, an extract of which is reproduced below:

"(85) …The Commission should develop a concrete methodology to minimise greenhouse gas emissions caused by indirect land-use changes. To this end, the Commission should analyse, on the basis of best available scientific evidence, in particular, the inclusion of a factor for indirect land-use changes in the calculation of greenhouse gas emissions and the need to incentivise sustainable biofuels which minimise the impacts of land-use change and improve biofuel sustainability with respect to indirect land-use change."

As noted above, the macro-economic approach is believed to contain a number of limitations, examples of which are detailed below. The current consultation is intended to aid the development of the concrete methodology mentioned above and to review the work the Commission has done to attempt to better understand the magnitude of the issues.

Biofuels producers can, with the exception of ILUC criteria, calculate the emissions factor of a biofuel as it is possible to obtain actual data from the parties along the supply chain. However when it comes to the indirect affects these are virtually all out of the producers or their suppliers control so the assessment of the effects of ILUC cannot readily be assessed on the basis of real data collection, but is derived via the use of models used to assess the effects. Most of the modelling work on the impact of ILUC to date has used existing or modified existing macro economic models none of which were developed to assess biofuels. Unlike many other aspects relating to emissions within the biofuels sector the impacts of ILUC are unlikely to be static over time and as such any solution needs to be able to quantify this.

We believe that the existing macro economic modelling is not a robust basis for modelling ILUC effects; we believe that it fails to:

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1. Show the impact of the mandatory carbon and sustainability criteria
2. Present a robust and accurate approach to yield increase
3. Use clear market principles of crop response to demand increase
4. Model co-product usage correctly
5. Use evidence of "real world" economic thinking and back testing of all assumptions
6. Be transparent and open in methodology and assumptions
7. Recognise the differences in feedstock, location and fuel type
8. Model the oil seeds market correctly (palm primarily grown for oil, soy for meal)
9. Realistically model the change in trade flows
10. Accurately assess current land use and changes, with different data sources giving very varied results

The main conclusion that can be drawn from the work undertaken by the Commission to date, especially the literature review and the comparison of modelling, is the inconsistency of the results, which causes us to believe that it is impossible to reach a reliable conclusion on any single ILUC factor per feedstock at this point in time.

ILUC effects are highly dependant on feedstock and growth locations which will have different ILUC factors so we believe that the additive risk category approach; using a range (risk category) rather than a single average number is more appropriate. This has the added advantage of identifying the areas of greater risk and thereby focusing mitigation efforts against areas of highest risk. The work recently undertaken by E4Tech for the UK government (published 19th October 2010 and attached as Appendix 4) is a clear example of what is possible when factoring in a real world approach to modelling impacts. This creates a strong argument for a risk matrix approach on biofuels similar to that being developed by the LowCVP (submitted to the Commission for this consultation) and Ecofys that highlights feedstocks that are at lower risk of ILUC and those at higher risk. This would then allow mitigation policies to be put in place so that users of each crop type can demonstrate the activities which are being pursued to mitigate those risks. It would also ensure that no one single crop type is excluded where it is exhibiting best practice in ILUC mitigation). As such it would appear logical to adopt a risk based approach similar to that outlined in the LowCVP work as the basis for dealing with the issues arising out of ILUC.

We have attached 4 appendices to our response:
Appendix 1: Detailed discussion of the IFPRI study for the commission
Appendix 2: Detailed discussion of the literature review and JRC model comparison work
Appendix 3: Introduction and discussion of the E4tech causal-descriptive modelling
Appendix 4: E4Tech Study: "A causal descriptive approach to modelling the GHG emissions associated with the indirect land use impacts of biofuels causal-descriptive modelling to assess ILUC" published 19th October 2010 by the Department for Transport (UK Government)

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Question 1 – Do you consider that the analytical work referred to above, and/or other analytical work in this field, provides a good basis for determining how significant indirect land use change resulting for the production of biofuels is?

No.

The work undertaken by the European Commission to date effectively highlights that very significant uncertainties exist in both the scale and accuracy of estimates of indirect land use change that is directly attributable to biofuel policy in the EU.

Clearly this is a critical area and as such it is imperative that any solutions deal with key fundamental issues. At the present time it is felt that the work undertaken to date has a number of limitations, namely:

- Any solution should incorporate the impact of mandatory carbon and sustainability criteria as set out in the existing legislation.
- The implications of yields need to be properly considered.
- Co-products and their impact will need to be evaluated and included.
- In modelling a solution the effects of any crop response needs to be incorporated.
- Assumptions need to be robust and capable of being back tested.
- Models need to be transparent.

We continue to believe that all models that undertake work in this area must have transparent solutions to the following issues for any robust outcomes to be considered:

1. <u>Utilise the existing legislation on the mandatory carbon and sustainability criteria</u>

In many respects the Renewable Energy Directive would act as a starting basis for any solution in that it significantly limits crop expansion in sensitive areas and rules out biofuel pathways with GHG savings that are sub optimal. Incorporating these policies in the first instance into member states legislation not only allows for a clear and consistent approach but will help determine which biofuel pathways "win through" as a minimum and this will in turn have a knock on effect on the likely bioethanol and biodiesel mix which will affect the respective feedstock demand and likely ILUC. This will underpin the ILUC approach and focus it into a risk based approach. It is not envisaged that this will encapsulate all the ILUC issues but it would at least provide a minimum set of criteria.

2. <u>A robust approach to yield increase</u>

The potential impact that yield improvements could have on any ILUC outcomes is significant and as such any solution must incorporate the effects of yield as part of the solution. In addition to considering historic performance of a particular crop a model will need to be developed that considers the likely drivers on any yield change, namely:

- Technology
- Price
- Input
- Variety
- Husbandry
- Research
- Quality of farm management

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The extent to which crop outputs grow as a result of yield increase has a very significant determining factor on the scale of any ILUC factor and this is especially notable on EU produced wheat and oilseed rape.

The importance of this cannot be overstated, in the Aglink Cosimo work studied by JRC a small increase in yield above baseline eliminates any ILUC effects on wheat and coarse grain feedstocks. A downfall of many modelling approaches is the setting of exogenous yield growth that does not vary with demand. This is a significant flaw as any demand above a set level is then always assumed to be met by additional land. This is an unscientific assumption and is not supported by data on historic yield trends in the EU, which demonstrates circa 80% of the demand induced supply increase has traditionally come from demand induced yield improvement and circa 20% from an increase in planted land, which was often idled.
In addition, models often contain an arbitrary view on crop yield on newly converted land. In the case of the EU with both the presence of rotational set aside and further land falling idle there is little science to suggest that yields on such land will be significantly less than the average for land in current cultivation.

3. Modelling of co-product usage

When evaluating the various feedstocks it is only logical that all outputs are taken into account. In essence it cannot be possible to assess the impact of ILUC without examining the impacts of all products generated in the process. As such the solution needs to include a robust evaluation of co-products that demonstrates a clear understanding of relationships at a crop level in terms of what is substituted and in what proportion. The literature review clearly demonstrates that impacts at a crop level vary massively in reducing land use needs between 7% for palm and 94% for Wheat. Without clarity on this issue it is very likely that land use will be significantly overstated.

In addition work carried out on behalf of the UK government by E4tech (attached at appendix 4) clearly shows the impact of co-products on land usage.

4. Clear market principles of crop response to demand increase

When considering how markets respond to additional demand, there is a need to adopt a scientific approach to land use change at a regional and crop level. To date the models consistently fail to correctly assess the impact of falling land use in light of relatively static non-biofuel demand and increasing yields. This increased idling of land in Europe does present relatively low carbon routes for additional crops once demand for additional crops rises above yield potential and crops are freed up by co-product availability.

In quantum terms the amount of farmed European arable land dropped by over 7Mha from 2000 to 2008 (FAO data), which itself could provide twice the EU 2020 ethanol demand stated in the NREAPs currently submitted to the Commission (assuming average yield, via wheat ethanol), without any yield improvement on existing land.

5. Evidence of "real world" economic thinking and back testing of all assumptions

Given the static nature of these models there is little real world understanding of production expansion possibilities. A good case in point is the assertion in IFPRI that the EU will import somewhere between 10 and 15 billion litres of Brazilian ethanol to meet its targets. This is despite the fact that current UNICA (the Brazilian sugarcane industry association) estimates are for a maximum of 15bn litres available for the world market by 2020 and that current exports due to rising sugar prices have struggled to get past 1-2 bn litres in 2009/10.

In adopting an inconsistent approach to both yield and co-product substitution, there is an inherent risk that this will under emphasize the attractiveness of EU produced biofuels that may, in fact, have little or no ILUC effects.

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In addition, there is scant evidence in any of the models of robust thinking on real world technological limits regarding blend walls and how much of each type of biofuel can be included in fossil fuels. Better understanding of this is vital to ensure the right mix of biofuel is modelled and this will have a consequent effect on feedstock usage, co product availability and ultimately net land use change.

All the models should be appraised thoroughly in a real world context and back tested against historic data to prove both robust methodologies and more importantly robust assumptions.

6. Transparent

In order to ensure a credible solution, all models need to make available all their workings, data sources and assumptions be open to rigorous peer review.

From the documents presented it is clear that the authors of the 4 documents retain considerable doubt as to the certainty of approach.

- The literature review summary shows 20 gaps in the work it has analyzed, some of the more important ones are those highlighted above, but taken together they demonstrate that there is no broad scientific consensus yet to establish any specific ILUC factors.
- In their conclusion on p21 of the JRC review of Aglink Cosimo they state "Their ability to simulate many of the impacts of biofuel policies, whether intended or unintended, that are identified in table 2.2, is incomplete, hardly compatible between models and for some effects non existent"
- On p46 of the IFPRI model review the authors state "assessing the impact of biofuel policies and the ILUC co-efficients is quite challenging due to a lot of uncertainties!" They go on to say that more research is needed in 5 key areas.
    1. Understanding EU farmer behaviour
    2. Understanding marginal productivity on new land.
    3. The ethanol : biodiesel mix
    4. Endogenous yield growth based on application of technology.
    5. Improving the dataset.

Question 2 – On the basis of the available evidence, do you think that EU action is needed to address indirect land use change?

From the evidence presented there is no robust scientific methodological approach to determining crop specific ILUC available today. Land use change is a phenomenon of more than just biofuel policy and policy frameworks must be developed across all land use types. Vireol, however do believe, that there are strong actions that can be taken quickly that will help rule out biofuels at greatest risk of generating ILUC and provide all feedstocks with a chance to mitigate impacts.

Vireol continue to believe that the right approach is to use bottom up simpler modelling (spreadsheet based) designed to account specifically for land use change and the variables at play in the all markets. By nature these simpler models are transparent and concentrate on the key variables that have a significant impact on land use change.

The work recently undertaken by E4Tech, attached as appendix 4, provides a good example of what is possible when factoring in a real world approach to modelling impacts. This in turn creates a strong argument for a risk matrix approach on biofuels similar to that being developed by the lowCVP (submitted to the Commission for this consultation) and Ecofys that highlights feedstocks that are at low risk of ILUC and those at high risk. This would then allow mitigation policies to be put in place so that each crop type can demonstrate the activities it is pursuing to mitigate those risks. It would also ensure that no one single crop type is excluded where it is exhibiting best practice in ILUC mitigation. However, it does ensure that the burden of proof is transferred to

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those crops at greatest risk and allows good biofuels to thrive in the market place. In identifying the marginal area it will enable resources to be focused on those critical areas enabling a more directed approach and ultimately a more workable solution when it comes to implementation.

Question 3 – If action is to be taken, and if it is to have the effect of encouraging greater use of some categories of biofuel and/or less use of other categories of biofuel than would other wise be the case, it would be necessary to identify these categories of biofuel on the basis of the analytical work. As such, do you think it is possible to draw sufficiently reliable conclusions on whether indirect land use change impacts of biofuels vary according to:

Feedstock type
Geographical location
Land management

All the work done does suggest that there are key differences between the ability of different feedstocks and regions to react to an increase in their demand created by biofuels. As such anything that is done in the future must assess "risk" at a feedstock and growing location level. In line with the answer to Q2 Vireol believe the best approach to dealing with ILUC is the development of risk assessment models and policies that apply mitigation according to risk.

In developing such a risk based solution policy makers need to ensure that any such legislation is not only workable, in that it can both be implemented effectively and administered, but that stakeholders "buy-in" to it. Critically such an approach must be credible and thereby encourage the genuine "leaders" to actively participate.

Question 4 – Based on your responses to the above questions, what course of action do you think appropriate?

A. ***Take no action for the time being, while monitoring impacts including trends in certain key parameters and, if appropriate, proposing corrective action at a later date.***
B. ***Take action by encouraging greater use of some categories of biofuel***
C. ***Take action by discouraging the use of some categories of biofuel***
D. ***Take some other form of action***

Vireol does not believe that there is sufficient evidence today to define an absolute policy for addressing the effects of ILUC. All of the modelling work presented today has significant flaws that render their outcomes at best uncertain. As indicated in the executive summary it is felt that the current models have significant limitations in a number of areas. Vireol, however do believe, that there are strong actions that can be taken quickly that will help rule out biofuels at greatest risk of generating ILUC and provide all feedstocks with a chance to mitigate impacts. These actions include:

1. Full implementation of the RED carbon and sustainability methodology in each member state by the start of January 2011. We remain concerned that factors developed to mitigate some of the issues outlined will not be in place quickly in all member states and for as long as unknown biofuels are accepted in the marketplace the reputation of biofuels in general will continue to be under question, despite the presence of very good biofuels.
2. Further work and support of the real world modelling efforts of parties E4Tech and Ecofys in developing causal- descriptive models that in time can allow for risk based assessments of biofuels
3. Put in place actions to ensure sustainability criteria is extended to all land based production sectors so all effects are direct effects.

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4. Developing feedstock mitigation pathways in line with the causal descriptive modelling that will allow feedstocks that act sustainably in the face of additional demand for their products to contribute to the biofuel targets.

There are a wide range of options available to mitigate ILUC, which policy should seek to encourage, some of these can be implemented by the biofuels producers and others require government or international co-operation. These include measures at the:

National or international level, such as:

- Protect high conservation and carbon rich lands from conversion (e.g. effective elimination of conversion of peat lands to grow oil palm, UN-REDD)
- Effective solutions to stop EU rapeseed oil for biodiesel being diverted from the food market and replaced by palm or soy oil
- Amend blend limits and fuels standards so the quantity of lower ILUC risk biofuels is not limited by ability to blend a high enough quantity into the fossil fuels
- R&D investment to increase agricultural productivity at the national level
- Ensure any land converted from crop use remains in agricultural use and is not quickly abandoned
- Mitigate against ILUC within each country/region of feedstock production so that any displacement effects can be monitored and mitigated against locally, for example by growing more crops on local idle land
- Apply sustainability criteria to other non food agricultural land end users for example clothing, tobacco, beverage alcohol and domestic (pet) animal feed

Regional level, such as:

- by land use zoning and infrastructure to improve yields or establishment of responsible cultivation areas

Producer level, such as:

- reducing waste and using wastes and residues such as by adopting advanced technologies
- upgrading of biofuel co-products in order to displace other crops (e.g. wheat DDGS for animal feed displacing soy)
- Sale of co-products into established animal feed markets instead of use for energy generation
- Upgrading of crop residues (e.g. bagasse at the biofuel producer site to replace a primary feedstock crop)
- Reducing the GHG-emissions through production efficiencies (this not does reduce the risk of indirect land use change but does reduce the risk of the ILUC criteria being exceeded since it is a combination of direct and indirect emissions)

Farm / production level by:

- Driving feedstock crop yield improvement through partnership and investment in the agricultural supply chain (although only the marginal production associated with the increased yields is ILUC-free)
- Using idle or marginal lands.
- Use crops from high yield areas as it has already mitigated against ILUC

The main conclusion that can be drawn from the work undertaken by the commission to date, especially the literature review and the comparison of modelling, is the inconsistency of the results, which causes us to believe that it is impossible to reach a conclusion as to an ILUC factor at this point in time. However a combination of intermediate stop gap mitigation area measures applied to high or medium risk pathways and further work on developing causal-descriptive models that in time can allow for risk of different biofuels to be properly assessed would appear to be the most sensible path to take at this point in time.

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