

Biofuels and indirect land use change

The case for mitigation

October 2011

About this study

Ernst & Young were commissioned to produce this report by a consortium of the following organisations:

- ▶ ePURE (European Renewable Ethanol Association)
- ▶ IUCN (International Union for Conservation of Nature)
- ▶ Neste Oil
- ▶ PANGEA (Partners for Euro-African Green Energy)
- ▶ Riverstone Holdings
- ▶ Shell

The conclusions expressed in this report do not necessarily reflect the views of each individual consortium member.

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1. Executive summary

This study examines the four options being considered by the European Commission for dealing with indirect land use change (ILUC) arising from the use of biofuels under the Renewable Energy Directive. An alternative approach is developed that would encourage producers and growers to undertake practices that mitigate ILUC. This study identifies a range of ILUC mitigation practices and recommends a market mechanism to encourage such activities through the use of a carbon credit scheme.

With liquid fuels likely to remain the primary energy source for road transport for at least the next few decades, biofuels are widely recognised as an important means of lowering the greenhouse gas emissions of transport. However, some stakeholders have concerns that the use of crops for biofuels could displace existing agricultural production. This could cause the expansion of cropland to replace those crops that had been used for biofuels instead of other uses, such as food or animal feed. This potential impact, known as indirect land use change (ILUC), could ultimately result in land with high natural carbon stocks being converted for agriculture. There could also be other potential impacts such as environmental damage or risks to food security.

This study demonstrates that there are a range of activities that, through incentives, could be proactively encouraged to prevent or reduce the risks of ILUC occurring in the first place.

The European Commission is considering a number of options in response to ILUC for biofuels. All these proposed policy options have drawbacks. Most importantly none encourage producers to adopt practices that reduce ILUC risks, nor do they improve investor confidence for biofuel development. Given these factors, it is unclear how the policy options will contribute to an overall reduction in the carbon emissions from transport fuels.

Research for this study found that producers may be willing to adopt further sustainability requirements for biofuels, but only if the financial value gained outweighed the costs of adopting the requirements. For a successful outcome, activities that reduce the risks of ILUC need to be encouraged, rather than simply mandated. Most markets for commodity crops do not have the same sustainability demands as the biofuels industry, although they are more significant end markets for producers and just as likely to create ILUC.

By assigning a carbon credit to biofuels that prevent or reduce the risk of ILUC, financial value can be created to incentivise the adoption of practices that prevent or mitigate ILUC.

The Renewable Energy Directive (RED) contains a 29gCO_{2eq}/MJ carbon credit for biofuels produced from feedstocks grown on severely degraded or heavily contaminated land. This mechanism could be extended to provide a carbon credit to those biofuels that meet specified ILUC mitigation criteria. Such criteria would identify activities that prevent or minimise the 'displacement effect' of using an agricultural commodity crop for biofuels. Examples include the use of biofuels co-products to substitute animal feeds, the production of biofuel feedstock crops on abandoned or degraded land, yield improvements and the use of wastes as feedstock for biofuel production. Further measures are identified and described on pages 24 to 26 in this report.

The ILUC mitigation credit would improve the reported carbon intensity of qualifying biofuels to reflect the emissions saved as a result of reducing or preventing ILUC. This would make them worth more to fuel suppliers as they need less physical volume to meet mandatory greenhouse gas reduction targets, and so create financial value without the need for fiscal intervention. Biofuels producers would be incentivised to adopt ILUC mitigation measures in order to benefit from higher prices offered by fuel suppliers for biofuels that qualify for the ILUC mitigation credit.



If 10% of all biofuels used in the EU in 2020 qualified for a 29gCO₂eq/MJ ILUC mitigation credit, financial value of up to \$1.6 billion could be created in that year alone for those feedstock growers and biofuels producers that had invested in practices that mitigate ILUC impacts.

In this scenario, qualifying biofuels are worth up to 30% more than biofuels that do not qualify for the credit, creating a strong financial incentive for the adoption of more sustainable agricultural practices. Importantly, the carbon credit and associated improved product value would only be available to producers who have implemented verifiable ILUC mitigation practices. The total value created would be dependent upon the level of carbon credit assigned and the level of uptake by producers.

The ILUC mitigation credit would work alongside, and remain subject to, the existing compliance processes for the RED and the Fuels Quality Directive (FQD). There are options in how policymakers apply the mechanism. One potential option would be to provide carbon credits through a tiered approach in order to preferentially reward some ILUC mitigation practices over others. Another option could be to combine the incentive of the ILUC mitigation credit with a delayed ILUC penalty applied to those producers that do not adopt ILUC mitigation measures. These options have challenges and would require further study to assess the relative ILUC mitigation characteristics of the different practices and to define the appropriate carbon values for a tiered credit system or a possible penalty.

The ILUC mitigation credit scheme does not provide a 'silver bullet' solution to the challenges of ILUC. Given the uncertainty in quantifying the GHG emissions arising from ILUC, the carbon credits will not precisely correspond to the level of emissions abatement achieved by ILUC mitigation measures. However, the benefits of the ILUC mitigation credit scheme significantly outweigh its shortcomings. The scheme could also be applied as part of a wider programme of policy interventions on ILUC, such as multilateral co-operation on land use controls. To progress the ILUC mitigation credit scheme from concept to full implementation there are some areas that will require decisions from policymakers, such as defining the level of the carbon credit and the list of ILUC mitigation measures eligible for the credit.

Swift action on these issues to bring the ILUC mitigation credit scheme into operation represents the best opportunity to provide an effective policy response to the challenge of ILUC. By incentivising the adoption of certain sustainable agricultural practices, it could also make an important contribution towards some of the wider challenges facing the global agricultural system beyond the narrow concerns about biofuels.



2. Introduction

The need to reduce transport emissions

Reducing the greenhouse gas emissions of transport, particularly road transport, is one of the major challenges for policy makers tasked with tackling climate change. The European Commission (EC) has committed to reducing total greenhouse gas emissions (from all sources) in Europe by 20% by 2020, and is considering a greenhouse gas reduction target of 80-95% by 2050¹. Despite advances in vehicle fuel efficiency, aggregate emissions from transport increased by 24% from 1990-2008 and now represent approximately 20% of total annual greenhouse gas emissions in Europe². If these stretching greenhouse gas reduction targets are to be met, reductions in emissions from transport, particularly road transport, must play a significant part. It has been estimated that an 80% overall reduction in greenhouse gas emissions by 2050 would require a 95% reduction in road transport emission³.

Biofuels are important - but there are concerns about possible indirect effects

Liquid fuels are likely to remain the primary energy source for road transport for at least the next few decades. In this context, biofuels are widely recognised as an important means of lowering the carbon emissions of transport. They may also provide benefits such as increased energy security and rural economic development. Consequently, a number of national governments across the world have put in place legislation to require biofuels to form a proportion of the road transport fuel mix. However, there are also concerns about the impacts of such policies. These concerns centre on two main questions: will biofuels achieve genuine carbon savings, and will policies that encourage biofuels have negative impacts for food security and the natural environment?

It is generally accepted that not all biofuels are equal and, therefore, it is important that policies encourage uptake of the 'right' types of biofuels that are both sustainable and deliver the required greenhouse gas savings. The EC has included compulsory sustainability criteria and minimum greenhouse gas thresholds within the Renewable Energy Directive (RED) and the Fuels Quality Directive (FQD). Currently, the sustainability and greenhouse gas criteria of the RED and FQD

are focused on direct impacts, such as the type of land on which the biofuel feedstock crop was grown and the emissions resulting from the fuel manufacturing process. However, concerns about biofuels relate to both direct and potential indirect impacts. For certain stakeholders it is the risk of indirect land use change (ILUC) impacts that is of greatest concern, for example whether using a crop for biofuels displaces production of a crop elsewhere in order to meet the demands of that crop's original (pre-biofuel) market. In particular, there is concern that the use of crops for biofuels could displace other agricultural production activities onto land with high natural carbon stocks. This would result in significant greenhouse gas emissions from land conversion, and potentially negate the greenhouse gas benefits of using biofuels in the first place.

Concerns on current generation biofuels must be addressed

The development and use of advanced biofuels, such as those produced from cellulosic material (for example straw or wood chips), is seen by some stakeholders as a key means of counteracting sustainability concerns on biofuels. However, the European Union (EU) Member States' implementation plans for the RED show that biofuels using today's technology are expected to be the primary mechanism for meeting the EU's 2020 targets for renewable energy in transport. Due to their current high costs and present inability to be produced at scale, advanced biofuels are not expected to play a significant role in the overall transport energy mix by 2020. Similarly, while technologies such as electric vehicles are likely to play an important role in a future low carbon transport infrastructure, these are likely to remain niche technologies for at least the next decade.

Achievement of the EU's greenhouse gas reduction targets for transport, at least for 2020, will therefore rely heavily upon the use of current 'first generation' biofuels. Furthermore, current generation biofuels are likely to remain a significant part of the transport energy mix for several decades and will be important technological and economic enablers for the development and deployment of advanced biofuel technologies. It is therefore essential to find solutions that address current sustainability concerns, particularly in relation to ILUC.

1. Presidency Conclusions of the Brussels European Council (29/30 October 2009)

2. Report of the European Expert Group on Future Transport Fuels (January 2011)

3. McKinsey (2010) Powertrains for Europe: A fact-based analysis



'The potential effects of indirect land use need to be properly weighed in our biofuels policy. It is in our interest to investigate this seriously and ensure to have a legislation that avoids negative side effects.'

Günther Oettinger, European Commissioner for Energy

A number of policy options are being considered to address indirect land use change

The EC is committed by the RED to review the potential impact of greenhouse gas emissions from ILUC and, if appropriate, develop a methodology to address ILUC emissions. A public consultation was launched in 2009 on potential policy approaches to ILUC. Following a number of further consultation exercises and analytical studies, the EC published an interim report in December 2010 setting out four policy options it was formally considering:

- ▶ Take no action for the time being while continuing to monitor.
- ▶ Increasing the minimum greenhouse gas threshold for biofuels.
- ▶ Introducing additional sustainability requirements for certain biofuels.
- ▶ Attributing greenhouse gas emissions to biofuels reflecting the estimated ILUC impact.

About this study

A significant group of stakeholders in the ILUC debate believe that an additional policy option that warrants consideration is to incentivise the adoption of measures that reduce or prevent ILUC impacts occurring at all. A consortium of industry and non-governmental organisations have convened and have commissioned Ernst & Young to assess key issues in the ILUC debate and consider the options available to policymakers. In particular, the study considered the implications of the policy options presented by the EC and whether the use of market-led incentives to drive activities that mitigate the risk of ILUC may represent a viable alternative policy option.

Research for this study involved the following activities:

- ▶ A literature review of academic research studies, public and private sector-commissioned research and EC ILUC consultation responses to assess key themes in the debate around ILUC and review whether there is evidence supporting the various policy options for ILUC.
- ▶ An online survey of over 50 major feedstock producers and trade associations to assess the key factors driving producers' decisions to adopt sustainability measures, such as those introduced for biofuels. Respondents included organisations from all the main global regions producing biofuels for use in the EU.
- ▶ A series of focused workshops with feedstock producers and biofuels manufacturers in São Paulo, Buenos Aires, Kuala Lumpur, Brussels and London. The purpose of the workshops was to discuss in more detail how producers would respond to regulation on ILUC and the extent to which incentives could be used to drive the adoption of ILUC mitigation practices.
- ▶ Interviews with selected stakeholders from government, NGO and industry organisations to supplement information gathered during the workshops.
- ▶ Economic analysis and scenario modelling to provide a high-level assessment of the potential market impacts of introducing incentives for ILUC mitigation.



3. What is ILUC and why is it relevant?

- ▶ **Direct land use change** occurs when a *new activity occurs on an area of land*. Direct land use change can be observed and measured.
- ▶ **Indirect land use change (ILUC)** occurs as an *unintended consequence of land use decisions elsewhere*. Indirect land use change cannot be directly observed or measured.
- ▶ The primary reason why the concept of indirect land use change is a relevant concern is the risk that the use of crops for biofuels might displace other agricultural production activities onto land with high natural carbon stocks (resulting in significant greenhouse gas emissions from land conversion).

The basic premise for the concept of ILUC is the assumption that the use of agricultural commodities for biofuels places additional demand on top of existing uses for those commodities (such as food, animal feed or fibre). To meet the additional demand created by using a commodity crop as feedstock for biofuels, production of commodity crops may be displaced onto areas of land not currently available for arable crop production, thereby causing a change of land use. It is important to recognise that the displacement effects of ILUC may cross national borders and different feedstock crops⁴. For example, demand for European sugarbeet for biofuels could trigger expansion of sugarcane production in Brazil in order to maintain the supply of sugar. Equally, ILUC effects can occur within the same feedstock crop; for example, increased demand for sugarcane for bioethanol could result in land being converted from other uses to agricultural production so that existing non-biofuel demands for sugarcane can be met.

Direct land use change can be observed and measured as the reason for the change in land use is known (for example, conversion of grazing land in Brazil to sugarcane in order to meet increased demand for sugarcane). Indirect land use change cannot be directly measured or observed. This is because the impact of an activity in one location that is indirectly causing land use change in another location (for example, increased use of sugarbeet in Europe for biofuel causing an increased demand for sugar from sugarcane in Brazil) cannot be isolated from other factors that may also drive land use change (for example, decreasing profitability of cattle grazing making sugarcane a more economically attractive land use).

Two separate but related negative consequences of ILUC for biofuels are discussed in the literature:

- ▶ Firstly, there is the potential impact that ILUC could have on the greenhouse gas benefits of using biofuels in transport. Certain types of land use change can have very significant greenhouse gas impacts due to the conversion of natural carbon stocks into atmospheric carbon emissions which could negate any transport fuel greenhouse gas intensity reductions being achieved by the biofuels policy.
- ▶ Secondly, there is the potential that the consumption of agricultural resources for biofuels means that the needs of other users of the same resource cannot be met without undesired consequences (such as environmental damage through agricultural expansion, or risks to food security).

It should also be noted that not all biofuels will necessarily cause negative ILUC impacts. For example, in some instances the consumption of a commodity crop for biofuel may be offset by the production of co-products from the biofuel manufacturing process. These co-products can be used to directly substitute a different commodity crop, resulting in a limited or even negative overall demand for land from the biofuel⁵. Similarly, land use change as a result of biofuel demand can have positive impacts. For example, a study focusing on the greenhouse gas emissions associated with land use change from sugarcane expansion in Brazil found that sugarcane tended to expand onto pastures. The reported result was that land carbon uptake actually increased (thereby lowering land use emissions)⁶.

Political legitimacy for biofuels is likely to require a constructive response to both the challenges of greenhouse gas performance and resource impacts.

4. Ecofys (2010) *Responsible Cultivation Areas*

5. *ibid*

6. Gawel and Ludwig (2011) *The ILUC dilemma: How to deal with indirect land use changes when governing energy crops? Land Use Policy (In Press)*



ILUC is not unique to biofuels

ILUC is not a phenomenon unique to biofuels or to specific geographic regions. Any form of additional demand on the global agricultural system has the potential to create ILUC. Furthermore, biofuels account for a very small proportion of global agricultural production; approximately 2%, or around 36 Mha⁷, from a total cropland area of around 1,527 Mha⁸. Non-agricultural land use changes may also result in ILUC impacts, such as urban expansion or infrastructure development. Therefore the most effective means of mitigating ILUC is likely to be effective, global regulation on land use. This is beyond the remit of the private sector but nonetheless should remain an important consideration for policy makers.



7. UNEP (2009) *Towards Sustainable Production and Use of Resources: Assessing Biofuels*

8. FAOstat data for 'arable land and permanent crops' in 2008. Available from <http://faostat.fao.org> (viewed April 2010)





4. Modelling uncertainties and implications for policymakers

- ▶ There are significant uncertainties and varying assumptions in the modelling studies attempting to quantify the greenhouse gas impacts of ILUC.
- ▶ Policy stability is critical for investor confidence; uncertainty over policy direction has been significantly restraining the investment the EU needs to meet its climate change and renewable energy targets.
- ▶ Some of the potential solutions being proposed to monitor or regulate for ILUC create inconsistencies with related policies and could impact the delivery of some of the EU's climate goals.
- ▶ Measures to address ILUC must not undermine existing investments that have been made under the current RED requirements, nor dissuade future investments.

'We have to ensure that the biofuels we promote deliver clear greenhouse gas savings.'

Connie Hedegaard, European Commissioner for Climate Action

There are significant uncertainties in the studies on ILUC

A question that has dominated both public debate and research studies in relation to ILUC is whether biofuels can provide genuine greenhouse gas reductions once potential ILUC impacts have been taken into account.

Indirect changes to land use cannot be observed, hence estimating the greenhouse gas impacts of these changes requires the use of models that make assumptions about future impacts and the interactions between different input parameters. Consequently, the models are complex and the outcomes inherently uncertain⁷. Modelling the land use change impacts of biofuels is relatively new (the first study was published in 2007)⁹ though a significant amount of work has been published on this subject since then. In 2010 the EC undertook a review of the scientific literature modelling the land use change impacts of biofuels, drawing on over 150 contributions on the topic and reviewing 22 different modelling exercises¹⁰. The EC concluded that the science on estimating ILUC impacts was inconclusive and that all of the models for evaluating ILUC had significant gaps or assumptions that created uncertainty in the nature and scale of impacts calculated by the models. Key areas of concern included the land use and yield data used in the models, the treatment of co-products, assumptions about the types of land use change and the methods for allocating greenhouse gas emissions. Since the EC's review was completed further studies have been published but significant uncertainties in the modelling of ILUC remain.

Uncertainty about ILUC effects could be reduced but making improvements to models and the supporting data is likely to be time-consuming and resource intensive, even when focusing efforts on just one feedstock in one country¹¹. Possibly as a result of this, there is significant variability in the quantity of literature focused on investigating the ILUC impacts of different feedstocks. For example, conducting the literature review for this study revealed that there is a considerable body of evidence relating to bioethanol from European wheat, but very little in comparison that focuses on biodiesel from European rapeseed.



Modelling uncertainties relating to the role of biofuels co-products

The manufacturing process for many biofuels results in co-products. Many of these co-products can be used for animal feed, while others can be used as a fuel source. The majority of ILUC models do not properly account for protein mass balance flows within the agricultural system, focusing instead on measures such as mass or energy content. This is a significant omission as protein content is an important factor in determining the extent to which co-products from biofuels production may be able to substitute crops in the production of animal feeds. The impact of omitting protein mass balance flows is that many models are likely to substantially underestimate the extent to which co-products from the production of certain types of biofuels may offset the land requirements of those biofuels¹². For example, one modelling study undertaken by IFPRI, which allocates co-products on the basis of energy content, calculates the ILUC-related emissions for wheat ethanol as 16-37mg CO₂/MJ¹³. Another modelling study undertaken by E4tech, which assesses the feed displacement ratio rather than energy content, calculates the ILUC-related emissions for wheat as between -53 and -5mg CO₂/MJ. According to the E4tech analysis, rather than creating greenhouse gas emissions from ILUC the co-products of wheat ethanol actually mean a carbon credit is gained. This is due to the ability of European wheat co-products to substitute soy bean imports into the EU¹⁴.



Modelling uncertainties on the impacts of land use changes

The majority of studies apply a simplistic allocation of carbon emissions to land use changes. For example, when considering the greenhouse gas impacts of agricultural production expanding into areas that were formerly forested, most models attribute all of the greenhouse gas impacts of this land use change to the new agricultural production activity¹⁵. In reality, there are usually multiple drivers for land use change; assigning all the carbon impacts to agriculture implies that other activities, such as logging for pulp and paper, could be considered 'carbon neutral'.

There is also an assumption in most of the studies that the greenhouse gas impacts of land use change will always be negative (increasing emissions). This may not always be the case. Some forms of agriculture, such as no till farming, have the potential to increase stocks of soil carbon sequestration. Similarly, perennial crops such as oil palm and jatropha will sequester carbon in their roots and trunks. These positive impacts need to be considered alongside those of activities that can cause significant emissions, such as fertiliser use.



9. EC (2010) *The impact of land use change on greenhouse gas emissions from biofuels and bioliquids: Literature review*

10. *ibid*

11. Nassar et al (2010) *An allocation methodology to assess greenhouse gas emissions associated with land use change*

12. Lywood (2011) *Accounting for biofuel co-products in ILUC models: Where has all the protein gone?*

13. Delft (2010) *Marginal land use changes for varying biofuels volumes*

14. E4tech (2010) *A causal descriptive approach to modelling the greenhouse gas emissions associated with the indirect land use impacts of biofuels*

15. See 9



'The main purpose of mandatory national targets is to provide certainty for investors and to encourage continuous development of technologies...'

EU Renewable Energy Directive

Policy uncertainty restrains investment in renewable technologies

Achievement of the EU's targets for renewable energy development and greenhouse gas emissions reductions is heavily dependent upon the private sector as the EC's intended primary source of investment funding¹⁶. For private sector investors, the certainty that policies, once established, will remain in place is a key factor in their decisions and has been explicitly recognised as such in the text of the RED. Biofuels producers have a legal obligation to comply with sustainability requirements, so potential investors in biofuels need to understand what rules and costs may be associated with compliance.

Similarly, investors need certainty that the greenhouse gas benefits of technologies they invest in can be clearly recognised and valued by the market. A prerequisite for effective regulation on carbon emissions is the ability to account for the greenhouse gas savings of measures introduced as a result of the policy and to be able to monitor progress towards greenhouse gas reduction targets. Effective implementation of the RED and FQD requires the ability to compare the greenhouse gas intensity of biofuels to that of fossil fuels and monitor changes in the greenhouse gas intensity of biofuels over time. This is particularly important given that the greenhouse gas intensity of fossil fuels may change as fossil fuels are increasingly produced from unconventional sources. Uncertainty on how the greenhouse gas emissions of biofuels are calculated makes it difficult for investors to determine how the market will value the greenhouse gas performance of a particular biofuel.

There are a number of potential implications resulting from the current policy uncertainty in relation to biofuels and ILUC:

► ***Insufficient investment in current biofuels technologies to meet existing mandates***

Investors consulted as part of this study noted that investment in current biofuel technologies, including those that perform well against the EU's current sustainability criteria, is being held back as investors wait to see whether regulation for ILUC changes the investment case for biofuel technologies. This could have impacts for the achievement of the RED and FQD targets.

► ***Insufficient investment to commercialise advanced biofuels***

There is a risk of restraining development and implementation of advanced biofuels with high greenhouse gas savings and low risks of ILUC. On a global basis, uncertainty over policy and governmental support for biofuel developments, coupled with the recent financial crisis, is widely recognised to be restraining the rate at which advanced biofuel technologies are being moved towards demonstration at scale¹⁷. As many advanced biofuel technologies are based on a model where advanced biofuels production is co-located with current generation biofuels production, assuring the continued existence of this market will be an essential part of providing the certainty that investors need before deploying capital into advanced biofuel technologies.



► **Potential restraints to broader investment in renewable energy**

There is a risk of sending mixed messages on how climate change policy is developed and implemented in the EU. This in turn could erode the investment appetite of investors in other areas of renewable energy beyond biofuels, potentially jeopardising some of the EU's broader carbon reduction goals. Recent analysis has suggested that the current average annual capital investment in all forms of renewable energy in Europe is €35 billion; this rate of investment is approximately half of the level of investment required in order to reach the EU's renewable energy targets for 2020¹⁸.

Measures to address ILUC for biofuels need to consider implications for other sectors

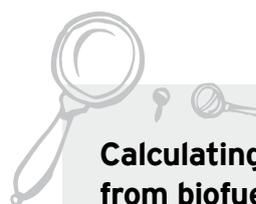
ILUC impacts are not unique to biofuels and biofuels are often a relatively niche market for the commodity crop that provides the feedstock. Consequently, measures to address ILUC for biofuels are unlikely to address all the core ILUC-related concerns of stakeholders as long as there are other markets which also have the potential to create ILUC impact, but do not have their own requirements to reduce ILUC risks. Unless all markets have the same requirements, feedstock producers will always have the option to avoid ILUC requirements for biofuels by selling to a market without these requirements.

The best approach to reducing the risk of ILUC impacts occurring, therefore, is to focus on those solutions that are most likely to have impacts beyond just the biofuels sector. Measures that reduce direct emissions and ILUC risks for biofuels could also create opportunities to reduce emissions from other industries, such as food production, that are the main users of the commodity crops that provide feedstocks for biofuels.

16. EC (2011) *Communication to Parliament - Renewable Energy: Progressing towards the 2020 target*

17. Murphy et al (2011) *Global developments in the competition for land from biofuels*

18. Ecofys (2011) *Financing renewable energy in the European energy market*



Calculating ILUC emissions from biofuels

For a number of stakeholders in the ILUC debate, a core objective of ILUC modelling studies is to enable the quantification of ILUC emissions so that a better understanding can be gained of the relative life cycle emission benefits (or otherwise) of using biofuels for transport fuels. However, in the debate on ILUC policy some fundamental issues in relation to this objective are often overlooked:

- As indirect land use changes cannot be directly observed, estimating potential ILUC emissions requires the use of modelling and assumptions about complex cause-and-effect relationships. Consequently, regardless of how far models are refined, data on ILUC emissions will always be uncertain and vulnerable to challenge.
- The econometric models used to estimate ILUC emissions are focused primarily on potential future impacts (for example, the use of rapeseed for biofuel reduces the volume of vegetable oil available to non-biofuel users and therefore stimulates demand for palm oil, resulting in land use changes in order to increase palm oil production capability). Combining data on ILUC emissions with data on direct (production) emissions, as some studies argue, would mean adding data on potential future emissions to known historical emissions. This would make it extremely difficult for policymakers to understand the actual impacts on carbon emissions of biofuels policies, or to monitor progress towards emissions reduction targets.

As a result of these issues an inevitable outcome of incorporating the quantification of ILUC emissions into regulatory policy will therefore be uncertainty; uncertainty over both how accurate the stated ILUC emissions for a given biofuel actually are, and whether the policy is achieving its intended emissions reduction objectives.





5. Analysis of ILUC policy options

- ▶ The EC is formally considering four policy options for addressing the ILUC impacts of biofuels under the RED and FQD:
- ▶ **Option 1 - Take no action for the time being, while continuing to monitor:** This option would maintain the RED and FQD in their current form but potentially introduce a means of monitoring the ILUC impacts of biofuels.
- ▶ **Option 2 - Raise the minimum greenhouse gas saving threshold for biofuels:** This option would increase the minimum greenhouse gas saving threshold that biofuels must pass in order to count towards Member States' national targets under the RED.
- ▶ **Option 3 - Introduce additional sustainability requirements on certain categories of biofuels:** This option would see the introduction of sustainability requirements that are additional to those currently within the RED (and replicated in the FQD).
- ▶ **Option 4 - Attribute a quantity of greenhouse gas emissions to biofuels reflecting the estimated ILUC impact:** This policy option would introduce an ILUC 'factor' that allocates additional greenhouse gas emissions to the calculated 'direct' emissions, in order to account for potential emissions resulting from ILUC impacts.
- ▶ **Additional option suggested by this study - Incentivise ILUC mitigation:** A further policy option that may warrant consideration is to introduce a market-based scheme that incentivises the production and use of biofuels that have a reduced risk of ILUC impacts.

5.1 Context in which ILUC policy options must be considered

Within the literature there is a general consensus that biofuels could have ILUC impacts. The nature and scale of these impacts is disputed, but the fact that impacts can occur is not^{19,20,21}. Responding to the challenge of ILUC is a political imperative for biofuels because of the importance of current first-generation biofuels to the achievement of medium-term greenhouse gas reduction goals for transport fuels, and the level of concern from certain stakeholders on potential sustainability risks.

The EC is formally considering four policy options, namely: take no action for the time being while continuing to monitor; increasing the minimum greenhouse gas saving threshold for biofuels; introducing additional sustainability requirements on certain categories of biofuels; and attributing a quantity of greenhouse gas emissions to biofuels reflecting the estimated

ILUC impact. In considering these, or any further policy options, it will be important for the EC to evaluate how the success of different policy options may be impacted by:

- ▶ How the EU biofuels market is expected to develop.
- ▶ The relationship between biofuels policies and feedstock producer decisions.

The EU transport biofuels market

Over the next decade, demand for biofuels in the EU is estimated to increase from around 10,000 kilotonnes of oil equivalent (ktoe) in 2010 or around 4% of total road transport fuel demand, to just under 30,000 ktoe, or around 8.6% of total fuel demand²². The majority of this biofuels demand is likely to be for biodiesel.

19. See 9

20. Netherlands Environmental Assessment Agency (2010) *how to deal with indirect land-use change in the EU Renewable Energy Directive*

21. Tyner et al (2010) *Land use changes and consequent CO2 emissions due to US corn ethanol production: A comprehensive analysis*

22. EC (2011) *Indirect land use change and biofuels: Study requested by the European Parliament's Committee on Environment, Public Health and Food Safety*

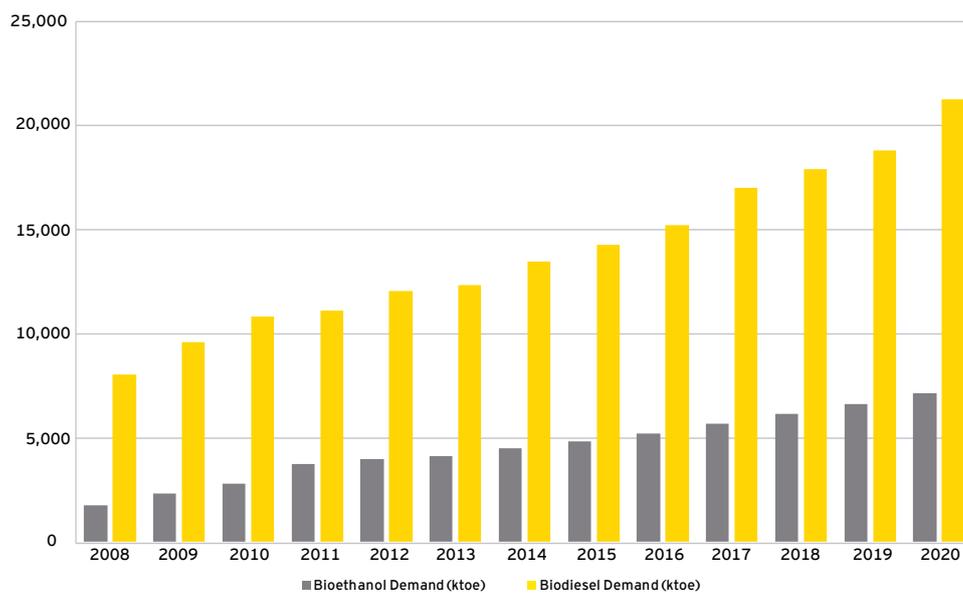


Figure 1: Forecasted EU demand (ktoe) for bioethanol and biodiesel to 2020 based on Member States' National Renewable Energy Action Plans

The proportionate mix of biodiesel and bioethanol expected to be required in the EU has important implications for ILUC policy, as there are differences in the greenhouse gas intensities of biofuels from different feedstocks based on their direct emissions. However, feedstocks for both biodiesel and bioethanol will need to be used in order to meet the EU's targets. Significantly more biodiesel is likely to be required than bioethanol given the popularity of diesel vehicles in Europe; yet biodiesel feedstocks typically have lower greenhouse gas savings than bioethanol feedstocks (for example see Figure 4 on page 18). Should measures to address ILUC introduce additional greenhouse gas constraints, for example by raising the minimum greenhouse gas saving threshold or by allocating an ILUC emission factor, it is likely that biodiesel feedstocks will be impacted to a greater extent than bioethanol feedstocks.

Related to this is the potential impact of 'blend walls'. The blend wall is the maximum proportion of biofuel that can be blended with gasoline or diesel without requiring further investments

in vehicle technologies or fuel distribution and retailing infrastructure. This is relevant to the ILUC debate because the effect of the blend wall means that policymakers must evaluate the impact of ILUC policy measures against the achievement of the renewable energy content and greenhouse gas intensity reduction targets of the RED and FQD respectively. For example, if measures to address ILUC were to substantially reduce the availability of biodiesel feedstocks, policymakers would likely have to make a choice:

- ▶ Accept that the RED and FQD targets are unlikely to be met, with the consequential impacts for emissions reduction in transport and investments in renewable technologies.

or

- ▶ Require investment in vehicle technologies and fuel distribution infrastructure in order to change the bioethanol blend limit so that a greater proportion of bioethanol can be used.



The relationship between biofuels policies and feedstock producer decisions

Given that ILUC impacts centre on the use of land, it is important to understand how farmers and growers have responded to existing biofuels regulations and how they are likely to respond to changes to these regulations. The RED contains specific sustainability requirements with which all biofuels must demonstrate compliance in order to be counted towards Member States' targets under the RED and FQD. However, these requirements do not specifically address potential ILUC impacts. If policy measures to address ILUC place additional requirements on feedstock producers, it is essential that such measures are aligned with existing policy measures, such as the RED sustainability requirements.

There are currently at least 17 different voluntary or regulatory certification schemes or assurance requirements that can be applied to biofuel feedstock crops²³, including the requirements of the RED, plus many more national-level crop certification schemes or standards. As illustrated by Figure 2,

the majority of respondents to an Ernst & Young surveyⁱ of major feedstock producers and trade associations were either already participating in one or more sustainability schemes, or were intending to do so within the next year. Figure 3 shows that farmers and growers have been adopting sustainability standards primarily to improve their market options, either through enabling their crop to access a greater number of potential buyers or to achieve a price premium.

Whilst survey respondents noted that the biofuels industry was increasing in importance as a buyer, for a significant proportion of respondents the biofuels industry remained relatively insignificant as a market for their crops. The majority of feedstock crops used in biofuels are not grown specifically for energy purposes; the animal feed, vegetable oil or sugar markets are more significant end markets. Therefore feedstock producers have options as to what crops they grow and to which markets they are sold.

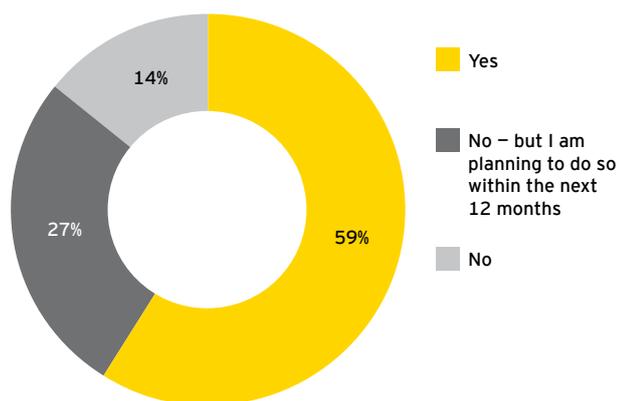


Figure 2: Do you participate in a sustainability scheme for your crops?

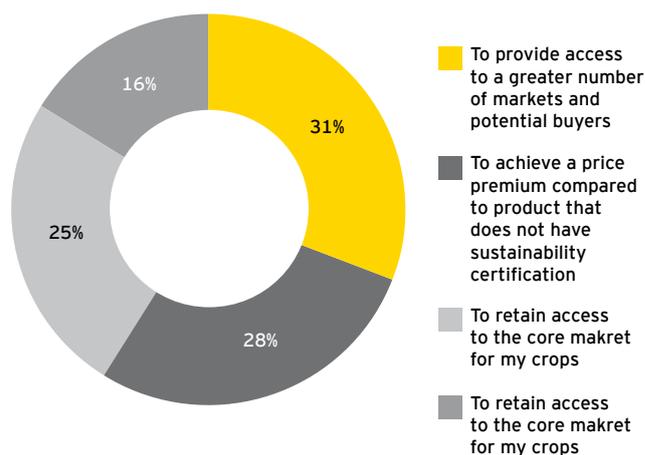


Figure 3: What is your motivation for participating in a sustainability scheme?

23. Scarlat & Dallemand (2010) Recent developments of biofuels/bioenergy sustainability certification: A global overview
 i. Ernst & Young undertook a targeted survey of over 50 major feedstock producers and trade associations from the major feedstock groups and production regions for biofuels currently used in Europe. Survey respondents included several national farmers associations in Europe, major sugarcane, soy and palm oil producers and a number of small producers from both developed and developing countries. Survey respondents are not named in this report to protect commercial confidentiality.



Responses to the survey suggest that feedstock producers will adopt sustainability schemes if there is a market demand. A number of voluntary schemes, such as the Roundtable for Sustainable Palm Oil (RSPO), are recognised by buyers across different markets (for example biofuels and food). The importance of market access as a driver for the adoption of sustainability schemes is shown by Figure 3, and was further highlighted during the producer workshops Ernst & Young undertook for this studyⁱⁱ. At each of the workshops participants stated that access to the EU biofuels market was very important, not only due to the growing size of the market but also because the EU was seen as 'setting the standard' for other markets. Biofuels producers who could meet EU requirements on quality and sustainability would almost certainly be able to meet the requirements of other markets.

However, the debate and resulting policy decisions on ILUC potentially adds a new dynamic to the EU biofuels market and its importance or otherwise to producers. The policy response to ILUC could have the effect of limiting the attractiveness of the EU biofuels market to producers through creating barriers to market entry. Alternatively, ILUC policy could create opportunities to differentiate and encourage the production of the most sustainable biofuels.

5.2 Analysis of policy options

Set out on the following pages is an analysis of the four policy options that the EC is formally considering to address ILUC under the RED and FQD, together with an additional option of incentivising ILUC mitigation (measures that reduce or prevent ILUC impacts) that could also be considered. This analysis, which is summarised in Section 5.3, considers whether the policy options are likely to:

- ▶ Encourage the adoption of practices that mitigate ILUC risk?
- ▶ Improve the overall greenhouse gas performance of biofuels in the EU?
- ▶ Enable blenders to fulfil regulatory biofuel mandates in a cost effective manner?
- ▶ Improve investor confidence?

ii. Ernst & Young organised and facilitated a series of one-day workshops with feedstock producers and biofuels manufacturers in Sao Paulo, Buenos Aires, Kuala Lumpur, Brussels and London. The purpose of the workshops was to discuss in more detail how producers would respond to regulation on ILUC and the extent to which incentives could be used to drive the adoption of ILUC mitigation practices.



Delays in RED and FQD implementation are hindering investment in innovation

The RED and the FQD provide effective building blocks to drive the uptake of sustainable biofuels and promote carbon intensity reduction for transport fuels. Both of these outcomes would have benefits for reducing ILUC risks. However, delays in implementation of the RED and FQD by Member States and a lack of clarity on the pathway for greenhouse gas intensity reductions in transport fuels are limiting effectiveness.

The key impact of this delay is market uncertainty. The scale of this uncertainty was consistently highlighted in the producer workshops undertaken for this study, and was particularly evident amongst biofuels producers outside of the EU. With no understanding of exactly when the RED will come into force across the Member States, and even greater uncertainty about the role Member States expect biofuels to play in meeting the 6% greenhouse gas reduction target of the FQD, a commoditised market has been created. Biofuels are traded solely on the basis of their technical specifications and there remains, for the time being, no tangible pricing differential for sustainability or greenhouse gas performance. Consequently there are limited incentives for biofuel producers to invest in sustainability or greenhouse gas performance improvement measures, beyond the bare minimum required for RED compliance.



Policy option 1: Take no action for the time being while continuing to monitor

This policy option would see the RED and FQD unchanged from their current form, though the EC could develop specific measures in order to monitor parameters that are relevant to stakeholder concerns about ILUC.

Encourage the adoption of practices that mitigate ILUC risk?

The RED contains a number of mandatory requirements, replicated in the FQD, relating to the status of the land on which crops for biofuels production were grown; in summary that land must not have been a high natural carbon stock in 2008 or be of high biodiversity value. These requirements have a role in potentially reducing ILUC risks by placing a control on direct land use change. This could impact the type of land onto which agricultural production is displaced as growers of commodity crops, who wish to retain the option of selling any of their crops to the EU biofuels market, will need to ensure compliance with the requirements for all their crops. Failure to do so would reduce the grower's market options. This is something that has not been considered in the existing models seeking to evaluate ILUC impacts.

Nonetheless, there are a number of stakeholders who believe the existing RED sustainability requirements are insufficient to address the risk of ILUC impacts from biofuels. The RED requirements, in their current form, are focused on direct impacts and therefore provide no mechanism for explicitly recognising and encouraging the adoption of those practices that may reduce ILUC risks.

Improve the overall greenhouse gas performance of biofuels in the EU?

The FQD contains a mandatory target for a 6% reduction in the greenhouse gas intensity of transport fuels by 2020. The RED requires biofuels to achieve a minimum greenhouse gas saving of 35% compared to fossil fuels, rising to 50% by 2017 (and 60% by 2018 if produced from a biofuels manufacturing plant that becomes operational post-2017). Analysis conducted for the EC by the JEC Biofuels Programme suggested that achieving the FQD greenhouse gas intensity reduction targets would require all biofuels to achieve average greenhouse gas savings of 63-73% by 2020²⁴. The potential increase in



greenhouse gas intensity of fossil fuels could further increase the need for biofuels to achieve improved greenhouse gas savings in order to reduce the overall greenhouse gas intensity of the blended transport fuel.

Consequently there is a strong argument to be made that the RED and FQD already contain mechanisms that will drive improvements in the greenhouse gas performance of biofuels. However, greenhouse gas emissions under the RED and FQD are calculated in relation to direct emissions only. There are no mechanisms that explicitly seek to encourage measures to reduce the risk of emissions resulting from ILUC impacts.

Enable blenders to fulfil regulatory biofuel mandates in a cost effective manner?

This policy option would not create any changes to the current blend economics of complying with the RED and FQD, so the impact would be neutral.

Improve investor confidence

Taking the decision not to introduce additional policy measures would reduce an area of risk currently facing potential biofuels investors. However, if there is a perceived lack of political agreement on the issue and a risk that, after a period of monitoring, further policy measures could be introduced, then uncertainty will remain. This uncertainty would be likely to prolong the current lack of investor confidence with negative impacts for biofuel investment.



Improving the impact of the RED and FQD

The producer workshops highlighted a number of measures that may improve the effectiveness of the RED and FQD and create a market that values the sustainability and greenhouse gas performance of biofuels:

- ▶ Rapid and effective implementation of the RED and FQD by Member States will provide a strong signal to the market, removing uncertainty about whether and when the Directives will be implemented.
- ▶ The FQD allows for Member States to set interim greenhouse gas reduction targets of 2% by 2014 and 4% by 2018, rather than just the final greenhouse gas reduction target of 6% by 2020. Mandating the interim greenhouse gas reduction targets would add significant clarity to the greenhouse gas reduction pathway expected of biofuels and provide greater certainty to industry.
- ▶ All Member States should require fuel suppliers (who will usually also be blenders of biofuels) to report on progress against the interim greenhouse gas targets. As part of this, blenders should be required to report separately on the contribution of the biofuels they use to achievement of the greenhouse gas reduction targets. This would provide a further reputational driver for blenders to purchase the more sustainable, higher performing biofuels.
- ▶ Further clarity is needed on the EC definitions for feedstocks that can be classified as wastes or residues, or have been produced on land that is severely degraded or heavily contaminated. This would help biofuels producers to prioritise the use of feedstocks that have inherently reduced risks of ILUC by virtue of not directly displacing another commodity crop.





Monitoring mechanisms for biofuels policy risks

One option for monitoring the nature and scale of ILUC impacts from biofuels, suggested by a number of participants at workshops for this study, could be to identify 'critical impact factors'. These would relate to those issues of greatest concern to stakeholders worried about the potential negative impacts of EU biofuels policies. Through engagement with stakeholders (e.g., governments, NGOs, industry) it should be possible to agree a short list of critical impact factors. These should be specific, measurable outcomes that are directly related to concerns about ILUC impacts, for example increased conversion of high carbon stock land as a result of growing biofuels demand.

Defining a specific outcome will enable monitoring mechanisms to be developed that can evaluate the direct links between use of EU biofuels and the identified potential impact areas (e.g., seek to establish whether there is a causal relationship between growth of biodiesel consumption in Europe and conversion of peatlands for palm

oil plantations in South East Asia). Unlike ILUC modelling exercises, which attempt to predict future outcomes, monitoring mechanisms would be evaluating the extent to which certain outcomes predicted by the models have actually occurred. If, through monitoring critical impact factors, it could be established that current EU policies were not preventing the negative impacts from occurring, this would provide evidence to support a re-evaluation of EU policies. Alternatively, if monitoring the critical impact factors established that there was no deterioration or, indeed, that there had been an improvement, then this should help reassure stakeholders who have specific concerns about the impacts of biofuels policies. The concept of critical impact factors is supported by the findings of a stakeholder workshop organised by Shell and IUCN, which included the identification of a number of parameters that could be evaluated as part of efforts to monitor potential ILUC impacts. Examples of such parameters identified in the workshop included the utilisation of non-agricultural lands (for agricultural purposes), protection of highly biodiverse lands, strategic land use planning and the securing of land rights²⁵.

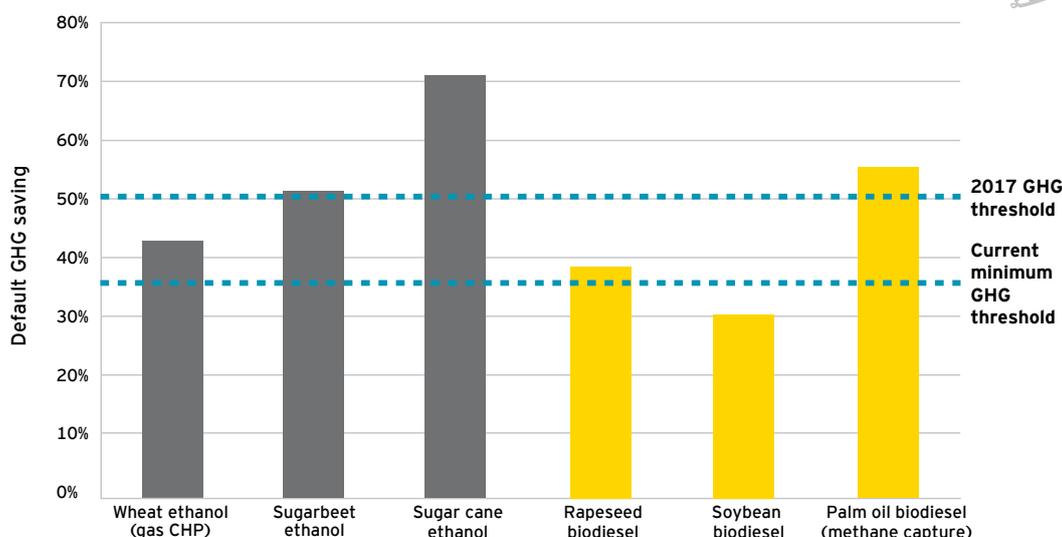


Figure 4: Default greenhouse gas values from the Renewable Energy Directive for key biofuel feedstocks used in the EU

25. Report of the Shell/IUCN indirect land use change workshop (21-22 September 2010): www.iucn.org/about/work/programmes/economics/econ_stayinformed/?6255/ilucworkshop (viewed April 2011)



Policy option 2: Increase the minimum greenhouse gas saving threshold for biofuels

Currently, in order to comply with the RED all biofuels must achieve a minimum greenhouse gas saving of 35%, based on direct emissions, rising to 50% in 2017, as illustrated by Figure 4. This option would further increase the minimum greenhouse gas saving threshold that biofuels must pass in order to be used within the EU.

Encourage the adoption of practices that mitigate ILUC risk?

The minimum greenhouse gas saving threshold relates only to direct emissions, so will not necessarily have an impact on reducing the risk of ILUC emissions. Therefore this policy option would not encourage feedstock producers and biofuels manufacturers to adopt practices that may mitigate ILUC risk.

Moreover, there is a risk that qualifying biofuels may have a greater risk of ILUC impacts than some of the biofuels that no longer qualifyⁱⁱⁱ. These ILUC risks could be exacerbated by crop expansion in response to increased demand for these qualifying biofuels.

Improve the overall greenhouse gas performance of biofuels in the EU?

Figure 4 shows that the minimum greenhouse gas saving thresholds in the RED already mean that some biofuels producers will need to demonstrate that the greenhouse gas savings of their biofuels are better than the assumed 'default' values if they are to access the EU market. Many more biofuels producers will face this requirement when the minimum greenhouse gas saving threshold increases in 2017. Further increases in the minimum greenhouse gas threshold for all biofuels as a means of recognising potential ILUC emissions will therefore improve the overall greenhouse gas savings achieved by biofuels in the EU. However, this will only be in relation to direct emissions. Reductions in ILUC emissions might occur for some biofuels, but this would be purely coincidental rather than by policy design (and, as noted above, ILUC emissions could also increase).

Enable blenders to fulfil regulatory biofuel mandates in a cost effective manner?

It is likely that an increased greenhouse gas saving threshold would mean a reduction in the range of biofuel feedstocks available to blenders. Unless sufficient quantities of qualifying biofuels are available there may be a constraint on supply which, in a competitive market, is likely to increase costs at the blend point. Increased costs at the blend point could be passed on to consumers. There is also a possibility that a limitation on supply created by the increased minimum greenhouse gas thresholds, coupled with the impact of blend walls, could mean that it becomes more challenging to meet the RED and FQD targets unless policymakers take action to address blend wall constraints.

Improve investor confidence?

Increases in the minimum greenhouse gas saving threshold are already built into the RED, as is a safeguard mechanism that caps any increases in the greenhouse gas saving threshold to 45% until 2017. Any further changes have the potential to undermine the objective stated in the RED of providing a stable framework for investors.

There is also the risk that increasing the minimum greenhouse gas saving threshold creates challenges in meeting the volumetric RED target for the renewable content of transport fuels, given the constraints of the blend wall. This could be particularly exacerbated if the impact of raising the greenhouse gas threshold was to significantly constrain the availability of biodiesel feedstocks which, as illustrated by Figure 4, are most likely to be impacted by an increase in the minimum threshold for biofuels. The potential outcome is a policy change that undermines a central policy target, further decreasing investor confidence in the EU's regulatory framework for renewable energy.

ⁱⁱⁱ. For example, if the minimum greenhouse gas threshold increased from 35% to 45%, a blender might choose to substitute rapeseed biodiesel (which has a RED default greenhouse gas saving of 38%) for sunflower biodiesel (which has a RED default greenhouse gas saving of 51%). However, according to a review of several different ILUC models by CE Delft (Biofuels: Indirect land use change and climate impact, June 2010), sunflower biodiesel is estimated to have average ILUC emissions of 64 gCO₂/MJ whereas average ILUC emissions from rapeseed biodiesel are estimated to be considerably lower at 36 gCO₂/MJ. Whilst there will always be a high degree of uncertainty on estimates of ILUC emissions, all modelling studies agree that ILUC risks can vary substantially between different biofuel feedstocks.



Policy option 3: Introduce additional sustainability requirements on certain categories of biofuels

The third option under consideration by the EC is to develop sustainability requirements that are additional to those currently within the RED (and replicated in the FQD) and specifically focused on addressing potential ILUC impacts.

It could be argued that the introduction of sustainability requirements for biofuels through the RED is already having a demonstrable impact on feedstock producers (as illustrated, for example, by Figure 2). This would seem to provide evidence supporting the development of further sustainability requirements focused on the issue of ILUC. These additional requirements could be focused on the mitigation of ILUC risks, and only those organisations able to demonstrate compliance with the new requirements would be able to sell product into the EU biofuels market.

Encourage the adoption of practices that mitigate ILUC risk?

Care is needed to distinguish between (a) measures that drive actual changes in the behaviours and decisions of growers and farmers with respect to land management and crop production, and (b) measures that merely increase the administrative burden for producers.

It is also necessary to consider the circumstances under which additional sustainability criteria are likely to be adopted. For example, Stakeholders consulted during the course of this study stated consistently that voluntary schemes, such as those designed to meet the RED sustainability criteria, tend only to be adopted by those organisations that can either adopt the scheme at minimal cost, or are large enough to absorb the additional cost without adverse impacts on short-term profitability. This effect is particularly pronounced in markets outside of the EU where the adoption by feedstock producers of non-regulatory sustainability schemes (in response to consumer demand) may be less commonplace.

This may appear a desirable outcome; strict biofuels sustainability requirements mean that only a selection of market leading organisations are able to supply biofuels to the EU. However, in the context of rising global demand for agricultural commodities, there is reason to doubt that continued access to the EU biofuels market will, by itself, be a clear value differentiator for many feedstock producers.

As feedstock producers have various options in the markets they sell to, unless there is a clear link to financial value it is unlikely that additional sustainability criteria would be adopted. Instead, there is a strong likelihood that crops will be sold to markets that are not making such stringent demands. If the criteria are not adopted by producers, it is highly unlikely that the intended benefits for ILUC mitigation will be achieved.

In addition there are a number of potential issues that would need to be addressed in relation to the practicality of developing and applying selective additional sustainability requirements. Policymakers would need to define how the categories of biofuels subject to the additional requirements will be selected, whether additional requirements would be feedstock or geography-specific, and understand whether there are implications of this approach in relation to possible barriers to trade.

Improve the overall greenhouse gas performance of biofuels in the EU?

Sustainability requirements could be designed to mean that for the selected categories of biofuels, only those that achieve higher greenhouse gas savings can meet the requirements. This could be achieved in relation to both direct emissions and potential ILUC emissions. For example, the additional requirements could mean that certain categories of biofuels must demonstrate that certain technologies are being used to reduce direct emissions, such as methane capture for a palm oil mill. Similarly, biofuels could be required to demonstrate that certain measures that can reduce or prevent ILUC emissions are in place, such as the production of co-products that are sold into animal feed markets as a replacement for other commodity crops. Biofuels that adopted these requirements would therefore achieve improved greenhouse gas savings. However, if producers refused to adopt the additional sustainability requirements, choosing instead to sell feedstock crops to other markets, the potential benefits in terms of GHG performance for biofuels in the EU would not be realised.

Enable blenders to fulfil regulatory biofuel mandates in a cost effective manner?

Additional requirements are likely to increase the costs of compliance, either through the adoption of practices to reduce ILUC risks, or through documenting existing practices in order to demonstrate compliance with the new requirements.



Consequently, if enacted without an accompanying economic incentive, the likely impact of additional sustainability requirements would be a reduction in the 'pool' of organisations willing and able to invest in demonstrating compliance.

As with increasing the minimum greenhouse gas threshold, there would be the risk that a restricted range of biofuel feedstocks available in the market could result in escalating costs at the blend point, and hence to consumers. Similarly, a limitation on supply created by the additional sustainability requirements, coupled with the impact of blend walls, could mean that it becomes more challenging to meet the RED and FQD targets unless policymakers take action to address blend wall constraints.

Improve investor confidence?

The introduction of additional sustainability requirements would be likely to negatively impact investor confidence. The sustainability requirements already contained within the RED are considered by a number of industry stakeholders to be stretching and the introduction of additional requirements could be seen as policymakers 'moving the goalposts'. There will also be concerns for investors about the potential implications for existing investments.

Sustainability requirements may have an important role to play in addressing ILUC. However, policymakers will need to consider the conditions under which the criteria may achieve successful outcomes. It will be important for any additional requirements to support innovation by recognising improvements in greenhouse gas savings and measures that reduce ILUC risk.

Policy option 4: Attribute a quantity of greenhouse gas emissions to biofuels reflecting the estimated ILUC impact

This policy option would introduce an ILUC 'factor' that allocates additional greenhouse gas emissions to the calculated direct emissions, in order to account for potential emissions resulting from ILUC impacts. This is the policy approach to ILUC that is arguably the most widely discussed in the literature and has been adopted at a federal level in the US through the Renewable Fuels Standard (RFS2) and at a state level through California's Low Carbon Fuels Standard (LCFS).

Encourage the adoption of practices that mitigate ILUC risk?

The models used to estimate ILUC emissions (and therefore provide data for a potential ILUC factor) apply ILUC emissions to biofuels according to relatively simple categorisations such as feedstock type and geography. An ILUC factor may influence the purchasing decisions of blenders seeking to improve the carbon savings of transport fuels. However, as producers do not have the means to differentiate their product on the basis of ILUC mitigation there is little reason to adopt ILUC mitigation practices. Furthermore, even if the mechanisms for calculating an ILUC factor allowed for differentiation of ILUC mitigation practices, the avoidance or reduction of an ILUC penalty applied at the blend point is unlikely to be sufficient to encourage feedstock producers to adopt mitigation practices. Selling feedstock to non-biofuel markets is likely to remain an easier and more cost effective option.

Improving the overall greenhouse gas performance of biofuels in the EU?

If it was possible to calculate an ILUC factor according to a scientifically robust methodology, a likely outcome would be that the biofuels used in the EU would be those with reduced ILUC emissions. However, as discussed in Section 3, the models estimating ILUC emissions are highly uncertain and, given that ILUC impacts cannot be directly observed, there will always be inherent uncertainty when attempting to quantify emissions from ILUC. Therefore it would be difficult for policymakers to determine the extent to which the greenhouse gas performance of biofuels had actually changed as the result of introducing an ILUC factor.

Added to this is the likelihood that because the ILUC factor has the impact of reducing the greenhouse gas savings of biofuels, an increased volume of biofuels may be required in order to meet the greenhouse gas intensity reduction target of the FQD. The effect of the blend wall may limit increases in the volume of biofuels used, unless policymakers take action to address these constraints. Nevertheless, it should be noted that without action to address the risks of ILUC, increases in biofuel volume could potentially increase ILUC emissions.



Enable blenders to fulfil regulatory biofuel mandates in a cost effective manner?

Attributing a variable ILUC factor to biofuels will have a similar impact to increasing the overall greenhouse gas threshold in that the range of feedstocks available to blenders is reduced by virtue of less biofuels meeting the minimum greenhouse gas threshold of the RED. The impact of this, combined with the effect of blend walls, is likely to be increased challenges in fulfilling the mandates of the RED and FQD and potentially increased costs to consumers at the pump.

Improve investor confidence

The inherent uncertainties involved in applying an ILUC factor will create ambiguity in the regulatory framework. The application of ILUC factors in the LCFS is proving to be highly contentious, with the California Air Resources Board (CARB) already substantially revising ILUC factors from its original estimates²⁶. For example, the ILUC factor adopted in the LCFS for corn ethanol has been halved between 2010 and 2011. CARB have committed to further re-evaluation of the ILUC factors in the LCFS even though the LCFS only entered its compliance phase in 2011²⁷.

In addition to the inherent imprecision in the modelling of ILUC, there are some further implications of adopting an ILUC factor approach that warrant consideration by policymakers:

- ▶ The calculation of biofuels emissions based on both direct and indirect impacts introduces a methodological inconsistency into the FQD. Greenhouse gas intensity under the FQD of both fossil fuels and biofuels is based on direct emissions, so using a different approach for just biofuels would make meaningful comparisons extremely difficult.
- ▶ ILUC impacts are not static, being affected by dynamic factors such as commodity prices in various markets, regulatory policies and climatic conditions. Therefore, the estimated indirect emissions of biofuels would need to be frequently revised. This is an even greater imperative given the immaturity of the science.
- ▶ ILUC factors must be applied ex-ante, as the estimated emissions have not yet occurred. If an ex-post assessment of an ILUC factor found that the estimated emissions used

for the factor were markedly different to what actually occurred, then the effectiveness of the ILUC factor as a policy option would likely be challenged.

- ▶ Attributing indirect emissions to biofuels introduces a double standard into the EU's climate change policies unless the same approach was to be adopted by other forms of transport energy, such as fossil fuels or electric vehicles. This inconsistency could also have implications for wider EU climate change policies, for example in the interplay between the RED rules on bioliquids and the EU Emissions Trading Scheme for the heat/power generation sector.

Issues such as the above mean that the introduction of ILUC factors is arguably the policy option that would have the greatest impact in terms of regulatory uncertainty and is therefore most likely to undermine the EU's goals for private sector-led investment in renewable technologies, particularly advanced biofuels.

Additional policy option suggested by this study: Incentivise ILUC mitigation

Whilst measuring the potential scale of ILUC impacts may be difficult, this need not be a barrier to proactively encouraging activities that can reduce the risks of ILUC occurring in the first place. This additional policy option would introduce incentives to recognise and reward biofuels with a reduced risk of ILUC impacts.

There are indications that incentivising ILUC mitigation could be more politically acceptable than the alternative policy interventions that the EC is considering for ILUC. As part of its consultation process the EC has sought views from stakeholders on what course of action would be appropriate for addressing ILUC. Responses to this public consultation, illustrated by Figure 5, indicate that the majority of stakeholders who responded, including just over 50% of biofuels producers, would prefer no action on ILUC. The majority of those who supported action on ILUC, including over 20% of biofuels producers and around 30% of NGOs, would prefer an alternative to the EC's proposals. None of the respondent groups described in Figure 5 had a majority supporting any of the EC's proposals for addressing ILUC. In their responses to the EC's consultation, eight Member States (Belgium, France, Germany, Italy, Netherlands, Poland, Romania and the UK) indicated they would support incentives for ILUC mitigation²⁸.

26. RFA: CARB to cut LCFS penalty for ethanol in half, *Biofuels Journal*, 19 November 2010: www.biofuelsjournal.com/articles/RFA__CARB_to_Cut_LCFS_Penalty_for_Ethanol_in_Half-101602.html (viewed April 2011)

27. ICCT Policy Updates (April 2011) *United States Low Carbon Fuel Policies*

28. Analysis commissioned by a consortium member and reviewed by Ernst & Young



ILUC factors in California's Low Carbon Fuels Standard

The California Air Resources Board (CARB) adopted ILUC factors for biofuels as part of the Low Carbon Fuels Standard (LCFS). CARB established a number of 'expert sub-groups' to review and evaluate the implementation of the LCFS, including the use of ILUC factors. The CARB expert sub-group for 'Comparative and Alternative Modelling Approaches' published its report in December 2010²⁹. This made a number of observations in relation to the use of ILUC factors, including the following:

- ▶ ILUC factors represent only a static picture of potential impacts, whereas real consequences are dynamic and change over time.
- ▶ Given that ILUC impacts are dynamic, factors should be frequently revised; however this creates regulatory uncertainty.

- ▶ Persistent uncertainties in ILUC modelling create doubt as to whether investments in databases will deliver satisfactory levels of confidence in their results.
- ▶ Risk mitigation measures, rather than penalties, may provide a stronger empirical basis to reduce ILUC risks from growing biofuels demand.

In addition to the observations of the CARB expert sub-groups, it is important to note that unlike the RED, the LCFS has no minimum greenhouse gas saving thresholds and, currently, no mandatory sustainability requirements. The lack of these safeguards in the LCFS means that regardless of what factors are applied, there is no regulatory restriction preventing the use of biofuels from unsustainable sources or with poor greenhouse gas savings.

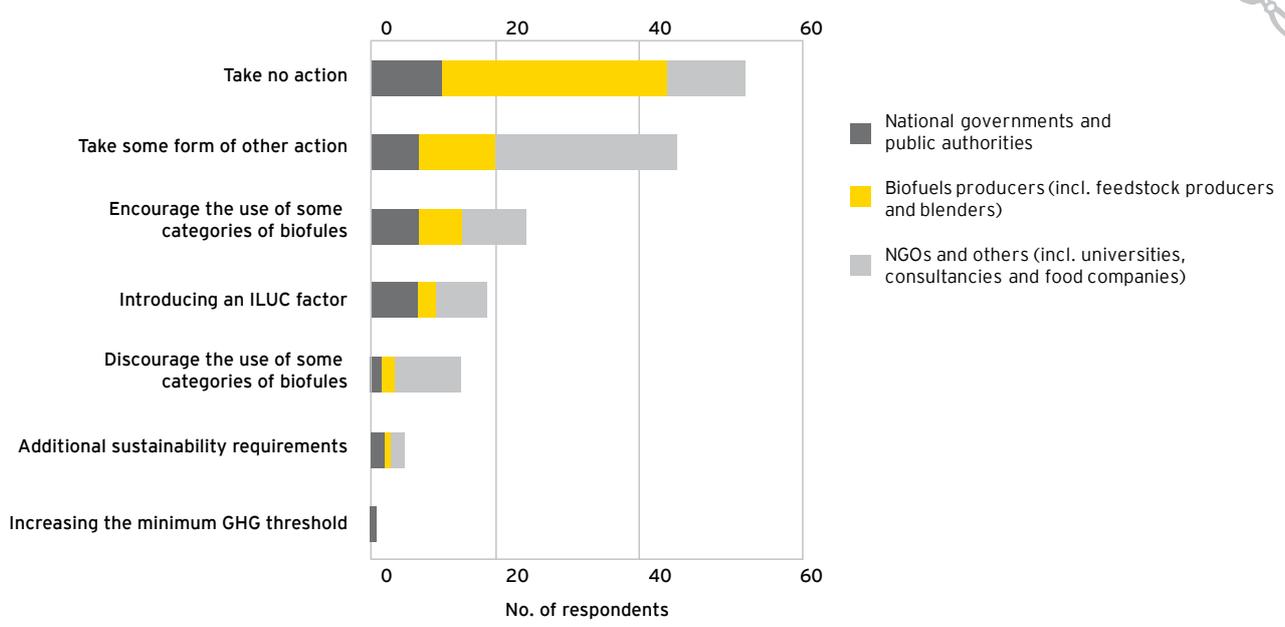


Figure 5: Responses to Question 4 of the EU's public consultation of July 2010 on how ILUC should be addressed

29. Final Report of the CARB Expert Subgroup on 'Comparative and Alternative Modelling Approaches' (2010) <http://www.arb.ca.gov/fuels/lcfs/workgroups/ewg/010511-final-rpt-indirect-effects.pdf> (viewed March 2011)

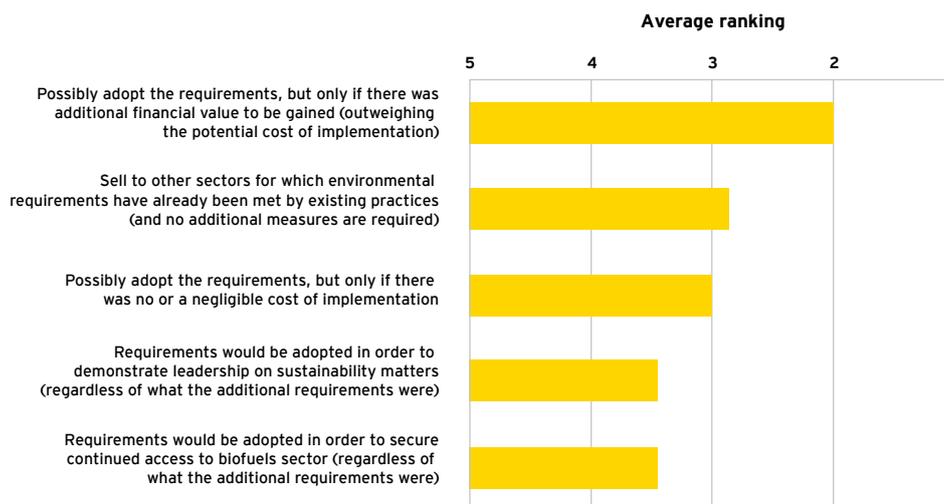


Figure 6: If the biofuels sector unilaterally required additional environmental requirements beyond those that you are currently fulfilling, what would be your response? (Respondents ranked the options 1-5 in order of preference, with 1 being the most preferred option)

Encourage the adoption of practices that mitigate ILUC risk?

Research for this study, as illustrated by Figure 6, found that biofuels producers and feedstock growers would be willing to adopt further sustainability measures in relation to biofuels, but only if the adoption of these measures will result in additional financial value than can be gained through current practices. An incentive scheme that provides financial value to producers has a good chance of successful adoption. However, a mechanism that introduces additional requirements but does not provide additional financial value is more likely to result in producers selling their crops to other markets for which requirements have already been met by existing practices.

Some measures that reduce ILUC risks, such as land use controls, can only be controlled by regulatory authorities. However, many ILUC mitigation measures are either within the direct control of individual organisations in the biofuels value chain, or may be significantly influenced by market signals. With the right policy environment, such practices could be incentivised to encourage further uptake and thereby increase the adoption of better management practices within the agriculture sector.

There is a significant range of measures available across the supply chain that can reduce ILUC risks by preventing or minimising the 'displacement effect' of using an agricultural

commodity crop for biofuels. Importantly, for all of these measures there are examples of practical implementation, making them commercially relevant. However, for the majority of these measures there is currently limited uptake, hence the need for incentives. Key ILUC risk reduction activities include:

- ▶ **Use of co-products**
Maximising the use of co-products from the biofuel manufacturing process can significantly reduce the risk of ILUC for some feedstocks. The use of co-products can also have a role in encouraging the displacement of unsustainable animal feed production; for example co-products from wheat ethanol may substitute animal feeds that could otherwise have been produced using unsustainable agricultural practices.
- ▶ **Yield increases**
By increasing crop yields the need to expand the area of land in agricultural production in order to meet rising demand for commodity crops can be reduced. Crop yield increases globally are likely to come from simple, relatively low cost agronomic management gains in conventional cropping³⁰ and could also be gained from 'resource conserving' agricultural practice³¹. This can have particular benefits in regions such as the former Soviet Union states, Asia and Sub-Saharan Africa. In more

30. See 17

31. Pretty et al (2006) Resource-conserving agriculture increases yields in developing countries, *Environmental Science and Technology*, Vol 40. No. 4



developed agricultural economies there is also likely to be significant scope for yield increases through innovations in agronomy, provided the right incentives are in place. To avoid unintended impacts, it will be important that measures to increase yields should contain safeguards to prevent negative environmental impacts (for example on biodiversity, soil or water) that can be associated with some agricultural intensification practices. EU and national environmental regulations will have an important role in this regard.

► **Manufacturing efficiencies**

Measures such as improving the feedstock conversion efficiency of the biofuel manufacturing process, for example improving oil capture from the oil seed crushing process, may also have a role to play in reducing ILUC risk by producing 'more from less'.

► **Crop production on abandoned or degraded lands**

Expanding production onto abandoned or degraded land means that the impacts of land use change can be controlled and limited to those areas where effects are acceptable. For example, the EC estimated that there is approximately 5 million hectares of abandoned cropland within the EU (including set aside but excluding abandoned agricultural grassland)³². The Brazilian government has also announced its intention to work with industry in developing several million hectares of degraded land for biodiesel feedstock production³³.

► **Producing biofuels from wastes or residues**

The production of biofuels from wastes or residues, such as biodiesel produced from used cooking oil, mitigates ILUC because biofuels are being produced from a feedstock that requires no new land requirements and may otherwise have no or negligible value. Consequently, there is a reduced risk of such feedstocks being replaced by agricultural expansion elsewhere.



Yield improvements for wheat and rapeseed

In the UK, a number of research studies have been undertaken that have sought to investigate ways of optimising crop yields to meet the demands of the biofuels sector. Studies undertaken by the consultancy ADAS for a group of biofuels and farming organisations have examined the relationships between nitrogen fertiliser application (the biggest source of greenhouse gas emissions from the production of wheat and oilseed rape), plant varieties and yields. The driver for this research was the need to understand the options available to farmers to reduce greenhouse gas emissions of crop production whilst at the same time ensuring that measures to reduce emissions (by reducing fertiliser application) did not inadvertently increase ILUC risks through reducing yields. Findings from the research included:

- Adjusting the timings of nitrogen fertiliser application for second-crop wheat can increase yields by more than 0.5 t/ha³⁴.
- Specific traits have been identified in a number of varieties of oilseed rape that enable plant productivity to be maintained with minimal external applications of nitrogen fertiliser. This will enable plant breeders to develop new varieties of oilseed rape that reduce emissions from cultivation whilst maintaining yields³⁵.



32. EC (2009) *Prospects for agricultural markets and income 2008-2015*: http://ec.europa.eu/agriculture/publi/caprep/prospects2008/index_en.htm (viewed March 2011)

33. *Programme for sustainable production of palm oil*. Multiple sources, e.g.: http://news.mongabay.com/2010/0507-amazon_palm_oil.html (viewed March 2011)

34. *Early nitrogen can give a lift to alcohol yield*, *Farmers Weekly* 26 March 2011

35. *Personal communications from representatives of Northeast Biofuels and ADAS*, March 2011



► **Intensification of production through systems integration**

Introducing energy crop cultivation without displacing the original land use would mitigate the risk of ILUC occurring. This could occur through practices such as double cropping food and energy crops, or by integrating different forms of agricultural production into the same land area^{iv}.

► **Agronomy support**

The producer workshops for this study highlighted the importance of agronomy support as a means of reducing ILUC risks, particularly in developing countries. Sophisticated feedstock producers can provide agronomy assistance to small scale or low income farmers, helping them to improve their productivity and thereby reducing ILUC risks. For example, a number of palm oil producers are providing financial assistance and training to communities of independent palm oil growers to help them improve yields and quality standards.

► **Advanced biofuels**

Advanced biofuels can be an important means of reducing the risk of ILUC impacts from biofuels. Biofuels produced from feedstocks that are wastes or residues, such as maize stover, or from feedstocks that are removed from the agricultural commodity crop system, such as algae, do not displace commodity crops and are therefore an important means of mitigating ILUC.

Improve the overall greenhouse gas performance of biofuels in the EU?

The RED and FQD contain mechanisms that are designed to incentivise certain types of biofuels. The RED allows for certain biofuels, such as those manufactured from feedstocks classified as 'wastes', to count twice towards the RED energy content targets. The intention of this mechanism is to incentivise the market to preferentially seek biofuels that qualify for this 'double counting', as blenders need to buy less physical biofuel volume in order to meet the volumetric targets.

Similarly, the RED and FQD contain a provision that allows a carbon 'bonus' or 'credit' of 29gCO_{2eq}/MJ to be assigned to biofuels that are from feedstocks grown on 'severely degraded' or 'heavily contaminated' land. This carbon credit would

artificially improve the greenhouse gas intensity reductions achieved by qualifying biofuels, with the intention being that qualifying biofuels then become more attractive to blenders in the context of the FQD greenhouse gas reduction targets. Due to an unclear and potentially restrictive definition for severely degraded or heavily contaminated land the carbon credit mechanism is not yet being used by biofuels producers, but the mechanism for the credit is enshrined in the text of the Directive.

Both of these incentive mechanisms could be adapted to provide a market-based incentive for biofuels that adopt ILUC mitigation measures. All ILUC mitigation activities, by virtue of reducing or preventing ILUC impacts, will also reduce or prevent ILUC emissions. Therefore any incentive scheme that encourages a shift towards those biofuels with an ILUC incentive attached will have the impact of improving the greenhouse gas performance of biofuels. However there are two trade-offs in relation to how the greenhouse gas performance of biofuels is monitored and reported:

- Accounting for the emission reductions achieved through ILUC mitigation measures will be subject to the same uncertainties as estimates of ILUC emissions. Only direct emissions can be measured with a relatively high degree of confidence.
- If the incentive mechanism is a carbon credit for ILUC mitigation that is applied to the direct emissions of biofuels, an artificial distortion will be introduced to the reporting of biofuels greenhouse gas performance (as would be the case if the 29gCO_{2eq}/MJ credit was assigned to biofuels from feedstocks grown on severely degraded or heavily contaminated land). The carbon credit value is arbitrary and may not reflect the actual greenhouse gas savings being achieved, though as noted above, the actual greenhouse gas savings cannot be accurately calculated anyway.

iv. For example the Integrated Food-Energy Systems (IFES) approach being developed by the Food and Agriculture Organisation of the United Nations: www.fao.org/bioenergy

36. PEMANDU (2010) Economic Transformation Programme: A roadmap for Malaysia



Improving palm oil productivity in Malaysia

The Malaysian government has ambitious plans to increase the palm oil industry's contribution to gross national income by almost 240% from 2010 - 2020³⁶. To achieve this growth the government has developed a portfolio of initiatives that it intends to drive across the industry. As many of these initiatives are focused on increasing agricultural productivity, there would also potentially be significant benefits in terms of reducing ILUC risks. Initiatives include:

- ▶ Accelerating the removal of older, lower yielding trees and replanting with young, high yield varieties. This will be achieved by regulatory measures on the age/productivity of trees and by providing financial support to assist smallholders with replanting.
- ▶ Improving fresh fruit bunch (FFB) yield amongst smallholders in particular by expanding agricultural support services, ensuring smallholders are organised into cooperatives and mandating the uptake of specified industry best practices by all producers.
- ▶ Improving regulatory oversight over milling activities in order to drive improvements in the oil extraction rate and the quality of co-products from palm oil production (for example improving the quality of palm kernel expeller so it can be used as a poultry feedstock).
- ▶ Accelerating the commercialisation of advanced biofuels that utilise biomass residues from palm oil processing (such as empty fruit bunches, tree fronds and trunks).



Enable blenders to fulfil regulatory biofuel mandates in a cost effective manner?

Market-based incentive mechanisms create value by enabling blenders to fulfil mandates while buying a reduced physical volume of biofuels. As such they are explicitly designed to help mandates to be fulfilled in a cost effective manner, whilst also providing a basis for value to be passed down the supply chain to biofuels producers.

Improve investor confidence?

Unlike policy options that 'penalise' biofuels as a means of responding to concerns about potential ILUC impacts, incentivising the adoption of ILUC mitigation offers substantially fewer downsides. Notably, the negative impacts of constraints on the biofuels market are avoided, such as the risk of missing RED and FQD targets or increasing costs to consumers as an unintended consequence of ILUC regulation. There are also other important benefits to investors:

- ▶ The rationale and mechanisms for an incentive scheme have already been built into the RED and FQD.
- ▶ The prospect of additional financial value may encourage investors to develop new products and stimulate a more competitive biofuels market.

The overall impact will be improved policy stability and increased investor confidence. However, there is a risk that investments in non-qualifying biofuels could be indirectly impacted by virtue of blenders preferentially seeking biofuels that qualify for the incentive.



Other options available to policymakers

Given the broad range of potential ILUC impacts and, most importantly, the fact that ILUC effects are not limited to the biofuels sector, no single solution is likely to provide a 'silver bullet' policy option. Arguably, with effective land use planning that is enforced from global to local levels, ILUC impacts would not occur. However, such systems do not exist and are unlikely to be developed in the foreseeable future. Therefore policymakers may wish to consider a suite of measures that, in combination, present a joined-up response with a strong likelihood of success in reducing the potential ILUC risks from biofuels.

Policymakers may wish to support mitigation measures that are implemented within biofuels value chains with macro-level initiatives to address the most significant ILUC risks. Macro-level initiatives will, by their very nature, have a wider scope than just the biofuels sector and therefore will require a different approach to initiatives that are specifically focused on the biofuels value chain. However, with a scope that is wider than the relatively narrow niche of biofuels, the potential benefits of macro-level initiatives are likely to extend across other sectors that may have more significant ILUC impacts than biofuels.



Agroecological zoning

Land management controls imposed by national governments may not be able to prevent ILUC on a wider scale, as they have no control over what happens outside of national borders. However, they can be an effective means of reducing the ILUC risks associated with a particular feedstock and region or country. A number of countries have established agroecological zoning, which restricts the production of certain commodity crops to specific areas. A good example of this is the implementation of agroecological zoning areas for sugarcane and palm oil production in Brazil. Mozambique has also introduced land use planning that indicates areas for food production, natural resource protection and biofuels feedstock production.



Voluntary land use moratoriums

The Soy Moratorium is a multi-stakeholder initiative that was established in 2006 with a commitment from major soy buyers not to acquire soybeans from areas in the Amazon biome that had been deforested after July 2006. The Moratorium was signed by the corporate membership of the Brazilian vegetable oil association, ABIOVE, and the national grain exporters association, ANEC. Together, ABIOVE and ANEC members are reported to represent around 94% of Brazil's soybean industry³⁷.

Under the Moratorium, soy farmers must register their holdings in order to be included on the approved supplier listings for ABIOVE and ANEC members. NGO stakeholders monitor registered properties using a combination of remote sensing data and on-the-ground compliance checks.

The Soy Moratorium was initially limited to a two-year commitment, but has since been renewed by signatories every year since 2008. The Moratorium has been widely hailed as an example of a successful initiative by its supporters, such as Greenpeace, who are calling for similar initiatives to be developed for other sectors such as cattle ranching³⁸. Initiatives such as the Soy Moratorium are likely to have significant benefits in reducing ILUC risk in a particular region.



37. *Brazil throws weight behind Amazon soy ban*, Reuters Brazil, June 17 2008
38. *Rhett A. Butler*, mongabay.com (6 March 2011) *Moratorium on Amazon deforestation for soy production proving effective*, <http://news.mongabay.com/2011/0306-soy-moratorium.html> (viewed April 2011)



Bilateral or multilateral co-operation on ILUC risk reduction

A common concern voiced by participants at each of the producer workshops held as part of the research for this study, was that national-level initiatives that could have positive impacts for ILUC mitigation are not currently recognised or rewarded by EU biofuels policy. Examples of such measures could include agroecological zoning controls, or efforts to develop and implement national sustainability standards, such as the Indonesian Sustainable Palm Oil (ISPO) standard. National sustainability standards would need to be sufficiently aligned to the RED requirements in order to be recognised in this way.

The RED already contains provisions that encourage the development of bilateral or multilateral agreements between Member States and non-EU countries in relation to the sustainability of biofuels production. Policymakers should give consideration to whether formal recognition of national-level initiatives that can be demonstrated to support the EC's sustainability goals can be built into the administration of the RED sustainability requirements. This could include the use of effective land use controls by governments of countries seeking access to the EU biofuels market for their producers.

In addition, a number of biofuels producers attending workshops for this study outside of the EU stated that if the EU was to remove import tariffs in the context of a bilateral agreement that makes stringent requirements for ILUC mitigation, the market economics for their industries would be materially changed. This would provide a strong incentive against which producers may be willing to make substantial investments in ILUC mitigation in order to access the EU market. However, fiscal intervention measures are beyond the scope of the RED and FQD so are not considered further within this report.

5.3 Summary of ILUC policy options

Table 1 (overleaf) provides a summary comparison of the different policy options for ILUC that are currently being considered by the EC, together with the further option of providing incentives for ILUC mitigation through the mechanisms in the RED and FQD.

It should be noted that this is a high level summary of potential impacts; the actual impact will be determined by detailed design. Nevertheless, it is clear that all of the ILUC penalty options (increasing the greenhouse gas threshold, introducing additional sustainability criteria and/or introducing an ILUC factor) are unlikely to result in the adoption of ILUC mitigation practices by producers, so will be of limited effectiveness in reducing ILUC risks. Furthermore, there is the risk that ILUC penalty options could create unintended consequences for EU biofuels policy. These include potential challenges in achieving the fundamental purpose for which the RED and FQD were designed: increasing the use of renewable energy and lowering the greenhouse gas emissions of transport fuels. There is also the further risk of increasing costs to consumers.

By contrast, incentivising ILUC mitigation presents far less risk in terms of unintended consequences. Incentives are most likely to encourage producers to adopt ILUC mitigation practices, thereby making an incentive-based approach most likely to succeed in reducing ILUC risk. Introducing ILUC incentives will not create barriers to the achievement of RED and FQD targets; rather the opposite impact is more likely, with a properly designed incentive scheme making it more likely that the EU's objectives for biofuels will be achieved. This summary analysis assumes that additional production costs for ILUC mitigation are offset by the value of the incentive that is applied.



Policy option	Encouraging the adoption of practices to mitigate ILUC	Improving the GHG performance of biofuels
Take no further action while continuing to monitor	<ul style="list-style-type: none"> ▶ No change to current practices, therefore no incentive to adopt mitigation practioner. 	<ul style="list-style-type: none"> ▶ No change to current greenhouse gas performance.
Increase greenhouse gas saving threshold (all biofuels)	<ul style="list-style-type: none"> ▶ No incentives for change 'on the ground'. Biofuels that perform better on the basis of direct emissions will continue to qualify, regardless of their associated ILUC risks. 	<ul style="list-style-type: none"> ▶ Production likely to shift to those biofuels with higher direct greenhouse gas savings, therefore the greenhouse gas performance of biofuels is likely to improve, but only in relation to direct emissions. ▶ Once ILUC imports are taken into account, the overall greenhouse gas impact is uncertain.
Sustainability requirements (selected biofuels)	<ul style="list-style-type: none"> ▶ Without an accompanying economic incentive, sustainability criteria are likely to be a compliance burden, and are therefore unlikely to encourage the adoption of mitigation practices. 	<ul style="list-style-type: none"> ▶ Sustainability criteria could result in production shifting to biofuels with higher greenhouse gas savings. If this occurred then overall greenhouse gas performance would improve.
ILUC factor (all biofuels in varying degrees)	<ul style="list-style-type: none"> ▶ No incentives created for change 'on the ground'. 	<ul style="list-style-type: none"> ▶ Production is likely to shift to those biofuels with higher greenhouse gas savings, therefore overall greenhouse gas performance is likely to improve. ▶ But this could be offset by ILUC impacts of increased volumes of biofuels in order to meet RED mandates.
Incentives for ILUC mitigation	<ul style="list-style-type: none"> ▶ Feedstock producers rewarded for mitigating ILUC, with the credit offsetting additional costs of production. 	<ul style="list-style-type: none"> ▶ Production will shift to those biofuels with an ILUC incentive attached. If the incentive is a carbon credit, overall greenhouse gas performance is likely to improve. ▶ Actual greenhouse gas savings achieved (as opposed to 'on paper' savings from the credit) will depend on the specific mitigation measures adopted.

Key:

- Positive impact
- Uncertain impact
- Negative impact

Table 1: Summary of the potential impacts of different ILUC policy options.



Ability to fulfil mandates in a cost effective manner	Improve investor confidence
<ul style="list-style-type: none"> ▶ No change to current ability to fulfil mandates or in the costs to industry/ consumers of biofuels policies. 	<ul style="list-style-type: none"> ▶ Agreement to take no action on ILUC would improve investor confidence. ▶ However by continuing to monitor the possibility for future action may remain, damaging investor confidence.
<ul style="list-style-type: none"> ▶ Increasing the minimum threshold means less feedstock is eligible for use in the EU. Unless sufficient quantities of qualifying feedstocks are available there may be a constraint on supply, which in a competitive market is likely to increase costs at the blend point. This would mean higher costs to meet RED mandates. ▶ Constraints on the availability of feedstocks, combined with the impact of blend walls, could create challenges in meeting mandates. 	<ul style="list-style-type: none"> ▶ Greenhouse gas threshold is already planned to change over time (included in RED). Any further change has potential to undermine investor confidence (policy will appear not consistent). ▶ This is especially relevant as the minimum threshold will affect all fuels.
<ul style="list-style-type: none"> ▶ Tightening the sustainability criteria means less feedstock is eligible for use in the EU. Unless sufficient quantities of qualifying feedstocks are available there may be a constraint on supply, which in a competitive market is likely to increase costs at the blend point. This would mean higher costs to meet RED mandates. ▶ Constraints on the availability of feedstocks, combined with the impact of blend walls, could create challenges in meeting mandates. 	<ul style="list-style-type: none"> ▶ Sustainability criteria are already included in RED and are already considered stretching. Any further change could undermine the confidence of potential biofuels investors.
<ul style="list-style-type: none"> ▶ Less feedstock is eligible for use. Unless sufficient quantities of qualifying feedstocks are available there may be a constraint on supply, which in a competitive market is likely to increase costs to meet RED mandates. ▶ More feedstock may be required in order to meet FQD targets (greenhouse gas penalties reduce the carbon intensity of biofuels, therefore an increased biofuel volume is needed to reduce overall transport fuel greenhouse gas intensity), though blend walls could restrain this in which case the FQD target would probably not be met. 	<ul style="list-style-type: none"> ▶ To remain relevant ILUC factors will be subject to constant change as modelling evolves, increasing policy/regulatory risks for investors. ▶ Potential conflicts are created with climate change policies beyond biofuels, thereby further reducing investor confidence.
<ul style="list-style-type: none"> ▶ Additional measures to qualify for mitigation incentive increase the cost of production for qualifying biofuels, though this should be offset by the incentive. ▶ If the incentive mechanism is a carbon credit, less feedstock is likely to be required to meet greenhouse gas target (because of higher greenhouse gas savings in new biofuels). ▶ Less feedstock means blend walls are less likely to be a constraint in meeting mandates. 	<ul style="list-style-type: none"> ▶ It may encourage investors to develop new products if the potential reward is sufficient. ▶ There is a potential risk of indirectly impacting investments in non-qualifying biofuels due to blenders giving preference to biofuels that qualify for the credit.



6. Designing an effective incentive scheme for ILUC mitigation

- ▶ In order for a market-based incentive scheme to work, it must provide value at the blend point that can be passed down the supply chain to producers that meet ILUC mitigation criteria.
- ▶ The RED and FQD already contain the mechanism for a $29\text{gCO}_{2\text{eq}}/\text{MJ}$ credit to be awarded to biofuels produced on severely degraded land. This mechanism could be expanded to encompass a broader range of measures recognised to mitigate ILUC.
- ▶ A carbon-related ILUC mitigation credit would create financial value that could potentially be invested in sustainable agricultural production. If 10% of biofuels used in the EU in 2020 qualified for a $29\text{gCO}_{2\text{eq}}/\text{MJ}$ credit, the financial value created could be worth over US \$1.6 billion.
- ▶ There are options in how the carbon credit mechanism is applied, including the potential to develop a two-tiered credit system that gives a greater benefit to those measures that are recognised as being most effective in reducing ILUC risks, and the potential to combine the ILUC mitigation credit with a delayed penalty mechanism. Further work would be required to develop these options.

Engagement with producers for this study indicates that producers are potentially willing to invest in ILUC mitigation, but only if there is a favourable likelihood of gaining an adequate level of additional financial value compared to 'business as usual'. In considering what would be an appropriate incentive mechanism for ILUC mitigation, this study identified a number of further requirements:

- ▶ The incentive mechanism must provide a means for differentiating biofuels that have the ILUC mitigation potential that policymakers wish to encourage.
- ▶ Qualification for the incentive must be performance-based; the incentive only applies once there has been the verified adoption of practices that are recognised to reduce ILUC risk.
- ▶ The basis on which the incentive operates should be consistent with the existing mechanisms of the RED and FQD.
- ▶ The incentive should not require a fiscal stimulus from Member States but instead should be market-based.
- ▶ The incentive mechanism must be transparent and relatively straightforward to implement at a policy level.
- ▶ The beneficiaries of financial value generated by the incentive scheme must be the biofuels producers, as they are the ones who would incur additional costs by adopting ILUC mitigation measures.

Creating value for biofuels producers depends upon creating value at the blend point

For an ILUC mitigation incentive to be market led (as opposed to being led by fiscal intervention by governments) a mechanism needs to be created that results in value to the biofuels end-user, in this case the blender. Biofuels are currently more expensive at the blend point than fossil fuels and stakeholders consulted in the course of this study do not expect this to change in the medium term (e.g., before 2020) for a number of reasons, including:

- ▶ Lower energy densities of bio-components compared to fossil-components which means a greater volume of biofuel is needed to produce the same energy as a smaller volume of fossil fuel.
- ▶ Prices for current generation biofuels are tied to the costs of feedstock commodities, which are expected to remain high due to escalating demand from the food, animal feed, consumer products and biofuel markets.

Therefore a mechanism that allows blenders to meet their obligations through less physical volume of biofuel could mean that blenders are able to pay more for certain biofuels whilst still incurring a saving at the blend point. This rationale is already contained in the RED through the 'double counting' incentive that applies to biofuels from wastes and the 'carbon credit' that applies to biofuels from 'severely degraded' or 'heavily contaminated' land. However, the relative



effectiveness of a market-based incentive for ILUC mitigation based on either the RED renewable energy content target or the FQD greenhouse gas reduction target will depend upon how stretching these targets are for industry, and whether one target is more demanding than the other.

Potential increases in the greenhouse gas intensity of fossil fuels (as a result of increasing production emissions from the use of oil from unconventional sources) could further increase the need for biofuels to provide the required greenhouse gas intensity reductions. Consequently, a mechanism that enables blenders to achieve the FQD target with a reduction in the physical volumes of biofuels that need to be purchased is more likely to generate value than a mechanism that assists with achievement of the RED target. As the FQD target relates to greenhouse gas intensity reduction, it follows that a market-based incentive for ILUC mitigation should be carbon related.

Options for incentivising ILUC mitigation

A number of options were considered as a means of developing a carbon-related incentive mechanism for ILUC mitigation. This included a carbon 'performance bonus' that could further differentiate the greenhouse gas savings of biofuels that reached a defined best practice benchmark in relation to direct greenhouse gas emissions, and a carbon credit that could be awarded to biofuels that meet defined ILUC mitigation criteria. Based on the need to ensure that the incentive scheme is focussed on ILUC mitigation activities, the carbon credit scheme was deemed most suitable. Importantly, a carbon credit mechanism for ILUC mitigation could be based on the existing mechanism in RED for a $29\text{gCO}_{2\text{eq}}/\text{MJ}$ credit for biofuels from severely degraded or heavily contaminated land. Key features of the carbon credit mechanism would include the following:

- ▶ A list of measures could be developed that are deemed to reduce ILUC risk. Producers who can demonstrate compliance with one or more of these measures could be awarded a carbon credit.
- ▶ The carbon credit would improve the reported carbon intensity of qualifying biofuels, making them worth more to blenders as they need less volume to meet greenhouse gas reduction targets, and therefore can pay more. Producers will be incentivised to lower greenhouse gas intensity to enhance market penetration and potentially benefit from higher prices paid by blenders.

- ▶ ILUC mitigating practices could be developed as an optional 'add-on' to existing RED certification schemes; producers that wish to 'buy in' to ILUC mitigation could adopt the required measures and look to receive a financial premium from blenders as a result.

The potential drawback of this mechanism is that the carbon credit would be applied based on compliance with certain criteria rather than after the calculation of the actual greenhouse gas benefits resulting from ILUC mitigation activities. As a result the link between a biofuels' actual greenhouse gas performance and the financial reward received from the market would be less clear.

Given the uncertainties in estimating ILUC emissions, the measurement of carbon emission reductions from ILUC mitigation practices is equally problematic. However, shortcomings in the ability to measure ILUC emissions should not prevent the adoption of activities that can proactively reduce ILUC risks. It is important that efforts to understand the scale of ILUC impacts continue. However, it is more important to have a mechanism that drives tangible change 'on the ground' to reduce the risks of ILUC occurring in the first place than it is to achieve precision in the accounting of ILUC emissions (and ILUC emission reduction activities).

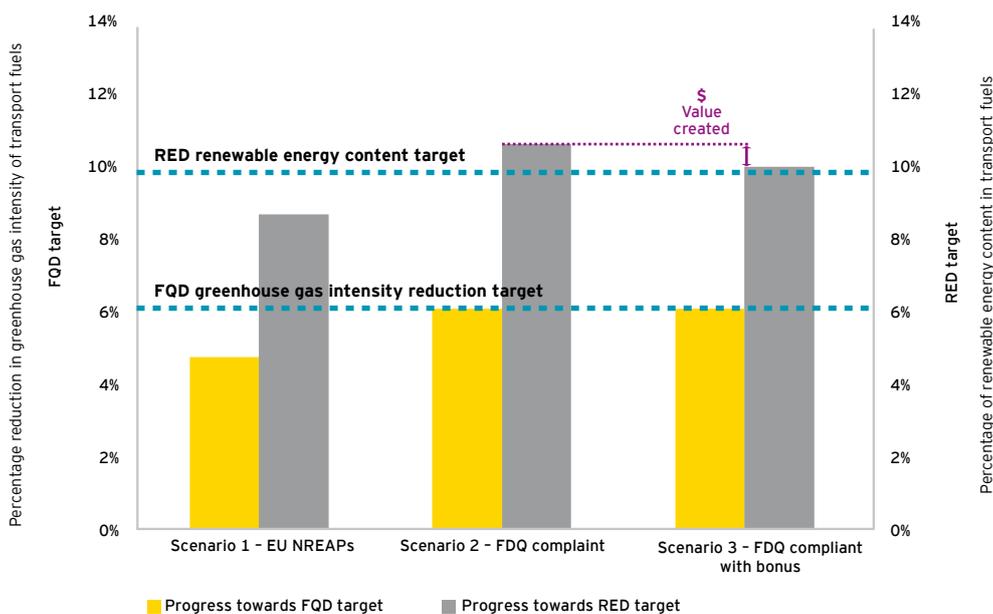


Figure 7: Illustrative impact of a carbon credit for ILUC mitigation. Data from Member States' National Renewable Energy Action Plans (NREAPs) is compared to scenarios where biofuels become the only means of achieving the FQD target to illustrate the impact of a carbon credit for ILUC mitigation.

Potential impact of the carbon credit

Impact on the biofuels market

A carbon credit would provide a market incentive for ILUC mitigation by enabling blenders to meet their FQD targets through less physical volume than would otherwise be required. Figure 7 shows the results of analysis undertaken by Ernst & Young to illustrate the potential impact of a 29gCO_{2eq}/MJ credit applying to 10% of the biofuels feedstock necessary to achieve the FQD 6% greenhouse gas intensity reduction at an EU level in 2020. It can be seen that the volume of feedstock required is reduced, generating value at the blend point that can be passed on to producers.

The financial value of the credit will be dependent upon a range of factors, but most notably the costs of biofuel production. Financial value is generated through cost savings at the blend point, which blenders realise through reduced biofuel volume requirements to meet the FQD targets, as illustrated by Scenario 3 in Figure 7. It is important to note that financial value is only generated if biofuels producers adopt ILUC mitigation measures that qualify for the credit.

Table 2 provides an indication of the potential scale of financial value that could be generated in the EU biofuels market during the year 2020 through a 29gCO_{2eq}/MJ carbon credit for ILUC mitigation. Value is generated through the cost savings that the credit would provide to blenders. This value would then become available for the market to allocate to market participants, in particular blenders and biofuels producers, as a means of financing investment in ILUC mitigation.

It is important to note that financial value only exists if biofuels producers adopt ILUC mitigation measures that qualify for the credit. If no producers adopt the mitigation measures, there is no basis for blenders to pay a premium and therefore no value created.

Table 2 also illustrates the potential value that could be generated at different levels of market uptake of ILUC mitigation practices that qualify for a 29gCO_{2eq}/MJ credit, as represented by the percentages of total feedstock. These calculations assume biofuels provide all of the greenhouse gas savings required to meet the FQD target of 6% greenhouse gas intensity reduction in transport fuels by 2020. It is also assumed that biofuels only achieve the 'typical' greenhouse gas savings for direct emissions (or the minimum greenhouse gas saving threshold set out in the RED for those biofuels



where the typical greenhouse gas saving is below this). If biofuels' direct greenhouse gas savings were higher than has been assumed in this analysis, the impact would be a reduction in the total available value created. Similarly, if the carbon credit was less than 29gCO_{2eq}/MJ there would also be a reduction in the total value created.

Scenario	Value created for ILUC mitigation (US \$ billion) in 2020
No ILUC mitigation bonus	0
10% of total feedstock qualify for the credit	1.65
20% of total feedstock qualify for the credit	1.83

Table 2: Indicative total annual value created in 2020 by a 29gCO_{2eq}/MJ credit for ILUC mitigation.

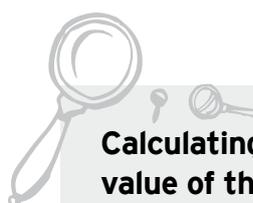
Table 3 illustrates what the value of the ILUC mitigation credit could be to biofuel producers if the total 'pot' was worth around US \$1.65 billion in 2020 (i.e. 10% of all biofuels used in the EU in 2020 qualify for a 29gCO_{2eq}/MJ ILUC mitigation credit). This is based only on production costs for a 'standard' blend biodiesel (before blending with fossil fuels and excluding levies, charges or subsidies), and assumes all value is passed down to biofuels producers rather than retained by blenders. It can be seen that under this scenario, adopting practices that qualify for a 29gCO_{2eq}/MJ ILUC mitigation credit could generate a premium of almost 30% compared to biofuels that do not qualify for the credit.

Biofuel type	Biofuel value US \$/litre in 2020
Biodiesel without ILUC mitigation credit	1.39
Biodiesel with the ILUC mitigation credit	1.80

Table 3: Indicative value per litre created in 2020 by a 29gCO_{2eq}/MJ credit for ILUC mitigation applying to biodiesel, with 10% of all biofuel feedstocks in the EU qualifying for the ILUC mitigation credit.

Clearly this is a very substantial premium, particularly when compared to existing premiums available in the market for biofuels that have voluntary certification schemes. For example, during the first five months of 2011 RSPO certified

palm oil was trading at an average premium of approximately 0.5% over non-certified oil³⁹. However, it should be noted that the reason the premium in the scenario outlined above is so substantial is due to the impact of the 29gCO_{2eq}/MJ credit on the greenhouse gas performance of the qualifying biofuel. In order to achieve the minimum greenhouse gas saving of 50% required by the RED from 2017 onwards, biofuels must have a maximum greenhouse gas intensity of 41.9gCO_{2eq}/MJ^v. With almost 70% of the minimum greenhouse gas saving requirement being met by the ILUC mitigation credit alone,



Calculating the potential market value of the ILUC mitigation credit

Data for Tables 2 and 3 has been calculated on the basis of publicly available market data and making a number of assumptions on the type of feedstocks used, the biofuel blends (B7, E10 etc.) available in the market, the carbon intensity savings of biofuels, and the prices of biofuels feedstocks and finished blends. Total costs in the transport fuel market to meet the RED and FQD targets were estimated and then different scenarios applied to model the potential impact of the credit mechanism. All scenarios assume the credit is set at 29gCO_{2eq}/MJ, with the variability being the volume of feedstocks available that qualify for the credit. All feedstocks are potentially eligible for the ILUC mitigation credit, which begins in 2013. The cost savings, and therefore the potential 'value' available to the market, is represented in 2010 prices. Commodity price forecast data was obtained from the Food and Agricultural Policy Research Institute (FAPRI) 2010 US and World Agricultural Outlook, the OECD-FAO Agricultural Outlook 2010-2019 and the US Department of Energy (DoE) Annual Energy Outlook 2010.



39. Ernst & Young analysis, based on Greenpalm certificate price data supplied by a consortium member and compared against palm oil price data available on Index Mundi for January - April 2011

v. The fossil fuel comparator for the RED is currently set at 83.8gCO_{2eq}/MJ

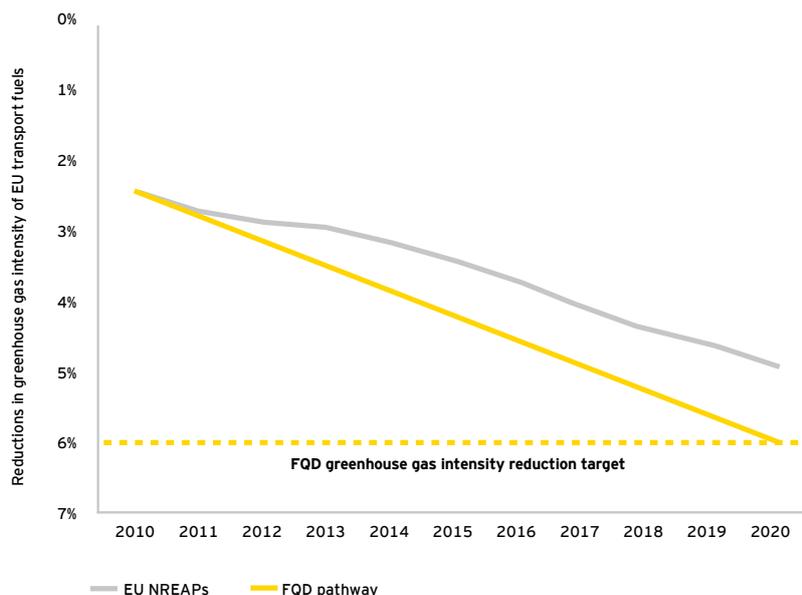


Figure 8: Greenhouse gas intensity reduction pathways for the FQD

the credit can be expected to provide a material premium compared to non-qualifying biofuels. Policymakers will need to determine whether $29\text{gCO}_{2\text{eq}}/\text{MJ}$ is an appropriate carbon value for a credit scheme; this study has focussed on a carbon credit of $29\text{gCO}_{2\text{eq}}/\text{MJ}$ solely due to the precedent set by the RED and FQD.

To-date there has been little reason for biofuel producers to identify and assign costs to the adoption of ILUC mitigation measures. Therefore, it was not possible within the timescale of this study to obtain sufficient data from producers that would enable a financial cost/benefit analysis for ILUC mitigation.

Impact on producer behaviours

The potential greenhouse gas intensity reduction pathway for biofuels under the FQD is illustrated by Figure 8. As illustrated above, under the Member State's implementation plans for the RED (NREAPs) the FQD target will not be hit in 2020. Establishing interim targets, as suggested on page 17 of this report, will force the greenhouse gas intensity of transport fuels to reduce steadily until 2020. The impact will be to require the early adoption of greenhouse gas performance improvement measures.

When combined with interim greenhouse gas reduction targets for the FQD, a carbon credit is likely to incentivise the early

adoption of ILUC mitigation practices. Biofuels producers will have an incentive to look for 'quick win' measures that are recognised practices for reducing ILUC risks in order to benefit from the growing gap between the typical greenhouse gas savings achieved by biofuels and interim FQD targets.

Options in the application of the ILUC mitigation credit mechanism

Value of the carbon credit

As previously discussed, the carbon credit mechanism contained in the RED and FQD assigns a credit of $29\text{gCO}_{2\text{eq}}/\text{MJ}$ to qualifying biofuels. Policymakers would have options in how this mechanism is expanded to create an incentive for ILUC mitigation:

- The value of the carbon credit could remain unchanged at $29\text{gCO}_{2\text{eq}}/\text{MJ}$. This would be the simplest approach and builds upon the precedent set out in the RED and FQD. However, there is a risk that some stakeholders may view this as too simplistic as it limits the means to differentiate between different types of practices for reducing ILUC risks, even though some ILUC mitigation measures may be deemed more effective than others.



- ▶ A two-tiered ILUC mitigation credit could be used, with a higher carbon credit being awarded to those practices that policymakers deem most effective in reducing ILUC risks. For example, some ILUC mitigation measures could qualify for a 29gCO_{2eq}/MJ credit, whereas others could qualify for a credit at a reduced value. This may be deemed more credible by some stakeholders as it would allow, for example, preference to be given to those practices that entirely avoid displacement impacts (such as the production of biofuels from unutilised wastes). Practices that reduce ILUC risks could still be rewarded, albeit to a lesser extent. The disadvantage of this option is the uncertainty of the relative carbon benefits of different ILUC mitigation practices. Policy makers would also need to define appropriate carbon values for the two levels of credit. These are areas where further work would be required if the two-tiered approach is to be progressed. Care would be needed to ensure that the value of the lower tier carbon credit was not so low as to be an insufficient incentive for producers to adopt ILUC mitigation practices.

It should be noted that a variable carbon credit (as opposed to a pre-defined two-tier credit) for ILUC mitigation is not recommended, as this would be subject to the same uncertainties as an ILUC factor.

Combining the ILUC mitigation credit with a penalty mechanism

Policymakers could choose to accompany the 'carrot' of the ILUC mitigation credit with a 'stick' in the form of an ILUC penalty. A penalty, such as an ILUC factor, could be applied to those producers who, following a defined time period subsequent to the introduction of the ILUC mitigation credit scheme, still had not adopted any verifiable ILUC mitigation measures. This could provide reassurance to some stakeholders who may be concerned about the risk of ILUC mitigation measures not being adopted by producers.

It is important to emphasise that if this combined approach is adopted, it must be done so in a sequential manner. There are three consecutive stages that would be required:

- ▶ Introduce the ILUC mitigation credit scheme, and allow sufficient time for its adoption.

- ▶ Monitor the adoption of ILUC mitigation practices following the introduction of the credit scheme.
- ▶ If the adoption of ILUC mitigation practices is limited, and the results of monitoring show that ILUC risks persist in certain biofuels value chains, then an ILUC factor (or some other form of penalty) would be applied to those producers in the higher risk value chains that have not demonstrated the uptake of any ILUC mitigation measures.

The sequential and selective approach to applying an ILUC penalty is important because if an ILUC penalty was applied to all biofuels, the ability of the credit to create value for producers would be reduced or even removed completely. This would occur if the impact of the penalty, be it in terms of a greenhouse gas factor or financial costs, was equal to or greater than the benefit created by the ILUC mitigation credit. Therefore if the ILUC mitigation credit is to be combined with a delayed penalty, the penalty should only apply to 'laggards'; producers of biofuels with high risks of ILUC impacts who have had the opportunity to adopt ILUC mitigation measures, but have chosen not to.

A key element of this combined approach will be the length of time that is allowed for the ILUC mitigation incentive scheme to work. Some ILUC mitigation measures, for example rehabilitating degraded land and bringing oil palm into production, will have long lead times. It will be essential that careful consideration is given to the time delay that is allowed before an ILUC penalty might apply in order to avoid reducing or negating the ability of the ILUC mitigation credit to incentivise longer term investments in sustainable agricultural production.



7. Practical implementation of an ILUC mitigation credit scheme

- ▶ A carbon credit would be assigned to a defined list of ILUC mitigation measures. Policymakers will need to determine if this is a credit of $29\text{gCO}_{2\text{eq}}/\text{MJ}$ or a two-tiered credit system with two different carbon values.
- ▶ This credit would be built into the existing greenhouse gas reporting and auditing processes for the RED and FQD.
- ▶ There are a number of ILUC mitigation measures which could be incentivised through an ILUC mitigation credit scheme in order to encourage adoption by industry. Policymakers should work with industry and certification schemes to refine the details and enable formal ratification into EU policy.

This study has argued that incentivising ILUC mitigation through a carbon credit scheme represents the most effective way to achieve a meaningful and effective response to the challenge of ILUC, whilst supporting the EU's broader goals of reductions in emissions from transport fuels and policy stability for investors in renewable energy. The proposed ILUC mitigation credit scheme is not without its limitations, notably in relation to carbon accounting where the ILUC mitigation credit would introduce an artificial distortion in the greenhouse gas reporting for qualifying biofuels. Whilst the implementation of ILUC mitigation measures would reduce potential ILUC emissions, the ILUC mitigation credit would not precisely relate to the level of emissions abatement achieved (although it should be noted that precision in calculations of ILUC emission reductions is unlikely to be achievable for the same reasons ILUC emissions cannot be accurately calculated).

Nonetheless, without fiscal intervention from governments and within the existing regulatory framework of the RED and FQD, it is the only identifiable mechanism that could create value to incentivise agricultural practices that reduce ILUC risks. Developing the ILUC mitigation credit scheme from concept to full practical implementation will not be without challenges. However, these challenges are not insurmountable, particularly as many of the processes for implementing the ILUC mitigation credit scheme should be able to build upon existing processes that are already being established for the RED and FQD.

An ILUC mitigation credit would work within existing RED/FQD reporting processes

Within the EU biofuels market, standard reporting processes have evolved for greenhouse gas and sustainability information as the biofuels industry has responded to mandatory reporting requirements, first from the UK's Renewable Transport Fuels Obligation and now in preparation for the RED and FQD. These processes usually involve biofuels producers preparing 'supplier declarations' to accompany each consignment of biofuel sent to a customer (usually a blender or an intermediary trader). The supplier declarations usually state the reported greenhouse gas performance of the biofuel being supplied and make claims in relation to compliance with the RED sustainability criteria. In some instances the supplier declaration may be accompanied by an audit certificate from an independent verifier, in order to provide confidence in the accuracy of the reported information. Blenders compile information from the supplier declarations in their reporting to the relevant regulatory authorities in the Member States, and are also responsible for ensuring the reported information has been audited to an appropriate standard.

The ILUC mitigation credit scheme could work alongside these established processes. Biofuels producers adopting a qualifying ILUC mitigation measure, or that have produced biofuels using feedstock that qualifies for an ILUC mitigation credit, would factor the $29\text{gCO}_{2\text{eq}}/\text{MJ}$ credit (or different credit value, if defined by policymakers) into the greenhouse gas performance reported on the supplier declaration. This would improve the greenhouse gas performance of the biofuel consignment and enable it to be sold at a premium compared to similar biofuels without the ILUC mitigation



credit. The supplier declaration should also state that the consignment of biofuel qualifies for the ILUC mitigation credit. An audit certificate from an independent verifier would assure the veracity of the biofuel producer's claim. Blenders purchasing qualifying biofuels would benefit from the improved greenhouse gas performance, enabling them to reach their greenhouse gas reduction targets with a lower volume of biofuels than might otherwise be required. Using information from the supplier declarations, they would also include within their reporting to Member States details of the volume of biofuels supplied from ILUC mitigating sources.

Core principles for the ILUC mitigation credit scheme

In order for the scenario outlined above to work in practice there are a number of core principles that need to be applied:

► **Verification**

It will be important that producers are only able to qualify for the ILUC credit once the adoption of an appropriate ILUC mitigation measure has been independently verified. Verification could be undertaken by independent and qualified auditors that have been commissioned by producers to provide an opinion on whether a particular ILUC mitigation measure can qualify for the ILUC credit, assessed against a list of eligible ILUC mitigation measures. Alternatively it could be undertaken as part of a voluntary scheme if that scheme had developed appropriate procedures for verifying ILUC mitigation. For example, voluntary certification schemes approved by the EC for verifying compliance with the RED should be allowed to develop an ILUC mitigation 'annex' to their standard certification schemes. This annex would be optional for producers, but would enable proof of compliance with the ILUC mitigating criteria to be provided to end-users (blenders).

► **Additionality**

All measures that qualify for the ILUC mitigation credit must be able to demonstrate that the adopted measure prevents or reduces the displacement effect of commodity crop production being displaced onto areas of land not currently available for arable crop production, thereby causing a change of land use. Additionality would be demonstrated through the 'proof points' that apply to the measure being adopted; examples of these are described on pages overleaf.

► **Retrospective application**

The ILUC mitigation credit must be available retrospectively to avoid discriminating against existing practices. For example, if a feedstock had been grown on degraded land, but the decision to develop the degraded land had been taken prior to the development of the credit scheme, biofuel produced from this land should still be able to qualify for the credit. The timescale for retrospective application will need to be determined by policymakers, and may vary for different ILUC mitigation measures.

► **Mass balance rules**

The 'mass balance' rules contained within the RED and FQD should apply equally in relation to the ILUC mitigation credit. For example, if only 25% of the total feedstock used to manufacture a consignment of biofuel qualified for the credit, the biofuels producer should still be able to calculate and report one greenhouse gas value for the consignment rather than having to manage the feedstock as two physically separate consignments.

► **Application of multiple ILUC mitigation measures**

All measures that qualify for the credit should be able to claim the credit for the relevant part of the value chain, as each part of the value chain that adopts an ILUC mitigation measure will have incurred costs by doing so. This could mean that a biofuel produced from feedstock grown on abandoned land and with co-products that substitute commodity crops in the animal feed market would be able to claim an ILUC mitigation credit for each of the ILUC mitigation measures taken. However, it should be noted that the cumulative greenhouse gas savings of doing so would, in most cases, be substantially reduced by the mass balance rules described above.

► **Auditing requirements**

Due to the potential additional financial value of the credit there is an increased risk of fraud compared to biofuels that do not qualify for the credit. It will be important that policymakers develop adequate safeguards in the auditing standards used under the RED, for example in voluntary certification schemes, to reduce the risk of fraud. Auditors should be required to use a risk and materiality basis for auditing ILUC mitigation credit claims, and not restrict sampling to formulaic determinations of sample size.



Value of the carbon credit

- ▶ Whilst all ILUC mitigation activities will reduce carbon emissions by the fact they are mitigating ILUC, different mitigation practices are likely to achieve different emission savings in real terms. Therefore, assigning a defined carbon credit inevitably means that there is a trade-off in terms of accurate greenhouse gas reporting for biofuels that qualify for the credit. However, calculating the precise carbon savings achieved by different ILUC mitigation measures would be challenging and likely to cause a substantial delay in implementing a practical incentive scheme. Two options for applying the ILUC mitigation credit have been proposed on pages 36 and 37. Policymakers will need to determine which option is to be adopted.

Duration and timing of the ILUC mitigation credit scheme

Policymakers will need to consider the timing for implementation and duration of the ILUC mitigation credit scheme. It is recognised that the ILUC mitigation credit scheme cannot be implemented immediately as there are some matters, identified in this report, that will require decisions from policymakers. However, there is a risk that delays in implementation will result in the use of biofuels with a greater probability of ILUC impacts. Policymakers may wish to consider a phased introduction of the scheme, so that incentives are provided for blenders to begin preferentially sourcing biofuels that are recognised to have a lower risk of ILUC impacts whilst issues that may require further consultation and analysis are resolved.

Related to this, it is important to recognise that the ILUC mitigation credit scheme includes both the recognition of existing practices that mitigate ILUC, and incentives to undertake new practices in order to mitigate ILUC. Biofuels producers that are already mitigating ILUC are likely to receive a greater proportionate benefit than those producers that need to invest in order to qualify for the credit. It is argued that such producers should not be excluded from benefiting from the ILUC mitigation credit scheme as the most important objective of the scheme is to create a market that preferentially rewards biofuels that mitigate ILUC compared to those biofuels that do not. Nevertheless, policymakers may wish to consider whether, over time, the ILUC mitigation credit scheme should favour certain types of ILUC mitigation measures over others. One

way this could be done is through the duration of the scheme for different types of ILUC mitigation, for example specifying that the ILUC mitigation credits will apply until a certain date for particular types of ILUC mitigation measure.

Examples of how ILUC mitigation measures could qualify for the ILUC mitigation credit

Some examples of possible 'proof points' needed to demonstrate that an ILUC mitigation measure qualifies for the ILUC mitigation credit are described below. It should be noted that the measures described below are not exhaustive; there will be further measures that could also qualify for the ILUC mitigation credit.

▶ **Co-products**

Co-products from biofuel production can directly substitute the use of other agricultural commodities in animal feeds. However, they may also have other uses that would not have an ILUC mitigation effect, such as providing biomass fuel for electricity generation. In order to qualify for the credit, producers should be required to provide proof of sale of the co-product to a farmer or animal feed merchant. Co-products resulting from the biofuel production process must not be the principal source of economic value from the production process (i.e., they must not be worth more than the biofuel itself).

▶ **Yield increases**

It will be important to avoid discriminating against rotational crop production and to reduce the impact of weather variability to enable genuine yield improvements to be identified and rewarded. Yield improvements should therefore be based against average data for a defined geographical region, normalised over a period such as the previous five years. To qualify for the credit feedstock producers would need to demonstrate an improvement each harvest year of an agreed percentage increase against a rolling five-year regional average. It will be important that geographical regions are set appropriately. For example, data on yield increases compared to a national average might only mean that biofuel feedstock crops were grown in more productive regions, as opposed to representing a genuine improvement in yields. Therefore a more appropriate geographical region might be defined as a NUTS 2 region in Europe, or perhaps a state/province in other countries. It will also be important to ensure that



the agreed percentage increase that qualifies for the credit does not penalise more productive systems where the proportionate increase potential is smaller than in less productive systems.

► **Manufacturing efficiencies**

Manufacturing efficiencies could be demonstrated at a plant or at a production chain level (feedstock production, storage and processing) and qualify for the credit if additionality can be demonstrated in relation to a commodity crop. Producers wishing to use manufacturing efficiencies as a means of claiming the ILUC mitigation credit should present their case to a verifier who will then make an assessment of validity. The assessment of validity should be based on whether meaningful improvements in manufacturing efficiency compared to a baseline production level can be determined to have resulted following a specific change in a production process. As the nature and scale of manufacturing efficiencies will vary significantly for different types of feedstocks and production systems, more research will be required to specify what efficiency measures can qualify as an ILUC mitigation measure. As production processes can be subject to change year-on-year, manufacturing efficiencies would need to be assessed annually to qualify for the credit on an on-going basis.

► **Crop production on abandoned lands**

Verification that crop production has occurred on abandoned lands should be undertaken using similar mechanisms that voluntary schemes have already developed in order to verify land use for the existing RED sustainability requirements or have been developed by other methodologies. In some instances there may be existing land use databases that can be accessed to provide relevant data, such as the RSPO's land use database or data held by national or regional government agencies. Policymakers will need to establish a clear definition for 'abandoned' land, ensuring that the definition of abandoned land does not discriminate against the use of idle cropland in developed countries. Auditors will need to ensure that verification of land use for the ILUC mitigation credit is sufficiently rigorous to prevent fraudulent claims.

► **Production of biofuels from wastes or residues**

Claiming the ILUC mitigation credit in recognition of the use of wastes or residues will require evidence to prove what feedstocks have been used in the biofuel production process. This should be undertaken using the same reporting and verification requirements that already exist in the RED to enable 'double counting' under the RED. In this instance such biofuels will qualify for both the double counting credit (for energy content) and ILUC mitigation credit (for carbon savings). Within the context of a market-based mechanism for ILUC mitigation this is deemed acceptable, as the double counting credit for energy content may not create significant financial value for biofuels producers compared to a carbon credit that recognises the ILUC mitigation benefits of such feedstocks. However, policymakers may wish to review this depending upon the extent to which Member States also introduce fiscal incentives, such as duty derogation, to encourage the production of biofuels from waste or residues.

► **Intensification of production through systems integration**

Claiming the ILUC mitigation credit for systems integration would require verification that the integrated agricultural system was functioning as designed, and that biofuel feedstocks could be traced to the particular area (such as a plantation) where the systems integration was being applied.

► **Agronomy support**

Investments by biofuels producers in agronomy support measures should be able to qualify for the credit, provided that a link can be established and independently verified between the agronomy support and improved productivity of the farmers receiving the support. Further research will be required to determine the nature and scale of agronomy support measures that would be appropriate to reward, and what boundaries and definitions should be applied. Such measures would need to be reassessed annually to qualify for the credit on an on-going basis.

► **Advanced biofuels**

Advanced biofuels would qualify for the ILUC mitigation credit on the basis of the feedstock used. As with current generation biofuels produced from wastes and residues, such as biodiesel produced from used cooking oil, the ILUC mitigation credit will be additional to the 'double counting' credit in RED, where this applies.



Next steps for policymakers

In order to progress the ILUC mitigation credit from concept to full implementation there will need to be further consultation and research on a number of specific areas:

- ▶ Policymakers will need to determine whether the ILUC mitigation credit scheme will be based on the existing 29gCO_{2eq}/MJ credit in the RED and FQD, or if a two-tier approach is to be adopted. If the latter option is chosen, policymakers will need to undertake some analysis to determine the appropriate carbon values for the two tiers of the ILUC mitigation credit scheme.
- ▶ Some definitions and core principles for the ILUC mitigation credit scheme should be established. This would include, for example, the definition of 'additionality' that applies to the scheme and guidance on audit requirements.
- ▶ In conjunction with feedstock growers, biofuels producers and feedstock-specific voluntary schemes, developing a list of measures that qualify for the ILUC mitigation credit. The specific requirements for each measure to be deemed as qualifying for the credit should be defined as part of this work.
- ▶ Research could be undertaken in order to provide or improve publicly available datasets that can provide baselines against which the impact of ILUC mitigation activities can be assessed. This might include compiling and making available data on yields for key feedstock crops. It could also include supporting the development of land use databases in key biofuels production regions where such data is not yet widely available.
- ▶ Building on the initial support for ILUC mitigation outlined from eight Member States, political support for the ILUC mitigation credit scheme needs to be secured from other Member States, and a firm timeline set out for implementation.

For the ILUC mitigation credit scheme to be effective it is essential that the FQD is fully implemented by Member States. Establishing measures such as interim targets will make a significant difference to the effectiveness of the FQD in enabling an EU biofuels market that places a financial premium on biofuels with a low risk of ILUC impacts. Similarly, guidance should be developed at an EU level on what feedstocks can be classified as wastes or residues under the RED given the low risk of ILUC associated with these feedstocks.

In order for the ILUC mitigation credit to be effective, it is of paramount importance that the EC's intentions are clearly set out and that implementation plans are transparent. Producers need certainty that policymakers will not 'move the goalposts' and that the rules against which they invest at the commencement of the project will remain in place for the time-period of the investment. Many ILUC mitigation measures, such as the use of degraded land for feedstock production, are likely to require significant up-front capital investment and may take a number of years until returns can start to be generated. For example, if an oil palm producer wished to develop a new plantation on degraded land, there would be the time taken to acquire the land and prepare it for planting, then at least three years from planting until first harvest, and a further two to four years for the trees to reach maturity and full yield potential.



8. Conclusions

Achievement of the EU's goals for greenhouse gas reduction in transport fuels is dependent upon the use of biofuels. However, some stakeholders are concerned about the potential ILUC impacts of biofuels and are questioning the appropriateness of policies that encourage their use. Given the lack of an alternative solution for achieving meaningful reductions in the greenhouse gas emissions of transport fuels, developing a considered response to stakeholder concerns about the potential ILUC impacts of biofuels is an imperative for policymakers.

The EC needs to develop an ILUC policy response that effectively addresses stakeholder concerns but can also be delivered in an economically efficient manner and within the context of the existing RED and FQD. It is also necessary to ensure that there is a stable policy environment that supports private sector investment. Of the potential responses that are being formally considered by EC policymakers:

- ▶ Taking no further action fails to respond to stakeholder concerns on ILUC and creates uncertainty on what policy changes might follow from efforts to monitor ILUC impacts.
- ▶ Raising the minimum greenhouse gas saving threshold for biofuels may improve the direct emissions savings achieved by biofuels in the EU but has no impact on ILUC.

- ▶ Imposing additional sustainability requirements for certain biofuels creates an additional burden for biofuels producers, making it unlikely that the requirements will be adopted and therefore unlikely that the risks of ILUC will be reduced.
- ▶ The application of an ILUC factor is significantly impeded by the uncertainty in estimating ILUC emissions. An ILUC factor by itself is also unlikely to be effective in encouraging the adoption of ILUC mitigation practices that address the root causes of ILUC and could have unintended negative consequences for some of the EU's wider climate and renewable energy goals.

By contrast, using market mechanisms to incentivise ILUC mitigation presents a proactive response to the challenge of ILUC whilst minimising the risk of unintended consequences. This report has demonstrated that there are a wide range of measures that can reduce ILUC risk and that the existing carbon credit mechanism in the RED and FQD can provide the basis for an effective market-based incentive scheme for ILUC mitigation. It is the only policy option, within the context of the RED and FQD, that provides:

- ▶ A compelling case for biofuels producers to adopt ILUC mitigation measures.

- ▶ A compelling case for blenders to preferentially use these biofuels at the expense of biofuels with a higher risk of ILUC impacts.
- ▶ Substantial financial value that can be invested in sustainable agricultural production.
- ▶ Support for innovation and investment in sustainable biofuels, including advanced biofuels.

Beyond the scope of this report there are a number of areas that require further research and consultation to bring the ILUC mitigation credit scheme into implementation, but none of these areas provide insurmountable challenges. It is also recognised that there is no 'silver bullet' solution to the challenge of ILUC. The ILUC mitigation credit scheme should work within the context of unambiguous implementation of the RED and FQD by Member States, progressive targets for greenhouse gas reduction from biofuels and continued support from the EU for progressive land use management by national governments.

The debate on the potential ILUC impacts of biofuels is forcing a hard look at the use of agricultural land resources. Taking a positive approach to the challenge of ILUC by recognising and rewarding the most sustainable biofuels will create opportunities for innovation and technological development that could make an important contribution towards some of the wider challenges facing the global agricultural system.

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