BIOFUELS
Handle with care

An analysis of EU biofuel policy with recommendations for action

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SUGARCANE HARVESTING

1. Summary

For many policymakers biofuels must have seemed like a dream-come-true. The arguments put forward by supporters were plentiful and powerful. Carbon Dioxide emissions (CO_2) could be cut because the biofuel crops absorb CO_2 while they grow and energy security could be guaranteed because biofuels can be grown at home or imported from stable regions rather than oil states. The car industry also liked them because they took political focus away from vehicle fuel efficiency as a route to cutting CO_2 emissions. Cars require only minor modifications to become green-looking 'flexfuel' models. Farmers liked them because it created another market for their products and even oil companies came to like them, because it enabled them to look more "green".

The EU and other regions hurried to put in place volume targets and financial incentives to force the market to adopt biofuels. However, in the rush, the full impacts of their production were not well understood. And, by focusing on a single nascent technology, rather than on the goal - carbon emissions reductions - the dream soon turned to a nightmare. It has now become clear that there is no simple answer to the question of whether biofuels are truly a sustainable alternative to fossil fuels. The evidence, much of it published in the last three years, suggests that in the vast majority of existing cases, they are not. A change to current policy is needed.

This report follows the adoption, at the end of 2008, of the European Union's mandatory 10% renewable energy target for transport, to be reached by 2020. It attempts to assess the environmental implications of that policy. Its key findings are that if the target is, as is widely accepted, almost completely to be met through the use of biofuels, it is highly unlikely to be met sustainably. In short, there is a very substantial risk that current policy will cause more harm than good.

One of the most important reasons for this is the failure to account for the environmental impact of indirect land use change (ILUC). When agricultural land is converted for biofuel production, land elsewhere will be converted for agriculture, releasing lots of CO_2 emissions, hence the term 'indirect' land use change. Assessing the impact of ILUC and incorporating it in biofuels policy is critically important to ensuring biofuels really do reduce carbon emissions and do not indirectly increase them.

It's not too late to fix the policy. The sustainability criteria in the EU law should be redefined to ensure that all environmental and social impacts are taken into account, thereby promoting only the biofuels that bring genuine overall benefits. Subsequently, the volume targets for biofuels should be replaced with a target for greenhouse gas (GHG) reduction for transport fuels. In this way support for transport fuels would be based on their climate performance, rather than their name. This way, the policy would actually be in line with its original purpose, to contribute to the EU's fight against climate change.

The report's key conclusions are as follows:

> The estimated global impact of the increased use of biofuels, resulting from this EU policy, on land use change and biodiversity are very significant. Meeting the 10% transport target using predominantly biofuels would require the combination of a large increase in the area of land devoted to biofuel crops and an unprecedented increase in the intensity of farming. Together this would adversely affect carbon stock and biodiversity, through habitat conversion and

intensification of farming methods. Such additional pressure on ecosystems and biodiversity would come at a time when the world is already facing an unprecedented collapse in the numbers of species.

> While the 'sustainability criteria' in the renewable energy law were ostensibly put in place to ensure, inter alia, that only biofuels that reduce GHG emissions by at least 35% compared to fossil fuels would qualify for government support, in practice the Directive is more likely to increase transport emissions than reduce them. That is due to the failure to address indirect land use change (ILUC) mentioned above and because of weak and opaque verification mechanisms that are intended to prevent direct land use change.

> As the main justification for public policies supporting biofuels is reduced GHG emissions, it is essential that this issue is properly addressed by EU policymakers and that ILUC factor is included in the GHG emissions calculation associated with biofuels.

> The sustainability criteria also fail to effectively mitigate against the risk of widespread impacts on biodiversity, and on vulnerable communities in some of the poorest regions of the world.

> The process of monitoring and verifying the sustainability of biofuels that are sold on the European market is dependent on good governance in producer countries and robust enforcement and monitoring of standards. Even if the law's certification schemes are implemented correctly (and there are many doubts over enforcement), they will not resolve the numerous sustainability concerns, most notably indirect impacts on land use change and biodiversity.

> The current process for calculating GHG emissions from biofuels and, in particular, the default GHG savings values assigned to different types and production pathways of biofuels, is opaque and raises questions about the independence, credibility and validity of the process.

> Many fundamental uncertainties in the law will only be fully resolved as part of the comitology (technical committee) process, with little or no democratic oversight from the European Parliament or other interested stakeholders such as environmental groups. This also raises questions about the transparency and legitimacy of the process.

Overall, the legislation contains many uncertainties and issues yet to be resolved. The shortcomings of the current law do not only damage the environment, they are also likely to hamper the development of an environmentally and economically sustainable future for renewables in transport.

In order to correct the potentially negative impacts of the policy, we have formulated a set of specific recommendations for decision-makers and investors on the following pages.

2. Recommendations

for European Policy

> The EU should scrap the energy-based target for renewables (biofuels) in transport and replace it with a GHG reduction target, provided that robust calculation to include emissions from both direct and indirect land use change from biofuels is included.

> Regardless of the future of the overall targets, an absolute priority is to include estimates for the carbon impact of ILUC in the regulation. Only with scientifically robust calculation of ILUC effects, and proposals to avoid them in the sourcing of all biomass for energy, are current policies likely to reduce GHG emissions from transport. In doing this the EU should learn a lesson from California, which has adopted ILUC factors for different biofuel crops based on scientific assessment open to public scrutiny. In addition, further safeguards are needed to reduce biodiversity risks due to ILUC.

> The policy as currently framed risks encouraging a short term 'bubble' in almost all kinds of biofuels. But in the medium and longer term, there can be no market for fuels that are responsible for the release of large amounts of carbon. A change to the law is therefore urgent to ensure that the industry only invests in biofuels that are sustainable when all environmental impacts (particularly ILUC) are taken into account. Such a precautionary approach would be perfectly in line with EU law and would give long-term security to the industry.

> The Commission should ensure transparency and involvement of all relevant stakeholders in the future legislative process, which has to clarify numerous uncertainties in the law. Only with openness and transparency will the law and its implementation regain credibility.

for EU Member States

> Develop legislation, taxation policy and other measures that limit energy demand in the transport sector. These measures would include substantial increases in vehicle efficiency alongside a move away from car-dependency, e.g. by improving the public transport system, making walking and cycling more attractive, and more effective strategic and local planning to reduce the need to travel. Similar efficiency stimulation is needed for freight transport where specific fuel consumption of trucks must be reduced and more sustainable alternatives to road transport encouraged.

> Set no new binding targets for biofuels for the next few years and abolish or lower existing ones in order to avoid a massive lock-in to biofuel streams that are highly unlikely to be viable in the medium term. This can be achieved by not planning for an increase in biofuel use when drawing up national Renewable Energy Action Plans until at least the 2014 review.

> Promote non-biofuel renewable energy sources in transport, including renewable electricity.

for industry and investors

> Concentrate investment in areas that reduce energy demand in the transport sector. This creates the best conditions to meet a future with higher energy prices and drastic increases in GHG emission reduction requirements.

> Only invest in biofuels that demonstrably do not pose significant land use issues and do not risk social and/or conservation conflicts, such as biofuels derived from wastes or some residues.

> Avoid investments in biofuels that narrowly pass the GHG threshold and pose ILUC issues – such investments are likely to be lost once the EU includes ILUC effects in the law.

> Slow down on other biofuel investments, including those that qualify as 'second-generation' feedstock until land use issues have been properly addressed in the sustainability standards (due by the end of 2012).

> Invest in other promising renewable and low-carbon energy sources in transport, including renewable electricity in transport (e.g. trains, ships, plug-in hybrids, battery electric vehicles etc.) These hold promise for real and lasting GHG emissions reduction.

Since the biofuel industry is highly dependent on government support, investor security and high oil prices, it is important to make clear that the law does not give clearance for any biofuel production. Security of investments crucially depends on environmental sustainability. Investors in biofuels should therefore think twice before putting their money into the development of feedstocks that require large areas of land or are unsustainable in any other way.

Credit: Marcel Silvius, Wetlands International

THE INCREASE OF FOOD PRICES BY 25-30% IN EARLY 2008 COULD BE ATTRIBUTED TO BIOFUELS

3. Context

In December 2008, the EU adopted a new biofuels policy as part of the Renewable Energy Directive. This report provides a comprehensive analysis of that policy, identifying environmental and developmental threats and opportunities.

Before the policy analysis begins, we start with some of the essential facts about biofuels and the expected impacts of significantly increasing their production.

FUEL FROM PLANTS

The production of energy from renewable biological resources such as wood is as old as humankind. The production of liquid fuels from biologically-based materials such as grains, oil seeds, straw and wood is a much more recent development.

The somewhat misleading term 'first generation' is often used for biofuels produced from food crops such as palm oil, rape seed, corn and sugar cane and 'second generation' for biofuels sourced from cellulosic materials such as straw and wood. The terminology is misleading because it implies that 'first generation' technology is a necessary first step to lead to more advanced 'second generation' technologies. This is not the case because an entirely different infrastructure is needed to produce 'second generation' biofuels.

It is also misleading because it implies that one is older than the other. In fact, 'second generation' technologies (for example the Fischer Tropsch process) for converting biomass to liquids were developed in the 1930s in Germany when the country was cut off from imports and forced to use domestic coal reserves to produce liquid fuels. Although coal-to-liquid technology is commercially available today, the application of this technology for biomass is still at the pilot stage.

GLOBAL GROWTH IN BIOFUELS PRODUCTION

Many countries around the world are now producing biofuels. Globally, the US and Brazil are world leaders in ethanol production (mostly from sugar cane in Brazil and maize in the US) and the EU is the world leader in producing biodiesel (mostly from rapeseed). A number of developing countries, such as some African nations, India, Indonesia and Malaysia, are also seeking to boost their production capacities, mostly for vegetable oils. However, Brazil also has ambitions to export its expertise in ethanol production from sugar cane, especially to African countries.

The production of these biofuels at current and estimated future levels has an effect on the cost of food globally as more and more land is used to grow feedstocks for energy production rather than food, which has a devastating impact on the livelihoods of millions of people in the southern hemisphere who are denied access to land to grow food. Recent estimates by the OECD, the Food and Agriculture Organisation (FAO) and the International Food Policy Research Institute (IFPRI) on the impact on food prices from using crops for biofuel production suggests the increase of food prices by 25-30% in early 2008 could be attributed to biofuels (IFPRI 2008)[1]. Currently, a third of US corn is used to produce ethanol (EPA 2009), while about half of EU vegetable oils go towards the production of biodiesel (World bank 2008).

Within the EU, the Dutch Environment Assessment Agency has estimated that meeting the proposed 10% biofuel target, would require between 20-30 million hectares of cropland (MNP 2008), equal to the entire surface of the United Kingdom.

ENVIRONMENTAL 'BENEFITS'

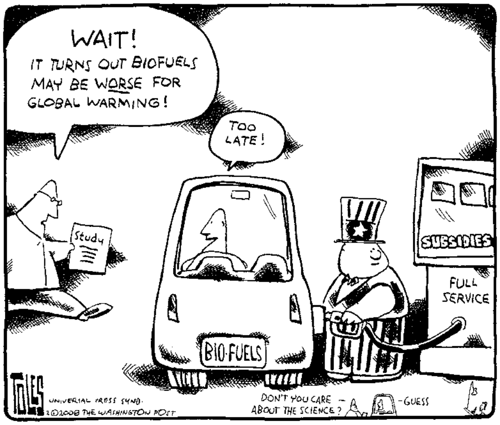
Biofuels have been touted as part of the solution to climate change. The crops used to make them absorb carbon when they grow and are thus claimed to be carbon neutral or at least better on a well-to-wheel basis in comparison with fossil fuels.

As energy is used throughout the biofuels production chain, the GHG balance in most production pathways is expressed in GHG savings, ranging anywhere from 10-90% compared with fossil fuels.

The much-praised GHG reduction benefits of biofuels are in most cases either marginal or non-existent.

However, the much-praised GHG reduction benefits of biofuels are in most cases either marginal or non-existent. The critical flaw in most conventional calculations is that, on the one hand, they allocate a 'free carbon lunch' to biofuels by wrongly presuming that if crops for fuel were not grown, there would be no alternative vegetation cover that would also sequester carbon.

On the other hand, they ignore the 'hidden carbon costs' arising when land is converted to agriculture



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to meet the growing need for more land as a result of the expansion of biofuels. Conversion of land normally results in substantial releases of carbon from the loss of above-ground vegetation and ploughing of the land releases substantial amounts of carbon stored in the soil. Drainage of peatland soils for agriculture in particular can result in huge initial and ongoing emissions.

The effects of direct land use change on the GHG emission balance of biofuels is shown in figure 1 which compares the "default data" of the Renewable Energy Directive (RED) to the same data, but including GHG impacts from direct land use change (LUC) as it was included in the default data of the German Biofuels Sustainability Ordinance (BSO)[2] .

The graph shows that the GHG emission balance is shifted beyond the RED threshold if emissions from direct LUC are included. In this case, none of the biofuels would achieve the GHG reduction level of 35% compared to fossil fuels as specified in the RED. This means that most biofuels feedstocks will have to be grown on land already in agricultural production, while the existing food production will be displaced somewhere else.

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[1] According to FAO the prices of food rose by nearly 40 percent in 2007 and made further large jumps in early 2008. The preconditions for rapidly rising food prices stem from underlying long-term trends in food supply and demand that have contributed to a tightening of global food markets during the past decade. However, high food-price triggers have included biofuel policies, which have led to large volumes of food crops being shifted into bioethanol and biodiesel production; bad weather in key production areas, such as droughts in wheat-producing Australia and Ukraine; and higher oil prices, which have contributed to increased costs of production inputs and transportation. Prices then spiraled further as a result of poor government policies such as export bans and import subsidies, combined with speculative trading and storage behavior in reaction to these policies (IFPRI 2008).

[2] For a brief explanation of the BSO calculation, see OEKO/IFEU (2009).

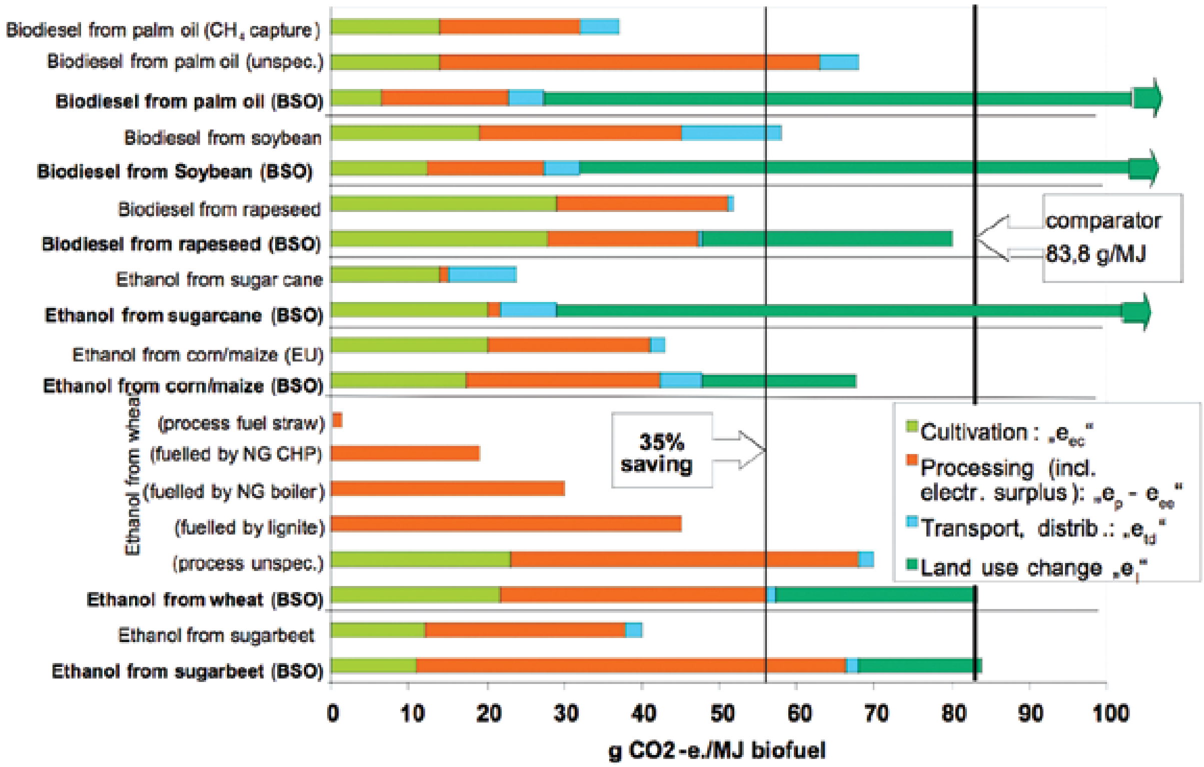


Figure 1: Comparing the GHG balance of biofuels with and without the carbon impact of land use change

Without an appropriate inclusion of GHG from direct LUC, the RED calculation of GHG emission balances could erroneously encourage high-GHG balance biofuels to be eligible under the renewable fuel target.

Recent studies including one published in Science (Searchinger 2008)[3] , the Gallagher Review for the UK government (2008), the German study by WBGU (2008) and the UNEP's sensitivity analysis of GHG balances of biofuels (UNEP 2009) found that the most critical factor in determining GHG impacts for biofuels is the impact of direct and indirect land use change on carbon stocks. The table in Annex II illustrates how this affects the GHG balance for a number of biofuel pathways in the US, and figure 2 shows the effect of direct and indirect land use change on the GHG emission balance of biomass feedstock provision.

[3] See also Searchinger, Timothy 2009: Evaluating Biofuels - The Consequences of Using Land to Make Fuel; Brussels Forum Paper Series of the German Marshall Fund of the United States, Washington DC http://www.gmfus.org/template/download.cfm?document=/doc/Biofuels final.pdf


WHEN AGRICULTURAL LAND IS CONVERTED FOR BIOFUELS, MORE LAND FOR FOOD IS NEEDED ELSEWHERE. THIS CAN LEAD TO DEFORESTATION AND CONSEQUENTLY A HUGE RELEASE OF CARBON. THE EMISSIONS FROM THIS ‘INDIRECT LAND USE CHANGE’ (ILUC) CAUSED BY BIOFUELS MUST BE ACCOUNTED FOR.
Credit: BirdLife International

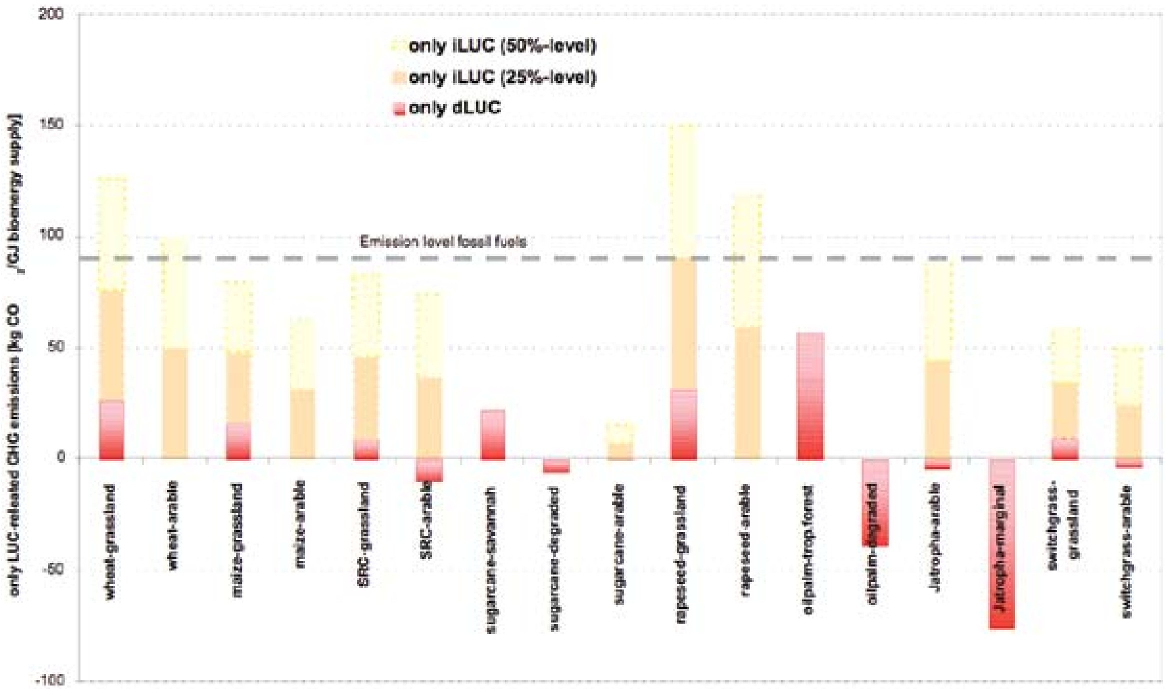
Figure 2: the effect of direct and indirect land use change on the GHG emission balance of biomass feedstock production.

The graph shows potential GHG emissions from direct and indirect land use change of the bioenergy feedstocks production only, i.e. the data exclude life-cycle and downstream conversion emissions (WBGU 2008)[4] .

As can be seen, only very few biofuel feedstocks would achieve a 35% GHG reduction compared to fossil fuels. Even so-called second-generation biofuels from e.g. switchgrass or short-rotation coppice (SRC) would only achieve small reductions if ILUC is taken into account.

Thus, the 'second generation' biofuels, currently heralded by many as a better kind of biofuel, are also likely to have serious drawbacks and limitations. For example, any plant that is big enough to be economically viable will involve the transportation of huge volumes of raw materials, which will result in high transport costs and emissions. Another concern is whether the raw materials used for second generation fuels could be used more efficiently for other purposes, for example in combined heat and power plants where their use would produce greater energy output and save a greater proportion of GHG emissions relative to fossil fuels.

Furthermore if crop residues are removed for second generation biofuel production, they are no longer left to rot down into the soil which improves the soil's fertility. Equally, those second generation feedstocks that require land will lead to both direct and indirect land use change which will potentially have significant negative consequences for GHG balance and will likely compete with food production.



[4] The indirect LUC emissions are depicted for a "near-term" 25% risk level, and for a medium-term 50% risk level. The percentages refer to the theoretical level of GHG emissions from ILUC as determined by Fritsche (2009). For a more detailed explanation, see WBGU (2008).

Producing liquid fuel from plants to power vehicles is a highly inefficient, wasteful way to use energy.

Perhaps the most critical issue is that producing liquid fuel from plants to power vehicles is a highly inefficient, wasteful way to use energy. Typically the efficiency of transforming energy into movement with an internal combustion engine (ICE), whether powered by biofuel or other forms of liquid hydro carbon, is 18% for petrol and 23% for diesel engines. In comparison, an electric motor can reach an efficiency rate of 65% on a tank-to-wheel basis (Kendall 2008: 86), a statistic that reflects relatively few years of research and development into car batteries. According to a recent study by Campbell, Lobell and Field (2009: 1055), bioelectricity used in electric vehicles produces an average of 81% more transportation kilometres and 108% more emissions offsets per unit area of cropland than cellulosic ethanol burned in an ICE. Although there are many issues to be resolved in renewables-based electrification of transport (i.e. potential and disposal of batteries), it can be said that investing in biofuels is not the most efficient way of mitigating climate change.

Another important recent finding by the European Joint Research Centre (JRC 2008) has been that the costs to society (both costs to produce as well as increased feedstock prices) of achieving the proposed EU 10% biofuel target by 2020 could be as high as 65 billion EUR with only marginal benefits in terms of employment, security of supply and reduced GHG emissions. The study found that almost every other technology to reduce GHG emissions is cheaper than producing biofuels.

Furthermore, a study by 75 scientists from 21 countries working under the umbrella of the International Council for Science concluded that, 'In light of the potential adverse environmental consequences, potential displacement or competition with food crops, and difficulty of meeting ... goals without large-scale land conversion, current mandates and targets for liquid biofuels should be reconsidered' (SCOPE report 2008).

All this means that in a very optimistic, best-case scenario, biofuels may play a minor role in reducing GHG emissions in some parts of the world. In a more realistic scenario, biofuels have the potential to accelerate ecosystem breakdown on a massive scale through agricultural expansion and intensification and threaten the livelihoods of those hundreds of millions of people who already spend over 50% of their income on food.

EU POLICY BACKGROUND

The EU's first Biofuels Directive (2003) set an indicative target that biofuels should form at least 5.75% of all petrol and diesel placed on the market for transport purposes by 2010. A review of this Directive began in 2005. After many internal discussions the Commission finally included its proposal for a revised Biofuels Directive as part of the new Renewable Energy Directive which it proposed in January 2008. The Renewable Energy Directive (RED) sets an overall target of 20% renewable energy for the EU which has then been sub-divided between EU Member States depending on their existing levels of renewable energy development and their GDP.

The Directive does not set any targets for specific sectors or technologies except one: a 10% share of renewable energy in the transport sector to be achieved by all EU Member States. Although this target can also be partially met by increasing the number of electric cars on the road or using renewable electricity in railways, it is widely assumed that the target will act as a major driver for increased biofuel production.

At the 2007 European Spring Council, heads of governments gave their support to the 10% biofuels target under the clear condition that production would be sustainable and second generation biofuels would be commercially available. During the 2008 Spring Council, the 27 leaders no longer included explicit support for the biofuels target in their conclusions and merely reiterated the importance of ensuring the sustainability of biofuels.

In the meantime the Commission published a proposal for a revised Fuel Quality Directive (FQD) in early 2007. The proposal included an obligation for fuel suppliers to monitor and reduce the GHG intensity of fuel sold on the EU market by 10% over 10 years (2010-2020). Producing biofuels would be one tool to meet this obligation, on the basis of their contribution to the reduction of GHG emissions. Apart from producing and using biofuels, oil companies are expected to be able to realise significant reductions in GHGs in the fossil fuel supply chain, especially by reducing venting and flaring and by achieving efficiency gains in refineries. It is even estimated by some[5] that the entire 10% GHG reduction target could be met through efficiency measures alone, although it is difficult to get a reliable estimate as the necessary data is held by the oil industry.

Meanwhile, in early 2008 the stream of critical reports and studies on biofuels intensified, including reports from the OECD, Global Subsidies Initiative, FAO, IMF, World Bank, UK Government, Dutch Environment Agency, a German environmental advisory body and even the Commission's own scientific advisory body, the Joint Research Centre. (These reports are listed in the references section at the end of this publication.)

PUBLIC DEBATE ON BIOFUELS

Perhaps the most important reason for the rapid growth in opposition to biofuels is the dramatic increase in awareness of the unintended consequences of their production among both policy makers and the general public. This has partly been the result of the increasing number of critical reports from national and international bodies mentioned earlier together with a rapidly expanding science base highlighting the risks of biofuels production. However, the media have also played a key role, particularly in highlighting the fuel vs. food debate. The level of public debate about the issue has increased dramatically. Probably the most important driver behind this new awareness was the drastic and sustained increase in the prices of a number of key commodities. This focus on the fuel vs. fuel debate has, on the one hand, been useful as it has helped raise awareness of impacts, but on the other hand it has sometimes over-simplified the debate at the expense of other, equally important, environmental impacts.

Current evidence suggests that the proposed EU biofuels target for 2020 of 10% by energy is unlikely to be met sustainably and the introduction of biofuels should therefore be slowed while we improve our understanding of indirect land-use change and effective systems are implemented to manage risks.

Gallagher Review for the UK government, 2008

Perhaps most significantly for the EU, in February 2008, the UK's Secretary of State for Transport Ruth Kelly ordered a major review of all existing and emerging evidence on the indirect impacts of biofuels. A crucial difference between the UK (Gallagher) review GHG balance figures and those used by the Commission is that the Gallagher report assesses the indirect impacts of increased biofuels production, i.e. it looks at the hidden carbon costs. The Gallagher report (2008:8) concluded that "the displacement of existing agricultural production, due to biofuel demand, is accelerating land use change and, if left unchecked, will reduce biodiversity and may even cause greenhouse gas emissions rather than savings".

[5] For more on this see Friends of the Earth 2008 report Extracting the Truth: Oil Industry Attempts to Undermine the Fuel Quality Directive, available at: http://www.foeeurope.org/corporates/Extractives/Extractingthetruth_April08.pdf

Although the study's conclusions fell short of advising the UK government to abandon support for the biofuels target, it called for a slowdown until 2015 and listed a number of challenges to be addressed by then before picking up speed again. These challenges include such issues as building a global governance structure to effectively deal with deforestation. Specifically with reference to the new EU target, the report concluded that "Current evidence suggests that the proposed EU biofuels target for 2020 of 10% by energy is unlikely to be met sustainably and the introduction of biofuels should therefore be slowed while we improve our understanding of indirect land-use change and effective systems are implemented to manage risks."

An agreement between the European Parliament, Council and the Commission on the Renewable Energy Directive was reached on 9 December 2008. Under immense pressure from the French Presidency, aided by Commission negotiators from the transport and energy directorate (DG TREN), the Parliament was forced to give up on the majority of its amendments which would have ensured clear conditions as to which biofuel technologies and feedstocks would play a role following implementation of the Directive.

As it stands, there are different potential interpretations of the Directive which means that Member States will be able to continue cooling their support for biofuels. Indeed some such as the UK, the Netherlands and Germany have already slowed down or lowered their ambitions[6] .

A full analysis of the main elements of the directive is given in the next chapter.

[6] The German government in 2009 scaled down its biofuels mandate from 6.25% to 5.25% for 2009 and freezed it at 6.25% for 2010-2015. The Dutch government scaled down in 2008 from 5.75% in 2010 to 4%. The UK in early 2009 set its biofuel mandate for 2010 at 3.25% pushing back the 5% target to 2013-2014.

4. Main elements of the Renewable Energy Directive (RED)

1. A TARGET OF 10% RENEWABLES IN TRANSPORT

The Directive contains a legally binding target for 10% of energy used in transport to come from renewable sources by 2020 (Article 3.4). This target has to be met individually by each EU Member State and they can choose to do this either through use of biofuels or renewable electricity in cars and trains. Moreover according to the law a report is foreseen in 2014 at the latest, which will review the cost-efficiency of measures to implement the target, the impacts of the implementation, the availability of electric and hydrogen vehicles, the possibility of meeting the target sustainably and an evaluation of market conditions. Although the Directive is not explicit about whether the target itself will be reviewed, this is possible (Article 23.8.b) and a number of Member States are responding as if this will be the case.

The target itself is defined in the following way:

$$\frac{\text{Renewable energy used in } \textbf{all forms of transport}}{\text{All energy used in } \textbf{road transport}} = \text{final target}$$

This means that only road and rail transport will be used to calculate the volume of the target in a Member state, but renewable sources in other transport modes can also count towards the target. For example, if a Member state decides to invest in renewable fuels in its aviation sector, it will still be able to count it towards its transport target, on condition that these fuels are sustainable.

However, there are no provisions for how the amount of renewable energy used in non road/rail sectors should be calculated to count towards the target. By contrast there are detailed provisions on how biofuels and renewable electricity in road vehicles should be calculated. This is the first of a number of inconsistencies and uncertainties in the Directive.

There is a specific extra incentive for biofuels produced from waste, residues, non-food cellulosic materials and ligno-cellulosic materials. These will count twice towards the target (Article 21.2), with the justification that they are more expensive to produce and hence need more encouragement. This means that in practice a Member State could decide to use 5% of such biofuels and thereby reach its entire obligation for renewables in the transport sector. However it is highly uncertain that such biofuels will be commercially available by 2020.

2. GHG SAVING THRESHOLDS

Until 2017, biofuels and other bioliquids (i.e. vegetable oil used in electricity generation) will only need to achieve GHG savings of 35% compared to fossil fuels. From 2017, this threshold rises to 50%, and 60% for biofuels produced in installations which start their production in 2017 and onwards (Article 17.2). Moreover, a so-called grandfathering clause has been included which exempts biofuels and bioliquids produced in installations that were in operation in January 2008 from meeting any GHG saving threshold until April 2013 (Article 17.2). These higher saving thresholds are subject to a review, at the latest by 2014, in order to take into account the

HOW MUCH OF THE ELECTRICITY USED IN TRANSPORT IS FROM RENEWABLE SOURCES? PICK A FIGURE!

The Directive has a rather confused approach to the use of electricity in transport. Renewable electricity used in electric cars will count 2.5 times towards the target, to reflect the fact that the electric engine is a much more efficient way to use renewable energy than burning biofuels in an internal combustion engine. As only road vehicles and not electric trains benefit from this incentive, the Directive gives less encouragement for Member States to switch the electricity supply for trains to renewables.

The origin of the electricity can be presented in two different ways. This will give Member States an opportunity to choose the percentage of renewable electricity used for their electric car fleet or for trains. One option is to base this percentage on the EU average, the other is to base it on the national average share of renewable electricity. In practice this means countries with a high level of renewable electricity like Sweden and Austria can use their own (relatively high) share. Meanwhile, countries with a low share of renewable electricity – like the UK and Italy – will use the EU share, currently around 14% (EEA 2008) rising to around 35% by 2020. This means that the UK will be able to count electricity in transport in 2020 as if 35% of it were renewable, regardless of the real figure. Another large uncertainty is how electricity consumed in road vehicles will be estimated as there is currently no method to measure electricity for vehicles separately from overall national supply.

As a result of these conflicting provisions, it is currently very difficult to say what role renewable electricity will play in reaching the transport target. Much will depend on the support policies in place in individual Member States.

availability of technologies and suitable biofuels (Article 23.8.a). Although the grandfathering clause makes it possible for existing installations to continue to produce unsustainable biofuels, the 2017 deadline, coupled with the fact that after 2010 indirect land use change impacts will need to be considered in determining GHG impacts, will hamper investments in new installations as it is unclear for which feedstocks and technologies there will be support in the long term.

3. SUSTAINABILITY CRITERIA

Biofuels and bioliquids will have to meet certain 'sustainability criteria' in order to be counted towards the renewable energy in transport target or eligible for national support schemes under the Directive, such as tax exemptions. The sustainability criteria are based on the EU's internal market rules, which means that once a biofuel is approved as sustainable in one Member state, other EU states cannot prevent this fuel benefiting from their own national support schemes. However, states can still decide to differentiate between better and worse performing biofuels, by giving higher subsidies to 'better' biofuels.

The sustainability criteria defined in Article 17 include the GHG saving threshold but also identify a number of 'no go' areas for the production of biofuels: high biodiversity areas (Article 17.3), and land with high carbon stocks (Article 17.4). However, in reality these rules are problematic as outlined below.

Protection of high biodiversity areas (Article 17.3)

The definition of high biodiversity areas is very restrictive and may only guarantee the protection of primary undisturbed forests (a tiny percentage of the world's forests) and officially recognised nature protection areas. Highly biodiverse grassland and areas with high numbers of endangered species or ecosystems are also included but these still have to be defined and are both problematic. A major weakness is that even when areas with high numbers of endangered species or ecosystems are recognised as such by the International Union for Conservation of Nature (IUCN), and there is provision for this within the Directive, the Commission still has the right to ignore the fact. The Commission will also have the power to determine which biodiversity-rich grasslands will receive protection from development for biofuels by proposing criteria and geographic ranges for such habitats.

Many other high biodiversity areas fall outside the scope of protection including natural and semi-natural forests that do not fall into the scope of the primary forest definition, highly biodiverse savannahs, etc. As many decisions will be in the hands of the Commission through the comitology procedure, it is difficult to say what level of biodiversity protection will be guaranteed by this Directive. This weakness comes just as the EU struggles to meet its objective of putting a stop to biodiversity loss by 2010.

Protection of high carbon stock areas (Article 17.4 and 17.5)

These two articles should in theory protect high carbon stock areas from conversion for biofuels production. However, in reality they potentially allow up to 95% of global peatlands and 50% of global forests to be converted for the production of raw materials for biofuels.

High carbon stock areas should not be converted for agricultural use because high emissions released into the atmosphere would nullify any GHG reductions achieved by biofuels. In the Directive these areas are defined as forests with a canopy cover higher than 30%[7], wetlands and, under some conditions, peatlands. This is insufficient, as it excludes many other high carbon areas, while it creates many loopholes even for high carbon areas that are included.

Protection of forests

With canopy cover defined as cover higher than 30%, the EU is rejecting the internationally recognised forest definition of the FAO[8] and potentially allowing up to 50% of global forested areas to be eligible for conversion for biofuels.

It is important to clarify that this article would not prevent the use of wood or forestry residues for the production of 'advanced' biofuels. Producers would still be able to use as much materials as they can, as long as they do not convert the forest into other land uses such as a field or grassland. However, the problem is that only forest with a canopy cover above 30% will definitely be protected against conversion, and according to the Intergovernmental Panel on Climate Change (IPCC) this represents less than 50% of global forest.

The protection of forests that have a canopy cover of between 10 and 30% will be conditional. They will be excluded from being eligible for conversion, unless biofuels producers can prove that their conversion does not lead to emissions higher than 35% (or 50% from 2017 on) compared with fossil fuels. This probably means that most biofuels will not justify forest conversion, if emissions from direct land use change are duly taken into account.

Another unclear aspect is whether natural areas will be protected against conversion for the production of cellulosic biofuels. As biofuels produced from wood have very high default GHG savings (starting at 70%),

[7] Most definitions of forest refer to canopy or crown cover, which is essentially the percentage of ground area shaded by the crowns of the trees, when they are in full leaf.

[8] The definition recognised by FAO: Land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10%, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agriculture or urban use (FAO 2007).

this could mean that they could still qualify for national support schemes, even though carbon-rich areas were converted.

Similarly there are question marks over the protection of grasslands and savannahs which are also rich in carbon. The directive is not clear on whether these areas will be protected. Everything depends on default values for direct land use change which will be added at a later stage.

Protection of peatlands

The Directive prohibits the production of biofuels on peatlands, unless a producer can prove that such cultivation did not involve the drainage of previously undrained soil. Although this constitutes a clear legal principle that would effectively prevent the use of peatlands, the definition of 'undrained' peatland still has to be defined by the Commission.

The adjective 'undrained' was added in order to allow countries such as Sweden and Finland to continue draining their peatlands for biofuels production[9]. Moreover, this provision creates a loophole in the Directive that might enable further draining of tropical peatlands in South East Asia, where emissions from drainage are ten times higher than in boreal zones. This is also the main area of the planet with huge peatlands; 50% of all new palm oil plantations (often for biofuel) are on peatlands. 95% of the peatlands in South East Asia have already been drained to some extent[10], which would allow plantation owners to argue that their new plantations were on pre-drained peatlands and therefore their feedstock should be accepted as counting towards the EU biofuels target and meeting the 'sustainability' criteria.

Allowing biofuels from drained peatlands causes major problems, especially in tropical zones. Drainage in South East Asia is also much deeper compared to drainage for Scandinavian forestry. Currently, total peatland CO_2 emissions go up to 3,000 Mt/y, which amounts to more than 10% of global CO_2 emissions – 2,000 Mt/y of these are in South East Asia. These emissions have been rapidly increasing since 1985 and will increase further unless action is taken. Over 90% of these South East Asian emissions originate from Indonesia, which puts the country in third place (after the USA and China) in the global CO_2 emission ranking (Wetlands International 2008). Palm oil production is the major driving force behind these disturbing figures.

If the carbon calculator for direct land use change in Annex V.C of the Directive is used consistently, this problem could in theory be avoided. However, this calculator can only account for conversion of peatlands[11]. Draining peatlands also results in high and ongoing GHG emissions, so biofuels produced from these areas should be disqualified because they do not pass the GHG savings threshold. However, it is unclear when and if the emissions from the drainage of peatlands will be included in the life-cycle analysis. According to a 'recital' in the Directive, the Commission should develop methodologies that take into consideration the emissions from drainage of peatlands, but without a set deadline. Draining of peatland could therefore continue and lead to substantial emissions. Moreover there is a risk that if default values are applied to biofuels coming from third countries where the raw materials are grown on peatlands, the emissions from drainage will not be properly accounted for.

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[9] Finland and some other Member States lobbied for this wording also in order to open up the market for peat used as an energy source. According to the IPCC, peat is defined as a fossil fuel, since it has been slowly stored in the soil since the glacial age. Burning peat results in high GHG emissions from burning and from the soil, while its exploitation also causes great concerns for nature conservation and water management. However, the definition of biomass in the Directive prevents countries from using peat as a renewable source.

[10] The currently drained peatlands in Indonesia and Malaysia were often drained for logging purposes. This is generally just a shallow drainage, leading to low emissions. Drainage for palm oil is by definition deep drainage (minimum 60cm; often up to a metre deep). This means that further draining of already drained soils in South East Asia leads to emissions of up to 90 tonnes CO_2/yr/ha.

[11] According to a 'recital' in the Directive, the Commission should develop methodologies that take into consideration the emissions from drainage of peatlands in the life-cycle analysis calculations, but it is unclear when and if this will happen.

Credit: Marcel Silvius, Wetlands International

95% OF THE PEATLANDS IN SOUTH EAST ASIA HAVE ALREADY BEEN DRAINED TO SOME EXTENT, SO A PROVISION TO PROTECT ONLY 'UNDRAINED' PEATLANDS FROM CULTIVATION FOR BIOFUELS IS ALMOST WORTHLESS.

Social standards (Article 17.7)

The definition of sustainability also implies socially sound production. Since biofuels complying with sustainability criteria will get large amounts of public support and money, they should also prove to be socially responsible.

The Commission is required to report on whether producer countries have ratified and implemented certain relevant International Labour Organisation (ILO) conventions (Article 17.7). This is inadequate to ensure social sustainability as it ignores what actually happens at the level of the plantation. For example, it is quite possible that a particular producer country has ratified and implemented all relevant ILO conventions, but due to weak enforcement, biofuels are still produced on particular plantations at the expense of human rights. Brazil has ratified the ILO fundamental conventions 29 and 105 on the elimination of forced and compulsory labour, yet Amnesty International continues to report numerous cases of forced labour in the Brazilian sugarcane sector[12].

Recital 40 of the Directive states that in the absence of 'multilateral or bilateral agreements and voluntary international schemes' covering key 'environmental and social considerations', Member States "shall require economic operators to report on these issues". Details of exactly what form this reporting should take, and to what extent it is required, remain unclear. In other words, the 'guarantees' appear to be extremely weak and offer no concrete protection to exploited labour on biofuels plantations.

Another weakness in the definition of social criteria is that it does not take into account the land grabbing happening in many countries in the southern hemisphere, which has an impact on the development and livelihoods of numerous communities.

Sustainability of biomass (Article 17.9)

Proposals to extend the sustainability standards to solid biomass, have been postponed to the end of 2009. At that point the Commission is due to present a report which may, if it deems it appropriate, include proposals to extend the scheme. This proposal may also include amendments to the calculation methodology in Annex V of the Directive and the sustainability criteria relating to carbon stocks (Article 17.9).

Protection of soil, air and water (Articles 17.6, 17.7 and 18.9)

Environmental provisions for the production of biofuels crops in the EU are limited to environmental cross-compliance rules[13] under the Common Agricultural Policy (CAP). Some new provisions on environmental criteria for third countries (soil, water and air protection) were added to the final compromise in Article 18. However they do not translate into mandatory requirements, but have to be taken into consideration in international agreements, voluntary certification schemes and reporting by biofuels producers.

The Directive says the Commission should report in 2012 on whether it is appropriate to introduce mandatory requirements for water, air and soil protection at a later stage. However, this is very unlikely to happen due to the Commission's view that it does not think such requirements would be possible in the context of WTO rules.

[12] In March 2007, the Brazilian Ministry of Labour rescued 288 workers from forced labour at six sugar cane plantations in São Paulo state and 409 workers from an ethanol plant in Mato Grosso do Sul. Over 1,000 workers were released from 'conditions analogous to slavery' on sugar cane plantations owned by ethanol producer Pagrisa in Pará State in June 2007 (Amnesty International 2008).

[13] Cross-compliance means that farmers' receipt of direct aid depends on their respect for environmental and other relevant legislation. However, the verification of this measure is very weak, as only 1% of farms have to be spot-checked in a year, which means that it is practically impossible to detect breaches.

4, VERIFICATION OF COMPLIANCE

The verification of compliance is critical to the impact of the sustainability criteria. i.e. can we be sure these sustainability criteria are actually being implemented on the ground. The Commission has been given a lot of discretion on this issue. The Commission alone will decide, through an advisory committee, exactly what information Member States will require operators to report on, and it must act with a view to avoiding an 'excessive administrative burden' (Article 18.3. third sub-paragraph). Information submitted to a transparency platform yet to be set up (Article 24) will only be publicly available in summary form to preserve the confidentiality of 'commercially sensitive information'. All of this indicates that the Commission is unlikely to inform the public about the real impacts of biofuel production. However a number of Member States have indicated that they will themselves make public the information they will submit to the Commission.

Moreover, the Commission has the option to approve bilateral and multilateral agreements with third countries and decide that these agreements will serve as validation that all sustainability criteria will be met for biofuels produced in that country (Article 18.4). Similarly the Commission can decide that being part of an existing national or international voluntary scheme means the sustainability standards are met, including if such schemes contain information on GHG savings (Article 18.4 second sub-paragraph), despite the fact that most such schemes were never set up for this purpose. Lastly, when a Member State or the Commission itself wants to know whether a specific source of biofuels complies with the Directive or not, the Commission can simply decide this on its own (Article 18.8), with no oversight whatsoever.

5. INDIRECT LAND USE CHANGE IMPACTS

Indirect land use change (ILUC) takes place when land is converted from food production to growing biofuel crops and this results in forest or other land being cleared elsewhere in the world to replace the lost food production. When that new land is cleared, substantial amounts of carbon are released.

A decision on how to factor in the indirect impacts on land use from the production of biofuels has been postponed until the end of 2010, creating an important loophole in the legislation which could lead to a substantial increase in GHG emissions

The estimates on how much additional land will be needed to meet biofuels targets vary widely. The assessment of the European Commission estimated that the 10% target would not require much additional land, but would mostly lead to "further increases in productivity" (EC 2008). However, they have only evaluated the land use impact of a 7 and 14% target,

COUNT THE CARBON COSTS OF BIOFUELS, NOT JUST THE BENEFITS

Calculating the greenhouse gas costs of land use change, whether direct or indirect, is necessary under basic principles of accounting. Typical calculations of the greenhouse gas benefits of biofuels already count land because they assign to biofuels the benefit from the carbon absorbed by plants from the atmosphere, which requires land. But if land is used to absorb carbon and produce plants for biofuels, it is not used to absorb carbon into plants for other purposes with other benefits. Those plants may directly reduce greenhouse gases, for example, by storing carbon in forests, or indirectly, by providing food, and thus eliminating the chance that other high carbon areas such as forests would need to be destroyed to produce that food instead. Using the land for biofuels gives up these other benefits and therefore has a cost. A proper accounting system must count not only the benefits of using land to replace fossil fuels but must also count these costs.

which would lead to additional requirement of 7.6 and 18.3 million hectares (equivalent to one to three times the entire area of the Czech Republic). Both scenarios assumed one quarter imports, diversion of exports, 20-40% 'second generation' biofuels and high yields on abandoned or set-aside land. It is unlikely that any of these assumptions will be realised.

The Dutch Environment Assessment Agency re-evaluated these claims and estimated that meeting the 10% biofuel target would require an additional 20-30 million hectares of cropland (MNP 2008), equal to the entire surface area of the UK.

Another analysis by CE Delft estimated that the total requirement for land for biofuels, if all major countries and regions were to attain their stated targets to 2020, would be between 56 and 166 million hectares (The Gallagher review 2008: 30).

Biofuels appear to represent a substantial share of the additional land demand to 2020. The evidence indicates that they may represent between 11% and 83% of the additional global agricultural land requirement forecast (ibid.).

An important evaluation on global land use also came from the SCOPE study mentioned earlier. According to that report, the new agricultural land required to meet a global target of 10% range from 118 to 508 million hectares, depending on the crop type and assumed productivity level (SCOPE report 2008: 2). The higher estimate means bringing into agricultural production an area larger than the EU or one third of the current area of arable land worldwide (1,400 million hectares).

Because of constraints on the productivity of biofuel crops such as water availability, the higher end of estimates for land use needs may be more realistic.

According to the Directive, the Commission has to submit a report, due by the end of December 2010, in which it should review the impacts of indirect land use change, look at ways to minimise the impacts and, if it thinks it appropriate, make a proposal to address these impacts. At the same time the Directive ensures that any biofuels produced in installations in use before 2013 will not be affected by any new ILUC rules. This could mean in theory that installations constructed between now and 2013 could increase the production of unsustainable biofuels. However, this is unlikely to happen in practice as by 2017 these installations will also need to achieve a minimum GHG saving of 50% taking into account indirect land use change impacts (Article 17.4). Moreover, the Directive sets a limit to the total capacity of installations for which this deadline extension applies: only the biofuels production capacity that installations have by the end of 2012 fall under this extension. Increased capacity after 2012 in existing installations will immediately have to meet the new requirements to avoid indirect land use change impacts.

6. CALCULATING GHG EMISSIONS AND DEFAULT VALUES

Instead of calculating the real GHG impacts, the Directive allows Member States to use 'default GHG emission savings' figures for different types of biofuels, or disaggregated default values for the different parts of a biofuel's life cycle. These default values have been set at such a level that most biofuels on the market today automatically comply with the Directive, irrespective of their real impacts. These values can be used for biofuel feedstocks produced outside the EU, within the EU in areas where a Member State believes that the emissions from cultivation are equivalent or lower than the default values, or when these feedstocks are waste or residues other then agricultural, aquaculture and fisheries residues (Article 19.3). A worrying element of the methodology for calculating real GHG emissions is that emission savings from Carbon Capture and Storage (CCS) can count towards calculating the total emissions from a particular biofuel. Although CCS is unlikely to play a significant role before 2020, it may play into the hands of the peat industry which has been consistently arguing that when using CCS 'second generation' biofuels made from peat could deliver significant emission savings (Annex V.C.1).

Biofuels grown on degraded land also get a bonus of 29g CO_2eq, which is an equivalent to 35% GHG savings. This is a high-risk approach as there is no viable existing definition of what degraded land is and also because it fiddles with the principle of accounting for GHG emissions. Such biased accounting, where costs are not taken into consideration, in reality encourages biofuels from degraded land because they are more expensive to produce. In practice, the majority of production would still come from first generation feedstock, because it still meets the GHG threshold requirements and is also cheaper to produce.

The actual process for deciding on default GHG saving values for biofuels is opaque and not subject to independent monitoring.

Default values and disaggregated default values come from the JEC[14]. These values were updated by the Commission at the closing stages of political negotiations, after the Parliament's Industry committee had already voted on the Directive, demanding a higher GHG savings threshold. At that point, the default GHG savings for almost all biofuels were revised upwards and as a result virtually all biofuels now meet both the 35% and 50% thresholds.

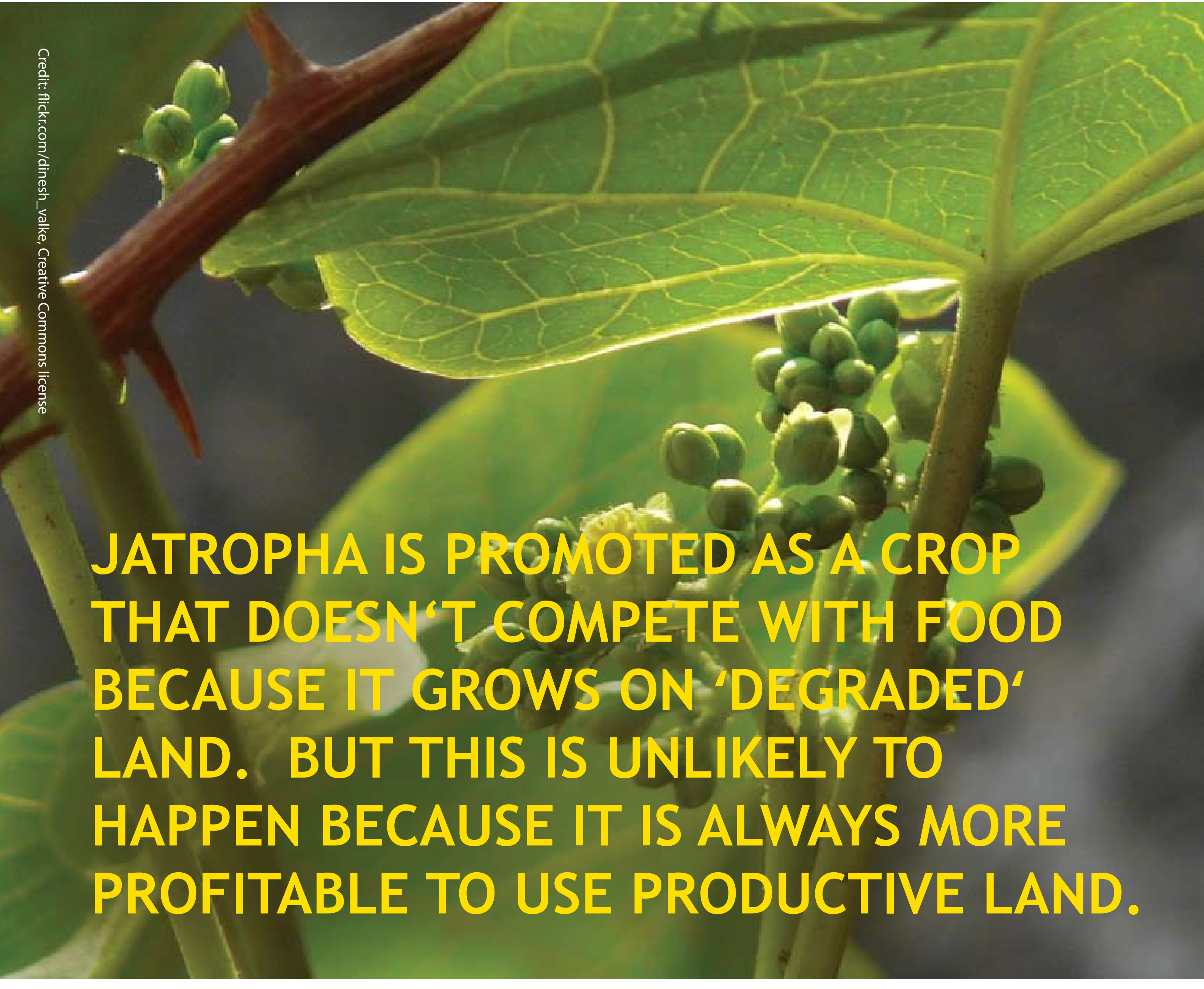
Especially significant was the difference for sugar beet ethanol that was increased from 35% to 52% default GHG savings. According to the Commission this is due to improvements in processing and to the fact that following the sugar reform, sugar beet is now grown in more efficient regions. However, we know that only the most efficient factories in the UK produce sugar beet ethanol with 55% GHG savings. Therefore, 52% seems suspiciously high for a "conservative" default value.

Jatropha is a tree species that has often been a 'poster boy' for the concept of producing biofuels on 'degraded' land without having to compete with food production. A key question though is the productivity of the tree in the dry, degraded lands on which it is said to thrive. Yale University's School of Forestry and Environmental Studies, recently launched the first detailed lifecycle environmental assessment of jatropha as a biofuel. Although this study is in its early stages, it notes that it is already clear that, while jatropha can indeed grow on lands with minimal water and poor nutrition, „if you plant trees in a marginal area, and all they do is just not die, it doesn't mean you're going to get a lot of oil from them." According to the researcher, evidence suggests that the tree will grow far more productively on higher quality land with more rainfall or irrigation.

Growing bioenergy crops on so-called marginal areas can also risk social conflicts. For example, India has been strongly supporting jatropha planting to meet its domestic biofuels targets. However, according to the Indian environmental group, Navdanya, government foresters have drained rice paddies in order to plant jatropha in the poor and mostly tribal state of Chhattisgarh. As early as mid-2007, protests broke out in the mostly desert state of Rajasthan over a government scheme to reclassify village commons lands - widely used for grazing livestock - as 'wasteland' targeted for biofuel production, primarily jatropha.
(The Guardian, 5 May 2009)

Examples of failing fuels are diesel from soybeans (31% GHG savings), and certain production pathways of rapeseed biodiesel and wheat ethanol.The process of obtaining default values is very opaque and is not subject to any independent monitoring. There has been no commitment by the Commission to open the process of obtaining these values to an independent review.

[14] JEC: the abbreviation stands for the first letters of JRC, EUCAR and CONCAWE, respectively the Commission's Joint Research Center, EUCAR (representing major European vehicle manufacturers) and CONCAWE (representing most oil companies operating in Europe)


Credit: flickr.com/dinesh_valke, Creative Commons license
JATROPHA IS PROMOTED AS A CROP THAT DOESN'T COMPETE WITH FOOD BECAUSE IT GROWS ON 'DEGRADED' LAND. BUT THIS IS UNLIKELY TO HAPPEN BECAUSE IT IS ALWAYS MORE PROFITABLE TO USE PRODUCTIVE LAND.

How should the EU tackle land use change?

Greenhouse gas (GHG) emissions from land use change can be very significant. As the main justification for public policies supporting biofuels is GHG emission reduction, it is essential that this issue is properly addressed by EU policy-makers. It is critical to include the impacts of land conversion when calculating the net GHG emissions arising from biofuels and to revise existing policies in order to mitigate the ILUC risks.

"It would be far less scientifically credible to ignore the effects of land use changes altogether than it is to use the best approach available to assess these known emissions sources"

Environmental Protection Agency, USA -

Including direct land use change is relatively straightforward and is already part of the GHG methodology for biofuels in EU legislation. Assessing the impacts of indirect land use change is somewhat more complex, but has already been done by the US Environment Protection Agency (EPA) and the Californian Air Resources Board (CARB) (See box).

It is clear that monitoring and certification schemes, as proposed in the sustainability criteria for biofuels will not help, when it comes to indirect land use change. By definition, a sustainability certification scheme can only certify what happens on the actual plantation providing the feedstock. Displaced production will in most cases move to places that are unknown to or out of the control of the plantation owner. Measures are needed that differentiate biofuels based on the impacts different feedstock have on land use change worldwide.

The European Commission should evaluate and address the issue of indirect land use change according to the following five principles:

REGULATION IN THE US – THE LOW CARBON FUELS STANDARD AND THE ENVIRONMENTAL PROTECTION AGENCY'S ASSESSMENT

In the US, indirect impacts are already taken into account in the GHG calculation methodology. The Californian Low Carbon Fuel Standard has established a carbon intensity factor for indirect impacts for different biofuels production pathways. This is a valuable effort, although the values incorporated in the end are low and are not in line with the precautionary principle.

According to the US federal 'Renewable Fuels Standard' (part of the Energy Independence and Security (EISA) Act of 2007), the EPA also had to assess lifecycle greenhouse gas emissions of biofuels, which includes "direct emissions and significant indirect emissions such as significant emissions from land use changes" (RFS 2007).

The EPA's analysis suggests that the assessment of lifecycle GHG emissions for biofuels is significantly affected by the secondary agricultural sector GHG impacts from increased biofuel feedstock production and the international impact of land use change from increased biofuel feedstock production. The EPA concluded: "Although there are uncertainties associated with these estimates, it would be far less scientifically credible to ignore the effects of land use changes altogether than it is to use the best approach available to assess these known emissions sources." *(EPA analysis 2009: 286)*

1. **Assess the global impacts of biofuels targets and legislation on global land use change**

   Such an evaluation should take into consideration the impacts of biofuel mandates and support policies around the world on commodity prices and the resulting pressures to convert new land for agricultural production. It should also include realistic assumptions about demand increases driven by population growth and changes in diets, mostly in developing countries. EU biofuels targets cannot be assessed in isolation.

   One of the best ways to conduct this evaluation is to model the likely impacts. Modelling should focus on the impact of additional demand from biofuels production and should hence attribute the GHG emissions to biofuels and not average them over all agricultural production. In contrast with food production, we produce biofuels to reduce global warming. The reason to calculate indirect land use change is to determine whether biofuels actually provide a lower GHG alternative to fossil fuels and if so by how much.

   The evaluation process should be transparent and accessible. The assumptions of modelling should be explained in detail, including what the results depend on. The process should also be open to public scrutiny, peer reviewed and be based on the best available science.

   In modelling there is always an element of uncertainty, which should be made explicit. Although the relationships between agricultural markets and land use are broadly well understood, it is not clear exactly how the world will respond to biofuels mandates. Therefore, ILUC modelling must be understood as a risk analysis that identifies the range of additional emissions caused by indirect land use change, which should serve as an indicator for a policy response.

2. **Review the overall policy based on the ILUC analysis**

   If the modelling shows that the overall indirect impacts of the European biofuels mandate are likely to be substantial, then the first and most sensible approach to reduce these impacts is a downward adjustment of the EU target. A reduction or the dropping of the target altogether must remain serious options if evidence demonstrates that the agreed safeguard measures fail to solve the serious problems caused by biofuel expansion.

   Another important safeguard against ILUC is integrated and robust sustainable land use planning and management at a local, national and global level. Land management includes identifying and protecting carbon stores and areas of high social, developmental and natural value and enforcing the protection of these. This element is crucial since ILUC will not only have a damaging effect on carbon savings, but also on biodiversity, natural resources and local communities.

   Ultimately, land management should be established through global governance, preferably in the form of an international agreement, which would introduce a mandatory accounting system at a global level for all emissions occurring from land use and land use change, in combination with ambitious targets to reduce these emissions. This would mean that any net emissions from land use and land use change will be capped and will have to be compensated in other sectors, in case they exceed the cap. If such a system is properly implemented and verified, indirect emissions would essentially disappear, as all countries would have to account and reduce emissions occurring from land use. Of course such a global agreement will need to be integrated with agreements on biodiversity conservation and measures to guarantee the rights of local populations and sustainable use of resources, to avoid one sided policies that aim at stabilising countries' carbon stocks at the expense of other elements of sustainability. However, it should be recognised that such an agreement is a long-term option, which is unlikely to be negotiated soon enough to have any relevance for addressing the impacts of existing biofuels policies. Therefore, an ILUC factor should be the immediate short-term policy response.

3. **Develop an indirect land use change correction factor**
   The results of modelling should be translated into an indirect land use change correction factor, adding to the direct GHG emissions from the feedstock production the expected emissions from displaced land-use. The ILUC factor is the only viable short- and medium-term policy response to ILUC and should be based on sound modelling using the best available data. As in any other environmental policy, a precautionary approach should be used, and ILUC numbers should be selected that provide a high level of assurance that the indirect land use effects will not be greater than those estimated. This precautionary approach recognises that the world cannot afford to pursue strategies that present a realistic risk of increasing greenhouse gas emissions, particularly in a manner that crowds out other strategies for reducing them, while placing unnecessary pressure on land.

4. **ILUC factors for different biofuel production** chains should be translated into a GHG calculation methodology in the Renewable Energy and Fuel Quality Directives and should differentiate between biofuels with higher and lower risks of ILUC

   Modelling should ensure separate evaluation of different feedstocks and whether or not they are for biodiesel or bioethanol. This is essential in order to enable the market to differentiate between feedstocks and to allow those feedstocks with low and high risks of ILUC to be distinguished. ILUC factors should be different for different feedstocks, and those categories of feedstocks should be drawn narrowly. For example, if the amount of ILUC depends on whether a crop such as jatropha achieves certain yields and is grown on certain kinds of low-productivity lands, then that ILUC factor should be limited to only jatropha that achieves those yields and uses such lands. Other jatropha should receive a different ILUC factor. To limit complexity, the key factors should be specified.

5. **Create a list of feedstocks that do not cause land use change**
   The Commission should also identify a list of feedstocks that do not cause land use change and would thus have an ILUC factor of "0". Such lists should not be based merely on name (so-called "second generation" feedstocks can also cause displacement) or unrealistic assumptions (e.g. within the next five years there will be an effective global agreement on land management), but must set forth the specific characteristics needed to avoid ILUC.

   Such a list could include biofuels from waste materials that have no other use. However, there are some basic physical constraints on the amount of biomass that can be removed from forests or fields without leading to soil degradation, loss of fertility and other problems. It is also important not to confuse waste with by-products that might have little economic value at present but in fact already have more efficient uses (for soil improvement, stationary energy production, animal feed, building material etc). The concept of what is 'waste', in short, requires careful attention.

In conclusion, an ILUC factor is necessary in the short- and medium-term to provide the right market signals for producers to shift away from the most climate damaging biofuel feedstocks. Land planning and better land management in producing countries would bring improvements to agricultural practices in general, increasing protection for biodiverse and high carbon stock land. Global land management agreements are a long-term solution, which could probably solve the question of ILUC, with the right political commitment and robust implementation.

5. Other biofuel-related legislation

THE FUEL QUALITY DIRECTIVE (ARTICLE 7A)

Around the same time as the RED was adopted, the revised Fuel Quality Directive (FQD) was also agreed[15].

Article 7a of the FQD obliges transport fuel suppliers to reduce the carbon emissions from the production of the fuels they sell by 6% by 2020 (an additional 4% reduction is voluntary). The main benefits of the FQD are that it is technology neutral and that it will hamper the market for dirty, 'unconventional' oils such as those sourced from tar-sands and coal-to-liquid technology. Fuel suppliers will also have more ways to achieve the specified reductions, for example by reducing flaring and venting, improving the efficiency of refining processes or through the use of alternative fuels (LPG, CNG, biofuels or electricity).

However the oil industry has, so far, been averse to doing so and are instead, likely to simply increase sales of biofuels rather than improve their production operations. Biofuels used in the EU will count towards both the FQD targets and the RED targets, provided that they meet the sustainability criteria, which are identical in both directives.

However, all the concerns about biofuels vis-à-vis the RED remain with the FQD. The potential of biofuels to reduce GHG emissions still hangs in the balance and will crucially depend on how ILUC is taken into account. Nevertheless, it is important that the principle of technology-neutral GHG reduction targets (as opposed to technology specific volume targets) are maintained to some extent, in order to prevent dirty, unconventional oil from reaching the EU market.

CARS AND CO_2

The Regulation to improve the fuel efficiency of (and thereby reduce CO_2 emissions from) new cars, agreed at the end of 2008, was substantially weakened by intensive lobbying from the motor industry. The presumed future use of biofuels was the main reason for weakening the target from 120 to 130 g CO_2/km, a target originally to be achieved through car technology improvements alone.

[15] More information on the Fuel Quality Directive can be found in a T&E briefing : www.transportenvironment.org/Publications/prep_hand_out/lid:523

AVIATION IN THE EUROPEAN UNION EMISSIONS TRADING SCHEME (EU-ETS)

Biofuels in the aviation sector count as zero-emissions in the European Union's Emissions Trading Scheme (ETS). This is due to an accounting flaw created by the Kyoto Protocol, which was translated into the ETS. Hence, companies can „reduce" greenhouse gas emissions (and therefore avoid having to buy permits) by using biofuels, but the emissions from land clearing associated with biofuel production are ignored. This approach in effect treats all bioenergy as carbon-free, which creates vast incentives to replace fossil fuels with bioenergy even if it involves extensive clearing of the world's forests and wetlands (Searchinger 2009). As a result, there will be a big incentive by the aviation industry to use biofuels, if they are proven technically viable, as zero emissions fuels based on flawed accounting and creating inconsistencies with their use in other sectors.

These examples show that biofuels are often used as an escape clause for companies that do not want to employ other, more lasting measures, to reduce their emissions, such as investing in measures that increase efficiency. Biofuels policy in different laws should therefore be made more consistent across the board and be amended in such a way as to only promote biofuels that truly save GHG emissions and do not pose social or conservation conflicts.

Credit: Wetlands International

EU BIOFUELS POLICY IS INCREASING THE PRESSURE ON FRAGILE ECOSYSTEMS AROUND THE WORLD. BUT IT'S NOT TOO LATE TO FIX THE PROBLEM. THE SUSTAINABILITY CRITERIA SHOULD BE REDEFINED TO ENSURE THAT ALL IMPACTS ARE TAKEN INTO ACCOUNT, THEREBY PROMOTING ONLY THE BIOFUELS THAT BRING GENUINE BENEFITS.

ANNEX I: A SELECTION OF RELEVANT RECENT PUBLICATIONS

Amnesty International Report (2008): The State of the World's Human Rights.
www.amnesty.org/en/region/brazil/report-2008.

Californian Air Resource Board (2009): Proposed Regulation to Implement the Low Carbon Fuel Standard. Volume I.
www.arb.ca.gov/fuels/lcfs/030409lcfs_isor_vol1.pdf.

Campbell, J. E., Lobell, D. B. and Field, C. B. (2009): Greater Transportation Efficiency and GHG offsets from Bioelectricity Than Ethanol. Science. Vol 324, 22 May 2009. Pages: 1055-7.

De Santi, Giovanni et al (2008): Biofuels in the European Context: Facts and Uncertainties. Joint Research Centre, European Commission.

Doornbosch, Richard and Steenblik, Ronald (2007): Biofuels: Is the cure worse then the disease? Prepared of the Round Table on Sustainable Development at the OECD.
www.oecd.org/dataoecd/15/46/39348696.pdf.

Environment Protection Agency (2009): Draft Regulatory Impact Analysis: Changes to Renewable Fuels Standard Program.
www.epa.gov/orcdizux/renewablefuels/420d09001.pdf.

European Environmental Bureau (2009): Analysis of EU's revised Biofuels and Bioenergy policy.
www.eeb.org/publication/2009/EEB_Biofuel_Policy_Analysis_2009_FINAL.pdf.

European Joint Research Centre (2008): Biofuels in the European Context: Facts and Uncertainties.
www.ec.europa.eu/dgs/jrc/downloads/jrc_biofuels_report.pdf.

FAO (2007): Definitional issues related to reducing emissions from deforestation in developing countries. Forests and Climate Change Working Paper 5.
www.fao.org/docrep/009/j9345e/j9345e00.htm#TopOfPage.

Fritsche, Uwe R. (2009): Accounting for GHG Emissions from Indirect Land Use Change: The iLUC Factor Approach. Presented at the IEA Bioenergy Task 38 Workshop "Land Use Changes due to Bioenergy - Quantifying and Managing Climate Change and Other Environmental Impacts", 30-31 March 2009, Helsinki.

GBEP (Global Bioenergy Partnership) (2009): Summary of the GBEP Workshop on Indirect Land Use Change: Status of and Perspectives on Science-Based Policies. Held on 15 May 2009, New York
www.globalbioenergy.org/fileadmin/user_upload/gbep/docs/2009_events/Workshop_ILUC_NY_15May_2009/GBEP_iLUC_workshop_-_Summary.pdf.

German Environmental Advisory Council (SRU) (2007): Climate Change Mitigation by biomass. Berlin.
www.lowcvp.org.uk/assets/reports/SRU_Exec_Summary_07.pdf.

Global Subsidies Initiative (2007): Biofuels - at what cost?
www.globalsubsidies.org/files/assets/Subsidies_to_biofuels_in_the_EU_final.pdf.

Hooijer Aljosja et al. (2006): Peat CO_2: Assesment of CO_2 emissions from drained peatlands in South-east Asia. Wetlands International.

IEA (2005): Prospects for hydrogen and fuel cells.
www.iea.org/textbase/nppdf/free/2005/hydrogen2005.pdf

IFPRI (2008): Biofuels and Grain Prices Impacts and Policy Responses. Testimony by Mark W. Rosegrant before the U.S. Senate Committee on Homeland Security and Governmental Affairs.
www.ifpri.org/pubs/testimony/rosegrant20080507.asp.

International Council for Science (2009): Rapid Assessment on Biofuels and the Environment: Overview and Key Findings. The Scientific Committee on Problems of the Environment (SCOPE).
www.globalbioenergy.org/uploads/media/0903_SCOPE_-_Rapid_assessment_on_biofuels_and_the_environment_overview_and_key_findings_-_Exec_Summary.pdf.

Kendall, Gary (2008): Plugged in. The end of oil age. WWF.
www.assets.panda.org/downloads/plugged_in_full_report_final.pdf.

MNP (Dutch Environmental Assessment Agency) (2008): Local and global consequences of the EU renewable directive for biofuels. Bilthoven.

OECD (2008): Biofuel Support Policies: An Economic Assessment.
www.oecd.org/document/30/0,3343,en_2649_33785_41211998_1_1_1_37401,00.html.

OEKO (Oeko-Institut)/IFEU (Institute for Energy and Environmental Research) (2009): Sustainable Bioenergy: Current Status and Outlook. Summary of recent results from the research project. Development of strategies and sustainability standards for the certification of biomass for international trade. Sponsored by the German Federal Environment Agency. Darmstadt/Heidelberg.
www.umweltdaten.de/publikationen/fpdf-l/3741.pdf.

Searchinger, Timothy (2009): Accurately Accounting For The Greenhouse Gas Emissions Of Bioenergy.
To be published in October 2009 by Princeton University.

Searchinger, Timothy et al. (2008): Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land Use Change. Science Express. February 2008.

Transport & Environment (2008): Background briefing. The revised Fuel Quality Directive. December 2008.
www.transportenvironment.org/Publications/prep_hand_out/lid:523.

UK Renewables Fuels Agency (2008): The Gallagher Review of the Indirect Effects of Biofuels Production.
www.renewablefuelsagency.org/_db/_documents/Report_of_the_Gallagher_review.pdf.

UNEP (United Nations Environment Programme) (2009): Review of Bioenergy Life-Cycles: Results of Sensitivity Analysis. Prepared by Oeko-Institut for UNEP-DTIE. Darmstadt/Paris.

WBGU (German Advisory Council on Global Change) (2008): World in Transition – Future Bioenergy and Sustainable Land Use. Berlin.
www.wbgu.de/wbgu_jg2008_engl.html.

World Bank (2008): A Note on Rising Food Prices. Policy Research Working Paper 4682.
www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2008/07/28/000020439_20080728103002/Rendered/PDF/WP4682.pdf.

ANNEX II: UNDERSTANDING THE ROLE OF LAND USE IN GHG EMISSIONS FROM BIOFUELS (SEARCHINGER 2008)

Understanding the role of land in comparing greenhouse gas emissions from biofuels and conventional fuels
Why calculating land use change just means accounting for the costs of using land as well the benefits

GREET AND UK DEFAULT VALUES CO_2 EMISSIONS FOR VARIOUS FUELS, GRAMS (CO_2 EQUIVALENT PER MEGA JOULE OF ENERGY IN FUEL)								
	1	2	3	4	5	6	7	8
				Land use effects				
	Production emissions	Refining and retail transport	Combustion	Land use benefit carbon removed from air by plants used for biofuels	Land use cost emissions from cropland expansion to replace crops on land diverted to biofuels (as estimated by Searchinger/ Heimlich)	Total without any land use effects (rows 1+2+3)	Total counting land use benefit only (rows 1+2+3+4)	Total counting land use benefit and cost (rows 1+2+3+4+5)
GREET								
Gasoline	4	15	72	0	0	91	91	91
Corn Ethanol	24	40	71	-62	104	135 (+48%)	73 (-20%)	177 (+93%)
Biomass Ethanol	10	9	71	-62	111	90 (-1%)	28 (-70%)	138 (+51%)
Diesel	5	11	68	0	0	84	84	84
Soy Biodiesel	23	23	69	-76	110-180	115 (+37%)	39 (-57%)	+149 to +219
UK Default Values- Diesel*	3	14	69			86	86	86
UK Deafult Palm to Biodiesel	8-9	35-36	69	-69	?	112-114 (+30% to 33%)	43-45 (-50% to -48%)	?
UK Default Rape Biodiesel for UK	52	0	69	-69	?	121 (+41%)	52 (-40%)	?

*Percentages are for biofuel compared to gasoline or diesel

ANNEX III: OVERVIEW OF COMMISSION ACTIONS IN IMPLEMENTATION

		2009	2010	2011	2012	2013	2014
ARTICLE 17 SUSTAINABILITY CRITERIA							
REC. 72	COM develops methodology for peatland: Comitology with SCRUTINY – no deadline	■	■	■	■	■	■
ART 17.3	COM develop criteria for grassland: Comitology with SCRUTINY – no deadline	■	■	■	■	■	■
ART 17.9	COM report: sustainability of biomass: CODECISION	■					
ART 17.7	COM report on national / 3rd country measures to respect sustainability criteria, specifically on availability of foodstuffs at affordable prices, land use rights, Respect of ILO Conventions: CODECISION, IF report accompanied by proposals (reports are due every 2 years)	■	■	■	■		
ARTICLE 18 VERIFICATION							
ART 18.3	COM list of reporting requirements for economic operators: ADVISORY procedure – NO deadline	■	■		■		
ART 18.4	COM recognises areas for the protection of rare, threatened or endangered ecosystems or species – NO deadline	■	■	■	■	■	■
ART 18.4	COM can decide that land falls into category of degraded land and gets a bonus – NO deadline	■	■	■	■	■	■
ART 18.4	COM decides on compatibility of nat or international voluntary schemes with sustainability criteria – NO deadline	■	■	■	■	■	■
ART 18.2	COM Report on mass balance verification method and potential to allow other methods: CODECISION	■	■	■	■		
ART 18.9	COM Report on effectiveness of provision of information on sustainability criteria and feasibility of introducing mandatory requirements for air, soil or water: CODECISION, IF there is a proposal for corrective action	■	■	■	■	■	■
ART 18.8	MS can request Com to decide whether sustainability criteria are correctly applied for a specific biofuel: ADVISORY PROCEDURE – NO deadline	■	■	■	■	■	■
ARTICLE 19 GHG CALCULATION							
ART 19.2	MS report areas with lower GHG values from agricultural cultivation, where default values can be applied	■					
ART 19.4	COM report areas in 3rd countries with lower GHG values from agricultural cultivation: CODECISION	■					
ART 19.6	COM Report on addressing and minimising ILUC: CODECISION	■	■				
ART 19.5	COM Report on the estimated typical and default values: SCRUTINY	■	■	■	■		■
ARTICLE 22 REPORTING BY MEMBER STATES							
ART 22	MS implementation reports due every 2 years (availability of biomass, commodity prices, land use changes, second gen, impact on biodiversity, water resources, estimated GHG savings, etc.)			■		■	
ARTICLE 23 REPORTING BY THE COMMISSION							
ART 23	COM Reports on implementation of the Directive due every 2 years (based on own analysis and MS reports): CODECISION, IF corrective action is proposed				■		■
ART 23.8	COM Report and review of the transport target (review minimum GHG savings threshold, cost-efficiency of the target, feasibility of reaching the target in a sustainable way, impact of the target on food prices, etc.): CODECISION	■	■	■	■	■	■

BIOFUELS
Handle with care

This report follows the adoption, at the end of 2008, of the European Union's mandatory 10% renewable energy target for transport, to be reached by 2020. It attempts to assess the environmental implications of that policy. Its key findings are that if the target is, as is widely accepted, almost completely to be met through the use of biofuels, it is highly unlikely to be met sustainably. In short, there is a very substantial risk that current policy will cause more harm than good. The report contains recommendations for European policy, EU member states, investors and the biofuels industry.