JULIE'S BICYCLE

SUSTAINING CREATIVITY

FACT SHEET:
BIOFUELS

Solving our climate and oil woes?

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The Issue

The live performance sector has shown a particular interest in biofuels as offering a partial solution for reducing the environmental impacts of tour travel, and a significant number of iconic artists, especially in the US, have used biodiesel in their trucks and buses. However, concerns about the environmental benefits of biofuels remain. This is a short overview of the science and policy and some guidance.

What are biofuels?

In the quest to reduce burning fossil fuels alternative fuels are being developed. One such group of fuels is biofuels, which refers to a wide range of plant material used to create the fuel. There are three "generations" of biofuels, a term which refers to the type of plant material used to create the fuel.

The best-known "first generation" fuels are ethanol and biodiesel. Ethanol is produced from fermented sugar, which can be derived from corn, wheat, sugar cane and sugar beet. It can be blended with petrol and gas or be used on its own in a flex-fuel vehicle (a vehicle adapted for its use). Biodiesel has similar properties to petroleum diesel. It is produced by processing vegetable oil, such as soybean oil, palm oil, rapeseed/canola oil, wild flaxseed oil and waste cooking oil.

"Second generation" biofuels are meant to overcome the dilemma of using a plant material that is also a food source, explored below. Ethanol can be derived from cellulosic material (e.g. pulp and paper byproducts, switchgrass, corn stover, etc.) or for biodiesel inedible oil such as from the jatropha plant. There are several methods for converting cellulose to a usable biofuel.

Finally, algae are considered a "third generation" plant material for biodiesel. Unfortunately few of the second and third generation technologies are economically viable at present.

Controversy surrounding biofuels is manifold. First generation fuels compete with food production, causing spikes in food prices and/or displacement of food cultivation to currently un-cleared lands. This latter issue can take many forms and has been given the name indirect land use change (ILUC). Often these new areas are in tropical countries that are not limited by temperate seasons, have plentiful solar radiation and (ideally) ample rainfall.

In many parts of the world this is linked to the clearance of logged rainforest, loss of biodiversity and displacement of local communities. Expansion of agricultural commodities (not specific to biofuels) has already been the cause of considerable rainforest loss in Southeast Asia; however, in the potential race to produce enough "green fuel" greater attention is being paid to Sub-Saharan Africa and South America by multi-national biofuel companies. Tanzania is an example where several American and European companies interested in producing biofuels for export have been accused of displacing local farmers. In addition, sections of the vast tropical forest of the Congo Basin have been sited for extensive oil palm plantations to meet some of China's demand for biofuels.

Aside from the obvious human rights issues associated with the land-grab are the environmental consequences of this expansion. The question of carbon savings is key if biofuels are intended to be a carbon-mitigating measure.

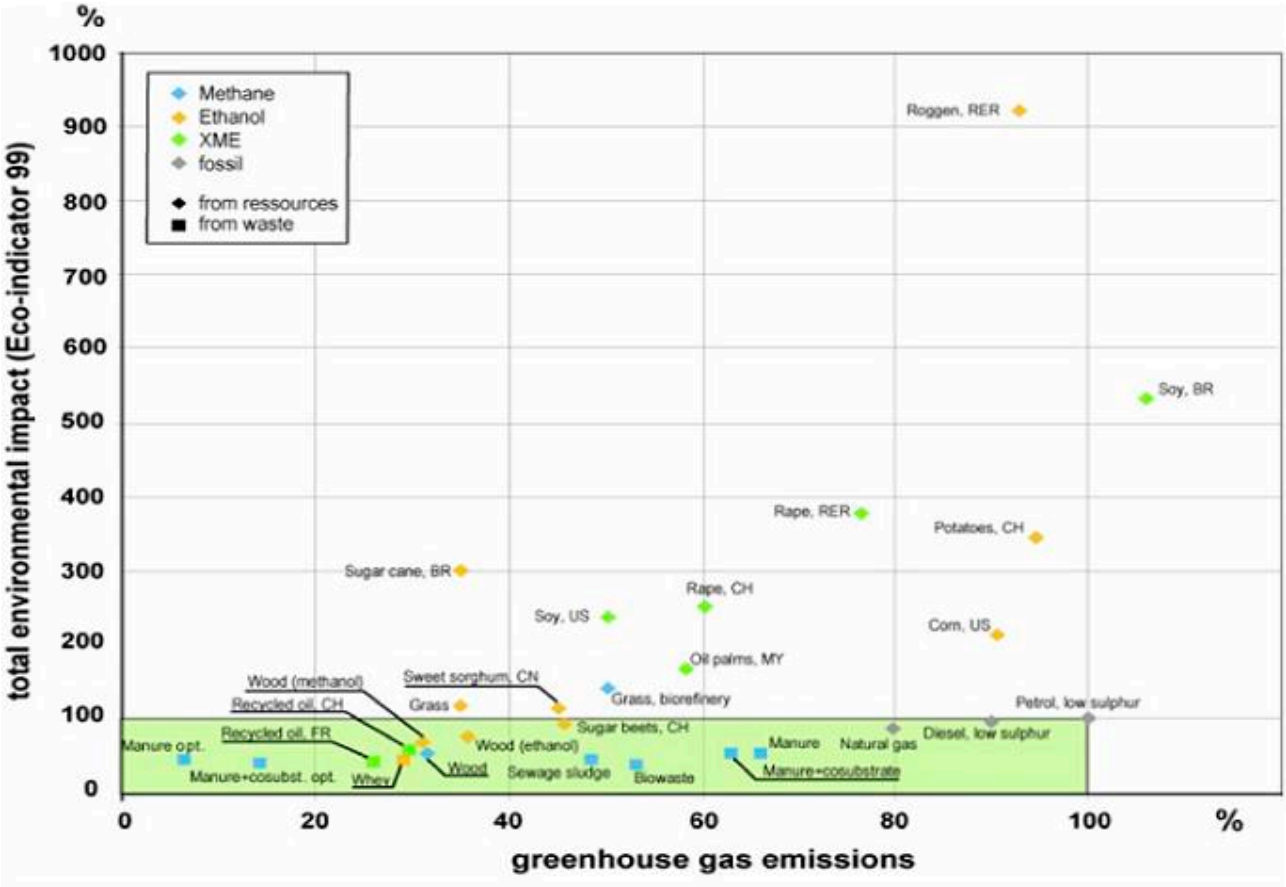
Carbon emissions can result from the clearing of carbon-rich forest; loss of carbon through soil erosion; addition of fertilizers to grow biofuels (including the embedded emissions from fertilizer

production and Nitrogen Oxides (NOx) emissions after application) and transport of feedstock before its conversion.

In order to have a greenhouse gas saving, production of a biofuel should not release more carbon than would have been emitted by combusting the same volume of fossil fuel. Currently, the carbon emissions from combusting the actual biofuel is not included in a carbon lifecycle analysis of the fuel, due to the assumption that the carbon released through burning can be reabsorbed through the re-growth of the biofuel feedstock.

The energy balance of a biofuel refers to the amount of fossil energy used to produce a biofuel compared to how much energy the biofuel has available for combustion. The carbon saving and energy balance among biofuels is significantly different across plant materials. For example, US corn-ethanol barely breaks even both in terms of carbon savings and energy balance; while, Brazil's sugarcane ethanol has roughly eight times the energy benefit. Swiss researchers have provided a helpful graph comparing biofuels from their net energy saving benefit (see Figure 1). This graphic shows the estimated carbon savings of the fuel and also their "total environmental impact described by a single eco-indicator value.

Figure 1: Greenhouse gas emissions versus environmental impacts for several biofuel feedstocks, including wastes (Source: Zah, R. et al. 2007).



Government biofuels policies

Currently biofuels are having a difficult time competing with the relatively low price for crude oil, and therefore its respective industries are buoyed by government subsidies and mandates. The EU has one of the largest biofuel mandates as part of its Renewable Energy Directive (RE-D) which stipulates that 10% of the EU's transport fuel must come from renewable fuels by 2020 (EU 2009). This policy has been blamed for much of the international hysteria to produce biofuels. As a means of ameliorating the impacts of this mandate, the recently published RE-D provides detailed sustainability criteria, including the requirement that the biofuel used must have a 35% greenhouse gas saving compared to the relevant fossil fuel it is replacing. However, it appears increasingly likely the EU will be reducing its mandate due to a recent study capping the "sustainable" volume of biofuel at 5.6%, after which negative impacts such as ILUC will overwhelm any carbon savings of the policy. At the same time, not all biofuels sold in the EU necessarily meet the sustainability requirements because only biofuel counted toward the RE-D's mandate must meet these criteria. Unfortunately, even the sustainability of these volumes is unclear, as many of the leading fuel retailers in the UK have not properly reported the source of their fuels to the Renewable Fuels Agency (RFA).

The US has both a mandate - the Renewable Fuel Standard (RFS) - that requires fuel blenders to use 36 billion gallons of renewable fuel by 2022 and significant subsidies for biodiesel blending of $1.00 per gallon of blended biodiesel. This policy has affected the viability of the EU biodiesel industry due to the phenomenon known as "splash and dash", whereby biodiesel produced in other parts of the world are brought to a US port and blended with 1% petroleum diesel in order to receive the tax credit. It is then taken to Rotterdam where it is "dumped" on the EU market. The German government responded by establishing a ban on 20% biodiesel blends from the US, but this does not stop cheap 19% biodiesel blends being traded. Nevertheless, the US biofuel industry (particularly the ethanol industry) is suffering from narrow margins and uncertain markets.

The US biofuel industry recently benefited from an Environmental Protection Agency (EPA) ruling, which increased the ethanol blending volume to increase from 10% to 15% in gas/petrol based on findings this blend could be used in conventional engines after 2001. This effectively increased ethanol demand by 50%, thereby allowing for further investment in the industry. It is possible to purchase an 85% blend of ethanol, which can only be used in a flex fuel vehicle (FFV). This new ruling also includes greenhouse gas saving requirements of 20% for any new biofuel producing facility (e.g. corn starch-based ethanol powered by natural gas, biogas or biomass), 50% for biomass-based diesel or advanced biofuel and 60% to be classified as cellulosic biofuel (EPA 2009). The EPA is continuing to develop environmental rules regarding the treatment of indirect land use change (ILUC) for their greenhouse gas savings estimates and carbon savings for biofuel plant materials, asking for support from the National Academy of Sciences.

Parallel to these efforts, the Roundtable on Sustainable Biofuels (RSB) (1) is developing sustainability criteria. It is following developments in other certification schemes such as: the Roundtable on Sustainable Palm Oil (RSPO), the Roundtable on Responsible Soy (RTRS) and the Better Sugarcane Initiative (BSI).

Guidance on what you should look if wanting to source biofuels

If sourcing biofuels in the EU, it is important to be sure it meets the RE-D requirements (especially if it has been imported). Alternative certification is not an adequate assurance of the fuel's carbon benefits. For example, the RSPO does not have greenhouse gas emission requirements yet, therefore there is no guarantee that the biodiesel is reducing or preventing carbon emissions.

Hence, meeting the EU RE-D requirements is the most important for the carbon savings of the biofuel you purchase. However, by buying a biodiesel produced from edible oil there is always a concern the same volume of oil may be consumed as food from a cheaper less environmentally responsible source. Nevertheless, you can always refer to Figure 1 to see the impact of the plant material in question.

Biofuel derived from waste products (such as used cooking oil or animal carcasses) has minimal environmental and carbon issues, so is the most straightforward to source.

In the US, the EPA is in the process of developing similar environmental regulations to the EU; however, most of the biofuel available has been produced domestically and therefore the relative impact of the feedstock can be assessed from Figure 18.

Where to source biofuels

If your tour wants to use biofuels in trucks, buses and other vehicles it is easier to source biodiesel separately, as ethanol is usually blended with petrol and can only be used in flex-fuel vehicles in its pure form. Make sure to source biofuels in Europe that meet EU RE-D requirements.

Updated information on EU biodiesel regulations: http://www.ebb-eu.org
To identify stations selling biodiesel globally: http://findbiodiesel.org
For stations in the US that sell E85: http://e85vehicles.com/e85-stations.html
For a guide to buying biodiesel in the US: http://www.biodiesel.org/buyingbiodiesel/guide

Useful Sources

Low-Impact Living Initiative (LILI) (useful links on biofuels):
http://www.lowimpact.org/linksbiofuels.htm

Scientific Facts on Liquid Biofuels for Transport: Prospects, Risks and Opportunities. (peer reviewed). Green Facts: http://www.greenfacts.org/en/biofuels/index.htm#2

References

1: The Roundtable on Sustainable Biofuels (RSB) (2009). RSB Principles & Criteria for Sustainable Biofuel Production. École Polytechnique Fédérale de Lausanne (EPFL), Lausanne.