



## BIOFUELS AND AVIATION Briefing

Biofuels are being touted as the solution to curbing the aviation industry's carbon emissions, yet there is currently no viable alternative to kerosene at any significant level.

First generation biofuels present huge problems in terms of fuelling the destruction of rainforests and threatening food security. The government-commissioned review of biofuels (the Gallagher Review) called for a slow down in their use because of concerns over sustainability.

Second and third generation biofuels have not yet been tested on a large scale and so there are huge uncertainties over their environmental impacts.

These concerns have been also raised by a wide variety of respected bodies including the Royal Society, the United Nations Food and Agriculture Organisation and the Environmental Audit Committee. The problems include:

### **The real impact of biofuels**

The explosive growth in biofuels has put pressure on land, directly and indirectly, and this change in land-use can lead to significant increases in carbon emissions. Firstly, forests and other critical carbon sinks are being cleared to make room for biofuel crops. Secondly, biofuels crops are displacing food crops, forcing farmers to clear forests and drain peatlands in order to find new land to cultivate.

The current regulations governing biofuels are inadequate because they do not fully take into account the full environmental impact of biofuels. For example the current regulations governing biofuels do not:

- properly take into account the impact of indirect land-use changes, and in some cases, do not deal with direct land-use change properly
- protect high carbon areas like peatlands
- incentivise those biofuels that have the least environmental impact

By not properly accounting for life cycle emissions, the role that biofuels can play in reducing emissions is overestimated. Recent papers in *Science* have indicated that if the negative indirect effects of biofuels are included, then biofuels crops can actually be significantly worse for the climate than the fossil fuels they replace.<sup>1</sup>

In the absence of detailed data around the impact of biofuels, there needs to be a 'default cost' which reflects the energy and carbon impacts of biofuels. This would then help to drive improvements in sustainability along the supply chain.

### **Marginal land**

Increasingly the biofuels industry and government are trying to deflect concerns about food security by saying that only 'idle and marginal' land will be used. However:

<sup>1</sup> Searchinger et al, Published Online February 7, 2008 *Science* doi:10.1126/science.1151861 ; Fargione et al, Published Online February 7, 2008 *Science* doi:10.1126/science.1152747

- Definitions of idle land are incredibly complex and can be described as western-centric. Land described as idle land from high level surveys is used by shifting pastoralists and in practice is less idle than Hyde Park.
- The economic consultants, CE Delft, reported that some idle land could be developed without harming the environment but part cannot.<sup>2</sup>
- As mentioned above, there is no effective regulation or governance in place for proper land use. Since the Gallagher Review said over a year ago that production of biofuels should be directed towards idle and marginal lands, little has changed. Forests, peatlands and other carbon sinks are still being cleared to grow biofuel crops, such as palm oil.

### **The demand for biofuels**

Even if these serious concerns could be addressed, meeting the aviation industry's demand for biofuels would require massive amounts of biomass, which in turn would require huge areas of land. At present, there is no serious analysis of the amount of biomass that can be delivered sustainably on a global level.

The industry currently uses about 240 million tonnes of kerosene every year. If biofuels were used to replace just 1 per cent of this total, it would need more than the total global biodiesel production for 2002<sup>3</sup>. The New Scientist estimates that an area three times the size of Germany would be required to meet current global demand for jet fuel from biomass to liquid (assuming the average crop yields of 10 tonnes of biomass per hectare<sup>4</sup>).

The airline industry has been very vocal about ongoing research into the potential of biofuels as an alternative to kerosene. Virgin flew a plane from London to Amsterdam, using a fuel mix which included 5% biofuel (a coconut and babassu based biofuel). The quantities needed to power this single flight by biofuel alone would have been massive, and no flight has ever been completed using biofuels alone. The New Scientist calculated 3 million coconuts would have been needed to power the entire flight by just biofuels.

There are also lots of other competing demands for biofuels. Biomass may well offer a cheap way of providing low carbon heat – one of the most problematic sectors to make low-carbon. The Government's own Renewable Energy Strategy consultation made clear that the biofuels that are available in the future will not be best used in planes - "due to a range of technical, safety and economic challenges, it is arguable that... biofuels would be used either in road transport or electricity generation in preference to aviation."<sup>5</sup>

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<sup>2</sup>[http://www.renewablefuelsagency.org/\\_db/\\_documents/CE\\_Delft\\_Agricultural\\_land\\_availability\\_and\\_dem\\_and.pdf](http://www.renewablefuelsagency.org/_db/_documents/CE_Delft_Agricultural_land_availability_and_dem_and.pdf)

<sup>3</sup> Wardle D.A., Global sale of green air travel supported using biodiesel, Renewable and Sustainable Energy Reviews, Volume 7, Number 1, February 2003 , pp. 1-64(64)

<sup>4</sup> New Scientist, Vol 199, No 2669, August 2008

<sup>5</sup> UK Renewable Energy Strategy consultation - Department for Business, Enterprise and Regulatory Reform (June 2008), P175 para 6.4.5

## **R&D and second and third generation biofuels**

Biofuels have never been demonstrated on a commercial scale. Biomass to liquids have never been demonstrated at any realistic level at a cost that competes with existing technologies or fossil costs, and we are not aware of any large scale demonstration for aviation fuel at the refinery scale.

### Algae

In practice there is significant investment going into R&D in algae<sup>6</sup>, yet algae is likely to have a small role in the overall production scenario and even Exxon, who are prepared to invest \$500 billion, accept that it may not work.

There is no evidence as to whether algae works at scale or whether it is economically viable to produce.

More worryingly there is no real sense of the environmental consequences of algae production, for example in terms of water, land-use and life cycle carbon emissions. Algae production is effectively aquaculture so it could be very damaging if done badly (for example, mangrove decimation).

Even if some of these issues could be addressed, again it is likely to require significant quantities of land. Some initial land-use estimates for algae suggest that an area the size of Ireland would be needed to meet current demand.<sup>7</sup>

### Jatropha

Jatropha faces similar land issues. Initial estimates suggest an area twice the size of France would be needed to produce enough Jatropha to meet aviation demand<sup>8</sup>.

## **Timeframe and cumulative emissions**

The uptake of biofuels by 2020 will be very limited. If biofuels were to overcome the significant concerns set out in this briefing they wouldn't start having any real impact until 2025.

This raises the point about cumulative emissions. Emissions need to peak by 2015 and decline sharply thereafter. If biofuels can play a role it will not be in achieving this peak, but much later on when emissions will already have to be in steady decline through other mitigation measures. Relying on biofuels to achieve these reductions at a later stage as a balance against allowing higher emissions due to rapid aviation expansion in the shorter term is extremely high risk given the probability that they will not deliver as required. The cumulative emissions in that period would be higher increasing the overall climate risk. In addition the trajectory for getting emissions down in that later time will be steeper making the effort needed greater and more expensive..

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<sup>6</sup> <http://news.bbc.co.uk/1/hi/sci/tech/7661975.stm>

<sup>7</sup> New Scientist, Vol 199, No 2669, August 2008

<sup>8</sup> Ibid.

## Greenpeace position

Greenpeace has serious concerns that faith in biofuels as the silver bullet for climate change is a dangerous distraction from rising emissions from the aviation industry. Whilst biofuels *may* play a part in long-term future energy scenarios, they do not currently present a viable sustainable alternative to kerosene.

In practice, for biofuels to be produced sustainably and on a large scale would require massive changes to:

- agricultural management and practice – so that crops that are essential for human needs are prioritised over profits to be made from biofuels, which would compete for the same land and water. Intensively grown biofuels (and food) remain damaging to biodiversity.
- conditions of world trade – biofuels produced to good environmental standards need to be prioritised above those produced in a damaging way. Yet throughout the development of EU Renewable Energy Directive and UK Renewable Transport Fuels Obligation there were questions raised over whether environmental standards would conflict with narrow world trade rules.
- on-the-ground governance in developing countries – it remains true that expansion of land is often cheaper to manage in rainforest areas rather than on idle land. In Indonesia forests are being cleared in anticipation of biofuel demand even though there are millions of hectares of cleared land that could be used with less damage to climate and biodiversity. This shows that without governance in the right places it is very hard to direct biofuels to places that do not create environmental damage.

Attempts to implement progressive reform in these areas have been subject to concerted efforts by many stakeholders for decades with only limited progress. It is inconceivable that such reforms will now be forthcoming for the convenience of the aviation industry. Until these conditions have been met, it would be wholly irresponsible to adopt large scale biofuels targets. Government policy must therefore be focused on constraining current demand, for example, by rejecting a third runway at Heathrow.

Greenpeace believes that bioenergy has an important role to play in tackling climate change, but has deep concerns that the recent development of liquid biofuels has taken place in the absence of proper recognition of mitigation against the wider negative impacts. For biofuels to play a role critical issues of sustainability and levels of supply need to be addressed. Greenpeace agrees with the Gallagher Review's finding that until such questions are satisfactorily resolved we should proceed with utmost caution. Moreover all parts of the economy will be competing for available bioenergy stocks and there is a strong case for focusing their use in other sectors. It is therefore extremely dangerous to allow the suggestion of a role for biofuels in aviation to obscure the need for demand constraint in the short and long term or for biofuels to be presented as a solution for aviation emissions. A comprehensive sustainable bioenergy strategy across all sectors is needed to deal with the challenges and to ensure we get the most carbon reduction possible from the limited sustainable bioenergy resources that are available.