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# Flying in the face of the facts

## Greenwashing the aviation industry with biofuels

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# Table of Contents



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# Flying in the face of the facts

***Greenwashing the aviation industry with biofuels***

## Introduction

In response to international pressure to reduce greenhouse gas (GHG) emissions, the aviation industry is looking to biofuels to 'green' its image. The International Air Transport Association (IATA) intends to source 6% of airline fuel from biofuels by 2020,[1] whilst the European aviation industry, supported by the European Commission, intends to secure 2 million tonnes of bio-kerosene per year by 2020.[2] Global aviation is already responsible for an estimated 4.9% of man-made climate change[3] – socially and environmentally destructive biofuels only threaten to exacerbate this.

This briefing demonstrates that biofuels are a false solution for the aviation industry. The social and environmental impacts of current biofuels can be devastating: they cause deforestation, food price rises, hunger, poverty, biodiversity loss and they often produce more GHG emissions than the fossil fuels they replace. Biofuels present the aviation industry with a convenient blind alley, facilitating the industry's expansion plans and avoiding pressure to reduce their fuel use and diverting political attention from the real need to cut air travel in order to reduce climate change.

## What are aviation biofuels?

Aviation biofuels are made from plants and animal fat, and are a potential replacement for fossil fuels as jet fuel. Aviation biofuels have been used in test flights by many airlines worldwide, keen to 'green' their image by finding alternatives to fossil fuels. KLM, Air France, Virgin Atlantic, Lufthansa, JAL, Aeromexico, TAROM, Continental Airlines, Boeing and others have carried out test flights with various blends of biofuel.

Before they can be used commercially, aviation biofuels need to be certified as being safe for use in aircraft (including by ASTM International) to ensure that things such as freezing point, fluidity, energy density and composition are appropriate for aircraft. This is not to be confused with sustainability certification which looks at environmental and social impacts of growing the crops (discussed in more detail below). Palm oil and jatropha are two of the main aviation biofuel feedstocks currently in consideration, despite large social and environmental concerns. The main aviation biofuel feedstocks being researched are detailed on pages 5 to 7.

## What is driving the development of aviation biofuels?

Aviation biofuels are being developed in response to some key financial factors – the increasing cost of conventional jet fuel and the likely cost of meeting emissions reductions targets – as well as an increasing societal expectation on the industry to reduce its emissions, and a political and military interest in energy security.

### The aviation industry

Aviation is expanding. The International Air Transport Association (IATA) predicts that by 2014 there will be 3.3 billion passengers, up by 800 million from 2009, and 38 million tonnes of air cargo, up 12.5 million tonnes from 2009.[4] However, in the face of international pressure to act on climate change the industry has committed "to stop the growth of our emissions from 2020 and to halve emissions by 2050 compared to 2005 levels"[5].

These two conflicting aims – expansion of air travel and decrease in emissions – will prove difficult to reconcile, especially as there are fewer options for reducing emissions in aviation than there are in land based transport. Increasing the use of biofuels is a key part of this plan – hence plans by the European aviation industry to achieve 2 million tonnes of bio-kerosene per year by 2020, and the IATA aim for a 6% mix of biofuels by 2020. As well as using biofuels, the industry plans to find emissions reductions through reducing inefficiencies in its flights, operations and infrastructure and to avoid emissions reductions through emissions trading and offsetting.

### The Emissions Trading Scheme (ETS)

The European Union Emissions Trading Scheme (EU ETS) is the world's largest carbon trading mechanism, and one of the key policy drivers pushing airlines to pursue biofuels. Under the scheme, the EU's largest emitters of $CO_2$ must report on their annual emissions. An upper limit (or cap) is then set and allowances (certificates) are given for the industry to emit up to this limit. The industry can sell certificates on the market if it emits below the limit and buy extra certificates if it emits above the limit.[6] The ETS has been extended to include the airline industry from 2012 onwards. The IATA has estimated that the ETS will cost the industry €3.5 billion in the first year, with costs rising after that.[7]

The EU ETS incorrectly assumes aviation biofuels are 'carbon neutral' – i.e. that they produce no net $CO_2$. This gives airlines a massive incentive to use aviation biofuels to meet their ETS obligations. Any growth in the number of flights will be 'free' under the ETS if biofuels are used in those flights. This contradicts other EU policy (for example the Renewable Energy Directive) in which biofuels are given different $CO_2$ savings figures depending on what feedstock they are made from.

The EU ETS is a fundamental part of the EU's climate policy, but Friends of the Earth has shown that it is failing to deliver $CO_2$ reductions overall.[8] And it will not help to deliver significant cuts in the aviation sector as, instead of reducing unsustainable aviation levels, it encourages airlines to use biofuels that are likely to increase emissions.

## Current research projects

Aviation is not currently subject to the same legal mechanisms that regulate biofuels in EU road transport. Current EU, national government, and military subsidised projects include:

- The EU's Sustainable Way for Alternative Fuels and Energy for Aviation (SWAFEA) project is being financed by the European Commission's Directorate General for Transport and Energy to investigate the feasibility and the impact of the use of alternative fuels in aviation.

- The German Government is contributing €5 million to the "FAIR" initiative (Future Aircraft Research) which is looking at biofuels, other alternative fuels and aircraft concepts. Of this €2.5 million will subsidise Lufthansa's "burnFAIR" project in which it plans to trial biofuel for six months in one engine of an aircraft flying the short 460km Hamburg to Frankfurt commercial route.

- Dutch airline KLM was granted a Netherlands government subsidy of €1.25 million to develop bio-kerosene in 2010.[9]

- The US military, in a quest for improving energy security, has invested heavily in biofuels. The US Department of Defense has spent hundreds of millions of dollars on the development, testing, and certification of alternative fuels that can substitute for petroleum-derived fuels used by the Army, Navy and Marine Corps, and Air Force in their tactical weapon systems. However, a study carried out for the Department by RAND (the National Defense Research Institute) in January 2011 has seriously questioned the validity of this strategy. [10]

## Alternative fuels at a glance

Conventional jet fuel is made from kerosene (also called paraffin), which comes from crude oil, and various other chemicals. The following fuels made from plant oil, animal fat or waste organic material are a potential replacement for conventional jet fuels.

### Palm oil

- Oil palm trees, native to Africa and Central and South America, and grown in tropical areas, produce palm oil, which is extracted from the fruit and the kernel.
- Has a wide variety of uses including for food, cooking, cosmetics and as a biodiesel.
- The most consumed vegetable oil in the world (about 45 million tonnes in 2008-9)[11], 35% of international vegetable oil market.[12]
- Has high oil yield per hectare compared to most other oil seeds, and hence there are strong economic incentives.

### Problems with palm oil

- The UN says palm oil expansion is the primary driver of deforestation in South East Asia.
- Deforestation for oil palm plantations causes massive biodiversity loss, including of critically endangered species e.g. the orang-utan, Sumatran elephant and Sumatran tiger.
- Oil palm plantations are well documented as causing and being associated with human rights abuses, land conflicts and a range of social and environmental impacts.[14]
- Even "sustainably certified" palm oil is not

- Malaysia and Indonesia produced 87% of the world total in 2009-10.[13]

## Jatropha

- Jatropha *curcas* is a bushy tree native to South America. It can withstand dry and semi-arid conditions, and is used for hedges in Asia and Africa, because it is not grazed by animals.
- Its oil-rich seeds can be used to make soap and for medicinal purposes, but are inedible.
- Several airlines – including Air New Zealand, Continental, TAM, JAL - have flown aircraft with biodiesel made partially from jatropha.
- It is predicted that each year for the next 5-7 years approximately 1.5 to 2 million hectares of Jatropha will be planted.[15]

## Camelina

- Camelina is a flowering plant in the *Brassisaceae* (mustard or cabbage) family that originates from central Europe and grows in temperate regions.
- Historically it has been used for cooking, lamp oil and lubricants. It can be used in animal feed.
- The US is leading production, which is targeted at the aviation industry. Also Airbus and TAROM (Romania) have launched projects to produce aviation biofuel from European-grown camelina.[17]

## Rape seed (of which canola is a variety):

- Another flowering plant in the *Brassisaceae* family. It is used as an animal feed as well as for human consumption and as a biodiesel.
- The EU used to be a net exporter of rape seed oil but became a net importer to meet demand for biodiesel.[20]
- The third most used vegetable oil – with guaranteed to be sustainable – see p10 below.
- Greenhouse gas emissions are higher than from diesel due to emissions from peatland clearance and draining and deforestation.

## Problems with jatropha

- There are numerous accounts of land grabs for jatropha plantations in Africa and forced evictions from land in India.[16]
- Often claimed that it does not compete with food for land. But previously cultivated land has already been turned over to jatropha and subsistence producers displaced.
- Key to its profitability is yield. The high yields initially predicted are not being achieved.
- Although it grows on degraded, dry land, yields high enough for profitability have not been achieved in these conditions.
- Not much is available on the world market.

## Problems with Camelina

- Cultivation is competing with food crops: in response to high wheat prices in 2008 camelina cultivation decreased dramatically.[18]
- Unproven profits – in Montana planting halved because wheat is more profitable.[19]
- Can be grown in difficult, dry conditions but yields are uncertain in these areas. There are no independent analyses of yield and cost.
- GHG emissions – especially indirect emissions – from camelina biofuel, not yet assessed.

## Problems with oilseed rape

- Biofuel from oilseed rape may be worse for the climate than conventional diesel.
- If rape seed is diverted out of food market into fuel market, the additional food oils are likely to be obtained by expanding palm oil and soy production, driving deforestation.
- There is conflicting information about

22.35 million tonnes produced in 2009/10.[21]
- The main producers are China, India, Canada and the EU.

whether it is suitable for aviation biofuels.[22]
- Approximately 90% of canola grown in Canada is genetically modified to be resistant to herbicide Roundup. It has escaped into the wild in Canada, the US and Australia.

## Algae

- Some scientists and industries are excited by algae as a source of biofuel because it can theoretically produce many times more oil and carbohydrates per hectare than conventional crops, and could be grown with salt water, in contaminated or difficult areas. However, trials are ongoing.
- Some airlines have included algal fuel in their trials, including Continental and KLM.
- There are many research projects looking at cost efficient ways to create algal biofuel. But algal biofuel is not yet commercially available.

## Problems with algae

- It is still at an early developmental stage.
- One key hurdle is that algae need a high level of nutrients and energy, which can mean the biofuel has a worse $CO_2$ balance than fossil fuel.[23]
- Another concern is water use if freshwater input is needed.
- Small quantities have been produced but it is too expensive to be competitive as a biofuel and it is not yet commercially available.
- Research involves genetic manipulation of algae for e.g. quick growth, high oil content. There is concern about genetic contamination.

## Animal fat

- Biodiesel can be made from animal fats including tallow, lard, poultry fat and fish oil.
- Tallow is used industrially in cosmetics, soap and lubricants.
- Where tallow is genuinely a waste product it makes sense to use it for biodiesel.

## Problems with animal fat

- There is a limited supply, much of which is already used in industrial applications.
- Use of tallow for biodiesel competes with existing uses – if it is diverted into biodiesel production, petrochemical substitutes will be used as replacements.[24]

## Fischer-Tropsch fuels

- The Fischer-Tropsch process is a chemical process that creates fuel. Aviation fuels have been made from gas ("gas to liquid" F-T GTL), coal ("coal to liquid" CTL) and from biomass ("biomass to liquid" BTL) using this process.
- BTL (e.g. wood waste) is classed as a biofuel.

## Problems with Fischer-Tropsch

- Gas and coal to liquid have similar $CO_2$ emissions to traditional diesel, even when carbon capture and storage is used.[25]
- Biomass to liquid is prohibitively expensive because of the large energy input required, and risks driving additional deforestation.

# Problems with aviation biofuels

## Greenhouse gas emissions from aviation biofuels

IATA and individual airlines often use a figure of 80% for the amount of CO2 that they assume would be saved by biofuels compared to conventional fuels.[26] The EU ETS assumes that biofuels are carbon neutral (i.e. a 100% saving). Both of these figures are wildly optimistic and unscientific.

As plants grow, they absorb $CO_2$. When the biofuels made from these plants are burnt, the $CO_2$ is re-released into the atmosphere. If the system was this simple, biofuels could be assumed to be carbon neutral. But $CO_2$ and other greenhouse gases are produced at all stages of the biofuel lifecycle: clearing and ploughing the land releases $CO_2$ (especially when this is done at the expense of forests and other carbon rich ecosystems), fertilising the crops creates many greenhouses gases, harvesting and processing the crops into fuel uses energy, transporting the crops and fuel uses energy. Incorporating all of these and other factors is called life cycle analysis: essential to fully understanding the impacts of biofuels. Unfortunately many studies looking at the greenhouse gas balance of biofuels do not include full comprehensive life cycle analysis.

In the EU Directive on the promotion of the use of energy from renewable sources (RED), which sets a target that 10% of all road transport fuel should be from renewable fuels by 2020, the EU sets default figures for each type of biofuel feedstock. These currently vary from 16% to 85% savings, with palm oil being 19% and rape seed being 38%.

Even these low figures do not include an essential and significant element: the impacts of indirect land use change (ILUC). This happens as a result of the large-scale land demands that growing significant quantities of biofuels requires. When land used to grow food crops is turned over to biofuel crops, agriculture has to expand elsewhere to meet the previous and ever-growing demand for crops for food and feed – often at the expense of forests, grasslands, peat lands, wetlands, and other carbon rich ecosystems. This results in substantial increases in GHG emissions from the soil and removed vegetation.

When the significant impacts of ILUC are included, scientific studies consistently show that most of the currently used biofuels are worse for the climate than fossil fuels. For example a report produced by IEEP for Friends of the Earth Europe and other NGOs found that EU road biofuels are between 81% and 167% worse for the climate than the equivalent fossil fuels. Oil seed crops – such as palm oil and rape seed – used to make aviation biofuels, have some of the highest ILUC impacts of all biofuels[27] – particularly when palm oil based fuel is sourced from formerly forested areas or peat lands.[28]

## Land use

Friends of the Earth believes that the question of land use is one of the key crucial problems with biofuels for several reasons:

**Food or fuel?** The impacts on food prices of agricultural land being turned over for biofuel production have been well documented. The majority of studies cite biofuels as being amongst the key drivers of the dramatic food price rises we have seen in the past few years. Since the food price spike of 2008, food prices have remained historically high and have spiked again to record levels in early 2011. This is having disastrous consequences for the world's poorest and most hungry people. After the 2008 food price spike, the Food and Agriculture Organisation of the UN estimated that 100 million more people were pushed into chronic hunger and poverty. [29] The World Bank estimates that 44 million people were pushed into poverty between June and December 2010 as a result of high food prices[30]; a report it prepared with WTO, OECD and other agencies for the G20 Agriculture Ministers meeting in Paris, in June 2011, recommends that "G20 governments remove provisions of current national policies that subsidize (or mandate) biofuels production or consumption", to reduce volatility in global food prices.[31] The Asian Development Bank estimates that food price rises of 20% and 30% would create 128.8 million and 193.2 million more poor people in Asia alone.[32]

**Land grabs:** Friends of the Earth is increasingly concerned that local communities are being deprived of their livelihoods and access to natural resources as a result of the burgeoning growth of biofuels. Cases where land traditionally used by local communities is leased or sold – often without free prior informed consent or adequate compensation – to outside investors (from, often Western and Chinese, corporations and from governments) are becoming increasingly common across Africa. Access to land provides food and livelihoods for billions of people around the world and these land grabs, driven by ever increasing demands for natural resources, including for biofuel, are taking place against a backdrop of rising food prices. Friends of the Earth has recently documented that 5 million hectares of land, an area the size of Denmark, across 11 African countries, is currently being acquired for biofuels.[33]

**Ownership and land rights:** Friends of the Earth has also documented many cases of human rights abuses and disregard of traditional land rights in the establishment of palm oil plantations in Indonesia[34], jatropha plantations in India[35] and for various biofuel crops across Latin America.[36]

### How much land would be needed to meet the aviation industry's projected biofuel demand?

The answer depends on the crops and the yield as well as how much fuel the industry uses. Calculations vary dramatically.

Extrapolating from figures indicated by Lufthansa, Friends of the Earth has calculated that the target of the European aviation industry to supply 2 million tonnes of bio-kerosene by 2020 could require approximately 3.5 million hectares of feedstock to be grown.[37] For comparison, this is roughly the size of Belgium. This would result in large amounts of GHG

emissions from indirect land use change, which have not been accounted for by the aviation industry.

The EU SWAFEA study says "if the industry is to produce 225 billion litres of low carbon fuel by 2030 in order to meet IATA's zero carbon sector growth targets, 225 plants of a similar scale to the Neste plants presently under construction must be on stream by 2030, or 10 plants a year from 2010 which is close to one every month".[38] Biofuelwatch has calculated that this means 45 million hectares of land for palm oil or 138 million hectares for camelina would be needed to meet IATA's aim. For context, current palm plantations cover 12 million hectares worldwide. Current biofuel plantations cover between 20 and 25 million hectares.[39]

## Sustainability criteria cannot solve key problems

Recognising the huge social and environmental problems with biofuels, some policy makers and industries have turned to sustainability criteria and certification schemes in the hope that they will address these problems. Unfortunately, certification schemes cannot and do not solve some of the key issues associated with biofuels. Some of the biggest environmental and social problems are caused by the actual expansions of crop land rather than how crops are grown. Certification schemes do not solve the land pressure, deforestation, habitat loss and social conflicts caused by displacing agricultural activities. And they cannot address the rise in food prices as a partial result of the increased competition for raw materials created by biofuels.

The most advanced scheme is the Round Table on Sustainable Palm Oil (RSPO) which was set up in 2004 for "*promoting the growth and use of sustainable oil palm products through credible global standards and engagement of stakeholders*"[40]. Palm oil meeting its standards is certified, awarded an RSPO logo and can be sold as being "sustainable". RSPO certified palm oil is, by some measures, likely to be more sustainably produced than non certified palm oil, but RSPO certification does not mean the palm oil, grown on big monoculture plantations, is sustainable.

Friends of the Earth has documented how RSPO certified palm oil is contributing to deforestation and indirect land use change.[41] Friends of the Earth has also investigated some RSPO members with worrying conclusions:

- RSPO members expanding their oil palm plantations in Ketapang District, Borneo – including Sime Darby and Cargill – developed palm oil activities without legally required permits. Part of the plantation areas overlap with protected forestland areas; whilst fast track licensing of about 40%  the districts' land area will result in more biodiversity loss, peat land drainage, carbon emissions and potential land conflicts with villagers.[42]

- Malaysian palm oil giant IOI is an RSPO board member. There is evidence indicating that IOI is responsible for deforestation to create palm plantations, in breach of the RSPO's environmental requirements.  It has allegedly misled the Indonesian Government, falsely claiming it did not conduct any land clearing before its Environmental Impact Assessments were reviewed and approved.  IOI has become involved in land rights conflicts with local communities in Sarawak, Malaysia, who claim it has used intimidation techniques against community members involved in action to reclaim their native land.[43]

Certification schemes, like the RSPO, which cannot guarantee sustainability and are easily open to abuse, are acting as a smokescreen for the aviation industry – enabling it to say it is pursuing only “sustainable” biofuels and thus promoting the unsustainable expansion of the biofuels industry.

## Conclusions and recommendations

The aviation industry, in its drive to make its image greener, increase energy security and decrease greenhouse gas emissions, is turning to biofuels. The industry is assisted by government and military support for aviation biofuels in the form of policy targets, funding and research programmes, and is given extra incentive through the ETS, which is promoting aviation biofuels as “carbon neutral”.

However, aviation biofuels can cause more problems than the fossil fuels they replace. Most aviation biofuels contribute more to climate change than conventional jet fuel. Biofuels are causing land grabs, increased food prices, deforestation, biodiversity loss and human rights abuses. Sustainability schemes and certification criteria do not and cannot solve most of these problems.

Friends of the Earth Europe welcomes research into new solutions to climate change, including from the aviation industry. However, biofuels are a false solution and there should be no further expansion of biofuel use in Europe until all the impacts have been fully reviewed.

**Friends of the Earth Europe is calling for the EU and its member states to:**

- Urgently review the full impacts of biofuels on climate change, biodiversity, rural communities and food security.
- Take account of the full carbon footprint of all biofuels by introducing indirect land use change ‘factors’ rooted in the precautionary principle.
- Ensure that biofuels do not count as a 100% $CO_2$ reduction under the EU ETS and are instead allocated a realistic carbon value based on the full carbon footprint including ILUC factors.
- Press for aviation (and shipping) to be included in international climate agreements.
- Stop subsidising airlines and airports and rapidly support non-flying modes of transport, especially within the EU.
- Abolish the ban on aviation fuel taxation.

**Friends of the Earth Europe is calling for airlines and the aviation industry to:**

- Recognise that the currently available biofuels will not help them achieve their emissions reductions targets sustainably.
- Revise their claims about the GHG emissions saving potential and sustainability of biofuels, to include the effects of indirect land use change.
- Withdraw their biofuels targets and replace them with emissions reductions targets based on actual reductions in emissions.

**Prepared by Friends of the Earth Europe, with Hannah Griffiths and Robbie Blake | June 2011**

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| France | Les Amis de la Terre |
| Georgia | Sakhartvelos Mtsvaneta Modzraoba |
| Germany | Bund für Umwelt und Naturschutz Deutschland (BUND) |
| Hungary | Magyar Természetvédok Szövetsége |
| Ireland | Friends of the Earth |
| Italy | Amici della Terra |
| Latvia | Latvian - Vides Aizsardzibas Klubs |
| Lithuania | Lietuvos Zaliuju Judéjimas |
| Luxembourg | Mouvement Ecologique |
| Macedonia | Dvizhenje na Ekologistite na Makedonija |
| Malta | Moviment ghall-Ambjent |
| The Netherlands | Vereniging Milieudefensie |
| Norway | Norges Naturvernforbund |
| Poland | Polski Klub Ekologiczny |
| Scotland | Friends of the Earth Scotland |
| Slovakia | Priatelia Zeme - Slovensko |
| Spain | Amigos de la Tierra |
| Sweden | Miljöförbundet Jordens Vänner |
| Switzerland | Pro Natura |
| Ukraine | Zelenyi Svit |

**Friends of the Earth Europe** campaigns for sustainable and just societies and for the protection of the environment, unites 30 national organisations with thousands of local groups and is part of the world's largest grassroots environmental network, Friends of the Earth International.

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