

Quick guide

Biofuels for transport

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1. What is biofuel?

Biofuels are **renewable fuels** derived from biomass (material from living sources e.g. plants) and biowaste (biodegradable waste such as food, agricultural and garden waste).

First generation biofuels refers to fuels produced using existing technology from food crops. For example, bioethanol is produced from the starch and sugar components of plants through fermentation. Biodiesel is produced from plant oils and animal fats through a process called trans-esterification.¹ The EU is responsible for 50 per cent of global biodiesel production and the USA and Brazil are responsible for 80 per cent of global bioethanol production.² Biodiesel and bioethanol are not produced commercially in Wales.³

Second generation biofuels are produced using the whole of the plant and can be produced using non-food sources such as wood and biowaste. They will often have lower emissions than first generation biofuels.⁴ Second generation biofuels are not currently produced on a commercial scale.⁵

Biofuel for transport

Up to 5 per cent of diesel or petrol can be replaced with biodiesel or bioethanol respectively. Some diesel engines can run on 100 per cent biodiesel, but petrol engines require modification to run on higher percentages of bioethanol.⁶

Transport fuel is a non-devolved matter in the UK.

¹ Biofuel.org.uk, [*First generation biofuels*](#), Webpage [Accessed 1 April 2011]

² European Commission Joint Research Centre, [*Impacts of the EU Biofuel Target on Agricultural Markets and Land Use*](#), 2010 [Accessed 7 April 2011]

³ Department of Energy and Climate Change, [*Liquid biofuel producers and suppliers*](#), 2011 [Accessed 8 April 2011]

⁴ Parliamentary Office of Science and Technology, [*Transport Biofuels: Postnote 293*](#), August 2007 [Accessed 4 April 2011]

⁵ Birdlife International, [*Biofuels: indirect land use change and climate impact*](#), June 2010 [Accessed 5 April 2011]

⁶ House of Commons Library, [*Biofuels Standard Note SN/SC/3691*](#), 21 July 2010 [Accessed 6 April 2011]

2. What are the arguments for and against biofuel?

Energy security

Global energy demand and energy prices are predicted to increase and become more volatile.⁷ The UK Government report that biofuels could **increase the diversity of energy supply sources**, contributing to energy security.⁸ According to Defra, biofuel production could also reduce the UK's dependence on imported energy by **providing a domestic supply**.⁹

Food security

The **diversion of land from food to fuel production** has been suggested as **one of the causes for the rising food prices during the 2008 food crisis**. Although there is broad agreement that biofuel production increases food prices, opinions on the magnitude of its effect on food security vary.^{10,11,12} European Commission analysis found that food price increases attributed to biofuels were further **increased by policies supporting biofuel production** (e.g. EU targets).¹³ On the other hand it is argued that, if policy allows, biofuel production could **provide a grain reserve** which could be used for food if needed. However, according to the UK Government, current policy does not appear to be flexible enough to allow this.¹⁴

Reducing greenhouse gas emissions

Biofuels are considered carbon neutral as plants absorb carbon dioxide while they grow, which is then released when they are burnt. Therefore **replacing fossil fuel with biofuel could decrease carbon emissions**. However carbon dioxide is also emitted during its production and transportation.¹⁵ The EU Renewable Energy Directive reports that replacing fossil fuel with biofuel could save between **32 per cent** (first generation) and **95 per cent** (second generation) of greenhouse gas (GHG) emissions.¹⁶

However, a number of reports express concerns regarding the way in which emissions

⁷ Foresight, *The Future of Food and Farming: Final project report*, 2011 [Accessed 23 February 2011]

⁸ House of Commons Library, *Biofuels Standard Note SN/SC/3691*, 21 July 2010 [Accessed 6 April 2011]

⁹ Defra, *The facts on biodiesel and bioethanol*, July 2003 [Accessed 5 April 2011]

¹⁰ HM Government, *The 2007/08 Agricultural Price Spikes: Causes and Policy Implications*, n.d. (archived content) [Accessed 7 April 2011]

¹¹ Renewable Fuels Agency, *The Gallagher Review of the indirect effects of biofuels production*, July 2008 [Accessed 6 April 2011]

¹² Chakraborty, A., *Secret report: biofuel caused food crisis*, *The Guardian Online*, 3 July 2008 [Accessed 7 April 2011]

¹³ European Commission Joint Research Centre, *Impacts of the EU Biofuel Target on Agricultural Markets and Land Use*, 2010 [Accessed 7 April 2011]

¹⁴ HM Government, *The 2007/08 Agricultural Price Spikes: Causes and Policy Implications*, n.d. (archived content) [Accessed 7 April 2011]

¹⁵ Parliamentary Office of Science and Technology, *Transport Biofuels: Postnote 293*, August 2007 [Accessed 4 April 2011]

¹⁶ OJ L **140**, 5.6.2009

estimates are calculated. For example, estimates such as those above **do not account for indirect effects** of biofuel production such as land use change¹⁷ and some methods may **underestimate the amount of nitrous oxide released**. As nitrous oxide is a more potent GHG than carbon dioxide, its release may **negate the benefits of biofuel use** based on carbon emissions.¹⁸

Finally, current estimates suggest that the cost of GHG emissions savings from biofuel for transport is higher than for other options such as producing electricity and heat from biomass.¹⁹

Land use change

Land use change, for example deforestation in South East Asia for palm oil production (biodiesel),²⁰ could result in a net increase in GHG emissions and loss of biodiversity.²¹ One study, using a number of different calculation methods to calculate potential GHG emissions, estimated that a range of first generation **biofuels could produce between 1/3 and six times the amount of GHG emissions as fossil fuels**.²² According to the RSPB, energy crop production has already resulted in a loss of biodiversity in the UK.²³ European Environment Agency (EEA) analysis suggests that, without harming the environment, there is not enough land available in the EU for biofuel production on the scale required to meet current EU targets. According to the EEA, imports would be required to make up the difference, threatening the environment elsewhere as the sustainability of imports cannot at present be guaranteed.²⁴ However, in terms of land use change, the impact of second generation biofuel technology utilising waste would be lower than for other technologies as no additional land is required.²⁵

¹⁷ Renewable Fuels Agency, *[The Gallagher Review of the indirect effects of biofuels production](#)*, July 2008 [Accessed 6 April 2011]

¹⁸ Crutzen, P. J. et al. (2008) *[N₂O release from agro-biofuel production negates global warming reduction by replacing fossil fuels](#)*, *Atmospheric Chemistry and Physics*, 8, p.389-395.

¹⁹ Environmental Audit Committee, *[Are biofuels sustainable?](#)*, 15 January 2008, HC 76-I 2007-08, p.3 [Accessed 11 April 2011]

²⁰ Greenpeace, *[Palm Oil](#)*, Webpage [Accessed 6 April 2011]

²¹ Renewable Fuels Agency, *[The Gallagher Review of the indirect effects of biofuels production](#)*, July 2008 [Accessed 6 April 2011]

²² Birdlife International, *[Biofuels: indirect land use change and climate impact](#)*, June 2010 [Accessed 5 April 2011]

²³ RSPB, *[Birds in the UK and the EU](#)*, 25 February 2008 [Accessed 6 April 2011]

²⁴ European Environment Agency Press Release, *[Suspend 10 percent biofuels target, says EEA's scientific advisory body](#)*, 11 April 2008 [Accessed 7 April 2011]

²⁵ Birdlife International, *[Biofuels: indirect land use change and climate impact](#)*, June 2010 [Accessed 5 April 2011]

Are biofuels sustainable?

In their inquiry into the sustainability of biofuels, the House of Commons Environmental Audit Committee concluded that:

Biofuels can reduce greenhouse gas emissions from road transport—but most first generation biofuels have a detrimental impact on the environment overall. In addition, most biofuels are often **not an effective use of bioenergy resources**, in terms either of cutting greenhouse gas emissions or value-for-money. The Government must ensure that its biofuels policy balances greenhouse gas emission cuts with wider environmental impacts, so that biofuels are only used where they contribute to sustainable emissions reductions. [...] In general **biofuels produced from conventional crops should no longer receive support from the Government.** Instead the Government should concentrate on the development of more efficient biofuel technologies that might have a sustainable role in the future. [...] The Government should seek to ensure that EU policy changes to reflect the concerns raised in this report. This means **implementing a moratorium on current targets** until technology improves, robust mechanisms to **prevent damaging land use change** are developed, and **international sustainability standards** are agreed. Only then might biofuels have a role to play. In the meantime, **other more effective ways of cutting emissions from road transport should be pursued.**²⁶ [my emphasis throughout]

The Gallagher Review²⁷

In 2008, a UK Government funded report - the Gallagher Review - examined the indirect effect of biofuel production and **questioned its sustainability.** At the time the *Biofuels Directive 2003 (2003/30/EC)*²⁸ and the Renewable Transport Fuel Obligation (2007)²⁹ set targets for biofuel use in transport. The review stated that there is ‘**a significant risk that current [2008] policy will lead to net greenhouse gas emissions and loss of biodiversity through habitat destruction**’. It made a number of policy recommendations to ensure future biofuel production is sustainable, such as suggesting the creation of targets for producing biofuel from waste. **Some** of the recommendations have been addressed by subsequent policy developments at a UK and European level.

3. What is the current policy on biofuel?

EU Renewable Energy and Fuel Quality Directives

The *EU Renewable Energy Directive 2009 (2009/28/EC)*³⁰ (RED) requires Member States to ensure that **10 per cent of energy used for transport is renewable by 2020.** The *EU Fuel Quality Directive 2009 (2009/30/EC)*³¹ (FQD) requires Member States to **decrease GHG**

²⁶ Environmental Audit Committee, [*Are biofuels sustainable?*](#), 15 January 2008, HC 76-I 2007-08, para.1-3 [Accessed 11 April 2011]

²⁷ Renewable Fuels Agency, [*The Gallagher Review of the indirect effects of biofuels production*](#), July 2008 [Accessed 6 April 2011]

²⁸ OJ L [123](#), 17.5.2003

²⁹ The [*Renewable Transport Fuel Obligations Order 2007*](#), SI 2007/3072

³⁰ OJ L [140](#), 5.6.2009

³¹ OJ L [140](#), 5.6.2009

emissions from transport energy by 6 per cent between 2010 and 2020, partly through an increased use of sustainably produced biofuels.

The Gallagher review recommended that:

At EU-level, targets within the Renewable Energy Directive and Fuel Quality Directive should recognise the **need to avoid both direct and indirect landuse change** that leads to significant loss of carbon stocks [...] Urgent further work is needed to enable incentives and targets for biofuels to be **based upon lifecycle greenhouse gas emissions that include... Indirect land-use change** [...] The European Commission should specifically consider the findings with respect to avoided land use from co-products as part of the on-going design of the Fuel Quality Directive and the mandatory threshold for GHG savings proposed in the Renewable Energy Directive.³² [my emphasis throughout]

Both Directives define minimum **sustainability criteria** which biofuels must meet e.g. the raw material must not be obtained from land that is biologically diverse. Biofuels **must also save at least 35 per cent of GHG emissions** per unit energy compared with fossil fuels. From 2017 this target will rise to 50 per cent and again to 60 per cent in 2018 for new production plants. Member States must also ensure that if the raw material for biofuel is sourced from third countries, those countries ratify and implement various Conventions such as those concerning minimum working age and the abolition of forced labour. However, **land use change is not included** in the emissions calculations.

In accordance with the RED, the UK published a **National Renewable Energy Action Plan** in 2010 setting out measures to ensure the UK meets the 2020 target. Second generation biofuels are not expected to contribute to meeting the target.³³

Renewable Transport Fuel Obligations Order

The UK *Renewable Transport Fuel Obligations Order 2007*³⁴ (RTFO) required transport fuel suppliers to provide **5.26 per cent (by volume)** of their supply as renewable fuel (biodiesel, bioethanol or natural gas) by 2010. The *Renewable Transport Fuel Obligations (Amendment) Order 2009*³⁵ amended this target following publication of the Gallagher Review which recommended:

The introduction of biofuels should be significantly slowed until adequate controls to address displacement effects are implemented and are demonstrated to be effective. A slowdown will also reduce the impact of biofuels on food commodity prices, notably oil seeds, which have a detrimental effect upon the poorest people [...] The current RTFO target for 2008/09 should be retained but the RTFO Order amended to require a lower rate of increase of 0.5% pa rising to a maximum of 5% by volume by 2013.³⁶

³² Renewable Fuels Agency, *The Gallagher Review of the indirect effects of biofuels production*, July 2008 [Accessed 6 April 2011]

³³ Department of Energy and Climate Change, *National Renewable Energy Action Plan for the United Kingdom*, 2010 [Accessed 6 April 2011]

³⁴ The *Renewable Transport Fuel Obligations Order 2007*, SI 2007/3072

³⁵ The *Renewable Transport Fuel Obligations (Amendment) Order 2009*, SI 2009/843

³⁶ Renewable Fuels Agency, *The Gallagher Review of the indirect effects of biofuels production*, July 2008 [Accessed 6 April 2011]

The amended Order now requires suppliers to provide **4.17 per cent renewable transport fuel in 2011, 4.71 per cent in 2012 and 5.26 per cent from 2013 onwards**. Suppliers must pay 30p per litre for any shortfall in renewable fuel supplied.

Suppliers who provide carbon and sustainability reports may qualify for Renewable Transport Fuel certificates if they meet '**qualifying environmental standards**' or 'sustainability meta-standards' defined in the RTFO technical guidance, such as the Forestry Stewardship Council certification. These **standards do not currently comply with the RED and FQD sustainability criteria** and are subject to on-going amendments to increase compliance. The Department for Transport is consulting on **changes to the RTFO Order to implement the RED and FQD sustainability criteria by the end of 2011**.³⁷

Subsidies and levies

In 2010, following the Common Agriculture Policy Health Check, **funding for the production of energy crops was abolished**.³⁸ From 1 April 2010 excise duty rates for bioethanol and biodiesel were increased to the same level as conventional petrol and diesel. However the excise duty rate on biodiesel produced from waste cooking oil will be 20 pence per litre less than for other transport biofuels until 31 March 2012.³⁹

4. How much biofuel is used in the UK?⁴⁰

During 2009/2010 1,568 million litres of biofuel were consumed in the UK, equivalent to **3.33 per cent** of UK transport fuel by volume, **exceeding the 2009/2010 RTFO target of 3.25 per cent**. Seventy per cent of this was biodiesel, and 10 per cent was sourced from the UK. The most common raw materials used and countries of origin were soy from Argentina and America, sugar cane from Brazil, oilseed rape from Germany, tallow, and palm oil from Malaysia.⁴¹ **Tallow, molasses and corn oil almost always met the RTFO 'qualifying environmental standards'** for 2009/2010 whereas others such as **palm oil, soy and oilseed rape performed poorly**.⁴² Overall, just **31 per cent** of the biofuel met the qualifying environmental standard. **Land use change was not reliably reported** by suppliers and therefore GHG emissions could not be accurately calculated.⁴³

Data on progress toward the RED target are not available as current datasets include biofuels that fail to meet the Directive's sustainability criteria.⁴⁴

³⁷ Renewable Fuels Agency, *Carbon and Sustainability reporting within the Renewable Transport Fuel Obligation: Technical Guidance Part One*, March 2011 [Accessed 11 April 2011]

³⁸ Welsh Assembly Government, Elin Jones (Minister for Rural Affairs), *Political Agreement on the CAP Health Check*, Cabinet Oral Statement, 25 November 2008 [Accessed 5 April 2011]

³⁹ HM Revenue & Customs, *Revenue and Customs Brief 23/10*, 10 May 2010, [Accessed, 6 April 2011]

⁴⁰ Data is not available for Wales

⁴¹ Department for Transport, *Data on biofuel supply*, Webpage [Accessed 8 April 2011]

⁴² Renewable Fuels Agency, *Verified Data for Year Two of the RTFO*, n.d. [Accessed 8 April 2011]

⁴³ Renewable Fuels Agency, *Year Two of the RTFO*, January 2011 [Accessed 6 April 2011]

⁴⁴ Eurostat, *Share of renewable energy in fuel consumption of transport*, n.d. [Accessed 11 April 2011]

Further information

For further information on aspects of Biofuels for transport, please contact **Nia Seaton** (Nia.Seaton@wales.gov.uk), Research Service.

For further information on the topics below, double click on the links.

- Department for Transport [Biofuels](#) website
- The [Gallagher Review](#) of the indirect effect of biofuel production
- The Environmental Audit Committee's report [Are Biofuels Sustainable?](#)

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MRS 11/0870 Hannah Rose

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