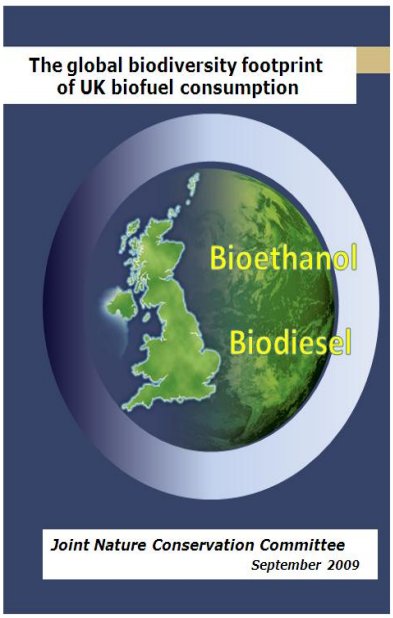

The global biodiversity footprint of UK biofuel consumption

Report summary

September 2009

Joint Nature Conservation Committee

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- The UK's Renewable Transport Fuels Obligation (RTFO) came into effect on 15th April 2008. During the first year of monitoring approximately 1 million tonnes of bioethanol and biodiesel were supplied to the UK market, 84% of this was biodiesel. Over 90% of the biofuels used were imported.

- Total global land requirement to supply this annual biofuel demand is estimated at 1.4 million hectares. This land use requirement, and associated environmental impacts, occurs primarily overseas;

- Primarily as a consequence of the high UK usage of soya based biodiesel, over 60% of the land use pressure arising from UK biofuel consumption occurs in the USA, Argentina and Brazil.

- The current UK biofuels land use footprint falls primarily within temperate grassland biomes in both the northern and southern hemisphere;

- Measured in land use requirement, pressure on tropical forests arising through current UK biofuels consumption is less than one tenth that being exerted on temperate grassland;

- UK consumption of transport biofuels could increase six-fold by 2020 rising to 6 million tonnes a year. This would create a potential global land use requirement of between 4 and 8 million hectares;

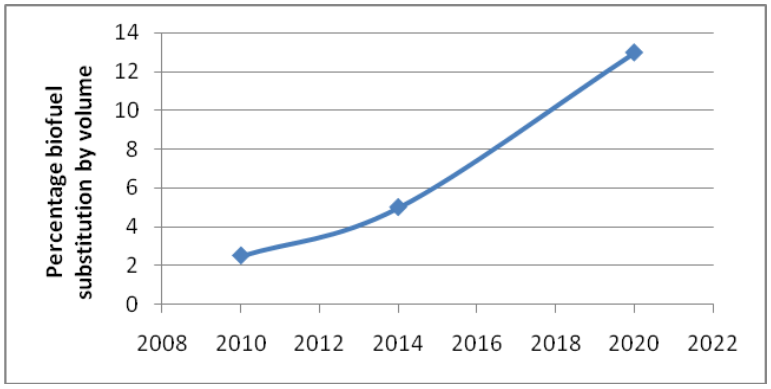
- Current EU policy to improve the greenhouse gas performance of biofuels will favour the future use of tropical biofuels feedstocks (sugar cane and palm oil) increasing impacts on tropical forests and savannah.

Biofuels in the United Kingdom

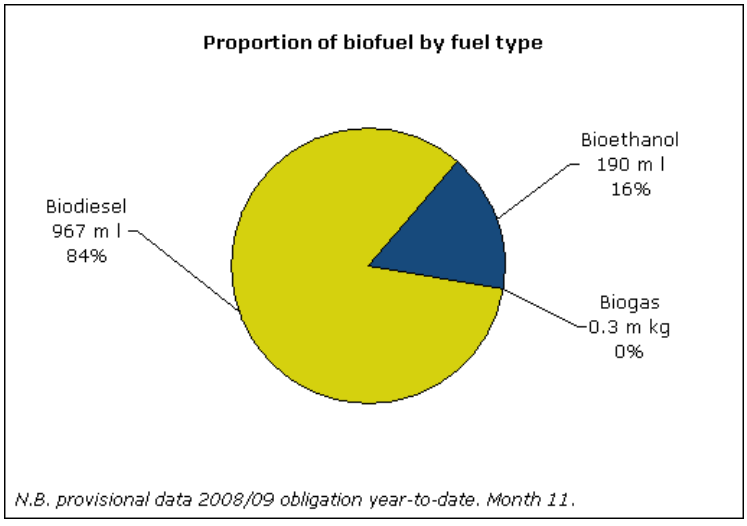
UK biofuel targets and current consumption

The UK's Renewable Transport Fuels Obligation (RTFO) requires major suppliers of fossil fuels in the UK to ensure that a specified percentage of the road fuels they supply are made up of renewable fuels. The Obligation came into effect on 15th April 2008 and the target for the first year of the obligation was 2.5% *by volume.* The Renewable Fuels Agency (RFA)[1] monitors feedstock used for biofuels consumed in the UK. The average UK biofuels market share for the first year of the obligation was 2.6% *(volume)* with approximately 1 million tonnes supplied to the UK market, 84% of which was biodiesel and the rest almost exclusively bioethanol.

To comply with the EU Renewable Energy Directive, the UK will need to achieve a 10% substitution level (*by energy*) by 2020 which equates with approximately 13% substitution by volume[2].



Projected UK biofuels substitution rate (by volume)



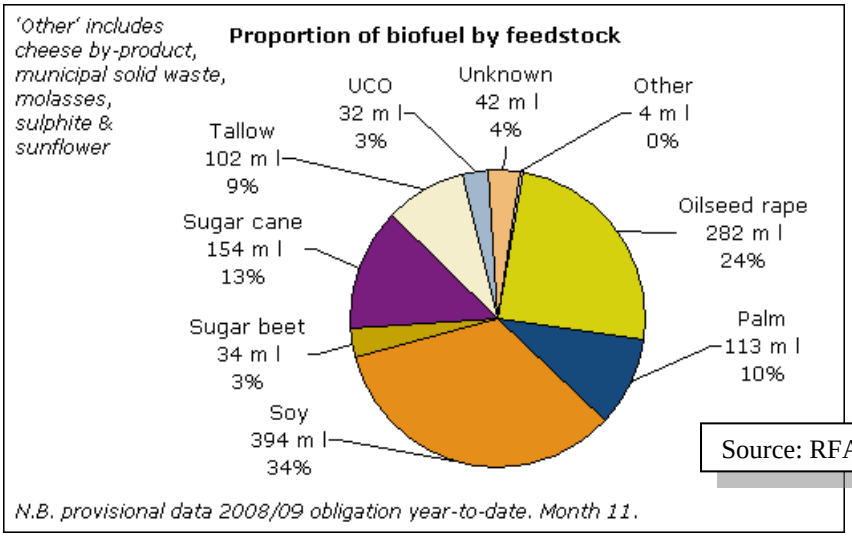
UK biofuel types 2008/09. Source: UK Renewable Fuels Agency *(volumes in litres)*

[1] http://www.dft.gov.uk/rfa/

[2] Energy content of ethanol is 61% of petroleum. Energy content of biodiesel is 88% of mineral diesel.

Current biofuel feedstock for biofuels used in the UK

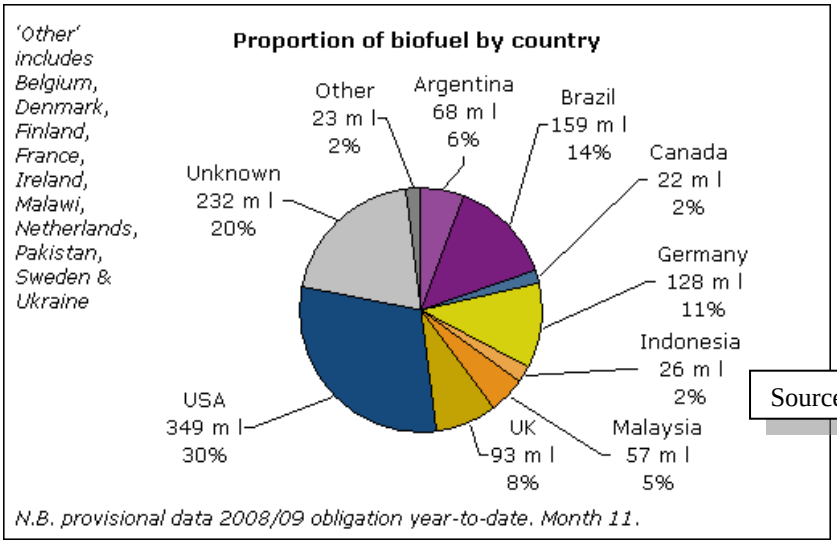
- As a consequence of the dominance of biodiesel approximately 70% of UK biofuels are sourced from three plant oils – soya, oilseed rape and palm oil;
- 80% of UK bioethanol comes from Brazilian sugarcane with the balance from UK sugar beet;
- Biodiesel has more diverse feedstocks than bioethanol including, in addition to the three plant oils mentioned above, recycled tallow and cooking oil.



Source: RFA

Current geographical sources of UK biofuels

- During the first year of RFA monitoring over 90% of biofuels used in the UK were imported;
- Approximately 30% of all UK biofuels are sourced from the USA as soya based biodiesel;
- Less than 10% of UK biofuel was domestically sourced;
- Bioethanol comes almost entirely from two sources - Brazil (80%) and domestic (19%).



Source: RFA

Biodiversity impacts of biofuels

Biofuel production can impact on biodiversity at the global level through reducing or increasing greenhouse gas emissions driving climate change. Local impacts can arise from land use change causing habitat destruction, impairment of soil function, water use, pollution and the use of GMOs and non-native species.

Climate change

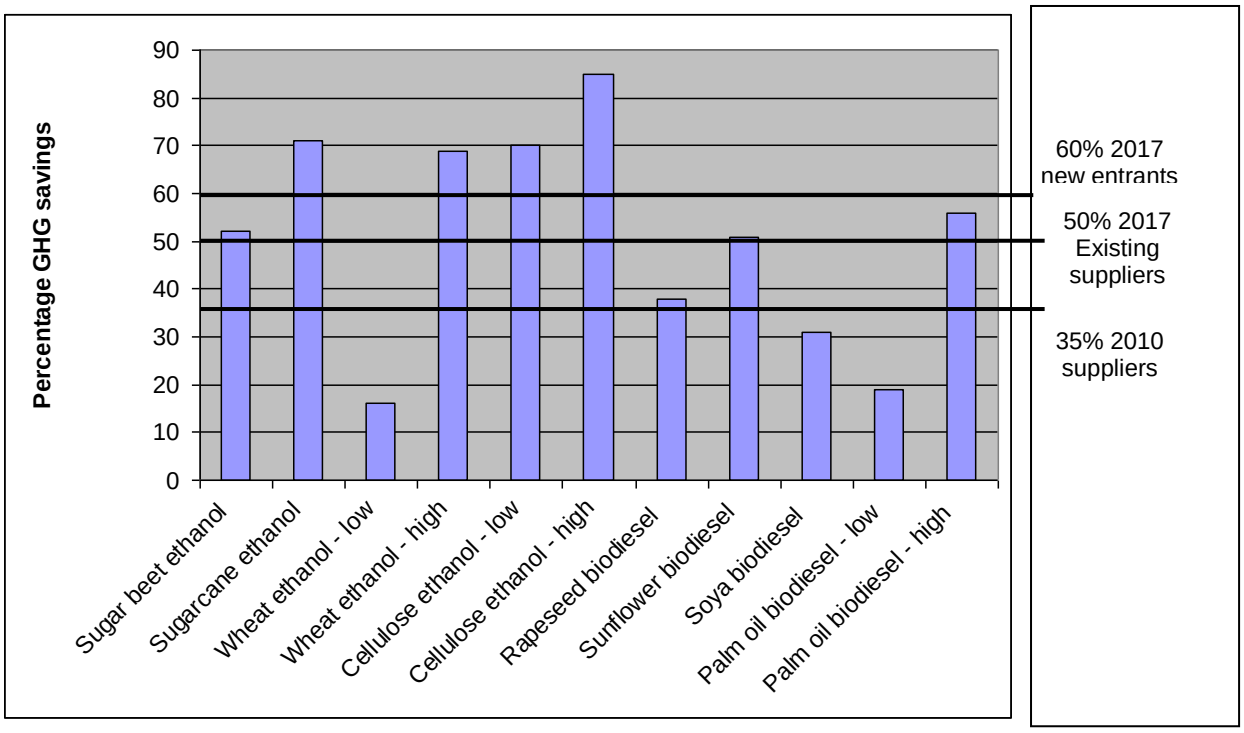
Climate change is a major threat to biodiversity and the use of biofuels has been proposed as a means to reduce the greenhouse gas emissions (GHG) associated with burning mineral diesel and petrol (gasoline). The average carbon intensity of these fossil transport fuels is 86kgs of CO_2 equivalent for each gigajoule of energy released. It is with this value that GHG emissions associated with biofuels use must be compared. The land use changes accompanying bioenergy crop expansion, crop cultivation techniques and manufacturing processes for biofuels also generate greenhouse gases. Understanding the GHG emissions associated with individual biofuel types requires a full life cycle analysis of the production and use of these fuels. Quantifying the GHG emissions associated with land use change remains a major challenge but soils under sub-tropical savannah and tropical forests are significant carbon stores which will be lost to the atmosphere when cultivated for food or fuel.

The EU Renewable Energy Directive (RED) sets minimum GHG emission reductions from biofuels relative to fossil fuels. These reductions are set according to a sliding scale, 35% in 2010 rising to 50% by 2017 for existing producers. New producers in 2017 will have to achieve 60% reduction. As the GHG ceiling is raised crops such as soya and rapeseed may become ineligible for use in the EU with sugar cane and palm oil increasingly favoured alongside second generation biofuels.

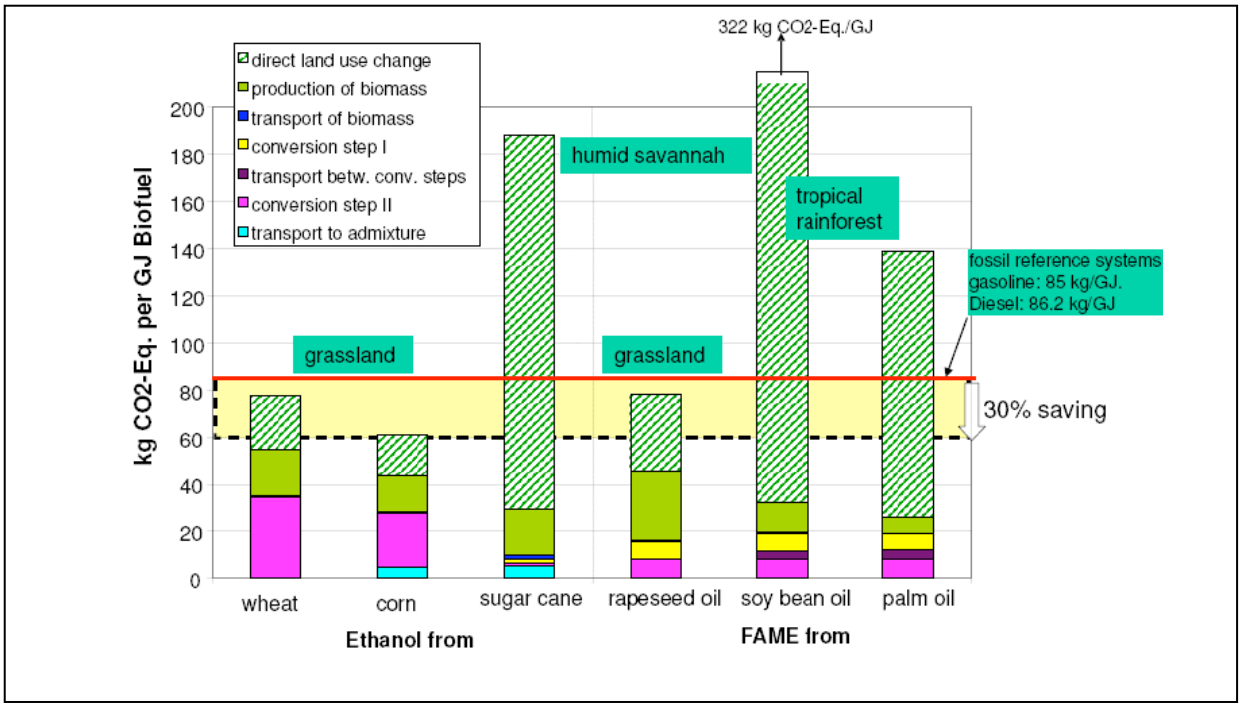
Land-use change

Land use change associated with increased use of biomass for fuels may impact on biodiversity through destruction of natural habitats, in particular grasslands and forests. Land use change may be 'direct' or 'indirect'. Direct change resulting from biofuels production is the change in land use which occurs when a natural function or pre-existing agricultural system is replaced by bioenergy crops. Such change is easy to recognise and can result in natural grassland and forest being replaced by bioenergy crops. Indirect land use change is a result of new bioenergy crop production on existing agricultural land displacing food crop production or grazing activity to other areas previously under natural grass, forest or wetland cover. Recognising and quantifying this effect is inherently difficult.

Direct biodiversity loss from both types of land use change can be significant. The growth in the use of biofuels in recent years has exerted differential pressure on existing cropland, forests and grassland. Use of bioenergy crops such as rapeseed and cereals have, over the last decade, impacted primarily on existing agricultural land displacing food use. Other crops, such as sugar cane, soya and palm oil have impacted primarily on grasslands and forests through expansion into new areas.



GHG savings from biofuels crops and EU GHG savings requirement



Significance of land use change in calculating GHG savings from biofuels
Source: European Federation for Transport and Environment
www.transportenvironment.org/Publications/prep_hand_out/lid:527

Quantifying ecosystem impacts

It is possible to quantify the pressures exerted by UK biofuels consumption on global ecosystems by recognising source countries and crops, estimating the land use requirement to produce the fuels consumed in the UK and identifying the ecosystems put under pressure. The way in which these pressures on biodiversity might be expressed – through habitat loss, soil function impacts, water use, impacts of invasive alien species/GMOs or pollution – will be specific to each region. The JNCC analysis therefore defines *where* in the world and in which ecosystems impacts are likely to occur but not *how* they will impact on biodiversity.

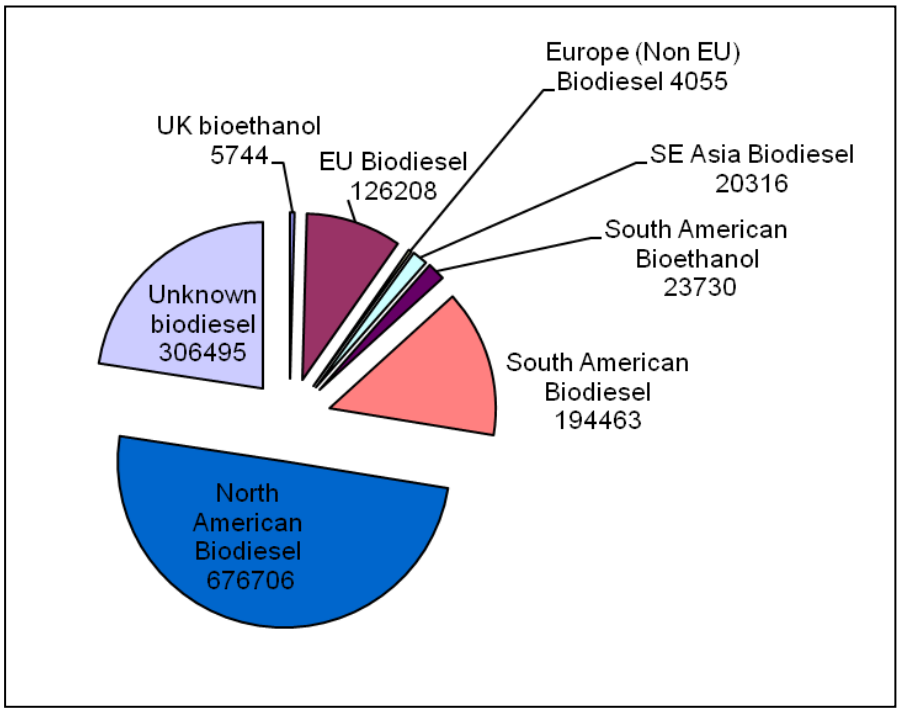
The JNCC analysis of the **current** pattern of UK biofuel use (based on the first year of RFA reporting) can be summarised as follows:

- Approximately 80% of the 1 million tonnes of biofuels used in the UK were produced from agricultural crops (rather than recycled biomaterials) and therefore have a land use requirement;
- Total global land requirement to supply these biofuels was approximately 1.4 million hectares;
- Over 90% of the UK's biofuels are imported and this land use requirement, and associated environmental impact, occurs primarily overseas;
- The high use of soya based biodiesel in the UK results in over 60% of the land use pressure arising from UK biofuels consumption occurring in the 'Americas', specifically the USA[3], Argentina and Brazil. This 'American' soya/biodiesel footprint falls primarily within temperate grassland biomes;
- The UK biofuels footprint on tropical forest systems is modest because of the limited use of palm oil for biodiesel and the high yield for this oil crop. Impacts on tropical/subtropical grasslands through ethanol production are also limited by low use of ethanol in the UK and high yields of Brazilian sugar cane. Measured in land use requirement, pressure on tropical forest is less than one tenth that being exerted on temperate grassland.

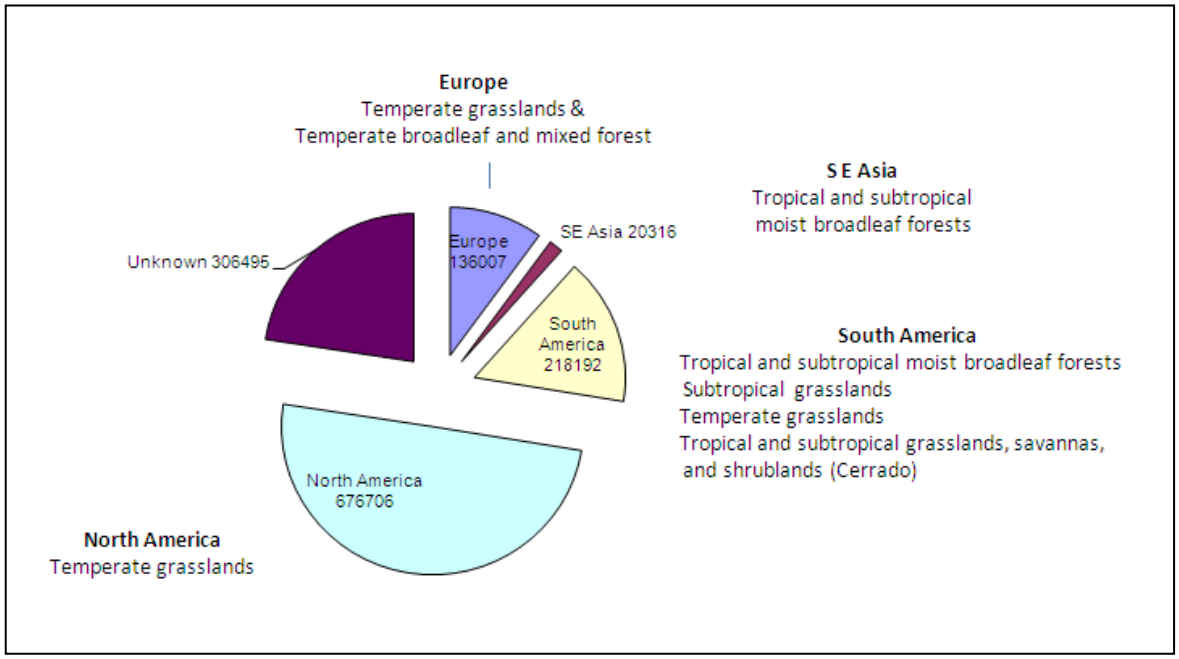
JNCC analysis of likely **future impacts** of UK biofuel use suggests:

- UK consumption of transport biofuels could increase six-fold between 2010 and 2020, rising to 6 million tonnes a year if the EU targets are met. It is highly probable that most of the UK demand for biofuels in 2020 will be met from first generation fuels sourced from food crops;
- By 2020 the global land use footprint arising from UK biofuels use could increase from the current 1.4 million hectares to between 4 and 8 million hectares depending upon the fuels and feedstocks used;
- By 2020 ecosystem impacts will be spread over a wider global area than at present with eastern European and western Russia likely to be increasingly affected by UK use of biofuels. Temperate grasslands in the northern and southern hemispheres are likely to come under greater pressure;
- EU policy in GHG reduction from biofuels (requiring a progressive increase in greenhouse gas savings) will increasingly favour second generation biofuels (derived from recycled materials and cellulose) and the preferential use of palm oil and sugar cane over soya and rapeseed. This policy will increase land use and other impacts on tropical savannah and rainforest.

[3] Until recently soya based biodiesel imported from the USA included biodiesel originating in Argentina and re-exported to UK. Defining the origin of all UK soya based diesel was not possible. The tax advantages driving this flow have now been countered by EU action and direct exports of biodiesel from Argentina to the EU have already increased.



Calculated global land requirement to supply UK biofuels
Values in hectares



Global distribution of land supporting UK biofuels consumption
and biomes potentially impacted
Values in hectares.

JOINT NATURE CONSERVATION COMMITTEE

The Joint Nature Conservation Committee (JNCC) is the statutory adviser to Government on UK and international nature conservation. Its work contributes to maintaining and enriching biological diversity, conserving geological features and sustaining natural systems.

JNCC delivers the UK and international responsibilities of the Council for Nature Conservation and the Countryside (CNCC), the Countryside Council for Wales (CCW), Natural England, and Scottish Natural Heritage (SNH). The functions that arise from these responsibilities are principally to:

- advise Government on the development and implementation of policies for, or affecting, nature conservation in the UK and internationally;
- provide advice and disseminate knowledge on nature conservation issues affecting the UK and internationally;
- establish common standards throughout the UK for nature conservation, including monitoring, research, and the analysis of results;
- commission or support research which it deems relevant to these functions.

The Committee comprises 14 members: a Chairman and five independent members appointed by the Secretary of State; the Chairman of CNCC; the Chairmen or deputy Chairmen of CCW, Natural England and SNH; and one other member from each of these bodies.

JNCC, originally established under the Environmental Protection Act 1990, was reconstituted by the Natural Environment and Rural Communities Act 2006. Support is provided to the JNCC by a company limited by guarantee (JNCC Support Co) that the Committee established in 2005.

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