



**Biofuels:**  
**ethical issues**  
*A guide to the report*

NUFFIELD  
COUNCIL ON  
BIOETHICS

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# Introduction

This guide summarises the main themes and recommendations that are discussed in the Nuffield Council on Bioethics' report *Biofuels: ethical issues*, published April 2011.

Notes in square brackets refer to the chapters and paragraphs in the report.

Fuel for transport makes up almost a third of the current world energy consumption. Biofuels – renewable liquid or gaseous transport fuels derived from plant or animal material – have emerged as one of a number of possible alternatives to fossil fuels that might help meet our energy needs in an environmentally sustainable way.

However, biofuels production, which mainly uses food crops, has been controversial because in some cases it has led to deforestation, and to disputes over rising food prices and land use. New types of biofuels, such as those using non-food crops and algae, are being developed with the aim of meeting our energy demands whilst avoiding the problems of the past.

At the moment, biofuels make up only a small proportion of world energy use, but this is expected to increase, due in part to targets and policies that are encouraging uptake of biofuels for transport. It has been estimated that biofuels will provide almost 9 per cent of transport fuel in Europe by 2020.



# Why do we need biofuels?

The recent development of biofuels has been driven by three key global challenges:

## 1) Energy security

Energy security is the constant availability and supply of affordable energy for consumers and industry. Risks to energy security include, for example, disruptions to the supply of imported fossil fuels, limited availability of fuel, and energy price spikes.

The possibility of deriving biofuels from locally grown sources and using them as alternatives to petrol products is attractive for many countries, including the UK, that currently depend largely on fossil fuels.

## 2) Economic development

Investment in biofuels could lead to a significant boost in economic development, including the creation of new jobs and new sources of income for farmers. This would be of particular benefit to developing countries in which a large proportion of the population are employed in agriculture.

Global economic growth has contributed to a dramatic rise in world energy demand. In developing countries, energy consumption is predicted to increase by 84 per cent by 2035, and new sources of energy, such as biofuels, may have a role to play in meeting this demand.

## 3) Mitigation of climate change

In the UK, transport accounts for around a fifth of total greenhouse gas emissions. It is hoped that, with appropriate production methods, biofuels will produce significantly fewer greenhouse gas emissions than are currently produced by fossil fuels.

The apparent potential of biofuels to address all three of the above challenges makes them an attractive option to policy makers [Chapter 1].



# Current biofuels

Despite the initial promise of providing a renewable and sustainable energy source, current methods of biofuels production raise a number of problems.

There are concerns about the effects on the environment, on food security and prices, and on the human rights of workers and communities in countries where biofuels crops are grown.

Two main types of biofuels are currently in commercial production:

- **Bioethanol** (to blend with petrol) - made from sugar/starch from crops such as sugar cane, corn or wheat.
- **Biodiesel** (to blend with diesel) - made from oils of crops such as palm, soybean, oilseed rape, or sunflower.



## Case studies

The following three case studies illustrate some of the problems associated with the development of biofuels in different countries:

### Bioethanol from corn in the USA

The USA is the world's largest bioethanol producer. The rapid increase in production of bioethanol from corn – driven mainly by economic and energy security concerns - has been partially blamed for increasing the price of corn and other grains in developing countries. There are also disputes over whether corn-based ethanol produces fewer overall greenhouse gas emissions than fossil fuels.

### Bioethanol from sugar cane in Brazil

Brazil has the highest uptake rate of bioethanol in the world, and it is the largest exporter of ethanol fuel. Although Brazilian ethanol production from sugar cane is hailed by some as the most successful example of a large-scale biofuels programme, it has been criticised for contributing to deforestation in rich habitat areas, leading to a loss of biodiversity. Many are also concerned about abuses to worker's rights including unhealthy working conditions and informal child labour.

### Biodiesel from palm oil in Malaysia

Malaysia is the second largest international producer of palm oil (after Indonesia). The conversion of forests to palm oil plantations has raised concerns over detrimental impacts on biodiversity in the region. For example, conservationists have warned that the endangered orang-utan (native to Malaysia and Indonesia) is being pushed to extinction. There are also concerns that 'land-grabs' by palm oil producers looking to obtain land for growing biofuels crops may be forcing out indigenous communities [Chapter 2].

## New approaches

The development of new biofuels technology is a rapidly growing field of research. The aim is to produce economically viable biofuels that generate fewer greenhouse gases and use fewer natural resources than current production methods.

Two of the main approaches in development are biofuels made from non-edible parts of crops (known as lignocellulosic biofuels) and biofuels made from algae.



### Lignocellulosic biofuels

Researchers are developing technologies that enable all of the plant biomass to be used in production, including the woody lignin and cellulose, instead of just the edible sugary, starchy or oily parts. Willow, miscanthus and switchgrass are amongst the most promising lignocellulosic crops. These crops can be grown specifically to make biofuels, and they offer a number of advantages — as well as having potentially high energy outputs, they do not strip nutrients from the soil and they can be bred to improve yield, water use and pest resistance.

Using the waste parts of food crops to produce biofuels is another possibility.



### Algae

The production of algal biofuels is mostly at the experimental stage and very expensive due to costly harvesting and processing. However, there are several potential advantages of algae over lignocellulosic crops. They could produce biodiesel more directly, avoiding the need for complicated processing technologies, and they could be cultivated in places where crops cannot be grown, so they will not compete for agricultural land [Chapter 3].

# Ethics

## Moral values relevant to current and new biofuels include: human rights, solidarity, sustainability, stewardship and justice.

Drawing on these values, the Council sets out six ethical principles that policy makers should use to evaluate biofuel technologies and guide policy development.

1. Biofuels development should not be at the expense of people's essential rights (including access to sufficient food and water, health rights, work rights and land entitlements).
2. Biofuels should be environmentally sustainable.
3. Biofuels should contribute to a net reduction of total greenhouse gas emissions and not exacerbate global climate change.
4. Biofuels should develop in accordance with trade principles that are fair and recognise the rights of people to just reward (including labour rights and intellectual property rights).
5. Costs and benefits of biofuels should be distributed in an equitable way.
6. If the first five principles are respected and if biofuels can play a crucial role in mitigating dangerous climate change then, depending on certain key considerations, there is a duty to develop such biofuels [Chapter 4].

We test European and UK biofuels policies against these ethical principles and recommend how they could be improved. Policies for, and regulation of, biofuels have led to or exacerbated ethical problems in the past, so it is important to have a set of ethical principles against which the policies can be evaluated [Chapter 5].

## Biofuels policies

A number of European and UK policies specifically promote the use of biofuels. For example:

- The European Commission Renewable Energy Directive (2009) states that renewable energy sources such as biofuels should account for a minimum of 10 per cent of transport petrol and diesel by 2020.
- The UK Renewable Transport Fuel Obligation (Amendment) Order (2009) requires that 5 per cent of total transport fuel should originate from renewable sources by 2013.

## Principle 1: Human rights

**Biofuels development should not be at the expense of people's essential rights (including access to sufficient food and water, health rights, work rights and land entitlements).**

Target-based policies for biofuels have in the past been criticised for contributing to human rights violations. They have encouraged producers to scale up production as quickly and easily as possible in order to meet the targets, which has sometimes meant developing the biofuels in countries with less strict regulations.

In recent years there has been some improvement in the human rights protections offered by European policy. For example the Renewable Energy Directive has incorporated a commitment to monitoring human rights, and the UK has developed social sustainability standards, but these are not widely enforced outside of Europe.

A promising global initiative is the Roundtable on Sustainable Biofuels – a voluntary organisation representing farmers, industry, campaigners and governments. The Roundtable sets out standards on human rights and environmental sustainability across the life cycle of the biofuel.

### We conclude

Biofuels policy targets should set out to avoid incentivising human rights abuses. The European Commission should set up monitoring systems so that sanctions can quickly be put in place if human rights abuses are detected.

A compulsory certification scheme should be set up to ensure that all biofuels produced in or imported into the EU meet human rights standards, similar to the voluntary scheme developed by the Roundtable on Sustainable Biofuels [Chapter 5; paras 5.11 - 5.23].



## Principle 2: Environmental sustainability

### Biofuels should be environmentally sustainable.

The rapid expansion of current biofuels production is unlikely to be environmentally sustainable for a number of reasons. Biodiversity may be lost when forests, grassland or peatland are cleared to grow biofuels crops. Even if existing agricultural land is used, some argue that food production will simply be moved elsewhere, causing the release of greenhouse gas emissions and damage to the environment and using land in other parts of the world (this is known as 'indirect land use change').

In addition, current biofuels crops yield relatively low amounts of energy, meaning more land is needed to make the required amount of fuel, and biofuels are often imported from countries with less stringent environmental sustainability regulations.

Only 31 per cent of biofuels used in the UK met an environmental standard in 2009/2010. Current environmental policies related to biofuels production are generally weak, and they vary from country to country. The large number of standards and certification systems that are currently being developed is likely to cause confusion.

### We conclude

An international environmental sustainability standard for biofuels production should be developed, for example by the United Nations Environment Programme. This standard should also aim to prevent unsustainable practices in other forms of agriculture [Chapter 5; paras 5.24 - 5.35].



## Principle 3: Climate change

**Biofuels should contribute to a net reduction of total greenhouse gas emissions and not exacerbate global climate change.**

Biofuels targets may offer incentives for countries that do not have climate change mitigation policies to increase their production levels, leading to increased greenhouse gas emissions.

The Renewable Energy Directive states that greenhouse gas emissions savings are required from all biofuels supplied within the EU. However, controls need to be strengthened to ensure that all biofuels imported into Europe offer greenhouse gas emissions savings throughout their whole production lifecycle, from 'field-to-tank'.

Life cycle assessment of biofuels takes into account the greenhouse gas emissions associated with:

- changes to the land used to grow biofuels
- resources needed for growing biofuels crops e.g. soil cultivation, fertiliser, water supply and harvesting
- processing requirements e.g. the extraction of sugars and oils from the crops
- transport e.g. of the crops and of the biofuel itself to the place where it will be used [Chapter 2]

There has been controversy over the extent to which biofuels production causes indirect land use change and its associated greenhouse gas emissions. Burning forests, cutting down trees and clearing areas of rich greenery contribute to higher levels of greenhouse gases in the atmosphere, but biofuels production is just one of many activities damaging land.



### We conclude

A single international standard for assessing greenhouse gas emissions across the life cycle of biofuels should be used by the European Commission and the UK Government.

Policies on land use change should be set within a global, co-ordinated response to climate change, with strong international and local measures to prevent destruction of high carbon stocks such as rainforests, wetlands and peatlands [Chapter 5; paras 5.36 - 5.53].

## Principle 4: Just reward

Biofuels should be developed in accordance with trade principles that are fair and recognise the rights of people to just reward (including labour rights and intellectual property rights).

### Fair trade

Low wages and unfair prices for farmers and labourers have been associated with biofuels production in developing countries. On the other hand, the increasing global market for biofuels may provide additional income and new jobs in these countries.

Although the Renewable Energy Directive demands that workers in all countries that produce EU biofuel inputs are fairly paid, it is not clear whether countries outside the EU abide by these protective policies.

### We conclude

Biofuels targets set by the EU and the UK Government should promote fair trade principles. Any changes to the targets must carefully consider the possible impacts on developing countries.

EU and national trade principles developed as part of biofuels regulation should be proportionate and take into account the differences between countries and production systems, whilst also protecting vulnerable populations.

### Intellectual property

In many cases, biofuels production is only feasible after very large initial investment. Intellectual property will play a key role in recouping investment and securing future profits for investors. An appropriate licensing scheme may help balance the interests of the parties involved.

### We conclude

The UK Intellectual Property Office should develop a licence scheme for biofuels and a framework of principles and best practices based on current international guidelines.

More research should be carried out on the economic and social impacts of intellectual property in this field [Chapter 5; paras 5.54 – 5.84].

## Principle 5: Equitable distribution

**Costs and benefits of biofuels should be distributed in an equitable way.**

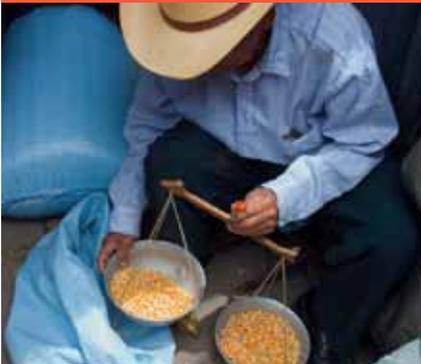
The costs and benefits of biofuels production extend well beyond financial losses or gains. There may be associated environmental, political, social, or economic issues that confer benefits or burdens only on certain sections of society. For example, investment in biofuels to reduce greenhouse gas emissions may pose threats to the human rights of workers and communities in poorer or more vulnerable countries, whilst delivering benefits for climate change in the developed world.

Policies that encourage biofuels production must therefore balance the needs of local and international markets. There are many examples of successful, small-scale, local biofuels initiatives that provide energy, income and livelihoods in areas that do not produce much fuel, such as in rural Mali. It is important that certification schemes for biofuels should not disadvantage producers in poor countries where small-scale production could provide essential fuel and energy to the local community.

### We conclude

Policies should ensure that benefits of biofuels production are shared equitably, for example, through public-private partnerships.

Biofuels policy and future sustainability initiatives should not discourage local, small-scale biofuels production, particularly in developing countries that are fuel poor [Chapter 5; paras 5.85 – 5.102].



## Principle 6: An ethical duty?

If the first five principles are respected and if biofuels can play a crucial role in mitigating dangerous climate change then, depending on certain key considerations, there is a duty to develop such biofuels.

Key considerations:

- Will the costs of the development be out of proportion to the benefits, compared to other major public spending priorities?
- Are there competing energy sources that might be even better at reducing greenhouse gas emissions, while still meeting all the required ethical principles?
- Is there an alternative and better use of the crops needed to produce biofuels?
- Are there areas of uncertainty in the development of a technology, and are there efforts to reduce them?
- Will the technologies lead to irreversible harms, once they are scaled up?
- Are the views of those directly affected by the implementation of a technology being considered?
- Can regulations be applied in a proportionate way?

These questions should be considered as part of a comprehensive analysis of all future energy options. The ethical principles, together with these questions, could be used as a checklist of 'ethical suitability' to decide which energy options are most appropriate in the future.

### We conclude

UK and EU policy makers and researchers should consider and compare broad energy portfolios rather than individual technology options in isolation, using our ethical principles (see page 5) as a basis for evaluation [Chapter 6; paras 6.27 – 6.38].

## New biofuels technologies

Biotechnologies such as advanced breeding strategies and genetic modification could help to produce higher-yielding biofuels crops that better meet our ethical principles.

Using these technologies may lead to the development of biofuels that offer greater greenhouse gas emissions savings, without significant land use change or other harms to the environment.

However, there is a big discrepancy between the targets and penalties that are in place for current biofuels, and the very few incentives for new methods of developing biofuels. Producers keen to avoid penalties for not reaching their targets may prefer established biofuels over newer ones that need further development and investment.

### We conclude

Policy makers should incentivise research and development of new biofuels technologies that need less land and other resources, avoid social and environmental harms, and reduce greenhouse gas emissions [Chapter 6; paras 6.16-6.26].



# An ethical standard

This report proposes a proportionate approach to governance for biofuels, including a comprehensive ethical standard based on our ethical principles.

Although targets provide long-term stability to producers, current targets in European and UK policies have encouraged the rapid and unsustainable expansion of biofuels production.

Bringing together the recommendations so far, we believe a wider strategy that includes an ethical standard for biofuels, alongside more responsive and flexible targets, will be helpful to guide future policy developments.

A standard and certification scheme will be most effective if accompanied by financial rewards and other incentives, but these must be used intelligently and be accompanied by ongoing monitoring of impacts.

## We conclude

European and national biofuels targets should be replaced with a more sophisticated target-based strategy that considers the wider consequences of biofuels production.

The strategy should incorporate a comprehensive ethical standard for all biofuels developed in and imported into the EU, enforced through a certification scheme. The standard should include:

- protection of human rights and the environment
- full life cycle assessment of greenhouse gas emissions
- fair trade principles
- access and benefit-sharing schemes

The EU should provide financial support and advice to countries that might struggle to certify biofuels in this way.

The ethical standard and associated certification scheme should ideally be applied to all similar technologies and products to guide decision making in a wider policy context.

Biofuels have a clear role to play in contributing to energy security, particularly in the transport sector, and in helping to mitigate climate change, although the extent to which they can contribute to a reduction in greenhouse gas emissions remains uncertain. There are strong reasons to support biofuels developments and technologies that meet our ethical principles, alongside other renewable energy sources and attempts to reduce overall demand for energy [Chapter 6; paras 6.39 - 6.59].



# Summary

Concerns over energy security, economic development and climate change are driving the development of biofuels as one of a number of possible alternatives to fossil fuels for helping to meet increasing global energy demands.

Current methods of biofuels production have been associated with harms to the environment, threats to food security and prices, and human rights violations in the countries where they are grown.

New types of biofuels, such as lignocellulosic and algal biofuels, could help to reduce greenhouse gas emissions whilst avoiding the problems raised by current production methods, but commercial-scale production is some years away.

This report presents a framework of evaluation to guide ethical policy making for biofuels, and recommends that current biofuels targets should be replaced with a more sophisticated strategy that considers the wider consequences of biofuels production. Specific recommendations for policy are made in the following areas:

- Human rights
- Environmental sustainability
- Climate change
- Just reward
- Equitable distribution of costs and benefits

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