Chapter 5

Ethical Principles and biofuels policy

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Box 5.1: Overview

This chapter explores in more detail the policies that have determined the current state of development, production and utilisation of biofuels, the policy environment within which they are embedded and their benefits and ethical implications, i.e. the 'biofuels system'.

The aim of the chapter is:

- to test existing biofuels policies (principally those relevant to the UK and the rest of the European Union) against our Ethical Principles;
- to identify deficiencies in these policies and areas where they conflict with our Ethical Principles; and
- to make recommendations for possible improvements or modifications to existing biofuels policies that help achieve compliance with our Ethical Principles.

We recognise the enormous challenges when developing policy in a multidimensional and global area of rapid development and great uncertainty. On the other hand, precisely because biofuels are driven largely by policy and regulation, it is very important to point out where existing policy violates our Ethical Principles, and how this could be avoided or ameliorated.

Where Principles are not met and decision makers find themselves 'on the wrong side' of one or several of our Principles, they will need to apply sound judgment and go as far as possible to meet the Principles in the future. The Principles, in turn, can help to identify which of the alternatives in a particular situation is the least problematic, and serve as a benchmark of what production should aspire to.

In this chapter we focus mainly on biofuels-specific policy instruments, such as the European Renewable Energy Directive. Under each of the Ethical Principles developed in the previous chapter, we investigate relevant existing policies and their contribution towards violating elements of the Principle. We also identify challenges for the future, and, towards the end of the subsections, make specific recommendations as to how existing policy could be improved.

In addition, later in the chapter we carry out the same analysis for general policy instruments, such as guidelines for research and development, trade law, land use policies and general intellectual property policies.

Our recommendations may not be the only options but they provide what we believe to be the best available way forward, and we hope that these will provide some guidance to stakeholders when developing ethical biofuels policy.

Introduction

5.1 We have so far taken a general approach and have provided an ethical framework that policy makers can apply to decisions, and in policy development. In this chapter, we work the Ethical Principles through existing policies with more technical detail. In Chapter 6, we return to more general points.

5.2 From the information given in earlier chapters, the conclusion could be drawn that a major cause of the ethical issues raised by biofuels production is not the technologies themselves, but rather the policies that led to their extremely rapid adoption. Our analysis so far has covered a complex set of interactions related to the development, production and use of biofuels and the policy environment within which they are embedded. We will refer to this as the 'biofuels system', and this chapter explores in more detail the policies that have largely determined the current state of this system; the potential of these policies to support or violate the Principles laid out in our ethical framework; and how future policy developments could improve the ethical performance of this biofuels system.

5.3 Formulating policies so that they avoid violating our Ethical Principles while enabling the generation of the expected benefits of biofuels is a difficult task in any circumstances and these problems are amplified in such a rapidly changing technological landscape. Quantitative and qualitative aspects of technological advances are difficult to predict and thus their early integration into policy formulation is problematic. For example, the extent to which it will be possible through direct incentives to promote innovation or, through other policy incentives, to

improve the efficiency of biofuels production from lignocellulosic feedstocks is still uncertain and meanwhile entirely new approaches to biofuels production may emerge. At the same time, breakthroughs in other areas of energy generation may render biofuels obsolete. There is thus a dynamic interaction between technology development and policy development.

5.4 Policy decisions have to take account of the long timescales and often massive infrastructure investments involved in bringing biofuels technologies to market, creating a danger of becoming locked into a sub-optimal technology. On the other hand, spreading resources more thinly as a means to keeping a wider range of options open risks an outcome where none of them is sufficiently well supported to achieve success. The diversity of types of risk involved could lead to paralysis, with missed opportunities to make significant progress in climate change mitigation, energy security and economic development.

5.5 Many policies affect the way biofuels are developed. Biofuel-specific policies, such as biofuels targets, duties on particular biofuels or biofuels certification (the latter still being under development), play out against an important general policy background, including trade agreements, intellectual property (IP) law, land and labour rights, and other general policies that shape the conditions under which biofuels are developed and adopted. The challenge for biofuels lies in aligning these biofuel-specific and general policies with effective technology development on the one hand, and with our Ethical Principles on the other. Moreover, specific and general policies should, wherever possible, align with each other and avoid inconsistencies such as perverse incentives or contradictions.

5.6 In this chapter, we consider how the dynamic interactions between policy, technology and their pragmatic implementation can be filtered through the Ethical Principles that we proposed in Chapter 4, supporting the development of a more ethical biofuels system. We describe relevant policies and discuss examples where there is a danger that they conflict with our Ethical Principles. More specifically, this chapter aims:

- to test existing biofuels policies (principally those relevant to the UK and the rest of the European Union, EU) against our Ethical Principles;
- to identify deficiencies in these policies and areas where they conflict with or fail to meet the requirements of our Ethical Principles; and
- to make recommendations for possible improvements or modifications to existing biofuels policy in order to help achieve compliance with our Ethical Principles.

5.7 Under the heading of each of our Ethical Principles, we therefore discuss the relevant *biofuel-specific* policy instruments and investigate whether and how these policies might currently contribute to violations of the Ethical Principles or to supporting them. Where possible, we also look at continuing efforts to improve biofuel-specific policies and suggest how they could tackle future challenges. *General* policy instruments, which form a continuous background to several specific policy instruments and indeed to several of our Ethical Principles, are considered in paragraphs 5.103–5.122. In this chapter, we restrict our analysis to Principles 1–5. Issues raised by Principle 6 are taken up in Chapter 6, as are some general policy changes we recommend as part of our governance approach.

Ethical Principles and their application through policy

5.8 A major cause of the ethical issues raised by biofuels production is not the technologies themselves but rather the policies that led to their extremely rapid adoption. In this chapter, we consider how the interaction of policy, technology and their practical implementation can be filtered through the Ethical Principles (see Box 5.2), supporting the development of a more ethical biofuels system.

Box 5.2: Our Ethical Principles

i. 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).

ii. Biofuels should be environmentally sustainable.

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

iv. 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).

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

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

These additional key considerations are: absolute cost; alternative energy sources; opportunity costs; the existing degree of uncertainty; irreversibility; degree of participation; and the notion of proportionate governance.

5.9 While we believe that the Ethical Principles developed in Chapter 4 should be adhered to in all biofuels policy, whether existing or newly developed, we are aware of the enormous challenges when developing policy in an area of rapid development and great uncertainty. There can be many difficulties in enforcing a firm ethical framework in the real world because the reality of policy making is complex, messy, and often far from perfect. Moreover, there is also a danger of too much additional 'red tape' and bureaucratic burden. The challenge is to overcome 'one size fits all' approaches and develop policy that is proportionate to the specific risks and benefits involved.[421] But it is precisely because of the extent to which biofuels developments are driven by policy and regulation that it is important to identify where existing policy is failing to meet the required ethical standards, and how this could be avoided or ameliorated.

5.10 In this chapter we test existing biofuels policies against our Ethical Principles and develop recommendations as to how they could be improved. In doing so, we are not claiming that this is the only way to proceed. In a complex policy area, there may be other options, but we believe that our recommendations offer a way forward, and we hope that these will provide helpful guidance when developing future biofuels policy.

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)

> **"Industrial biofuels…contribute to speculation on the food markets, world food price rises and world hunger. They are linked to human rights abuses and displacements of peoples from their land in South America, Asia and Africa. Society moving towards a greater use of biofuels will exacerbate all the above problems further and lead to extreme changes in weather patterns, food and water insecurity and therefore increases in climate refugees and societal unrest and possibly societal collapse even more quickly than predicted by mainstream climate scientists."**[422]

> **"By considering bans on biofuels, the world would be denying livelihood opportunities to the poor, increasing hunger. No one speaks of banning tobacco, cotton, floriculture or other non-food crops in order to free up more land for food, because these provide crucial income-earning opportunities for farmers. Biofuels do the same."**[423]

[421] Academy of Medical Sciences (2011) *A new pathway for the regulation and governance of health research*, available at: http://www.acmedsci.ac.uk/p99puid209.html.
[422] Food Not Fuel, responding to the Working Party's consultation.
[423] International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), responding to the Working Party's consultation.

Target-based biofuel-specific policies

5.11 To incentivise sustainable biofuels production that supports human rights, it is essential that appropriate new and existing technologies and their deployment are supported through policy development. This involves not only preventing bad practice, but also encouraging good practice.

5.12 In Europe, the Renewable Energy Directive (RED)[424] is of huge importance in driving and regulating the biofuels system. European law requires all EU Member States to implement this Directive into national law by the end of 2010. The RED and national policies in Members States (in the UK, this is the Renewable Transport Fuels Obligation, RTFO) set out regulatory frameworks for biofuels and introduce mandatory targets for producers. The current RED mandatory target is for 10 per cent of transport energy to come from renewable sources in Member States by 2020.[425] Such target-based policies, in particular those focusing exclusively on biofuels, have been criticised as contributing to human rights violations that take place beyond the boundaries of EU Member States, for example in developing countries. These policies effectively establish artificial markets for large-scale biofuels production with several consequences. Firstly, biofuels providers, incentivised to fulfil targets, scale up production rapidly and in the easiest way possible, often resulting in producers moving into countries with a lax regulatory environment. Indeed, a recent World Bank report stated that investors tend to target countries with lax laws when acquiring land.[426]

5.13 Secondly, biofuels markets supported and incentivised by target-based policies make it attractive for poorer countries to scale up their own biofuels production rapidly; however, in some cases this has been associated with human rights violations.[427] The most controversial example of this is the 'food versus fuel' debate (discussed in Chapter 2) where biofuels markets established as a result of specific targets were blamed for the diversion of food crops into fuel production, and this in turn was blamed for local food shortages in some developing countries and spikes in global food prices. Recent reports, for example from the World Bank,[428] have painted a more complex picture. Biofuels production is certainly not the only culprit behind rising food prices; target-based policies incentivising production are one among several factors impacting on the availability and the price of food.[429] Nevertheless, provisions need to be implemented to avoid such effects, as well as other threats to human rights, in the future.

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[424] Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC [2009] OJ L140/16.

[425] In detail, the target is specified as a 10 per cent target for renewable energy content. The contribution of biofuels is included, along with those from alternative fuels and improvements in fossil fuels. The RED establishes minimum thresholds for the greenhouse gas reduction of biofuels. The Fuels Quality Directive that works alongside the RED incentivises the blending of biofuels that exceed the minimum requirement (in the Fuel Quality Directive, the overall target is now actually specified as a 10 per cent reduction in life cycle GHG emissions per unit of energy supplied: Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC [2009] OJ L140/88, art 7(a)). The UK's RTFO sets the national target at 5 per cent of biofuels by 2013. Such national target-based policies effectively establish mandatory markets for biofuels, Art 4 of The Renewable Transport Fuel Obligations Order 2007 amended by The Renewable Transport Fuel Obligations (Amendment) Order 2009.

[426] World Bank (2010) *Rising global interest in farmland: can it yield sustainable and equitable benefits?*, available at: http://siteresources.worldbank.org/INTARD/Resources/ESW_Sept7_final_final.pdf, p49.

[427] In 2007, Amnesty International highlighted the rescue in Brazil of more than 2,000 sugar cane workers from forced labour or conditions analogous to slavery. See: Amnesty International (2008) *Brazil: Amnesty International report 2008*, available at: https://www.amnesty.org/en/region/brazil/report-2008#. It is difficult to distinguish precisely whether these are problems of the Brazilian sugar cane industry or the Brazilian sugar cane industry as it relates to bioethanol production.

[428] Baffes J and Haniotis T (2010) *Placing the 2006/08 commodity price boom into perspective*, available at: http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2010/07/21/000158349_20100721110120/Rendered/PDF/WPS5371.pdf. This paper from the World Bank argues that the effect of biofuels on food has not been as large as originally thought; instead, the use of commodities by financial investors may have been partly responsible for the 2007/08 spike.

[429] Paarlberg R (2010) *Food politics: what everyone needs to know* (Oxford: Oxford University Press), chapter 3; Westhoff P (2010) *The economics of food: how feeding and fueling the planet affects food prices* (New Jersey: FT Press).

5.14 The RED has recently incorporated some social requirements. It gives a broad commitment to assessing/monitoring every two years the impacts of biofuels production on agricultural products (especially food), on wider development issues and on land use rights. If necessary, coercive action should be taken to address any shortcomings. It also supports further assessment of social consequences of the production and consumption of biofuels. In the UK, the Renewable Fuels Agency (RFA) developed some sustainability criteria, the RTFO-Meta standard, which include standards for social sustainability. However, the RTFO-Meta standard does not include any safeguards against impacts on food security.[430]

5.15 Within Europe, standards such as the RTFO-Meta standard will not be difficult to implement and enforce as they are set within a strong legal and policy framework that supports similar standards in many other areas. It is thus unlikely that Principle 1 will be violated for biofuels produced within the EU. However, the RED also proposes that equivalent compliance for biofuels sourced *outside* the EU should be achieved by multilateral and bilateral agreements and voluntary international or national schemes, such as the Conventions of the International Labour Organization.[431] These include protection against child labour and forced labour, and aim to ensure a minimum wage level, acceptable work conditions and equal pay between men and women. In the absence of concrete and binding agreements and schemes, it is proposed that EU Member States would require suitable reporting by producers and suppliers of biofuels from countries outside the EU. The form and impact of such propositions is currently unclear.

5.16 Owing to reasons of implementation, cooperation and enforcement, it is much easier successfully to implement policies that aim to ensure that human rights are not endangered on a *national* level than on an international level. As mentioned in Chapter 2, Brazil has in the past been accused of ignoring human rights issues in producing biofuels. However, recent policy developments, such as the ZAE Cana zoning policy[432] (which specifically regulates and includes provisions for protecting food security), appear to have had some positive effect. It remains to be seen whether the degree of enforcement of this policy is sufficient, but ZAE Cana zoning could be seen as one potential model of a national policy that could be used in other countries.

Challenges for the future: sustainability standards and certification

5.17 A promising international approach is emerging through sustainability initiatives that cover issues relevant to human rights as well as environmental sustainability (Principle 2) and the reduction of greenhouse gas (GHG) emissions (Principle 3). Biofuels sustainability standards lay out guidelines for environmentally and socially acceptable biofuels production and distribution. Certification is a policy instrument to signal that such standards have been satisfied by demonstrating compliance.[433] Certification can be voluntary or mandatory; currently, the RED calls for voluntary sustainability schemes to be implemented by EU Member States. Benchmarked[434] against the (itself incomplete) RTFO-Meta standard, the Roundtable on Sustainable Biofuels (RSB) standards appear currently to have the most comprehensive set of sustainability criteria (see Box 5.3). The RSB ultimately aims to operate as a certification scheme.

[430] Renewable Fuels Agency (2010) *Benchmarks of sustainability standards and certification schemes*, available at: http://www.renewablefuelsagency.gov.uk/reportsandpublications/guidance/carbonandsustainabilityguidance/benchmarks.
[431] ILOLEX (2011) *Database of international labour standards*, available at: http://www.ilo.org/ilolex/english/convdisp1.htm.
[432] Ministério da Agricultura, Pecuária e Abastecimento (2009) *Zonamento Agroecologico de Cana-de-Acucar*, English version available at: http://www.unica.com.br/downloads/sugarcane-agroecological-zoning.pdf.
[433] An overview of current sustainability and certification initiatives can be found at: http://www.renewablefuelsagency.gov.uk/sites/rfa/files/_documents/Benchmark_results_per cent28July_2010per cent29.pdf.
[434] Renewable Fuels Agency (2010) *Benchmarks of sustainability standards and certification schemes*, available at: http://www.renewablefuelsagency.gov.uk/reportsandpublications/guidance/carbonandsustainabilityguidance/benchmarks.

Box 5.3: Roundtable on Sustainable Biofuels[435]

The Roundtable on Sustainable Biofuels (RSB) is a voluntary, international stakeholder organisation, coordinated by the Energy Center at the École Polytechnique Fédérale de Lausanne, which brings together farmers, industry, non-governmental organisations (NGOs), governments, experts and other biofuels stakeholders. It seeks to establish standards for sustainable biofuels production and a third-party certification scheme which would allow the enforcement of these standards for all biofuels awarded the label "sustainably produced".

The current RSB standard covers more aspects than most other standards, and includes the entire biofuels value chain from "farm to tank". For example, the criteria and indicators of compliance address local food security and the use of technology, which, for example, are not part of the UK RTFO-Meta Standard.

RSB sustainability criteria

The RSB standard Version 1 is based on 12 criteria under the following headings:

1 Legality
2 Planning, Monitoring and Continuous Improvement
3 Greenhouse Gas Emissions
4 Human and Labour Rights
5 Rural and Social Development
6 Local Food Security
7 Conservation
8 Soil
9 Water
10 Air
11 Use of Technology, Inputs and Management of Waste
12 Land Rights

The RSB is also developing the 'Standard for EU market access', to be used by producers, operators and traders who supply biofuels to the EU. This is intended to ensure compliance of the RSB certification system with the sustainability criteria for biofuels as defined by the RED. All participating operators producing, converting, processing or trading biomass/biofuels for use in the EU will have to comply with the provisions of the EU Standard in addition to the RSB "Principles & Criteria" and all other RSB standards to qualify for certification.

5.18 It is of course debatable whether multilateral and bilateral agreements such as those captured in the RSB standard will have enough 'bite' to avoid impacts on food and water security and to allow sufficient protection of health and land and labour rights if they remain voluntary. Several of the voluntary agreements and schemes mentioned in the RED, such as the Conventions of the International Labour Organization, have been in existence for a long time, yet breaches are still reported.[436]

Challenges for the future: technologies and scale of production

5.19 In reaction to the problems surrounding established biofuels production from food crops, the RED also seeks to encourage research on, and development and deployment of, new biomass feedstocks and biofuels technologies, some of which have been described in Chapter 3. In the RED, these are referred to as second and third generation biofuels. For example, EU Member States might give extra support for biofuels that are derived from particular non-food biomass feedstocks.

5.20 The right to food, land, water and – through these – to health can all be violated if land, water and food are used for biofuels production. Indeed some argue that we need all even remotely productive land and any available water for food production, and therefore *all* biofuels violate Principle 1. However, not *all* biofuels use these resources. Examples include the use of

[435] Roundtable on Sustainable Biofuels (2010) *RSB principles & criteria for sustainable biofuel production*, available at: http://rsb.epfl.ch/files/content/sites/rsb2/files/Biofuels/Versionper cent202/PCsper cent20V2/10-11-12per cent20RSBper cent20PCsper cent20Versionper cent202.pdf.

[436] For example, see: International Labour Organization (2009) *Information and reports on the application of conventions and recommendations: report of the Committee on the Application of Standards*, available at: http://www.ilo.org/wcmsp5/groups/public/---ed_norm/---relconf/documents/meetingdocument/wcms_108378.pdf.

agricultural or municipal residues, as described in Chapter 3. Furthermore, as mentioned above, the relationship between world food supply and hunger is complex. It is not necessarily the case that if more food is produced on the planet, fewer people will be hungry. It is possible that low-tech local biofuels production in developing countries can improve the situation by providing a local energy source without affecting local food supplies. Both the policies and the technologies needed to drive improvements in these areas differ for different parts of the world. In some cases it will be appropriate for the development of biofuels to be on a local basis to serve the needs of local farmers (small scale). It is important that policies to support technology development for small-scale local production are not neglected in the debate about large-scale production for the mass market (see also paragraphs 5.91–5.95 and recommendation 5.100).

5.21 It appears that, in order to support appropriate technology development to avoid impacts on food and other human rights, the question to ask is how the best use can be made of any particular area of land and source of local water supply so that people's basic human rights are met in a sustainable way. This, however, is very obviously a challenge that goes far beyond the context of biofuels policy making. Production of both food and biofuels crops can be increased using a range of technologies. For example, in 2009 the Royal Society suggested a number of systematic improvements to allow for sustainable intensification of agriculture (see Box 5.4), and these should be supported, but ultimately integrated policies are necessary for sustainable development of all crops, whether they are used for food or for fuel. We will come back briefly to this fundamental challenge in Chapter 6.

Box 5.4: Sustainable intensification of global agriculture

In October 2009, the Royal Society published a report[437] on the contribution of the biological sciences to sustainable intensification of global food crop production, concluding that they must play a vital role, but refraining from discussion of what policies might be needed to deliver this aspiration.

The report examined the technologies that could be used, including genetic improvement of crops and new crop and soil management practices. Genetic improvement – achieved through either breeding or genetic modification – could be used to refine existing crops. Equally, more radical improvements were possible, with potential changes including a reduced need for fertiliser or increased photosynthetic efficiency. Crop and soil management practices could be used to address constraints in existing crop varieties.

The report adopted an "inclusive approach" to these methods, asserting that a diversity of approaches is needed to meet the range of problems of global agriculture that are determined by local conditions, crops and cultures.

Recommendations

5.22 **We recommend to European Commission (EC) and national policy makers that any mandatory national biofuels targets required by the Renewable Energy Directive should be set in such a way as to avoid incentivising human rights abuses. Where monitoring through biannual reports detects such effects, sanctions need to be enacted effectively and swiftly. We recommend that the EC develops and implements effective structures of oversight to this effect.**

5.23 **We recommend making certification based on comprehensive standards related to human rights mandatory for all biofuels developed in the EU or imported into the EU, for example as part of a certification scheme such as the one developed by the Roundtable on Sustainable Biofuels. This should be included in the Renewable Energy Directive and national policy instruments such as the UK Renewable Transport Fuel Obligation Order.**

[437] Royal Society (2009) *Reaping the benefits: science and the sustainable intensification of global agriculture*, available at: http://royalsociety.org/WorkArea/DownloadAsset.aspx?id=4294967942.

Principle 2: Environmental sustainability

Biofuels should be environmentally sustainable[438]

> **"[It is necessary to] establish an international certification system that verifies the sustainability of any given biofuel based on a range of factors like environmental, climate, and social."**[439]
>
> **"If regulation or certification of biofuels prove successful, it could become a showcase for sustainable agriculture…"**[440]
>
> **"…the genetic modification of feedstock plants to increase biofuel processing efficiency is an issue of greater public concern, as it represents a wider environmental release."**[441]
>
> **"New genetic engineering strategies, for example, in developing drought-resistant crops have distinct advantages for water savings."**[442]

5.24 Similar issues to those described in the previous section underlie some of the current environmental problems of biofuels production. Biofuels targets such as those included in the RED could, through their magnitude, lead to violations of our Ethical Principle 2, because they encourage – necessitate – a rapid expansion of current biofuels production and use. Such rapid expansion is unlikely to be environmentally sustainable because of direct and indirect land use change, the relatively poor environmental performance of some current biofuels feedstocks, and the import of biofuels, sometimes from countries with less stringent sustainability regulations. As we noted above, initiatives such as that of the RSB cover environmental sustainability in addition to protection of basic human rights. In this section we focus on the environmental implications of current biofuel-specific policies.

Biofuel-specific policies

5.25 In the UK, to fulfil the targets set out in the RTFO, most of the biofuels are currently imported. Ninety-three per cent of the fuel from UK feedstocks met environmental sustainability standards during 2009–2010, but overall only 31 per cent of biofuels used in the UK met an environmental standard (compared with a target of 50 per cent).[443]

5.26 The RED includes standards on the protection of areas of high biodiversity and that are high in sequestered carbon which are applicable to all biofuels developed from food crops. The standards apply to biofuels that are used towards the EU renewable energy target regardless of where the feedstock was produced. The RED also reports to the European Parliament whether biofuels source countries have ratified and implemented some general policies, including the Cartagena Protocol on Biosafety[444] and the Convention on International Trade in Endangered Species of Wild Flora and Fauna.[445] An important feature of sustainability criteria as envisaged by the RED is that biofuels should not be sourced from primary forests, or from certain temperate and tropical grasslands.[446] EU standards relating to other environmental concerns

[438] We are aware of the fact that that there is not an accepted definition of 'sustainability' and that, currently, many different things are discussed under this heading. Often, sustainability is taken to include both social as well as environmental aspects of sustainable development, production and use of a given technology, and there are many interpretations as to what each of these elements means. Therefore, and to avoid confusion, we do not use the term sustainability in this report except when it denotes what has often been understood as its core meaning. i.e. the protection of the environment.
[439] Anonymous respondent, responding to the Working Party's consultation.
[440] Anonymous respondent, responding to the Working Party's consultation.
[441] NNFCC, responding to the Working Party's consultation.
[442] Society for General Microbiology, responding to the Working Party's consultation.
[443] Renewable Fuels Agency (2010) *Year two of the RTFO*, available at: http://www.renewablefuelsagency.gov.uk/sites/rfa/files/Year_Two_RTFO_v2.pdf, p16.
[444] Cartagena Protocol on Biosafety to the Convention on Biological Diversity of 2000.
[445] Convention on International Trade in Endangered Species of Wild Flora and Fauna of 1973.
[446] Such as, for example, highly biodiverse savannahs, steppes, scrublands and prairies.

such as soil and water conservation apply only to feedstocks grown in the EU and draw on the standards set in place under the provisions referred to under the Common Agricultural Policy.[447]

5.27 However, the situation is different *outside* the EU. In the RED, approaches to cover the key environmental considerations of biofuels systems outside the EU are expected to be implemented through multilateral and bilateral agreements, and voluntary international or national schemes. If these fail to materialise, producers and suppliers of biofuels will be required to report on key environmental considerations to Member States. Such provisions carry the same difficulties in implementation and enforcement that were mentioned with regard to human rights protection above – they might lack sufficient 'bite'. For example, a substantial portion of the biodiesel counted towards the UK's RTFO in 2009–2010 was made from palm oil from Malaysia (73 million litres).[448] Only approximately one-quarter of that met a qualifying environmental standard.[449] Some of the dangers to the environment which have been linked to the expansion of palm oil production in Malaysia, such as the destruction of rainforest and loss of biodiversity, have been outlined in Chapter 2. In order to avoid such impacts, international agreements need to have sufficient force behind them.

5.28 The UK has to adhere to the EU standards but the UK RFA also issues certificates based on the RTFO-Meta standard which, alongside the social criteria mentioned in the previous section, includes criteria for environmental sustainability, covering protection of biodiversity. In the US, the Renewable Fuel Standard (RFS) programme mandates biofuels targets but only addresses one aspect of environmental sustainability related to GHG reduction. There are, therefore, differences between countries and regions in how and whether environmental sustainability of biofuels systems is addressed in specific biofuels policies.

5.29 Concerns over the environmental sustainability of biofuels have led a number of governments, and intergovernmental and international organisations, non-governmental organisations (NGOs) and the private sector to develop sustainability standards for biofuels that are, or could be, used to support environmental policies, as described under our Principle 2. Elements or criteria relating to environmental sustainability, such as biodiversity protection, soil and water quality, protection of carbon-rich lands, and GHG emissions, are also developed in these standards. Some of these are more stringent than the regulatory standards included in the RTFO, the RFS and the RED. They cover a greater range of environmental issues, such as soil and water conservation, and could be used by governments or the private sector; the RSB (see Box 5.3 above) is one such standard. Standards are also being created for specific crops by producer groups, such as the Roundtable on Sustainable Palm Oil[450] and the Better Sugarcane Initiative.[451] In addition, some organisations and groups of stakeholders are providing guidance to national authorities on biofuels production within their territories, such as the Global Bioenergy Partnership,[452] with the aim of making biofuels production more sustainable.

Challenges for the future: sustainability standards and certification

5.30 Overall, existing policies, standards and targets to ensure sustainability, good stewardship of biofuels production and thus adherence with Principle 2 are weak. Either they include no environmental standards or they do not cover all biofuels. For instance, EU sustainability standards do not cover all new approaches to biofuels development. Neither do they cover all biofuels currently used within the EU, but only those used to comply with the RED, renewable

[447] Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC [2009] OJ L140/16, art 17.
[448] Renewable Fuels Agency (2010) *Year two of the RTFO*, available at: http://www.renewablefuelsagency.gov.uk/sites/rfa/files/Year_Two_RTFO_v2.pdf, p50.
[449] The Renewable Fuels Agency gives the percentage of palm oil diesel (most of which originates in Malaysia) certified by the standard of the Roundtable on Sustainable Palm Oil, see: Renewable Fuels Agency (2010) *Year two of the RTFO*, available at: http://www.renewablefuelsagency.gov.uk/sites/rfa/files/Year_Two_RTFO_v2.pdf, p36.
[450] Roundtable on Sustainable Palm Oil (2011) *Who is RSPO?,* available at: http://www.rspo.org/.
[451] Bonsucro (2011) *Better Sugar Cane Initiative*, available at: http://www.bettersugarcane.org/.
[452] Global Bioenergy Partnership (2011) *About GBEP*, available at: http://www.globalbioenergy.org/.

energy obligations or subsidies. The voluntary sustainability standards for biofuels and related policies are works in progress, and they include a number of unresolved issues and imperfectly defined concepts which if not resolved will limit their effectiveness.

5.31 Moreover, environmental sustainability of biofuels systems is a global problem owing to indirect land use change, GHG emissions and international trade in feedstocks. Current policies are disparate across countries and could benefit from harmonisation, and the large number of stakeholders currently developing standards and certification systems is likely to cause confusion among end users. A multitude of competing schemes will limit their credibility, create market-access difficulties and limit their effectiveness, especially if slightly different schemes are adopted by countries following the RED's recent suggestion.[453] Some organisations, including industry stakeholders, are therefore calling for one meta-standard that will be applicable on an international scale but getting agreement on such a standard is likely to be challenging.

Technology-support policies

5.32 Technological advances have a substantial role to play in reducing the environmental impacts of biofuels by increasing the efficiency of biofuels production at all points in the supply chain. As described in Chapter 3, there is considerable scope to achieve this through a wide range of technological advances ranging from improved water and fertiliser-use efficiency and pest resistance in biomass crop production, to enzymes modified using biotechnology to digest lignocellulose more efficiently. Biotechnologies for genetic improvement, including advanced plant breeding strategies and genetic modification, provide a whole repertoire of helpful tools to enhance environmental performance (see Box 5.5).

Box 5.5: Biotechnologies for genetic improvement of biofuels: examples

Advanced plant breeding strategies for biofuels
Advanced plant breeding strategies can be used to test plant hybrids and to select the variety with a desired trait. For example, Rothamsted Research in collaboration with the University of York is endeavouring to identify markers for the genes in willow that allow it to be grown as short rotation coppice. It is hoped that these markers can then be used to accelerate breeding to develop high biomass yield.[454]

Genetically modified poplar
Feedstocks can be modified to express traits that benefit biofuels production. For example, genetically modified poplar trees are currently under development. Through modified connections within the lignocellulose, the wood provides a more accessible source of cellulose for lignocellulosic bioethanol.[455] The increased accessibility of sugars would have an important positive impact on increasing yields and thus on land use and environmental performance.

Genetically modified enzymes for processing
Novozymes,[456] a company specialising in enzyme production, has used genetic modification to develop a cellulase complex that enables more efficient and cost-effective processing of lignocellulosic ethanol. It can be used with a variety of feedstocks and process technologies, and is claimed to produce significantly higher conversion yields, leading to lower processing costs.[457] More efficient processing of lignocellulose increases the amount of biofuel produced per unit biomass input, thus potentially improving life cycle assessment and the economic performance of biofuels production.

[453] European Commission (2010) *Communication from the Commission on voluntary schemes and default values in the EU biofuels and bioliquids sustainability scheme*, available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:160:0001:0007:EN:PDF.
[454] Rothamsted Centre for Bioenergy and Climate Change (2011) *Accelerating breeding for biomass yield in short rotation coppice willow by exploiting knowledge of shoot development in* Arabidopsis, available at: http://www.rothamsted.ac.uk/Research/Centres/ProjectDetails.php?Centre=BCC&ProjectID=4840.
[455] Penn State Live (28 Dec 2008) *Modified plants may yield more biofuel*, available at: http://live.psu.edu/story/36682.
[456] Novozymes (2011) *About us – rethink tomorrow*, available at: http://www.novozymes.com/en/about-us/Pages/default.aspx.
[457] Novozymes (2011) *Novozymes Cellic® CTec2*, available at: http://www.bioenergy.novozymes.com/cellulosic-ethanol/cellic-product-information/.

5.33 In keeping with earlier Nuffield Council reports,[458] we believe that technologies for genetic improvement could be important tools in achieving a sustainable increase in biofuels production without endangering the environment. Regarding genomics- and marker-assisted breeding strategies and in particular genetic modification, we encourage the development of policies to capture the benefits of these technologies in biofuels development, at the same time ensuring that appropriate regulatory systems in place are able to minimise any relevant risks. This applies equally to the introduction of new non-native plants, such as foreign crops, through to the application of nascent technologies such as synthetic biology.[459]

Recommendations

5.34 **We conclude that the best possible standard of environmental sustainability should be developed for biofuels production, for example by an international organisation already working towards such a standard, such as the United Nations Environment Programme. This standard should be implemented as part of a proportionate biofuels certification scheme. This should be achieved in such a way as to prevent displacement and/or the leakage of unsustainable practices into other forms of agriculture.**

5.35 **Policies are needed to investigate the application of biotechnologies for genetic improvement of crops where this has the potential to support the environmental performance of biofuels production, with appropriate regulatory oversight.**

Principle 3: Climate change

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

> **"In absence of…proper methodologies allowing a full monitoring of national and international iLUC impacts…the application of a default iLUC GHG factor is viable in the short term."**[460]
>
> **"Until better safeguards against iLUC are in place in a country, imports of biofuel feedstocks from that country should be banned."**[461]
>
> **"Land use change is a big [myth] invented by [opponents] to biofuels...It is wrong to concentrate on the few bad exceptions (which of course are not tolerable and have to be avoided)."**[462]
>
> **"There is a danger that the EU (and even more so the UK) pose the iLUC question in such a way that it can never be answered, and succeed only in slowing down the development of a much needed industry [in these countries]."**[463]
>
> **"EuropaBio believes that the best approach to tackle any land use change is through the development of integrated and global measures to address agriculture land use efficiency and emissions."**[464]

5.36 At first sight, Principle 3 seems to be a straightforward requirement that is already embedded in current and emerging policy and regulations on biofuels in the US, the EU and the UK.

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[458] Nuffield Council on Bioethics (2004) *The use of genetically modified crops in developing countries: a follow-up Discussion Paper*, available at: http://www.nuffieldbioethics.org/sites/default/files/GMper cent20Cropsper cent20Discussionper cent20Paperper cent202004.pdf; Nuffield Council on Bioethics (1999) *Genetically modified crops: the ethical and social issues*, available at: http://www.nuffieldbioethics.org/sites/default/files/GMper cent20cropsper cent20-per cent20fullper cent20report.pdf.

[459] Synthetic biology is emerging as an important new technique for the development of biofuels. Synthetic biology can be understood as an approach that draws on principles elucidated by biologists, chemists, physicists and engineers deliberately to redesign existing or design and construct novel biological systems and organisms, devices and systems. A range of definitions of synthetic biology have been proposed by a number of scientific and advisory bodies. Our definition here follows the definition in: Royal Society (2008) *Synthetic biology: scientific discussion meeting summary*, available at: http://royalsociety.org/WorkArea/DownloadAsset.aspx?id=5486. In the context of biofuels it can be seen as an extension of genetic modification technology.

[460] International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), responding to the Working Party's consultation.

[461] Professor Keith Smith, responding to the Working Party's consultation.

[462] Anonymous respondent, responding to the Working Party's consultation.

[463] Swan Institute, Newcastle University, responding to the Working Party's consultation.

[464] EuropaBio, responding to the Working Party's consultation.

However, the three drivers of biofuels development outlined in Chapter 1 have different objectives and can conflict with each other. Biofuels policies that are implemented mainly with the aim of improving economic development and/or energy security and therefore encourage industrialised production of large volumes of biofuels can lead to production pathways that do not generate significant GHG emissions savings.

Biofuel-specific policies

5.37 The best-known example of a problematic policy of this nature comes from corn-based ethanol production in the US. While producers of corn ethanol, over a relatively short period of time, succeeded in producing significant quantities of biofuels and generating income, largely from subsidies, the low or allegedly negative GHG emissions savings from corn ethanol have been a matter of much debate (as discussed in Chapter 2).

5.38 Corn-based ethanol production has been supported by several policies (see Chapter 2), and by high oil prices. National policies such as tax breaks and other subsidies for biofuels production, if they are not accompanied by stringent requirements for GHG emissions savings, may lead to a violation of Principle 3. This was recognised in the US where the Energy Independence and Security Act of 2007 required that any biofuels produced after enactment (i.e. those now used to comply with the new Renewable Fuels Standard) generate at least 20 per cent GHG emissions savings.[465]

5.39 International mandates and targets may incentivise scaling up of biofuels production in countries that do not have climate change mitigation policies, and this may lead to production of biofuels with low GHG emissions savings (unless sustainability safeguards are applied to the trade in biofuels). Environmental protection and climate change mitigation are intertwined – protecting carbon sinks[466] and biodiverse land amounts to, among other results, avoiding GHG emissions and both are currently negatively affected by existing policies enabling rapid biofuels development.

5.40 The situation in Europe is different. Both climate change mitigation and the transition towards a low carbon economy with reduced GHG emissions has become a primary driver for biofuels developments. The RED specifies requirements for net GHG emissions savings from biofuels supplied in the EU: the current target of at least 35 per cent of emissions saved, rising to 50 per cent from 1 January 2017; and at least 60 per cent savings from 1 January 2018 for biofuels installations starting on or after 1 January 2017.[467]

5.41 The RED can, however, be criticised as an instrument enabling Europe to achieve its climate change goals, through incentivising the rest of the world to help fulfil these goals, to the detriment of their own interests or global emission targets. Without a policy instrument such as a certification scheme that ensures that all biofuels imported into Europe and counted towards the European target deliver GHG emissions savings throughout their whole production process ("from field to tank"), the RED could be seen to be 'outsourcing' the pressing problem of climate change mitigation. There are provisions for this within the RED although their effectiveness needs to be tested through actual implementation.

Challenges for the future: measuring GHG emissions

5.42 The recommendation that GHG emissions be measured in full life cycle assessments (LCAs) raises manifold difficulties itself. A number of these are fundamentally methodological and are

[465] s202 Energy Independence and Security Act of 2007.
[466] A carbon sink is anything that absorbs more carbon that it releases, for example forests.
[467] Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC [2009] OJ L140/16, art 17.2

related to the purposes of LCA and the questions which it aims to answer. In the context of biofuels *regulation*, it is necessary to answer the question: "Who is responsible for any given net change in total GHG emissions due to biofuels production?" In contrast, for biofuels *policy analysis*, the relevant question is: "What is the overall effect on GHG emissions of a policy which promotes production of a biofuel?" In the parlance of the field, the biofuels regulation methodology is equivalent to *attributional* LCA and the biofuels policy analysis methodology is equivalent to *consequential* LCA.[468]

5.43 The choice of methodology determines what is included and how, and this in turn affects the resulting estimates of net GHG emissions savings. Contentious areas of inclusion are the key elements: co-product allocation; treatment of wastes and residues as biomass feedstocks for biofuels production; and direct land use change (dLUC) and indirect land use change (iLUC) (see also Box 2.8 in Chapter 2).

5.44 Each methodology brings different challenges. In attributional LCA, the challenge is the allocation of responsibility for GHG emissions: producers have immediate influence over their so-called 'direct' GHG emissions, which arise from activities such as their combustion of fossil fuels during processing. However, 'indirect' GHG emissions also arise, and these can be significant and sometimes greater than direct GHG emissions. For example, a biofuels producer may purchase chemicals for use in processing. There will be GHG emissions associated with the original production of these chemicals. Such indirect GHG emissions are normally attributed to the biofuels producer. In terms of LCA, this approach for incorporating GHG emissions that occur further from the immediate production process is referred to as "expanding the system boundary". However, the act of expanding system boundaries dilutes a producer's control and influence over emissions produced and thus their responsibility for the emissions associated with the biofuels delivered. Attributing responsibility for increasingly remote emissions can thus become increasingly arbitrary.

5.45 In consequential LCA, it is necessary to expand the system boundary to its full extent so that the global consequences are incorporated into the GHG emissions calculations. It does not attempt to attribute all these consequences to a given producer. Instead, its purpose is to link initial cause to ultimate effect. However, this implies global modelling with a vast scope that is capable of tracing all connections and evaluating them in terms of resulting GHG emissions. The data requirements of such modelling are extremely difficult. For example, the consequences for GHG emissions of purchasing a given chemical might be easy to calculate on a small scale but, if the policy is globally significant, this could encourage major increases in production of that chemical, requiring new manufacturing facilities to be constructed. These facilities may incorporate new technologies so that GHG emissions might be very different, positively or negatively depending on the technology adopted, from those associated with existing facilities. Hence, consequential LCA has to take global dynamics and scale into account in assessing likely connections and consequences, and evaluating GHG emissions is an extremely challenging *ex ante* activity involving future considerations, whereas in attributional LCA evaluation is an *ex post* activity that is only concerned with the present or the recent past.

5.46 It follows that the determination of iLUC, co-product allocation and the treatment of residues and wastes are all important challenges for GHG emissions calculations. They are addressed in the RED but they are also the subject of controversial debates, and much uncertainty surrounds the question of how to determine them in the best way (see Box 5.6). However, considerable controversy can be removed by appreciating the distinction between attributional LCA (for biofuels regulation) and consequential LCA (for biofuels policy analysis) and, thereby, understanding and accepting that different approaches legitimately answer different questions. Furthermore, by adopting the correct form of LCA in the relevant circumstances, a logically

[468] Brander M, Tipper R, Hutchinson C and Davis G (2009) *Consequential and attributional approaches to LCA: a guide to policy makers with specific reference to greenhouse gas LCA of biofuels*, available at: http://d3u3pjcknor73l.cloudfront.net/assets/media/pdf/approachesto_LCA3_technical.pdf.

coherent and consistent basis for GHG emissions calculations can be devised, justified and applied rigorously in practice.

Box 5.6: Challenges in measuring GHG emissions

The net GHG emissions savings of a biofuel are defined as the percentage difference in total GHG emissions of a biofuel relative to those of a conventional fuel that is displaced.[469] Net reductions in total GHG emissions arise when net savings exceed zero per cent and are, therefore, positive. Conversely, where net savings are equal to or less than zero per cent, the biofuel generates the same or more GHG emissions than the conventional fuel that it is intended to replace.

In general, the methodology for calculating GHG emissions is based on basic LCA principles (see Box 2.8 in Chapter 2) and the choice of methodology depends on the question being addressed.

Land use change

For dLUC, the EC has determined that the most effective approach is to ensure that no land with high carbon stocks is used for the cultivation of biofuels feedstocks.[470] However, how such land is defined is still unclear and this is one of the difficulties in formulating environmental sustainability standards.

To address iLUC, the RED proposes that the EC should develop a methodology to minimise GHG emissions associated with iLUC, possibly by means of a factor to be applied to relevant biofuels.[471] A final decision has not been made on which methodology to use[472] but, in any case, changes will not apply until 31 December 2017 to any biofuels installation that is in production before the end of 2013, provided that it currently achieves at least 45 per cent net GHG emissions savings (this is frequently referred to as 'grandfathering').

The difficulty in incorporating iLUC into standards is where to set the boundaries and how to gauge whether iLUC has occurred.

Residues and wastes

The RED also specifies[473] that all associated GHG emissions prior to the collection of "residues and waste products"[474] – which are to be used as biofuels feedstocks – should be excluded from calculations. In practice, most of these residues and wastes are co-products of other processes. Hence, for consistency, so-called 'upstream' GHG emissions associated with their production should be subject to the specified co-product allocation procedure. In the case of the RED, this co-product allocation is based on the energy content of the co-products and involves estimating and comparing "energy flows" associated with each co-product on the basis of its energy content multiplied by its quantity.

5.47 Of all the issues concerning the evaluation of GHG emissions for biofuels, the debate over iLUC has been the most contentious. In the absence of effective global action, the potential impact of biofuels via iLUC has been something of a 'lightning rod' for concerns over destruction of important carbon stocks, such as rainforests and peatland. It is now generally appreciated that biofuels production is one of many developments that can generate direct and indirect pressure on LUC and lead to the destruction of important carbon stocks. It is recognised that dLUC for biofuels production should be avoided and biofuels regulations can require this. However, such regulations, which only apply to one form of land use, are a very ineffective way of dealing with the destruction of carbon stocks. Instead, a much better approach is for internationally agreed

[469] Mathematically: $S = [(G_a - G_b)/G_b] \times 100$ per cent
where S = net GHG emissions savings of a biofuel (per cent)
G_a = total GHG emissions of a conventional fuel (kg eq. CO_2/MJ)
G_b = total GHG emissions of a biofuel (kg eq. CO_2/MJ)

[470] Commission Decision of 10 June 2010 on guidelines for the calculation of land carbon stocks for the purpose of Annex V to Directive 2009/28/EC (2010/335/EU) [2010] OJ L151/19; Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC [2009] OJ L140/16, art 17.3–17.6.

[471] Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC [2009] OJ L140/16, recital 85. It is implied that this factor might apply to biofuels derived from non-food cellulosic and lignocellulosic biomass feedstocks as well as biofuels produced from food crops.

[472] A report discussing some future policy options has recently been published; see: European Commission (2010) *Report from the Commission on indirect land-use change related to biofuels and bioliquids*, available at: http://ec.europa.eu/energy/renewables/biofuels/doc/land-use-change/com_2010_811_report_en.pdf. The final impact assessment together with a legislative proposal is expected to be published in July 2011.

[473] Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC [2009] OJ L140/16, art 19.3.

[474] These are specified as various forms of agricultural crop residues and residues from processing chains (other than biofuels processing chains) with no potential for food or feed use.

policies, with strong monitoring and policing measures, to prevent the loss of major carbon stocks. This would address LUC directly at the point where it takes place and by those who are immediately responsible. If such a more targeted approach to LUC were successful, and as it will have to be as part of a serious international response to global climate change, the need to consider iLUC would become irrelevant for biofuels or any other activity that involves significant land use. In our subsequent recommendation, we therefore suggest more holistic changes to policy than have recently been put forward, for example by the EC.[475] The issue that would then remain would be whether sufficient land is available for all future land uses including the cultivation of crops for biofuels. This requires substantial information, which currently does not exist, on global land use to consider the potentially constrained supply against diverse and competing demand. The resolution is a matter for international policy that also recognises the need to choose between competing options (see Chapter 6).

Technology-support policies

5.48 Some new approaches to biofuels development are likely to fare well in terms of their GHG emissions savings. One technological breakthrough that could enable the scaling up of production and significant GHG emissions savings is the use of algal biofuels produced using nutrient-rich wastewater and carbon dioxide-rich flue gas from power stations. Indeed, some biofuels may be able to avoid any significant land use change. Implementation of the RED at individual EU Member State level will help to determine whether there is support for such new biofuels technologies.

5.49 In the UK, it is likely that, unless support for specific new technologies is made explicit, such support can only function indirectly. For example, under the RTFO,[476] suppliers are obliged to reach target contributions and target savings and they are penalised financially if they do not. There is thus pressure to adopt the technologies that enable developers to avoid penalties, and this may lead them to choose technologies that are already established over those which need further development and investment. Targets are rather blunt instruments to promote new technologies. We therefore conclude that specific biofuels policy should include instruments to stimulate the development of biofuels that will need little land and few other resources, and that produce significant GHG emissions savings (with some safeguards around fair cost–benefit sharing, as set out below).

Recommendations

5.50 **We recommend to the European Commission (EC) Directorate-General for Energy and Transport and the UK Department for Transport, Department of Energy and Climate Change, Department for Environment, Food and Rural Affairs and Department for International Development that different biofuel types be certified on the basis of their life cycle greenhouse gas emissions according to attributional life cycle assessment (LCA), and based on a single international standard. This requires elucidation of the important distinction between attributional and consequential LCA. Such certification should be complemented by a robust regulatory mechanism to ensure compliance. The standard should be drawn up by the original authors of the Renewable Energy Directive, including the Joint Research Centre and the subsequent regulators who must translate EC policy into individual Member State practice. The standard should be extended globally, for example in cooperation with the United Nations Framework Convention on Climate Change.**

5.51 **We recommend to the European Commission Directorate-General for Energy and Transport and the UK Department of Energy and Climate Change, as well as to the United**

[475] European Commission (2010): *Report from the Commission on indirect land-use change related to biofuels and bioliquids*, available at: http://ec.europa.eu/energy/renewables/biofuels/doc/land-use-change/com_2010_811_report_en.pdf.
[476] The Renewable Transport Fuel Obligations Order 2007 amended by The Renewable Transport Fuel Obligations (Amendment) Order 2009, art 21.

Nations Framework Convention on Climate Change Secretariat, that policies on land use change should be set within a wider framework of global agreement on a coordinated response to climate change, which directly tackles land use change, with strong international and local measures to prevent destruction of high carbon stocks, thereby eliminating or minimising harmful direct or indirect land use change.

5.52 In order to support such initiatives and in compliance with attributional LCA, greenhouse gas (GHG) emissions calculations for *regulatory* purposes should be based on the concept of economic responsibility of relevant operators, which means that the use of residues and wastes as biomass feedstocks, and allocation between co-products, should be based on price, and that GHG emissions from iLUC should be excluded from calculations. GHG emissions calculated for *policy* purposes and related to the issue of iLUC for biofuels and all other agricultural activities should be addressed by consequential LCA with due regard given to the difficulties and uncertainties associated with modelling global iLUC.

5.53 **Specific biofuels policies should include technology-relevant instruments to stimulate the development of those biofuels and biofuels crops that can be demonstrated to produce significant net greenhouse gas emissions savings, for example through high biomass yield with minimal inputs and land use. Such instruments could, for example, be developed by national research councils.**

Principle 4: Just reward

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)

> **"New mass products always impact on the small scale farmer and worker negatively unless they are protected in participatory schemes (shares, minimum prices regulations, etc.)"**[477]
>
> **"Biofuel distilleries generally must be large to be economically efficient which leads to concentration of profits in the hands of a few; however farmer alliances and multiple-option crops can significantly empower farmers in their relationships with distillers."**[478]

5.54 As has been mentioned, one of the facets of biofuels is the complexity and geographic scope of the value chains through which they are produced, processed and distributed. In many respects, these value chains mirror the existing inequalities that characterise agricultural production and they may exacerbate them. These need to be considered from the perspective of fair trade in order to comply with just reward. Another important aspect of just reward is how IP is approached, and we turn to this in the second half of this chapter.

Biofuel-specific policies

5.55 Biofuels blending targets are a policy that has the potential to threaten the basis of fair trade in biofuels. Such targets promote investment in developing country biofuels feedstock production as the EU cannot meet them through its own feedstock production. This increase in new forms of export agriculture has multidimensional implications for fair trade, of which there are environmental and human rights dimensions such as effects on food security. Such examples have already been mentioned.

5.56 Much investment in biofuels feedstock production in developing countries has been accused of not benefiting either smallholders or farm labourers. Experience in Brazil, for example, has shown that workers producing sugar for bioethanol production can suffer low wages, job

[477] Individual at Rothamsted Research, in the institute's response to the Working Party's consultation.
[478] International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), responding to the Working Party's consultation.

insecurity and often dangerous working conditions (see Chapter 2). An Oxfam report[479] from 2008 suggests that, as Brazil's sugar cane feedstock production matures and mechanises, job opportunities shrink and farm labour is dramatically cut. On the other hand, the potentially very large expansion of the industry might provide a significant number of new, often better jobs (running the machines) to the displaced workers. Brazil is an interesting example in this respect. One of the major reasons for the improved economy in Brazil is the dramatic growth in commodity-based exports, and sugar cane and ethanol are among these commodities. This kind of economic growth (along with some social programmes, for example funded by the World Bank) has had a large impact in reducing poverty: poverty reduced dramatically in Brazil from 20 per cent of the population in 2004 to 7 per cent of the population in 2009.[480] This could be seen as a successful example of 'trickle-down economics', where an economic boom alleviates some of the poverty in a population, and, in Brazil, biofuels probably played some part in this.

5.57 However, the EU's biofuels targets have acted as a stimulus to oil palm production in countries such as Indonesia and Malaysia (see Chapter 2), resulting in the consolidation of oil palm production into large-scale plantations, and this has been accused of squeezing out smallholders who are unable to compete. Likewise, investment in jatropha (see Chapter 3) as a source of oil for biodiesel production in Africa could raise some difficult issues. Countries such as Ethiopia are investing in large-scale jatropha plantations on the basis of targets. Such countries might become vulnerable to changing demand, for example following EU policy changes.

5.58 The protection of labour rights to ensure adequate payment to labourers in all countries producing biomass feedstocks for EU biofuels supplies is addressed in the RED under sustainability criteria with requirements for ratification and implementation of relevant Conventions of the International Labour Organization,[481] with reports on this every two years. Again, a key issue is whether countries outside the EU adhere to these protective policies when faced with strong incentives for scaling up their biofuels production (i.e. biofuels targets). Concerns noted above regarding the favoured acquisition of land in countries with lax standards are also relevant to fair trade and fair rewards.

Challenges for the future: Fairtrade schemes

5.59 Ensuring fair reward in global patterns of agriculture is very difficult. This is due to entrenched global inequalities and the difficulties of governing complex value chains that cross international boundaries and intersect with many different sets of interests. One of the approaches that have achieved a measure of success in generating fair wages and fairer trade relationships has been the introduction of Fairtrade[482] schemes, which recognise the rights of people to just reward and thus conform to the ethical value of solidarity (see Box 5.7).

[479] Oxfam International (2008) *Another inconvenient truth: how biofuels policies are deepening poverty and accelerating climate change*, available at: http://www.oxfam.org/sites/www.oxfam.org/files/bp114-inconvenient-truth-biofuels-0806.pdf, p27.

[480] World Bank (2010) *Brazil country brief*, available at: http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/LACEXT/BRAZILEXTN/0,,menuPK:322351~pagePK:141132~piPK:141107~theSitePK:322341,00.html#economy.

[481] Convention concerning Forced or Compulsory Labour; Convention concerning Freedom of Association and Protection of the Right to Organise; Convention concerning the Application of the Principles of the Right to Organise and to Bargain Collectively; Convention concerning Equal Remuneration of Men and Women Workers for Work of Equal Value; Convention concerning the Abolition of Forced Labour; Convention concerning Discrimination in Respect of Employment and Occupation; Convention concerning Minimum Age of Admission to Employment; and Convention concerning the Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labour.

[482] In this report, 'fair trade' is used as a generic term, while 'Fairtrade' relates to the Fairtrade brand and movement.

Box 5.7: Fairtrade schemes

There is no universally agreed definition of fair trade but the Fairtrade Labelling Organizations (FLO) International uses the following broad definition: "Fairtrade is an alternative approach to conventional trade and is based on a partnership between producers and consumers. Fairtrade offers producers a better deal and improved terms of trade."[483] Our Principle of just reward, including fair trade, relates to the creation of greater solidarity between consumers and producers and is embodied in this definition, but the 'Fairtrade' movement has also made a significant effort to incorporate this Principle into certification schemes.

Since the 1980s there has been a rapid growth in certification schemes run by not-for-profit Fairtrade labelling organisations. In 1997, a process of convergence among labelling organisations led to creation of FLO International, an umbrella organisation whose mission is to set the Fairtrade standards, to support, inspect and certify disadvantaged producers, and to bring clarity to the Fairtrade message globally.

In 2002, FLO launched for the first time an International Fairtrade Certification Mark. The goals of the launch were to improve the visibility of the Mark in supermarket shelves and facilitate trade for Fairtrade products. Fairtrade certification schemes are now used for dozens of products, including coffee, tea, rice, bananas, cotton, sugar, honey, quinoa and nuts.

Yet, Fairtrade certification schemes have been criticised by a variety of researchers and commentators for a number of reasons. The *Financial Times* found that the certification was often being used by non-certified producers[484] and that some wage workers were hired by Fairtrade producers who were in violation of the minimum wage and Fairtrade standards.

The Adam Smith Institute claimed in 2008 that Fairtrade has had little impact on the percentage of final sale value ending up with producers, as only 10 per cent of the Fairtrade premium for a cup of coffee at a popular coffee chain goes to purchase Fairtrade coffee beans instead of standard beans.[485]

Some Fairtrade supporters[486] have noted that large certification schemes tend to favour larger producers. The Fairtrade brand can in some circumstances undermine essential broader principles such as the building of solidarity between consumers and producers and shortening supply chains between them. Thus, while trade principles that are fair should apply to procurement of feedstocks for biofuels, care should be taken before endorsing particular certification schemes.

5.60 Given the limitations of current Fairtrade schemes, it is not clear that their simple application is useful and sufficient. Instead, trade principles that are fair should be incorporated into the efforts described under the other Principles above to establish sustainable biofuels production, for example as part of certification. These principles should respond to the particularities of biofuels value chains and also correspond with some of the complexities of competing and often contradictory goals and systems of governance that currently drive investment in biofuels.

5.61 Generating multidimensional certification for the fair trade of biofuels represents an important step towards ensuring the environmental, economic and developmental sustainability of global trade in biofuels.[487] As yet, no internationally agreed biofuels fair trade principles exist. There are examples of nationally agreed principles, notably in Brazil with its 'Social Fuel Seal' for biodiesel,[488] and there may be lessons to be learnt from this case. Lessons may also be drawn from fair trade principles in other contexts, but in many ways biofuels will be more difficult to certify as 'fair trade' given the range of impacts and implications involved. Impacts are often subjective, little understood and difficult to assess and we need to understand the complexities

[483] Fairtrade International (2011) *What is Fairtrade?*, available at: http://www.fairtrade.net/what_is_fairtrade.0.html.
[484] The Financial Times (8 Sep 2006) *The bitter cost of 'fair trade' coffee*, available at: http://www.ft.com/cms/s/2/d191adbc-3f4d-11db-a37c-0000779e2340.html.
[485] Sidwell M (2008) *Unfair trade*, available at: http://adamsmith.org/images/pdf/unfair_trade.pdf, p11.
[486] Such as The Lorna Young Foundation and Fairtrade entrepreneurs Jurang.
[487] Woods J and Diaz-Chavez R (2007) *The environmental certification of biofuels: discussion paper no. 2007-6*, available at: http://www.fao.org/uploads/media/0712_Joint_transport_research_centre_-_The_environmental_certification_of_biofuels_-_DiscussionPaper.pdf.
[488] The Brazilian Ministry of Agrarian Development issues the 'Social Fuel Seal' to biodiesel producers who promote social inclusion and regional development by generating jobs and income for family farmers who are part of the Brazilian National Program to strengthen family agriculture; for more details see: Ministério do Desenvolvimento Agrario, Secretaria da Agricultura Familiar (2010) *Biodiesel – o selo combastível social*, available at: http://portal.mda.gov.br/portal/saf/programas/biodiesel/2286313 *[in Portuguese]*.

of developing a system of certifying biofuels as fairly traded and not to rush into making mistakes or mis-calibrations.

5.62 Relevant uncertainties result from the complexity of biofuels supply chains, from methodological and scientific issues, and from differing dynamic societal and environmental interactions. Assessing the net impacts of biofuels production and use on fair trade is thus fraught with difficulty.[489] For example, strict guidelines in Indonesia regarding the use of environmental impact assessments and government regulation of new plantations via licensing and certification are claimed to have had little impact on managing plantation development. A Friends of the Earth report in 2009 points to the existence of 'fast track' licensing, with *de facto* waiving of legal requirements designed to protect the environment and local communities, in favour of securing state income. The report indicates that many companies, including subsidiaries of multinational agribusinesses, have commenced plantations without having secured the necessary approvals.[490]

5.63 Development of global certification of fair trade biofuels needs to take account of the relative capacities of countries to enforce the principles on which fair trade is built. Thinking holistically about the global governance of biofuels in terms of the common good is therefore important and the lack of capacity, blind spots and lack of political will which may hinder the development of fair trade in biofuels will lead to demands for more research, analysis and resources. This issue is not specific to biofuels, and we will come back to it in Chapter 6.

5.64 However, the act of attempting to develop trade principles that are fair will draw attention to crucial issues and it is hoped that it will stimulate new forms of analysis that will be able to inform the development of appropriate certification, regulatory and governance schemes, avoiding some of the existing problems.

Recommendations

5.65 **Current and future biofuels blending targets for the EU and UK need to take a long-term view and promote trade principles that are fair. The effects on developing countries of future changes in targets need to be monitored carefully.**

5.66 **Given the limitations of current Fairtrade schemes, we propose that trade principles that are fair be developed as part of sustainable biofuels certification requirements by EU and national stakeholders, such as the authors of the Renewable Energy Directive and the UK Department for International Development. This needs to happen in a proportionate and flexible way to acknowledge the differences between countries and production systems, while at the same time strictly maintaining the protection of vulnerable populations.**

Intellectual property

5.67 There are many justifications for IP, including natural and human rights, incentive theory and reward theory.[491] Intellectual property regimes operate through a paradox: the public benefit of encouraging new innovations is incentivised by the prospect of private property rights over the self-same innovations. The public interest can therefore be jeopardised if the private rights are exercised in ways that prevent or restrict public access to new goods. Principle 4 seeks to find a

[489] Woods J and Diaz-Chavez R (2007) *The environmental certification of biofuels: discussion paper no. 2007-6*, available at: http://www.fao.org/uploads/media/0712_Joint_transport_research_centre_-_The_environmental_certification_of_biofuels_-_DiscussionPaper.pdf.

[490] Friends of the Earth (2009) *Failing governance – avoiding responsibilities: European biofuel policies and oil palm plantation expansion in Ketapang District, West Kalimatan, Indonesia*, available at: http://www.foei.org/en/resources/publications/pdfs/2009/european-biofuel-policies-failing-governance-avoiding-responsibilities/view, pp13ff.

[491] Hettinger EC (1989) Justifying intellectual property *Philosophy and Public Affairs* **19**: 31–52. See also: MacQueen H, Waelde C, Laurie G and Brown A (2010) *Contemporary intellectual property: law and policy*, 2nd Edition (Oxford: Oxford University Press), chapter 1.

balance between rewarding parties for their innovation and investment while trying to encourage access to knowledge and materials. For example, while human rights support the granting and protection of IP, this cannot come at the cost of other fundamental rights. Moreover, although solidarity demands that knowledge be shared, a way must also be found to support the holders or generators of this knowledge.

5.68 For biofuels in many cases, financial return will only be possible after the investment of very large sums of money in the development of biofuels products, infrastructure and facilities. Intellectual property will undoubtedly play a key role in attempts to secure such a return. The two most relevant intellectual property rights (IPRs) are likely to be: patents over novel inventions that make technical or industrial contributions to human knowledge; and plant variety rights which may be used to protect a new plant variety specifically bred for its use in biofuels production (see Box 5.8).

Box 5.8: Patents and plant variety rights

Patents

Intellectual property offices around the world assess broadly similar criteria to determine whether a new invention is worthy of patent protection.[492] The Patents Act 1977 was enacted to bring the UK in line with the European Patent Convention and these instruments in turn reflect the obligations under the World Trade Organization's (WTO) Agreement on Trade Related Aspects of Intellectual Property Rights[493] (TRIPs). This sets criteria and minimum standards for IP protection to be adopted by WTO members through national legislation. The objective of the TRIPs Agreement is to strengthen and harmonise intellectual property rights around the world. In particular, article 27 requires that patents shall be available for any inventions in all fields of technology.[494]

The areas of biofuels development most likely to attract patents are lignocellulosic or algal developments, or new process technologies for the more efficient development of biofuels from currently used sources. In 1998, the European Parliament passed the Directive on the legal protection of biotechnological inventions, commonly known as the Biotechnology Directive.[495] This Directive sought to clarify the patentability of inventions in the field of biotechnology, including inventions involving plants, by providing clear and effective legal protection.[496] The problem had been that patent law specifically excludes protection for "plant…varieties or essentially biological processes for the production of plants".[497] The Directive and related case law now make it clear that patentability is only excluded with respect to plant varieties as such or to processes for their production consisting entirely of natural phenomena.[498]

The TRIPs Agreement reflects this exclusion in that plants may be excluded from patent protection. However, it goes on to require that, in such circumstances, plant variety protection must be offered by means of a *sui generis* (bespoke) system.[499] Moreover, TRIPs allows for patents and plant variety rights to coexist in countries that so wish. Thus, in another paradox, from a potential exclusion is born the possibility of cumulative protection.[500]

Plant variety rights

Advanced plant breeding strategies as outlined in Chapter 3 could lead to the development of new plant varieties with improved traits suitable in the production of biofuels. These new varieties may be protected under the provisions of the UK Plant Varieties Act 1997.[501] At the EU level, new varieties may be protected under the Community Plant Variety Right

[492] These are that the invention must: i) be novel, in the sense of not having been previously available to the public; ii) demonstrate an inventive step, in the sense that the invention is not obvious to an expert in the field; and iii) demonstrate industrial applicability/utility, in the sense that it can be made or used in a technical field.
[493] Agreement of Trade Related Aspects of Intellectual Property Rights of 1994.
[494] Ibid, art 27.
[495] Directive 98/44/EC of the European Parliament and of the Council of 6 July 1998 on the legal protection of biotechnological inventions, [1998] OJ L213/13.
[496] The implementation of the Directive has not been without controversy; see for example: Llewelyn M and Adcock M (2006) *European plant intellectual property* (Oxford: Hart Publishing).
[497] Directive 98/44/EC of the European Parliament and of the Council of 6 July 1998 on the legal protection of biotechnological inventions, [1998] OJ L213/13, recital 9.
[498] Bostyn SJR (2009) How biological is essentially biological? The referrals to the enlarged Board of Appeal G-2/07 and G-1/08 *European Intellectual Property Review* **31**: 549–58. The Enlarged Board of Appeal at the European Patent Office in December 2010 has now provided further clarification on the meaning of "essentially biological processes"; see: European Patent Office (2010) *No European patents for essentially biological breeding processes*, available at: http://www.epo.org/topics/news/2010/20101209a.html.
[499] Agreement of Trade Related Aspects of Intellectual Property Rights of 1994, art 27(3).
[500] Westkamp G (2003) TRIPS principles, reciprocity and creation of sui generis types of intellectual property rights for new technology *The Journal of World Intellectual Property* **6**: 827–59.

Regulation.[502] This allows plant breeders to apply for a single EU-wide right to protect their varieties and potentially gives considerable control over the entire European market.

In order to meet their international obligations under TRIPs, some countries joined the International Union for the Protection of New Varieties of Plants (UPOV) and implemented either the 1978 or 1991 versions of the Convention.[503] Other countries have implemented their own plant variety right protection legislation. Few African or Asian countries are members of UPOV[504] and have instead implemented their own plant variety right protection legislation.

5.69 Both the plant variety right and patent regimes can provide a reward for innovation which, at least in part, meets the requirements of Principle 4. Additionally, both regimes contain mechanisms that can help towards the sharing of knowledge and balance the various rights and interests in IP to ensure a just reward.

Balancing rights and interests in intellectual property

5.70 Intellectual property regimes are full of tensions and political agendas. As the above discussion demonstrates, there has been a tendency towards more and stronger IPRs over the years. Moreover, there is a need for bilateral free trade agreements (FTAs) to help states compete in the world market. Intellectual property rights are specifically addressed within these agreements. All EU FTAs seek to strengthen IP legislation, especially in areas such as enforcement, beyond that required by the TRIPs Agreement. This is a common negotiating tactic of developed countries when dealing with developing or least developed countries. These so-called TRIPs-Plus provisions may limit further the latitude that developing countries have under the TRIPs Agreement in implementing IP legislation.[505]

5.71 It is unrealistic and probably economically imprudent to suggest that the number or scope of IPRs should be reduced. A better approach is to recognise the distinction between the existence and the exercise of IPRs. Thus, whereas IP might be claimed over plant varieties, it is important to note that certain flexibilities nonetheless arise which limit the ways in which IPRs can be used against third parties. For example, plant breeders' rights are not infringed by acts done with the objective of breeding, discovering or developing new varieties (although it is likely that a patent over the same material would be infringed). Another approach is to influence the way in which IP is exploited – which is done principally through the grant of licences.

Challenges for the future: the sharing of knowledge – licensing

5.72 A balance between the sharing of knowledge and access to information may best be achieved through appropriate control of licensing practices (see Box 5.9).

Box 5.9: Licensing instruments

Compulsory licence
Under the UK Patents Act 1977, a compulsory licence may be granted in certain restricted circumstances where the public interest is being undermined by the patent holder's behaviour, notably the refusal to use or to license an invention. However, the criteria are strict and the overriding concern has been not to fetter the rights of the patent holder. Accordingly, such licences are rarely, if ever, granted.

Under WTO law, article 31 of TRIPs allows member states to grant compulsory licences where it is in the public interest to

[501] Plant Varieties Act 1997. The criteria for granting protection are that the plant variety must be: i) distinctive; ii) uniform; and iii) stable. It must also be new but in ways far less stringent than those tested under patent law, s4(2) Plant Varieties Act 1997.
[502] Council Regulation (EC) No 2100/94 of 27 July 1994 on Community plant variety rights, [1994] OJ L 227/001.
[503] International Union for the Protection of New Varieties of Plants of 1978 and 1991, Conventions available at: http://www.upov.int/en/publications/conventions/index.html. Countries wishing to join to the 1978 Convention had to deposit an instrument of accession before the first anniversary of the entry into force of the 1991 Convention. All countries wishing to become a member of UPOV must now accede to the 1991 Convention.
[504] International Union for the Protection of New Varieties of Plants (2011) *Members of the International Union for the Protection of New Varieties of Plants*, available at: http://www.upov.int/export/sites/upov/en/about/members/pdf/pub423.pdf.
[505] Matthews D (2010) The Lisbon Treaty, trade agreements and the enforcement of intellectual property rights *European Intellectual Property Rights* **32:** 104–12.

do so. The applicant for such a licence has to comply with a number of qualifying criteria before a licence will be granted. Some of these conditions may be waived in the case of a national emergency or other circumstances of extreme urgency. There has been a lot of debate as to what these terms actually mean and when these provisions can be used.

The Doha Declaration[506] helped to clarify what is meant by "a national emergency or other circumstances of extreme urgency".[507] The Declaration means that each member has the freedom to determine what constitutes a national emergency or circumstances of extreme urgency. The Declaration is also important in that it is now recognised that emergency may not be a short-term problem and measures may be adopted and maintained as long as the underlying situation persists. This has important implications for compulsory licensing of climate change technology including biofuels.

Exclusive licence
An exclusive licence typically grants the licensee an exclusive territory or an exclusive set of customers. The effect is to exclude the licensor either from that geographical territory or those customers for however long the licence lasts.

Sole licence
If the licence is a 'sole licence', this means the licensee is the only licensee in that territory or for that group of customers. This is different from an exclusive licence where the licensor themselves will not compete. Sole licences mean that the licensor remains free to compete with the licensee but simply that other licensees will not be granted.

Non-exclusive licence
A non-exclusive licence leaves the licensor free to compete or appoint other licensees in the territory without restriction.

Cross-licence
In the realms where dual protections exist and where it is not possible to proceed with work in one section without fear of violating an IPR in another, the Biotechnology Directive, article 12 provides for the grant of non-exclusive compulsory cross-licences.

5.73 Many consider compulsory licence provisions as a form of safety valve within IP law, simply designed to moderate the excessive demands of licensors. The compulsory license system is too complex and confrontational to be used except in extreme circumstances to gain access to technology. There is little support in practice for such indiscriminate use of compulsory licences, and this is also the view of the Council. However, more imaginative uses of licensing are possible.

5.74 Contrary to much speculation and despite a few high profile cases, there is little strong evidence to suggest that IPRs holders are using their rights aggressively and in ways that are having a chilling effect on the public interest. This is not to suggest that problems do not exist with how IP is exploited, but it does indicate that there is hope for the way forward. For example, the Organisation for Economic Co-operation and Development (OECD) has produced a set of guidelines which outline principles and instances of best practice for licence agreements, particularly the use of non-exclusive licences.[508] The guidelines provide a template to help frame balanced and acceptable licensing terms when there are competing interests or inequity in terms of bargaining power. They outline key considerations that licensing agreements should address, such as encouraging rapid dissemination of information, fostering innovation, ensuring opportunities for all parties to obtain returns and providing certainty over the scope of the licence, the rights associated with the technology and the ownership of rights arising from any research using the technology. In addition, they suggest a variety of approaches to the payment of royalties that take into account the financial burden falling on the licensee over the lifetime of the licence. The widespread use of non-exclusive licences which utilise the principles and best practices outlined in the OECD report should be encouraged in the area of biofuels. The recommendation that continuous monitoring of practices and a stronger economic evidence base for the impact of IPRs should also be adopted.

[506] Doha Declaration of 2001 G-77/SS/2005/1.
[507] Agreement of Trade Related Aspects of Intellectual Property Rights of 1994, art 31b.
[508] Organisation for Economic Co-operation and Development (2006) *Guidelines for the licensing of genetic inventions*, available at: http://www.oecd.org/dataoecd/39/38/36198812.pdf.

5.75 A more recent report suggests that the challenges do not lie with IP alone. In *Patents and Clean Energy*,[509] many companies involved in clean energy technology were described as willing to offer more flexible licensing terms (including monetary ones) to entities based in developing countries but did not do so owing to a number of factors such as transaction costs, challenges in identifying a suitable partner and mutually agreed licensing conditions (i.e. pricing and the geographical or exclusive scope of the agreement), and other market conditions.

5.76 The exercise of IPRs through an array of licensing practices can not only provide rights holders with the ability to achieve a return on their investment but also ensure and encourage access to these inventions. While there is no optimum single model for licensing, the environment and manner in which rights holders choose to carry out such activities has and will increasingly have implications for future research, development, access and dissemination of biofuels-related technology. The ethical responsibility with which these practices are approached can be better discharged by considering how far and how well draft licensing agreements reflect the core principles of this report.

Challenges for the future: the sharing of knowledge – research exemption

5.77 The freedom to pursue scientific research and to enjoy the benefits of scientific progress are explicitly recognised as human rights.[510] Where these conflict with IPRs, it raises questions about how well existing systems strike an appropriate balance.

5.78 Advanced plant breeding strategies, such as those described in Chapter 3, may lead to the development of new plant varieties which can be protected by plant variety rights. The plant variety rights regime meets our requirements for Principle 4, in that it provides a reward for innovation but permits access to the result of that innovation.

5.79 One of the cornerstones of a plant variety rights system is the breeders' exemption.[511] The exemption allows breeders to use protected material for the purpose of breeding other varieties without the authorisation of the plant variety right holder. This exemption was included because it was considered in the public interest to allow breeders free access to plant material in order to breed new varieties. Where this research leads to a new variety, the breeder of the new variety can claim rights over it without having to obtain permission from the first breeder. The exception to this exemption is where the new variety is considered to be an essentially derived variety.

5.80 This is not the case under patent law. The right to use patented material for research purposes only applies where those acts are regarded as private, non-commercial use and experimental. The interpretation of the research exemption is notoriously uneven between countries although the tendency is towards a very narrow construction; generally speaking, any research for commercial purposes will be seen as infringing the patent. Accordingly, patent law does not permit the same level of access to knowledge and products as seen under the plant variety rights provisions.

5.81 In France and Germany, the breeders' exemption from plant variety law has been integrated into patent law via the research exemption allowing the use of biological material for the purpose of breeding, discovering and developing a new plant variety.[512] The Netherlands is soon to adopt the same approach. The introduction of the breeders' exemption into UK patent law would go some way to striking the balance required by Principle 4.

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[509] United Nations (2010) *Patents and clean energy: bridging the gap between evidence and policy – final report*, available at: http://www.epo.org/topics/issues/clean-energy/study.html.

[510] International Covenant on Economic, Social and Cultural Rights of 1966, art 15.

[511] International Convention for the Protection of New Varieties of Plants of 1991, art 15.

[512] Unlike the breeders' exemption, however, it does not extend to the subsequent commercial use. Thus, a new plant or plant variety that still possesses the specific characteristics of the patented plant can only be brought to market after a licence has been obtained. If the patent holder is unwilling to grant a licence, the breeder may obtain a compulsory licence under the condition that the patent holder is entitled to a cross-licence on the protected variety.

Recommendations

5.82 **We recommend the drafting and adoption by the UK Intellectual Property Office of a licensing scheme and a framework of biofuels principles and best practices along the lines of the Organisation for Economic Co-operation and Development guidelines.**

5.83 **We recommend increasing the availability of licensing arrangements with respect to biofuels technologies and more research on the economic and social impacts of intellectual property in these fields.**

5.84 **We recommend to the UK Department for Business, Innovation and Skills and the Intellectual Property Office the introduction of the breeders' exemption into UK patent law.**

Principle 5: Equitable distribution of costs and benefits

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

> **"Since the private sector is much weaker in developing countries than in developed, the governments in developing countries should particularly stimulate public-private partnerships"**[513]
>
> **"A recent study from Tanzania [IIED (2009) *Biofuels, Land Access and Rural Livelihoods in Tanzania*], for example, shows that with due recognition of local contexts biofuel companies using out grower and other contracted smallholder arrangements have little direct negative impacts on land access and represent a more positive model for the environment and local livelihoods…Foreign firms can contract local small farmers to grow crops for them, providing farmers with more security and predictability than from simply selling crops on open markets."**[514]

5.85 Developing policies to ensure that the costs and benefits of biofuels are distributed in an equitable way is not straightforward. First of all, it is important to note that costs and benefits relevant to equity extend well beyond purely financial losses or revenue. The costs and benefits of biofuels production may be complex and interrelated and accumulate in different ways in different contexts. For example, depending on how one chooses to model GHG emissions, climate change mitigation benefits may accrue immediately, several hundred years from now, or not at all. One must also make distinctions between benefits that might be described as public goods and benefits which may accrue to only certain segments of society in certain parts of the world – a sufficient supply of liquid transport fuel is one example.

5.86 As laid out in Chapter 4, there are strong reasons to consider the reduction of GHG emissions as a benefit and reducing the rate of global warming may be described as a common good. The specific benefit of this common good, however, needs to be offset against the burdens on some segments of society to enable this to happen. For example, investment in biofuels to reduce GHG emissions may lead to food insecurity or pose livelihood implications for only certain, invariably poorer or more vulnerable, parts of society (see Principle 1).

5.87 The inherent complexity of global biofuels value chains and uncertainty about their impacts make it difficult to develop universal policy aimed at shared costs and benefits. Many agro-food systems and global value chains share costs and benefits in broadly similar ways: risks are generally disproportionately borne by the basic feedstock producer due to the institutional arrangements that govern the relationships in the chain. The power to shape these institutional arrangements is usually held further along the chain away from the locus of production, and this power has been progressively strengthened as particular actors, supermarkets for example, gain control over more elements of the chain.

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[513] International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), responding to the Working Party's consultation.
[514] Dr Thomas Molony, Centre of African Studies, University of Edinburgh, responding to the Working Party's consultation.

5.88 Costs and benefits may range from proximate to structural, and from environmental to political, social or economic, and there will invariably be trade-offs in conceptualising policy that aims to distribute costs and benefits equitably. It is more realistic to aim to ensure that policy concerned with the common good aims broadly to maximise benefits and reduce costs, while ensuring that additional inequities are not created in an already inequitable world.

Biofuel-specific policies

5.89 Although the RED endeavours to address most of our Principles discussed so far in some – albeit sometimes inadequate – way, the issue of equitable cost–benefit distribution is not specifically included. Moreover, Principle 5 is the only one of our Principles which is not, in some specific way, addressed in initiatives to develop and establish biofuels sustainability standards and certification mentioned above. This is surprising since most issues discussed in this chapter could also be framed in terms of costs, benefits and equity.

5.90 The RED and other policies incentivising biofuels production have potential impacts that could lead to violations of equity in cost–benefit distribution. For example, if a developing country invests heavily in slow-growing feedstocks such as jatropha, which has been heralded to help fulfil GHG emissions savings requirements, and these are then superseded or deemed less important through changes in policy, the country could incur significant costs that are not captured by current policies.[515] Developing countries and their farmers will be ill-equipped to become competitive quickly in other land use activities or by using other forms of biofuels production. Moreover, some of the new biofuels promoted through the RED may remove a comparative advantage of many developing countries, i.e. that those located in the tropics they can produce biomass more quickly and efficiently. New biofuels, such as those discussed in Chapter 3, may rely on advanced technologies to which developing countries may not have access. Policies need to ensure that new technologies and innovations are readily available to all and this will require the involvement of developing countries in the actual development of these technologies.

Challenges for the future: international setting

5.91 One of the key challenges for policies designed to support equitable cost–benefit sharing is the current skewed distribution of power, resources, resilience and options that characterises global agricultural (and other) production chains. These shape different goals, aspirations and interests so that it will be impossible to develop policies that will not face opposition or require trade-offs that are unpalatable to some stakeholders. Powerful interests will strive to ensure that negative impacts affect those who are relatively powerless. For example, a system where industry consolidates agricultural land to grow biofuels feedstocks in Indonesia benefits fewer people than would be the case for smallholder-led cultivation on the same parcel of land. It is, however, difficult to develop policies to intervene equitably in this scenario as there may be economies of scale in commercialising agricultural production (for example, around jatropha production) that offset the disadvantages of placing production and profits in the hands of relatively fewer people.

5.92 Multiple trade-offs between different costs and benefits and the people they impact upon, some of which are little understood or not yet identified, mean that policy will invariably generate inequities unless it is itself similarly complex and nuanced. There are very few examples of policies avoiding such consequences entirely. The RED aims to generate European benefits, reducing GHG emissions without seriously impacting on the energy consumption and lifestyle patterns of European citizens. It does not aim to give equal weight to the implications within the countries that produce feedstocks and biofuels for that market. At best, there could be indirect implications for economic equity through biofuels pricing which could be promoted by the RED.

[515] To some degree, this is also true for perennial biomass crops such as willow, poplar, miscanthus and switchgrass which take approximately four years before yields are obtained.

5.93 A key concern regarding the equitable international distribution of biofuels benefits is to ensure appropriate management of global versus local production. As a global market in feedstocks and biofuels develops, it is likely that commodities will be drawn towards developed regions of the world to meet their populations' needs. There are many examples of successful, small-scale, local biofuels initiatives that provide energy, income and livelihoods in fuel-poor locales not connected to mains electricity, for example in rural Mali,[516] and these examples of positive developmental impacts may be lost if policies are geared to the internationalisation of biofuels markets as in the RED's targets. Policies that encourage biofuels production therefore need to balance production for local needs and production for international markets.

5.94 Policies that encourage the development and adoption of appropriate technologies, for example small-scale biorefineries, are relevant in many contexts. National and international policies focused on energy security and lowering GHG emissions should include mechanisms to encourage local biofuels production and consumption where this is helpful, serving local needs as well as serving the needs of the developed world. Likewise, policies are needed that encourage smallholder and outcropper production of feedstocks in a sustainable way, particularly in developing countries which suffer from fuel poverty. Policies should recognise that, while there may be economies of scale and efficiencies in commercialising and centralising feedstock production, this can sometimes limit local livelihood benefits. The relatively high cost of processing encourages centralised production, but encouraging the development of, for example, small-scale biorefineries can encourage smallholders to derive income from feedstock production, delivering many additional local benefits that are not recognised in global equations. Echoing some thoughts expressed in the introduction to this chapter, it is also important to recognise that policies aimed to ensure sustainable industrial production, such as, for example, certification, have to be wielded with care, lest they impose inappropriate 'red tape'. Where local small-scale production serves important needs, such as providing energy which would otherwise not be available, certification should allow for exceptions in order not to stifle such essential production and disadvantage small-scale producers in poor countries. (Of course, biofuels for export, for example into the EU, would always need to adhere to international certification.)

5.95 Similar thoughts can moreover apply to the developed world: a decentralised model of refining where a refinery works with local networks of feedstock suppliers could have infrastructural advantages of flexibility in the UK and should not be discouraged.

Challenges for the future: public–private partnerships and product-development partnerships

5.96 Public–private partnerships (PPPs) constitute one mechanism for risk sharing and developing technologies and products that correspond to the needs of a variety of stakeholders in developing countries as well as those in the EU and US. Another benefit-sharing model which could inform approaches to biofuels is the private/public product-development partnership (PDP) which has been successful in public health and healthcare, for example in drug development for HIV/AIDS or vaccines for malaria in developing countries. A very successful example of this is the public–private initiative to distribute HIV/AIDS medicines in Botswana.[517] Botswana, which has one of the highest HIV infection rates in the world, has seen active investment by its government into HIV research and drug development, mainly together with major international PPPs involving foreign donors. A well-known example of this is the African Comprehensive HIV/AIDS Partnership, which was established in 2000 between the Government

[516] Practical Action Consulting (2009) *Small-scale bioenergy initiatives: brief description and preliminary lessons on livelihood impacts from case studies in Asia, Latin America and Africa*, available at: ftp://ftp.fao.org/docrep/fao/011/aj991e/aj991e.pdf, pp51–5.

[517] Ramiah I and Reich MR (2005) Public-private partnerships and antiretroviral drugs for HIV/AIDS: lessons from Botswana *Health Affairs* **24**: 545–51.

of Botswana, the Bill & Melinda Gates Foundation and the Merck Company Foundation. With help from these and other partners, Botswana has established one of Africa's most comprehensive programmes of HIV/AIDS prevention and treatment. By 2008, more than 80 per cent of those in need were receiving treatment.[518]

5.97 It is important to acknowledge that such models are much less common in the area of energy technologies. Partnership approaches have been advocated by some developing countries during international climate change negotiations. For example, a network of Climate Innovation Centres has been suggested for India.[519] They have also been at the forefront of calls for compulsory licensing of some low carbon technologies – a suggestion that industrialised country governments and firms have strongly resisted. However, unlike in health care, there has not yet been significant agreement to implement such proposals. Some pilots of the Climate Innovation Centre concept are under way with funding from the UK Department for International Development.

5.98 Where they exist, these partnerships involve public–private interaction between sometimes multiple stakeholders, opening up new innovation pathways in areas where there are barriers to development such as market failures or lack of incentives for commercial development. They help to bridge the gaps between established institutions and actors to achieve what they cannot bring about in isolation, "building collective capacity to respond to turbulent conditions as creative solutions are needed that exceed the limited perspectives of each individual partner".[520]

5.99 With appropriate adaptation to local contexts and the policy areas involved in biofuels, such PPPs could be envisaged for biofuels. With biofuels, development faces the difficulty of integrating the interests of many international stakeholders from several sectors while protecting the environment as well as the interests of the poorer populations affected. Moreover, national and international policies intersect in biofuels development in many ways, for example agricultural policy, climate change policy and trade regulation, and PPPs could be a vehicle for developing biofuels in the interests of multiple stakeholders dealing with a complex institutional and organisational environment. Funding for biofuels is already distributed between public and private stakeholders (see Box 5.10), and this setting could be a launch pad for PDPs. However, it is important to acknowledge that progress so far in implementing arrangements of this nature for low carbon technologies – at least under the official umbrella of the United Nations (UN) Framework Convention on Climate Change – has been very limited, and there is much need for improvement.

Box 5.10: Public and public/private funding for biofuels: examples

BSBEC (UK)

- The BBSRC Sustainable Bioenergy Centre (BSBEC) brings together six research groups and 14 industrial partners. Funding totals £24 million, of which industrial partners contribute around £4 million, and the remainder comes from Research Councils UK.[521]

European Biofuels Technology Platform (EU)

- The European Biofuels Technology Platform proposed the creation of the European Industrial Bioenergy Initiative (EIBI), which has been launched in November 2010.[522]

[518] Republic of Botswana, Ministry of State President, National AIDS Coordinating Agency (2008) *2008 progress report of the national response to the UNGASS Declaration of Commitment on HIV/AIDS*, available at: http://www.unaids.org/en/dataanalysis/monitoringcountryprogress/2010progressreportssubmittedbycountries/2008progressreportssubmittedbycountries/botswana_2008_country_progress_report_en.pdf.

[519] Sagar AD, Bremner C and Grubb M (2009) Climate Innovation Centres: a partnership approach to meeting energy and climate challenges *Natural Resources Forum* **33**: 274–84.

[520] Saad M, Rowe K and James P (1999) Developing and sustaining effective partnerships through a high level of trust, in *Public and private sector partnerships: furthering development*, Montanheiro L, Haigh B, Morris D and Linehan M (Editors) (Sheffield: Sheffield Hallam University Press), p498.

[521] BBSRC Sustainable Bioenergy Centre (2010) *About us*, available at: http://www.bsbec.bbsrc.ac.uk/about/index.html.

- The EIBI would select and fund demonstration and/or reference plants projects, with a budget of €6–8 billion over 10 years. Both public and private research and development capability in the EU would be focused on achieving EU strategic objectives.
- The main outcomes would include developing EU use of sustainable biomass resources adjusted to local context, and stimulating education and training in the related scientific and technological areas.

Energy Biosciences Institute (US)

- The Energy Biosciences Institute (EBI) is working on the development of 'next-generation biofuels' (e.g. produced from dedicated energy crops), as well as various applications of biology to the energy sector.[523]
- EBI is a collaboration between the University of California, Berkeley, the Lawrence Berkeley National Laboratory, the University of Illinois at Urbana-Champaign and BP, which has committed to support the Institute with a 10-year, 500 million USD grant.

Recommendations

5.100 **We recommend that biofuels policy and future sustainability and certification initiatives should not discourage decentralised biofuels production, particularly in developing countries that suffer from fuel poverty.**

5.101 **Protection against the imposition of unfair costs on vulnerable populations should be developed and implemented.**

5.102 **Policy instruments, such as innovation incentives, bilateral agreements between the UK and other countries, and project funding, should be developed and implemented to ensure that benefits of biofuels production are shared equitably. This could, for example, be done through public–private or product-development partnerships. National instruments should be implemented with the help of governmental departments such as the UK Department for International Development and Department of Energy and Climate Change. International organisations such as the United Nations Framework Convention on Climate Change could oversee international schemes.**

[522] European Biofuels Technology Platform (2010) *European Industrial Bioenergy Initiative (EIBI)*, available at: http://www.biofuelstp.eu/eibi.html.

[523] Energy Biosciences Institute (2010) *EBI at-a-glance*, available at: http://www.energybiosciencesinstitute.org/index.php?option=com_content&task=blogsection&id=2&Itemid=3.

General policy instruments

5.103 So far, we have looked at specific policies under each of the ethical principles. In addition to these biofuels-specific instruments, a wider policy background is relevant to meeting our Ethical Principles in biofuels systems. Many of these policies are international. They operate at different levels, have different status and interact in complex ways with national legislative systems. They include: guidelines for research and development; the World Trade Organization (WTO) law that includes environmental and trade standards; environmental sustainability and biodiversity standards; land law to protect property rights; formal schemes/practices (e.g. fair trade schemes); and direct innovation promotion policies. Some of these general policies can have problematic effects on biofuels development, while others – if enforced – could help to avoid some of the ethical problems. Below, we discuss some examples to illustrate the complexity of the general policy background for biofuels, and make some recommendations for improvement.

Guidelines for research and development

5.104 The oversight of research and development relevant to biofuels differs greatly internationally, and among the many fields involved, including, for example, agricultural science, climate science and biotechnology. Academic research in the UK will be covered by general ethical requirements but so far there is little in the way of ethical guidance on the various fields of research relevant to biofuels, despite the fact that research outcomes can be important elements in either causing or mitigating some of the ethical problems discussed in previous chapters and above. Existing academic ethical guidelines are probably sufficient for early-stage academic research where it is unclear what the basic research outcomes are going to be. However, once basic research outcomes have been clarified, i.e. at the development stage of proof-of-concept, our ethical framework could be used as a checklist or benchmark for considering whether a technology has the potential to violate one of our Ethical Principles. It is a challenging, forward-looking activity to try to assess the potential impacts of research outcomes on human rights, food security, the environment and GHG emissions, as well as effects on just reward and the fair allocation of benefits and harms. We believe, however, that such assessments will be increasingly necessary (see discussion in Chapter 6), and that they could aid the decision making of those stakeholders who take the technology towards further development and implementation (e.g. industry and governments). In the future, ethical impact assessment could become a requirement of larger research grants aimed at bringing technologies into wider commercial use.

5.105 **We recommend to research councils, funders and managers that work should be undertaken to evaluate the likely ethical effects of implementing particular biofuels technologies on a larger scale. This should happen at the stage of proof of concept. In the future, ethical impact assessment should become a requirement of larger research grants aimed at bringing technologies towards wider commercial use.**

WTO law

5.106 WTO law, insofar as it relates to the environmental sustainability of biofuels (Principle 2) (see Box 5.9), can make the application of policies designed to implement environmental sustainability standards for biofuels potentially difficult (see Box 5.11). Moreover, it is hard to predict whether and how current conflicts between trade law and sustainability standards will be resolved. Concerns about being accused of discrimination under WTO law may make some countries wary of applying strict sustainability standards. On the other hand, there exist measures within WTO law[524] that could be called upon in support of sustainability standards.

[524] General Agreement on Tariffs and Trade (GATT 1947).

Box 5.11: WTO law and biofuels

Two WTO agreements are pertinent to sustainability standards. The Agreement on Technical Barriers to Trade (TBT) deals specifically with mandatory technical regulations and voluntary standards, and the General Agreement on Tariffs and Trade (GATT) covers trade in goods. The TBT Agreement aims to ensure that standards do not result in barriers to international trade.[525] It prohibits discrimination against and between foreign products and the application of standards that are more trade restrictive than necessary. The GATT applies to a broader range of measures but contains similar rules.[526]

Discrimination can be said to occur if a member state makes a distinction between what are called "like products".[527]

It could be argued that different biofuels are "like products" even if manufactured through different processes, one being less sustainable than the other. Thus, in the course of applying Principle 2, member states could conceivably be infringing WTO law by refusing one biofuel over another. However, it is not clear whether different biofuels would be considered like or not.

Land use policy

5.107 A further important concern of relevance to the protection of human rights, the environment, climate change mitigation and the equitable distribution of relevant costs and benefits – and thus to almost all our Ethical Principles – are land use policies. Developing a coordinated approach to global land policy not only in relation to biofuels but also more generally is constrained by the principle of national sovereignty over resources, including land, enshrined in the core treaties of the Universal Declaration of Human Rights – the International Covenant on Civil and Political Rights[528] and the International Covenant on Economic, Social and Cultural Rights[529] – and principles of international law. Issues of land policy are sensitive even at the national scale, let alone internationally. Nonetheless, an international approach to land policy was laid out in Chapter 10 of Agenda 21, of the *Programme of action for sustainable development* agreed at the UN Conference on Environment and Development in Brazil in 1992. This chapter, entitled *Integrated approach to the planning and management of land resources*,[530] includes important aspects of land management proposed by the UN Commission on Sustainable Development (CSD).

5.108 In 2000, the CSD called for further government action on integrated land use planning to address, inter alia, issues of tenure and resolve competition among various domestic sectors for land resources.[531] However, this approach largely concentrates on *national* land use policy and seeks to promote equal access and rights to water and other natural and biological resources for all citizens (see Box 5.12).

Box 5.12: Reform of national land policy

Reform of national land policy is currently being promoted on the international development agenda. The African Union has issued a declaration on the need for work on land reform and has produced a fifth draft of a framework and guidance on land policy in Africa.[532] Further guidance on the importance of land reform for equitable development and poverty

[525] Agreement on Technical Barriers to Trade.
[526] General Agreement on Tariffs and Trade (GATT 1947). See also: World Trade Organization (2009) *Trade and climate change*, available at: http://www.wto.org/english/res_e/booksp_e/trade_climate_change_e.pdf.
[527] World Trade Organization (2009) *Trade and climate change*, available at: http://www.wto.org/english/res_e/booksp_e/trade_climate_change_e.pdf, pp106ff.
[528] International Covenant on Civil and Political Rights of 1966, art 1(2).
[529] International Covenant on Economic, Social and Cultural Rights of 1966, art 1(2).
[530] United Nations Development Programme (1992) *Integrated approach to the planning and management of land resources*, available at: http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=52&ArticleID=58.
[531] United Nations Economic and Social Council (2000) *Commission on Sustainable Development: report on the eighth session*, available at: http://www.un.org/documents/ecosoc/docs/2000/e2000-29.htm.
[532] African Union (2009) *Declaration on land issues and challenges in Africa*, available at: http://www.unhabitat.org/downloads/docs/AssemblyDecisionLand.pdf; African Union, African Development Fund and Economic Commission for Africa (2008) *Land policy initiative: a framework to strengthen land rights, enhance productivity and secure livelihoods*, available at: http://www.uneca.org/sdd/events/land-policy/LandPolicyInitiative.pdf.

alleviation has also been produced recently by organisations such as the World Bank, the International Fund for Agricultural Development and the EU. All these institutions recognise that land policy reform needs to be undertaken in a transparent and participatory manner. Land use policy and planning are particularly complex as they involve balancing multiple objectives, multiple alternatives and multiple social interests and preferences.[533] To provide guidance on addressing these challenges, in 1997 the Food and Agriculture Organization of the United Nations (FAO) and UN Environment Programme outlined key issues and set out a strategy for change to assist governments in achieving integrated land management in the report *Negotiating a sustainable future for land*.[534] The FAO has also been working with national governments to build their national capacity to collect data to provide a basis for agro-ecological zoning.[535] The Brazilian agro-ecological zoning policy ZAE Cana, mentioned previously, is designed to restrict agricultural expansion to areas where it will have less environmental impact.[536]

5.109 As for the international context, mechanisms such as certification schemes and comprehensive LCAs that are able to account for different kinds of land use and could help to limit further land conversion are not yet available and are plagued with difficulties of implementation, measurement and monitoring. Despite these difficulties in influencing sustainable land use at the international level, the UN does recognise trans-boundary responsibilities of governments. It notes that governments have a responsibility to ensure that their actions do not cause damage to the environment of other states or to areas beyond national jurisdiction. So, this could potentially provide scope to work on aspects of global land policy. In reality, complex and lengthy negotiations will be required to agree a comprehensive and equitable approach that provides sufficient incentives to encourage implementation.

5.110 In the meantime, developing a harmonised approach to LCA and certification, and supporting fully integrated approaches to spatial planning at the national level that combine both agricultural and environmental aspects, will all begin to address the issue of 'leakage' of unsustainable practices into other areas of agriculture that would otherwise be addressed by internationally coordinated land policies. It is far beyond the remit of our report to make recommendations regarding international land use policies, but we return to this issue briefly in Chapter 6.

General international intellectual property instruments

5.111 The IP regime can play a role in ensuring that the costs and benefits associated with biofuels are distributed in an equitable way. This could be achieved by taking one of the key objectives of the Convention on Biological Diversity (CBD)[537] and integrating it into the IP regime. The most important requirement in the context of our Ethical Principles found within the CBD[538] is that of the fair and equitable sharing of the benefits arising from the use of genetic resources. The CBD articles on access and benefit sharing (ABS)[539] have been translated into the Bonn Guidelines on Access to Genetic Resources and the Fair and Equitable Sharing of the Benefits Arising out of their Utilization[540] (see Box 5.13). The UK has set up a competent national authority that is responsible for ABS arrangements and provides information on such

[533] Bantayan N and Bishop I (1998) Linking objective and subjective modelling for landuse decision making *Landscape and Urban Planning* **43**: 35–48.
[534] Food and Agriculture Organization of the United Nations and United Nations Environment Programme (1997) *Negotiating a sustainable future for land*, available at: http://www.fao.org/fileadmin/templates/nr/images/resources/pdf_documents/negotiat.pdf.
[535] For example, see: Food and Agriculture Organization of the United Nations (2011) *FAO Bioenergy and Food Security (BEFS) Project*, available at: http://www.fao.org/bioenergy/foodsecurity/befs/en/.
[536] Ministério da Agricultura, Pecuária e Abastecimento (2009) *Zonamento Agroecologico de Cana-de-Acucar*, English version available at: http://www.unica.com.br/downloads/sugarcane-agroecological-zoning.pdf.
[537] Convention on Biological Diversity of 1992. There are many other international instruments that can help build on the Principle, including but not limited to the International Convention for the Protection of New Varieties of Plants (UPOV Convention), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR) and the World Intellectual Property Organization (WIPO) instruments. It should be noted that none of these treaties or conventions are specifically aimed at IPRs *and* access and benefit sharing but contain elements that are relevant for an international regime.
[538] The CBD has three core objectives: the conservation of biological diversity; the sustainable use of the components of biological diversity; and the fair and equitable sharing of the benefits arising out of the use of genetic resources.
[539] Convention on Biological Diversity of 1992, art 8(j), 15, 16, 17, 19 and 20.
[540] The Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of Their Utilization of 2002.

arrangements within its jurisdiction.[541] However, so far policy has not brought about any changes within law, including IP law.[542]

Box 5.13: The Convention on Biological Diversity and the Bonn Guidelines

Article 15 of the CBD outlines the requirements for an access and benefit sharing (ABS) system, including those of prior informed consent and the fair and equitable sharing of benefits. However, there was little understanding of the meaning of these terms and the Article provided no detail on how to implement measures to fulfil these requirements in an effective and appropriate way.

After many years of discussion, the Bonn Guidelines – adopted by the parties to the CBD in 2002 – provide a flexible framework, setting out a series of aims, ideals or key features for the practical implementation of an ABS system. The guidelines can be used by contracting parties to introduce effective national legislation to fulfil the requirements for ABS. It could be argued that compliance with the CBD cannot be obtained until national legislation on ABS has been introduced.

The CBD requires a mechanism to facilitate access to plant material while the benefits arising from the utilisation of this material should be shared in a fair and equitable manner.[543] In order to bring this measure in line with Principle 4, a "share of the benefits arising from utilization" should be interpreted as meaning the sharing of benefit arising out of IPRs over the resource. The benefits that arise do not have to be monetary in nature but can include non-monetary benefits such as technology transfer and training projects.

The Bonn Guidelines, although not legally binding, suggest that countries take measures to encourage the disclosure of the country of origin of the genetic resources in applications for IPRs. This is relevant to biofuels particularly where material is sourced in developing countries. The requirement for the disclosure of origin of the genetic resources by those applying for patent protection could be one way of implementing the ABS provisions of the CBD and act as a mechanism to track compliance with these requirements.

5.112 Although the CBD and IP regimes may appear to have very different aims and objectives, many observers believe that the IP regime should support the objectives of the CBD, bringing a coherence to the interrelationship between these international agreements. A submission by the EC and its Member States in 2005[544] expressed the view that the disclosure of origin requirement for genetic resources should be applied to all patent applications. An obligation to disclose the country of origin of genetic resources in IPRs applications could help to trace future claims to access new knowledge or to share in its benefits. The Plant Varieties Act 1997 and the Community Plant Variety Right Regulation (EC/2100/94)[545] both contain a requirement to disclose the origin of the parents of a new variety and geographical origin of the variety itself.[546] There is no equivalent legal requirement in patent law, although some European countries, such as Belgium, have decided to implement the spirit of Recital 27 of the Biotechnology Directive,[547] which has had a similar effect.

[541] Department for Environment, Food and Rural Affairs (2009) *Genetic resources: access and benefit sharing*, available at: http://www.defra.gov.uk/environment/biodiversity/geneticresources/access.htm.

[542] The UK remains committed to the Ninth Conference of Parties' decision to implement an international regime on access and benefit sharing of genetic resources by the Tenth Conference of Parties in 2010, available at: www.cbd.int/doc/world/gb/gb-nr-04-en.doc.

[543] Equity in the CBD has been interpreted to mean unjust enrichment. Unjust enrichment is the principle that one person should not be able to take advantage unfairly of another's situation to earn a benefit that should belong, at least in part, to that other person. Equity law provides that unjust enrichment should lead to fair compensation.

[544] European Community and its Member States (2004) *Disclosure of origin or source of genetic resources and associated traditional knowledge in patent applications: proposal of the European Community and its Member States to WIPO*, available at: http://www.wipo.int/tk/en/genetic/proposals/european_community.pdf. The issue is being discussed again at the Third Intersessional Working Group in March 2011.

[545] Plant Varieties Act 1997; Council Regulation (EC) No 2100/94 of 27 July 1994 on Community plant variety rights [1994] OJ L 227/001.

[546] Section 4 of the Technical Questionnaire for a Community Plant Variety Right includes questions on the origin of the parents of a new variety and geographical origin of the variety itself. This requirement does not apply to all varieties.

[547] Directive 98/44/EC of the European Parliament and of the Council of 6 July 1998 on the legal protection of biotechnological inventions [1998] OJ L213/13, recital 27: "Whereas if an invention is based on biological material of plant or animal origin or if it uses such material, the patent application should, where appropriate, include information on the geographical origin of such material, if known; whereas this is without prejudice to the processing of patent applications or the validity of rights arising from granted patents."

5.113 The disclosure requirement would not affect the granting or enforceability of patents or the validity of rights arising from the patents. The aims of this provision are simply to contribute to transparency with regard to the geographical origin of the genetic source on which the invention is directly based, to help facilitate countries providing genetic resources to monitor compliance with regulations and contracts regarding access to and sharing of benefits from genetic resources, and to bring national policy in line with the Bonn Guidelines.[548] This could help the fair and equitable sharing of the benefits arising from the award of an IPR.

Challenges for the future: the UK and access and benefit sharing

5.114 Biofuels developments will use plants and plant genetic resources from outside the UK and the introduction of a disclosure of origin process in the patent application system in the UK would go some way to meeting the requirements of the equitable distribution of costs and benefits as required by Principle 5. The UK in its role as a competent national authority currently provides information for those seeking access to genetic resources and it also has a role in the monitoring, evaluation and enforcement of ABS agreements. This role could be expanded to include verification of the geographical origin of a resource in any relevant patent application. The competent national authority rather than patent examiners has the capacity required for verification of the information.

Challenges for the future: International access and benefit sharing

5.115 The above policy developments will only cover applicants (both domestic and foreign) seeking access to the UK's genetic resources. Therefore, they will not achieve the benefit-sharing objectives of the CBD internationally. Ensuring the equitable distribution of costs and benefits in biofuels development internationally will require, for example, an international protocol on ABS. In July 2010 at the Ninth Meeting of the *Ad Hoc* Open-ended Working Group on Access and Benefit-sharing of the CBD, agreement was reached on the text of a legally binding protocol on access to, and sharing of, the benefits from the use of genetic resources – the Nagoya Protocol. The draft protocol was finalised and adopted on 29 October 2010.[549] The Nagoya Protocol will open for signature by parties to the CBD from 2 February 2011. The UK should take the lead in ensuring the operation of such an effective global multilateral benefit-sharing mechanism. A successful ABS regime would allow developing countries, in particular, to exploit their genetic resources and reduce possible occurrences of misappropriation of those resources.

5.116 The Nagoya Protocol obliges members to establish clear rules and procedures for requiring and establishing mutually agreed terms on benefit sharing, including those in relation to IPRs. The UK could take a lead by linking the roles of the competent national authority on ABS with that of the IP office. The competent national authority, through the multilateral system, can raise awareness and facilitate access to material that can be used in the research and development of biofuels, while the UK Intellectual Property Office, which is already fast tracking green inventions through the patent system, can take a leading role in monitoring licensing agreements and commissioning research on the impacts of IPRs on technological development and access thereto.[550]

[548] While it is the case in administrative terms that this option would only require a minor change in the law, there is a serious question about whether there is sufficient political will to bring about such a change. A more stringent version of the disclosure of origin, not recommended here, would make failure to disclose or dishonest disclosure result in either the patent application not being accepted or if granted not enforceable. This option would undoubtedly be met by universal opposition within the patent regimes.

[549] Convention on Biological Diversity (2010) *A new era of living in harmony with nature is born at the Nagoya Biodiversity Summit,* available at: http://www.cbd.int/doc/press/2010/pr-2010-10-29-cop-10-en.pdf.

[550] The UK Intellectual Property Office has assumed an active role in commissioning research and monitoring IP activity in recent years.

Recommendations

5.117 **We recommend to the UK Department for Business, Innovation and Skills and the Intellectual Property Office that the UK continues to promote compliance to access and benefit-sharing schemes by all users of genetic resources, including those employing them for the purposes of biofuels production.**

5.118 **We also recommend that a 'disclosure of origin' requirement be introduced into UK patent law to improve transparency about genetic resource use in order to facilitate access and benefit sharing.**

5.119 **We recommend that consideration be given to the introduction of a mandatory 'disclosure of origin of genetic resources' requirement in intellectual property law with appropriate sanctions, either outside or within patent law, for non- or incorrect disclosure.**

5.120 **We recommend that the UK updates current access and benefit-sharing arrangements to take account of the legislative, administrative and policy measures introduced in the Nagoya Protocol on Access and Benefit Sharing. This process could be overseen by the UK Department for International Development and should be integrated into more specific biofuels polices, such as a sustainability standard and certification scheme.**

5.121 **We recommend to the UK Department for International Development that the UK should take the lead in giving support to developing countries to set up competent national authorities on access and benefit sharing and in providing advice on the practical implementation of the requirements of the Nagoya Protocol and Bonn Guidelines.**

5.122 **We recommend that international organisations such as the World Trade Organization and the World Intellectual Property Organization look into the feasibility of integrating the key concepts of the Convention on Biological Diversity into intellectual property law. This may lessen the adverse impact that the Trade Related Aspects of Intellectual Property Rights Agreement has had on developing countries.**

Summary

5.123 This chapter has demonstrated how individual elements of the policy environment act either to support or to challenge the application of our Ethical Principles 1–5 in the development of biofuels, and has made recommendations on how modifications could be introduced to help meet the requirements of these Principles. The interacting elements of the complex international system behind the development and use of biofuels include: public and commercial users of fuels; researchers in public institutions and commercial laboratories developing improvements to existing biofuels and radically new approaches to biofuels developments; NGOs often with principled views on biofuels; farmers in the developing and developed world; industry ranging from small companies to large multinationals; national and international regulatory systems; and governments and policy makers. We have not yet addressed Principle 6 – a potential duty to develop biofuels – in this chapter, but we turn to it in Chapter 6. There, we open up the debate beyond the biofuels context.