BIOENERGY IN THE UK

TURNING GREEN PROMISES INTO ENVIRONMENTAL REALITY

A policy paper by

Wildlife and Countryside Link
Northern Ireland Environment Link
Wales Environment Link
Scottish Environment LINK

The Link organisations bring together environmental voluntary organisations in the UK united by their common interest in the conservation and enjoyment of the natural and historic environment. There are four Link organisations in the UK.

Each Link is a coalition organisation, representing a number of environmental non-governmental organisations (NGOs). The Links aim to add value to the work of individual organisations by facilitating information exchange and collaborative working amongst members on issues the members choose.

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Executive Summary

The production of bioenergy in the UK is set to increase as a source of low carbon energy for heat, power, and transport. This will have serious effects on land use, and as a consequence, on biodiversity, landscapes, historic environment and our soil and water resources.

The nature of the impacts will depend on a combination of factors including type of feedstock, crop management, previous land use, scale of development and spatial distribution.

Government policies designed to support the bioenergy sector continue to develop rapidly. But a greater focus on managing changes in land use is essential, if the growth of bioenergy production and use in the UK is to take place in a way that provides genuine greenhouse gas savings, contributes to the achievement of other environmental goals, and avoids damaging impacts.

The multiple pressures on land in the UK - to provide food, other commodities, wildlife, recreation, beautiful landscapes and ecosystem services – present a policy challenge to manage both the size of the bioenergy market, and the wider environmental impacts of bioenergy developments.

Link has identified six priorities for Government action to ensure that the growth in UK bioenergy production maximises greenhouse gas savings and minimises damaging environmental impacts:

1. Undertake a strategic assessment of the role of bioenergy in the UK and devolved countries' energy mix, taking account of environmental constraints and the capacity of other kinds of renewable energy and energy saving measures.
2. Introduce minimum standards and certification of greenhouse gas savings and environmental impacts for all forms of bioenergy.
3. Ensure that the planning system is equipped to respond to the pressures on land use of bioenergy projects and provides appropriate policy and guidance.
4. Identify opportunities for bioenergy development to contribute to the achievement of other environmental goals, and ensure these are acted upon.
5. Actively promote small scale, local uses of bioenergy, particularly the use of biomass for heat and power, providing the production, processing and generation is undertaken in an environmentally sustainable manner.
6. Undertake further research to ensure bioenergy policy is based on a thorough understanding of the environmental threats and opportunities.

LINK'S VISION FOR BIOENERGY

Bioenergy will play an important role in reducing greenhouse gas emissions in the UK. Small-scale heat and power generation from biomass will deliver significant emissions savings whilst enabling the restoration, management and creation of woodlands. Biofuels from combinable crops will play a small, transitionary role in the transport sector, with new technologies and vehicle efficiencies taking their place.

Careful land use planning, along with properly appraised expansion of bioenergy cropping, will protect Britain's most important areas for biodiversity, landscape and cultural heritage from inappropriate bioenergy developments. Use of existing soil and water resources will be sustainable. Where possible bioenergy developments will assist in landscape-scale habitat establishment and management. Bioenergy producers will embrace the principles of sustainability and ensure genuine greenhouse gas emissions savings at every stage of the production chain whilst meeting high environmental standards.

Introduction

This paper sets out the measures Wildlife and Countryside Link, Wales Environment Link, Northern Ireland Environment Link and Scottish Environment LINK (hereafter known collectively as 'Link') believe need to be taken by national and devolved governments, and associated agencies and public bodies, to ensure that UK bioenergy production and use develops in a sustainable way, achieving significant greenhouse gas (GHG) savings, whilst avoiding damaging impacts on the natural and historic environment.

These recommendations are informed by a report from Land Use Consultants (LUC) on the potential environmental impacts of increased bioenergy production and use in the UK, commissioned by Link in 2006[1].

This paper addresses the consequences of bioenergy production on biodiversity, landscape, and the natural and historic environment in the UK only[2]. Link recognises that the increasing demand for bioenergy is also exacerbating unsustainable agricultural expansion and deforestation abroad. This is a key concern to Link, and one that needs to be addressed by the UK Government, but it falls outside the scope of this paper.

'Bioenergy' is an inclusive term for all forms of biomass (biodegradable matter from agricultural or forestry crops, waste and residues used as a source of renewable heat or energy generation), and liquid biofuels (renewable transport fuels such as bioethanol and biodiesel, produced from biomass). For the purpose of this paper and whilst acknowledging their role, Link is not looking at waste digestion and biogas sources.

Context

Climate change is the greatest challenge facing the global environment, and the evidence that these changes are caused principally by human activity releasing GHG is now incontrovertible[3].

In 2006, the UK Government pledged to reduce national GHG emissions by 60% by 2050[4]. As one element in planning to achieve this it committed to generating 10% of the UK's electricity from renewable sources by 2010, increasing to 20% by 2020[5] and increasing the use of biofuels for transport to 5% by volume by 2010[6].

The primary delivery instruments for these goals are the Renewables Obligation and the Renewable Transport Fuel Obligation (RTFO), as well as a range of tax incentives and grant schemes.

This could translate into a major expansion of bioenergy production in the UK, as reflected by the aspirational commitments made in the UK Biomass Strategy, the Woodfuel Strategy for England, the Scottish Biomass Action Plan, the Scottish Forestry Strategy, and Northern Ireland's Renewable Energy Action Plan. This growth is likely to continue as the EU places increasing importance on bioenergy, and particularly on biofuels.

Bioenergy production, processing and transport will have serious effects on land use, and as a consequence, on biodiversity, landscapes, historic environment and our soil and water resources. Government policies designed to support the bioenergy sector continue to develop rapidly. There needs to be greater focus on managing the changes to land use if the growth of bioenergy production and use in the UK is to take place in a way that maximises achievement of environmental goals (other than reducing GHG emissions) and minimises damaging impacts.

Guiding principles of sustainable bioenergy

The following principles set out what Link would consider to be a sustainable bioenergy development. We recommend these principles for use by the UK Government and devolved administrations when formulating policies, plans and programmes for bioenergy, and also as guidance for the assessment of specific bioenergy developments.

1. The scale and nature of bioenergy generation at national and local levels are planned strategically to ensure that demand can be met by bioenergy crops grown within sustainable limits.

2. GHG savings are maximised throughout the production pathway, without undermining other environmental interests. Minimising the use of inorganic and organic fertilisers and pesticides will be integral to this and will deliver significant benefits to biodiversity and water quality.

3. Locations are avoided where bioenergy developments could:

   - Lead to a net increase in GHG emissions due to release of stored carbon.
   - Adversely affect biodiversity, in particular priority species, habitats and designated wildlife sites.
   - Adversely affect the quality or quantity of water resources and the biodiversity of aquatic environment.
   - Damage landscape character, sensitive historic landscapes and archaeological sites or nationally or locally designated landscapes.
   - Adversely affect the soil structure or increase erosion and sedimentation.

4. Minimum environmental standards and best practice guidelines for all bioenergy crops are followed and enforced through national and regional planning policy, Environmental Impact Assessments (EIAs), grant funding conditions and local authority policies. Public sector procurement policies should also support this.

5. Bioenergy developments comply with the UK Forestry Standard and the UK Woodland Assurance Standard where relevant. This would ensure the appropriate location, design and management of Short Rotation Forestry (SRF) and Short Rotation Coppice (SRC) plantations and assessments undertaken on the potential impacts on biodiversity, landscape character and archaeology.

6. Efforts are made to seek to reinvigorate the sensitive management of the semi-natural woodland resource where relevant, and to restore semi-natural habitats, including ancient woodland and other habitats currently planted with non-native conifers. Where possible planting should increase functional connectivity between habitats and across landscapes through buffering, extending and re-connecting vulnerable semi-natural habitats.

7. Climate change proofing is undertaken to take into account potential impacts of climate change over the lifetime of the crops, on growing conditions and the soil and water resources they require.

Potential impacts of bioenergy in the UK

Bioenergy is a land hungry source of renewable heat, power, and, in particular, of transport fuels:

- The production of 1GW of electricity from *Miscanthus* SRC biomass (one-third of the 10% target from renewable sources by 2010) would require up to an 80 fold increase in the area planted under these crops to 1.2 million ha[7], i.e. approximately 6.5% of the UK's agricultural land.
- Projections for meeting the RTFO targets on biofuel utilisation suggest that the 5% (by volume) target by 2010 would require between 1.2m ha[8] and 1.9m[9] ha of additional land to be given over to growing wheat and oilseed rape, i.e. between 20-32% of the UK's arable land.

These figures are estimates and there is inevitably uncertainty surrounding the exact land-take of bioenergy, or indeed the likely divide between heat, power and fuel production, but it is clear that significant land-use change is inevitable if Government's targets for the sector are to be met.

In the shorter term, much of our bioenergy is likely to come from conventional arable crops, as well as straw, waste wood and woodfuel. Over the longer term, most would need to come from SRC and *Miscanthus*. This is because the quantity of straw and woodfuels from conventional forestry is likely to remain relatively static unless there is an increase in supply from native woodland restoration and management in England (as the Woodfuel Strategy for England[10] suggests), SRF or if wood currently used in other markets is redirected to bioenergy.

Bioenergy expansion will not be uniform across the UK in terms of size or form and this lack of uniformity will be crucial in managing acceptable landscape and habitat change. In England, there is capacity to produce the full range of feedstocks on arable land, grasslands and even in the uplands. In Scotland, SRC willow and oilseed rape are likely to be the main energy crops grown, as well as use of existing plantation forestry, with a number of large biodiesel production plants and electricity generation plants already planned[11]. In Northern Ireland, agricultural land is predominantly grassland and therefore much of the biomass is likely to be SRC willow and oilseed rape, with approximately 800ha of SRC already planted[12]. In Wales, the potential for bioenergy also lies in the growth of biomass crops such as SRC willow and *Miscanthus*, and existing forestry plantations.

Factors determining the nature of the impact

The high land take of bioenergy means that significant levels of production pose both threats and opportunities for the management of the UK's landscape, biodiversity, and cultural heritage. The nature of this impact will depend on a combination of factors described below and how they are regulated, managed or mitigated.

1. The type of bioenergy feedstock grown

Currently there is a division between bioenergy for heat and power, and for liquid biofuels. The former relies on woody feedstocks from forestry, SRC and *Miscanthus* – known as biomass. The latter currently relies on conventional arable crops. Technology permitting, biofuels will become increasingly reliant on woody feedstocks in the future.

Existing woods, forestry plantations and arable crops already represent a major proportion of land-use in the UK. However the large-scale cultivation of new crops such as woody crops and perennial grasses, could result in substantial changes to the character of our landscapes and large-scale ecological changes.

There are opportunities and threats from new and existing sources of bioenergy.

Opportunities include:

- Stimulating the restoration and sensitive, appropriate management of existing woods and the creation of new woods, will help to sustain and improve woodland biodiversity and assist in the delivery of UK Biodiversity Action Plan (BAP) native woodland targets.
- Increasing habitat diversity through the introduction of new crops. For example, suitably located and managed SRC willow can be a good habitat for woodland edge species.
- The use of forest residues and existing low-grade timber to provide biomass could also provide opportunities for the enhancement of existing native woods and the restoration of planted ancient woodland sites (PAWS) and other semi-natural habitats, such as lowland heathland or blanket bog, through selective and ecologically appropriate removal of non-native conifers.
- Providing an outlet for woodland products from existing amenity woodland thus helps to support its maintenance.

New crops in particular pose a number of threats, for example:

- Mature *Miscanthus* crops are unlikely to be suitable for ground nesting birds, such as skylark and lapwing, except early in the breeding season before the main period of annual crop growth is underway[13]. Wild plant populations in mature *Miscanthus* crops are likely to be limited by crop shading, dense leaf litter and post-harvest broad-spectrum weed control if applied[14].
- Non-native tree species, such as eucalyptus, are very effective at taking up water, particularly in drier conditions, threatening local hydrological regimes as well as potentially replacing important habitats.
- Many novel energy crops, and willow coppice, have root systems that penetrate considerably deeper than conventional arable crops. They may therefore cause damage to archaeological sites which have survived beneath existing arable regimes.
- Tall perennial grasses or woody crops could have a significant and potentially damaging effect on landscape character, for example in landscapes predominantly consisting of smaller scale lowland field systems or upland moors.
- Ease of public access could be made more difficult by the physical characteristics of some types of crops which may also affect viewpoints from Rights of Way.

However, for many energy crops, information is lacking on the effects of cultivation on a commercial scale. Even more lacking is knowledge of best management practices.

Factors determining the nature of the impact

2. Management of the bioenergy crop

The management of energy crops will have an enormous impact on the environment: on the level of GHG savings, on water and soil quality, on biodiversity and landscape character, and on historical and archaeological features. Where management is sympathetic and crop location is well informed, some benefits could be delivered, but poor management could introduce new risks. A growing market for conventional crops may simply propagate unsustainable practices due to intensification of production.

For example:

- Maximising GHG savings requires minimising the use of artificial nitrogen inputs. This would also carry significant benefits for water quality and biodiversity, but this gain will only be secured if producers are required to deliver high GHG savings. If not, an increased demand for conventional arable crops will intensify the problems that already exist with arable agriculture.
- SRC and *Miscanthus* may be harvested using heavy machinery in winter, risking soil compaction and erosion of soils once crops have been removed.

- The deep cultivation required to remove roots when SRC crops are replaced, and to harvest *Miscanthus* rootstocks for sale to establish plantations could lead to soil erosion and threaten archaeological sites.

However, there may also be opportunities, for example:

- Sensitive management practices including the use of headlands and rides, planting crops at intervals to create variety in the age structure of crops, planting mixed species, avoiding large unbroken plots, and by using or partly using native species wherever possible, may bring biodiversity and landscape benefits.

3. The nature of the land-use bioenergy crops replace

The nature of existing land use is a key factor in determining the environmental impacts and GHG saving potential of bioenergy. This is more usually highlighted as an issue for biofuel production in the tropics, where rainforests are destroyed and huge amounts of carbon stored in soils are released into the atmosphere, but it is also important within the UK.

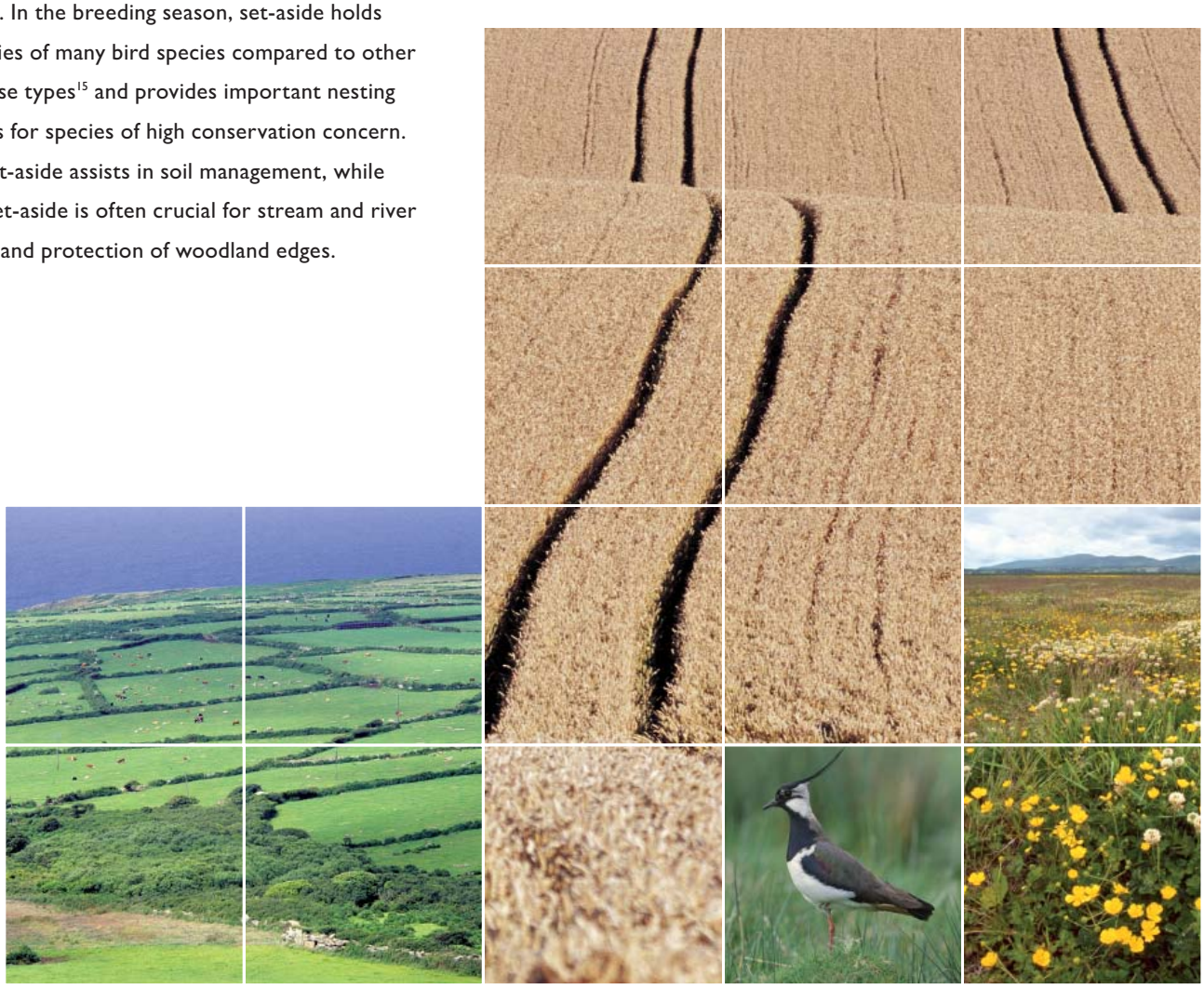
Using land for bioenergy production could result in neutral or even beneficial outcomes in certain cases for example where bioenergy crops replace intensive land uses or when native or ancient woodland is restored or brought back into appropriate management in certain areas. However, the risk of loss of landscape and biodiversity will be high on land with semi-natural characteristics, such as permanent pasture, semi-improved grassland, wet grassland, marshland and other marginal land. Furthermore, the overall GHG saving potential of a particular bioenergy development depends on the impact of the land use change on carbon stored in the soil, particularly where this involves carbon and methane rich soils such as peat.

For example

- SRC and *Miscanthus* can both be grown on areas that would usually be considered marginal for agriculture, but are often the most valuable areas for wildlife, such as important wet grassland for priority bird species.
- SRF, SRC or tall perennial energy crop plantations in sensitive open landscapes could also have a detrimental effect on biodiversity and landscape character.
- Traditional pastoral landscapes could be endangered by tall, woody crops that would obscure characteristic features, such as field patterns, hedges and walls.
- The further conversion of set-aside land into bioenergy production is perhaps the most immediate threat. Set-aside is known to provide a range of biodiversity benefits including important feeding and nesting resources for many farmland bird species and also for arable weeds. In the breeding season, set-aside holds higher densities of many bird species compared to other arable land-use types[15] and provides important nesting opportunities for species of high conservation concern. Rotational set-aside assists in soil management, while permanent set-aside is often crucial for stream and river management and protection of woodland edges.

4. The scale of bioenergy development and its spatial distribution

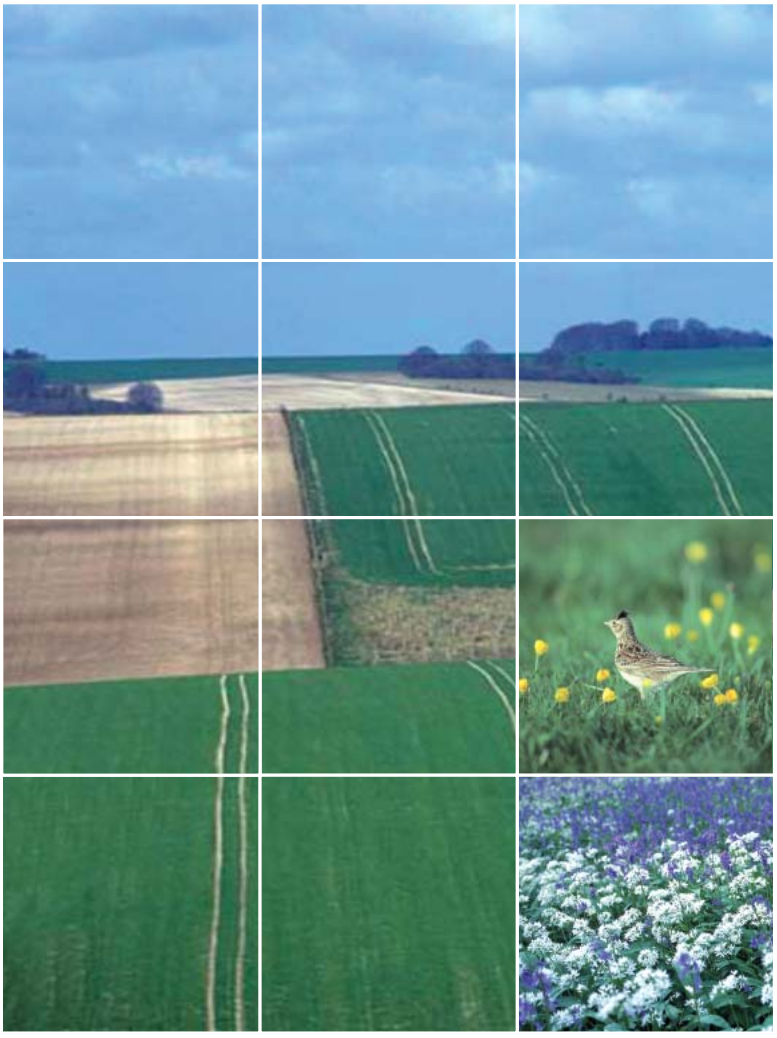
The cost and carbon footprint of transporting bulky biomass crops within the UK is relatively high, encouraging production to be clustered close to processing and generation plants. This is reflected by UK grant funding for bioenergy crops, which specifies that they should be grown as close as possible to the end user, usually within 25 miles. While this results in savings of GHG from transport, the creation of concentrated monocultures threatens biodiversity and the landscape character. Small-scale, local bioenergy developments would minimise these risks and would maximise opportunities for biodiversity and landscape character and public engagement and understanding.



Recommendations for the sustainable development of bioenergy

Government has a key role to play to ensure bioenergy in the UK makes an effective contribution to reducing the UK's GHG emissions whilst minimising damaging environmental impacts and contributing to other environmental improvements, particularly for the UK's woodland and forestry resource.

The multiple pressures on land in the UK - to provide food, other commodities, wildlife, recreation, beautiful landscapes and ecosystem services – present a policy challenge to manage both the size of the bioenergy market, and the environmental impacts of bioenergy developments. The quality of our environment must remain centre-stage as bioenergy markets develop.



With this in mind, Link has developed the following recommendations:

1. Undertake a strategic assessment of the role of bioenergy in the UK's and devolved countries' energy mix taking account of environmental constraints and the capacity of other kinds of renewable energy and energy saving measures

If the scale and nature of bioenergy demand leads to unsustainable energy crop planting and management, this will inevitably lead to conflict with policies and measures aimed at securing sustainable design and management of crops. A strategic assessment of the resource available is therefore required. This should seek to identify the level and type of bioenergy production that should be encouraged, taking account of environmental constraints and the capacity of other kinds of renewable energy and energy saving measures to deliver greenhouse gas savings.

2. Introduce minimum standards and certification of GHG savings and environmental impacts for all forms of bioenergy

The bioenergy market is being created through Government support, including obligations, tax incentives and grants. It is therefore reasonable for the public to expect bioenergy production to meet minimum environmental standards, prove that it does so and protect and enhance public benefits, such as biodiversity, landscape, archaeology and water quality. Supporting and reinforcing the system of EIAs, these standards should cover the entire production pathway and include GHG emissions savings as well as impacts on biodiversity, soil, water, landscape character and the historic environment.

For example, successful applications for Government support through country energy crop planting schemes, such as England's Energy Crop Scheme, should adhere to minimum environmental standards and associated best practice guidance on planting and management.

Government support should be contingent on environmentally robust certification and on minimum GHG emissions savings being made, so that, for example, eligibility for obligations, tax incentives and grants requires proof of certification. Furthermore, higher GHG savings should be encouraged through higher levels of support, incentivising good practice. This should take place across the bioenergy sector as a whole, so that, for example, biomass for heat schemes would receive greater support than conventional biofuel schemes that offer lower GHG savings. This would maximise the GHG emissions saving potential of our limited land resource.

GHG certification should be based on the work already conducted for the GHG reporting mechanism that will form part of the RTFO, whilst sustainability certification should be based on existing independent standards. In the forestry sector, this should mean certification to UK Woodland Assurance Standard (UKWAS).

3. Ensure that the planning system is equipped to respond to the pressures on land use of bioenergy projects and provides appropriate policy and guidance

Most agricultural operations do not require planning permission. However, for production to be sustainable, bioenergy crops will often be planted close to processing plants, transport hubs and the power stations in which they are used. This could result in concentrations of monocultures of particular crop types (including non-native species) in areas around the bioenergy infrastructure with which they are associated. This may result in damaging impacts on some species and habitats, alter the character of the landscape or affect archaeological sites and remains.

Some land uses may provide agricultural or other land management practices that are important for maintaining priority species and habitats or important populations. They may also produce particular food crops that form part of local food networks which are important for the viability of local communities and rural economies.

There is therefore a need to ensure that the planning system is able to prevent the damaging effects caused by the displacement of land uses that arise through development of bioenergy infrastructure. National, regional and local planning policy and guidance documents must be capable of addressing the implications of the location of bioenergy infrastructure on land use. These policies and guidance should be contained in national Planning Policy Statements, Regional Spatial Strategies or Local Development Frameworks. For example in England, Planning Policy Statements 6, 7 and 9[16] and Planning Policy Guidance 13[17] all address important considerations that should be applied to bioenergy development and which should be taken fully into account when planning applications are made for bioenergy infrastructure.

Future reviews of some planning policies and guidance may need to consider whether bioenergy developments could have particular implications for the policies or guidance they contain. The forthcoming Planning Policy Statement on Climate Change, and the Energy White Paper also present opportunities for the Government to address this issue further.

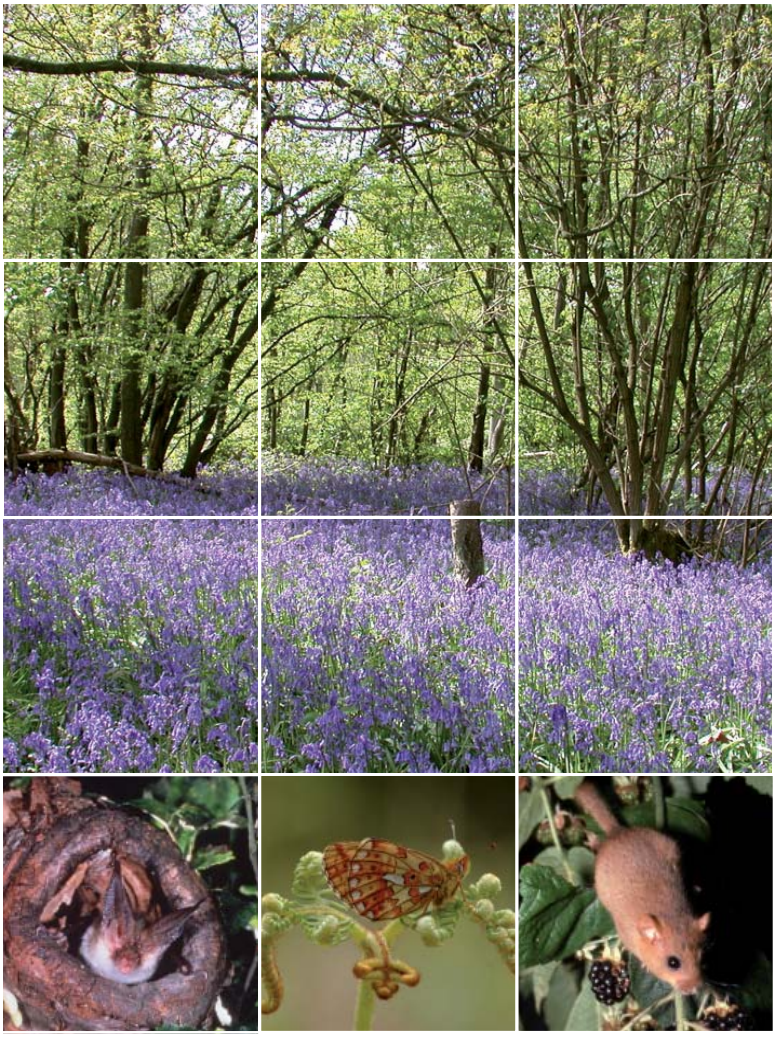
Where regional or local bioenergy 'opportunity' statements are produced, a wide range of consultees including the Government Offices, industry, Government agencies, farming organisations and NGOs should be engaged in their development. These opportunity statements should identify environmentally sensitive areas to help ensure bioenergy development is consistent with other national spatial planning policies on landscape, biodiversity, historic environment, public access and soil and water resources. They should consider the existing land uses and the existing bioenergy resource within the area, including woodland sites, and their economic and environmental suitability for bioenergy production. In order to achieve this, robust spatial mapping tools at an appropriate scale and covering all of these issues should be developed and applied.

Bioenergy opportunity statements and plans should also be climate proofed, so that, for example, infrastructure for bioenergy crops that are dependent on high water

inputs should not be developed in areas where severe water shortages are anticipated within the lifetime of the infrastructure.

Applications for bioenergy development may require EIAs, but this depends on the scale and location of the power plant and cropped areas. Applicants need to provide sufficient information, not just about buildings but about cropped areas and transport arrangements, to enable proper screening against the relevant EIA regulations.

Archaeological sites can only be protected in the place where they are, and detailed consultation of the Local Authority's Historic Environment Record will be required on the specific areas to be planted, in order to prevent damage to vulnerable archaeological sites. There should be no public funding for planting that would damage archaeological assets.



4. Identify opportunities for bioenergy development to contribute to the achievement of other environmental goals, and ensure these are acted upon

Policies put in place to deliver climate change targets should not reduce the ability to meet other environmental objectives. Rather than inhibiting our chances of meeting these targets, bioenergy could positively contribute to them, but only with the understanding and policies in place. A number of examples as to how this can be done follow below.

Priority species and habitats

The relevant statutory agencies should undertake a detailed review of the potential costs and benefits of bioenergy production for the various Habitat Action Plan (HAP) and Species Action Plan (SAP) targets and country biodiversity targets. This may require further primary research, particularly for crops such as *Miscanthus*, where existing information is limited. Following this review, a guidance note should be produced summarising how any negative impacts of bioenergy energy production can be avoided and how bioenergy could contribute towards the delivery of HAP and SAP targets. This habitat and species-specific guidance should be disseminated widely and used to inform delivery of country biodiversity and forestry strategies and the preparation of Local Biodiversity Action Plans.

The Water Framework Directive

The Environment Agency, Department of Environment Northern Ireland and Scottish Environmental Protection Agency should actively explore the opportunities for using bioenergy production to meet the objectives set out in the Water Framework Directive and Nitrates Directive. This will include identifying scope in the forthcoming River Basin Management Plans to create zones where bioenergy can be used to reduce nitrate levels and alleviate flood risk. It is also recommended that Defra and the devolved administrations review the opportunities for bioenergy to contribute towards the delivery of the EU's Thematic Strategy for Soil Protection.

Landscape character

The relevant statutory agencies should develop landscape guidelines on how to assess and address the potential effects of bioenergy production on different landscape character types, indicating key sensitivities to take into account and opportunities to enhance landscape character where appropriate. Landscape sensitivity studies should inform Government agencies policy on renewable energy, strategic guidance and bioenergy opportunity statements at the national, regional and local level for bioenergy developments. These should assess the sensitivity of different landscape character types to different types of bioenergy production. This also needs to be part of the separate forestry planning and consenting regimes.

5. Actively promote small scale, local uses of bioenergy, particularly the use of biomass for heat and power, providing the production, processing and generation is undertaken in an environmentally sustainable manner

Government should reaffirm its commitment to small-scale renewable projects by providing the necessary support and funding for a coordinated one-stop shop support and advice service for community and domestic renewables in England and Wales. This could be achieved through an expansion of the role and remit of existing programmes and through approaches such as LEADER using any relevant measures in Rural Development Programmes.

Link is concerned that in the drive to meet the renewable energy targets, the Government is prioritising funding and resources for large scale renewable energy projects to the detriment of small scale renewable programmes. Whilst grants for small scale schemes are being made available through the Low Carbon Buildings Programme, this does not provide advice and support for those seeking to design and install renewable schemes. This key service is currently provided by the Scottish Community and Householder Renewables Initiative (SCHRI) and by Action Renewables in Northern Ireland who administer the Environment and Renewable Energy Fund (EREF). This service was provided in England by the Community Renewables Initiative (CRI) but this funding has now been closed. There is no co-ordinated programme available in Wales. It is therefore recommended that Defra and the Department for Business, Enterprise and Regulatory Reform should set out a clear strategy and funding stream for providing a coordinated support service for small scale renewable schemes in England and Wales.

All bioenergy incentives should be developed within a clear framework of measures to tackle climate change with emphasis on reducing demand as the easiest way to meet targets for producing a percentage of heat and power from renewable power.

6. Undertake further research to ensure bioenergy policy is based on a thorough understanding of environmental threats and opportunities.

There are a number of notable gaps in current information, including:

- The environmental threats and opportunities of growing certain types of bioenergy crops in the UK such as *Miscanthus*, reed canary grass, switchgrass, sorghum, sunflowers and eucalyptus for SRF. For example, no studies have been undertaken in the UK looking at the impacts of large-scale, mature stands of commercially grown Miscanthus on biodiversity and archaeology nor

Recommendations for the sustainable development of bioenergy

on the potential invasive characteristics of non-sterile energy crop species.

- Management practices that can deliver both reductions in GHG emissions and improve environmental sustainability of agricultural and forestry management need to be developed to maximise the environmental benefits, including for on-site biodiversity and not just for GHG savings. The results should feed into country agri-environment and forestry support schemes.
- The environmental impacts of perennial bioenergy crops being grown at the landscape scale, and ways of minimising the negative impacts, including the impacts on adjoining land and on the connectivity of habitats. These should not only examine the land that is cultivated for bioenergy crops but also the environmental consequences for adjoining land, for the connectivity of habitats and habitat quality.
- The effects of losing set-aside land to bioenergy crops, and possible measures to replace the benefits of set-aside in a more land efficient way.
- Evaluation of water use of bioenergy grasses compared to that of traditional crops and SRC is required. This is of concern as water requirements for perennial energy grasses are considerably higher than that of traditional crops.
- No comprehensive studies have been undertaken looking at the possible impacts of the different types of bioenergy crops grown in different areas of the country, under different intensity levels and with different levels of artificial inputs.
- The effects on landscape character and development patterns of built infrastructure related to bioenergy.

In addition to this, a long term monitoring programme should be established with regular assessments reporting on the area of land used for bioenergy; the type of land that is being replaced and indicators measuring the impacts on the environment. This will help to ensure the early identification of problems, so that appropriate good practice guidance, management, regulation and mitigation strategies can be put in place where necessary. The Government should also assess economic drivers as grant systems change to ensure that they are supporting the most sustainable forms of bioenergy particularly small scale schemes which deliver multiple benefits.

Notes

[1] Land Use Consultants (2007) Bioenergy: Environmental Impact and Best Practice

[2] For an international perspective see United Nations (2007) Sustainable Bioenergy: A framework for decision makers (http://esa.un.org/un-energy/pdf/susdev.Biofuels.FAO.pdf)

[3] Inter Governmental Panel on Climate Change (2001) Climate Change 2001 - The Scientific Basis. Third Assessment Report.

[4] The Energy Challenge, Energy Review Report 2006, Department of Trade and Industry, July 2006, see http://www.dti.gov.uk/files/file31890.pdf

[5] 2003 Energy White Paper

[6] See http://www.dft.gov.uk/pgr/roads/environment/rtfo/aboutrtfo

[7] Land Use Consultants (2007) Bioenergy: Environmental Impacts and Best Practice. This figure is based on an energy conversion factor of 25%.

[8] See http://www.nfuonline.com/x9763.xml

[9] Turley, DB (2006) Arable crop protection in the balance: profit and the environment. HGCA Conference, January 2006

[10] A Woodfuel Strategy for England, Forestry Commission England, see http://www.forestry.gov.uk/pdf/fce-woodfuel-strategy.pdf/$FILE/fce-woodfuel-strategy.pdf

[11] Commercial viability of alternative non food crops and biomass on Scottish Farms - a special study supported under SEERAD Advisory Activity 211, Bell et al (2007), March 2007 see http://www.sac.ac.uk/mainrep/pdfs/nonfoodbiomass.pdf

[12] Department of Agriculture and Rural Development (March 2007) Renewable Energy Action Plan

[13] Anderson GQA, Haskins LR & Nelson SH. (2004), The Effects of Bioenergy Crops on Farmland Birds in the UK: a Review of Current Knowledge and Future Predictions. pp 199-218 in: Parris, K. & Poincet, T. (eds) Biomass and Agriculture; sustainability, markets and policies. OECD, Paris. (ISBN 92-64-10555-7).Anderson et al 2004

[14] Anderson GQA, Haskins LR & Nelson SH. (2004), The Effects of Bioenergy Crops on Farmland Birds in the UK: a Review of Current Knowledge and Future Predictions. pp 199-218 in: Parris, K. & Poincet, T. (eds) Biomass and Agriculture; sustainability, markets and policies. OECD, Paris. (ISBN 92-64-10555-7); Defra (Department for Environment, Food and Rural Affairs), (2001). Planting and growing Miscanthus – best practice guidelines for applicants to Defra's energy crops scheme. London, UK: Defra. <http://www.defra.gov.uk/farm/acu/energy/Miscanthus-guide.pdf>

[15] Van Buskirk J & Willi Y (2004) Enhancement of Farmland Biodiversity within set-aside land. Conservation Biology 18: 987-994

[16] PPS 6 (Planning for Town Centres), PPS 7 (Sustainable Development in Rural Areas), PPS 9 (Biodiversity and Geological Conservation)

[17] Planning Policy Guidance 13 (Transport)

Photographs
Cover: Miscanthus, Lincolnshire crop, 3 years old, March shortly before harvest, Chris Tomson, RSPB; Road traffic, Andy Hay (rspb-images.com); Combine harvesting wheat, Cambridgeshire, Andy Hay (rspb-images.com); Drax B, Yorkshire, CPRE.
Page 5: Short rotation coppice willow, Chris Tomson, RSPB; Drax B, Yorkshire, CPRE (inset).
Page 6: (left to right) Miscanthus, Lincolnshire crop, 3 years old, March shortly before harvest, Chris Tomson, RSPB; South Downs, Sussex, CPRE; PAWS site, Woodland Trust Photo Library.
Page 8: Lapwings Vanellus vanellus, on winter flooded grazing land close to Ham Wall RSPB reserve, David Kjaer (rspb-images.com).
Page 9: (clockwise) Arable farming, intensive agriculture, wheat, Essex, Andy Hay (rspb-images.com); Agriculture around Lough Foyle, set-aside at Black Brae, 2004, Andy Hay (rspb-images.com); Lapwing Vanellus vanellus, adult, male in breeding habitat, Northumberland, Andy Hay (rspb-images.com); Field patterns, Penwith, Cornwall, CPRE.
Page 10: Farmland, Salisbury Plain, CPRE; Skylark Alauda avensis; in field of buttercups, Chris Gomersall (rspb-images.com) (inset); Ground flora, Nicholas Spur/WTPL (inset).
Page 12: Coppice Woodland, WTPL/Stuart Cooper; Brown long-eared bat, Hugh Clark & BCT; Pearl-bordered Fritillary, Jim Asher/Butterfly Conservation; Dormouse, The Mammal Society.
Page 13: Farmland, Shropshire, CPRE; The Biomass boiler at Gibson Mill, Hardcastle Crags, West Yorkshire, (c)NTPL/Joe Cornish (inset); Hedgerow surveying, CPRE (inset).
Page 14: Agriculture around Lough Foyle, set-aside at Black Brae, 2004, Andy Hay (rspb-images.com).
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