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HEATHLAND MANAGEMENT IN THE UK

by David Harley and Bob Davies

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FOREWORD

This paper is one of a series of 22 case studies that describe practical experiences in OECD Member countries with the use of incentive measures for the conservation of biodiversity and the sustainable use of its components. These case studies were submitted by OECD Member countries to the OECD Working Group on Economic Aspects of Biodiversity as a contribution to the OECD study of the design and implementation of appropriate incentive measures for biodiversity conservation and sustainable use. In order to ensure maximum comparability between the case studies, all were developed under the common methodology described in “Incentive Measures to Promote the Conservation and the Sustainable Use of Biodiversity: Framework for Case Studies” [OECD/GD(97)125].

The practical experiences described in the 22 case studies were used as the basis for the policy advice developed in the *Handbook of Incentive Measures for Biodiversity: Design and Implementation* (OECD, 1999). This *Handbook* combines the lessons learned through the various experiences described in the case studies – covering a wide range of ecosystems, economic pressures on biodiversity, and utilising various incentive measures – with sound economic theory to develop a practical, step-by-step guide for policy-makers on the design and implementation of successful incentive measures for the conservation and sustainable use of biodiversity.

This paper was written David Harley (Environmental Economist at The Royal Society for the Protection of Birds — RSPB) and Bob Davies (Economic Adviser at the UK Government Department of the Environment, Transport and the Regions — DETR). It is released as an unclassified document under the responsibility of the Secretary-General of the OECD with the aim of bringing information on this subject to the attention of a wider audience.

This study, and the other 21 case studies submitted by Member countries, are available on the world wide web at <http://www.oecd.org/env>.

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HEATHLAND MANAGEMENT IN THE UK

by

David Harley and Bob Davies¹

EXECUTIVE SUMMARY

This case study describes existing and potential incentive measures for the management of lowland heathlands in Dorset. Under the UK Biodiversity Action Plan, all existing lowland heathland is to be maintained, and a further 6 000 hectares is to be established by the year 2005. In the past, agricultural subsidies encouraged the conversion from heathlands, but today they are used to encourage the re-creation of the heathlands. Under the EU Agri-Environmental Regulation there are payments to private land managers to conserve heathlands. In addition, three projects on the Dorset Heathlands have been supported through environmental funds established through landfill tax credits. The study also suggests the possible use of a quarrying tax and/ or a greenfield development levy to counter urban sprawl and raise funds for brownfield redevelopment. There are also potential new markets which can be realised through sustainable use of the heathlands, such as the production of organic, extensively-reared meat or the generation of renewable energy through the burning of the by-products of heathland management (e.g. gorse). The RSPB Dorset Heathland Project undertakes practical conservation measures (largely based on voluntary field staff), and trains other groups or individuals in the sustainable management of the heathlands.

Ecosystem studied: arid and semi-arid areas.

Incentive measures used: Training and information provision, agri-environmental subsidies, market creation, environmental levies and taxes.

Main lessons learned: Public and private sector initiatives need to be co-ordinated; conservation initiatives should be comprehensive and wide-ranging; national and EU policies must be integrated; and new markets should be identified and established for long-term sustainable use of heathlands.

¹ The views expressed do not necessarily represent the policies of the RSPB or DETR.

1. GENERAL DESCRIPTION

This case study addresses incentive measures for the management of lowland heathlands in Dorset, UK. The ecosystem can be defined as an 'arid and semi-arid area' within the OECD classification.

Lowland heathlands are characterised by the presence of plants such as heather, dwarf gorses and cross-leaved heath and are generally found below 300m in altitude. Good quality heathland should consist of shrubs of varying heights and structures, some scattered trees and scrub, areas of bare ground, gorse, wet heaths, bogs and open water. The presence and numbers of characteristic birds, reptiles, invertebrates, vascular plants and lichens are important indicators of habitat quality. Heathlands typically occur on sandy, acid soils which, for the most part, are free-draining and hence dry.

Lowland heathlands are a priority habitat for nature conservation because they are rare and threatened. In England only one-sixth of the heathland present in 1800 now remains. The UK has some 58 000 hectares of lowland heathland, and accounts for about 20 per cent of the international total of this habitat. A habitat action plan has been drawn up under the UK Biodiversity Action Plan process (Biodiversity Steering Group 1995). The plan sets out two targets: to maintain, and improve by management, all existing lowland heathland; and to establish a further 6 000 hectares of heathland by 2005. The cost of reaching these targets was estimated at £2.1 million in 2000 rising to £3.4 million by 2010, in terms of extra annual public expenditure. Over three-quarters of this spending was required for management of the existing heathlands, less than a quarter on expansion.

The Dorset heathlands are an important part of the remaining lowland heathlands. In 1989 they covered about 7 500 ha. Reflecting the trends in England, only about one-sixth of the area existing in 1750 now remains. Surveys also suggest that in the early 1990s a third of the remaining area was of poor quality (e.g. suffering from scrub invasion) and required restoration.

The Dorset heathlands account for about 41 per cent of the UK Dartford warbler population, 13 per cent of woodlarks, 12 per cent of nightjars, 90 per cent of sand lizards and 80 per cent of smooth snakes. Some 96 per cent of the Dorset heathlands are designated as Sites of Special Scientific Interest (SSSI), under the Wildlife and Countryside Act 1981. Much of the area is a proposed Special Protection Area under the EU Birds Directive and a candidate Special Area of Conservation under the EU Habitats Directive (Woodrow *et al.*, 1996).

The main reasons for the decline in the area and quality of the Dorset heathlands have been loss of traditional management practices, urbanisation, agricultural improvement and afforestation (see Section 2). The main incentive measures which have helped reverse these declines are the RSPB Dorset Heathland Project and the UK Government's environmental land management schemes. This case study focuses on these measures which are targeted on public and private sector landowners and managers of remaining heathlands (see Section 5). The study also addresses other possible future incentive measures, including incentives for new markets for renewable energy, a greenfield development levy and the landfill tax environmental bodies mechanism.

The main economic sectors which are affected by these incentive measures are the agricultural and forestry sectors.

2. IDENTIFICATION OF CAUSES AND SOURCES OF PRESSURES

2.1 Identification of sectoral activities and resulting pressures

The main pressures have been from land use changes rather than pollution or species exploitation. Land use changes have included the cessation of traditional management practices, urbanisation, agricultural improvement and afforestation (Woodrow *et al.*, 1996).

Land use changes

Lowland heathland has resulted from several millennia of traditional practices like grazing by cattle, ponies and sheep, fuel gathering, collection of material for thatching, bedding and composting, and the firing of small areas of heath to promote new growth. These practices have declined since the late nineteenth century with changing technology. As transport improved with railway development, fuel, timber, animal feed and fertilisers could be more efficiently obtained from elsewhere. In most areas these changes took place before the First World War.

Without traditional management practices (or alternative forms of management), heathland suffers from increasing encroachment of trees and scrub, and ultimately reverts to woodland. Heathlands are classic plagioclimax habitats: human management (or natural intervention — fires and grazing) is needed to prevent natural successional processes from proceeding through to the development of woodlands (UK Government, 1994)

Urban development has been a major pressure over the 150 years. Bournemouth has grown from a fishing settlement of 695 inhabitants in 1851 to 160 000 in 1995. Housing and road developments have been significant pressures in recent years.

Much heathland has been lost to reclamation for agricultural improvement and coniferous afforestation, especially in the mid-twentieth century, but these pressures are reduced now. Current pressures are from mineral developments (sand and clay quarrying), lack of management and vandalism and arson.

2.2 Identification of underlying causes of biodiversity loss

The underlying causes of these land use changes have been technological change and ‘missing markets’.

Technological changes partly explain the cessation of traditional management practices and agricultural improvement, but will not be examined further. Institutional failure, in terms of the failure to integrate biodiversity and agricultural policies, is discussed in Section 2.3.

Missing markets

Missing markets have been a major factor during this century in respect of urban and road developments and the loss of traditional management practices.

Urban and road developments

Heathland has been a relatively cheap type of land for urban development. In 1990 its cost was estimated at between £1 300 and £2 000 per hectare, well below the price of farmland at the time (about £4 500 per hectare). These prices are insignificant compared with the price of land with planning permission for urban development — around £1 000 000 per hectare (Hanley *et al.*, 1991). Fortunately most of the remaining heathlands have a form of protection from development in the form of SSSI status, but the market pressures are clear.

The land market fails to reflect the environmental benefits of existing heathlands, and the environmental costs of development. One way of rectifying this would be to introduce a greenfield development levy (see Section 5.1).

The missing market argument can also be seen in the context of road developments. Because markets fail to incorporate all relevant social costs and benefits, the Department of Transport in England (now DETR) undertakes a cost benefit analysis (COBA) which tries to take them into account. In addition to market costs like the cost of land purchase and construction, COBA includes certain non-market benefits/costs like time savings to drivers and the costs of accidents — including the cost of the loss of human life — but excludes the non-market costs of habitat loss and other environmental costs (Department of Transport, 1989).

There are two concerns in respect of heathlands and the COBA evaluation. First, that COBA may favour road route options which use heathlands to those which use arable land, for the simple reason that the market price of heathland is generally lower. Second, that COBA may favour options that result in significant time savings (which are expressed as monetary terms) to those which result in less damage to conservation (which is not expressed in monetary terms).

However it must be stressed that COBA is only one input into the decision-making process. Environmental impact assessment (EIA) is also an important input and this will, of course, address impacts on heathlands. A recent Department of Transport review of the roads programme used weighting and scoring techniques to weigh up, systematically, economic, environmental and other factors (DETR, 1997). Such multi-criteria analysis (MCA) may be the best way to prevent possible bias towards those routes which have adverse 'non-monetised' impacts. The consideration of the heathland resource within an environmental resource accounting framework (at a UK level) might also be beneficial.

The DETR is now seeking to produce a New Appraisal Framework as part of its integrated transport policy. The framework will be a form of MCA with some monetisation. The idea is to ensure that Ministers are able to systematically appraise the monetised and non-monetised costs and benefits of particular transport options (not just new roads) against five criteria: integration, accessibility, environmental impact, economy and safety.

Although roads have damaged the Dorset heathlands in the past, and the missing markets argument was a key factor, road building is less of a threat today. However the basic argument (applying to other forms of development and other habitats) remains: there is a need for appraisal mechanisms to

fully include environmental impacts. There are two broad approaches which are not mutually exclusive: the monetary valuation of environmental externalities within cost benefit analysis and the use of MCA.

Under-management of heathlands

The most relevant missing market today concerns the lack of traditional management of existing heathlands, rather than development of heathland sites. The market provides poor returns for traditional land uses like grazing. Case studies for heathland sites in England suggest that grazing may generate up to £10 per hectare or actually cost the landowner up to £50 per hectare (Willis *et al.*, 1996). This reflects technological changes like grassland improvement and intensive management systems elsewhere. Heathlands are by definition nutrient poor and find it difficult to compete with grasslands in national markets.

The lack of management has led to the deterioration in the quality of heathlands. The survey (see Section 5.1) which suggested that a third of Dorset's heathlands was in need of restoration, indicated that the problems included scrub invasion (958 ha), bracken (792 ha) and rhododendron (29 ha). It has also been estimated that, without proper management, each year a further 1 per cent to 2 per cent will be lost to scrub invasion.

Environmental benefits of heathlands

A major cause of the under-management and over-development of heathlands is that markets do not reflect the environmental benefits of heathlands (i.e. the missing markets argument). The benefits include:

- Use values: the benefits people gain from use of heathlands, for example for walking and bird-watching.
- Existence (non-use) value: the value people place on the existence of species and habitats, irrespective of current or future use.

These benefits are extremely difficult to quantify in monetary terms, but a contingent valuation (CV) study at Avon Forest Park in Dorset found that visitors were willing to pay about £0.74 per visit 'to save the heathland from development' or £9.73 per visitor for an annual permit (Hanley *et al.*, 1991). Total willingness to pay amongst visitors was estimated at between £45 000 and £80 000 per year. These valuations mainly reflect use values, but may also include an element of existence value amongst users.

The survey also asked visitors how much they would be prepared to contribute to a trust fund for heathland conservation in general, and the mean willingness to pay was £25.57. This probably reflected existence value to a greater extent than the above site specific question.

The validity of such figures was examined by comparing this study (and others) with the results of real RSPB fund-raising appeals (Foster *et al.*, 1997). An RSPB appeal in 1994 for heathland conservation work resulted in an average donation, amongst respondents, of £19, significantly below the equivalent figure from the survey (£30). The response rate was also significantly lower than for the survey, but this partly reflected that it was a mail survey instead of a face to face questionnaire. Overall the RSPB appeal raised £260 000. What the appeals data does suggest is that existence values are real and that they can be captured by surveys — although they may be over-estimated by them.

However a recent study came to a different conclusion: that if the CV survey uses a realistic campaign style fund-raising mailing, similar to an appeal, then the average willingness to pay (amongst

respondents) does not exceed the real appeal results (although a higher response rate is found). This study involved sending out a CV survey at the same time as an appeal, both concerning the Isle of Eigg (Macmillan *et al.*, 1997). The results reflected both use and existence values.

These non-market benefits can be reflected in ‘markets’ by means of subsidies through environmental land management schemes (see Section 5). These can supplement income from grazing etc and allow heathlands to survive.

2.3 Identification of adverse incentives with negative impacts on biological diversity

This Section focuses on the role of agricultural subsidies. Another possible adverse incentive is the income tax system. A report by the University of Portsmouth examined how the UK tax system treats nature conservation and identified possible reforms (University of Portsmouth, 1995). One possible reform is to enhance the income tax deductibility of conservation expenditure. At present, while agricultural costs are clearly deductible, because they are for ‘business purposes’, the deductibility of conservation costs (including heathland management costs) is less clear. This deserves further examination.

Agricultural subsidies

Agricultural subsidies played a role in the past in encouraging the conversion of heathlands to more intensive agricultural use — although much conversion would have taken place without these subsidies (as a result of ‘market forces’).

Today the main possible adverse effect of agricultural subsidies on heathland conservation is to discourage the re-creation of heathland on this land. Heathland converted to agricultural land (or to forestry plantations) during the last fifty years is the land most suitable ecologically for re-establishment. However agricultural subsidies, in the form of livestock headage payments and arable area payments, mean that agricultural returns are higher than the returns from heathland re-creation.

The table below shows that gross margins from sheep and arable farming are significantly higher than those from heathland re-creation (A). If the livestock headage payments and arable area payments were removed, then the returns from heathland re-creation would still be less than those from farming, but the differences would be reduced (B). However this reduction assumes that the Countryside Stewardship grant rate would be maintained. In practice the grant would also be reduced because it is based on ‘income foregone’ (i.e. compensation for loss of agricultural income). Thus, under current policy, a reduction of production-related subsidies would not boost heathland re-creation grants relative to agricultural returns. However it might increase the extent of such re-creation, if the total heathland management budget was fixed.

Table 1. Gross margins from heathland re-creation, sheep farming and arable farming

	<i>Income (£)/ha/yr</i>
Heathland re-creation	
Countryside Stewardship grant	275
Variable costs	-50
Gross margin (A)	225
Sheep farming (lowland spring lambing - average performance)	
Ewe premium (@ £19/ewe & assuming 12 ewes per ha)	228
Gross margin per forage hectare (A)	503
Gross margin excluding ewe premium (B)	275
Arable farming (winter wheat - low performance)	
Arable area payment	265
Gross margin (A)	645
Gross margin excluding area payment (B)	380

Note: Heathland re-creation variable costs include weed control, soil acidification and seeding. Figures are based on Minsmere case study in Willis *et al.* (1996). Re-creation can take up to ten years. Sheep and arable figures are from Nix (1996). All the figures (gross margins) do not take account of overheads; labour costs for heathland re-establishment may be higher than for arable and lower than for sheep, while machinery costs may be lower than for arable and higher than for sheep.

Under alternative policy scenarios, if heathland re-establishment grants were maintained as agricultural subsidies fell, they would become more attractive relative to agricultural production. If the savings in agricultural expenditure were transferred to the heathland management budget (amongst other environmental budgets) the boost to heathland re-creation would be even greater.

Land managers will also be considering returns in the longer-term, once the heathland has been re-created and is subject to low intensity grazing. The returns from this are unfavourable, even if grants are available at £50 to £60 per hectare per year (see below). Excluding grants, grazing may generate modest income (up to £10 per hectare) or costs (up to £50 per hectare) depending on local conditions (Willis *et al.*, 1996). These incomes or costs partly depend on livestock headage subsidies. Livestock subsidies are therefore supporting heathland management, although the stocking rates are so low that subsidies per hectare are modest. A change from headage payments to area payments would benefit heathland management.

In summary, production-linked agricultural subsidies are ‘adverse’ subsidies in the sense that they are reducing the amount of heathland that can be re-established for a given heathland management budget. However, if the removal of agricultural subsidies led to a concomitant reduction in heathland management budgets, there would be no benefit for heathland management. Alternatively, if the budgets were maintained, or increased, there would be benefits. Another factor is that livestock subsidies have an important role to play in supporting heathland management — in the form of low-intensity grazing regimes. Their removal might jeopardise heathland management.

Overall, the extent to which heathland management would benefit from the removal of production-related agricultural subsidies (and are therefore ‘adverse’) depends on how heathland management budgets would be changed in response. There would at least be a possibility of heathland management benefiting from the removal or reduction of these subsidies.

3. IMPACTS ON ECOSYSTEMS

The impacts of these pressures on heathlands have been the loss of heathland to urban development and other land uses and the decline in the quality of the remaining heathlands.

The two impacts are related. Heathland loss has generally led to fragmentation. In the mid-eighteenth century there were nine continuous blocks of heathland; by 1978 there were 141 fragments, of which only 14 were over 100 hectares (Woodrow *et al.*, 1996). Fragmentation has resulted in reduced ecological quality; characteristic heathland species are often absent from the smaller areas. Also fragmentation increases the risk of scrub invasion.

The quality of the remaining heathland has also been adversely affected by the loss of traditional management practices. As stated in 2.1, without these practices heathland suffers from scrub and tree encroachment and will revert to woodland. This results in the replacement of the characteristic heathland species with more common woodland species, leading to an overall loss of biodiversity.

4. IMPACTS ON ECONOMY AND WELFARE

Economic impacts

The impacts of these pressures on the economy are difficult to assess. There may have been economic gains from housing, road and other urban developments on former heathlands. There may be economic gains from the cessation of 'inefficient' traditional management practices — e.g. from the transfer of sheep farming to other areas of the country, where yields are higher.

The main economic losses, particularly in the future if further heathlands are lost, would be the loss of revenue from green tourism. As discussed in Section 5.2, one RSPB reserve is estimated to attract visitors who spend £170 000 annually in the local economy. Tourism is estimated to account for 20 per cent of employment in the Isle of Purbeck district of Dorset, which has extensive heathlands (Rayment, 1997). The Purbeck Economic Development Strategy states that 'the environment is the greatest asset that the district has in terms of attracting and maintaining future businesses.' A survey in 1992 showed that 33 per cent of visitors to Purbeck mentioned the beauty of the scenery and wildlife as reasons for visiting the area.

One important consideration is that the economic gains from heathland development (e.g. for housing) are generally more direct than the economic losses. The losses are indirect, via green tourism, and require detailed surveys to estimate them. Any economic assessments must try to address these indirect effects.

Another factor is that there will be economic and employment gains from the restoration and management of neglected heathlands.

Welfare impacts

The overall impacts on human welfare go beyond these impacts on the economy. They should include the negative impacts on individuals' 'utility' caused by the loss of use and non-use values. In many cases, for example the loss of local recreational use value, these effects have negligible impact on the local economy but significantly reduce human welfare. Loss of existence values have no impact on the economy, but similarly reduce welfare. As recognised in Section 2.2, these losses are difficult to value in monetary terms.

5. IMPLEMENTATION OF INCENTIVE MEASURE(S) AND CONTEXT

5.1 Identification of incentive measures

This study focuses on the incentive measure of the RSPB Dorset Heathland Project. This can be classified as a joint private/public sector conservation initiative, with an element of public/private subsidy. It also discusses other incentive measures: environmental land management schemes, renewable energy markets, a greenfield development levy, the landfill tax and a quarrying tax.

Dorset Heathland Project

The Dorset Heathland Project was initiated by the RSPB in 1989 and its main objective was to increase the area of heathland in Dorset by 10 per cent (560 hectares) by 1999 by a programme of habitat restoration. Subsequently it has been given the following additional aims: to demonstrate management techniques to landowners, to reduce habitat fragmentation by careful targeting of management work, to establish inter-county-liaison, and to help establish long-term funding for heathland management at a UK level. It has also adopted the objective to re-create 60 hectares of heathland by 1999.

Funding of the project is summarised in the Table below.

Table 2. Funding for the Dorset Heathland Project 1989/90 to 1994/95

<i>Source</i>	<i>£000s</i>	<i>% of total</i>
British Petroleum	234	28
EU LIFE	243	30
Nature Conservancy Council	10	1
Other grants	13	1
RSPB	220	26
Contract income	120	14
<i>Total</i>	<i>840</i>	

The main activity of the project is the work of field staff on practical conservation measures. The trained staff work on such restoration tasks as scrub clearance and gorse management, for both private and public sector landowners. Much of the work is carried out free of charge, but some of it is charged for on a contract basis: during the first five years total contract income was £120 000. Much of this contracted work was effectively financed by the environmental land management schemes (see below). Thus less than 14 per cent of the project is ultimately funded by the private sector market on a contract basis.

Restoration and maintenance work is carefully targeted. Sites are selected by various criteria. First, the extent of the threat, taking account of the level of scrub and bracken invasion, the risk of site

fragmentation and the size of sites (generally sites of less than 20 hectares are not considered because they are too small to support a good range of heathland biodiversity). Second, the ecological importance of sites in terms of designations (like SSSIs) and their 'link potential', i.e. potential to link fragmented sites. Third, the opportunity for permission to carry out work — some owners may have no wish to improve the habitat value of their sites, sometimes because they think it will reduce its development potential (Woodrow *et al.*, 1996).

After a possible site is identified, a biological survey is undertaken with the agreement of the landowner. Management suggestions are then made to the landowner. Following agreement with the landowner, the work is carried out by the project on a no-cost or cost recovery basis, and advice is given on the availability of grants (see below) where applicable. Long-term management plans are drawn up in most cases.

Other important activities are advising other organisations on their heathland initiatives (e.g. Forest Enterprise and Dorset County Council), providing training to other organisations and education work. The project represents a skills bank which benefits heathland conservation locally and nationally. The project has contributed to the Dorset Heathland Forum which includes representatives of other NGOs, statutory conservation bodies and Dorset County Council. This aims to co-ordinate the management of heathlands by the member groups. It has adopted the Dorset Heathland Strategy which sets out conservation policies.

The project had met its target of restoring 560 hectares by autumn 1996, three years ahead of schedule. A further 250 ha has been restored by other organisations, including NGOs, local authorities and English Nature. But more restoration work remains to be done. A survey reported in 1993 estimated that about 2 290 ha of heathland in Dorset (or 32 per cent of the total) was covered in scrub, pine plantations, bracken and rhododendron (Woodrow *et al.*, 1996). This suggests that a further 1 500 ha requires restoration.

The project is also beginning to undertake re-establishment work. It has set a new target to re-create 60 ha by 1999. This involves creation of heathland on land that was formerly heathland but is now arable or forestry land (for example) and is no longer classified as heathland (unlike the heathland in need of restoration — see above).

Environmental land management schemes

These schemes pay private land managers to conserve heathlands and other habitats. The payments reflect the environmental benefits of heathlands (see Section 2.2) and help meet environmental objectives. Most of the schemes operate under the EU Agri-Environment Regulation (2078/92) which aims to 'promote agricultural production methods compatible with the requirements of the protection of the environment and maintenance of the countryside'.

Total UK expenditure under the agri-environment measures was about £80 million in 1996/97; of the England total of £65 million, £50 million went to farmers, the remainder on running costs, administration and monitoring (House of Commons Agriculture Committee 1997). Expenditure on these measures has increased over recent years but still represent less than 3 per cent of total CAP expenditure in the UK (c. £3 billion per year) - although most of this is obligatory production linked support.

The main schemes for Dorset's heathlands are Countryside Stewardship and the Wildlife Enhancement Scheme.

Countryside Stewardship

This is administered by the Ministry for Agriculture Fisheries and Food (MAFF) and is an agri-environment measure. Heathlands are one of the habitats targeted by the scheme.

Table 3. Standard heathland payment rates under Countryside Stewardship

<i>Prescription</i>	<i>Payment rate (1996)</i>
Base (for maintaining existing area)	£20/ha/yr
Supplement (for improving quality)	£30/ha/yr
Re-creating heath	£275/ha/yr for 10 years
Scrub clearance	£100 to £500/ha
Bracken control	£50 to £100/ha

Wildlife Enhancement Scheme

This is administered by English Nature, the statutory nature conservation body, and is not an agri-environment measure. Annual WES expenditure in Dorset on heathlands was £210 000 in 1996/97, of which £70 000 was annual payments and £140 000 capital payments. The scheme covered 1991 ha at March 1997, including 703 ha being grazed (English Nature, 1997a). It only applies to SSSIs.

Table 4. Standard heathland payment rates under Wildlife Enhancement Scheme

<i>Prescription</i>	<i>Payment rate (1997)</i>
Base (for maintaining existing area)	£25/ha/yr
Grazing by cattle or ponies	£60/ha/yr (plus upto £500 per site)
Fencing	£2/m
Scrub clearance	£600 to £1000/ha
Rhododendron clearance	£1500/ha
Bracken clearance	£300 per ha

English Nature also operates the Reserves Enhancement Scheme, which is targeted on reserve management by smaller NGOs. Expenditure on this scheme on Dorset heathlands was about £40 000 in 1995/96. 'Section 15' grants under the Wildlife and Countryside Act (administered by English Nature) accounted for a further £12 000 (Rayment, 1997).

Renewable energy markets

The above incentive measures involve subsidies for the conservation management of heathlands. These subsidies reflect the environmental benefits provided, and can therefore be defended on economic grounds. However in the long-term it may prove necessary to find new markets for heathlands.

Heathlands only exist because of past markets (e.g. for grazing), which have been in decline. Unless new markets are found, increasing subsidies will be required which may not be forthcoming.

One possible 'new' market is premium markets for organic (and other) meat from extensively-reared, traditional breeds, of cattle and sheep. This Section focuses on new markets from renewable energy. Heathlands have traditionally been used for energy — for example, gorse has been used as a fuel for baking bread — but these markets have disappeared.

A report by ETSU (the Energy Technology Support Unit) (ETSU, 1994) assessed all the possible forms of renewable energy. One of these was 'agricultural and forestry wastes', which include the by-products of heathland management (wood, bracken, etc.) although no specific mention was made of heathlands. The assessment suggested that under the 'Heightened Environmental Concern' scenarios, involving a high carbon tax, these wastes could provide 6.5 TWhrs of electricity per year, equivalent to 2 per cent of total UK supply.

Compared with 'energy crops' (e.g. coppice and miscanthus) these sources benefit from low fuel costs (i.e. the costs of supply to the power station) because they are by-products of management for other purposes (such as timber production), although transport costs from dispersed sources may be higher. There may also be problems in ensuring continuity of supplies.

The typical value of the wastes, per tonne of dry matter, delivered to the power station, is £30 per tonne. The value to the site manager must be reduced to take account of transport costs. The value is therefore comparable to the value of heathland by-products (mulch) currently sold at Arne RSPB reserve at £5 to £15 per tonne. The value of timber would tend to be higher but would depend on quality. Timber sold at Arne is medium quality, typically used as fence posts, rails and sawlogs, and is sold as 'standing timber' i.e. the buyer pays the harvesting costs (Harley *et al.*, 1996).

The analysis of the costs of RSPB heathland management operations (Harley *et al.*, 1996) suggests that the net costs of woodland and scrub removal vary from £290 to £2 000 per hectare, taking account of timber and mulch revenue. Income from by-products can make a significant contribution to costs (as much as 70 per cent at Arne), but net restoration costs will still be substantial. (The costings are explained further in Section 5.3). Income from energy markets is likely to be more significant for heathland restoration than for on-going management.

The main way in which the renewable energy markets for waste products are currently being developed is through the Non-Fossil Fuel Obligation (NFFO). This is funded, at over £100 million per year, by the fossil fuel levy on electricity bills. Projects involving energy crops and these wastes (collectively known as biomass) accounted for only 3 out of the total of 141 projects in the third round of NFFO in 1994. In the fourth round (1997) they accounted for 7 out of 195 projects — or 67 MW capacity. Current expenditure on biomass is negligible but is set to increase if these projects are realised. By February 1997 one project had won planning permission and this will take both willow coppice and forestry residues. The average contracted price has fallen from 8.5p/kWhr (1994) to 5.5p per kWhr (1997), suggesting that the economics are improving (ENDS, 1997).

The objective of NFFO is to develop markets for renewables by providing medium-term (15 year) subsidies. It is not intended to support markets in the long-term and it is hoped that after NFFO contracts have finished the markets will be self-supporting. In this context, the role of carbon taxes could be crucial in the longer-term. The analysis by ETSU suggests that agricultural and forestry wastes will only provide significant electricity if a carbon tax is introduced. Alternatively, the markets for 'green energy' might develop — with electricity consumers willing to pay a price premium for renewable energy,

as for organic food. Some trials have commenced in the UK and significant markets are understood to be developing in the Netherlands.

It should be noted that the development of renewable energy markets would benefit other wildlife habitats as well as heathlands, in particular reedbeds (through supporting reed markets) and woodlands (through supporting fuelwood markets, including coppicing).

Greenfield development levy

This levy could be a way of reflecting environmental costs and benefits in land use decisions and markets *and* providing new sources of finance for conservation. The Civic Trust, a UK NGO, has suggested the introduction of a greenfield development levy to encourage the development of 'brownfield' (developed) sites and discourage the development of 'greenfield' (undeveloped) sites, including heathlands (Planning, 1996). Greenfield housing developments would be subject to a levy of 10 per cent of the site value (with planning permission) and the revenue (of about £250 million per annum) would be used to subsidise brownfield developments - which generally involve extra costs (for example higher site preparation costs). Brownfield sites of existing wildlife conservation value would need to be protected.

The levy would be unlikely to significantly reduce the rate of development of Dorset heathlands for housing, because most of the heathlands already benefit from statutory protection (96 per cent are SSSI) and would be unlikely to receive planning permission anyway. However the levy could help protect heathlands elsewhere in the UK. Also the revenue from the levy could help to fund management of Dorset (and other) heathlands. This could be justified by reference to the damage caused by housing (and other) developments to heathlands over recent decades. It would be logical to apply the levy to all greenfield developments, not just housing developments: it could cover industrial, mineral and road developments etc.

Landfill tax

Another form of incentive measure for heathland conservation is the landfill tax. The tax was introduced in 1996 and is intended to ensure that the price of landfill reflects the environmental costs, thereby encouraging recycling and other forms of waste management. Where payments are made to registered environmental bodies the liability to the UK Exchequer can be reduced through a tax credit. Up to 20 per cent of the revenue (amounting to £90 million in the first year) can effectively be spent by the environmental bodies. The objectives of these bodies are statutorily defined, and include restoration and reclamation of former landfill sites and improving the environment in the vicinity of sites. Such improvements can include the creation of wildlife habitats (HM Customs and Excise, 1996).

By October 1997 over £30 million had been paid to environmental bodies. At least three projects, with a total value of £27 000, have been approved in principle for the Dorset heathlands. The extent to which the landfill tax could be used in future for heathland management and biodiversity conservation generally depends partly on how the existing regulations are interpreted, but also on whether the regulations are amended following the current review. The objectives of the environmental bodies could be widened to ensure that more projects needed for implementation of the Biodiversity Action Plan qualify.

Quarrying or aggregates tax

A further incentive measure which could fund heathland management is a quarrying tax, which is currently being considered by the UK Government. Quarrying has damaged and is damaging heathlands and so it would be justified to use part of the revenue to fund management activities which help repair this damage.

Heritage Lottery Funds

This is an important new source of funds for heathland management. £14 million will be spent on heathland management in Cornwall, Suffolk and Shropshire over the next five years, under a project led by English Nature (English Nature, 1997b).

5.2 Process of implementation and distributional effects

The process of implementation has been discussed above (Section 5.1). This Section addresses employment impacts.

Dorset Heathland Project

The project employs ten FTE (full time equivalent) staff and spent £80 000 on local goods and services in 1995/96. On the assumption that each job supports a further 0.25 jobs in the local economy, through expenditure by employees, a further 2.5 jobs are supported. On the assumption for each every £30 000 spent on local goods and services an extra job is supported, expenditure by the project supported a further 2.5 local jobs (Rayment, 1997). See Table 5 below.

Dorset heathland work in general

Total annual expenditure by the organisations involved in heathland management in Dorset has been estimated at £1.2 million. This includes English Nature (£372 000, including WES but excluding payments to other organisations), RSPB (£300 000), Dorset County Council (£143 000) and the National Trust (£120 000). Direct employment was estimated at 38.5 FTE. Using similar assumptions as for the Dorset Heathland Project the employment impacts are summarised below.

Heathland work also generates employment through visitor expenditure. The RSPB Arne reserve in Dorset currently attracts 30 000 visitors per year, and a survey has estimated that they spend an average of £5.75 each in the local economy. They therefore contribute £170 000 in the local economy — which in turn supports 5.7 jobs. The Table uses a figure of 6, but this is likely to be an underestimate of the total, since it considers only one site.

Table 5. Employment from Dorset Heathland Project and Dorset Heathland management in general

<i>Type of employment</i>	<i>DHP</i>	<i>All organisations</i>
Direct employment	10.0	38.5
Employee expenditure	2.5	9.5
Management expenditure	2.5	13.0
Visitor expenditure (Arne)	?	6.0
<i>Total FTE jobs</i>	<i>15.0 +</i>	<i>67.0</i>

5.3 The role of information and uncertainty in the implementation process

Costings

A key feature of the Dorset Heathland Project has been the development of accurate costings for conservation work. This has been important in gaining funding from external sources (like the EU LIFE fund) and for charging out work to other landowners. They have also been useful in estimating the costs of implementing the habitat action plan at a UK level (see Section 1).

Each operation is costed based on the amount of labour, machinery and consumables used. For labour, an average daily rate is estimated, taking account of all overheads. For machinery, the annual depreciation and maintenance cost of each type of machinery is divided by the expected annual use (in days) to give a daily charge rate. Annual depreciation is calculated by dividing the current replacement cost of the machinery (less the residual value) by the number of years in use. The current replacement cost is used rather than the original purchase price to allow for inflation. There is no consideration of interest or finance charges. Consumables like fuel are then added.

The following costs do not take account of revenue from by-products (e.g. timber, wood residues, mulch) or from agri-environmental payments. This was because under the project any such income goes to the landowner not the project. The net costs will therefore be lower.

Table 6. Dorset Heathland Project management operation costs in 1994/95

<i>Operation</i>	<i>Cost (£)/ha</i>
Pine clearance	
> 20 years old	1600
< 20 years old	950
Birch clearance	1900
Rhododendron clearance	6700
Gorse management	5300
Bracken clearance	
Swiping	110
Knapsack sprays	270
ULVA	210
Heather foraging & firebreaks	500

Source: Woodrow *et al.* (1996).

In a further report (Harley *et al.*, 1996) standard costs have been developed to allow the comparison of costs between sites on a common basis. Standard or 'generic' costs were estimated for labour (£70 per day) and for each type of machinery (e.g. £66 per day for a 90 horsepower tractor). Costs were presented for the Dorset Heathland Project, Arne and Minsmere RSPB nature reserves on a common basis — although only Arne and Minsmere include income from by-products (grants were excluded). The following table indicates the range of costs involved, with actual net costs depending on physical characteristics of the local site and the availability of local markets for by-products.

**Table 7. Dorset Heathland Project, Arne and Minsmere nature reserves
Range of management operation costs in 1993/4 and 1994/5**

<i>Operation</i>	<i>Cost (£)/ha</i>
Pine and birch clearance	900 - 2100
Scrub removal	290 - 360
Pine seedlings removal	35
Rhododendron clearance	6400 - 29000
Gorse management	2300 - 11000
Mowing bracken	100 - 150
Spraying bracken	130 - 260
Mowing heather	270 - 550

In future this type of information could be used to compare the cost effectiveness of different management operations — the costs could be set against the ecological benefits.

It should be noted that these costs are generally higher than the payment rates under the environment land management schemes presented in Section 5.1. This probably reflects the more intensive management undertaken by the RSPB (especially at its reserves) than can be expected in the wider countryside. Another factor is that the payment rates reflect the minimum payment levels required

to deliver the work under competitive tender. They therefore tend to reflect minimum rates to avoid the possibility of paying excessive grants. Higher payments may be made in exceptional circumstances. There may also be definitional differences.

Ecological benefits

The project has restored over 560 hectares of heathland.

The ecological impact of this has been monitored for birds, but not other animal species (vegetation monitoring has been carried out). Changes in population for 3 key breeding bird species are shown in the table below. This monitoring covered 885 hectares, only 282 hectares of which was subject to management by the project since 1989. Therefore the results are not conclusive, but do suggest ecological benefits.

Table 8. Summary of populations of key bird species on 8 monitored sites

<i>Species</i>	<i>1991</i>	<i>1994</i>	<i>% change</i>
Nightjar	47	60	+28
Dartford warbler	36	72	+100
Woodlark	14	20	+43

Source: Woodrow *et al.* (1996).

5.4 Framework and context of implementation

This has been discussed in Section 5.1.

6. POLICY RELEVANT CONCLUSIONS

6.1 Transferability of the experience

The lessons discussed below can be transferred to other habitats in the UK and to other countries in general. Lesson 3 applies throughout the EU.

6.2/6.3 Lessons learned and policy advice for implementation

1. *The need for co-ordination between public and private sector initiatives.*

In this case this has been furthered by the Dorset Heathland Forum and their production of the Dorset Heathland Strategy. There have also been joint research initiatives.

2. *The need for conservation initiatives to be comprehensive and wide-ranging.*

Initiatives must include not only the provision of grants, but also advice, availability of skilled manpower, technical trials, research, monitoring and policy development. In this case, the Dorset Heathland Project has complemented the role of the environmental land management schemes (provision of grants and advice) by providing the skilled manpower, technical expertise and funds to carry out intensive and highly targeted management work.

3. *The need for more integration of national and EU policies which impact on heathlands.*

Although the Dorset Heathland Forum has been successful in integrating local policies and initiatives, a major challenge remains to integrate biodiversity and agricultural policies at a national and EU level. In particular Section 2.3 discussed how heathland re-creation — to meet the UK Biodiversity Action Plan — may be being hampered by agricultural subsidies available under the EU's Common Agricultural Policy. Although the agri-environment measures are helping to meet biodiversity objectives, they are small compared with 'mainstream' subsidies which encourage agricultural production. Substantial re-creation of heathland and other wildlife habitats will continue to be difficult to fund until there is thorough reform of the CAP.

4. *The need for additional public sector resources to be spent on heathland management.*

Although the Dorset Heathland Project has been successful in Dorset there is a limit to how much similar projects, funded mainly by the private sector and the EU LIFE funds, can contribute to the lowland heathland habitat action plan at the UK level. While the Dorset Heathland Project contributed £840 000 between 1989/90 and 94/95 or £140 000 per year (Section 5.1) this amounts to only about 7 per cent of the total extra annual expenditure required at a UK level by 2000 (Section 1). The bulk of the funding will have to come from the UK Government, probably through an expansion of the environment land management schemes. Other sources of funding could include the landfill tax environmental bodies mechanism, a greenfield development levy, a quarrying tax and the National Lottery.

5. *The need to identify new markets which can support heathlands in the long-term, without public subsidy.*

This study has identified renewable energy markets as a possibility, although this does require public subsidy in the medium term to develop the technology and markets.

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