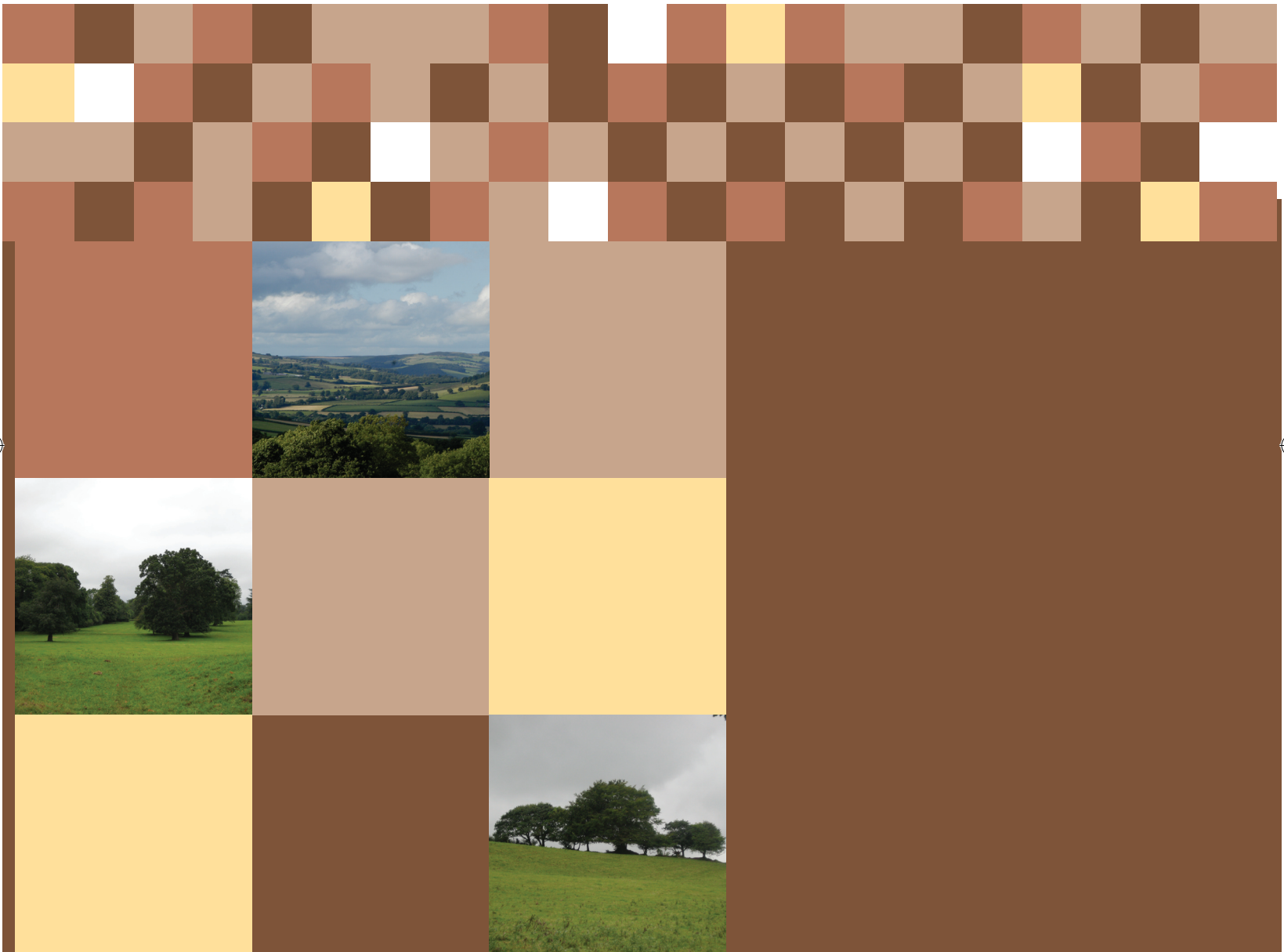


# Sustaining the Land

## A Review of Land Management Actions Under Axis 2 of the Rural Development Plan for Wales 2007-2013



Cronfa Amaethyddol Ewrop ar gyfer Datblygu Gwledig:  
Ewrop yn Buddsoddi mewn Ardaloedd Gwledig  
The European Agricultural Fund for Rural  
Development: Europe Investing in Rural Areas



Llywodraeth Cynulliad Cymru  
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# ***Sustaining the Land***

## **A REVIEW OF LAND MANAGEMENT ACTIONS UNDER AXIS 2 OF THE RURAL DEVELOPMENT PLAN FOR WALES 2007-13**

*The Welsh Assembly Government invites comments on the future structure of support for environmentally sustainable land management in Wales. Further details of the consultation, and how to respond to it, can be found in section 8 of this paper. The closing date for comments is 19 December 2008.*

### **1. CONTEXT FOR THE REVIEW**

More than ever before the Welsh countryside is under pressure to contribute to society's needs – crucially for food and timber, but also for recreation, as wildlife habitat and now as a resource in our response to the adverse effects of climate change. Now more than ever, we need our land to deliver many functions for us.

The current consultation on a new strategy for Welsh farming (*Farming, Food and Countryside: building a secure future*) recognises this multi-objective approach, setting the opportunities for Welsh farmers to position themselves as producers of high-quality, environmentally friendly products alongside the realities of recent and likely future CAP reform, which (as the Health Check proposals and “challenge agenda” published by the European Commission in May 2008 demonstrate) will require adaptation as support is shifted towards rural development measures, and the wider environmental objectives of the Welsh Assembly Government, which will require concerted action on the part of land managers to contribute towards achieving those objectives, for example through conserving soil carbon.

The present consultation seeks to grasp this major opportunity to refocus support for land management in Wales to ensure that the maximum possible contribution is made to achieving these wider objectives while having a strong focus on food and timber production. It proposes, in section 6 of this paper, a number of alternative options, which can be considered to some extent as different ways of achieving the same result: a more coherent, more efficient and more targeted approach to land management support in Wales.

The land management schemes initially included in the Rural Development Plan for Wales 2007-13 were developed over a considerable period, have proved popular with land managers, and have generally been shown by

evaluation to be at least partially effective and efficient in delivering environmental outputs. Nevertheless the Assembly Government has recognised that a number of fundamental issues need to be addressed in the future design of land management support, including:

- the need to tackle wider environmental challenges including climate change – reducing emissions and adapting to climate change;
- the effects of CAP reform on land management practices and the likely direction – signposted in the Health Check proposals – of CAP support post 2013, which will mean not only that farmers need to connect more strongly with their markets but also that rural development measures will need to be strengthened to tackle the new challenges ;
- the need to prepare for the implementation of the Water Framework Directive;
- the need for greater integration between schemes to attain a range of environmental benefits

The Assembly Government has therefore chosen to undertake a wide-ranging review of delivery across the whole spectrum of the activities permitted under Axis 2 of the Rural Development Regulation (Reg. EC/1698/2005), with a view to modifying the Plan in 2009 to implement changes arising from the review. The review takes forward elements of the *One Wales* commitment to “submit a Rural Development Plan (RDP) for 2007-2013 to the European Union, based on the level of Tir Mynydd funding agreed by the Assembly in March 2007 and develop a replacement scheme post 2010, taking into account the impact on elements within Axis 2”. The RDP commits the Assembly Government to the review, and the outcome will of course need to be agreed with the European Commission.

The scope of the review includes all the potential measures specified in Article 36 of the Regulation, namely:

- natural handicap payments to farmers in mountain areas, together with payments to farmers in other areas with handicaps;
- Natura 2000 payments and payments linked to the Water Framework Directive;
- agri-environment payments;
- animal welfare payments;
- forestry schemes including first afforestation, establishment of agroforestry systems and forest environment payments;
- support for non-productive investments linked to the above.

The key objective of the review is to maximise the effectiveness of spending under Axis 2 in meeting the Assembly Government's wider environmental objectives, particularly those arising from the *Wales Environment Strategy* – relating to the climate change agenda, action to halt the loss of biodiversity and maintain designated sites in favourable condition, action to maintain and enhance the historic character of our landscape, and the development of landscape-scale and ecosystems approaches; from *Farming for the Future*

and the *Farming, Food and Countryside* vision – relating to the future sustainability of farming and the shift from direct subsidy to payment for public goods; and from *Woodlands for Wales* – relating to the sustainable management of woodlands.

In parallel with this review further work is being undertaken to develop the ecosystems approach and to consider the scope for landscape-scale action. In this context the *Wales Spatial Plan* remains relevant; it noted that “many of the benefits of agri-environmental action can only be obtained by taking action across a wider geographical area: for instance to create habitat on a scale to sustain biodiversity, managing river catchment areas to prevent flooding, or developing footpaths. Action on this broader landscape scale, coupled with the management of the Assembly Government’s woodlands, will become increasingly important to help the Welsh landscape and wildlife to adapt to climate change.” This ecosystems work is identifying the different needs of different areas in Wales – for example uplands, the ffridd, flood plains and coastal areas – and will complement and inform the approach taken in this paper, although the geographical targeting of land management measures advocated in this paper is based more on fit with high-level policy objectives.

This approach highlights the strong focus on agri-environment schemes, both within the existing Plan and in this review, since this is where the bulk of the available resources are directed, not least because agri-environment action remains the surest way of achieving the Assembly Government’s environmental policy outcomes across the wider countryside. Such action also provides the most significant means of support for high nature value areas including Natura 2000 sites, and given the extent of this support, together with support from state-aided management agreements, the Assembly Government has made clear that it does not intend to introduce any additional measures at this stage; rather, the requirement to achieve biodiversity outcomes is fully integrated into this review. For the same reason – that support is already provided from other sources – the Assembly Government has indicated that no animal welfare payments will be made under Axis 2.

The review is, however, the medium through which the *One Wales* commitment that “We will explore the introduction of a grant scheme to convert to biomass crops” will be discharged, although it is recognised that any support would in fact have to be provided under Axis 1 (see section 4.6 for further details).

In order to ensure that the review is informed by, and achieves acceptance from, as wide a spectrum of key external stakeholders as possible, a stakeholder group was established in February 2007 and has already met on several occasions. The following interests are represented: the farming unions (NFU Cymru, FUW and CLA); environmental agencies (Countryside Council for Wales, Environment Agency Wales); the environmental NGOs (National Trust, RSPB representing Wales Environment Link); the National Parks (Snowdonia NPA); the organic sector (Organic Centre Wales); and the wider rural community (Institute of Rural Sciences, Upland Forum).

This paper represents the first distillation of the ideas which have been contributed by stakeholders and by Assembly Government interests, and is structured as follows:

- introduction – purpose of land management interventions
- extent to which existing schemes are fit for purpose
- high level outcomes which should be delivered by a new suite of schemes
- options for delivering these outcomes
- conclusions and recommendations

The approach taken to the review recognises that the policy landscape is continuing to evolve, not least in respect of continuing CAP reform and significant shifts of money into rural development measures, initially through the successive increases that have been announced in rates of compulsory modulation from 2009 onwards and in the longer term through the transfer already signalled in the Commission's Health Check proposals, of resources from Pillar 1 of the CAP into Pillar 2. This means that over time it should be possible to make increasingly bold interventions to secure progress against key environmental priorities, including coastal and flood risk management, at a scale which will not be possible in the early years following implementation of the outcomes of the review. A key test for the Axis 2 review is that it should create a framework that can gear up to the increasing opportunities that will be created by the progressive switch of funding from Pillar 1 of the CAP to rural development measures.

## **2. INTRODUCTION**

Until the second half of the twentieth century, agricultural practices were responsible for producing some of the most diverse and species rich habitats in Britain. Farms practised a form of agriculture designed to optimise productivity under local environmental conditions, which resulted in spatially heterogeneous but predictable management processes. These processes produced a set of suitable habitats for a wide range of species and ecosystems.

Following the Second World War, significant increases in livestock and arable production (so-called *intensification*) were achieved through the modernisation of agricultural practice. More external inputs such as herbicides, artificial fertilisers and improved crop strains, together with modifications to the landscape such as improved drainage and the replacement of species-rich semi-natural vegetation with monocultural grass swards, resulted in a reduction in landscape and field scale heterogeneity and a resulting reduction in the numbers and diversity of species inhabiting those areas. Consequently, this increase in productivity has come at an environmental cost.

State funded land management schemes were introduced for the first time by the EU in the early 1990s and have continued to the present day in an effort to reduce the environmental impacts of intensification. These schemes in

Wales currently set levels of grant primarily upon the basis of income foregone, with an 'additional costs' element related to increased costs as a consequence of implementing a management prescription. This method is based upon the notion that most of the public goods (i.e. environmental goods and services) provided by farmers through a land management scheme are 'non-excludable' (once supplied, everyone can benefit) and 'non-rival' (consumption by one person does not reduce supply for others). These characteristics mean that they are undersupplied by markets, and hence, that there is a role for government in their provision.

Land management schemes funded through Axis 2 can therefore be viewed as the State (in this case the Welsh Assembly Government) buying environmental goods and services ('public goods') from farmers who would otherwise not supply them. It is worth noting that these schemes also provide socio-economic benefits which arise as a consequence of the increase in expenditure in mainly rural areas associated with the provision of grant. However, this is not the primary objective of these schemes. Getting this message across to land managers (i.e. that grant schemes under Axis 2 are not income support schemes) requires a significant cultural shift within the agricultural community. The difficulties associated with this cultural shift should not be underestimated. However, without this shift in understanding, delivering any significant changes to the current schemes will pose some real challenges.

There are difficulties with the provision of these public goods by the State, primarily because there is no interaction of demand and supply, which in a properly functioning competitive market produces the most favourable resource allocations, sets optimal prices, and encourages innovation to improve both efficiency and quality. Thus government has to estimate both the level of demand (i.e. how much consumers value environmental goods) and the level of delivery motivated by the price offered to land managers for supply. Level of demand can, to a certain extent, be estimated where the public goods are related to outcomes specified in legislation or other policies such as national Biodiversity Action Plan targets. Even where this is possible, however, none of the existing schemes operating in Wales have this cross reference or any mechanism for limiting further increases in production once a preferred level of demand has been satisfied other than the scoring process that limits entry into Tir Gofal.

The difficulties associated with setting the price in the absence of a market make the income foregone approach attractive. However, notwithstanding the fact that this principle is now enshrined in WTO and EU rules, there are difficulties with using income foregone as the principal basis for rate setting. For example, it assumes that all farmers would have maximally intensified every area of their farm in the absence of any agri-environment grant so as to derive the maximum income from agricultural production. This is unlikely to be true as there are likely to be some areas where the cost of initial intensification and its maintenance will exceed the return from such intensification. If this is the case, then income foregone payments may lead to overpayment for environmental goods since some may have been delivered

anyway on the less intensified areas of the farm. In addition, the CAP reforms of 2007 and the introduction of the Single Payment Scheme substantially decouples direct agricultural support payments from production decisions. This has implications for the levels of agri-environmental payments in that the altered production levels associated with participation in many agri-environmental schemes do not lead to any income being foregone. To provide meaningful income foregone calculations in these circumstances would require a farm model to predict the level of production under SPS conditions, and then compare with actual production within the agri-environment scheme. Getting this on an individual farm basis would be difficult and expensive. The difficulty associated with reliably estimating income foregone also reinforces the culture that these are income support schemes.

There is an indication in the Wales Audit Office (WAO) report into Tir Gofal that the UK interprets the requirements for income foregone in a more restrictive way than other EC member states. This will be investigated further as part of the review and, if it is the case, any new scheme that arises as a consequence of this review should make use of this increased flexibility.

In the longer term, it would be more effective to move the basis of payment from income foregone to payment for the delivery of environmental goods and services (output/outcome based payment). This would have several potentially beneficial outcomes:

- It would link the payment of grant directly to outputs at a farm level, thus developing a sense within the farming community that the delivery of these public goods is an integral part of the farm business. This shift in perception may have an important role in preparing the farming community for the transition of payments from Pillar 1 to Pillar 2.
- From the public point of view, it would mean that grant aid to land managers would be directly linked to the provision of goods and services that enhance the public's quality of life, making the value for money of such grants more apparent
- Monitoring and evaluation of scheme delivery would be simplified
- Breaking the link between income foregone and delivery of public goods would also overcome the difficulty associated with declining levels of income and thus a reducing rate of grant

The move to output based payment has to be regarded as a longer term objective since EU and WTO rules presently allow payment only on the basis of income foregone and additional costs incurred. However, a number of Member States are giving thought to the potential for change, and the review will include consideration of the ideas which are being developed as a result of this work, and will engage with the European Commission (EC) to explore the possibilities.



A significant issue with the output based approach is the problem of setting the level of payment in the absence of an efficient market. It may be possible to overcome this, either by undertaking research into actual costs of the work or by novel means such as inviting land managers to bid for funds to deliver defined public goods on their land, thus creating a market for delivery. However, experience from the USA and Australia suggests that land managers soon learn the 'target rate' for work and thus after 3-5 years all bids come in at just below the ceiling rate, thereby eliminating any advantage that the scheme may have offered.

In the short to medium term, however, there appears to be no alternative to continuing with payments on the basis of income foregone. In the longer term, it is suggested that the Welsh Assembly Government (WAG) should investigate the possibility of including soil carbon and water quality improvement in a 'cap and trade' scheme by setting up a working group to examine all the issues. It is understood from discussions with the EC that agricultural carbon management may be included in the next round of the European Emissions Trading Scheme (EETS). In principle, the EETS provides a market mechanism which could be extended to agriculture, provided suitable quantification methods could be developed, with adequate validation for time-variable carbon sequestering rates. The Shadow Price of Carbon (DEFRA 2007) also provides a valuation for policy options within an agri-environment scheme. If it is considered that such a scheme is feasible, experience from the USA suggests that the lead time between taking the decision to proceed and launching the scheme can be five years or more. Thus any such action has to be viewed as a medium term (post 2013) option. Given the potential benefits, it appears to be appropriate to commission a feasibility study to investigate the practicalities of such an approach.

Assuming that the State has a proper role in intervening to buy these public goods, the question arises of which public goods should be bought. Action 31 of the Wales Environment Strategy Action Plan states that 'We will use the opportunity of the revised Rural Development Plan to refocus and ensure greater targeting of our agri-environment and land management schemes to deliver our environmental priorities, in particular adaptation to climate change, tackling diffuse pollution from agriculture and enhancing biodiversity'.

Building on that commitment, this paper suggests that the State should, within the context of Axis 2, direct money at the purchase of those public goods to which it has a legal or policy commitment as described above; which meet the requirements of the EC vis-à-vis Axis 2 expenditure; and which can be delivered by land managers through changes to their current management practices. It should be recognised that this approach operates by substituting one funding mechanism for another. However, this mechanism is much more closely aligned to the delivery of policies and legislative requirements than the current schemes. In the longer term, as mentioned above, there seem to be opportunities for developing market mechanisms to deliver carbon conservation and water quality improvements but these will take longer to develop.

### **3. DO CURRENT AXIS 2 SCHEMES DELIVER THESE PUBLIC GOODS?**

#### **3.1 Evaluation of present delivery**

Evaluation of delivery through current schemes should consider the following issues:

- Have the schemes partially or wholly delivered the expected outcomes and outputs defined in any commissioning documentation?
- What evidence is there that the defined outcomes and outputs have been delivered?
- Has this delivery been cost-effective?
- Are the schemes fit for future purpose (i.e. do they deliver the public goods described above)?

#### **3.2. Agri-environment schemes**

None of the current schemes operating in Wales have extant commissioning documents that precisely define the scheme benefits, outcomes or outputs to be delivered, although Tir Gofal, for example, does have defined (although non-targeted) objectives. The effects of agri-environment schemes on the environment would ideally be determined if (trends in) habitat condition or species richness or abundance on scheme sites were compared with those on suitable control sites; however, as the WAO Tir Gofal study indicates, identifying control sites in this context is extremely difficult. Considerable work has, however, been undertaken to evaluate habitat condition as a proxy and the Countryside Survey will provide an overall Welsh picture in 2008.

The WAO report on Tir Gofal comments that “The scheme now covers 20 per cent of agricultural land in Wales, a level of uptake that compares well with similar schemes in England and Scotland, and coverage is greater in those areas that have particular environmental value: Sites of Special Scientific Interest, and Special Areas of Conservation. There is some evidence to suggest that the activities funded by the scheme *should* benefit habitats. However, there is only limited evidence about the extent to which beneficial changes to habitats can be attributed to Tir Gofal rather than other factors. Also, there is a lack of comprehensive data on Welsh habitats and how they are changing over time. This makes it difficult to put the achievements of Tir Gofal into context”. The point to be emphasised here is not that Tir Gofal has failed to deliver benefits but that evaluation of the delivery of those benefits is problematic. This is an important learning point which should be borne in mind should any new scheme be developed as a consequence of this review.

Assessing the cost-effectiveness of the delivery of these schemes in the absence of data regarding outputs is also problematic. Although the WAO reviewed the cost of administering the scheme it has not been possible to assess the cost of environmental change that the scheme is intended to deliver. In part, this is because many other factors apart from grant aid affect the delivery (or not) of environmental change on a farm. As Kleijn (2003) points out “No agri-environment scheme has been designed with the sole

objective of conserving biodiversity. Scheme design is the outcome of a process of careful balancing of a range of ecological, socio-economic, administrative and political interests.....prescriptions are largely inspired by traditional agricultural practices that used to be associated with high levels of biodiversity. Socio-economic considerations determine what prescriptions are acceptable to farmers and at what cost. Administrative considerations determine how elaborate a scheme can be tailored to the needs of the target species groups”<sup>1</sup>. This complex of objectives, together with a lack of understanding about how management practices on farms may have changed during the grant-aided period, makes it difficult to ascertain precisely how successful grant aid has been in achieving positive environmental change.

It is clear from this analysis that an agri-environment scheme that focuses on the improvement of biodiversity as its *raison d'être* cannot demonstrate a causal relationship between money spent and outputs achieved without devoting significant resources to the acquisition of baseline data and continuing monitoring of change throughout the life of the scheme.

### **3.3 Tir Mynydd**

Tir Mynydd is the name given to the Less Favoured Area (LFA) grant scheme for Wales. The LFA covers some 79% of the area of Wales (56% Severely Disadvantaged Area and 23% Disadvantaged Area) and the scheme provides payments to approximately 10,300 farmers. Tir Mynydd is intended to compensate farmers for the additional difficulty of farming within a set geographical area, thus theoretically preventing land abandonment.

The Mid Term Evaluation of the Rural Development Plan 2000-2006 suggested that Tir Mynydd delivers only indirectly in respect of public goods (as defined in the introductory section of this paper), although it has clearly had an important effect in underpinning traditional farm structures and husbandry, albeit at some environmental cost. It also found that the scheme is discriminatory both within the LFA – as not all farmers are eligible – and also against lowland producers.

The 2007 Institute of European Environmental Policy Review looked at LFA schemes across the EU and concluded that, at best, only baseline environmental protection is being achieved. It also pointed out that LFA schemes are failing at a basic level since they do not prevent land abandonment. In Wales the main effect has been to lead farmers to build their land areas by buying neighbouring fields and consolidating their operations. Their main conclusion was that in future LFA support must align with environmental priorities within a country. It is worth noting that LFA support is not viewed as mandatory by the EC. In England, DEFRA have announced their proposals to change the existing LFA scheme into a scheme with environmental outputs.

### **3.4. Woodland Management**

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<sup>1</sup> Kleijn, D. and Sutherland, W. J., How effective are agri-environment schemes in maintaining and conserving biodiversity?, *Journal of Applied Ecology* (2003), 40, 947-969

Woodland Grant Schemes in Wales have been the subject of a recent review, catalysed by publication of WAG's Woodland strategy in 2001 and the need to re-direct public support to new policy priorities. The review also concluded that the basis of grant aid should be a long term management plan for each woodland. This also has advantages for carbon issues. The Forestry Commission has worked with stakeholders to develop a new, innovative scheme which enables woodland owners to commit to a 10 year management programme. The scheme is IT based, with owners able to submit applications and claim grant on-line and to receive capital grants [only] for the delivery of policy priorities. As Appendix 1 shows, this scheme does provide delivery against many of the policy objectives referred to and has the potential to be modified or have its scope increased to deliver against an even wider range. The time commitment is also important for establishing the principle of permanence of improvements from environmental schemes

### **3.5. Are the current schemes fit for future purpose?**

The table at Appendix 1 shows delivery by existing schemes against a set of outcomes from the Wales Environment Strategy (WES). These outcomes have, in turn, been derived from the Water Framework Directive, the Habitats and Bird Directives and other emerging legislative/policy requirements such as climate change mitigation. The table clearly shows that delivery by the current schemes against those objectives is partial, with the possible exception of nature conservation. Other public goods listed in this table can be described as economic outputs from ecosystem services (outputs from ecosystem services can be characterised as either functional or economic; the economic model emphasises the relationship between such services and human activity). The economic model is seen as being the appropriate one to take in developing land management schemes since it emphasises the relationship between land management and the production of outputs, even if some of the outputs (such as soil carbon conservation) are novel to farmers. It is clear that there is little or no delivery from existing schemes that is explicitly aimed at the provision of economic outputs from ecosystems services (the first eight outcomes shown in the table).

This is not unexpected, as the schemes were, in the main, developed at a time when nature conservation was seen as the *raison d'être* for the operation of such schemes. Additionally, they have been developed in isolation and without a strategic overview of their relationship to WAG policy delivery. WES now provides that overview and, as Appendix 1 shows, the current suite of schemes need amendment or re-development in order to support delivery of the appropriate outcomes and actions. The arguments deployed above suggest that it is time for a complete review of how these schemes should be targeted and what outcomes they should seek to deliver. The emphasis placed upon the delivery of the economic outputs of ecosystem services (in addition to the delivery of biodiversity outputs) by policy and legislation shows the need to improve the delivery of those ecosystem services as well as the wider environmental improvements that have previously been the focus of agri-environment schemes. Since delivery of many of the outputs from

ecosystem services relies upon appropriate land management, any agri-environment scheme in Wales should ensure that part of its arsenal includes grants and training (building on the training already incorporated into Tir Gofal) that will enable land managers to deliver these outputs.

***Q1. Do you agree that current land management schemes deliver only imperfectly against the Assembly Government's wider environmental objectives?***

***Q2. Would a move to an outcome-based approach help to overcome this difficulty?***

***Q3. Do you agree that a feasibility study should be commissioned to investigate the possibilities of a carbon trading approach in Wales?***

#### **4. WHAT HIGH LEVEL OUTCOMES SHOULD BE DELIVERED?**

The EC's Health Check proposals, published in May 2008, provide an important cross-check with the contextual framework provided by the Wales Environment Strategy. The proposals envisage a significant acceleration in the transfer of resources into measures aimed at supporting rural development, and in particular the rural environment, with compulsory modulation increased to fund efforts with regard to EU priorities in the field of climate change, renewable energy, water management and biodiversity.

Importantly, there is significant commonality between these priorities and the Wales Environment Strategy's (WES) key themes, such that WES and its associated action plan provide a useful reference point when considering what environmental actions any WAG-funded grant scheme should support. To restate Action 31 of WES "*We will use the opportunity of the revised Rural Development Plan to refocus and ensure greater targeting of our agri-environment and land management schemes to deliver our environmental priorities, in particular adaptation to climate change, tackling diffuse pollution from agriculture and enhancing biodiversity*".

The table at Appendix 1 referred to above provides a useful summary of the outcomes it is proposed should be included in any revised scheme. These can be broadly grouped into the following categories:

- Carbon management – including soil carbon conservation; additional sequestration in soil and vegetation; carbon positive production of fibre for energy & substitution of fossil fuel; all through best practice management on organic soils; appropriate farm woodland management; the creation of new farm woodlands; creating new wetlands and, possibly, planting energy crops
- Water quality management
- Water quantity management (flood mitigation)
- Biodiversity management

- Landscape and heritage management
- Access, including educational access

Note that organic agriculture and woodland management are not treated as high level outcomes in themselves. Rather, this paper regards them as means of delivery of those outcomes. Many of the actions associated with these categories will need to be delivered at a catchment or landscape scale if we are to derive best value from the expenditure of public money. Any revised scheme must therefore allow for, and encourage, co-operative working between land managers at this scale.

#### **4.1. Carbon management**

##### **WES outcomes:**

- 16. Soil is managed to safeguard its ability to support plants and animals, store carbon and provide other important ecosystem services
- 8. Wales has improved resilience to the impacts of climate change

##### **4.1.1. Soil carbon conservation**

Agriculture is responsible for around 12% of greenhouse gas emissions in Wales (Baggott et al, 2006)<sup>2</sup>. Welsh soil has a total carbon stock in the order of 410Mt (megatonnes) of carbon.

The most accurate estimate of the carbon stock of Welsh soils is obtained by combining comparable data derived from Bradley *et al* 2005, *A soil carbon and land use database for the United Kingdom* and Smith *et al*, 2007, *Estimating carbon in organic soils – sequestration and emissions* (ECOSSE).

#### **Distribution of Welsh Soil Carbon, land use and management options**

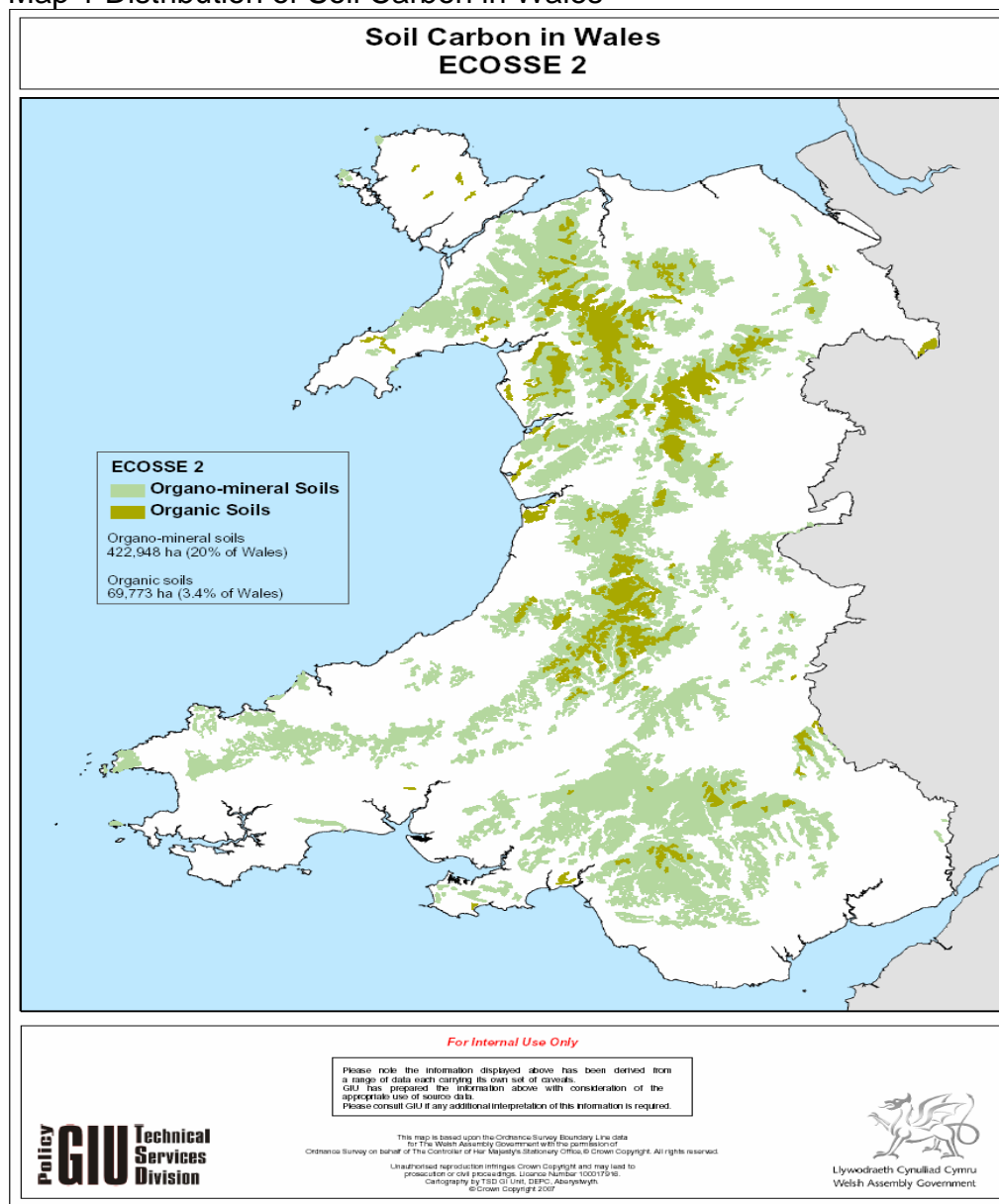
Table 1 Soil carbon content of Welsh soils

Soil Type	Stock Mtc
Organic	121.3
Organo-mineral	74.5
Mineral	183
Unclassified	30

Soils have been separated into four classes to aid the development of simple distribution maps. Organic soils have more than 40cm of surface organic horizon, organo-mineral soils have less than 40cm surface organic horizon and mineral soils have no surface organic horizon, unclassified are urban and non accessed (military owned etc) areas.

<sup>2</sup> Baggott, S.L., Cardenas, L., Downes, M., Garnett, E., Jackson, J., Li, Y., Passant, N., and Thomson, A. (2006). *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990 - 2004*. AEAT/ENV/R/2318 08/11/2006.

Map 1 Distribution of Soil Carbon in Wales



Map 1 reflects the fact that approximately half of the total soil carbon stock is located within an area of 492721 ha or 23.4% of the land surface of Wales, covered by organic and organo-mineral soils. The remaining 76.6 % of Wales is covered primarily by mineral soils with low carbon content.

In the UK, the greatest soil carbon density is found beneath woodland and semi-natural land uses such as rough grazing or unimproved land. In Wales, as stated above, approximately half of soil carbon is associated with the uplands and in particular with permanent grassland on organic soils. This vegetation category includes the majority of our peat (i.e. organic) soils. Degraded peat due to drainage, wind erosion and overgrazing is a significant source of emitted carbon, (380 000 tonnes per year in England and Wales). Such land use on organic soils results in increased loss of soil carbon. Conversion of these soils from permanent pasture and heathland to short term grassland or arable (although there is a limited amount of this in the

uplands) through activities such as drainage, ploughing and fertiliser application will significantly increase carbon dioxide and nitrous oxide emissions as the rate of organic matter decomposition increases following these activities. (It is true that this reduces methane emissions, but not by enough to offset the rate of increase for the other gases). Zero tillage reduces carbon dioxide emissions and loss of soil carbon, but the net emissions of greenhouse gases may increase because nitrous oxide emissions are increased. Issues surrounding the management of soils are therefore directly connected with policy initiatives to mitigate the effects of such emissions.

Current research (Bellamy *et al*, 2005<sup>3</sup>) suggests these organic soils lost carbon at an average rate of 2% per annum between 1978 and 2003, although it is not yet possible to determine how much was gaseous emission as opposed to dissolved organic carbon losses in water. But it is clear that the loss of a relatively small proportion of Welsh soil carbon would have a major effect on net emissions. The Acid Waters Monitoring Network and other research (notably Freeman *et al* 2006<sup>4</sup>) have reported significant increases in Dissolved Organic Carbon (DOC) within UK water bodies – a 91% increase since 1998. This DOC gives water arising from the uplands of Wales its characteristic ‘cold tea’ colour, something that water companies spend many millions of pounds removing at treatment works. It is important to recognise that the drivers for this DOC loss are not just land management but are linked to the reduction of acidic deposition, and the effect of climate change on soils.

#### **4.1.2. Management actions to conserve soil carbon within organic soils.**

A full list of management actions likely to be needed to conserve soil carbon is provided at Appendix 2. The high level actions are:

- New drainage should be prevented, and existing drainage impeded, with the objective of raising the water table
- Grazing should be managed to reduce the possibility of erosion. This can be achieved by limiting cattle numbers (especially in the winter), and reducing stocking densities
- Burning should not be allowed, except where there are significant biodiversity objectives that cannot be delivered through other vegetation management processes

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<sup>3</sup> Bellamy, P. H., Loveland, P. J., Bradley, R. I., Lark, R. M. and Kirk, G. J. D. (2005) Carbon losses from all soils across England and Wales 1978-2003. *Nature* 437, 245-248

<sup>4</sup> Freeman C, Fenner N, Ostle NJ, Kang H, Dowrick DJ, Reynolds B, Lock MA, Sleep D, Hughes S and Hudson J. (2004) Dissolved organic carbon export from peatlands under elevated carbon dioxide levels. [Nature](#) 430, 195 - 198



- Fertiliser applications should be limited to solid manure, applied only when the vegetation is growing
- Liming should be limited to sites where the soil pH is above 5 and should not take place on wet sites, irrespective of pH value.
- Conversion to short term grassland should not be allowed.
- The establishment of permanent pasture should be encouraged.

These actions could form the basis of a soil carbon conservation scheme, targeted at the organic and organo-mineral soils areas shown on the map above.

#### **4.1.3. Carbon sequestration in mineral soils.**

As described above, these soils cover 77% of Wales and account for just under half of Wales's soil carbon stock. Management practices such as arable farming and short term grassland management lead to a consistent soil disturbance which permits oxidation of soil carbon and its consequent loss into the atmosphere.

Although these soils are valued for their ease of access and relative fertility (compared to the upland organic soils) and are thus valued by farmers for their intrinsic agricultural potential, there are ways to increase the amount of carbon sequestered within these soils. These are:

- New woodland creation. Planting new, permanent woodland (preferably as extensions of existing farm woodlands) will provide opportunities for the development of brown earths on these sites. Over time, the accumulation of leaf litter and organic debris will build up on these sites and increase the soil carbon levels in comparison to a similar agricultural site.
- Creation and restoration of wetlands. There is strong evidence that lowland wetlands are large sinks of carbon. In addition, restoration of wet peatlands can sequester carbon. Both options are applicable in Wales, because much of our wet peatland has undergone extensive drainage, and more than half of the Welsh total is considered degraded. Carbon may be temporarily stored in wetlands as trees and plants and the living animals which feed upon them, and detritus including fallen trees and plants and the animals which feed upon them. In the longer term carbon may be stored in organic-rich soils, peats, and various forms of coal, shale, sandstone, and other sediments. It is long term storage that makes wetlands effective as carbon reservoirs. Wetlands often provide longer term carbon storage than other ecosystems systems because decompositional processes are hindered by the saturated conditions, high acidity and low temperatures. Many organic wetlands are underlain by deep layers of peat and it is not

uncommon to find ten or more metres of unconsolidated organic matter in peatlands. Significant quantities of carbon from both wetland and non wetland sources may also be trapped and stored in wetland sediments.

#### **4.1.4. Carbon positive production of fibre for energy**

**One Wales commitment:** “We will explore the introduction of a grant scheme to convert to energy crops”

The Rural Development Regulation envisages the possibility of support for the establishment costs of energy crops – either energy grasses such as miscanthus or short rotation coppice forestry - under Articles 20, 26, 36, 43 & 45 of Council Regulation (EC) No. 1698/2005. Miscanthus applications would be funded under Axis 1 of the Council Regulation (measure: modernisation of agricultural holdings) and short rotation coppice theoretically under Axis 2 (measures: first afforestation of agricultural land and first afforestation of non-agricultural land), although it is now understood that the EC would, somewhat counter-intuitively, expect to see this too funded under Axis 1. The production of biofuels from arable crops has not been considered as part of this review as production of crops for this purpose is likely to require the use of high quality agricultural land, which is in short supply in Wales.

Hitherto Welsh Assembly Government policy has been to support growth in demand for biomass rather than to encourage speculative supply not linked to long-term contracts securing a stable market for production. The Wood Energy Business Scheme operated by Forestry Commission Wales is a successful example of this approach, which has seen significant increases in capacity to use biomass material. One option is to continue with this emphasis on demand-side intervention, allowing market mechanisms to operate to stimulate supply initiatives without subsidy.

However, the draft WAG bioenergy strategy for Wales aims to secure the generation of 5 terawatt-hours of electricity and 2 terawatt-hours of usable heat energy from renewable biomass by 2020. Achieving this will require approximately 2,000,000 oven dry tonnes (odt) of biomass per annum. While a substantial proportion of this biomass could be derived from existing sources (including imported material, forest residues and farm woodlands), one estimate is that that around 400,000 odt would need to be provided by domestic energy crops and that this might require an area of some 40,000 hectares to be planted in the UK (although clearly the actual area planted would be for the market to decide). If these estimates were to be proved realistic, the potential costs of an energy crops scheme (assuming that support for planting were to be offered) would be significant. In England, where an Energy Crops Scheme is already established, the current rates of grant payment are based upon 40% of actual costs. The scheme in England is biased towards lowland arable areas where economies of scale and access already exist. Field patterns in Wales are much smaller and the arable tradition is much less established. Work undertaken in Wales suggests that establishment costs would be similar to those in England.

## ***Economics of energy crops***

Cambridge University and the Scottish Agricultural College assessed the farm-level economics of energy crop production in 2005<sup>5</sup>. Support payments were included in the estimates – i.e. planting grant together with the €45 per hectare payment under the CAP Energy Crop scheme. (The EC has of course proposed the abolition of the Energy Crop Scheme as part of the CAP health check proposals.)

Table 1 highlights the estimated production costs per tonne and average returns at the farm level from the major crops considered in this study. The table shows both gross and net margins for a range of energy crops. Gross margin is calculated as total income per hectare minus total variable cost per hectare and has been used for analysis and planning purposes in UK agriculture since the 1960s. Net margin is defined as gross margin per hectare minus fixed allocatable costs per hectare. It is used for complete enterprise costing and allows identification of all costs involved in a particular enterprise. The calculations were based on DEFRA grants in England that were set at £1000 per hectare for SRC and £920 for *Miscanthus*.

**Table 1: Summary of Average Costs and Returns from Different Crops for Energy - using Standard Assumptions**

<b>Crop</b>	<b>Production Cost</b>	<b>Gross Margin (£/ha)</b>	<b>Net Margin (£/ha)</b>
Short Rotation Coppice - Willow	£66 /odt	97	-163
<i>Miscanthus</i>	£46 /odt	75	-171
Wheat	£97 /t	301	-216
Sugar Beet	£24 /t	541	24
Oilseed Rape	£204 /t	305	-212

It is clear from this table that most energy crops produce a negative net margin (prices of wheat and oilseed rape have, of course, risen recently but not to an extent which would invalidate this conclusion; sugar beet would not achieve the same yields in Wales and would not therefore achieve a positive net margin here). This suggests that they are unlikely to be widely grown without more subsidy, particularly for initial establishment. In particular it was found that average variable costs of production are roughly equal to the likely market price, and that average total costs of production are much greater than the market price.

Following on from this analysis, the study examined the level at which energy crops would break-even (in terms of achieving a net present value equivalent to zero). Tables 2 and 3 present the level of price, yields, energy crop payment, establishment grant and rent necessary to achieve break even.

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<sup>5</sup> Farm level economic impacts of energy crop production. Final report. August 2005. Cambridge University and SAC

**Table 2 Comparison of break-even levels with standard assumptions Short Rotation Coppice (SRC).**

		Standard assumption	Break even levels	Difference
Price	£/odt	35	56	21
Yield	t/ odt/ha/yr	9	17	8
Energy Crop Premium	£/ha	30	193	163
Establishment Grant	£/ha	1000	2750	1750
Rent	£/ha	173	10	-163

Based on assumption of 6 per cent discount rate

**Table 3. Comparison of break-even levels with standard assumptions**  
***Miscanthus***

		Standard assumption	Break even levels	Difference
Price	£/odt	25	40	15
Yield	t/ha	14	25	11
Energy Crop Premium	£/ha	30	218	188
Establishment Grant	£/ha	920	2749	1829
Rent	£/ha	159	-12	-171

Based on assumption of 6 per cent discount rate

This analysis highlights that, when fully costed, the establishment grant would need to rise by £1750/ha for SRC, and £1829/ha for *Miscanthus* from the 2005 DEFRA rates, for establishment grants to offer a level of support that would enable a farmer to break even. Alternatively, yields would need to be 78 and 88 per cent higher than the standard assumptions for *Miscanthus* and SRC, respectively (assuming no changes in costs or support payments) for the crops to break even (that is to achieve a net present value equal to zero). In terms of the energy crop premium it is estimated that this would have to rise to £218 and £193 per hectare per year for *Miscanthus* and SRC respectively from the current level of approximately £30 (assuming yields, costs and prices remain the same). It is clear that energy crops are currently an economically unattractive proposition for farmers. Defra have recently commissioned a report to define establishment costs for *Miscanthus* and short rotation coppice (willow and poplar) which shows that the expected costs of establishment for *Miscanthus* are approximately £2000/ha, whilst SRC is likely to cost around £1660/ha. These costs would result in grant payments (at the maximum permissible rate of 40%) of £800 and £665 per ha respectively, reducing from the previous grants of £920 and £1000 offered by Defra. Since the payment now relates to actual costs there is likely to be considerable variability depending upon a range of site-related factors.

Clearly the most sensitive variable is the price as fuel. For both crops an increase in price of around 60 per cent would enable them to break even (again assuming no changes in costs or support payments). However, a price increase of this magnitude is highly unlikely, at least in the short to medium term. The 'ability to pay' that generating companies have is constrained by the price they receive for the energy they generate (including payments received for Renewable Obligations Certificates), modified by their generating costs. The only real variable is the cost of fuel, which the generators will seek to drive down to the level at which they can get all the fuel that they need. Because there are alternative fuel streams (e.g. waste wood and imported material), it is unrealistic to expect that prices for home grown material will rise above this level. Although the price of energy is increasing, driven by the upwards movement in oil and gas prices, there is no reason to suppose that much of this increase in value will 'trickle down' to fuel producers until fuel availability is reduced and the market becomes constrained. It is worth continuing to monitor fuel prices as it is conceivable that, over time, they may rise to the break even levels described above.

There is a large scale international trade in biomass. In 2004 (the last year for which figures are available), the UK imported 1.9 million tonnes or 28.08

Petajoules (PJ) of biomass (a petajoule is 160,000 tonnes of oil equivalent), of which 7.23 PJ were wood based<sup>3</sup>. The market price for this material is determined by two factors: availability of biomass and the price of the energy generated from it. Currently it is estimated that the EU-25 consumes approximately 50% of the potential biomass resource available within its own borders. This ignores, of course, the effects of import from beyond the borders and the potential for demand elsewhere. However it is likely that availability will not be a factor likely to drive prices markedly upwards in the short to medium term. As discussed above, it is also unlikely that there will be any significant increase in the market price for energy crops in the short to medium term.

Even within the EU, which generally has high standards of forest regulation, it is not possible to ascertain how much of this material is sustainably produced and can be certified as such. On the global market the difficulties associated with sustainability and certification are potentially increased as many countries have ineffective regulation and certification regimes. Since the 'carbon neutrality' of biomass depends upon the replacement of the harvested material with a new crop, it is important that the UK Government and the EU set legal requirements to ensure that both imported and home-produced biomass has been produced from sustainably managed sources. This ought to be a prerequisite to the development of a domestic energy crop market.

### ***Other issues***

If it is decided to proceed with an energy crop scheme, a number of factors need to be taken into account. These include:

Competition for suitable land. These crops are easiest to plant, manage and harvest on flat, fertile ground with a good water supply (although such crops can also be successfully cultivated, albeit with greater difficulty, on less fertile land). This type of land is in short supply in Wales and is in demand for horticulture and other high value agricultural uses. As the importance of food security increases, it is likely that demand for this land and the value of the products that can be grown on it will rise. So while as much as 600,000 hectares of Welsh agricultural land may be physically and climatically suitable for growing biomass, it is unlikely that at current prices the energy market will be able to offer competitive returns to a biomass grower on a significant proportion of this land, especially the most versatile and valuable land.

Landscape impact. The planting of large areas of biomass could have a significant effect on the landscape of Wales. This would be especially true of those areas where competition for the land drives biomass planting onto valley slopes. In addition, the harvesting of these crops on slopes would require machinery with aggressive traction which increases the likelihood of soil erosion and runoff, with potentially adverse consequences for water quality – though, conversely, planting might increase soil stability on slopes as the root mat develops.

Impact on biodiversity. There are complex issues to be considered here, with the likelihood of some favourable impacts on biodiversity, for example where degraded agricultural land is planted with short rotation forestry, but also some unfavourable impacts, especially at certain points of the planting and harvesting cycle, and where large blocks are planted. The impacts will depend heavily on the pre-existing biodiversity of the land that is cropped.

Carbon sequestration, The growing and use of biomass crops is likely to considerably increase the amount of carbon sequestered in soils (compared to grassland or arable uses). Additionally, where this biomass is used as a substitute for fossil fuels as a source of energy generation, it would reduce GHG emissions by between 213 tonnes and 317 tonnes per hectare in total over the life of the crop, depending upon which crop is planted, even taking account of initial carbon loss for preparing land for the crop. Conversion of arable land to biomass crops shows a larger benefit because arable soils are lower in carbon contents, and hence more able to sequester carbon. However, although these figures seem large it should be borne in mind that it would require around 39,700 hectares of SRC planting on grassland using an average net emission reduction figure of 252 tonnes (i.e. 12.6 tonnes per hectare per year) to offset 1% of Wales's annual GHG emissions, estimated at 50.05 megatonnes (Mt) in 2005.

Haulage. In general, haulage distances should be limited to below 20-30 miles (it is estimated that chipped forest residues have a mean economic transport distance of 30-50km (Royal Commission on Environmental Pollution, 2004)). Chipped energy crops are relatively bulky and thus have a low volume/weight ratio, making them not only costly to transport by lorry but meaning that the overall emissions savings from biomass production and consumption would be reduced or even reversed. Thus, where biomass is produced in Wales, the combination of short haulage distances and other impacts referred to above leads to the conclusion that any developments to be supported by biomass production, either from existing woodlands or new planting, should be for local use, probably as a substitute for fossil fuelled heat production.

It seems clear that growing energy crops is not – currently at least - economically attractive for farmers. The level of subsidy described above as necessary to support the establishment of either short rotation coppice or Miscanthus cannot be achieved under Axis 1 of the RDP, which limits grant aid to 40% of actual establishment costs. Conversely, there are good arguments for bringing more existing farm woodlands into management and using some of the wood arising from that management to fuel local, small scale heat plants. Bringing these woodlands into management could provide an additional source of income for the farmer and improve the environmental value of the woodland as well as contributing to carbon reduction through the substitution of a fossil fuel with wood. For these reasons, the Welsh Assembly Government is (subject to views expressed by consultees) minded not to proceed with the introduction of planting grants for energy crops but instead to support the development of renewable energy based on biomass by stimulating local demand

If, however, a decision were to be taken following this consultation to support energy crops in Wales in order to support the delivery of the bioenergy strategy, it is suggested that the following principles should be applied:

- Existing sources of biomass should preferentially be used to supply heat and power generating developments. Only when there is a demonstrable shortfall of biomass within economic haulage distance of a proposed development should the planting of energy crops be considered. This means encouraging land managers to make use of woodland management grants to bring their woodlands into management and to consider expanding woodland through the development of short rotation forestry where appropriate.
- Speculative planting of energy crops should not be supported. The principle should be that the creation of a local market through a proposed heat or generation development should drive the development of biomass production.

Detailed design of any scheme would be for consideration following a decision on whether or not to proceed with its introduction, but it would need to take account of the following factors:

- support should only be provided for those crops which are not easily removed and replaced by the farmer – miscanthus and short rotation coppice (SRC).
- there should be a minimum area restriction to ensure that areas planted are economic to manage. This should be at least three hectares although in many circumstances areas should be bigger in order to fit with the local landscape.
- applications should only be accepted when an applicant is able to demonstrate an existing or consented (in planning terms) local energy end-use for the crops.
- energy crops might be grown for end-use on-farm, e.g., to heat a home or business, but the applicant must be able to demonstrate the actual or planned capability to make use of the crop in this way.
- applicants should have to demonstrate that any energy crop planting did not conflict with any agri-environment prescriptions in effect on the farm.
- applicants should also be made aware that energy crops are not recognised as organic products under the EC organic standards.

Following CAP reform, energy aid payment must be claimed for growing energy crops on non set-aside land in order for that land to be eligible for payments under the Single Payment Scheme.



## **4.2. Water quality improvements.**

### **WES outcomes:**

- 13. Water resources are managed sustainably meeting the needs of society without causing damage to the environment
- 35. The quality of our groundwater, rivers, lakes and coastal waters is maintained and enhanced (guided by the Water Framework Directive)

The Water Framework Directive introduces new and more challenging standards and places a responsibility upon Member States to ensure that water bodies do not deteriorate and that water bodies achieve 'Good Ecological Condition' (GEC).

The Catchment-Sensitive Farming consultation in 2005 identified that water quality in Wales is generally good although there is need for targeted action in some rural catchments to deal with agricultural pollution and achieve GEC. It concluded that, over much of Wales, good land management to prevent any significant increase in pollution should be encouraged and that additional targeted measures should be applied within those sub-catchments where improvements in agricultural practices are required to ensure that water bodies achieve GEC.

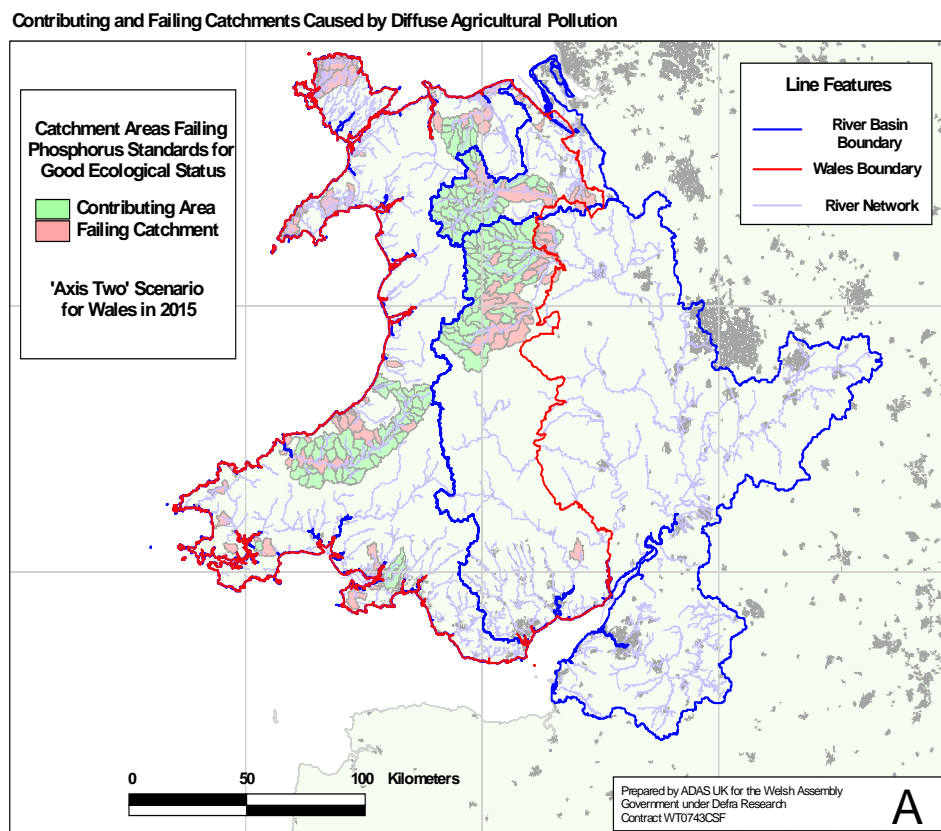
Implementation of targeted measures sufficient to achieve GEC in problem catchments is potentially expensive and it is important to prioritise those areas with proven water quality problems and where intervention will be effective. Eutrophication of watercourses by phosphate has been highlighted as a key priority. Initially any new scheme developed as a result of this review should target this issue, with both the selection of target sub-catchments and detailed scheme design guided by the available research evidence.

Looking towards the latter half of the RDP period and beyond it is anticipated that there will be a need to tackle other relevant water quality issues. These include:

- Eutrophication of some lakes and groundwaters by phosphate and in some areas nitrates also,
- Risks of some watercourses failing GEC due to high levels of sediment arising from anthropogenic causes,
- Some bathing and shellfish waters being at risk from high faecal coliform loadings.

Research is currently being undertaken to evaluate the extent of these issues and the cost-effectiveness of seeking to tackle them via Axis 2. It is pertinent that measures designed to alleviate phosphate problems will assist in tackling sediment and faecal coliform problems. However, the need for additional measures will be considered in future where justified on the basis of the available scientific and technical evidence.

Phosphate can enter rivers and streams in solution via drain flow or surface run-off or bound onto sediment via soil erosion or from defecation from livestock or erosion of river banks by farm animals. The actions listed below seek to reduce the amount of phosphate being put onto the land, minimise losses once it has been applied, minimise pollution from livestock and improve farm infrastructure to mitigate pollution.



## Map 2 Catchments where agricultural phosphate run-off is an issue

Map 2 indicates those sub-catchments that are at risk of failing to achieve GEC due in large part to agricultural phosphate, together with those sub-catchments that contribute phosphate to those that fail. Action should be targeted within these areas with priority given to those sub-catchments where intervention is deemed essential to meet WFD objectives and intervention is likely to be effective. It is worth noting that as knowledge and understanding improves, it is possible that more catchments may need the same approach.

The Catchment Sensitive Farming Consultation in 2005 advocated a supportive approach whereby capital grants should be offered in selected catchments for investment in infrastructure that reduces pollution e.g. improving manure storage and clean and dirty water separation; fencing of watercourses to exclude cattle and provision of alternative watering facilities; plus incentives for measures that reduce run-off and provide temporary water storage. Farms receiving grant should be required to adopt certain

compulsory land management requirements aimed at mitigating phosphate losses. These include:

- Compulsory resource management planning to ensure that fields are not 'over fertilised'
- No application of animal manures on land where there is high risk of causing significant pollution to water courses.
- No fertiliser or manure applications between October and February
- Use of buffers to reduce and intercept run-off.
- No winter harvested crops on steeply sloping land that presents a significant pollution risk or on land along watercourses that is prone to frequent flooding.
- Fencing of watercourses where cattle are part of the farm enterprise

In designing catchment measures the need for securing catchment scale action would require the inclusion of incentives to encourage scheme participation and co-operative measures designed to mitigate pollution through a scheme premium paid when all farmers within a targeted sub catchment join the scheme. The experience of the Pontbren scheme in Montgomeryshire will be useful in designing appropriate measures.

#### **4.3 Water quantity improvements (flood risk management)**

##### **WES outcomes:**

- 31. Appropriate measures are in place to manage the risk of flooding from rivers and the sea and help adapt to climate change impacts (measures defined by 2008, in place by 2026)

Land management schemes can contribute to the management of flood risk, but only if the measures are implemented at a catchment or floodplain-wide level. Studies undertaken by CCW and others demonstrate that some land management practices exacerbate flood risk. The practices include drainage, overstocking and inappropriate grazing (which increases soil compaction and therefore accelerated runoff), loss of riparian zones and tillage that increases erosion and weathering.

In order to reduce the impact of these practices, any new land management scheme should include the following:

- requirements for streamside tree planting
- planting shelterbelts that follow contours and can also therefore intercept downslope runoff and sediment
- reducing stocking levels in the hills and uplands

- maintaining and where necessary improving peat bogs and organic soils in catchments where flood risk management is deemed a priority.

It should be noted that although these measures (some of which mirror those required for water quality or soil carbon reasons) will assist in reducing run-off, the state of knowledge regarding land management practices and the degree to which their implementation can assist in mitigating down stream flood risk is still evolving. It may, therefore, be necessary to modify or enhance any new scheme as new evidence emerges.

#### **4.4. Biodiversity management**

##### **WES outcomes:**

- 19. The loss of biodiversity has been halted and we can see a definite recovery in the number, range and genetic diversity of species, including those species that need very specific conditions to survive (halt loss by 2010, recovery underway by 2026)
- 20. The wider environment is more favourable to biodiversity through appropriate management, reduced habitat fragmentation and increased extent and interconnectivity of habitats (halt loss by 2010, recovery underway by 2026)
- 21. Sites of international, Welsh and local importance are in favourable condition to support the species and habitats for which they have been identified (by 2010 95% of international sites to be in favourable condition; by 2015 95% of SSSIs to be in favourable condition; by 2026 all sites to be in favourable condition)

As described in section 2 of this paper, intensification of agricultural and forestry practice has been inextricably linked to a decline in environmental richness and diversity in the countryside. Despite the considerable efforts of many land managers it is unlikely that Wales will achieve the 2010 targets for achieving favourable condition of sites. For example there is evidence of continuing decline in many farmland bird species in the UK, with data from national monitoring schemes, county bird reports and species surveys suggesting that these are equally severe for some birds of farmed habitats in Wales. Two documents, *The State of Birds in Wales 2002* (Thorpe & Johnstone, 2003) and *The Population Status of Birds in Wales* (Thorpe & Young, 2003) have recently been published identifying species priorities in Wales. Of the 26 priority species, 18 are farmland birds. Some of these species have restricted distributions and have been the subject of highly targeted conservation projects e.g. black grouse and chough. However, the majority of these species are still widespread in Wales and as such traditional recovery projects, such as closely-targeted site safeguarding and work confined to nature reserves, are not appropriate mechanisms to influence their recovery.

A key finding of some recent work on farmland birds (the British Trust for Ornithology/RSPB breeding birds survey) is that over half the birds of farmed habitats decreased in range over the 20-year period to 2005. The RSPB's proposed 'Key Bird Areas' approach is a response to this range contraction, seeking to halt the decline in selected species and provide the appropriate conditions for expansion. Incorporating this approach, and using it not just with birds but with a wide range of species, as Tir Gofal has begun to do with greater use of species packages, would have wider biodiversity benefits.

While actions taken to conserve soil carbon and improve water management will also have significant nature conservation benefits, for any land management scheme to have the potential to halt the decline in vulnerable species, it must also deliver in two further ways:

- Critical resources at the times when they are needed. Species require different resources at different times of year. Any scheme that aims to halt the decline of these species must recognise these needs and target resources appropriately
- Critical resources where they are of greatest benefit to priority species of farmed habitats. The priority species are either restricted in distribution or have specific requirements that need to be provided (in the short term) within a small geographic area due to small dispersal distances (both seasonal and natal). In order for these species to benefit from any land management scheme and recover population levels, the right prescriptions need to be targeted to the right places.

Alongside this targeted approach, which may be focused on designated sites and buffer zones, there is a need to develop wider countryside resilience, especially in the light of changes that may arise as a consequence of climate change. However, any scheme that aims to improve countryside resilience must recognise that there are temporal and spatial variations to prescriptions that it is meant to deliver – there can be no 'one size fits all' approach. Although this argument is presented in the light of the bird data shown above, similar arguments can be made for most aspects of biodiversity management. Any scheme needs to recognise the importance of local climatic, soil and historic management variations and be able to accept differences in approach to future management that take these into account. By focusing management prescriptions upon outcomes rather than prescriptive management, it should be possible to allow land managers to use their skills and knowledge to deliver the desired result.

This scheme should therefore focus upon existing features of value on a farm and build upon them to deliver long term outcomes in ways that should integrate habitat, landscape and heritage management. *The ability to identify and quantify these outcomes at a farm level will be a key skill for project officers as it will form the basis of actions the farmer will undertake and the basis of the evaluation and monitoring process. Inevitably there will be a need for 'expert' advice on some issues but the project officer should be the person*

*who takes all of the advice and develops the appropriate outcomes from it.* Actions taken by farmers to achieve this improvement should vary by location in response to local requirements. This element of delivery could form the basis of a country-wide scheme focused upon the delivery of outcomes/outputs, allowing farmers more freedom of choice about the management prescriptions they would follow in order to deliver these outcomes. There is of course a very real training issue here, as some of these outcomes and their associated outputs will be novel to farmers. Additionally, consideration will have to be given to the means by which these outputs can be valued in order to provide the appropriate financial incentives.

#### **4.5. Woodland management**

The Welsh Assembly Government's **Woodland Strategy Vision** for Wales over the next 50 years is:

*"Wales will be known for high-quality woodlands that enhance the landscape, are appropriate to local conditions and have a diverse mixture of species and habitats that will provide real social and community benefits, support thriving woodland-based industries and contribute to a better quality environment throughout Wales"*

The Wales Woodland Strategy is currently being reviewed in the light of our *One Wales* commitments and there will be some changes to the strategic direction as a result of that review. This paper therefore confines itself to the management of farm woodlands as the Woodland Strategy review will include a public consultation on the overarching strategy for woodlands in Wales.

Of the approximately 280,000 hectares of woodland in Wales, some 80,000 hectares are classed as farm woodlands. A high proportion of this farm woodland is semi-natural and of high value in biodiversity and aesthetic terms, although much is in poor condition. This is a significant potential resource which could, with appropriate management, deliver environmental benefits and provide an additional income stream for farm businesses for products such as woodfuel to support local heating schemes.

New farm woodland development offers opportunities for improved soil carbon management on mineral soils, as well as providing shelter and helping to reduce run-off on slopes and ffridd land. These woodlands could also provide fuel for future local heat and power developments. In biodiversity terms they also offer improved opportunities for connectivity between sites when planted with the appropriate species and can contribute to wider countryside resilience because of their permanence as features in the countryside. An outcome of this review and subsequent consultation should therefore be more detailed guidance on where future woodland planting should take place and a target for increasing the amount of woodland, both on-farm and on other privately-owned land.

*Better Woodlands for Wales* is the Forestry Commission's recently redeveloped grant scheme for private woodland owners and, as noted above,

it is now outcome based. The scheme has been developed in consultation with woodland owners and their agents as well as the Forestry Commission's partner organisations. As a result, the new scheme places greater emphasis on good quality woodland management (whilst also offering grant for new woodland development) and offers grants specially designed for the management of Welsh woodlands to deliver the Wales Woodland Strategy. Grant aid is now based upon an approved long term management plan which must meet the minimum standards under the UK Woodland Assurance Scheme. Because of the way in which this scheme has been developed, it is well placed to be able to deliver alongside any new outcome based land management schemes developed as a result of this review.

Now that payments for all schemes funded under Axis 2 in Wales are being managed by a single paying agency, it may be worth considering whether or not there are transaction savings and other efficiencies that might be brought about by incorporating the Forestry Commission Grants and Licensing functions into a single body along with other grant delivery staff within Rural Affairs Department.

#### **4.6. Landscape and heritage**

##### **WES outcomes:**

- 23. The quality and diversity of the natural and historic character of our landscape and seascape is maintained and enhanced
- 26, The historic building stock and character is maintained to a high standard

The need to maintain and support the distinctive character of the Welsh historic environment has been identified in the Wales Spatial Plan as important in providing a sense of identity and pride in place. Although scheduled ancient monuments and listed buildings are protected by legislation, other aspects of the historic environment contribute to local distinctiveness and require careful management to ensure their survival. Tir Gofal in particular has been effective in providing support for management relating to the preservation of landscape features such as stone walls, sheepfolds, slate fences and hedges/hedgebanks. Tir Cynnal, too, requires participants to maintain all historic features. In addition, the focus on the whole farm has ensured that all historic features within the holding are managed to the agreed prescriptions. Any new scheme that is developed should ensure that it provides the same levels of support for these aspects of land management. This will entail providing some capital grant.

One of the most controversial aspects of the earlier farm subsidies of the 1960s and 1970s was that public funds went towards works which often destroyed historic and landscape features. It is important that in purchasing one set of "environmental goods" we do not use public funds to damage another environmental asset - not least because, once destroyed, these features are gone forever.

While many environmental actions will be benign to the landscape (including its historic components), others may have a detrimental effect both on individual historic features and on their wider setting. Examples might include:

- Environmental improvements requiring new build (e.g. better slurry/silage storage)
- Lower agricultural productivity with consequent abandonment of traditional buildings
- Woodland development
- Biomass crops
- Specific actions such as blocking drains (the blocking material has to come from somewhere - but not an adjacent historic monument!)

For developments controlled through the planning process there is a well established mechanism for identifying historic features, assessing their significance, evaluating the effect of the proposal, and identifying an appropriate “mitigation strategy” in response. This response might range from no action or simple recording in the case of a feature of limited significance, to total excavation of an important site where the development is of greater importance and cannot be sited elsewhere.

Many developments in the countryside, and especially those which might emerge from EU directives, will fall outside the formal planning process. In the past the historic environment has relied on the Environmental Impact Assessment (EIA) process, and this has proved reasonably effective for significant changes. However, it does have weaknesses in that historic features are not identified as a specific element to be taken into consideration in their own right, and small developments which can be individually very damaging are not covered. (For example, in a recent case a farmer was able to remove stone from an unimproved field without an EIA - even though the stone was an iron age field system - because that was not deemed to be an improvement or change of use under the EIA rules). Not all historic features must always be preserved - but they should be identified and taken into account during the decision process. Developing the EIA to include historic features may be a way of delivering this but of course there are resource implications.

If farmers are to receive public funds for providing environmental benefits then it is arguable that they should not be damaging any historic feature or causing an adverse landscape impact without some form of evaluation and control and a clear record of the decision making process. There is currently insufficient expertise regarding the historic environment in places where decisions on agri-environment schemes are being made. Clearly a well trained project officer is an important part of this process. However, there is also the opportunity to develop further the contractual relationship with the archaeological trusts in Wales. The trusts currently provide information to the Forestry Commission under just such a relationship so that heritage issues are considered as part of the development of a management plan for



woodland. Cadw currently provides grant-aid to the Archaeological Trusts for providing basic desk-based management advice for all Tir Gofal farm applications. A contractual relationship is currently being prepared between the Archaeological Trusts and WAG to cover additional field validation of advice for a proportion of these farms (currently around 20% of farms entering the scheme) - this arrangement previously existed between the Trusts and the Countryside Council for Wales (CCW). Extending this relationship to all land management schemes would provide the manager and project officer with invaluable information.

While there needs to be a mechanism to address the potential negative effects of a successor land management scheme on the landscape, there are also opportunities for synergy where the objectives of several conservation interests coincide. For example:

- **Soil Carbon:** Generally any form of erosion and soil loss is bad for soil carbon AND for historic features.
- **Water Management:** Efforts to increase the water retention capacity of the uplands (and thus slow down the speed at which water leaves uplands for the flood plains) will generally benefit historic features in those areas.

There is now an expectation (amongst both farmers and those concerned with the protection of the historic environment) that farmers in Tir Gofal can get help with the preservation and repair of historic features and this has provided tangible benefits. Regarding the historic environment, Tir Gofal is sometimes at its most effective when offering capital grants for specific work. It is the traditional farm buildings which especially benefit and given that most of these are not listed buildings (and therefore not eligible for any other support) one consequence of losing this support might be the loss or deterioration of this distinctive component of the Welsh countryside. Cadw are currently developing a Rural Regeneration Grants Scheme to provide support for listed buildings on the existing 'risk register'. However, this will not cover works on non-listed traditional farm buildings. Such works should be funded through an Axis 2 scheme, although this part of the scheme would have to operate under rules analogous to those applying to Axis 3, which covers this work. This approach should also apply to landscape features such as hedgebanks, drystone walls and slate fences. It is suggested that CCW's recently developed landscape assessments and, where available, the archaeological trusts' historic landscape characterisation work should be used to define which features are important in a particular landscape area, so that grant aid may be appropriately targeted. As capital grants can currently be applied to non-scheduled monuments this should also be supported through funding as described above.

The other major contribution of Tir Gofal to the protection of the historic environment has been the provision of information about it to farmers. Generally farmers in Wales are sympathetic, partly perhaps because of the survival of the family farm with strong links to past generations. Consequently this simple provision of information about the historic environment as part of

the Tir Gofal agreement has produced significant benefits. Cadw currently covers the cost of providing basic desk top information (from the Welsh Archaeological Trusts) to be incorporated into the formal agreement, and the cost of more detailed field validated information (for about 20% of agreements) will be covered by the Department for Rural Affairs (when contractual arrangements are finalised). The identification of historic features on Single Application Form maps could go some way to filling this particular gap but the quality of this data is variable and there is only very limited supporting advice. As suggested above, a more formal contractual arrangement with the Trusts, funded as part of each farm's application process, would ensure that a proper balance between the historic environment and other scheme objectives was delivered.

#### **4.7. Access**

##### **WES outcomes:**

- 29. There is sustainable, widespread and equitable access to the countryside and coast, which recognises the need for a balance between tranquil areas and areas supporting larger numbers of people and a range of activities. Damaging access will be discouraged.
- There is easy, equitable access to green space.

##### **4.7.1. Permissive access**

At present funding is provided through Tir Gofal to encourage land managers to allow permissive access on their land. This has been taken up by some 450 farmers, with about £500,000 of the Tir Gofal budget being spent on these developments. However, there are two issues associated with this funding which have arisen during this review. Firstly, it is difficult for a member of the public to find out where these permissive paths are (and in fact many members of the public are entirely unaware that they exist). Secondly, paths are usually limited to the participating farmer's land, sometimes stopping abruptly at a field boundary or providing a relatively short loop. There is clearly scope for improved value for money.

It is therefore suggested that permissive access continues to be supported, but that a more strategic approach should be taken in order to maximise the public benefits, with funding concentrated on proposals which meet one or more of the following conditions:

- It should be part of the developing coastal access programme
- It should provide a desired extension to a National Trail or existing public right of way (PROW). Where several farms have grouped together to provide a significant extension of such a path or trail, a premium should be paid to reward co-operation.
- It should provide a link from land already dedicated under the Countryside and Rights of Way Act 2005, such as land managed by Forestry

Commission Wales on behalf of the Assembly Government, on to open access areas where such links do not already exist.

- It should provide new or enhance existing provision for less-able access to the countryside.

In all cases there should be arrangements in place for local promotion of the new access in conjunction with the local access authority.

#### **4.7.2. Educational access**

At present, farmers who sign up for the educational access option in Tir Gofal are funded to carry out up to six educational visits. These can be from schools, Scouts, Women's Institutes or any other group. It is estimated that about 9000 children visited a farm under the scheme in the year ending April 2007. The quality of the educational experience provided by these farms is variable however, and some have difficulty attracting schools.

School visits help to develop young people's understanding of food and farming, and form part of the wider aim to reconnect the public with farming. Public understanding of what farmers do, and where food comes from, is important because the industry depends on the public for support, as customers and taxpayers. School visits are an opportunity for farmers to show the public what they really do and what their lives are like, dispelling misconceptions. Links with schools can be a rewarding experience for individual farmers, who gain new skills in communicating and a new angle on the work they are doing. They may lead to better integration of the farm with the local community, which may have business benefits if they are involved with direct sales.

Farm visits can provide an excellent learning experience for children. There are two strands to this: one is the range of school subjects that can be supported by a farm visit, and the other is the fact that children learn differently outside the classroom, and children who struggle in school may learn much better outdoors. The Welsh Assembly Government recognizes the value of the 'outdoor classroom', which is a strong feature of the new Foundation Phase programme for under-5s. A document on 'Best practice use of out of classroom learning' which encourages schools to take children on school trips was launched last year.

Support for the curriculum and WAG educational objectives includes:

- Clear links to science, geography, history and other subjects. Children can study food chains, habitats, water use, land use, maps, and buildings, care of animals and so on, and carry out practical investigations.
- Understanding where food comes from: this is very important to support the healthy eating agenda, including WAG's Appetite for Life school meals plan which calls for schools to tackle healthy eating at all levels.

- Sustainability and biodiversity: farms are an excellent place to teach young people about the interaction between humans and the countryside, and to demonstrate the impacts of food production on the environment.
- Other aspects of Personal and Social Education, such as links to the local community, understanding of people's jobs, consumer choices about food.

Two projects in Wales receive CCW funding to link schools with Tir Gofal farms. These are Learning on the Farm in west Wales, and the CAFÉ Project in Powys. Both of these projects report that teachers are highly appreciative of the visits. In cases where ongoing links are established between a farm and a school, the relationship can develop so that there is an increasingly productive fit between the needs of the school and what the farm can provide.

#### **4.8. Organic Farming**

The organic approach to farming has much to recommend it from the point of view of reducing the impacts of intensification, although it is important to recognise that, for the purposes of this paper, organic farming is regarded as a means of delivering public environmental goods although the practice also provides a route to market diversification. Additionally, the Food Standards Agency has recently indicated that in its view organic food is sometimes superior in quality, Reduction in inputs of fertiliser and pesticides, increasing the area of mixed farming with the introduction of small scale arable areas and improvements in soil structure as a result of the reduction of stocking density are all actions that have beneficial effects, especially in terms of water quality and nature conservation. It is worth remembering, however, that increased tillage to improve soil fertility may have soil carbon impacts in some areas.

Many organic farmers are also in other land management schemes such as Tir Gofal. Whilst this is in part because the greater levels of diversity on their farms enable them to achieve an acceptable score and because it is a lifestyle choice, there is also some evidence that some of the provisions within Tir Gofal provide support to organic farmers. In particular, the support for arable intervention that Tir Gofal provides allows organic farmers to take a risk in planting arable crops such as triticale, knowing that if they fail there will still be a payment from Tir Gofal to help support their enterprise. Given that the organic approach may deliver much of the benefit that Tir Gofal seeks to provide on conventional farms, the added benefit of allowing membership of both schemes is questionable. It is suggested that additional elements should be added to the organic scheme to support arable activities in particular or that an organic version of Tir Gofal should be offered.

#### **4.9. Common land.**

Many commons in Wales are of significant environmental value: many are designated for their nature conservation importance. However, the lack of (sympathetic) management of some commons means that this value can be

reduced through overgrazing or other damaging agricultural practices. Any new scheme should therefore offer the people who manage commons an opportunity to participate in the scheme. Because of the complexities of managing a relationship with a large number of commoners who may have differing views and objectives, it is proposed that any commons element of the scheme should be structured in the following way:

- Common land could only be entered into the scheme as a single application covering the whole common. Where a land manager has land outside the common this should be the subject of a separate application.
- All those who hold rights over the common must appoint one signatory to sign the common land application on their behalf. When making the application the signatory must comply with the following conditions:
  - The signatory must be either the owner of the common, a member of a Commons Council or commons management association or, if the commons management association is a legal entity, the association itself. The latter is to be preferred.
  - The signatory must secure the agreement of all known rights holders of the common or of the commons management association before making an application.
  - The application must cover the whole common and must not include any other land (e.g. privately managed in-bye land).
  - The signatory must take on the responsibility for delivery of the whole agreement.
  - All the payments will be made to the signatory and they must be responsible for paying back any grant if they are found to be in breach of the agreement.

***Q4. Have we identified all of the main drivers for future land management support? If we have not, which other drivers do you think are important?***

***Q5. Are the management actions identified in section 4.1 and Appendix 2 for conserving soil carbon the right ones? Will they be effective? Are there others we should consider?***

***Q6. Do you agree that the Assembly Government should support the development of renewable energy based on woody biomass by stimulating local demand?***

***Q7. Do you agree with the proposed approach to water quality and quantity management? If not, bearing in mind the legislative drivers, what approach should we adopt?***

***Q8. How should land management schemes be targeted to meet wider biodiversity objectives?***

***Q9, Do you agree that Better Woodlands for Wales should continue to provide support for woodland management? If not, how should this be best achieved?***

***Q10. What improvements should be made to increase the impact of support for landscape and the historic environment?***

***Q11. Is the intention to target support for permissive access on strategic routes appropriate? Can it be improved?***

## **5. HOW CAN THESE ISSUES BE ADDRESSED IN FUTURE LAND MANAGEMENT SCHEMES?**

### **5.1. An outcome based approach**

It is clear that there must be change to the current suite of schemes if WAG is to achieve the delivery of policy and legislative outcomes to which it is committed. Land management schemes funded through Axis 2 are one of the most direct ways in which the Assembly Government can influence the delivery of these outcomes and as such represent a key factor in successfully (or otherwise) delivering appropriate WES outcomes. As previously discussed, the outcomes referred to are:

- Carbon management - soil carbon conservation; additional sequestration in soil and vegetation; carbon positive production of fibre for energy & substitution of fossil fuel; all through best practice management on organic soils; appropriate farm woodland management; the creation of new farm woodlands; creating new wetlands and planting energy crops
- Water quality management
- Water quantity management (flood prevention)
- Biodiversity management
- Woodland management
- Access, landscape and heritage management

The current suite of grant schemes, developed at different times and for disparate reasons, has been modified over the years in order to improve efficiency of delivery or to change or broaden the benefits they deliver. However, as this review has shown, the current policy and legislative drivers that WAG has, coupled with changing expectations within the EU regarding the purpose of agricultural support payments, are highlighting the limited extent to which the existing schemes are delivering these outcomes. In particular, the landscape scale approach to land management which is increasingly needed cannot easily be delivered without significant change to current arrangements.

In contrast, the development of a new, outcome based scheme would negate many of the problems mentioned above:

- A new scheme designed to be able to deliver a range of policy outcomes would begin to deliver immediately.
- Defining the outcomes to be delivered at the beginning of the process would mean that monitoring and evaluation systems could be designed in to the schemes, thus enabling continuing assessment of delivery and value for money.
- If the scheme were properly designed, it should be possible to add new policy outcomes as they arise and remove existing ones once the targets are delivered, offering land managers the opportunity to participate in a stable scheme that should meet WAG's needs for some time to come.

The price for this is, of course, that some land managers would see a change in the proportion of their income that is made up of public subsidy. Whilst this might lead to some turbulence in the short term, it is argued that the benefits in the longer term of adopting this approach are much greater than the evolutionary approach discussed above. Once established, this approach offers predictability and stability to farmers, measurable policy delivery for WAG and the potential to reduce overheads through increased administrative efficiency and effectiveness by integrating the delivery of outcomes into a single scheme and by supporting that scheme with a well trained project team. The design of the scheme should not be driven by current IT provision. Rather, time should be given to defining the objectives and targets that arise from the high level outcomes, together with an improved definition of the actions that farmers will take to deliver those targets. In addition a monitoring and evaluation process must be designed at the same time so that this can begin when the scheme is launched. Only after all this work is done should the definition of the IT system be developed.

It should be recognised that significant effort will be required to define the outcomes to be achieved in a way that enables meaningful monitoring and evaluation to take place and allows the development of a set of inputs and outputs that will deliver those outcomes. A key question during consultation and the initial stages of scheme design will be "what does success look like"? However, without undertaking this work any new scheme will at best achieve partial delivery of the desired outcomes and will not be able to demonstrate whether or not any achievement has been delivered.

## **5.2. Need for a revision of cross compliance**

There is some evidence that there is a blurring of boundaries between current cross compliance requirements and some of the funded activities of the current suite of schemes; the outcome of the CAP Health Check process may well further complicate this issue. There is a need to review the cross compliance codes and to ensure that all legislative requirements (and nothing else) are captured within them. This should include obligations such as compliance with the Habitats Directive. This cross compliance regime, if effectively enforced, would ensure that no further environmental degradation took place upon any farm, allowing resources to be targeted at enhancement.

Cross-compliance conditions need to cover inspection to ensure that there is no adverse impact from land management operations on the objectives covered in Section 4 of this paper. In order to ensure that there is no double funding through the Single Payment and Axis 2, any new land management scheme should be designed so that it funds nothing that should be delivered through cross compliance.

### **5.3. Evaluation and monitoring**

As discussed above, the current schemes under Axis 2 do not have explicit measurable objectives or targets, making them very difficult to evaluate and to demonstrate value for money. Any new schemes should be designed around an agreed set of outcomes, which will inform the setting of targets and objectives and thus the scope of the proposed schemes. In addition, evaluation and monitoring processes should be integrated into the schemes from the beginning so that continuing scheme evaluation becomes part of normal business.

***Q12. Are the proposals for fully integrated monitoring and evaluation appropriate? How should we determine what outputs and outcomes should be measured?***

## **6. WHAT ARE THE OPTIONS FOR DELIVERING THE WELSH ASSEMBLY GOVERNMENT'S POLICY OBJECTIVES?**

This section considers three main options for delivering the policy objectives described above, and examines the benefits and drawbacks to each option. The generation of options is constrained by cost and feasibility, the parameters imposed by EC regulations and to some extent by their likely acceptability to stakeholders. It is envisaged that the transfer of resources from Pillar 1 to Pillar 2 – in the short term through compulsory modulation and in the longer term through the CAP Health Check proposals and further CAP reform – will lessen the financial constraints on more radical changes in future years. A biomass scheme has not been included in these options as no decision has yet been taken on the appropriateness of such a scheme in Wales.

The review has highlighted that the Welsh Assembly Government has substantial environmental obligations and duties placed upon it by EU Directives and UK statutes and that neither these nor its own core environmental policies can be effectively delivered without change to the current suite of schemes funded under Axis 2 of the Rural Development Plan. Retaining the status quo is therefore not a feasible option.

An illustration of the financial implications of the three options is given at the end of this section.



## **Option 1 - Modify existing schemes to provide increased policy delivery**

The current suite of schemes could be modified to increase their ability to deliver the outcomes shown in the table in Appendix 1. One approach which could be adopted would include the following elements:

### Tir Mynydd

#### *Option 1 (a)*

The existing scheme would be retained, recognising that compensatory payments relating to the physical and other handicaps associated in farming within a less favoured area should be regarded as one essential element of the package of land management measures offered within the Rural Development Plan. Taken as a whole, these measures provide for environmental protection through cross-compliance (including compliance with Good Agricultural & Environmental Condition) and for a substantial level of environmental benefit through Tir Gofal and other Axis 2 schemes. These benefits would, however, be prejudiced if a basic level of compensatory payment was not available to farmers in the less favoured area in order to help sustain their enterprises and ensure that they continue to farm areas suffering from physical handicaps.

#### *Option 1 (b)*

Although the scheme would be retained for the reasons indicated above, it would be amended in recognition of the fact that it does not deliver clearly measurable public benefits: payments per hectare are the same irrespective of the environmental outputs secured by the scheme - one Tir Mynydd farmer might be delivering significant benefits through sustainable land management whereas his neighbour could be doing no more than meeting cross compliance requirements. The amendments would be intended to ensure the scheme delivers demonstrable benefits in relation to “maintaining the countryside and promoting sustainable farming systems” as required by the Rural Development Regulation (EC 1698/05).

Additional environmental benefits would be achieved by adding voluntary environmental enhancements to the existing scheme, chosen from a menu of options (as was the case in an earlier version of Tir Mynydd). Potential enhancements which could attract additional payments might include:

- preparation and implementation of a resource management plan
- preparation of a carbon audit
- observance of a stock-free period in winter (especially on commons)
- implementation of a mixed stocking regime
- adherence to maximum and minimum stocking rates
- minimum level of deciduous woodland, fenced but managed to permit grazing

The Tir Mynydd scheme would, as now, have relatively low administrative overheads, and would be accessible to all farmers within the LFA, including dairy farmers and some others who are currently excluded from the scheme.

### Tir Cynnal

The Tir Cynnal scheme would be closed to new applicants, with basic environmental protection secured through cross-compliance.

### Tir Gofal.

The high level outcomes for a revised Tir Gofal scheme would be:

- **To protect and maintain landscape character** – by helping to maintain important features such as traditional field boundaries, field trees and farm woodlands
- **To protect the historic environment** – including traditional and historic farm buildings and archaeological features.
- **To improve conditions for farmland biodiversity** by targeting management prescriptions at the appropriate areas of Wales
- **To provide a pathway for organic farmers to enter Tir Gofal**
- **To improve carbon management** - soil carbon conservation; additional sequestration in soil and vegetation all through best practice management on organic soils; creating new wetlands
- **To improve water quality in targeted catchments** through reducing agricultural phosphate inputs either through direct run-off or through sediment.

This could form the core of the agri-environment suite representing the preferred option where a farm contains more than a threshold level of habitats, species, historic and landscape features. The scheme would be available throughout Wales, although there would be a heavy emphasis on providing higher-level protection for designated sites (SACs, SSSIs etc.) and land identified as important for protecting the biodiversity benefits of those sites, and also a very strong emphasis – with additional payments available – for collaborative action at a landscape scale. The scheme should, however, also be flexible enough to be able to deal with the complexities of common land and be able to raise environmental performance within more intensive farm practices.

A key early priority would be to develop a targeted landscape or catchment scale option to cover a wider range of environmental issues than the current scheme, with particular encouragement for collaborative actions to help tackle climate change issues such as flood risk management, reductions in greenhouse gas emissions and carbon capture and water quality, using the prescriptions described earlier in this paper. This would include actions to promote catchment sensitive farming in appropriate locations. Collaborative catchment landscape scale management would initially be concentrated within the LFA but there would be pilots elsewhere, including on flood plains and at the coast

In parallel to this wider action, there would need to be some farm level targeting of both annual management prescriptions and capital works, to make the most effective use of the available resources within Key Areas for priority species/habitats, including implementing species packages as a core element of delivery for species within Key Areas for priority species/habitats and adjusting existing prescriptions to deliver integrated, environmental benefits with more emphasis on tackling climate change, flood risks, diffuse pollution and species management in the wider countryside.

Issues requiring early resolution would also include:

- Developing an organic variant of Tir Gofal (or incorporating the relevant elements of Tir Gofal in the organic farming scheme) to remove the need for organic farmers to be in both Tir Gofal and the organic scheme, thus reducing administrative overheads
- Developing more results-led prescriptions, encouraging farmers to use their initiative to deliver prescribed outcomes and aligning agri-environment schemes more closely with the market realities now taking more prominence following the introduction of the Single Payment.
- Assisting project officers to raise their awareness and knowledge of issues such as climate change, flood risk management, diffuse pollution, priority species requirements and the new tools and information sources now available.

### Organic Farming Scheme

Organic farming is able to contribute to a number of priority areas:

- Improving water quality through reducing some chemical inputs and pollution risks.
- Enhancing biodiversity through lower stocking rates and more diverse farming patterns.
- Improved carbon management through organic soil management.
- Reducing carbon emissions through reduced N fertiliser use.

If it proves impractical to develop an organic version of Tir Gofal, the existing organic scheme should be revised so that it provides a broader spectrum of support to organic farmers, removing the need for them to be in more than one scheme and thus reducing overall transaction costs for WAG as well as simplifying the process for the farmer.

### Better Woodlands for Wales.

This scheme would continue to be made available to land managers across Wales. As previously discussed, the scheme offers land managers a management plan based grant for managing their woodlands, offering a route to a sustainable management certification scheme if the woodland owner desires it. This scheme already has many of the characteristics sought for a

new land management scheme and can operate almost seamlessly alongside any new scheme. It offers land owners the following benefits:

- A funded management planning and application process
- Comprehensive maps of all woodland on a site with a management plan
- The ability to make grant claims on line

Option 1 has the following advantages:

- It explicitly retains a Tir Mynydd element
- It has an element of familiarity for farmers as Tir Gofal also remains, albeit with an increased emphasis on landscape scale and collaborative action

But it also has a number of problems:

- It may not fully address the EC's concerns about the environmental benefits delivered by LFA schemes
- It makes Tir Gofal increasingly complex and could increase administrative and system overheads
- It is still difficult to deliver fully meaningful evaluation and therefore to demonstrate value for money
- It may not be possible to modify the processes to enable the current schemes to operate in a way that enables different outcomes to be delivered.

### **Option 2 - Introduce a new, two-tier pan-Wales scheme**

This scheme would have two levels, basic and advanced land management. The aims of **basic** land management – through a scheme which would be developed from the existing Tir Mynydd scheme, converted from a compensatory scheme to an entry-level environmental scheme and broadened to apply to the whole of Wales – would be to:

- **Protect and maintain landscape character** – by helping to maintain important features such as traditional field boundaries, field trees and farm woodlands
- **Protect the historic environment** – including traditional and historic farm buildings and archaeological features.
- **Improve conditions for farmland wildlife** by tailoring management prescriptions as appropriate for different areas within Wales
- **Improve the provision of permissive access where it is appropriate to do so** – where new access can join up with existing rights of way or national trails and where it will enhance the visitor experience and/or develop educational access
- **Encourage carbon positive production of fibre for energy & substitution of fossil fuel** – through management of existing woodlands, planting of new woodlands and, if appropriate, the planting and management of biomass crops.

The basic level would be available throughout Wales and would be menu based, offering land managers some freedom to choose which elements of the scheme they wished to deliver. There would be a number of elements within the menu, providing a wide range of options, several of which would be selected for each agreement. Each option would attract a number of points, and provided a points threshold was exceeded, entry to the scheme would be guaranteed.

Given that there is evidence that organic farming is able to contribute to improved water quality, soil management (and thus carbon storage) and enhanced biodiversity through a combination of reduced inputs and more diverse farming patterns, it is proposed that either the points threshold for an organic farm would be reduced or that the payment per hectare would be increased.

Farmers or their agents would be required to develop a simple map-based management plan showing the location of the features they wished to manage and relating those features to the management activities chosen from the menu. The management plan period should be at least seven – and preferably ten – years in order to enable any monitoring to derive some meaningful results. Payment for undertaking this work would be on a flat-rate per hectare basis, with payments based on a combination of income foregone and the costs of securing the continuation of the agricultural management necessary to deliver the specified environmental public goods. Land inside the LFA boundary would attract a flat rate premium payment reflecting the increased difficulty of farming in those areas, measured in relation to a variety of physical factors. As discussed under the landscape and heritage section above, some capital grant support for the maintenance of heritage features would also be needed. .

Because the scheme needs to be responsive to local conditions, menu options would differ across Wales – prescriptions aimed at halting the decline of the lapwing population are not universally appropriate for example.

The **advanced** element would be spatially targeted on specific areas where action is particularly important and would have the following initial objectives:

- **To undertake additional action on carbon management** - soil carbon conservation; additional sequestration in soil and vegetation all through best practice management on organic soils; creating new wetlands
- **To improve water quality in targeted catchments** through reducing agricultural phosphate inputs either through direct run-off or through sediment.
- **To test climate change adaptation methods** for flood control in targeted catchments and landscapes through collaborative schemes

The areas to be initially targeted would be as shown (indicatively at this stage) in Maps 1 and 2 and the prescriptions would reflect those shown in the soil carbon conservation and water quality improvement sections. These prescriptions would be mandatory for anyone entering the scheme. It is envisaged that the work programme at a catchment/landscape scale would be developed in consultation with that area's land managers, who are likely to have the best understanding of which actions are most appropriate in different areas, including highly specific actions to help biodiversity in appropriate cases. Payment rates would be two-tier, with higher payments available to land managers working together at a catchment scale to maximise the delivery of benefits. Capital grants would be available for extensive works such as large scale fencing and blocking of drainage.

An important element of this integrated scheme would be discussion with land managers – both at local level as described above (and perhaps most effectively through group discussions), to ensure that the actions proposed are the right ones to achieve the desired outcomes, and with farmers' and other land managers' representatives to explain the rationale for the scheme and its effects, environmentally and in financial terms, in different areas within Wales. The key point is that the while the desired environmental gains would be more clearly specified, more closely targeted and better monitored, the financial rewards offered for those gains would (because of the geographical distribution of priority areas for action to tackle soil carbon, water quality and biodiversity issues) be likely to be distributed in a similar pattern to present payments, offering a degree of stability while ensuring that the Assembly's environmental objectives were more fully achieved.

If a new scheme was made available on this basis, it would offer the following advantages:

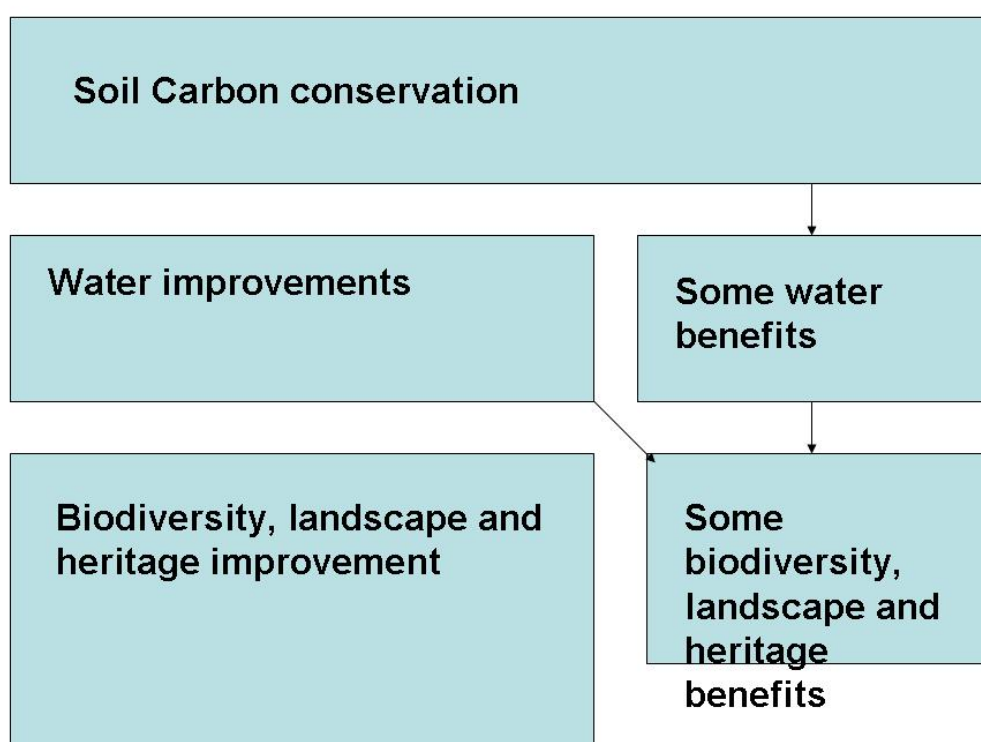
- A simple to understand and operate, universally available basic scheme which relies upon farmers' skills to deliver outcomes
- If correctly designed, the basic scheme should have relatively low overhead costs
- It would provide universal access for all farmers to the basic element of the scheme
- It would deliver against all the relevant WES outcomes
- It would provide a scalable scheme that could cope with changing priorities and emerging policy targets, including those for coastal and flood risk management – and thus should be available for a long period of time, offering certainty to land managers
- Evaluation and monitoring would be simplified and built in.

A number of issues would remain to be resolved, including:

- Encouragement for land managers to deliver novel outputs
- Extra training needed for farmers and project teams
- Funding requirements from Axes 1,2 and 3
- Cost and time of setting up an entirely new scheme

### **Option 3 - Introduce a fully targeted approach**

It is possible to argue that the resources available for future land management actions should be targeted explicitly and exclusively on the Assembly Government's high-level objectives, since a 'sharpened up' cross compliance code could deliver basic environmental (in the broadest sense) outcomes without further intervention by the State, thereby removing the requirement for an entry level scheme altogether. Under this scenario, resources available under Axis 2 would then be used to deliver the higher level outcomes defined by WES and related to the CAP health check challenges, supported by trained project officers and by the provision of extensive advice and support to farmers. The proposed scheme would have a hierarchy of 3 elements:



1. At the highest level, a landscape/catchment scale element would be designed to deliver soil carbon conservation on all holdings with organic or organo-mineral soils in Wales (as shown on Map 1 in section 4.1 of this paper). This element would use the actions described in the soil carbon conservation section and would have a two-tier payment, with higher payments available to land managers for

co-operating as previously described. As shown in the diagram above, this would also result in some water quality and environmental improvements.

2. Outside these areas, a targeted element designed primarily to deliver water quality improvements and flood risk management, using the actions previously described. This would target the catchments indicated on Map 2 in Section 4.2 of this paper. Additionally, it would also target some floodplain areas where large scale flood risk management practices such as the removal or lowering of flood defences to allow fields to flood could be trialled. Again, the two tier payment approach would be used to reward co-operation amongst farmers within each area.
3. Across the rest of Wales, a modified Tir Gofal scheme would be open to all other farmers to deliver environmental, heritage and landscape feature improvements as described in option 1. It would, however, be highly targeted on designated sites.

As with option 2, discussion with land managers and their representatives to explain the rationale for the scheme and its environmental and financial effects would be essential.

This option directly addresses the CAP health check challenges and provides a clear distinction between those areas of Wales where the primary business of farmers is food production, underpinned by cross compliance requirements, and those where the delivery of environmental goods and services is or will become the land manager's primary business activity, while still supported strongly by food production. In addition, the organic scheme would remain open throughout Wales.

This proposal offers the following advantages:

- It delivers against all policy outcomes and supports the overarching strategy outlined in *Farming, Food and Countryside: Building a Secure Future*
- It offers the opportunity to simplify and streamline agri-environment schemes in Wales, reducing running costs and increasing clarity
- It provides access to a scheme for all farmers
- It meets EC policy requirements
- It prepares farmers for the post-CAP reform and post-Health Check environment
- It offers stability – once this scheme is in place it is hard to see why anything other than evolutionary change to ensure maximum value for money from additional resources would be necessary, at least in the medium term (10-15 years).

However, it has a number of difficulties associated with it:

- It represents a serious change of emphasis for land management schemes. There would be a significant training requirement for some



landowners as they entered the scheme, although support from dedicated project officers should minimise this difficulty.

- The mandatory changes to land management practice might deter many land owners from joining such a scheme.
- There would be a significant cost to WAG associated with the new IT processes required to run the scheme.

Tables 4 and 5 present, purely on an illustrative basis, the potential financial implications associated with the options, for 2011 and 2013 (the final year of the present RDP). It should be noted that the room for manoeuvre is limited, particularly in the first of these years, by the substantial commitment of payments to ongoing agreements under existing schemes (principally Tir Gofal),

**Table 4: Illustrative Distribution of Axis 2 Resources in 2011**

(£ million)	Option 1(a)	Option 1(b)	Option 2	Option 3
Total resources available under RDP	87.8	87.8	87.8	87.8
Ongoing commitments	49.3	49.3	49.3	49.3
Tir Mynydd (inc. non-beef & sheep)	27.0	27.0	-	-
... plus voluntary environmental enhancements	-	3.0	-	-
New Tir Gofal agreements	4.0	3.0	-	-
Landscape/catchment schemes	3.0	2.0	-	-
New Organic Farming Scheme agreements	2.5	2.0	-	-
New Better Woodlands for Wales agreements	2.0	1.5	-	-
Basic land management	-	-	16.1	-
... LFA premium	-	-	14.4	-
Advanced land management	-	-	8.0	-
Carbon management	-	-	-	18.0
Water management	-	-	-	12.5
Biodiversity management	-	-	-	8.0
Total cost	87.8	87.8	87.8	87.8
Estimated expenditure in LFA	75.6	76.2	73.1	73.3

**Table 5: Illustrative Distribution of Axis 2 Resources in 2013**

(£ million)	Option 1(a)	Option 1(b)	Option 2	Option 3
Total resources available under RDP	90.1	90.1	90.1	90.1
Ongoing commitments	43.1	43.1	43.1	43.1
Tir Mynydd (inc. non-beef & sheep)	27.0	27.0	-	-
... plus voluntary environmental enhancements	-	3.0	-	-
New Tir Gofal agreements	5.0	4.0	-	-
Landscape/catchment schemes	10.0	8.0	-	-
New Organic Farming Scheme agreements	2.0	2.0	-	-
New Better Woodlands for Wales agreements	3.0	3.0	-	-
Basic land management	-	-	20.5	-
... LFA premium	-	-	14.4	-
Advanced land management	-	-	12.1	-
Carbon management	-	-	-	22.0
Water management	-	-	-	15.0
Biodiversity management	-	-	-	10.0
Total cost	90.1	90.1	90.1	90.1
Estimated expenditure in LFA	77.5	78.1	75.0	75.8

**Q13. Have we identified all of the main options for future land management support? If not, what other options do you think should be explored?**

**Q14. Do the options fully address the key objectives underlying public expenditure on environmental land management? Do you think that one or more of the options represent value for money?**

**Q15. Which option(s) do you prefer, and why?**

## 7. CONCLUSIONS

There is no doubt that the need to mitigate the impact of agricultural intensification, coupled with the legislative and policy requirements to deliver ecosystem services related outcomes leads to the conclusion that land managers in Wales need to be encouraged to deliver outputs that are not traditionally associated with agriculture and forestry. In addition, the market failures described in the introductory section to this paper confirm that the State has a clear role in ensuring that these outcomes and outputs are delivered since market forces alone will not do so.

It is clear that the current schemes operating under Axis 2 are only partially successful in delivering the desired outcomes. To a certain extent this is an accident of history as some of the newer policy and legislative drivers have arisen since these schemes were designed. Additionally however, the lack of a fully strategic approach to land management and the delivery of outcomes from that management has resulted in the fragmented development of schemes which have sought to deliver partial solutions. There is now an opportunity to adopt that strategic approach and develop an integrated scheme which, if designed correctly, should be able to respond to changing policy priorities in the future without the need for substantial re-design. The review has been timely in that it offers the opportunity to resolve issues about Tir Mynydd as well as potentially retargeting existing agri-environment resources in a way that offers future stability and a greater alignment between desired policy outcomes and delivery on the ground.

It may be possible to modify some of the existing schemes to increase the breadth of outcome delivery from that which is currently provided. However, this is likely to increase the complexity and overhead costs of these schemes.

Any new scheme that is developed needs to include actions to protect the landscape, heritage and access aspects of the countryside as well as the biodiversity, carbon management, soil and water issues described above. In addition, it will be necessary to provide training to land managers in the methods and techniques required to deliver the outcomes discussed as many of the are novel. This will require funding from Axes 1 and 3. It is, however, entirely acceptable to develop a scheme which has the majority of funding provided from one axis of the RDP, but which utilises a lesser amount of funding from other axes in order to deliver its outcomes.

Discussion both within and outside the stakeholder group suggests that there is a general understanding that change is needed. The *Farming, Food and Countryside* exercise has been helpful in this respect, highlighting the changes to the market and support environment that are likely to happen between now and 2020. This has helped to set the context for discussions with stakeholders.

### **Transitional arrangements**

Further consideration will need to be given to transitional arrangements for the period leading up to the introduction of any new scheme, which would of course be subject to approval from the European Commission following the submission of a modification to the Rural Development Plan for Wales. Precise implementation arrangements including the date from which a new scheme could be introduced cannot be determined at this stage, but relevant issues will include arrangements for closing down existing schemes and, potentially, transferring beneficiaries into the new scheme. Transitional arrangements may also need to be considered for individual land managers who are adversely affected by the changes – for example those who currently

claim both Tir Mynydd and Tir Cynnal/Tir Gofal payments but might not be able to do so in the future.

***Q16. What transitional arrangements should be put in place to minimise disruption in moving to a new system?***

## **8. NEXT STEPS**

Views on the options for future support for environmentally sustainable land management in Wales are welcome from everyone with an interest in the rural environment. In particular views are sought on the specific questions posed in the paper.

The consultation period is 12 weeks and the closing date for comments is 19 December. Further copies of this consultation paper are available from the Axis 2 Review Team at the address below, and a copy of this paper is available on the Welsh Assembly Government website (<http://www.countryside.wales.gov.uk/>). In addition we will be arranging a number of meetings at which we will be keen to hear the views of stakeholders; details will be available at the address below.

Following the consultation, proposals for a revised structure of support for land management in Wales will be submitted to the European Commission as part of a modification to the Rural Development Plan for Wales 2007-13.

It is the Welsh Assembly Government's policy to make publicly available all responses to consultation exercises. These will be placed in the Library of the National Assembly. If you do not wish your comments to be made available you should make this clear when you submit your comments.

Please send any comments by 19 December 2008 to:

Axis 2 Review Team  
Farm Development Division  
Welsh Assembly Government  
Crown Building  
Northgate Street  
Aberystwyth  
Ceredigion  
SY23 2JS

Email: [axis2consultation@wales.gsi.gov.uk](mailto:axis2consultation@wales.gsi.gov.uk)

## APPENDIX 1

### DELIVERY OF WALES ENVIRONMENT STRATEGY OUTCOMES: PERFORMANCE OF CURRENT SCHEMES

	Tir Cynnal	Tir Gofal	CSF	Organic	Tir Mynydd	BWW	FWPS
Resilience to climate change	NO	NO	NO	SOME	NO	YES	NO
Water resources managed sustainably	NO	NO	YES	NO	NO	NO	NO
Soil managed to retain carbon store	NO	NO	NO	NO	NO	NO	NO
Flood risk managed	NO	NO	NO	NO	NO	NO	NO
Water quality improved	NO	NO	YES	NO	NO	YES	YES
Diffuse pollution reduced	NO	NO	YES	YES	NO	NO	NO
Landscape/catchment scale	NO	NO	YES	NO	NO	NO	NO
Biodiversity recovery	YES	YES	NO	NO	NO	YES	YES
Wider environment more favourable	YES	YES	SOME	SOME	NO	YES	NO
Sites favourable	NO	YES	NO	NO	NO	YES	YES
Landscape maintained	NO	YES	NO	YES	NO	YES	YES
Access improved	NO	YES	NO	NO	NO	YES	NO
Historic building stock maintained	YES	YES	NO	NO	NO	NO	NO

### GOOD PRACTICE GUIDANCE FOR THE MANAGEMENT OF ORGANIC AND ORGANO-MINERAL SOILS

#### Drainage

- Any new drainage of organic soils should be avoided
- Existing drains should be blocked to reduce erosion, especially in catchments with reservoirs where colour in drainage water is a problem. Resources for this should be focused on slopes where the drainage is oldest.
- Maintaining as shallow a water table (i.e. close to the surface) as possible should be encouraged.
- Where drainage is a necessity, areas where the water table is generally 20 cm or more below the surface in the summer should be drained in preference to constantly waterlogged areas
- Drainage should not be used to mitigate N<sub>2</sub>O emissions on non-mineral soils, instead options such as reducing N inputs and grazing intensity should be explored.

#### Grazing

- Overgrazing causes significant damage to soil organic layers, reduces carbon storage and increases greenhouse gas emissions so stocking densities need to be carefully managed to minimise this, while limiting succession to protect vegetation communities.
- Heavier animals such as cattle should only be used in very limited numbers, where their less selective feeding will aid vegetation management, and not on wetter sites where they are more likely to cause significant damage.
- Stocking densities should be reduced in winter or animals removed completely, particularly on wetter sites.
- Stocking densities must take into account grazing pressure from wild animals such as deer and a reduced number of domestic livestock should be used on sites where deer are numerous.

- Deer control measures should be concentrated in areas with organic soils which are at risk of overgrazing.

## **Burning**

- Serious consideration should be given to halting the practice of burning on soils with significant stores of carbon, and the use of grazing alone to control community succession and encourage vegetation renewal, although this may require reductions in grazing density.
- Burning should not be allowed in areas with a high risk of erosion such as exposed areas or areas with extensive drainage gullies or ditches.
- Fires should be as small and controlled as possible so that only vegetation is consumed and litter and root mats remain to protect the soil from exposure
- The burning season should be confined to after wet periods in early spring, towards the end of the current legal season, as winter freeze-thaw cycles increase the risk of erosion when soil is no longer protected by vegetation.

## **Fertilising**

- Fertiliser applications should be kept to a minimum, especially when the soil is also limed.
- Applications should be carefully timed to avoid wet conditions as far as possible and ensure that nutrients are applied when the vegetation is in a growth phase and can make best use of them.
- The application of solid manure is preferable to either mineral fertilisers or liquid manure/slurry.
- Where applicable, nutrient input from manure and urine deposition by grazing animals should be accounted for when assessing further nutrient requirements.

## **Liming**

- Further lime additions should be avoided if possible, especially on wetter organic sites.
- Reducing liming in catchments which drain into water supply sources may reduce problems with 'colour' due to particulate organic matter.

- Soils in the pH 4-5 range may be most sensitive to a change in pH in terms of subsequent loss of carbon and therefore liming them, or liming more acidic soils up to this pH range, should be discouraged.

## **Tillage**

- Conservation or zero-till regimes should be encouraged
- Deep ploughing should not be allowed on soils with high carbon contents
- Winter ploughing should be avoided to reduce erosion risk and effects of freeze-thaw cycles on bare soil, and instead where necessary, ploughing should be carried out as close to new crop sowing as possible to minimise soil exposure.

## **Grassland conversion**

- Conversion to grassland causes loss of stored carbon and increased greenhouse gas emissions and therefore should be discouraged on organic soils
- Where possible, existing grassland should have drains blocked to restore a high water table, and fertiliser and lime additions stopped.
- If blocking drains completely is not feasible, maintaining as high a water table as possible will reduce carbon losses.
- Greenhouse gas emissions can be partially mitigated by minimising disturbance to the soil – using a permanent crop so no tillage is required and minimising fertiliser inputs.

## **Arable conversion**

- Conversion to arable land use is the most damaging practice for reducing C stocks and enhancing GHG emissions, and should therefore be strongly discouraged on soils with high carbon contents.
- Ideally, existing arable land on organic and organo-mineral soils should be restored to its natural water level and vegetation.
- Where restoration is not possible, the following measures will mitigate C and N losses
  - Maintain as high a water table as possible



- Stop deep ploughing and if possible change to zero or conservation tillage practices
- Avoid root crops such as potatoes and sugar beet which require more soil disturbance
- Minimise time in which soil is without crop coverage and change to permanent crops if possible