REFLECTING ENVIRONMENTAL LAND USE NEEDS INTO EU POLICY: PRESERVING AND ENHANCING THE ENVIRONMENTAL BENEFITS OF UNFARMED FEATURES ON EU FARMLAND

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Executive Summary

Purpose of the Report

This report provides a rationale for affording greater protection to Europe’s stock of farmland features in the future. It examines the distribution and density of features that exist across Europe’s agricultural landscapes, assesses the environmental benefits they confer and the pressures they are under, and reviews the measures currently providing a level of protection. The study, conducted between October 2007 and September 2008, is based on eight detailed case studies, an analysis of national databases on features, field visits, GIS analysis and an extensive literature review.

It concludes that features face a significant threat of removal or neglect, and if the important environmental benefits that they provide are to be retained, changes to the legislative and policy framework will be required, with the protection of farmland features more explicitly embedded in the objectives and intervention logic of both mandatory and voluntary approaches. Without appropriate safeguards, the capacity of a declining stock of farmland features to support biodiversity, to protect natural resources such as soil and water, and to play a role in climate change adaptation and mitigation strategies may be lost.

This report presents eight policy options for further protecting Europe’s farmland feature resource and enhancing the environmental benefits they provide. Three frame conditions are discussed, which if in place, would maximise the benefits of existing policies and measures as well as the eight options proposed. These frame conditions and policy options are appropriate for immediate implementation but are also situated within the longer term reform path of the CAP. Eight recommendations are made for securing the environmental benefits provided by Europe’s farmland features, the most pressing of which are to increase the budget devoted to agri-environment management, whether by modulation or otherwise, coupled with investment in a pan-European database on features and a robust system of monitoring.

The EU’s Green Infrastructure

Farmland features are a critical environmental resource, forming part of the ‘green infrastructure’ that extends through Europe’s agricultural landscapes. Farmland features comprise both natural and anthropogenic components of agricultural landscapes, and this study focuses on a sub-set of these. It is concerned with those farmland features that are generally under threat, either because of their size, or because their agronomic function has been lost or may be lost in the near future, and as such are considered to be a priority for future policy action.

Based on these discriminators, the features that have been considered in detail in this study are:

- Hedgerows
- Stone walls
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- Terraces and terrace walls
- Ditches
- Field margins and buffer strips
- Single trees, lines of trees and small groups of trees
- Small areas of woodland
- Semi-natural patches on farmland
- Traditional orchards
- Fallow
- Common land and drovers’ roads

Quantifying Europe’s Farmland Features Resource

The data to allow quantification and a description of the distribution, density and condition of farmland features across Europe are currently lacking. There are a small number of national databases and regional project-based datasets which provide some information on farmland features, but together they do not provide a comprehensive, up-to-date overview of the abundance of features across the EU, and at best, they include only partial trend data.

Robust data on the presence and condition of farmland features are crucial to the realisation of policy objectives both in relation to the protection of features, and to the identification and maintenance of High Nature Value farming systems. Data of this sort could inform strategic land use decisions at the landscape scale, as well as the targeting of support at areas where the environmental benefits are highest. Trend data would allow policy makers to take pre-emptive action before the stock of farmland features declines to a level where the environmental consequences would be intolerable. It is more cost effective to stem the decline in features and maintain the current resource than to re-establish or restore features at a later date. The capacity to detect and to manage change in an environmentally sensitive way is important in a rapidly changing rural context. A central recommendation of the study therefore is to invest in a pan-European database on farmland features through the incorporation of data on features in the existing Land Parcel Identification System (LPIS).

Environmental Benefits Provided by Farmland Features

Substantial evidence exists on the important environmental benefits provided by farmland features. To date, much discussion in the scientific literature has focused on the biodiversity benefits of farmland features. In addition, this study gathers significant evidence on the benefits farmland features provide for enhancing soil and water quality and in tackling climate change.

Biodiversity
Farmland features support biodiversity as they help to maintain habitat heterogeneity. They are host to a wealth of wild plant species and provide one or more of the following for fauna species: shelter, nesting habitat, food sources and/or movement corridors or transition/dispersal zones. A significant number of vertebrate animal species of Community interest rely on farmland features and thus if a certain quantity of features is lost, it would seriously undermine Europe’s capacity to meet its
environmental commitments, and to protect species of conservation concern. It is highly likely that farmland features are of similar importance to invertebrates and plants of Community interest.

A number of generic factors influence the biodiversity value of farmland features. The management of a farmland feature is critical in determining biodiversity value. In biodiversity terms, the size and connectivity of a feature are particularly important. Larger features are generally of greatest nature value. Some farmland features are likely to play an important role in maintaining functional connectivity in the landscape and so provide opportunities for foraging and genetic exchange between different species. The evidence suggests that protection and management measures should focus on maintaining large and/or wide semi-natural features with high vegetation diversity and structural complexity, because these are likely generally be of highest connectivity value.

**Soil Quality**

Farmland features help to protect soils from threats such as erosion, a decline in organic matter and landslides. Linear features, such as walls, hedges and lines of trees, are particularly valuable in helping to reduce erosion where they occur across run-off and erosion pathways. Trees, woody linear features, walls and terraces can all help to prevent landslides and have long been used to stabilise agricultural soils in steep and mountainous areas. Fallow land, common land, unutilised agricultural land and small patches of woodland may help to improve soil structure and organic content. They can all serve to enhance soil biodiversity, which in turn has a positive effect on soil structure.

**Water Quality**

Linear features are of particular value for water quality where they are positioned across run-off pathways. Hedges, lines of trees, and buffer strips help to reduce run-off of soil, thereby reducing siltation and eutrophication of water bodies, and leaching of nutrients, particularly nitrogen. The length and width of the linear feature can be important, with bigger features providing greater benefits.

**Climate Change**

Farmland features play a valuable role in carbon sequestration. Carbon sequestration can be promoted by retaining existing features and by switching from arable land to appropriately managed uncultivated patches where disturbance is reduced. Farmland features can help wildlife in agricultural landscapes adapt to climate change by providing functionally connected habitat networks, which may increase the resilience of species populations and, where necessary, facilitate movements in response to changing climatic conditions. Farmland features may be beneficial in allowing movement over short distances, but there is mixed scientific evidence to show how useful they are for dispersal over larger distances.

**Pressures on Farmland Features**

The evidence for trends in the stock of farmland features is patchy, typically derived from regional case studies rather than from a systematic monitoring of features at the national or European scales. In some cases, such as with hedgerows in Denmark,
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Historic losses have been halted and the volume of features has since increased, but more typically, features have been removed from agricultural landscapes or have fallen into disrepair. The loss, neglect or inappropriate management of Europe’s stock of farmland features can largely be explained by pressures associated with ongoing agricultural restructuring, including an intensification of agricultural land use, abandonment in certain areas, and land use change, in the past and in the future. In the majority of cases, this will result in a decline in the associated environmental benefits, although the specific environmental outcomes of particular pressures are context specific.

These pressures emanate from broader drivers of economic, structural and social change. Some of these are exogenous to the EU, and precipitate a process of agricultural restructuring, leading to changes in farm management decisions and practices. The CAP also remains an important driver of production decisions. In the past, it has had a negative impact on the stock of farmland features, but through cross compliance and some rural development measures the protection, appropriate management and creation of features is provided for increasingly.

Legal Protection of Farmland Features

Across the Member States, there is a complex matrix of policy interventions offering various levels of protection to different farmland features. The most relevant items of legislation for maintaining and enhancing the density, diversity and quality of farmland features are those which directly target them, such as the Birds and Habitats Directives\(^1\), standards for ‘Good Agricultural and Environmental Condition’ (GAEC) under cross compliance, the agri-environment measure, and pieces of national legislation.

The Birds and Habitats Directives provide a number of mechanisms to protect farmland features, but implementation with respect to agricultural land and agricultural activities needs to be improved. Cross compliance requires Member States to implement GAEC standards with obligations on beneficiaries of the SPS and SAPS to retain landscape features. The evidence suggests that the protection of farmland features through GAEC is inconsistent at the moment as only eleven Member States implement GAEC standards to protect existing features. In most Member States, agri-environment payments for the maintenance, restoration or creation of farmland features are available. Other rural development measures, including afforestation measures and the Less Favoured Area measure, are likely to have an indirect but important effect under certain circumstances. The requirements of the Water Framework Directive and, potentially, the Soil Framework Directive, provide a strong case for maintaining the existing farmland features resource, such as uncultivated margins and hedgerows, in order to contribute to the protection of natural resources.

In some Member States, farmland features are protected by national law. Certain pieces of national legislation are cross-cutting and seek to safeguard a range of features, whilst others are specific to particular features. These commitments are expressed through measures such as national parks, protected landscape areas, registers of historic landscapes and controls on infrastructure development. National sources of funding for protecting or maintaining features are relatively limited, however, and there are a number of arguments, including the existence of relevant instruments and funding for positioning the protection of farmland features within an overarching European framework.

The Implications of SPS and SAPS Eligibility Criteria for the Protection of Farmland Features

The rules regarding the definition of the area eligible for direct payments under the CAP Single Payment Scheme (SPS) and the Single Area Payment Scheme (SAPS) are likely to have an impact on farmland features. The way in which these rules are interpreted could, on the one hand, incentivise the removal of features, or on the other, reduce the incentive to do so. As such, these eligibility rules, in concert with relevant GAEC standards, form an important instrument in protecting the stock of Europe’s farmland features. An analysis of the rules suggests that if features are included in the area eligible for payments, the threat of removal in order to maximise the eligible area and therefore the value of the payment received is significantly reduced. This does not occur across all Member States and as such, there appear to be clear differences in the interpretation and subsequent implementation of the rules leading to differing levels of protection afforded to features.

The rule governing eligibility for the SAPS in Bulgaria and Romania may have a mixed environmental effect. Unlike other countries applying the SAPS, no reference date was set for the maximum permissible eligible area which means that new areas can become eligible for the SAPS on an annual basis. In intensively farmed areas, features that are not protected by GAEC or other national legislation could be under threat of removal if farmers choose to expand the area eligible for the direct payment. On the other hand, the absence of a reference date allows more land to come under the influence of the CAP each year. This would be particularly advantageous in those cases where land currently not registered is at risk of abandonment. If this land is included in the future, it could be targeted by appropriately designed measures to the benefit of the maintenance of the associated farmland features.

These rules are part of a nascent system. Even if all of the inconsistencies in interpretation and implementation are addressed, they do not provide a fail-safe mechanism for the protection of features because of other economic and structural factors in play. In particular, there is anecdotal evidence from the case studies to show that features have been removed, possibly due to the misinterpretation of the rules by farmers, but also to take advantage of rising market prices for agricultural commodities.
Policy Options for Farmland Features

If there is a commitment across Europe to maintain the stock of farmland features, three broad outcomes would need to be achieved:

1. The maintenance, in broad terms, of the density and distribution of farmland features, while accepting that some change will occur over time;

2. An increase in the density and distribution of farmland features, where necessary for environmental reasons;

3. The sympathetic management of farmland features to maximise environmental benefits.

These strategic outcomes translate into a number of objectives with action required both at the local and at the European scales. While the importance of national measures in protecting farmland features is clear, there are a number of arguments to support the case for EU action in the protection of features. First, the retention and appropriate management of farmland features contributes significantly to a number of environmental objectives set out in EU policies and international commitments. Second, farmland features are an integral component of rural landscapes, valued not only by local people but at a broader European scale. Third, many of the policy levers for influencing the management of features, including the requisite funding, lie within the ambit of the CAP.

To reverse trends in the decline and neglect of farmland features, the existing legislative and policy framework will need to be improved. This can be achieved either through modifications to existing instruments or through the introduction of new options. The eight options proposed are a mix of existing options and new options. The protection of farmland features would be maximised if three frame conditions are in place. The first is to create a pan-European database on the presence and condition of farmland features to address the gaps in the existing and available data. The second is to encourage a landscape scale approach to sustainable land management. The third is to encourage farmers to engage in collaborative action in order to address the environmental needs of a particular locality.

The eight policy options with the potential to safeguard the environmental benefits of farmland features proposed in this report include:

1. Ensuring Agri-Environment Schemes take adequate account of the protection, management and creation of farmland features.

2. Retaining all environmentally beneficial farmland features under GAEC.

3. Improving the implementation of the Birds and Habitats Directives on agricultural land.

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5. Tightening the criteria and thresholds used by Member States to define which projects require an Environmental Impact Assessment (EIA).

6. Designating a proportion of the total farm area as an Environmental Priority Area (EPA) and ensuring that it is under beneficial management.

7. Land Purchase.

8. Covenants.

Conclusions and Recommendations

The principal conclusions and recommendations of this study are as follows.

i. **There is a need to invest in a pan-European database on farmland features with data collected according to a standardised methodology and at regular intervals.**

The Land Parcel Identification System (LPIS) offers huge potential to collect data on the presence or absence of farmland features in a consistent way across the EU-27. Through the use of aerial photography, the LPIS marks the boundaries of agricultural parcels for the purpose of controlling the claims of farmers under the CAP’s Single Payment Scheme (SPS) and Single Area Payment Scheme (SAPS). It is recommended that the aerial photographs produced for the LPIS are used to identify and record non-agricultural elements, i.e. farmland features, a practice already recommended by the Commission Services. The recording of such data would underpin the capacity of the Member States to verify compliance with national GAEC standards for the retention of landscape features, and to develop landscape scale policy interventions that target features in a coordinated and strategic way. The LPIS does not necessarily need to be adapted to collect information on all farmland features, but only those that are protected in some way by the legislative baseline or are otherwise the attention of policy, such as the agri-environment measure. Further research and a feasibility study on developing the scope and application of LPIS is needed.

ii. **There is a need to maintain the broad stock of farmland features, in order to support Europe’s biodiversity, protect natural resources and contribute to climate change adaptation and mitigation.**

The weight of evidence shows that farmland features provide a range of environmental benefits. Some landscapes are relatively rich in farmland features, whilst others are comparatively denuded, as a result of historic and ongoing agricultural restructuring. Irrespective of policy drivers, agricultural restructuring will continue, and be marked by further intensification in some places, and marginalisation, and potentially land abandonment, in others. Unless appropriate legal safeguards are in place, the risks of inappropriate management or the removal of features - particularly if they no longer retain an agricultural function - will increase as a result of intensification. Where marginalisation is occurring, features are at
substantial risk of falling into neglect, which could reduce the ecological value of some. Land abandonment results in complex ecological changes, which can include the loss of some species that are closely associated with farmland features and the wider semi-natural habitat in which they are situated. In both cases, there are negative impacts on landscape and the associated cultural values placed on it.

A guiding principle should be to retain and appropriately manage the majority of existing farmland features and to prioritise the creation and restoration of features where the environmental need is greatest. Some loss of low-value features should be tolerated, although the most valuable features, such as old trees, traditional orchards and patches of species rich semi-natural vegetation, should be protected. Appropriate features should be re-created in order to restore greater diversity to simplified agricultural landscapes, but only where this will provide a demonstrable environmental benefit. Whilst new features will provide refuges for farmland biodiversity, the introduction of features in intensively farmed environments will be guided by the need to address soil and water quality problems in many cases.

iii. There is a need for sensitive implementation of the SAPS eligibility rules in Bulgaria and Romania.

The SAPS eligibility rules, as they apply to Bulgaria and Romania, could have both positive and negative environmental consequences, depending on the type and structural characteristics of the farming system and the local context. Some of these negative consequences can be avoided by amending the eligibility rules for farms and agricultural parcels under the SAPS. This should be informed by an identification and justification of customary land uses at the regional, rather than national level.

To counteract the threat of the removal of features in more intensive areas, it may be advisable to set a retrospective reference date for the total agricultural area that is eligible for the SAPS. A thorough implementation of GAEC standards should also help to protect the most valuable farmland features. In areas under threat of abandonment and which are not currently eligible for CAP support, the eligibility rules could be revisited, including those relating to a minimum holding size of 0.3 hectares, and to the density of trees or shrubs allowed. The advantage of this would be to increase the area of land under the influence of the CAP, to channel payments to marginal and extensive farming systems thereby providing some safeguards for farmland features that may otherwise fall into neglect as land is abandoned. Although receipts under the SAPS may be low for such small farms, this opens up the possibility to target these farms with measures that seek to reward the provision of environmental benefits.

iv. There is a need to encourage the protection of farmland features through cross compliance standards for ‘Good Agricultural and Environmental Condition’ (GAEC).

Features make an important contribution to the environmental value of Europe’s agricultural land. Consequently, their protection should form part of the legislative baseline affecting farmers. Alongside the setting and enforcing of legal obligations by
Member States to prevent the removal of the most valuable features, cross compliance GAEC, if implemented in a rigorous way, affords three layers of protection against the removal of features. First, the framework for the implementation of GAEC provided by Article 5 and Annex IV of Council Regulation 1782/2003 includes standards for the retention of landscape features, the retention of olive trees and the retention of terraces. In addition, the protection of a feature through GAEC results in the area occupied by the feature forming part of the eligible area for the purpose of calculating claims made under the SPS and the SAPS. This provides a second layer of protection, removing the incentive that otherwise exists to remove the feature in order to receive a higher payment. Thirdly, the Farm Advisory System, which must, as a minimum, provide guidance on all cross compliance standards, and be implemented by all Member States, should also provide further protection through awareness-raising.

The implementation of GAEC standards for the retention of landscape features remains partial across the Member States. Less than half have introduced relevant standards. It is recommended, therefore, that Member States are encouraged to observe the requirements of Article 5 and Annex IV of Regulation 1782/2003 and define GAEC standards for the retention of landscape features at the farm level.

v. There is a need to ensure Agri-Environment Schemes take adequate account of the management, restoration and creation of farmland features.

Whilst the full implementation of GAEC provides an important baseline in the protection of farmland features, this is not an appropriate instrument to deliver the active management of features given the costs incurred by farmers. Farmers in Spain and Italy are obliged to maintain terraces in order to meet national GAEC standards, however, given that costs are high, many farms with terraces are part of marginal farming systems, and enforcement levels are low, these standards are unlikely to be effective in practice.

Agri-environment payments are essential for compensating farmers for the costs incurred in the sympathetic management or restoration of features. In areas of highest environmental need, either where features are under particular threat, or where the environmental benefits from features are most concentrated, it is recommended that specific farmland features are adequately accounted for in agri-environment schemes.

vi. There is a need to promote new approaches to policy delivery in order to enhance the effectiveness of intervention.

The scope for improved coordination and targeting of the multiple measures affecting features is particularly strong at a relatively local scale, whether it is a large landscape, a watershed or administrative unit. The adoption of a strategic landscape approach for guiding a suite of policy measures on landscape, biodiversity, water management and farmland features in a coherent and more integrated way would add value to measures pursued in isolation. The protection and maintenance of farmland features should be one of the objectives of such an approach, but not form its sole focus. Member States should be encouraged to develop more integrated delivery
systems of this kind and could be incentivised to do so through measures offered via the EAFRD Regulation.

Moving beyond a compartmentalised approach to policy design and delivery would also involve encouraging collaborative action alongside the endeavours of individual farmers. There is evidence to suggest that greater environmental benefits might be achieved if the cooperation of neighbouring farmers or landowners in implementing complementary actions, such as the introduction of a buffer strip alongside a watercourse which traverses several holdings, could be secured. A number of examples of this approach can be found both within the EU and the USA, and thus there is a precedent for these sorts of actions, but techniques for encouraging collaborative action would benefit from further piloting and any proposed payment terms would need to be thoroughly examined for WTO compatibility.

vii. There is a need to identify and develop new policy measures that can safeguard Europe’s farmland features resource.

Whilst it is generally more cost effective to introduce amendments to existing policy measures, some innovative approaches, suitable for implementation at the European level, may further enhance the protection of farmland features. To this end, it is recommended that the benefits of introducing an Environmental Priority Area (EPA) requirement on farms receiving CAP payments are explored further. Whilst there are various ways to develop the EPA approach, it essentially requires farmers to designate a proportion of the total farm area as an EPA, to follow advice and locate the EPA where it would address pressing environmental concerns, and to undertake appropriate management. The appropriate proportion of land that should be designated an EPA would depend on a range of factors, including the size of the farm, the amount of unutilised land currently on the farm, the incidence of features such as watercourses and hedges that could be buffered by the EPA, and the scale of pressing environmental problems to be addressed, such as soil erosion. The EPA would therefore create an obligation to safeguard existing features, by creating a protective buffer around the feature, and in some cases result in the creation of new features, such as buffer strips, where these aid the protection of soils and improve water quality.

viii. An adequate budget is needed to satisfactorily implement agri-environment measures and to undertake systematic monitoring of Europe’s farmland features resource.

This study has identified the need to retain Europe’s existing farmland features resource. The retention of features can be achieved through existing European policy instruments, including GAEC, in combination with national measures designed to protect the most valuable features. However, the longer term management and restoration of farmland features, and the creation of new farmland features, where necessary to meet environmental goals, is likely to rest on compensation payments, and hence the appropriate use of a suite of rural development measures. In particular, the agri-environment measure and the non-productive investment measure can be used to maintain and increase the overall farmland features resource. However, to be
effective and to be implemented at the scale that might be necessary as pressures on farmland increase, an adequate European rural development budget is needed.

Increasing the budget devoted to agri-environment management, whether by modulation or otherwise, is central to a strategy for maintaining the stock and improving the condition of farmland features in Europe and it is recommended that the requisite steps are taken in order to secure these additional funds.
Chapter 1 Introduction

1 Introduction

Agricultural systems have shaped the European landscape over thousands of years and created habitats for a wide range of species. While many of these habitats, such as semi-natural pastures grazed by livestock and intensively and extensively managed arable cropping, form part of the productive area of the farm, others do not. Other habitats exist within the farmed landscape, including field boundaries such as hedgerows and grassy strips, more isolated features such as in-field trees, larger features between agricultural parcels such as small woods and water features such as ditches and ponds. These features form the focus of this study.

In most cases, these features do not contribute directly to the productive capacity of the farm, but may, in some cases, have an agricultural function. The term ‘unfarmed’, embedded within the title of this study, is therefore perhaps something of a misnomer, potentially carrying confusing parallels with the term ‘unmanaged’. Throughout this report, we have preferred to use the term ‘farmland features’.

Farmland features are a critical environmental resource. However, their continued existence, and therefore their ability to provide environmental benefits, is threatened. Without appropriate legal safeguards, the capacity of a declining stock of farmland features to support biodiversity, to protect natural resources such as soil and water, and to play a role in climate change adaptation and mitigation strategies may be lost. Pressures to remove or neglect the management of farmland features are likely to be exacerbated by ongoing agricultural restructuring and associated land use change, particularly in the light of rising arable commodity prices.

Farmland features are provided a level of protection by EU, national and regional level environmental legislation. The eligibility criteria for agricultural parcels that underpin the Common Agricultural Policy’s Single Payment Scheme and the Single Area Payment Scheme, mostly, de-incentivise the removal of features. The management of features for environmental reasons is provided for by a range of CAP rural development measures.

Through an examination of the different farmland features that exist through Europe, an assessment of the environmental benefits they confer and the pressures they are under, and a review of the measures currently providing farmland features with a level of protection, this study identifies the rationale for affording greater protection to farmland features in the future. This report presents a range of policy options for further protecting and enhancing Europe’s farmland feature resource, and concludes by framing these options in terms of the longer term reform path of the CAP.

1.1 Objectives

The study had the following objectives:

1. To produce a detailed description of farmland features and their geographical distribution, identifying which features are characteristic of which areas, based on the best available data sources.
2. To make an assessment of the environmental benefits provided by these features.
3. To assess the pressures these features are under (for example, removal, or neglect).
4. To examine the effectiveness of current legislation in protecting farmland features.
5. To explain the influence of the CAP Single Payment Scheme and Single Area Payment Scheme on the level of protection.
6. To propose policy options to ensure the protection of farmland features and maximise their environmental benefits, and to provide a broad estimate of the costs associated with the proposed policy options.

1.2 Structure of the Report and Overview of Accompanying Materials

This report is structured as follows. This chapter contains an outline of the methodology used (Chapter 1.3). Chapter 2 discusses the scope of the study and its focus on farmland features. Chapter 3 describes the principal characteristics and some distribution information of twelve farmland features (hedgerows; stone walls; terraces; ditches; field margins and buffer strips; single trees, lines of trees and small groups of trees; small areas of woodland; other semi-natural patches; traditional orchards; fallow; common land; and, drovers’ roads). In Chapter 4, the main findings of an analysis of six national datasets that include information on the presence of farmland features are presented, alongside a summary of the farmland features that are characteristic of eight of Europe’s Environmental Zones. The latter draws on the results of a survey, undertaken for this study, of 42 sites in five countries. Two different proposals for developing a more comprehensive data source on farmland features are also presented.

The environmental benefits provided by farmland features are reviewed in detail in Chapter 5. In Chapter 6 the pressures placed on farmland features are analysed in terms of a range of driving forces, including both those endogenous and exogenous to the EU. A wide range of legislation is reviewed in Chapter 7, including, but not limited to, EU nature conservation legislation and legislation related to both Pillars of the CAP. Chapter 8 focuses on the eligibility criteria for the CAP Single Payment Scheme and the Single Area Payment Scheme, and the implications for farmland features.

The final chapters focus on eight policy options which may be of value to further securing the protection of farmland features in the EU. Chapter 9.1 sets out the need for policy to intervene and safeguard or enhance the environmental benefits provided by farmland features. The merits of an EU approach are discussed. The broad objectives for policy measures targeting farmland features are also set out. In Chapter 9.5, eight policy options, and an outline of the associated costs, are described. Three further tools for enhancing the benefits that can be achieved from any suite of implemented measures, both existing and prospective, are also described, in Chapter 9.4. These policy options are contextualised in terms of the evolving agricultural policy environment in Chapter 9.6. To this end, a framework for a structured, multi-instrumental approach to sustainable land use is presented. Chapter 10 presents the study’s key conclusions and recommendations.

This report is accompanied by a number of other outputs. The analysis of datasets was undertaken by Alterra, who wrote a separate report summarising the results of their
work. The key findings are included in Chapter 4 of this main report. Eight case study reports are available for Denmark, France, Germany, Italy, Sweden, Romania, Spain, and the UK. The case study reports, written by national experts, include a description of the farmland features that can be found in each country, with the stock of features quantified where possible. National evidence on the associated environmental benefits and pressures is also included, as is a review of the influence of both European and national legislation in protecting farmland features. In each case study, the particular pressures facing farmland features, and the role of the regulatory framework in their protection, in a specific region are investigated in more detail.

Twelve fiches have also been prepared for the farmland features investigated by this study. Each fiche draws together the available information on each feature in order to consolidate the information available in a more digestible form. The fiches include a quantification of the extent of each feature, where such data exists, information on the condition of the feature, including trends in the total stock, if available, and an overview of the associated environmental benefits, pressures and legal provisions.

1.3 Methodology

The results and analysis presented in this report stem from a combination of quantitative and qualitative research methods. Eight case studies formed a central plank of data collection, and are described in further detail below. The approach to the analysis of the national datasets which contain information on farmland features, as well as the field visits, is described in Chapter 4. Significant limits exist in relation to the availability of consistent information on the distribution and density of farmland features in Europe.

Much of the report is based on an exhaustive literature review of the relevant academic literature, as well as a review of the relevant Regulations and Directives, and research reports prepared for the Commission services, governmental and non-governmental bodies. Because of the detailed technical nature of the SPS and SAPS analysis, DG Agriculture was consulted to ensure that our interpretation of the relevant rules is correct. The policy options were drawn up following a review of the results of the preceding stages of the study and in conjunction with a further literature review. A workshop was held at IEEP, involving experts participating in the project, in order to flesh out the policy options.

The case study material fed into all project tasks bar the development of policy options. Case study Member States were carefully selected according to where quantitative data on farmland features exist, and where there are gaps in available data, to cover a range of different farming systems and to ensure sufficient geographical breadth in order to investigate the different pressures and environmental benefits associated with farmland features across Europe. Each case study functioned at two levels (see Table 1-1), and data collection and reporting followed a common template and guidance document prepared by IEEP. In the cases of France and Denmark, good data on the density of farmland features and information on their distribution were available. The Danish partner undertook a GIS analysis of the presence of farmland features in order to produce detailed distribution maps and to quantify regional variations in the density of features.
At the national level, each case study expert reviewed national literature and drew on their experience in order to identify and describe relevant features and examine their geographical distribution. Literature available within the Member State was reviewed in order to assess the environmental benefits these features deliver as well as the pressures they are under. The purpose of this literature review was to include references not written in the English language. In order to gain in-depth material, each national expert then focused on a specific region in order to undertake a small number of interviews with selected experts. This focus allowed a more precise analysis to be made of the level of protection offered by national legislation, the consequences of SFP/SAPS implementation for the protection of farmland features, and also, but not limited to, the level of protection offered by cross compliance and agri-environment schemes. In-depth semi-structured interviews took place with representatives of local conservation groups, government nature conservation authorities, environmental NGOs and farmers between December 2007 and March 2008.

Particular difficulties were encountered with collecting data on farmland features in Romania. Because of the near complete absence of relevant literature, the case study is almost entirely based on expert interviews.

Table 1-1: Case Study Member States and Regions.

<table>
<thead>
<tr>
<th>Case Study Member State</th>
<th>Regional focus</th>
<th>Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>Hvorslev and Sønder Omme</td>
<td>University of Copenhagen (KU)</td>
</tr>
<tr>
<td>France</td>
<td>Basse-Normandie</td>
<td>Solagro</td>
</tr>
<tr>
<td>Germany</td>
<td>Schorfheide-Chorin</td>
<td>Ecologic</td>
</tr>
<tr>
<td>Italy</td>
<td>Veneto - Lagoon of Venice</td>
<td>INEA</td>
</tr>
<tr>
<td>Romania</td>
<td>- -</td>
<td>IEEP</td>
</tr>
<tr>
<td>Spain</td>
<td>Extremadura</td>
<td>IDRISI</td>
</tr>
<tr>
<td>Sweden</td>
<td>Mälaren</td>
<td>IEEP</td>
</tr>
<tr>
<td>UK</td>
<td>North-west (Cumbria)</td>
<td>IEEP</td>
</tr>
</tbody>
</table>

A semi-quantitative approach was taken to the cost assessment of the menu of policy options. This took place in two steps. First, a generic analysis of the type and extent of costs attached to broad policy options was undertaken. Second, the types of costs associated with each policy option were assessed and examples of the costs, as provided by a literature review, outlined. Agri-environment payment rates provided a useful assessment of the overall costs to the farmer as they are calculated on the basis of income foregone and other accompanying additional costs. The approach to the cost assessment is explained further in Annex 3.

This report follows from the Inception Report produced for the kick off meeting in October 2007, the First Interim Report submitted on 1 February 2008, the Second Interim Report submitted on 1 May 2008 and the draft final report submitted on 1 August 2008. The project steering group included representatives of DG Environment and DG Agriculture who met with IEEP on four occasions in order to comment on and guide the work in progress.
2 The EU’s ‘Green Infrastructure’

Europe’s agricultural landscape is highly diverse. It is composed of a range of land uses, cultivated at different levels of intensity, ranging from extensively grazed semi-natural vegetation, to highly intensive arable and permanent crops grown under glass or plastic. Sometimes these are very simple landscapes, comprising vast monocultures of crops, whereas others are fine-grained mosaics - the artefacts of mixed farming systems, with patches of semi-natural vegetation. Some agricultural landscapes are more wooded than others such as many parts of England, where there are only remnants and pockets of woodland in a predominantly open landscape. In most new Member States, extensive swathes of semi-natural vegetation continue to exist, whereas in countries such as the Netherlands, semi-natural vegetation is confined to marginal land and field corners. Part of the diversity of Europe’s agricultural landscape is derived from a variation in the scale of different landscape elements. Different types of land cover form a continuum ranging from a landscape patch or feature to a land use in its own right, depending on its size relative to other types of land cover in the surrounding landscape. It is this diversity and the structural heterogeneity of agricultural landscapes which imbue them with their special character and is valued by society at large.

Farmland features are a critical environmental resource, forming the skeleton of the agricultural landscape or agriculture’s ‘green infrastructure’. They can be defined as spatially identifiable natural, semi-natural or man-made landscape elements. Some are integral to current farming systems, whereas others are relics of traditional systems long abandoned. They are classified in a number of ways, depending on the level of detail at which they are identified. A common classification of features is that developed by Bunce et al. (2005) which has been field tested in all of the major Environmental Zones in Europe (it is known as the BioHab classification system). It covers all habitats in Europe in a consistent manner and was developed to monitor changes in habitats and biodiversity.

Following the classical description of a landscape, the BioHab classification system clusters features in a farmed landscape into three categories:

1. **Point Features**: individual landscape components which cover a small part of the overall landscape, for example, single trees, small clusters of trees, ponds, monuments, windmills, buildings, cairns, tumuli and other archaeological remains.

2. **Linear Features**: landscape components that are linear in nature, for example, hedges, lines of trees, stone walls, terrace walls, banks, streams, ditches, margins and buffer strips, riparian strips, tracks, irrigation networks, drovers’ roads and transhumance routes, fences and paths.

3. **Patch Features**: landscape components covering larger areas, for example, semi-natural grassland, orchards, woodlands, waterbodies, dehesas, montados and large areas of rocky ground.

Farmland features provide a range of environmental benefits and ecosystem services. These include the maintenance of biodiversity through the provision of habitats and food sources and natural resource protection. In some cases they contribute to the mitigation of climate change through carbon sequestration and facilitate adaptation to
climate change by enhancing the resilience of species, whilst also enabling them to disperse in response to changing conditions.

Biodiversity and climate priorities are likely to take centre stage both in discussions about the future of the CAP and more broadly in debates about the focus of EU spending. Agriculture could play a critical role in meeting associated objectives, particularly in terms of reducing greenhouse gas emissions, fossil fuel substitution through bioenergy, and the sequestration of soil carbon. Agriculture’s environmental impact is much broader in scope, however, extending to soil, water and landscape. Soil quality is likely to become a higher priority as new EU policies for the protection of soils are created. The Water Framework Directive (2000/60/EC) is emerging as a strong driver, ensuring that water quality issues are afforded a high priority.

The protection of farmland features can play a central role in achieving these objectives, given their benefits for soil and water quality, for landscape and biodiversity, and for addressing climate change. A wide body of legislation exists to protect farmland features. However, there are some noticeable gaps in implementation and a failure to provide comprehensive protection of environmentally beneficial farmland features in many Member States. In an era of high commodity prices, and accelerated agricultural restructuring, particularly in the new Member States, the pressures on farmland features arising from the dual processes of intensification and abandonment are likely to increase, leading to a reduction in the incidental provision of environmental benefits. If the environmental benefits of farmland features are to be secured in the future, the existing policy and legislative framework needs to be improved to protect them, both in terms of preventing their removal and ensuring appropriate management.

2.1 The Scope of the Study

With these broader policy questions in mind, this section sets out the discriminating characteristics of farmland features.

Farmland features fall under the influence of EU agricultural policy

This study focuses on a subset of features on EU farmland which fall under the, albeit not exclusive, influence of EU agricultural policy. The study is concerned with identifying the threats to farmland features and hence the policy need, before delivering a suite of recommendations for a policy framework and associated options that would be required to preserve the environmental benefits that these features confer.

Unfarmed Features and Farmland Features

The original specification for the study used the term ‘unfarmed features’. In order to dispel any confusion that may arise in referring to those features which retain an agronomic function as unfarmed, we have chosen to refer to the generic features resource as farmland features.

In the context of this study, three discriminators have been used to determine whether a feature falls within the remit of the study. These discriminators afford a fairly inclusive definition of a farmland feature in order to arrive at policy options which are
appropriate for maintaining, protecting and ensuring the appropriate management of a broad sub-set of the EU’s ‘green infrastructure’.

The first discriminator relates to scale. In effect, this study is concerned with point, linear and small patch features. If a patch feature is sufficiently large it is considered a land use in its own right and does not fall within the scope of this study. As such, although semi-natural grassland, such as dehesa or montado are extensive land uses that may cover thousands of hectares and are at times under threat from a loss of management and associated environmental value, they are not considered further because they are a large-scale farmed land use. Common land is often composed of semi-natural grassland and sometimes trees and other smaller scale features. Because of the complexities surrounding its management and the policy challenges raised, common land has been included in the study as an example of a large scale semi-natural patch feature that is under threat of neglect and loss of environmental value.

The second discriminator relates to whether the feature retains an agronomic role, or not. Those features that have lost their original agricultural function, as may be the case with hedges, stone walls, ponds and drovers’ roads, are no longer integral to the farming system and as such, are of interest to the study because they may be at risk of removal, neglect or inappropriate management. The logic for a focus on these features is that whilst features provide environmental benefits and therefore are in need of protection, features that no longer have an agronomic function may be more vulnerable under current market conditions given that they are agronomically superfluous and therefore are at risk of removal.

The third discriminator relates to whether the agronomic function of the feature is about to be lost, or not. Those features where the agronomic function may soon be lost or become an obstacle to agricultural production are of interest because they may be at risk of removal, neglect or inappropriate management. A basic distinction can be made between more intensive and more extensive farming systems:

- In inherently fragile farming systems, there is a strong threat of a feature becoming redundant and losing its agronomic role. Features such as single trees, small clusters of trees, hedgerows, and stone walls, which whilst providing shelter for animals for example, may soon cease to do so in systems that are becoming economically unviable. This group also includes traditional orchards or terraces threatened by a loss of management, and drovers’ roads where the movement of livestock to dispersed pastures is becoming increasingly rare. These features are therefore under threat of neglect and abandonment. In such cases, the challenge is to retain the viability of the associated farming system, retain the function of the associated features and support the continuation of appropriate management, as necessary.
- In more intensive systems, there is a threat of the removal of features, or the degradation of features though neglect or inappropriate management. Features such as single trees, hedgerows and any remaining patches of uncultivated vegetation may be regarded as an obstacle to farming and under threat of removal, inappropriate management or neglect. Fallow land can also be included. Whilst part of the farming system, fallow is associated with a range of environmental values, but may be converted to arable use in order to boost agricultural productivity. In such cases, the challenge is to retain features,
support appropriate management as necessary, and restore or recreate features in the most denuded agricultural landscapes.

Given this framing of the study, features such as archaeological or historical relics, whilst of inherent historical and cultural interest, are not considered further.

Those features that fall within the scope of this study are represented in Figure 2-1. A description of all features that are considered by this study follows in Chapter 3.

Figure 2-1: The Scope of the Study.
3 A Description of Farmland Features

In this section, information is synthesised from the eight case studies, the data analysis and a review of the relevant literature to provide a description of the following twelve features:

- Hedgerows
- Stone walls
- Terraces and terrace walls
- Ditches
- Field margins and buffer strips
- Single trees, lines of trees and small groups of trees
- Small areas of woodland
- Semi-natural patches on farmland
- Traditional orchards
- Fallow
- Common land
- Drovers’ roads

Information is provided on their distribution, the density in which they may be found, and trends in total stock over time, where this information exists. Because of the large volume of information collected for this study, detailed fiches, published separately to this report, are available. Each fiche includes a description of the feature, information on presence and density, where data are available, and an overview of the identified environmental benefits, pressures and legal protection, largely drawing on the eight case studies conducted for this study.

3.1 Hedges and Hedgerows

Hedges are linear elements that consist of mainly wood and scrub species. Management, mainly cutting, mowing or flailing is usually evident and takes place to maintain the hedge’s characteristic shape. In addition to woody species there may be herbs and grasses. Species in a hedge are mostly densely placed together, giving a closed appearance.

Hedgerows are linear elements that consist of several rows of trees with a developed scrub layer. The herb vegetation is associated with wood communities. Fringe vegetation is present and the whole feature has a more or less closed appearance.

Bocage is a term applied to pastoral landscapes with small fields surrounded by hedges, and is typical of North East Atlantic France and Spain, and South West England. Other terms and translations include *Haies* (French), *Siepe* (Italian), *Hegn* (Danish), and *Hecken* or *Knicks* (German).
Chapter 3 A Description of Farmland Features

Figure 3-1: Photos of Hedges, Germany.

Left: Field hedgerow in Saxony (Source: http://www.oekoflaechenmanagement.de)
Right: Walled hedgerow/earth wall (Knick) (Source: http://www.stadt-stade.info/UPLOADS/entwicklg/natur/Wallhecke20.jpg)

Among the case study countries, hedges or hedgerows are present in Denmark, France, Germany, Italy, Romania, Spain and the UK.

- Estimates of average density in Denmark range from 1,991m/100ha to 2,668m/100ha (Brandt et al., 1996). Hedgerows are the most predominant line feature in the Sønder Omme case study area, with an average density of 5.3 km/100 ha, more than double the national average. The Saltum case study area has a lower density of hedges than the other case study areas, with an average of 2.5 km/100 ha, and greater variation between parishes (1-4.1 km/100 ha).
- France has about 608,000 ha of hedgerows, with high concentrations in traditional beef and dairy grazing regions including the Massif Central, the Atlantic west, and mountain valleys. In these areas the density can be as high as 150m/ha, or 10% of the utilised agricultural area (UAA). Hedgerows are the predominant farmland feature of Basse-Normandie, covering 25,000 ha, or 100,000 km.
- In Germany, the average hedgerow density is 22.8m/ha.
- In Italy, the average hedgerow density is 5.8m/ha with a total network of 117,900km. They are found in the highest density in the north.
- In Romania, the highest density of hedgerows is found in Transylvania.
- In Spain, the highest density is found in the north and some upland areas of Central Spain and the Pyrenees.
- In the UK, a total length of 468,000km is distributed throughout all regions, with a higher concentration in western and lowland pastoral areas of England and Wales.

3.2 Stone Walls

A stone wall is a linear element used as a parcel boundary and characterised by stones often covered with grasses and herbs and sometimes with scrub and woody species. Stone walls vary in size, design and construction. Stone walls were usually built as field boundaries or to divide/restrict livestock movement. They are often built with stones removed from fields. In Denmark, a small proportion of dikes (3%) are characterised by walls made of stone.
Figure 3-2: Photos of Stone Walls, Sweden and Italy.

Left: Stone wall in Skövde, Sweden (Source: Esseen et al., 2004).
Right: Stone wall in Italy (Source: Povellato and Trisorio, 2008).

Among the case study countries, stone walls are present in Denmark, France, Romania, Spain, Sweden and the UK. Quantitative evidence is limited, but:

- Stone walls are the most common farmland feature in Sweden. In southern Sweden the density of stone walls is greater than 1km per 100ha.
- In the UK, stone walls occur predominantly in upland areas. Stone walls comprise roughly 10 per cent of field boundaries in England.
- Stone walls are common in France, but no surveys cover their specific location and extent.
- Stone walls are abundant in mountain areas and some areas of southern Italy, mainly Puglia and Basilicata, due the large amounts of stone in the soil.
- In Spain, stone walls are most abundant in upland areas, and are widespread in the livestock areas of the west and north, as well as permanently cropped areas for vines and olives.
- In Romania, stone walls are fairly common in the mosaic landscape of the mountain regions where the traditional patterns of landownership were relatively undisturbed by collectivisation.

3.3 Terraces and Terrace Walls

Terraces are raised, flat-topped banks of earth, created to control erosion and provide flat surfaces for farming on sloping land, and are usually constructed with a retaining dry-stone wall.

Among the case study countries, terraces are present in France, Italy and Spain.

- The region of Liguria has the highest concentration of terraces in Italy (Varotto and Ferrarese, 2008). The total area was estimated to occupy around 30% of the territorial area, and 70% of total farmland. According to Pappalardo (2002), more than 50% of terraced farmland in Liguria is currently abandoned. The total area occupied by terraces in the Veneto case study region amounts to 2,688 ha (0.1% of the regional territory), distributed in small areas mainly in the hills (Varotto, 2007).
- In France, terraces are mainly located in the Mediterranean area and in mountain regions such as Cévennes and Pyrénées. Most terraces have long been abandoned.
In Spain, terraces are widespread in upland areas, where permanent crops (such as olives, vines, almonds, cherries) are cultivated. Some new plantations have earth terraces created with bulldozers, but without retaining walls. These serve a purpose for soil conservation but do not have value for nature conservation.

Figure 3-3: Photos of Terraces, Italy and Spain.

Left: Terraced vineyard in Valtellina (Lombardy, Italy) (Source: Povellato and Trisorio, 2008).
Right: Olive terraces suffering from over-intensive cultivation and soil erosion (Source: Beaufoy, 2008).

3.4 Ditches

Ditches are linear features characterised by a strip of grasses and herbs alongside a waterbody. They normally occur in a straight line. The watercourse has a water guiding function and can also be used as parcel boundary and drinking place for livestock. Trees can be present at the sides. They are man-made and are found alongside roadways or fields for the purpose of drainage. Ditches can also be built specifically for irrigation water drainage in Mediterranean regions. Ditches vary according to depth, width and water flow.

Figure 3-4: Photos of Ditches, Sweden and Germany.

Left: Open ditch, Sweden (Source: Länstyrelsen Örebro Län 2004)
Right: Ditch along pasture, Germany (Source: http://www.afao-soest.nrw.de/includes/images/bilderaufgaben/bilderbodenordnung/bilderverfahren/osternheuwiesengrabenwiese.jpg).
Ditches are found throughout the case study countries, but are particularly a feature of lowland, moorland, and coastal areas.

- In Denmark, Brandt et al. (1996) report a small decrease in the length of wet ditches in the period between 1986 and 1991, but that overall length during the 1980s and 1990s has been maintained. Kristensen and Andersen (2008) report an average of 1,087 m of ditches per 100 ha, rising to a maximum of 7,574 m/100 ha.
- In Italy, the 1998 ISTAT survey collected data on ditches and farm tracks (data on the two are not distinguished), and reports a network of 417,515 km of ditches and farm tracks, with an average of 20.7 m/ha of the total area of the holding.
- In Sweden, a total length of approximately 36,000 km of open ditches are registered under the KULT agri-environment scheme, with a figure of 150,000 km for all arable land in Sweden. The NILS landscape survey estimated the total length of ditches to be approximately 888,000 km. This figure is larger because it includes ditches of all types (including dry ditches), up to six metres wide.
- In Romania, ditches are especially common in the Danube floodplain and Wallachia.

### 3.5 Field Margins and Buffer Strips

Buffer strips and field margins are linear features characterised by a grassy appearance with herbs. They are mainly situated at the boundaries of cropped fields or adjacent to water features. Some are deliberately managed or created to provide conditions which benefit farmland or local area species, and to protect sensitive features such as rivers, wetlands, woodlands or hedgerows from pollution. Buffer strips range from grass to flower-rich habitats depending on local species and conservation focus, and vary in width. Grassy margins may occur together with farm tracks. These margins exist due to traditional land use and the need for access.

**Figure 3-5: Photos of Field Margins, Germany and Spain.**

![Field margin with red poppy](http://www.bfn.de/0313_naturvertraeglich.html)

![Herbaceous field margin reduced to minimum, La Serena SPA, Badajoz](http://Beaufoy, 2008)

Buffer strips and field margins are present in the case study countries of Denmark, France, Germany, Italy, Romania, Spain, Sweden and the UK. There are limited quantitative data.

- In Denmark, estimates suggest that field margins decreased during the 1980s, increased in the early 1990s, and decreased again in the late 1990s. Overall, there
was a small increase in the total length over the two decades. Brandt et al. (1996) report an average of 1,082 m of field margins per 100 ha.

- In France, approximately 423,000 ha of grassy strips have been introduced along rivers since the introduction of the environmental cover requirement in the national implementation of cross compliance. This is the only farmland feature reported to have increased in France over recent years.
- In the UK, cross compliance requirements resulted in a significant increase in the area of buffer strips along watercourses and hedgerows in England over recent years.
- In Spain, in the traditional landscapes of the interior and those with dryland cropping or a small-scale mosaic of parcels, herbaceous field boundaries are traditional elements of the landscape and can be found at quite a high density. In larger-scale landscapes, these features are sparse, and where farming has become more intensive, they may disappear altogether.

3.6 Single Trees, Lines of Trees and Small Groups of Trees

Solitary trees stand alone, and small groups of trees stand in a cluster of several trees. Lines of trees consist of one row of trees with, in most cases, an undergrowth of herbs and grasses. The trees are normally at a fixed distance from each other. The row can have an open to a more closed linear appearance. Lines of trees can be found along field boundaries, in field margins or buffer strips, as shelter belts, and along roads or avenues. A distinction is made with trees that may be found in hedgerows.

A number of the case studies make some further distinctions. In Sweden, ‘Avenue’ trees are defined as parallel lines of at least five trees. ‘Veteran trees’ describe very old, often species rich trees in the UK, a term also used in Italy (Alberi monumentali). In Italy, Macchie di campo, or woodland patches, may be defined as a few trees and/or tall shrubs irregularly placed on agricultural parcels.

Figure 3-6: Photos of Trees, Sweden and France.

Lines of trees, single trees, and small cluster of trees are present in all of the case study countries. There are some quantitative data:

- In Denmark, Brandt et al. (2006) found an average of 0.6 solitary trees per 100 ha. Kristensen and Andersen (2008) report up to eighty trees per 100 ha in central Denmark. Small groups of trees increased in number during the 1990s (Brandt
1996, Primdahl 1999, Kristensen 2003, Kristensen et al., 2004), largely in response to the availability of subsidies, but also, in part, due to some abandonment of poorer quality agricultural land and the activity of hobby farmers to whom changes in land management are less dependent on the availability of subsidies (Kristensen, 2003).

- In France, most in-field trees are located in grasslands around central and southern France; little data are available on tree lines or rows. IFN reported a decrease of 33,000 km in tree row length between 1975 and 1987. The more recent TERUTI survey reports a decline in in-field, solitary trees, at a rate 11,000 ha/year.

- In Italy, lines of trees and hedgerows are considered the main elements of the rural landscape. A progressive and continuous decline in the incidence of these features is reported (Genghini and Bonaviri, 2005).

- In Romania, lines of trees are fairly common across the country. Single trees are not particularly common but can be found on both traditionally managed meadows and the more intensive arable farmland.

- In Sweden, rows, lines, or avenues are not common, but are present throughout the country. Solitary trees are most common in the north and south east of Sweden, whilst in other areas, the incidence is less than one tree per 100 ha.

- In the UK, lines of trees are most common in upland or other exposed areas such as coastal areas, and usually occur in locations where shelter is needed, often around farmsteads or lambing fields. The Countryside Survey (2000) estimated that in 1998, England, Wales and Scotland had around 78,000 km of lines of trees associated with hedgerows, and that between 1990 and 1998 the length of lines of trees associated with hedgerows increased by 24,910 km, much of it arising from the degeneration of remnant hedges into lines of trees. The Forestry Commission estimated that in 2000 there were more than 77.5 million live trees occurring in a total of 1.6 million narrow linear features.

### 3.7 Small Areas of Woodland

Small areas of woodland on farms are characterised by the presence of plants from wood communities, woody species and a non linear appearance. Distinctive elements include a tree layer, a scrub layer and a herb layer. They can take a number of forms, from ancient native woodland, with extremely rich associated communities of flora and fauna, to new plantations of non-native species which support comparatively few native species.

**Figure 3-7: Photo of a Small Group of Trees, France.**

Small pockets of woodland are reported as a common feature in the case studies for Denmark, France, Germany, Italy, Romania and the UK. There are some data for these countries.

- In Denmark, a national average of 0.68 ha of woodlots per 100 ha is reported (Brandt et al., 1996), with the highest abundance in the hilly areas and sandy soils of Djursland, where there is an average of 2.54 ha of woodlots per 100 ha. Woodlots are on average 0.3 ha in size (Brandt et al., 1996).
- In France, small woodlands cover only 3.6 per cent of the total wooded area and are located mainly in the West and the South. The IFN survey reports an increase in abundance of 0.3 per cent between 1990 and 2002, but the TERUTI survey reports a decrease of one per cent, between 1992 and 2003.
- In Italy, there is a total of about 14,600 ha of small woodland patches on farms (1998). They are found in the highest frequency in northern and central Italy (9-10 ha/1000 ha), and the lowest in Southern Italy (4 ha/1000 ha). A high frequency is found on small farms, and a relatively low frequency on medium-large farms. A study in the Emilia Romagna plain shows that the abundance of small woodland or woodland patches has increased over the last fifty years (Genghini and Bonaviri, 2005).
- In the UK, 476,400 ha of farm woodland were reported in 1997, nearly half of which, 251,200 ha, is found in England. Woodland is also more common in the uplands, covering roughly 15 per cent of the land area compared to 10 per cent in the lowlands. Forestry Commission figures estimate a 27 per cent increase in UK farm woodland between 1997 and 2006.
- In Romania, woodland patches are fairly common in the south and east, where land is intensively farmed and there are few large swathes of trees remaining.

3.8 Semi-natural Patches

The term ‘patches of semi-natural land' is used to capture those features on a holding that are not utilised for agricultural production. These features range from very small field corners to areas of semi-natural habitats such as marsh or other types of wetland. Areas difficult to access or cultivated are included e.g. boggy/wet ground, uneven/rocky terrain or patches.

It includes cairns and stone heaps, which in some countries can have a religious or cultural meaning, but they also can be the product of remnant stones, heaped together by the farmer where there was no need or tradition for building stone walls. For example, in Sweden, two types of unutilised farmland are distinguished: ‘clearance cairns’, collections of stones removed from fields to facilitate agricultural activities; and ‘field islets’, non-arable outcrops in arable fields, often with trees and other vegetation. Such features are also common in Estonia.

The non-specific and varied nature of unutilised land on farmland means that data on the abundance or status of this feature is not available or reliable. All case study countries contain interpretations of this feature, and distribution is widespread, although they are probably more common in less intensively farmed or marginal (i.e. wet or steep) agricultural areas where holdings are more likely to have areas that are difficult to reach or are unproductive. In Sweden, clearance cairns occur mainly in the highlands where there is a good supply of stone. Field islets exist nationwide, but are relatively rare in the north and south. They occur in the highest density on the south
east highlands of the Småland region. There are approximately 45,000 registered units under the KULT scheme; however the actual number is estimated to be 158,000 units on arable land (Jordbruksverket, 2006a). Field islets are among the landscape elements which are the most frequently mismanaged (Jordbruksverket, 2006a).

In this study, we have not attempted to consider abandoned land, as this is considered a separate land use, rather than a farmland feature.

**Figure 3-8: Photos of Uncultivated Semi-Natural Patches, Sweden.**

Left: Field clearance cairn (Source: Länsstyrelsen Blekinge Län 2007).  
Right: Field islet (Source: änsstyrelsen Örebro Län, 2004).

### 3.9 Traditional Orchards

Traditional orchards are characterised by widely-spaced standard fruit trees of old and often scarce varieties planted at less than 150 trees per hectare. They are a distinctive feature of the local landscape in which they occur and contain rare fruit varieties. Traditional orchards may consist of apple (for fruit or cider), pear (for fruit or perry), cherry, plum, damson trees, cob nut, hazelnuts, walnuts, chestnuts, figs, peaches, lemons, oranges, almonds and olives. They are characterised by low intensity management, by tree varieties that are likely to be unique to or have a long association with the area in which the orchard is located and may not be solely managed for fruit production (i.e. a system of agroforestry which combines fruit production with livestock grazing or undercropping). Intensively managed dwarf or bush trees in closely packed plantations are not considered to be traditional orchards.

Data collated by Natural England (2008) from a range of European sources provide an estimate of the area covered by traditional orchards in a number of Member States (Table 3-1). The geographical distribution of fruit orchards varies significantly in Europe according to climatic conditions and the fruit crop in question. In general, crops such as apples and pears are located in more temperate climates, whilst crops suited to drier conditions such as olives or lemon and orange groves are located in the Mediterranean regions.

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2 This is follows a definition provided by Defra in relation to eligibility for agri-environment schemes (see: [http://www.defra.gov.uk/erdp/schemes/hls/handbook/appendix1-c-orchards.htm](http://www.defra.gov.uk/erdp/schemes/hls/handbook/appendix1-c-orchards.htm)).
Figure 3-9: Photo of Traditional Orchard, England; and Abandoned Olive Grove, Spain.

Left: Traditional Orchard, Devon, England (Credit: J Bartley).
Right: Abandoned olive grove, high fire risk and reduced biodiversity, Obejo, Córdoba, Spain (Source: Beaufoy, 2008).

The main regions in France for traditional apple and pear orchards are Normandy, Sarthe and Mayenne. Plum orchards are located in Lorraine and Alsace, traditional walnut trees are mainly located in the Southwest, whilst olive trees and chestnut trees are mainly found in the Mediterranean area.

Table 3-1: Estimated Extent of Traditional Orchards in Europe.

<table>
<thead>
<tr>
<th>Country</th>
<th>Estimated area of traditional orchard (ha)</th>
<th>% of agricultural area</th>
<th>Date of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>225,000-500,000</td>
<td>1.3-2.9</td>
<td>1995/1997</td>
</tr>
<tr>
<td>Poland</td>
<td>198,770</td>
<td>1.1</td>
<td>1996</td>
</tr>
<tr>
<td>France</td>
<td>186,282 / 145,957</td>
<td>0.6 / 0.5</td>
<td>1996 / 2002</td>
</tr>
<tr>
<td>Romania</td>
<td>180,005</td>
<td>1.22</td>
<td>1996</td>
</tr>
<tr>
<td>Croatia</td>
<td>64,456</td>
<td>2.14</td>
<td>1996</td>
</tr>
<tr>
<td>Switzerland</td>
<td>41,912</td>
<td>3.9</td>
<td>1979/1985</td>
</tr>
<tr>
<td>Spain</td>
<td>35,627</td>
<td>5.4</td>
<td>1998</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>25,350</td>
<td>0.15</td>
<td>2002/2006</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>9,277</td>
<td>0.26</td>
<td>1995</td>
</tr>
<tr>
<td>Austria</td>
<td>8,564</td>
<td>0.25</td>
<td>1993</td>
</tr>
<tr>
<td>Belgium</td>
<td>676</td>
<td>0.05</td>
<td>1996</td>
</tr>
<tr>
<td>Luxemburg</td>
<td>92</td>
<td>0.04</td>
<td>1997</td>
</tr>
<tr>
<td>Finland</td>
<td>20-30</td>
<td>&lt; 0.01</td>
<td>1997</td>
</tr>
</tbody>
</table>


Notes:
- Only orchards in the temperate zone of Europe are included;
- Absence of a country from table is because no data were available. Absence does not imply that the country has no traditional orchards;
- The definition of ‘traditional’ is taken to be low intensity (extensive) management with large well-spaced trees, contrasting with intensive orchards with densely planted, dwarf trees managed by high inputs of agro-chemicals.

In the UK cider apple orchards are predominantly located in the southwest (Devon and Somerset) and in the English counties located close to the border with Wales.
(including Herefordshire and Worcestershire). Production of eating apples, pears and other fruits is primarily located in the South East (Kent, Sussex, Suffolk) and the Vale of Evesham (Worcestershire).

In Germany traditional orchards cover approximately 200,000-500,000 hectares and are predominantly located in the South and Mid-German Länder\(^3\) including Hessen, Baden-Württemberg, Saarland, and Bavaria. German fruit production is dominated by apples with numerous local varieties. Pears are common, particularly in the south, where cherries, damson plums, and peaches are also grown in certain areas. Apricots are also grown in Sachsen Anhalt and South Brandenburg (Keech, 2002).

In Spain intensive olive production is widespread (2.5 million hectares nationally) but the occurrence of traditional olive groves, where a semi-natural understorey is grazed or cut in late spring, is limited to certain locations, such as parts of the west of Caceres (Valencia de Alcántara) and north of Córdoba (Obejo). Almond trees are quite widespread (578,717 hectares) with some of these occurring on plantations in traditional dryland mosaic systems. Other production types includes hazelnuts, walnuts, and traditional chestnut plantations, which occur in the mixed farming/woodland landscape in the north of Caceres, León, Cantabria, and some upland areas of Andalucía. Traditional apple and pear orchards account for a small proportion of production (maximum of 10,000 hectares out of a total of 57,000 hectares of apples in 1990) and are located primarily in Asturias.

The majority of Europe’s traditional orchards have undergone long-term declines in area as well as in active management, with implications for environmental condition. According to data summarised by Natural England (2008), there has been a decline in orchard area in England of 63% since 1950. Recent losses of traditional orchards took place in the counties of Kent (1.8% net loss per year, 1999-2003) and Gloucestershire (1.2% net loss per year, 1999-2004). Around 35% of the total area of traditional orchards in southern Germany were lost between 1957 and 1982. Around 60% of orchards in France were lost between 1929 and 1998. Pointereau and Coulon (2005) report a loss of traditional orchard area in France of 44% between 1982 and 2002, and average annual declines of three per cent in the number of traditional fruit trees in Calvados and Manche were reported between 1980 and 2003.

### 3.10 Fallow

The European Environment Agency\(^4\) defines fallow land as:

> ‘Arable land not under rotation that is set at rest for a period of time ranging from one to five years before it is cultivated again, or land usually under permanent crops, meadows or pastures, which is not being used for that purpose for a period of at least one year. Arable land which is normally used for the cultivation of temporary crops but which is temporarily used for grazing is included.’

The abundance and distribution of fallow land has been inextricably linked to set-aside, at least in relation to arable fallow, since the introduction of compulsory set-

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\(^3\) [http://www.nabu.de/imperia/md/content/nabude/streuobst/59.pdf](http://www.nabu.de/imperia/md/content/nabude/streuobst/59.pdf)

aside in 1992. The area of land left as fallow can be expected to decrease sharply across all Member States with the setting of a zero per cent target for 2008 and the anticipated abolition of compulsory set-aside in the CAP Health Check.

The amount of set-aside varies significantly across the EU. As shown by Table 3-2 in 2006/7, France, Germany and Spain had the largest areas of land formally registered as set-aside – 1.1 million ha, 0.78 million ha and 0.67 million ha respectively – reflecting their large agricultural areas. The UK had the fourth largest share at 352,000 ha followed by Italy (238,000 ha) and Denmark (151,000 ha) (IEEP, 2008d). In 2000, the breakdown of rotational and non-rotational set-aside in the EU was estimated to be 48% rotational and 52% non-rotational but with ‘sharp national and regional variations’ (Oréade-Brèche, 2002). Whether set-aside is rotational or non-rotational is an important determinant of its environmental benefits. For example, the biodiversity benefits of land under long term set-aside will be greater than that set-aside only for a period of a few years.

Not all set-side can be classified as fallow. For example, non-food crops and industrial crops used for biomass could be grown on set-aside prior to its suspension (zero rate) in 2008. In addition, permitted set-aside practices such as the spraying off of all plant material (targeted at common weeds) limit the associated environmental benefits when compared with traditional fallow management where semi-natural vegetation is retained and fallow is a part of the crop rotation.

Table 3-2: Areas of Land Under Set-aside and Industrial Crops in 2006/7 Marketing Year.

<table>
<thead>
<tr>
<th>Member State</th>
<th>UAA (Ha)</th>
<th>Set-aside Area (Ha)</th>
<th>Set-aside as % of UAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>3,266,240</td>
<td>81,000</td>
<td>2.5</td>
</tr>
<tr>
<td>BE/LU</td>
<td>1,385,580</td>
<td>35,000</td>
<td>2.5</td>
</tr>
<tr>
<td>DE</td>
<td>17,035,220</td>
<td>784,000</td>
<td>4.6</td>
</tr>
<tr>
<td>DK</td>
<td>2,707,690</td>
<td>151,000</td>
<td>5.6</td>
</tr>
<tr>
<td>EL</td>
<td>3,983,790</td>
<td>15,000</td>
<td>0.38</td>
</tr>
<tr>
<td>ES</td>
<td>24,855,130</td>
<td>675,000</td>
<td>2.7</td>
</tr>
<tr>
<td>FI</td>
<td>2,263,560</td>
<td>114,000</td>
<td>5</td>
</tr>
<tr>
<td>FR</td>
<td>27,590,940</td>
<td>1,100,000</td>
<td>4</td>
</tr>
<tr>
<td>IE</td>
<td>4,219,380</td>
<td>26,000</td>
<td>0.6</td>
</tr>
<tr>
<td>IT</td>
<td>12,707,850</td>
<td>238,000</td>
<td>1.9</td>
</tr>
<tr>
<td>NL</td>
<td>1,958,060</td>
<td>21,000</td>
<td>1.1</td>
</tr>
<tr>
<td>PT</td>
<td>3,679,590</td>
<td>33,000</td>
<td>0.9</td>
</tr>
<tr>
<td>SE</td>
<td>3,192,450</td>
<td>103,000</td>
<td>3.2</td>
</tr>
<tr>
<td>UK</td>
<td>15,956,960</td>
<td>352,000</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Source: Eurostat Cereals Balance Sheet Marketing Year 2006/7.

The following regional variations in the area of fallow are described in the case studies. In France fallows are mainly located in the principal crop production regions such as Centre (169,000 ha in 2003), Midi-Pyrénées (120,000 ha), Poitou-Charentes (91,000 ha), Aquitaine (89,000 ha) and Pays de Loire (74,000 ha). In Spain most non-irrigated arable cropping takes place on land that, in a European context, is of relatively low productivity. Where there is a severe lack of precipitation, it is normal practice to leave part of the land fallow for a period of between one and three years.
for the soil to recover. The proportion of land left fallow varies according to the physical conditions of the area in question, but in more extreme conditions it may as much as 75 per cent. Thus in any year, a considerable area of Spain’s arable land is in fallow. In 2005, approximately 7.3 million hectares of non-irrigated land was under arable crops, whilst approximately three million hectares of arable land was under fallow or otherwise not in use.

In the UK, the Defra Agriculture June Census data shows that the area of bare fallow was 164,000 ha in 2005, 197,000 ha in 2006 and 165,000 ha in 2007, while set-aside showed a steady decline from 535,000 ha in 2005, to 466,000 ha in 2006 and 440,000 ha in 2007 (Defra, 2008a). It is most concentrated in the primarily arable areas of the East and South East. In Sweden the area of fallow land has increased across the country since Sweden joined the EU in 1995. In 2006, fallow land corresponded to 306,900 hectares or about 12 per cent of agricultural land. In 2006, 49 per cent of fallow land was short term set-aside (1-3 years), half of which was one-year set-aside. Much of the fallow land which was voluntarily set-aside is being brought back into production. Between 2007 and 2008, the area of fallow land in Sweden decreased by about 50 per cent, according to the Swedish Board of Agriculture (Herodes, 2008).

3.11 Common Land

Common land can be defined as land ‘owned by an identified group of people [or an individual], which has the right to exclude non-owners and the duty to maintain the property through constraints placed on use’ (Folke et al., 1995). However, many different arrangements exist in Europe with regard to common rights and land tenure.

It is estimated that only nine per cent of the land area of Western Europe is now managed through common property rights. Owing to the widespread privatisation and enclosure of common land across Europe between the 17th and 19th centuries, common land is now far less widespread than it once was in Europe. For example common land used to account for half of the land area of England and Scotland, but now accounts for only four per cent and seven per cent respectively (Defra, 2008b and Brown, 2006). In the 20th century large areas of previously common land were lost in Communist Eastern Europe with the creation of vast collective and state farms which in some countries absorbed the majority of agricultural land. For example, it is thought that 77 per cent of Romania’s arable land was on such farms when collectivisation was declared complete in 1962.

European countries that have large areas of common land include the UK, Norway, Sweden, France, Italy, Spain, Portugal, Greece, Slovakia and Romania (Brown, 2002). The Navarra region of northern Spain has 490,000 ha of common land, primarily grassland and forest used for grazing as well as firewood and plant collection (Berge et al., 2003). Forest commons have existed in Sweden since pre-medieval times, and nearly a quarter of the forest in Slovakia is under common ownership. Slovakia has 470,900 ha of forest under common ownership (Sulek, 2006). Greece has 4 million ha of common land, mostly semi-natural pasture (Poux et al., 2006) and 83% of pasture is state owned or communal (Bunce et al., 2001). Baldios are common heathlands in northern Portugal and are used for the common grazing of goats and sheep (Cultbase, 2008).
Areas of common land around Europe differ in terms of: the types of common property rights; administrative structures (e.g. commons councils (England) and Land Associations (Slovakia)); the main habitat types (e.g. grass and heathland in the UK, forestry in Norway); and in terms of the use and level of use taking place. As a result of the diversity of common land across Europe, data on its abundance and distribution are lacking.

3.12 Drovers’ Roads

A drove road is a route used to seasonally transfer animals between grazing sites in different geographic and/or climatic zones. Terminology differs throughout Europe. For example, they are called Cañadas Reales in Spain and green lanes in the UK. Drover roads are associated with transhumance systems and are therefore sometimes termed transhumance routes. These are extensive animal systems based on livestock displacement (Bunce et al., 2004), and are founded on the need to reach pastures and forage resources. These systems are most clearly associated with mountain landscapes.

Figure 3-10: Photo of Cañada Real Soriana Occidental, in Segovia Spain.


The use of drovers’ roads still exists in many parts of Europe, many as a result of transhumance systems. Whilst particularly good evidence is available for Spain, transhumance routes are also known to exist in parts of Austria, France, Germany, Greece, Italy, Spain and Romania. In contrast, transhumance systems and hence the continued use of drovers’ roads have declined in Slovakia and Poland due to the decrease in livestock numbers since 1989 under Soviet agriculture, meaning many mountain pastures are not used or abandoned (Gonda et al., 2004). The use of drove roads ended much earlier in the UK, in the 1860s, and has declined dramatically elsewhere in part due to the development of road and rail transport, but also due to pervasive agricultural restructuring processes such as the gradual regional concentration and specialisation of production. These processes are characterised, for example, by the fencing in of open grazings, the extension of property rights over large areas of open land by large landowners and the introduction of improved rotations for hay, clover and fodder crops enabling cattle to be summered on farm (Jones and Wmfffre, 2004). Where drove roads are no longer used by livestock, the remnants may remain as metalled roads or be gravelled for recreational use.
In Spain, the principal drovers’ roads are Cañadas Reales (Beaufoy, 2008). These are major landscape features, with an official width of 75.22 metres, running for hundreds of kilometres across the country. They are estimated to cover 125,000 km and 425,000 ha of land in Spain. In addition to the Cañadas Reales, at regional and local levels, there is a network of smaller drovers’ roads (e.g. cordeles, veredas). The network remains relatively strong in Spain and 800,000 sheep are still driven along these routes in seasonal migrations (Casas, 2004). After decades of neglect and decline, most regions have taken steps to identify, mark and protect the remaining drovers’ roads. Projects to encourage new uses, especially walking and cycling, have been developed. The movement of livestock is still common, but continues to decline.
Chapter 4 The Pilot Inventory of Farmland Features

The Dutch research institute, Alterra, was commissioned as part of this project, to identify, obtain and analyse those datasets that include information on the distribution, density and diversity of farmland features. As yet, there is no common database from which it is possible to describe and quantify the distribution, density and diversity of farmland features in Europe. Where data does exist, there is a lack of information on the condition of farmland features. The work completed by Alterra therefore assumed the character of an initial exploration, with the collation and analysis of the available data amounting to a pilot inventory of farmland features, rather than a definitive account of the distribution and abundance of features.

This section includes the main results of this work and the report produced by Alterra is published as a separate report (Jongman and Bunce, 2008). The work conducted for this project draws on the best available data as provided by six national surveys. The analysis of these datasets was supplemented by 42 field visits to selected sites in France, Netherlands, Spain, Sweden and the UK in order to develop an inventory of the farmland features that are characteristic of different parts of Europe.

Robust data on the presence and condition of farmland features are crucial to the realisation of overarching policy objectives. Data of this sort can inform strategic land use decisions at the landscape scale, with trend data allowing policy makers to take pre-emptive action before the stock of farmland features declines to a level where the environmental consequences would be intolerable. Two approaches to addressing the current data gap are presented in Chapter 4.3.

4.1 Key Results from National Databases

4.1.1 Methodology

Alterra identified datasets for each of the main Environmental Zones in Europe. Given that datasets are not available for each country, a broader scale approach was taken, founded on the principle that the features common to each Environmental Zone could be identified, and to the extent permitted by the available data, quantified. Most of the results are therefore presented by Environmental Zone.

The Environmental Zones, as shown in Figure 4-1, divide Europe into areas according to their principal environmental characteristics, whereby the variation in environmental conditions according to latitude, altitude and climate bears some influence on the type of farming system and hence on the associated farmland features present. As such, certain features are typical of different environmental zones, although the presence of many features will also be highly influenced by cultural and socio-economic factors. This means that the features identified here are unlikely to occur at the same incidence throughout the entire Environmental Zone. The figures presented therefore provide an indication of the type and density of farmland features in certain areas rather than an absolute representation of the total stock of features within a Member State or Environmental Zone. There are further limitations to the available data, as described in the following section.
For this study, eight databases were assessed by Alterra for their treatment of farmland features (see Table 4-1). The data stem from habitat surveys of varying levels of detail - in terms of the features actually recorded, the way in which farmland features are recorded (for example, different surveys define features in different ways), and in terms of the scale of and approach to sampling. The data are based on in-field habitat surveys of randomly selected ‘squares’ (normally 1 km x 1 km in size, but some are larger) distributed throughout the country in question. Sample sizes vary, as does the frequency of data collection.

Six of the eight examined datasets could be used for this study\(^5\). Four of these are based on the data provided by substantial national habitat surveys (Countryside

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\(^5\) One dataset, the ‘Picos de Europa Inventory’ (Spain) was considered inappropriate since it is based on student projects that do not use a representative sample. The Small Biotopes Survey (Denmark) is suitable for this study, but the data was corrupted during the course of this study and therefore could not be used. Other datasets not known to Alterra may exist.
Survey in the UK, NILS in Sweden, SINUS in Austria and SISPARES in Spain), and draw on large samples of at least 200 sample squares, and are conducted at regular intervals, albeit at not the same frequency. Two of the examined datasets are based on smaller scale project based surveys, and both draw on smaller samples.

Table 4-1: Databases Used for the Analysis of Farmland Features.

<table>
<thead>
<tr>
<th>Data source (environmental zones covered)</th>
<th>Description</th>
<th>Dataholder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Countryside Survey (CSS-GB) (Atlantic North and Atlantic Central)</td>
<td>Covers GB. The CSS is based on 569 km squares in 1998, 264 in 1984 and 1990.</td>
<td>CEH-UK.</td>
</tr>
<tr>
<td>NILS database (Alpine North, Boreal and Nemoral)</td>
<td>A combined inventory of infrared photograph interpretation and field data collection. In the years 2003-2007 the NILS project has collected information from 631 squares, each of which is 5x5 km in size. The project has used a stratified random sampling system for the field and aerial photographic research. A differentiation is made between point elements, linear features and edges (the border between different matrix elements). However, no differentiation has been made between these elements within agricultural land, forests and natural land.</td>
<td>SLU-Umea, Sweden.</td>
</tr>
<tr>
<td>SINUS (Alpine South, Continental and Pannonian)</td>
<td>Stratified random sample of 131 km squares in Austria conducted in 1996 and analysed with the help of aerial photographs and field data. Two follow up projects in 2002 (IN database) and 2005 (OM database), expanding the sample to about 200 units. 167 squares were identified as including the presence of farmland, and as such have been used for analysis in this study.</td>
<td>University of Vienna/ Umweltbundesamt, Austria.</td>
</tr>
<tr>
<td>SISPARES (Mediterranean North, Mediterranean South, Mediterranean Mountains and Alpine South)</td>
<td>Monitoring project of forest and land cover change in Spain based on stratified random sample of 215 squares of 4x4 km. Data on linear features are generally not available as the focus of SISPARES was not on these elements, but on land cover.</td>
<td>UPM Madrid, INIA, Spain.</td>
</tr>
<tr>
<td>Steekproef Landschap (Atlantic Central)</td>
<td>Monitoring project on changes in a number of landscape features in the Netherlands based on a stratified random sample of 72 squares. Data have been collected for the years 1990, 1996 and 2003. In 2003 field research was carried out, while the two other years have been analysed through topographic maps (1: 10,000).</td>
<td>Alterra, the Netherlands.</td>
</tr>
<tr>
<td>Alterra project database linked with KVL (Atlantic Central, Atlantic North)</td>
<td>Various sites in northern European Atlantic landscapes. Covers 5x1 km squares in Søndr Omme (DK), Groningen (NL) and the Lake District (GB) for the years 1999-2001. Includes detailed geographical information, vegetation squares and management information.</td>
<td>Alterra the Netherlands; and KU Denmark.</td>
</tr>
</tbody>
</table>

Source: Jongman and Bunce, 2008.

Data Limitations

Much of the necessary detail that is required to quantify the distribution and density of farmland features, and to understand their condition, is not available from the existing data, for a number of reasons.

The key issues with respect to the available data are a lack of comparability between countries. First, there is, as yet, no common methodological approach to surveying farmland features. Most of the surveys were not expressly designed to collect information on farmland features, with the focus more often on larger scale habitats. The available surveys therefore differ in terms of their treatment of farmland features, for example, with respect to the minimum size thresholds which determine whether a feature should be included or not.
Second, the year of data collection differs between surveys, further limiting the comparability of the results of surveys. In particular, there are no recent data for farmland features following the last reform of the CAP in 2003. In addition, field surveying has taken place at irregular intervals. The most recently available data date from the late 1990s in most cases, meaning the evidence base for policy making is now rather outdated. The units of data collection and presentation differ between surveys, with some projects using areal figures (for example, ha/km²), even for linear features, whilst others express the total stock of features in terms of length (m/ha), thus limiting comparability.

Sampling techniques are, however, relatively consistent between surveys. The surveys do not collect information on the condition of farmland features, but rather focus on presence. Data on management, and thereby condition, are particularly important for understanding whether abandonment has taken place. Finally, explanations regarding causality, in those cases where the stock of features is recorded to have increased or declined, are often absent.

4.1.2 Results

The results are presented below for each of the six analysed surveys.

NILS (Sweden)

Dominant features are ditches, farm roads, and to a lesser extent lines of trees (see Table 4-2). Most farmland in Sweden is located in the southern part of the country, and hence the density of farmland features is highest here (for example, there are 287 m/km² of field borders in the Nemoral zone and 50 m/km² in the Boreal zone) (Glimskär et al., 2007b).

Table 4-2: Farmland Features Across all Swedish Farmland According to the NILS Inventory.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Total length (km)</th>
<th>Average length (m)/ha agricultural land</th>
<th>Mean variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm roads</td>
<td>36,849</td>
<td>14.0</td>
<td>19.2</td>
</tr>
<tr>
<td>Stonewalls</td>
<td>7,094</td>
<td>2.7</td>
<td>77.3</td>
</tr>
<tr>
<td>Stone cairns</td>
<td>83</td>
<td>0.1</td>
<td>107.7</td>
</tr>
<tr>
<td>Vegetation strips</td>
<td>12,724</td>
<td>4.8</td>
<td>29.2</td>
</tr>
<tr>
<td>Earth walls</td>
<td>2,448</td>
<td>0.9</td>
<td>78.0</td>
</tr>
<tr>
<td>Ditches</td>
<td>92,839</td>
<td>35.3</td>
<td>10.2</td>
</tr>
<tr>
<td>Streams</td>
<td>6,857</td>
<td>2.6</td>
<td>44.8</td>
</tr>
<tr>
<td>Tree lines</td>
<td>20,780</td>
<td>7.9</td>
<td>28.0</td>
</tr>
<tr>
<td>Hedges</td>
<td>8,289</td>
<td>3.2</td>
<td>23.5</td>
</tr>
<tr>
<td>Alleys</td>
<td>4,710</td>
<td>1.8</td>
<td>34.0</td>
</tr>
</tbody>
</table>

NB Mean Variance is the average variation on both sides of the average length
Source: Jongman and Bunce, 2008; based on Glimskär et al., 2007b.
**SINUS (Austria)**

The features included in the 1996 SINUS survey, the 2002 IN survey and the 2005 OM survey are avenues, solitary trees (old/young), field scrub, field bank, rivers, ditches, hedges and standing water. The IN and OM surveys are based on the SINUS sample and hence can be used for comparison. The available data are summarised in Table 4-3, and show the total density of farmland features at three time intervals for three environmental zones and for Austria as a whole.

**Table 4-3: Density and Trends in Farmland Features in Three Environmental Zones in Austria.**

<table>
<thead>
<tr>
<th></th>
<th>Agricultural use (ha/km²)</th>
<th>Farmland features (ha/km²)</th>
<th>Non agricultural use (ha/km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Austria</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>61.53</td>
<td>3.20</td>
<td>35.31</td>
</tr>
<tr>
<td>2002</td>
<td>66.75</td>
<td>3.71</td>
<td>29.69</td>
</tr>
<tr>
<td>2005</td>
<td>62.60</td>
<td>3.70</td>
<td>34.50</td>
</tr>
<tr>
<td><strong>Alpine-south</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>54.27</td>
<td>3.14</td>
<td>42.73</td>
</tr>
<tr>
<td>2002</td>
<td>60.53</td>
<td>3.37</td>
<td>36.09</td>
</tr>
<tr>
<td>2005</td>
<td>59.36</td>
<td>2.74</td>
<td>37.89</td>
</tr>
<tr>
<td><strong>Continental</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>62.65</td>
<td>3.20</td>
<td>34.20</td>
</tr>
<tr>
<td>2002</td>
<td>66.73</td>
<td>3.81</td>
<td>29.45</td>
</tr>
<tr>
<td>2005</td>
<td>67.34</td>
<td>3.22</td>
<td>29.45</td>
</tr>
<tr>
<td><strong>Pannonian</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>69.27</td>
<td>3.35</td>
<td>27.38</td>
</tr>
<tr>
<td>2002</td>
<td>73.44</td>
<td>3.76</td>
<td>22.81</td>
</tr>
<tr>
<td>2005</td>
<td>32.26</td>
<td>2.82</td>
<td>64.93</td>
</tr>
</tbody>
</table>

Source: Jongman and Bunce, 2008; based on SINUS data, IN 2002 project and the OM 2005 project.

There was a relative increase in the density of features in the Alpine region between 1996 and 2002, based on the results from 13 sample squares, followed by a decline in density between 2002 and 2005. The change is mainly accounted for by an increase in scrub vegetation and young solitary trees. For the Continental region, 100 squares are available from the 1996 project and 15 squares from the 2002 project. A small increase in features was observed between 1996 and 2002, but data from the 2005 project, based on a sample of 16 squares, suggests that the density of features then declined. Although field banks were relatively untouched, the density of trees and water courses declined. The most significant changes take place in the Pannonian region, where the subsample is the smallest. The 1996 project used 25 squares here, while the 2002 project had 12 which could be used for comparison, and 5 squares in the 2005 sample. This is a flat region that is easily accessible and where land structure and use can be altered relatively easily. Hedges, ditches and vegetation strips decreased in abundance between 1996 and 2005. Because of the small sample size it is inappropriate to draw further conclusions.
**SISPARES (Spain)**

Within the SISPARES project relevant data have been collected on solitary trees and linear vegetation (which groups together tree lines and hedges). A comparison has been made between the years 1956, 1984 and 1998 (Table 4-4). The analysis for the first two years was conducted through photo interpretation, whilst in 1998, field research was also carried out.

**Table 4-4: Density of Trees and Linear Vegetation in Four Environmental Zones in Spain.**

<table>
<thead>
<tr>
<th>Environmental Zone</th>
<th>Sample Size</th>
<th>Trees (number/ha)</th>
<th>Linear vegetation (m/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpine South</td>
<td>66</td>
<td>0.59</td>
<td>0.15</td>
</tr>
<tr>
<td>Mediterranean mountains</td>
<td>36</td>
<td>0.20</td>
<td>0.30</td>
</tr>
<tr>
<td>Mediterranean North</td>
<td>51</td>
<td>0.80</td>
<td>2.00</td>
</tr>
<tr>
<td>Mediterranean South</td>
<td>288</td>
<td>0.57</td>
<td>0.33</td>
</tr>
</tbody>
</table>


The recorded trends vary between different environmental zones. In the Alpine region, the number of solitary trees declined, whilst elsewhere the number of trees increased. The area of linear vegetation increased between 1984 and 1998 in the Alpine South and Mediterranean South zones, but declined in the Mediterranean Mountains and Mediterranean North zones. The declines in linear vegetation have been attributed to the intensification of farming activity, the abandonment of pastures that are difficult to access and the increase of housing development.

**Steekproef Landschap (Dutch Landscapes Survey) (The Netherlands)**

Relevant data have been collected on linear vegetation for this survey conducted in 1990, 1996 and 2003. Linear vegetation is composed of tree rows and double tree lines for the purposes of this survey.

Figure 4-2 shows the changes in linear vegetation between 1990 and 2003 in terms of new plantings and removal. During the early 1990s there was a net increase in linear features, although this slowed down in the period post 1996, whilst the rate of removal remained fairly constant. Land use change is reasonably dynamic in the Netherlands due to agricultural improvement and the reallocation of parcels (Jongman, 2002).

The survey shows that historical parcel boundaries (ditches) were removed between 1990 and 1996 due to parcel reallocation and agricultural improvement works. This is illustrated in Figure 4-3 which shows one of the sample squares located near Oosterwolde in the north of the Netherlands in 1990 and 1996.
**Figure 4-2:** Changes in Linear Vegetation in the Netherlands 1990-1996 and 1996-2003.

![Changes in land use in the Netherlands: linear plantings compared with the stock of 1990](image)

Source: Jongman and Bunce, 2008.

**Figure 4-3:** Changes in the Density of Historical Parcel Boundaries (Ditches) in One Sample square 1990-1996, Oosterwolde in the North of the Netherlands.

![Left: 1990; Right: 1996.](image)

Source: Jongman and Bunce, 2008.

**Countryside Survey (Great Britain)**

The features analysed from the Countryside Survey are banks/grass strips, hedges and walls, as well as the combined total of all boundary features. The results are presented in Table 4-5 for each of six zones, three of which are located in the Atlantic Central (which covers the southern and central areas of England) and three in the Atlantic North (which covers most of Wales, northern England and all of Scotland). The results show that hedges are the most abundant linear feature. They increased
throughout the Atlantic Central zone between 1990 and 1998 but decreased in the Atlantic North zone over the same period. The length of walls increased in both zones over this period, although the total length of banks and grass strips marginally declined. The next set of data from survey work conducted in 2007 is due to be published in late 2008.

### Table 4-5: Length of Linear Features According to the Data of the British Countryside Survey, 1990 and 1998.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
<td>63,897</td>
<td>61</td>
<td>67</td>
<td>4,892</td>
<td>4,964</td>
<td>390</td>
<td>358</td>
<td>10,377</td>
</tr>
<tr>
<td>Zone 2</td>
<td>59,941</td>
<td>121</td>
<td>119</td>
<td>2,655</td>
<td>2,843</td>
<td>338</td>
<td>321</td>
<td>7,941</td>
</tr>
<tr>
<td>Zone 3</td>
<td>25,947</td>
<td>17</td>
<td>17</td>
<td>3,337</td>
<td>3,328</td>
<td>181</td>
<td>172</td>
<td>6,867</td>
</tr>
<tr>
<td>Atlantic Central</td>
<td>149,785</td>
<td>78</td>
<td>79</td>
<td>3,728</td>
<td>3,832</td>
<td>333</td>
<td>311</td>
<td>8,794</td>
</tr>
<tr>
<td>Zone 4</td>
<td>22,688</td>
<td>9</td>
<td>7</td>
<td>2,359</td>
<td>2,132</td>
<td>329</td>
<td>310</td>
<td>5,832</td>
</tr>
<tr>
<td>Zone 5</td>
<td>29,844</td>
<td>40</td>
<td>62</td>
<td>3,265</td>
<td>3,152</td>
<td>283</td>
<td>290</td>
<td>8,719</td>
</tr>
<tr>
<td>Zone 6</td>
<td>32,034</td>
<td>543</td>
<td>579</td>
<td>5,511</td>
<td>5,191</td>
<td>2609</td>
<td>2,442</td>
<td>12,415</td>
</tr>
<tr>
<td>Atlantic North</td>
<td>84,566</td>
<td>222</td>
<td>243</td>
<td>3,873</td>
<td>3,651</td>
<td>1176</td>
<td>1,110</td>
<td>9,344</td>
</tr>
</tbody>
</table>

Source: Jongman and Bunce, 2008.

### Alterra/KVL Atlantic North Project

In this small scale project, five squares each of 1 km² were selected in the Netherlands and Denmark in order to compare the changes in landscape features in different countries. Data are available for different years from the late 1960s to the late 1990s, although the year of data collection differs by country. Relevant data are available for tree rows and solitary trees in Denmark and the Netherlands and are summarised in Table 4-6.

In the Dutch study area, there was an overall decrease in the length and number of tree rows and solitary trees. The large decrease in the number solitary trees is attributed to the use of modern machinery. In Denmark, the number of tree rows remained stable after a decrease in the period 1971 - 1985 and the total length subsequently increased. Although the number of solitary trees in Denmark fluctuates, there is a net increase due to plantings after 1985. These plantings are partly based on the private initiatives of hobby farmers (Primdahl, 1999).
Table 4-6: Changes in Tree Rows and Solitary Trees in the Netherlands and Denmark.

<table>
<thead>
<tr>
<th></th>
<th>Netherlands</th>
<th>Denmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree rows</td>
<td>14,011</td>
<td>11,394</td>
</tr>
<tr>
<td>(metres)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>108</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average length</td>
<td>565</td>
<td>632</td>
</tr>
<tr>
<td>(metres)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solitary trees</td>
<td>221</td>
<td>104</td>
</tr>
<tr>
<td>(number)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Jongman and Bunce, 2008.

4.1.3 Summary

The available data demonstrate the diversity of farmland features present across the EU. The trend data present a mixed picture in terms of trends, with both declines and increases being recorded within different regions of the same country in the cases of Austria and Great Britain. The increases and decreases described above are context specific and are likely to be due to the influence of different pressures and policy environments.

There is a significant gap in the available data on the distribution, density and diversity of farmland features at the pan-European level. There are a small number of national databases and regional project-based datasets which provide relevant information on farmland features, but together they do not provide a comprehensive, up-to-date overview of the abundance of features for the EU, and at best, they include only partial trend data.

4.2 Key Results of the Field Visits

4.2.1 Methodology

Due to the partial understanding of the presence of farmland features in different parts of Europe provided by the available data, Alterra conducted a number of field visits to sample plots across Europe in order to describe those features that are characteristic of different Environmental Zones. A total of 42 field visits took place to selected sites in France, Netherlands, Spain, Sweden and the UK between September 2007 and May 2008. The features located in each site were recorded according to a standard coding system in order to classify patch, linear and point features according to different size thresholds.

These field visits were not conducted exclusively for this project, but were completed in combination with other ongoing projects in which Alterra is involved. Because of this, all squares are situated in the western part of Europe, and in the Lusitanian and Atlantic Central zones sample squares were selected arbitrarily due to their proximity to the sites of pre-arranged field visits. The identified features are understood to be
typical of these zones, based on the experience of the contractor. In all other zones, random sample squares each measuring 1 km$^2$, were selected from the relevant national surveys (as used for the surveys presented in the preceding section) for field visits. These sites capture the diversity of farmland features present in Europe and together represent eight of the thirteen Environmental Zones (Nemoral, Atlantic North, Atlantic Central, Lusitanian, Alpine South, Mediterranean Mountains, Mediterranean North and Mediterranean South (refer to Figure 4H1)). However, these sites are not representative of all farming systems and environmental conditions found in the EU. A more accurate overview could be achieved through a number of approaches, and two recommendations in this regard are made in Chapter 4.3.

4.2.2 Results of Field Visits

A description of the characteristic features of each Environmental Zone, based on these field visits is provided below. A description of each visited square is provided in the Annex to Alterra’s report.

The Nemoral Zone

A total of six squares were visited in Sweden. The matrix in the Nemoral Zone is made up of arable crops and grassland and the land is rather open. There is little abandonment, although some is visible. Patch features are mainly field corners, small woods and, occasionally, grass strips between fields. Linear features, grassland strips and tree lines are more dominant. Point features are also common and consist mainly of small field corners (similar to the patches but smaller), scattered trees and boulders.

The Atlantic North Zone

A total of five squares in England (in the Lake District in the north-west of the country) and five squares in Northern Ireland were visited. Most squares are dominated by grassland. Crops are also found in these squares but are less common than in other zones. There are not many unutilised patches. Linear features such as walls, hedges and tree lines adjacent to fields are dominant. Point features are not very abundant and are mainly small wetlands and trees.

The Atlantic Central Zone

Two squares in France and four squares in the Netherlands were visited. The matrix is made up by either crops or grasslands. In many places the land is dominated by one type of farming. Traditional small scale landscapes (for example, Oud Ootmarsum in the Netherlands) are rich in linear and point features. The uniform landscapes, such as those found in the Netherlands, mostly include linear features such as grass strips or ditches and streams.

The Alpine South Zone

This zone covers the mountain ranges in Europe south of Scandinavia. It includes the high peaks of the German mountains as well as the highest peaks of the Cantabrian Mountains. Four squares were visited in the Cantabrian Mountains. As in most mountain ranges, grassland dominates as illustrated by the data from the SINUS and SISPARES surveys. Patches with recently abandoned grassland or grassland that has not been used in recent years can be found scattered on the steeper slopes. Grazed scrub (heathlands) is also found here. Linear features differ from those found in the
northern zones and are characterised by the more abundant presence of walls, hedges and scrub, and tree lines. In the Cantabrian Mountains, terrace walls can be found. In some squares, tree lines are prominent as candelabras, a regional way of harvesting leaves of ash (Fraxinus angustifolia) as fodder. This habitat is in serious decline and at risk of extinction. Streams occur, but ditches are less prominent. Solitary trees (fruit trees, field trees and trees in hedges) are common.

_The Lusitanian Zone_

Two squares were visited in south-western France and three in north-western Spain. Grasslands dominate the matrix in this zone as it is the southern continuation of the Atlantic Zones. There is grazed scrub of different heights with the southern heathlands growing much taller than the northern heathlands. Linear features are abundant and tree lines are the most common. Other important linear features are walls and grass strips. Point features are not very abundant but trees (fruit trees, field trees and trees in hedges) do occur.

_The Mediterranean Mountain Zone_

Three squares were visited in Spain. As in the Alpine South zone the matrix is dominated by grassland, but also vineyards occur regularly. The prominent linear features are walls, both between fields and terrace walls. Streams are present as well. Point features occur regularly, mainly as solitary trees, and include fruit trees and solitary in-field trees.

_The Mediterranean North Zone_

Three squares were visited in Spain. The matrix is a mixture of arable crops, vineyards and some grassland. Dehesa is a unique part of the Mediterranean North matrix and is characterised by a combination of woody crops (cork and acorns) and grassland. The main features are small areas of recently abandoned or fallow land. There are many linear features such as tree lines, grass tracks and hedges of different sizes. There are several solitary olive trees and oak trees partly in use. There are also many small patches of unused grasslands in those places that are not easily accessed with agricultural tools. Some of these small patches have changed into areas of small scrubby bushes.

_The Mediterranean South Zone_

Four squares were visited. The matrix is mainly made up of crops and scrub that is partly grazed. There is not much grassland in this zone. Linear features occur and are mainly boundaries between fields in the form of grassland strips or scrub strips. River beds are mostly dry as rivers are intermittent. Point features are rare.

4.2.3 _Summary_

Table 4-7 shows the number of field visits that took place in each environmental zone and the frequency of features identified in each kilometre square visited. Given the small sample size, it is not appropriate to draw anything more than general conclusions. In addition, the sample has also captured more grassland systems, rather than arable or permanent crops, and so the results do not reflect the entirety of farmland in the EU.
The results show the dominance of linear and point features. Linear features are the most abundant and patch features the least common. Linear features, such as hedgerows and tree lines can be found in all zones, although species composition and management differs across Europe. Walls occur in all mountainous regions of Europe. Terraces are specific to the Mediterranean Mountain and Mediterranean North zones. Point features are reasonably abundant across all zones.

The most diverse range of features is found in Alpine South and Lusitanian because of the wide range of altitudes, topographic conditions and contrasting agricultural patterns found in these zones. The figures for Mediterranean North and Mediterranean South probably do not reflect the actual diversity present, because there is a wide range of contrasts within these regions (Blondel, 2004). For example, terraces were not recorded in the field visits conducted for this survey in the Mediterranean South, although it is known that this feature dominates whole areas in the Peloponnese in southern Greece and Tuscany (Central Italy).

Table 4-7: Summary Table of Sample Size and Incidence of Features in the Different Environmental Zones Visited.

<table>
<thead>
<tr>
<th></th>
<th>Nematol</th>
<th>Atlantic North</th>
<th>Atlantic Central</th>
<th>Alpine South</th>
<th>Lusitanian</th>
<th>Mediterranean Mountains</th>
<th>Mediterranean North</th>
<th>Mediterranean South</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>6</td>
<td>12</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td>Patch features (&gt;400m2) on, or adjacent to, farmland that are managed directly.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Patch features (&gt;400m2) on, or adjacent to, farmland that are indirectly influenced by current agriculture but are not managed actively.</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Linear features (&gt;30m) on, or adjacent to, farmland that are managed directly.</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Linear features (&gt;30m) on, or adjacent to, farmland that are indirectly influenced by current agriculture but are not managed actively.</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>3</td>
<td>8</td>
<td>6</td>
<td>55</td>
</tr>
<tr>
<td>Point features (1+) on, or adjacent to, farmland that are managed directly.</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Point features (1+) on, or adjacent to, farmland that are indirectly influenced by current agriculture but are not managed actively.</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>22</td>
<td>22</td>
<td>24</td>
<td>23</td>
<td>18</td>
<td>20</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

Source: Jongman and Bunce, 2008.

4.3 Towards a Farmland Features Monitoring System

In this study, a three pronged approach was used to collect information on the distribution, density and diversity of farmland features within the EU. Together, the results of the eight case studies, the analysis of the available datasets and the descriptions provided by the field visits, only provide a partial overview. In this final section, we outline the rationale for developing a system to record comprehensive
data on the presence of farmland features and present two different, but complementary, approaches.

4.3.1 The Need for a Farmland Features Monitoring System

The availability of robust data on farmland features is essential to realising a number of EU environmental policy objectives. Data are needed on the location of a majority of farmland features in order to develop a baseline against which to record trends in the distribution, density and condition (where possible) of farmland features. As a minimum, this data would include all of those features included in the regulatory baseline, but the possibilities afforded by the LPIS would allow for the collection of data on all features (see below).

A pan-European database of farmland features does not yet exist and if established, could be used to facilitate the implementation of cross compliance, regulatory or agri-environment based approaches to protecting and managing features. In particular, this data would be integral to the control system, for example, with respect to identifying breaches of the cross compliance GAEC standards for landscape features. Data of this sort can also be used to inform policy more generally and is central to any ambitions to deliver environmental outcomes at the landscape scale. Such a database could also provide data for indicators. It could, for example, feed relevant indicators within the Common Monitoring and Evaluation Framework (CMEF) and assist in evaluating the impact of rural development programmes on Europe’s stock of farmland features. Trend data would also permit changes to be detected and allow pre-emptive action to be taken, before the resource is lost outright. It is much more cost effective to stem the decline in features and maintain the current resource, than to re-establish or restore features at a later date. The capacity to detect and to anticipate change is important in a rapidly changing rural environment.

4.3.2 Two Potential Approaches

One method would be to expand the survey approach adopted in various countries to date to include a combination of an analysis of satellite images and field surveys of randomly selected plots. This would provide data on the presence of farmland features and field visits would allow some data to be collected on the condition of farmland features.

The second approach, which could input into the first, would be to collect information on farmland features through the Land Parcel Identification System (LPIS). The LPIS uses aerial photography (referred to as ‘orthophotos’) to identify agricultural parcels for the purpose of managing direct payments under the CAP. The approach could be extended to include the identification and recording of features present on agricultural parcels. However, the opportunity to collect data on the condition of farmland features is more limited in the absence of field visits. There may also be other constraints, with respect to the approach to identifying features (for example, whether this can be automated, or whether expert judgement would be required), and validating the presence of features through ground checks. It may also be costly, but these costs should be balanced against the benefits such a resource would provide.
4.3.3 Developing a Survey-based Monitoring System

A monitoring system could be developed for farmland features, possibly linked to ongoing surveying activities. Such a system could function at two levels: (1) to identify the presence of the feature (basic monitoring); and (2), to identify the presence of the feature and its characteristics (intensive monitoring). Recording the presence of farmland features can be done by non-experts, such as farmers, and would require clear definitions of farmland features which are understood in different cultural contexts.

This approach would provide a baseline of the total stock of farmland features and allow change to be monitored. This basic system could be linked to a more intensive system of monitoring in order to detect qualitative change in species and vegetation composition, as well as management information. Intensive habitat monitoring of this sort would need to be based on a stratified random sample and undertaken at regular intervals.

The use of satellite images and aerial photographs offers some scope to record the presence of farmland features and improve the efficiency of data collection. There are, however, some inherent limitations. First, the vertical structure of farmland features cannot be detected through overhead images. This means, for example, that it may be difficult to determine from an aerial photograph if a hedge is gappy, or not. It may also mean that certain features may not be recorded if they are obscured in some way by vegetation from another feature. For example a small pond may be hidden by overhanging tree canopies. Field validation would therefore need to accompany the use of aerial photography. These problems would also beset the LPIS-centred approach. However, at the pan-European scale this level of detail may not be necessary, although this would depend on the uses to which the data is put to.

The suitability of the Google Earth application was assessed for this project (for an example of an image, see Figure 4-4). Several sample units were explored, and in principle, there is scope to develop the approach further. There are, however, a number of issues to resolve:

- It is technically difficult to import Google images into a geographical database system for further analysis.
- There are copyright issues to resolve. Map data are protected by Intellectual Property Rights which are owned by Google. Google states that map information may not be distributed for any commercial purpose.
- The quality of the images differs across Europe. Some regions cannot be analysed at the 1km square level, although the resolution is understood to be improving.
- Google Earth only provides an aerial view, so the view from the ground cannot be seen. This may be important for determining the presence of certain features, as outlined above.
- An appropriate sampling system has not been developed yet.
The cost for a study combining field survey and photo interpretation at the EU level is estimated to be approximately €5.0 million, based on the costs of two earlier habitat survey projects, BioHab and BioPress\(^6\).

**Figure 4-4: Example of a Google Earth Image (UK).**

Source: Google Earth.

**4.3.4 Developing the Land Parcel Identification System (LPIS)**

The Land Parcel Identification System (LPIS) is a GIS tool applied by each Member State to record data on parcels of agricultural land and assist with the administration and control of farm subsidy payments through the Integrated Administration and Control System (IACS). The LPIS demarcates all agricultural areas, including those below the threshold set for claims (the minimum size of eligible parcels should not be higher than 0.3 ha) (pers. comm., DG AGRI Unit D1). The Commission services recommend that farmland features should be recorded in the LPIS, but we are not aware that this has been widely undertaken.

France, for example, integrates data on ponds and woods in the LPIS at present (Cooper *et al.*, 2007). In the case of the Romanian LPIS, it is understood that whilst high resolution digital aerial photos record the presence of solitary trees, groups of trees and terraces (the features included in GAEC in Romania), there is as yet no discussion of using the geo-information within the Romanian LPIS to develop a national register of landscape features as is taking place in some other new Member States, such as the Czech Republic (Arblaster, 2008). The Czech LPIS (Ministry of Agriculture of the Czech Republic, 2008) collects some agri-environment data, but, to the best of our knowledge, this does not yet include information on farmland features.

\(^6\) Two FP7 projects (EBONE (http://www.ebone.wur.nl/UK/partners/) and BioBio) are monitoring landscape change through existing networks of site observation and wider countryside mapping. More information on BioHab can be found at: www.alterra-research.nl/servlet/page/?pageid=744&dad=portal30&schema=PORTAL30
Data are collected for small-scale protected areas as well as plover and corncrake nesting grounds, and indicates the potential to integrate environmental data into the LPIS, including that on the presence of farmland features.

The LPIS provides a ready-made system through which to roll out the collection of data on farmland features. Ortho-photos, aerial images which ‘flatten’ the landscape so the actual size of features can be determined, form the basis of the LPIS and already include images of farmland features. However, it is understood a further step would need to be taken to digitise the presence of these features, to categorise the feature according to a standard typology, and to present this in a consistent format ready for manipulation by policy makers and researchers. For example in Spain, at present, various features are excluded from the eligible area and are demarcated accordingly with a line, although no record is made of what these excluded areas are (Guy Beaufoy, *pers. comm.*).

The use of aerial imagery is preferable to requiring farmers to record farmland features as part of their annual IACS submission as it removes the potential for inconsistency or inaccurate identification of features, particularly with respect to boundary features which could be recorded in a different way by the neighbouring farmer. On-the-spot checks, conducted by an inspector, must currently take place on five per cent of all holdings applying for the SPS each year. This physical inspection could be extended to verify the correct identification and delimitation of farmland features.

The implementation of agri-environment schemes gives a precedent for this type of approach. In order to provide a record of the features in receipt of rural development funding, participants in England’s Entry Level Stewardship scheme must identify, map and retain a series of farmland features as part of their agreement. This is known as the farm environment record and the features that should be mapped include hedgerows, stone walls and stone faced banks, in-field trees, mature boundary trees, ponds, wet ditches, traditional orchards and small groups of trees.

The costs of developing a comprehensive GIS based database of farmland features across Europe are unknown but are likely to be substantial. The total costs of introducing the current LPIS system were estimated to be €119 million for the EU-15 (Relin et al., 2003). No information is available about the costs of adapting the system to record data on the extent and distribution of farmland features. The first stage may be to undertake an EU-wide feasibility study to assess the best means of using LPIS in this way, the procedures for collecting, processing and recording data, and the costs - both technical and administrative - of doing so.

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7 An example of such a map can be viewed at: http://www.defra.gov.uk/erdp/pdfs/es/maps/example-els-fer.pdf
5 Environmental Benefits Provided by Farmland Features

5.1 Introduction

There is a good level of evidence to show that farmland features provide a number of important environmental benefits, as presented in this Chapter. Evidence from Europe and North America is reviewed, drawing on academic articles, policy papers and other grey literature.

The section is structured according to the key areas of environmental benefit arising from farmland features including: biodiversity (including the adaptation of species to climate change), soil quality, water quality and climate change abatement. Each section provides an overview of the benefits provided by farmland features as a whole and the generic factors that influence their environmental value (for example, management, context, size). Specific evidence, where available, for each feature is summarised. There is a varying amount of research and information available for each farmland feature covered here. Some features such as hedges and buffer strips have been the subject of considerable research. On the other hand, features such as ‘patches of unutilised agricultural land’ and ‘uncultivated patches on arable land’ are not addressed to the same extent by the literature. Where direct research is lacking for certain features, comments on their value are inferred from studies of other features with similar characteristics.

Variables Influencing Environmental Benefit

The range and level of benefits provided by farmland features are influenced by many factors (IEEP, 2007), including:

- Size – for some features, a minimum length or area will be required to support certain benefits, especially in relation to the populations of certain species.
- Context – location in relation to, and connectivity with other features can determine both the value of individual features and the value of collective features. For example, a single isolated small patch of woodland may be insufficient to support certain woodland bird species, but a heterogeneous landscape made up of a range of features might.
- Position – the position of certain features is very important in determining their environmental effectiveness. For example, buffer strips will contribute most to improving water quality where they are located between cultivated fields and across run-off pathways.
- Management and/or disturbance of feature – for example, hedges that are cut back severely on an annual basis will have less biodiversity value than those under less severe management. The biodiversity value of traditional orchards, for example, is dependent on low intensity management.
- Management and/or disturbance of surrounding land – for example, the intensity of agricultural management on surrounding land affects the water quality of ponds/ditches.
- Naturalness – in terms of form and species composition. For example, native trees have higher biodiversity value than exotic species.
• Season – some features will have greater environmental benefits in particular seasons. For example, buffer strips are more effective at reducing nutrient leaching in autumn than in spring.

• Age – generally older features, if properly managed, tend to be of higher value. For example, this is true in the case of the biodiversity value of hedges and stone walls and the effectiveness of grass buffer strips in reducing leaching of nutrients.

5.2 Biodiversity

5.2.1 Overview

It is estimated that 50 per cent of the species found in Europe are dependent on agricultural habitats (EEA, 2006). It is also widely recognised that many threatened species cannot be conserved through protected areas alone, and that semi-natural habitats and features in the wider agricultural landscape are essential for their conservation (Benton et al., 2003; Robinson and Sutherland, 2002; Donald et al. 2000; Hinsley and Bellamy, 2000; Tucker and Evans, 1997).

All of the farmland features reviewed here have benefits for biodiversity as they help to maintain habitat heterogeneity. They contribute to the provision of a range of niches which may support a diversity of species adapted to the conditions of different niches (Benton et al., 2003). The extent to which they contribute to high species diversity will depend on a range of factors including those listed in the introduction of this chapter. Farmland features are host to a wealth of wild plant species and provide one or more of the following for fauna species: shelter, nesting habitat, food sources and/or movement corridors or transition/dispersal zones. Furthermore, as indicated in Annex 1, a significant number of vertebrate animal species of Community interest benefit from farmland features. Although readily available data are insufficient to assess their importance in this study, it is highly likely that farmland features are of similar importance to invertebrates and plants of Community interest. Small areas of semi-natural vegetation also provide a source of soil invertebrates, pollen and seeds to the adjacent landscape (Corry and Iverson Nassauer, 2002). In addition, where the features assist resource protection, soil and water quality, these will in turn benefit a range of flora and fauna species.

Remaining patches of semi-natural habitats, such as grassland, shrubby heaths, bogs and fens, scrub and woodland are likely to be particularly valuable. Such habitats tend to be species-rich with significant numbers of species of conservation importance.

The habitat patches considered by this study are by definition small and may therefore hold small populations of species that may be vulnerable to extinction as a result of chance events and outside influences. However, if sufficient numbers of individuals from other local populations can re-colonise empty habitat patches after extinctions then the species may continue to survive as a metapopulation (Levins, 1970; Hanski & Gilpin, 1991, 1997). A metapopulation can be defined as a set of local populations within a larger area where migration from one local population to at least some other patches is possible (Hanski and Simberloff, 1997). Metapopulations exist at a spatial scale where individuals can occasionally disperse among different patches but do not make frequent movements because the patches are separated by substantial expanses.
of unsuitable habitat (Hunter, 2002). This intermediate rate of movement is usually sufficient to avoid long term genetic differentiation among patches, but low enough to allow each patch to be quite independent demographically. At high rates of interchange, there is effectively only one population occupying all the patches. Thus, it is important to note that not all species that are distributed in habitat patches are composed of metapopulations.

The edges of linear and patch features, such as field margins, boundaries, streams and woodland patches, may form ecotones, or zones of ecological change (Marshall and Moonen, 2002). Such ecotones often exhibit high biological diversity and can support species unique to the ecotone itself and not found in either of the neighbouring habitats.

A number of generic factors influence the biodiversity value of farmland features. In biodiversity terms, the size and connectivity of a feature are particularly important. In general, the larger the feature, the higher its nature value, and this has been illustrated by a number of studies looking at field margins, hedgerows and ponds (Downs and Racey, 2006 (UK); Biggs et al., 2005 (UK); De Bruijn, 1994 (Netherlands)). It is likely that larger habitats have better environmental conditions than smaller ones, at least in the centre, where negative influences from outside the borders are reduced or absent. Larger habitat patches are also likely to have more diverse environmental conditions, leading to more niches for a wider variety of species. Larger features will also be able to support larger populations, and the larger the population the more likely it is to be viable. Features that are small, at low density or highly fragmented are of most value to highly mobile species such as butterflies (IEEP, 2007; Weibull and Ostman, 2003).

The management of a farmland feature is also critical in determining biodiversity value. The severity and the timing of cutting of some farmland features can prevent the successful reproduction of many birds, invertebrate and annual plant species. The application of fertiliser, pesticide or herbicide will, in most cases, result in a loss of biodiversity value either by giving competitive advantage to nitrophilic and acid tolerant plant species or by destroying sensitive groups of flora and fauna and negatively affecting the predators that rely on them (Marshall and Moonen, 2002).

The contribution of farmland features to functional connectivity is discussed in more detail next, followed by a review of the biodiversity benefits associated with specific farmland features.

**Farmland Features and Functional Connectivity**

The long-term survival of many species is strongly dependent on the dispersal of individuals between different habitat patches. In addition, the movement of individuals is also necessary for genetic exchange amongst different populations, which may enable a species and its individual populations to adapt to changing environmental conditions. Movements amongst patches may also be necessary for foraging, where patches are too small to sustain an individual, and to enable longer-range migrations. As a result, it is important to maintain even small patches of semi-natural habitat, such as farmland features, and maintain functional connectivity amongst them.
Functional connectivity refers to a species’ ability to move between patches and potentially across the intervening habitat matrix. Functional connectivity is more ecologically relevant than structural connectivity, which, in referring to the physical structure of different patches in the landscape, is largely an anthropomorphic view of landscape structure. Importantly, functional connectivity is species-specific, and therefore the habitats or structures that can provide connectivity for one species may present barriers to others (Kettunen et al., 2007).

Some farmland features are likely to play an important role in maintaining functional connectivity in the landscape (see Box 5-1). However, it is evident that the connectivity value of farmland features will vary according to the species involved and a range of other complex factors. For example, the behaviour of species moving through hedgerows within agricultural landscapes is likely to be influenced by the nature of the intervening habitat matrix, the type and spatial distribution of adjacent habitats, season, farming activities (for example, intensity of pesticide use) and interactions between conspecifics and other species, such as competitors and predators (Davies and Pullin, 2006). However, strong unequivocal evidence to support the role farmland features can play in maintaining functional connectivity is currently lacking.

Particular care should be taken in developing policies that aim to maintain functional connectivity in farmland landscapes. The available evidence and the precautionary principle justify the basic protection of existing features that may provide functional connectivity. The evidence also suggests that protection and management measures should focus on maintaining farmland features characterised by large and/or wide semi-natural habitats with high vegetation diversity and structural complexity, because these are likely generally be of highest connectivity value. However, the enhancement of connectivity through the restoration of poorer quality connectivity features or the creation of new farmland features should be carefully considered (Kettunen et al., 2007). In particular, the biodiversity conservation need for, and cost-effectiveness of, increased connectivity should be assessed and potential risks, such as encouraging the spread of alien invasive species, taken into account.

**Hedgerows**

Hedgerows benefit wildlife by providing habitats, feeding sites, refuges, movement corridors and they support some species that would not otherwise exist in agricultural landscapes. They can also benefit agricultural systems as they harbour and support a number of beneficial species, particularly invertebrates.

Hedgerows are often diverse habitats in their own right. They can contain very diverse plant communities, including woody species in the hedge itself and non-woody species in hedge bottoms, and provide valuable breeding, resting and feeding habitats for a wide range of invertebrates, birds, mammals, reptiles and amphibians. In Britain alone, hedgerows are estimated to support 600 plant, 1500 insect, 65 bird and 25 mammal species (Pretty, 1998). In intensively managed lowland landscapes, linear features such as hedges, verges and watercourses have greater botanical diversity than other areas of the landscape (Marshall and Moonen, 2002). A project exploring
**Box 5-1: Evidence of the Effectiveness of Corridors in Providing Functional Connectivity.**

The evidence that corridors provide benefits by increasing connectivity, rather than simply by providing additional habitat, is rather limited, largely because of the practical difficulty of distinguishing between these two effects and because of methodological shortcomings in previous research. Whilst more recent studies provide increased evidence of the benefits of corridors, older studies present less convincing evidence.

From a review of the published literature up to 1994 it was found that many studies demonstrated that animals and plants prefer to move along corridors rather than cross the matrix habitat. However, an approximately equal number found no detectable effects and few, if any, showed that recolonisation would not have occurred without corridors (Dawson, 1994). Dawson could find no studies that conclusively demonstrated that corridors act as conduits that prevent extinctions in patches, possibly because few were sufficiently rigorous to demonstrate unambiguous advantages.

Nevertheless, Dawson concluded that corridors:

1. ‘Sometimes allow individual animals to survive by allowing them access to sufficient habitat to meet their needs;
2. May maintain populations of some animal and plant species by replenishment; however, most species probably fail to use a corridor or can cross the gaps between patches of habitat adequately without its aid; and,
3. Can serve the needs of some migratory animals in their seasonal movements’.

Other reviewers came to similar conclusions at about the same time (Hobbs 1992, Spellerberg & Gaywood 1993, Wiens 1995). For example Wiens suggested that the ‘evidence that species do depend on corridors for their movements or that corridors have clear conservation value … is limited and equivocal’. Little evidence was also found of the potential benefits of corridors in relation to movements required as a result of climate change (ITE, 1994; Wiens, 1995).

More recent studies have found increased evidence of benefits from corridors. For example, Gonzalez et al. (1998) demonstrated significant effects of corridors in preventing metapopulation extinction by providing an immigration ‘rescue effect’, and Mech and Hallet (2001) used genetic methods to argue that corridors increase connectivity for specialist mammals. A review of literature by Beier and Noss (1998) found convincing connectivity benefits of corridors, but in only around half of all published studies, largely because too few studies included all the necessary demographic parameters. A review by Debinski and Holt (2000) suggested that although the predicted positive relationship between species richness and fragment size is rarely apparent in empirical data from patches of natural habitat in fragmented landscapes, there is a consistent agreement across many studies that increasing connectivity increases species richness, and that movement is related to connectivity.

Linear features such as hedges, ditches, streams and their margins, and the edges of woodland, can be important habitats in their own right, as well as sometimes facilitating movements. For example, woodland edges and streams constitute favoured routes of travel for feeding bats according to a Scottish study (Downs and Racey, 2006) and hedges and ditches and their margins are favoured flightlines and feeding sites for barn owls (De Bruijn, 1994).

Despite these studies, it still remains unclear whether increases in movements and species richness are the direct result of connectivity, or simply because corridors provide additional habitat area. Haddad and Tewksbury (2006) note that the effects of corridors on population viability are little studied and the empirical understanding of the effects of corridors on community structure and diversity is still in its infancy. Although they find that support for corridor effects on population is growing, especially for smaller taxa with short generation times (because these are easier to study), there are many caveats.

Although there is little clear evidence that corridors directly provide significant population benefits, it seems prudent to assume that corridors should be maintained in accordance with the precautionary principle. This is particularly prudent given the difficulties associated with demonstrating their impacts. Consequently Beier and Noss (1998), reviewing the complexity and intractability of this issue, suggest that ‘those who would destroy the last remnants of natural connectivity should bear the burden of proving that corridor destruction will not harm target populations’.

Source: adapted from Kettunen et al., 2007.
integrated crop management in Italy, found that the use of field margins and thick networks of hedges helped to increase biodiversity through habitat provision and that the plant species diversity index increased by 40 per cent over seven years (Agra CEAS, 2002). The value of hedgerows as a habitat for a diverse range of species in northern France is particularly high because of considerable micro-habitat heterogeneity, complex vertical vegetation structures and the high plant diversity characteristic of old hedgerows (Burel and Baudry, 1995). A study in the Netherlands found the size of barn owl (Tyto alba) populations to be directly proportional to the length of hedgerows, lines of trees and woodland edges in a landscape, and recommended a minimum length of 3 – 5 km per km² for barn owl conservation (De Bruijn, 1994).

Hedges are important feeding sites for many species in agricultural landscapes, particularly because of the berries produced by woody plants and climbers in the hedge itself and also the flowers in hedge bottoms. Associated flowering plants provide nectar sources for invertebrates, particularly butterflies and bees, and these invertebrates in turn act as food for insectivorous birds and bats, particularly pipistrelle (Pipistrellus pipistrellus) and greater horseshoe (Rhinolophus ferrumequinum) bats (Marshall and Moonen, 2002). In a study of breeding birds in farmland in Eastern England, Mason and Macdonald (2000) found that common whitethroats had a preference for hedges, especially for tall hedges, whilst lesser whitethroats preferred only tall hedges.

The biodiversity associated with hedgerows can have positive agronomic impacts as hedgerows often support the natural predators of crop pests, such as certain species of beetles and spiders, and provide them with over-wintering habitat and food sources (Marshall and Moonen, 2002; Altieri, 1999). They also support pollinators, such as bumble bees and honey bees, which are important for some arable crops (Steffan-Dewenter et al., 2002 (Germany)). On the other hand, hedges and margins can allow some weed species to proliferate and spread into crops, such as annual Gallium aparine, perennial Elytrigia repens and biennial Heraclium sphondylium, and harbour pest species such as black bean aphids which can have negative environmental consequences if applications of pesticide and herbicide are increased as a result (Marshall and Moonen, 2002).

In their review of research from Europe and North America on the value of hedges for birds, Hinsley and Bellamy (2000) identified a number of features, which when associated with a hedgerow, increase its value for birds: headlands; verges; wildflower strips; game and wild bird cover; well-vegetated banks and ditches; and, mature, dead or decaying trees. Although hedges are more valuable for birds when associated with other natural features, fewer woodland birds nest in hedgerows as the density of woodland in the surrounding area increases, implying that hedges are sub-optimal habitats for such bird species. The review also identified a number of management practices which increase the value of hedgerows for birds: do not apply pesticide or herbicide to the hedgerow or hedge bottom; avoid overgrazing; encourage structural diversity (for example, hedges of different heights, hedgerow trees etc.); cut hedges on rotation; do not carry out cutting, ditch clearing or any other management which would disturb nesting birds during the nesting season; and, avoid excessive cutting.
According to the French case study, fifteen reptile species have been observed in the hedgerows of Brittany and the number of bird species and their abundance has been found to be twice that of open fields in *bocage* areas. Dense hedgerows with high numbers of pollarded trees are of particular value to saproxylic beetles, and for this reason some areas of the *bocage* landscape have been designated as Natura 2000 sites (Pointereau and Coulon, 2008). The UK case study (Eaton, 2008) found that hedgerows are the primary habitat for at least 47 species of conservation concern in the UK, including 13 globally threatened or rapidly declining ones. They are especially important for butterflies and moths, farmland birds, bats and dormice. Provisional results of a recent hedgerow survey conducted by the Cumbria Wildlife Trust found that Cumbrian hedgerows were more species rich than the national average: with 68 per cent of hedges surveyed having more than four woody species per 30 metre length, compared to an average of 39 per cent for Northern England and Wales. The hedgerows surveyed in Cumbria had between one and 14 woody species per 30 metre length (Cumbria Wildlife Trust, 2005). In the north-west of England, where Cumbria is located, hedgerows are important for Biodiversity Action Plan target species such as linnet, song-thrush and grey partridge (GFA-RACE and IEEP, 2003).

The style, shape, size and species composition of hedges are all important in determining their value as habitat and feeding sites. All of these attributes vary considerably between different regions of Europe according to local conditions and traditions. The biodiversity value of the ground flora associated with hedges is reduced if pesticide is applied to hedge bottoms, not just because of a general decrease in plant species richness, but because of an increase in annual weed species and a decrease in the flower-rich perennial plant community usually associated with unsprayed hedge bottoms (Dover and Sparks, 2000).

There is some evidence to suggest that hedgerows can act as wildlife movement corridors (see Box 5-1 above). According to one review of international research, they facilitate the movement and dispersal of birds, plants, invertebrates (particularly arthropods) and small mammals (Baudry, Bunce and Burel, 2000). More recently a systematic and comprehensive review of the evidence of connectivity benefits that hedgerows provide for woodland species was undertaken for Natural England (Davies and Pullin, 2006). This reviewed a number of studies that provide anecdotal evidence supporting the functional importance of corridors, reporting local mechanistic effects within the system, such as species movements. However, their overall conclusion was that:

‘the evidence currently available on the role of hedgerows is insufficient to definitively evaluate their effectiveness in regard to maintaining, or increasing, the population viability of species inhabiting woodland’.

This conclusion probably stems largely from the inadequacy of much of the research, and in particular the practical difficulties of separating the effects of habitat provision from connectivity benefits alone. There is therefore a need for further detailed research on this issue, especially to establish the factors that affect the value of hedges in providing connectivity for species of conservation importance.

The continuity and connectivity of hedges may be important, both in terms of hedgerows themselves but also their functional connection to other natural habitats.
Small gaps may act as movement barriers. For example, the dormouse (*Muscardinus avellanarius*) is thought to not usually cross gaps larger than five metres, and pipistrelle bats, when feeding above hedges do not usually cross gaps of more than 30 metres according to a study in Scotland by Marshall and Moonen (2002). The connectivity of hedges to other natural features is also crucial, especially in order to allow the persistence of metapopulations, particularly of invertebrates and parasitoids (Mauritzen *et al*., 1999).

Hedgerows can, however, act as a barrier to dispersal of some species, particularly invertebrates, especially where hedges are dense, tall and/or wide (Marshall and Moonen, 2002). There seems to be less evidence for this, than for their value in aiding dispersal.

**Lines of Trees**

The biodiversity benefits of lines of trees are very similar to those provided by single trees and those provided by hedges, particularly where the lines of trees occur along boundary lines or even within or in connection with hedgerows, thereby acting as nesting and feeding sites, and, potentially, movement corridors. Many lines of trees in the agricultural landscape will have evolved from abandoned hedges.

There is very little literature dedicated to the environmental benefits of lines of trees. The linear features containing trees that the literature more often refers to are shelter belts or woody margins. Shelter belts are lines of trees or thin strips of woodland created, usually around farmsteads or certain fields - for example, lambing fields - to provide shelter. They not only provide valuable shelter for both livestock and wild fauna and flora, but also provide habitat for beneficial fauna that can help control agricultural pest species (Agra CEAS, 2002). A study in Canada has found that woody margins significantly increase the diversity of herbivorous invertebrates (Holland and Fahrig, 2000). The study concluded that woody borders can play an important role in maintaining or enhancing farmland biodiversity. Features containing trees, either hedgerows, lines of trees, single trees or small woodland patches are valuable for a variety of invertebrate species, especially Saproxylic beetles such as *Osmoderma eremita*, for which a dense hedgerow network containing many hollow trees is particularly valuable, as demonstrated by several French and pan-European studies (Ranius *et al*., 2005; Vignon *et al*., 2004; Vignon and Arabi, 2003). For example, in Spain individual old trees are valuable habitats for certain species of beetle (e.g. *Cerambyx cerdo*) (Beaufoy, 2008). In Italy, trees have been found to play an important role as corridors for woodland plants (Sitzia, 2007). In Romania lines of trees are of particular biodiversity importance in the arid regions and the areas where agriculture is intensively managed, such as Dobrogea along the Black Sea, Banat in the west and East Wallachia, and the Mureș and Olt valleys, where there is very little forest cover left. In Dobrogea, for example, these trees provide roosting sites for the Natura 2000 designated Red Footed Falcon (*Falco vespertinus*) (Arblaster, 2008).

In the UK, the pedunculate oak (*Quercus robur*) can support a greater variety of wildlife than any other tree species in Europe, with a single tree containing up to 284 different species. A high proportion of bats are dependent on tree cavities for roost sites - from the more common noctule (in Britain) through to rarer old forest bats,
barbastelle and Bechstein's. Other mammals including squirrels, foxes and mink use tree hollows for resting, sleeping or even hibernation.

Factors that affect the biodiversity value of lines of trees are similar to those affecting hedgerows and single trees.

**Single Trees**

The biodiversity benefits of single trees share many of those described above for lines of trees. Single trees on farmland, particularly veteran trees\(^8\) form important habitats for a range of species, including hole nesting birds and bats, numerous invertebrates and lichens, mosses and fungi (Holmes, 1996; Peterken, 1996; Kirby \textit{et al.}, 1995; Rose, 1991). Trees with deadwood are important feeding sites for organisms such as saproxylic beetles and other invertebrates associated with decomposing wood (Hammond and Harding, 1991). Trees with cavities provide breeding sites and shelter for many more species, particularly of birds, such as barn owls, rodents and bats according to a Polish study of the importance of ‘champion trees’\(^9\) (Orlowski and Nowak, 2006). The health of veteran trees, and therefore their biodiversity value as living trees, can be negatively affected by damage to or soil compaction around their roots, or by high levels of nutrients and agro-chemicals. According to the UK’s Woodland Trust sympathetic management practices for veteran trees include: ploughing no closer than five metres beyond a tree’s canopy, not applying fertiliser or pesticides/herbicides to the base of a tree, not allowing livestock to congregate, and leaving deadwood around the base of the tree (Woodland Trust, 2004).

**Field margins and buffer strips**

Field margins and buffer strips are not only a valuable habitat in their own right, but like hedgerows, they may act as movement corridors and help to enhance the biodiversity value of adjacent features by protecting them from inputs applied to agricultural land. De Snoo’s (1999) study on the environmental effects of unsprayed field margins found that they benefited aquatic organisms by reducing pesticide drift to field boundary ditches, contained an increased abundance and diversity of flora, benefited phytophage insects and experienced a significantly higher frequency of visits from insectivorous bird species, such as the yellow wagtail (\textit{Motacilla flava}) than sprayed margins. In Germany, Tribe (2005) reports that arable field margins provide a habitat for over 2,000 species of insect associated with wetland ecosystems. In Romania, many herbs with international conservation designations found in traditional meadows are also found in grassy margins, including Gladiolus imbricatus (gladioli); species of the genus Echium and the genus Salvia, including Echium russicum (Viper’s bugloss); Iris humilis; and Dianthus (pinks) species (Arblaster, 2008). In the UK it is estimated that 70 per cent of the biodiversity found

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8 Veteran trees in the UK context are those that are of interest biologically, aesthetically or culturally because of their age; trees in the ancient stage of their life; and/or trees that are old relative to others of the same species (English Nature, 2000).

9 According to the definition given in nature protection acts, champion trees are those, which, owing to their outstanding age, size and physical condition, constitute an exceptional value, both natural and cultural (Orlowski and Nowak, 2006).
in English arable farms is found in the uncropped area at the side of fields (Eaton, 2008). Berg and Part (1994) also found in Sweden a positive relationship between red-backed shrikes and decidous scrubby edges.

There is substantial evidence that margins and buffer strips can enhance the biodiversity value of adjacent boundary features. An Irish study found that hedges with adjacent uncultivated and unsprayed margins had higher species richness than other hedges (Hegarty and Cooper, 1994, cited in Marshall and Moonen, 2002). Similarly, the value of hedgerows and woodland patches for small mammals can be greatly enhanced by the presence of a grass margin of between three and six metres and in turn, a high small mammal population benefits the predators that feed on them, including birds of prey such as the barn owl (De Bruijn, 1994).

Factors influencing the biodiversity value of buffer strips include how they are established (i.e. sown with a seed mix or natural regeneration), the species composition of the strips, the frequency and type of cutting and the age of the strips. Research suggests that the biodiversity value of buffer strips is increased where they are composed of a diverse plant community, rich in flowers and therefore nectar sources. Greater structural and plant diversity has been found to be beneficial for invertebrates and bird species (Carvell et al., 2007; Field et al., 2007; Olson and Wäckers, 2007). Evidence from a Belgian field trial shows that a failure to remove cuttings after mowing results in a decline in biodiversity, whilst removing cuttings helps to maintain a diverse sward in buffer strips (De Cauwer et al., 2005). Research on arable field margins in the Netherlands by Kleijn et al. (1996) found that in order to encourage rare arable weeds (Centaurea cyanus, Chrysanthemum segetum, Misopates orontium, Hypochaeris glabra and Papaver argemone) the cessation of both fertiliser and pesticide applications is essential.

**Stone Walls**

Dry stone walls support many species, because of the many different microhabitats they create, particularly in terms of warmth, exposure, light and shade, and because of lack of disturbance over long periods of time. They often have rich communities of lichens, mosses and ferns as well as many other plants associated with them. A survey of old dry stone walls in Ireland identified 133 plant species (Holland, 1972).

Walls are favoured habitats for many invertebrates such as molluscs, spiders and butterflies and species of reptiles, such as slow worms (*Anguis fragilis*), and amphibians. Reptiles find stone walls provide favourable habitats, as the environment surrounding stone walls is often dry, bright and warm, and the stones store heat. The taller grasses and vegetation sometimes found along walls provides valuable hunting ground for small mammals such as stoats and weasels, birds of prey such as small owls, and reptiles such as adders and lizards. Stone walls also provide nesting places for some birds, such as wrens (*Troglodytes troglodytes*) and wheatears (*Oenanthe oenanthe*) in the UK (Clifford and King, 2006; DSWA, 2004).

**Terraces**

Terraces have significant biodiversity value arising from their benefits for soil and water quality and management. Their beneficial effect on soil quality and water
content allow greater abundance of both agricultural and wild plant species, depending on management, which in turn can support a more diverse range of fauna species. The precise biodiversity value of terraces will be influenced by the type of terrace. Stone-walled terraces in Malta and southern Spain will have similar biodiversity values to those of stone walls, whereas the biodiversity benefits of grass terraces in more northerly regions will be similar to those of buffer strips, fallow land or unutilised agricultural areas, depending on management. Maltese stone-walled terrace landscapes support a number of endemic species, including Maltese spurge (*Euphorbia melitensis*), Maltese fleabane (*Chiliadenus bocconei*), Maltese spider orchid (*Ophrys melitensis*) and Maltese sea lavender (*Limonium melitensis*) (Rolé, 2007).

**Ditches**

Ditches act as both a habitat for aquatic and terrestrial species and as a wildlife movement corridor. Mauritzen *et al.* (1999) found that ditches acted as movement corridors for root voles (*Microtus oeconomus*) in the Netherlands and that root voles showed a clear preference for ditch habitat over adjacent meadows. Ditches may provide habitats for a number of rare and unusual species, such as temporary water invertebrates not found in other water bodies (Williams *et al*., 2003). Ditches can provide a refuge for those species associated with moist habitats that have been drained. In Germany Dieköttier *et al.* (2006) found that ditches have a significantly positive effect on the occurrence of the bumblebee species *Bombus muscorum*. In Romania, ditches are particularly important for amphibians such as newts, frogs and toads and aquatic invertebrates as they maintain small populations of these species on intensive land and may be the only breeding sites in an intensively farmed area (Arblaster, 2008). In Sweden, open ditches and the banks next to them provide habitats for frogs and salamanders, hare, and birds like corncrake, whinchat, reed bunting, and whitethroat (Herodes, 2008). Berg and Part (1994) also found in Sweden a positive relationship between whinchats and ditches. In the UK, Arnold (1983) found that the bigger a ditch is the more it is used by blackbirds, songthrushes, wrens, robins and dunnocks for food and shelter.

The value of ditches for biodiversity depends on the type of management they receive. The biodiversity value is reduced if agricultural inputs are applied to them or in their immediate vicinity and if they are managed too severely and frequently. Ditches should not be cleared of vegetation more frequently than once every three years, and only one side of the bank (ideally in alternate sections) should be cleared at a time. Appropriate management should include cutting of the vegetation on the banks, dredging, and management to minimise pollution of ditch water with fertiliser, manure or pesticides.

As with other water bodies, ditches are strongly affected by the management of adjacent land. A Dutch study found that ditch banks had highest plant species richness when adjacent to organic or ‘ecologically managed’ fields with pesticide and nutrient free buffer zones (Manhoudt *et al*., 2006).

**Ponds**

Ponds are very important habitats in agricultural landscapes (Wood *et al*., 2003). A number of different types of ponds are covered by Annex 1 of the Habitats Directive.
Chapter 5 Environmental Benefits Provided by Farmland Features

(92/43/EC) (see Annex 2) and their value as ‘stepping stone’ habitats is recognised in Article 10 of the Directive. They have a particularly important role as both habitat and feeding sites for a number of farmland species, particularly birds and bats. Insectivorous birds, such as wagtails, feed on the larvae and adult forms of invertebrates associated with ponds, such as midges and mayflies. Other birds, such as reed buntings (Emberiza schoeniculus), rely on tall vegetation surrounding ponds and water bodies for nesting and perching sites (Bradbury and Kirby, 2006). Pipistrelle and Daubenton’s (Myotis brandtii) bats also use farmland ponds as feeding sites (Downs and Racey, 2006). Farmland ponds contribute significantly to regional biodiversity as they support heterogeneous communities of aquatic organisms and often contain rare or unique species, as demonstrated by Declerck et al.’s (2006) study in Belgium and Williams et al.’s (2003) study in England.

In addition to permanent ponds that contain water year round, temporary ponds, that are dry for parts of the year are widespread across parts of Europe and also have biodiversity value. Mediterranean temporary ponds are one of the pond types included in Annex 1 of the Habitats Directive (92/43/EC). These types of ponds are particularly valuable for amphibians although ponds that contain water for longer periods of the year are most valuable as they can support both early and late breeders. The value of temporary ponds for amphibians is also increased where there are high numbers of other temporary ponds, with complementary hydro-periods, in the surrounding area. The species richness of temporary ponds falls significantly if they are converted into permanent irrigation reservoirs, as is increasingly the case in parts of southern Portugal and Spain (Beja and Alcazar, 2003). Conversely it has been found that temporary ponds in the UK are not as species-rich as naturally occurring permanent ponds (Collinson et al., 1995). Although temporary ponds occur more frequently and are better researched in the warmer climates of Southern Europe, they are also a valuable habitat in Northern Europe, and there is evidence to suggest that many support nationally rare species of aquatic organisms, particularly invertebrates (Nicolet et al., 2004; Collinson et al., 1995).

The management of land surrounding farm ponds and the adjacent vegetation can influence its biodiversity value. For example, pipistrelle and Daubenton’s bats tend to prefer feeding from large ponds with less overhanging vegetation that they can travel to along woodland edges and rivers (Downs and Racey, 2006). Ponds with clear water have a higher diversity of aquatic species. Clarity of water has been found to increase when ponds are surrounded by trees or woodland and to reduce where stock has access to the pond (Declerck et al., 2006). A study of trends in abundance of brown frogs (Rana arvalis and temporaria) in farmland ponds in Sweden found only one species, R. temporaria, in ponds in cropped fields and identified a reduction in abundance over the 17 years of the study, but did not identify the cause of the decline. Conversely, the study identified positive trends in abundance of both frog species in ponds on less intensively used land, such as pasture (Loman and Andersson, 2006).

Streams and any margins adjacent to streams

Streams and their margins can act as wildlife corridors facilitating movement of species between fragmented habitats and between feeding and breeding sites, and provide preferred flightlines for some species of bats (Kettunen et al., 2007; Downs and Racey, 2006).
Riparian strips have been found to provide an important habitat for many species of flora and fauna, particularly bird species. Two studies in arable areas of southern Quebec, Canada, found that riparian strips with trees and tall shrubs have the highest biodiversity value, exhibiting higher bird species richness and abundance than less diverse strips (Jobin et al. 2004; Deschênes et al. 2003). Streamside margins are valuable as a habitat in their own right, supporting different species complexes to either the stream itself or adjacent terrestrial habitat, but they are also often important for reproduction and recruitment, as illustrated by a UK study which found that aquatic invertebrate species attach their eggs to marginal vegetation (Harrison, 2000).

**Fallow Land**

Long-term fallow periods of several years provide relatively stable habitats which contribute to the maintenance of plants, invertebrates and birds characteristic of arable landscapes, such as the steppic arable systems of Portugal. The recently disturbed soil and small amounts of lost harvest associated with first year fallow provides an important foraging habitat for many seed eating birds in winter (Diaz and Telleria, 1994). One study of the little bustard in the Iberian Peninsula found that the birds preferred recent fallows and grassy vegetation (Silva et al., 2004), whilst another of the great bustard in southern Portugal identified a preference for a rotational crop system that included cereals and fallow (Moreira et al., 2004).

The length of time fields are left fallow varies in different regions of Europe, particularly according to soil type (Boatman et al., 1999). In Portugal, the intensification of arable farming, often associated with the introduction of irrigation, has led to the abandonment of fallows, creating a more uniform landscape lacking the flowering plants which are often abundant in fallows and low input arable crops (Boatman et al., 1999; Pineda and Montalvo, 1995).

Mandatory set-aside under the Common Agricultural Policy has been an important source of fallow land, both rotational and non-rotational. A Swedish study of the effects of set-aside policy on resident and migratory bird species identified increases of populations of four migratory bird species: lapwing (Vanellus vanellus), skylark (Alauda arvensis), starling (Sturnus vulgaris) and linnet (Carduelis cannabina) during the period following the introduction of set-aside, but no clear relationship for the populations of resident bird species (Wretenberg et al., 2007).

A number of studies have shown the importance of set-aside for the conservation of skylark populations. Wilson et al. (1997) found, for example, that breeding success was higher on set-aside than on intensively managed cereals, and Chamberlain et al. (1999) found that set-aside had consistently high rates of occupancy and high densities across the breeding season in a study of the UK. Similar results have been noted by Browne et al. (2000), Mason and Macdonald (2000) and Eraud and Boutin (2002). Watson and Rae (1997) found that set-aside fields in Scotland held more breeding species and higher densities of waders, partridges and skylarks than fields in crop. A positive relationship between corn buntings and set-aside land was identified in a study by Brickle et al. (2000) which focused on the South Downs in England. A study of arable farming in Sweden (Berg and Part, 1994) also found that whinchats and common whitethroats are positively associated with set-aside. More broadly,
Henderson *et al.* (2000), found that rotational and non-rotational set-aside supported higher densities and more species of birds than fields of wheat, brassicas, root crops and seed rye.

Evidence from Germany shows set-aside areas can benefit insect and spider populations such as butterflies, honeybees or arthropods as well as small mammals such as hares and mice (Schindler 2004, Muchow *et al.*, 2007, Bürki & Pfiffner 2000, Joest 2006/07, Lemke *et al.*, 2000, Wiedemeier & Duelli 2000, Grice *et al.*, 2007). According to Diekötter *et al.* (2006), fallow land has a positive effect on the population of bumblebees (*B. muscorum*).

The biodiversity impacts of set-aside have been relatively well studied in the UK with respect to birds and to a lesser extent with respect to mammals and higher plants. From a review of such studies Hodge *et al.* (2006) concluded that the likely biodiversity benefits included:

- Possible benefits for nationally scarce arable plant species, but little evidence of this in practice;
- Clear benefits of early naturally regenerated set-aside for breeding birds;
- Clear benefits to wintering birds from crop stubbles and weed seeds;
- Benefits to small mammal species (e.g. voles) from long-term set-aside, and thus benefits to their predators; and
- Benefits to insect and other invertebrate communities, which tend to increase with set-aside age.

An analysis of 127 studies from Europe and North America found that the number of species of birds, insects, spiders, and plants is higher (by 1-1.5 standard deviation units) on set-aside land, as are population densities (by 0.5-1 standard deviation units) (Buskirk and Willi, 2004). Larger and older plots were also found to protect more species and have higher population densities. Set-aside land was also found to be of greater biodiversity value in countries with less intensive agricultural practices and higher fractions of land removed from production, although arguably it is of equal, if not greater importance, in intensively farmed landscapes (Hodge *et al.* 2006).

**Semi-natural Patches on Farmland**

Some farmland landscapes retain small patches or relicts of semi-natural habitat because these may be difficult or uneconomic to farm, e.g. because they are on very steep, rocky, wet, dry or saline ground. As a result such habitats may have retained their natural physio-chemical characteristics such as nutrient-poor or waterlogged soils, which may never have been disturbed by cultivation or affected by herbicides or fertilisers, for example.

Thus such patches may contain very valuable near-natural or semi-natural vegetation communities, potentially including a number of habitats of Community interest (see Annex 2). The patches of habitat considered by this study are in most cases unlikely to be sufficiently large to merit designation as an SAC in their own right. However, they could be designated Natura 2000 features within a larger SAC.

Patches of semi-natural habitats and other unutilised agricultural will also be of considerable value to a very wide range of associated species. This is because such
habitats tend to hold a wide variety and abundance of food sources, provide cover for nesting and resting and are undisturbed by agricultural operations. For example, where unutilised land occurs on boggy or wet ground it can be a valuable feeding site for wading birds (where vegetation is not too tall) and reed buntings (UKBAPSG, 1998).

As discussed above, although small patches of such habitats may not be of high quality (for example, as a result of external influences such as spray drift or hydrological interference) they may help to sustain metapopulations of associated species. Furthermore, they may provide important stepping stones for longer-distance dispersal and migrations.

Uncultivated patches on arable land can provide important nesting sites for ground nesting birds such as skylarks. In England, the creation of 4 x 4 metre bare patches in winter cereals at a rate of two per hectare improves skylark productivity by about 50 per cent despite only taking up 0.32 per cent of the total field area (Momenta and Natural England, 2008).

**Abandoned Land**

In general, the cessation of agricultural management enables natural processes to take over, leading to successional habitat changes. These habitat changes vary but typically start with the growth of rank grassland and shrubs, followed by scrub and eventually forest. Land abandonment results in a reduction in grassland and arable habitats (particularly in low intensity marginal farming areas) and an increase in scrub and forest in the landscape.

Whether these changes are beneficial or detrimental largely depends on local conservation priorities. In predominantly agricultural areas small-scale abandonment can lead to increases in habitat and species diversity that can be beneficial. In fragmented landscapes abandonment may provide opportunities for managed habitat restoration projects (such as ‘rewilding’ in the UK), which could help connect isolated habitat patches.

On the other hand, large scale abandonment can lead to declines in habitat heterogeneity and species diversity across the landscape. This will be particularly detrimental where it affects habitats of high natural value, such as semi-natural grasslands (for example, Alpine meadows). Many species of high conservation value depend on such semi-natural habitats and may be of higher conservation importance than most of the generalist species that are likely to benefit from scrub and young forest habitats. In the longer term, i.e. centuries, naturally regenerated forests may gain high ecological values, though these may be impacted by the effects of climate change. Therefore, the impacts of land abandonment on functional connectivity and other biodiversity conservation issues need to be evaluated on a case-by-case basis, taking into account short-term and longer-term conservation goals at local, regional, national, EU and global levels and the requirement to provide an adaptive response to climate change.
Research into the effects of abandonment of limestone grassland on plant diversity in southern Germany identified a clear decline in plant species richness, from a starting point of 170 species, through three successional phases spread over 30 years:

- ‘early abandonment’ with initial litter accumulation: 145 species recorded;
- ‘late abandonment’ with scrub accumulation: 50 species recorded; and
- ‘very late abandonment’ with woodland development: 10 species recorded (van Dijk et al., 2005).

In contrast to above ground biodiversity, succession towards scrub and woodland on abandoned land can increase soil biodiversity (Holden et al., 2007).

In areas with poor soils on steep terrain in semi-arid areas where water retaining features such as terraces and walls are also lost due to neglect, biodiversity may be lost if new vegetative cover is unable to establish itself (Lesschen et al., 2006; Dunjo et al. 2003; Poyatos et al., 2003).

Aside from changes in the number of species, a change in the types of species is an inevitable result of abandonment as those associated with open and agricultural habitats decline and those associated with scrub and woodland increase (Clayden, 2002; Backshall et al., 2001). This is likely to be negative in conservation terms. Abandonment of arable land in predominantly grassland or moorland landscapes can result in the loss of feeding places for wintering birds such as geese, and of breeding sites for birds of European importance, such as corn bunting and ortolan bunting.

In Spanish Montados abandonment has been found to lead to rapid establishment of scrub cover resulting in the loss of the diverse flora associated with arable rotations (Boatman et al., 1999). In Northern European heather moorland, the encroachment by trees and scrub that is associated with abandonment can lead to the loss of birds characteristic of open moorland that are of international conservation concern (such as golden plover and dunlin), and their replacement by more common woodland birds (such as wren and whitethroat) (Clayden, 2002; Usher and Thompson, 1993). A study of abandoned farmland in central Italy found a decline in the abundance of three passerine bird species that were associated with features that deteriorated or disappeared after abandonment, such as hedges, pastures and field margins (Scozafava and De Sanctis, 2005).

Abandonment of extensively managed grassland would have negative effects on a number of bird species of global conservation concern, including: partridge (*Perdix perdix*), quail (*Coturnix coturnix*), blacktailed godwit (*Limosa limosa*), skylark (*Alauda arvensis*), red-backed shrike (*Lanius collurio*), lesser grey shrike (*Lanius minor*) and ortolan bunting (*Emberiza hortulana*). Conversely the early stages of succession on abandoned land are likely to benefit other birds, also of global conservation concern, such as corncrake (*Crex crex*), monatgu’s harrier (*Circus pygargus*) and lesser spotted eagle (*Aquila pomarina*) (van Dijk et al., 2005).

The greatest biodiversity gains from abandoned land are likely to occur when native species colonise the land and where the position of the abandoned land enables it to link existing native scrub or woodland (Peterken, 2002). The gains are also likely to be greater where small parcels of land are abandoned in intensively used landscapes, thereby increasing landscape heterogeneity and species diversity, rather than across...
large areas of high nature value farmland, thereby potentially endangering associated species (Kettunen et al., 2007).

Small Areas of Woodland

Small areas of woodland will benefit those woodland species that can either survive in small fragments or can make use of a network of small fragments, primarily highly mobile species such as butterflies and birds. Small pockets of woodland on farmland are likely to benefit declining species of European woodland birds, such as lesser spotted woodpecker (Dryocopus martius) and Eurasian wryneck (Jynx torquilla) (Gregory et al., 2007). New farm woodlands in the UK have been found to be particularly valuable for small mammals, particularly harvest mouse (Micromys minutus) and wood mouse (Apodemus sylvaticus), with much higher population densities than surrounding farmland or hedgerows (Moore et al., 2003). Field copses of 1 ha are known to host the eleven most abundant bird species in Germany (BSTELF, 1996). According to the Romania case study (Arblaster, 2008) some patches hold trees of conservation importance as they are semi-natural eastern steppic species - such as southern oak species, eastern hornbeam, smoke bush, St. Lucy’s cherry - which are remnants of cleared primeval forest.

Small farm woodlands are important as a habitat for woodland and woodland edge species, and as refuge and ‘stepping stone’ habitats. Farm woodlands have a disproportionately large value for species that utilise the woodland edge, due to the large edge length provided by small patches. For example, new farm woodlands in the UK have been found to be particularly valuable for small mammals, particularly harvest mouse (Micromys minutus) and wood mouse (Apodemus sylvaticus), with much higher population densities than surrounding farmland or hedgerows (Moore et al., 2003). Priority species associated with woodland edges include Grey Partridge (Perdix perdix) and Pipistrelle bat (Pipistrellus pipistrellus).

Traditional Orchards

A summary of the literature outlining the biodiversity benefits of traditional orchards in Europe was undertaken by Natural England (2008). The key findings are provided in Box 5-2, along with the original references provided by Natural England. In short, traditional orchards provide valuable habitats for birds, mammals and insects, and deadwood often found on old orchard trees can support many species of insects.

Common Land

Common land includes some of the most important sites for nature conservation in Europe. In England and Wales, for example, common land is largely covered (57 per cent) by the highest national nature conservation designation, Site of Special Scientific Interest, and two thirds of the area is comprised of Biodiversity Action Plan Priority Habitats (Acid Grassland, Dwarf Shrub and Bog) (Aitchison et al., 2000). The forest commons of Slovakia are considered to be of great importance for nature conservation and an essential component of the environment (Sulek, 2006).
Box 5-2: Summary of Biodiversity Benefits of Traditional Orchards.

A survey of four orchard areas in Rheinland-Pfalz, Germany, found 2,391 species, 408 of which were rare and/or endangered (Simon, 1992).

A survey of three small orchards in Worcestershire, England recorded 1,868 species, 61 of which were rare and/or threatened (Smart and Winnall, 2006). Taxa particularly suited to the habitat features of the ecosystem type are epiphytic lichens and bryophytes (Röller and de Bruyn, 1997, Lush et al., in prep.) and wood-decay (saproxylic) invertebrates (Robertson, 2006; Bavaria, Staatsministerium für Landesentwicklung und Umweltfragen, 1994).

The vegetation of the orchard floor may include varied and rare vascular plant flora or grassland fungi (Bautz, 1996; Robertson, 2006; Bavaria, Staatsministerium für Landesentwicklung und Umweltfragen, 1994).

The bird fauna of traditional orchards includes species declining in certain European countries or more widely, such as lesser spotted woodpecker *Dendrocopos minor*, wryneck *Jynx torquilla*, hoopoe *Upupa epops*, woodchat shrike *Lanius senator*, great grey shrike *Lanius excubitor* and little owl *Athene noctua* (Höntsch, 2005; Vogrin, 1997; Müller et al., 1988, Bitz, 1992).

Mammals and amphibians requiring mosaics of habitats are also present including species listed in Annex 2 of the EU Habitats Directive, for instance greater horseshoe bat *Rhinolophus ferrumequinum* (English Nature, 2000) and great crested newt *Triturus cristatus* (Smart and Winnall, 2006).

Fruit varieties are part of the agricultural biological diversity of traditional orchards. In Germany, most of the 1,400 German apple (*Malus*) varieties are found exclusively in traditional orchards (Herzog, 1998). The traditional perry pear (*Pyrus*) orchards of Gloucestershire, England have over 100 pear varieties (Luckwill and Pollard, 1963).


*Drovers’ Roads*

Drovers’ roads are regarded as important habitats in their own right and there is also evidence to suggest they act as ecological corridors (Bunce et al., 2006). However, further research is required in order to determine the present day biodiversity value of drovers’ roads and their contribution to ecological corridors. Drovers’ roads are also important components of extensive grazing systems as they enable low intensity grazing activity to take place on high mountain, remote and typically high nature value pastures.

5.3 Soil Quality

5.3.1 Overview

Farmland features help to address threats to soils, including erosion, a decline in organic matter and landslides. Linear features, such as walls, hedges and lines of trees are particularly valuable in helping to reduce erosion, where they occur across run-off and erosion pathways (Pretty, 1998). Trees, woody linear features, walls and terraces can all help to prevent landslides and have long been used to stabilise agricultural soils in steep and mountainous areas. However, with constructed features such as
walls and terraces, their capacity to prevent landslides depends on sustained management and is soon lost if management ceases, within ten years in certain cases (Poyatos et al., 2003).

Patch features such as fallow land, common land, unutilised agricultural land and small patches of woodland may help to improve soil structure and organic content. They can all serve to enhance soil biodiversity, which in turn can have a positive effect on soil structure. These improvements in organic matter and structure can in turn help to prevent run-off and soil erosion due to increased filtration and prevention of surface capping (Pretty, 1998). Finally, features such as field margins and buffer strips which allow leguminous plants to flourish, can help to boost soil fertility. Trees, hedges and small patches of woodland can all help to stabilise soils and reduce the risk of landslides in steep terrain.

Abandoned land appears to have mixed effects on soil quality depending on the context. Where there is fertile soil, adequate rain and fairly level terrain, abandonment leads to improved vegetation cover, reduced erosion and increased soil organic matter. However in semi-arid situations with thin, poor soil, especially when in steep terrain, abandonment can lead to severe problems of soil degradation, erosion and landslides.

Hedgerows

Woody linear features, such as hedges and lines of trees can help to reduce wind and water borne soil erosion, particularly where running along contours, and reduce the risk of landslides in steep terrain (Agra-CEAS, 2002; Marshall and Moonen, 2002). Hedgerows have a particular value in reducing wind borne soil erosion, particularly where hedges are tall and dense and occur in otherwise open, flat landscapes characterised by light soils and high winds. The shelter effect of a hedge extends for a horizontal distance that is ten times the height of the hedge. According to the French case study (Poinereau and Coulon, 2008), hedgerows have a wind break effect over a zone sixteen times their height, reducing windspeed by 60 per cent and evaporation by 35 per cent, thereby reducing potential damage to crops, sheltering livestock and reducing soil erosion. Two Danish studies have demonstrated the benefits hedges can provide in managing soil erosion on sandy soils (Olesen, 1979; Aslyng, 1976).

Terraces

Terraces are widely used in steep terrain in Southern Europe to facilitate cultivation and to minimise soil erosion. They are particularly important for minimising erosion where permanent crops such as olives are grown (Leyva et al., 2007).

Ponds

If they occur on run-off or erosion pathways, ponds can help to reduce soil erosion, although this could reduce the environmental value of the pond itself through siltation and eutrophication (Fiener et al., 2005).

Fallow Land

Fallow land can help to improve soil structure and organic matter, particularly as it can increase soil biodiversity (Pretty, 1998).
Abandoned Land

In general terms, abandonment will improve the quality, fertility and structure of soils, through accumulation of organic matter. However, while this is true for soils capable of developing good vegetation cover after the cessation of management, other soils that are thin and or infertile may experience soil degradation under abandonment, as found by a study in North East Spain (Dunjo et al., 2003). In situations were terraces are lost and vegetation is prevented from establishing itself due to an unstable soil surface, soil degradation may occur.

Land abandonment may have significant impacts on erosion and sedimentation processes. Whether these are positive or negative will depend very much on context and the changes in plant cover and landform when compared to those of the previous farming system. In some cases, succession of semi-natural vegetation after abandonment might increase plant cover, improve soil quality and reduce run-off and erosion, as found by studies in the Spanish Pyrenees. In other cases, water and soil conservation structures, such as terraces, may collapse as a result of abandonment and lead to an increase in run-off and erosion, as found by studies in north east and south east Spain (Lesschen et al., 2006; Lasanta et al., 2001).

Research in a semi-arid area of south east Spain found that abandoned land experienced much higher rates of soil erosion than cultivated land due to the quicker concentration of run-off due to crust formation and reduced surface storage capacity (Lesschen et al., 2006). In Southern European systems, such as the Portuguese Montados, greater vegetative cover may initially protect soil from erosion, but it also considerably increases the risk of fire once again exposing the soil to erosion (Andreu, 1995). Land abandonment in semi-arid areas of Southern Europe is likely to lead to increased soil erosion, at least in the short term, for the reasons described above and because ground cover is likely to be low for the first year or so after abandonment.

Where land does become afforested the character of the soil will change. Where abandonment leads to succession of heathland to woodland on peat soils in Northern Europe, it results in conversion of peat soils (podsols) to brown soils, increased pH and increased soil fertility (with increased levels of available nitrogen, calcium and phosphorous) (Atkinson, 1992; Grime, 1989). Afforestation of abandoned land can also help to reduce soil erosion and landslides as the trees stabilise the soil, intercept more rainfall and return more water to the atmosphere through evapotranspiration (Poyatos et al., 2003).

5.4 Water Quality

Linear farmland features are of particular value for water quality where they are positioned across run-off pathways. Linear features such as hedges, lines of trees, buffer strips and riparian strips help to reduce run-off of soil, thereby reducing siltation and eutrophication of water bodies, and leaching of nutrients, particularly nitrogen. The length and width of the linear feature can be important, with bigger features providing greater benefits.

Patch farmland features, including fallow land, unutilised agricultural land, common land and woodland patches, can also benefit water quality if in reasonable proximity of the water feature, partly due to their capacity to improve soil quality, thereby
avoiding run-off and sedimentation. Their vegetative cover increases water retention, absorption and evapotranspiration, further reducing run-off and helping to mitigate flooding events. Their benefits for water quality are greatest where they either occur adjacent to water bodies or on major run-off or erosion pathways.

**Hedgerows**

Hedgerows have the potential to improve water quality by reducing the need for pesticide application to adjacent arable fields as hedges can support natural predators of crop pest species (Marshall and Moonen, 2002; Altieri, 1999). A UK study found that the creation of new hedges along all farm boundaries reduced the loss of phosphorous by fifty per cent on sandy loam soil and by ten per cent on clay loam (Cuttle et al., 2006).

**Lines of Trees**

Studies in Estonia and England have found that wooded buffer strips are more effective than grass strips at reducing loss of nitrogen and phosphorous from fields. It has been suggested that the vegetation does not play an active role in nutrient retention in winter, rather it supplies soil micro-organisms with carbon necessary for denitrification, therefore reducing the nitrogen (but not phosphorous) loading of soils (Mander et al., 1997; Haycock and Pinay, 1993, cited in Marshall and Moonen, 2002).

**Field Margins and Buffer Strips**

Cereal field margins and grass buffer strips have been found to benefit water quality in the following ways (IEEP, 2008; Dorioz et al., 2006):

- Acting as a barrier to pesticide drift;
- Acting as a barrier to surface movement of water/sediments from fields to watercourses;
- Reducing leaching of nutrients (nitrates and phosphates);
- Reducing Biological Oxygen Demand and ammonium-N levels in surface water by intercepting surface run-off).

The location, size, composition and management of buffer strips can influence their effectiveness at reducing losses of nitrogen to surface water. To maximise their efficiency in reducing run off, buffer strips obviously need to be located where they will intercept the run-off pathways. The optimal size depends very much on context. It has been suggested that to control diffuse run-off, buffer strips of at least ten metres in width are needed for hill slopes of less than 100 metres, and buffer strips of at least 20 metres for hill slopes of more than 100 metres (Lacas et al., 2005). A Belgian study (Cors and Tychon, 2007) found that due to the higher rates of denitrification associated with higher carbon levels, old unmown grass buffer strips reduced nitrogen losses from a cultivated field to a greater extent than a six year old reseeded buffer strip. This suggests that permanent buffer strips are more effective tools for remediation of diffuse pollution than temporary ones.

Estimates of the effectiveness of narrow grass buffer strips in removing surface water nutrients and pesticides include the following:

- A Dutch study found that 3.5 metre buffer strips cut direct emissions to surface water of nutrients by 50 - 89 per cent and pesticides by 75 - 95 per cent (Sloots and van der Vlies, 2007).
Chapter 5 Environmental Benefits Provided by Farmland Features

- An Italian study found that a six metre wide buffer (five metres grass, one metre trees) reduced groundwater nitrate levels by between 60 - 90 per cent and phosphorous levels by 100 per cent (Borin and Bigon, 2002).
- 7.1 metre grass buffer strips were found to remove 80 per cent of total nitrogen and 62 per cent of nitrates in an English study (Lee et al., 2003). The addition of a 9.2 metre woody buffer increased this to 94 per cent of total nitrogen and 85 per cent of nitrates.
- Grass buffer strips of one, four to five and 10 metres width were found by van Djik et al. 1996 (cited in Marshall and Moonen, 2002) to reduce sediment discharge by 50 - 60, 60 - 90 and 90 - 99 per cent respectively.
- Strips over 50 metres wide result in the removal of around 75 per cent of nitrogen (Mayer et al. 2005).

As well as removing inputs that have entered groundwater from adjacent land, buffer strips also help to prevent drift of chemicals into water bodies and boundary features. De Snoo’s (1999) study of the environmental benefits of three metre and six metre unsprayed field margins found that three metre margins were effective at reducing pesticide spray drift into boundary ditches, reducing drift by 93 per cent, and with six metre margins no pesticide drift could be detected in the ditch.

**Ponds**

Ponds, both artificial and natural, can help protect the water quality of other waterbodies if they occur in run-off or erosion pathways. They can particularly help to reduce sediment load to other waterbodies. A study of artificial “detention” ponds in Germany found that they trapped between 54 - 85 per cent of received sediments (Fiener et al., 2005).

**Fallow Land**

One of the ways in which fallow land can improve water quality is simply by reducing the amount of inputs applied to agricultural land. This was acknowledged as being a particular benefit of compulsory set-aside. Land left as fallow under set-aside also helped to improve water quality by actively buffering watercourses from surface nutrient and soil run-off when appropriately located (IEEP, 2008).

The value of fallow land as a filter of surface water pollutants depends very much on the density and type of green cover on the land. In its initial stages, after harvest and before vegetation has established, fallow land can constitute a serious water pollution hazard due to increased run-off and soil erosion. However, once green cover has established, fallow land is of greatest benefit to water quality where it occurs across an erosion or run-off pathway and adjacent to a water body (Cumulus Consultants, 2007).

**Abandoned Land**

The influence of abandoned land on water quality is likely to be similar in many ways to that of fallow land with green cover, in terms of reducing the area of land receiving inputs and reducing run-off. The effect is likely to be closely linked to context and depend on the extent to which soil erosion occurs following the cessation of management.
Small Areas of Woodland

Woodland patches remove nutrients from agricultural soils and hold nitrogen, phosphorous and potassium, thereby helping to reduce the leaching of nutrients to water bodies (Corry and Iverson Nassauer, 2002).

5.5 Climate Change

5.5.1 Overview

Farmland features are likely to provide two distinct types of benefits in relation to climate change. First, in terms of mitigation and reduction of greenhouse gas emissions and, second, in terms of adaptation to the effects of climate change.

Any farmland features that increase below and/or above ground biomass will serve as a carbon store. Between 1990 and 1998 the terrestrial biosphere of Europe acted as a net carbon sink, absorbing between seven and ten per cent of annual anthropogenic CO₂ emissions. Figures differ vastly between countries, with some acting as significant carbon sinks (Austria, Bulgaria, Germany, Norway, Romania, Slovakia, Slovenia, Sweden, Switzerland) and others acting as net carbon sources (Denmark, Estonia, Ireland, Moldova, the Netherlands) (EEA, 2004). Many of the farmland features reviewed here could have a valuable role in boosting carbon sequestration, if their area were to be increased or their management adjusted. On the other hand, removal of farmland features could reduce the total carbon storage capacity.

Any area of land that does not receive active management and/or inputs could have benefits in terms of reducing greenhouse gas emissions as it does not give rise to the emissions associated with machinery use, livestock production, manure storage and use, nitrogen fertiliser production and use and the transport and/or storage of associated agricultural produce. Carbon sequestration can be promoted by retaining existing features and by switching from arable land to land uses with higher carbon inputs or reduced disturbance (such as grassy margins), although regional variations in soil type, sink saturation (with the greatest benefits usually occurring soon after a change in land use or management) and a need to secure long term, ideally permanent, land use or management change (as soil carbon is lost more rapidly than it is accumulated following reversion to former types of agriculture management or land use) will influence soil carbon sequestration (ECCP, 2000a; 2000b).

The climate change phenomena that farming systems, ecosystems and communities in Europe are likely to experience and need to adapt to will vary between different regions of Europe. In Southern, Central and Eastern Europe, climate change is anticipated to increase temperatures and decrease rainfall, causing water shortages and a corresponding decrease in crop productivity and an increase in wildfires. For Northern Europe, climate change is predicted to bring increased crop yields but more frequent winter floods, increased occurrence and severity of pests and diseases, endangered ecosystems and increasing ground instability (IPPC, 2007b). The biggest changes faced by terrestrial ecosystems, and already occurring in some cases, is a movement of plant and animals species, generally northward or to higher altitudes, and changes in plant phenology resulting in resource asynchrony such as lack of key food sources at critical times of the year (EEA, 2004).
Although academic and policy literature on agricultural adaptation to climate change focus on major changes in infrastructure and technology and changes in cropping patterns and crops types (e.g. FAO, 2007), there is also a potential role for farmland features. Those features that help conserve and regulate water resources, such as ponds, ditches, trees and hedges, and those that help maintain soil quality and reduce erosion will help both farmers and ecosystems in agricultural areas adapt to a changing climate. In broad terms, any of the farmland features that increase soil organic matter could contribute to both mitigation and adaptation. Increased soil organic matter increases soil carbon sequestration, improves soil structure and stability, as well as the capacity of soil to absorb and store water. This provides benefits in terms of plant growth, particularly in semi arid areas of Southern and Eastern Europe, and reduced flooding, particularly in areas of high precipitation in Northern and Western Europe (FAO, 2007). Well established fallow land and uncultivated areas will be particularly important in this respect.

Farmland features can help wildlife in agricultural landscapes adapt to climate change by potentially providing functionally connected habitats, which may increase the resilience of species populations and, where necessary facilitate movements in response to changing climatic conditions. Farmland features may be beneficial in allowing movement over short distances, but there is a question as to how useful they will be for dispersal over the large distances which might be necessary for species to adapt to climate change (Bennett, 2003). The remarks made with respect to functional connectivity in Chapter 5.2.1 are important here.

The role of farmland features in maintaining high biological diversity in agricultural landscapes is important under a changing climate. It is commonly argued that diversity (in terms of genes, species, ecosystems, and landscapes) increases resilience to changing environmental conditions and stresses (FAO, 2007), and in agricultural landscapes, the features reviewed here are often the main source of such diversity. Features, such as hedges, woodlands and buffer strips that support natural predators of crop pests could be valuable in helping agricultural systems to adapt to increased occurrence and severity of pest outbreaks. A high diversity of plants in farmland features may also help animals adapt to changes in plant phenology, giving them alternative food sources if the flowering or fruiting events of their normal food plants become out of synch with their feeding requirements. High diversity natural features may also be able to withstand better the invasion of / colonisation by exotic alien species, which are predicted to proliferate with climate change (Prieur-Richard et al., 2004; Hector et al., 2001). However, any intention to develop new features should take into account potential risks, such as encouraging the spread of alien invasive species.

**Hedges and Lines of Trees**

Trees and shrubs can have an important role in mitigating the impacts of extreme weather events as they not only help to maintain and restore soil fertility and conserve biodiversity, but they also improve the microclimate by buffering winds, regulating the water table, providing shade or shelter to crops, livestock and wildlife and can even help to stabilise coastal areas (FAO, 2007). They could also provide habitat corridors to help species disperse in response to climate change, but in most landscapes, hedges and lines of trees would only provide short distance corridors that could be insufficient to follow the shifts in climate. The conversion of arable land to
woodland, through deliberate afforestation or natural regeneration, is one way to sequester carbon (ECCP, 2000b), with the afforestation of former agricultural land estimate to sequester carbon at 0.6 t C/ha/yr during the first 10-20 years after planting (ECCP, 2000c).

Grassy Margins and Buffers

The ECCP Working Group on Sinks Related to Agricultural Soils (2000b) state that those measures which involve switching from conventional arable agriculture to other land-uses with higher carbon inputs or reduced disturbance offer the most potential for carbon sequestration. This includes the conversion of arable land to grassland, and in particular the expansion of field margins, on which grass, and possibly shrubs or trees, should be grown.

Table 5-1: Carbon Sequestration Potential of Different Arable Margin Options.

<table>
<thead>
<tr>
<th>Land use conversion</th>
<th>Soil Organic Carbon accumulation rate (% yr(^{-1}))</th>
<th>Above ground biomass C accumulation rate (t C ha(^{-1}) yr(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arable to grass margin</td>
<td>1.3</td>
<td>0.2(^{a})</td>
</tr>
<tr>
<td>Arable to hedgerow</td>
<td>1.23</td>
<td>1.0(^{b})</td>
</tr>
<tr>
<td>Arable to tree strip</td>
<td>1.17</td>
<td>2.8</td>
</tr>
</tbody>
</table>

\(^{a}\) Only during first year of change; \(^{b}\) only during second year of change.

Source: Falloon et al., 2004.

A UK study (Falloon et al., 2004) examining the carbon sequestration and storage potential of different types of arable margins, based on existing literature and estimates, found that strips with trees had the greatest potential. The carbon sequestration potential of buffer strips (see Table 5-1) will be highest during establishment of the strips, primarily the first year for grass strips, the first five years for hedges/scrubby buffer strips and longer for wooded strips. The carbon storage potential, calculated for an average UK arable farm of 260 hectares over 50 years, ranged from approximately 700 t C for two metre grass margins, to approximately 7500 t C for 20 metre margins with trees (2 metres trees, 18 metres grass). Margins with hedges were intermediate in potential, offering more potential than pure grass but less than margins with trees.

A change from arable to grass strips would significantly reduce N\(_2\)O emissions, by up to 1,298 kg C equivalent ha\(^{-1}\) yr\(^{-1}\), and would therefore further increase the climate change mitigation potential of buffer strips (Falloon et al., 2004).

Ditches

Ditches that can be used to maintain high water levels in peat based soils can help prevent the loss of carbon from such soils, thereby both helping to mitigate climate change by preventing carbon emissions and helping to adapt to climate change by preventing the drying out and decomposition of peat soils under a warmer, drier climate (Lloyd, 2006).
Fallow Land

A recent European review of N₂O emissions for different land cover types found that emissions from arable systems are on average 11.8 kg N₂O-N ha⁻¹ yr⁻¹ compared to only 1 kg N₂O-N ha⁻¹ yr⁻¹ for fallow (Machefert et al., 2002). As N₂O is a very powerful greenhouse gas, the reduction in N₂O emissions from converting arable to grassland would release 1,298 kg C equivalent ha⁻¹ yr⁻¹ (Falloon et al., 2004). In an evaluation of around 60 potential measures aimed at reducing greenhouse gas emissions from agriculture, the ECCP Agriculture Working Group, concluded that the use of set-aside offered the greatest N₂O reduction potential (6.2 Mt CO₂ for the EU-15) (ECCP, 2000a). A UK study (University of Cambridge, 2006) concluded that reversion of set-aside (including fallow land) to arable farming would primarily increase N₂O emissions through changes in the use of inorganic fertilisers, ploughing in crop residues, and emission of N₂O from leaching of agricultural nitrate and runoff.

Uncultivated/Abandoned Land

As discussed above in relation to soil quality, abandonment of agricultural land can lead to an accumulation of soil organic matter. This is important in relation to climate change mitigation as it also leads to an increase in soil organic carbon, although the capacity of soil to accumulate carbon is dependent on the type of soil (for example, clay soils have a higher absorption capacity than sandy soils) (ECCP, 2000b). Allowing natural regeneration to take place offers good potential to sequester carbon (ECCP, 2000b).

A review of studies on land use change and carbon sequestration (Post and Kwon, 2000) summarised findings from a long term study at Rothamstead, England, which found constant soil organic carbon accumulation rates of between 30 and 60 g C m⁻² y⁻¹ for 80 years following cessation of cultivation, as oak forest developed through natural succession. These rates are similar to average rates of accumulation for forest or grassland establishment found by other studies, of 33.8 g C m⁻² y⁻¹ and 33.2 g C m⁻² y⁻¹, respectively (Post and Kwon, 2000).

Small Areas of Woodland

The creation of new woodland patches has significant carbon sequestration potential due to the accumulation of above ground carbon. Some estimates suggest that natural woodland regeneration on previous arable land can result in soil organic carbon accumulation of 3.42 t C ha⁻¹ yr⁻¹ (0.62 t in soil organic carbon, and 2.8 in vegetation C accumulation), and that if applied to 10 per cent of the arable area of Europe, it could sequester 56.05 Tg C per year, approximately 4.5 per cent of European 1990 CO₂ emissions (Falloon et al., 2004; Smith et al., 2000). The overall carbon budget associated with woodland is most favourable where woodland is allowed to regenerate naturally, as there are substantial carbon emissions associated with forestry operations such as machinery used to prepare ground and plant trees.

5.6 State of Knowledge

There is a good level of evidence to show that farmland features provide a number of important environmental benefits. In particular, the biodiversity benefits of farmland features are well understood and grounded in a large body of empirical evidence. The benefits of certain features for soils, water and, in particular, for climate change
abatement are less well understood because the empirical evidence is, at this stage, less comprehensive. Where empirical evidence does exist, it is positive with respect to the benefits farmland features can provide for enhancing soil and water quality and in tackling climate change. There is thus a firm evidence base on which to develop a rationale for policy intervention.

The development of policy measures may benefit from further research. For example, additional work calculating the soil carbon sequestration potential of certain features such as buffer strips may be beneficial to the design of policy options regarding the desired combination of features of different sizes. In turn, this may facilitate the calculation of appropriate payment rates, which could be tied to the level of carbon sequestration.

Policy instruments tend to be designed in such a way as to achieve a particular environmental outcome. Indeed, a robust data source on the biodiversity benefits of farmland features allows policy instruments to be developed which explicitly target outcomes for biodiversity. This is part of good policy design, in theory increasing the relevance, effectiveness and efficiency of particular instruments. Whilst further knowledge of the interdependencies between the types of benefits provided by farmland features may be desirable, this should not preclude the development of policy instruments that are constructed in such a way so as to support the multiple environmental benefits that farmland features provide and which respond to the environmental priorities affecting different parts of Europe.
6 Pressures on Farmland Features

6.1 Introduction

In this section, a range of pressures on farmland features are identified drawing on the evidence gathered through the case studies and other literature. In turn, these pressures emanate from broader drivers of change, which result in particular outcomes for farmland features with a range of environmental impacts. A number of driving forces, including certain drivers which are exogenous to the EU, are identified which precipitate a process of agricultural restructuring, leading to changes in farm management decisions and practices. The process of agricultural restructuring is geographically specific. A restructuring trajectory typical of some parts of Europe is characterised by a gradual progression to fewer, larger farms, the increasing specialisation and regional concentration of production and a decline in the agricultural labour force and skills base. The gradual cessation of agricultural management and eventual land abandonment and associated loss of labour and skills is another restructuring trajectory. Restructuring is an ongoing process that takes place irrespective of changes to policy, although policy often steers the restructuring process in a particular direction or seeks to address the negative externalities associated with it (ECNC et al., 2006). This chain is illustrated in Figure 6-1.

Figure 6-1: Outcomes for Farmland Features Arising from Farm Level Pressures.

In the absence of appropriate policy intervention, the identified farm level pressures are expected to lead to one of four outcomes for farmland features, as follows:

1. Removal of farmland features.
2. Neglect of farmland features.
3. Inappropriate management of farmland features.
4. No change to farmland features.
These outcomes degrade the resource of farmland features by altering the distribution, density, diversity and quality of farmland features, and hence the range and degree of environmental benefits provided. The pressures and associated outcomes are context specific. Hence the level of threat to farmland features, the resulting environmental impact and the ongoing capacity of farmland features to provide environmental benefit varies across Europe and between different farming systems.

In the following sections, the connections between global drivers, the resulting pressures at the farm level, the outcomes for farmland features and the resulting environmental impact are described. The implications for the policy response are also discussed.

6.2 Exogenous Drivers

In an increasingly globalised and market-oriented agricultural sector, there are three macro level drivers which will have significant implications for agricultural production in the EU:

1. An increase in the global demand for food.
2. An increase in the global demand for bioenergy feedstocks.
3. Changes to climate and weather patterns resulting in changes to land use and production location.

Whilst there may be some debate as to whether these are the three most important macro drivers, these drivers will influence the long term and ongoing process of agricultural restructuring. The first two drivers will also influence global agricultural commodity prices over the medium term. Price changes affect the economic viability of farms and hence farm level production decisions which, in turn, lead to both changes in land use and the intensity of land use, with implications for farmland features. The effects of climate change on the location and intensity of production requires policy makers to assume a longer term perspective in terms of addressing the implications of climate change. Each driver is briefly described in turn.

An increase in the global demand for food

The demand for food is closely related to population growth and increases in income. The world population is predicted to increase from 6.7 billion in 2007 to 9.2 billion in 2050, with the majority of this growth taking place in less developed countries (UN, 2007). Countries such as China, India and Brazil are currently experiencing moderate population growth rates and high economic growth rates, contributing to a growth in food consumption, particularly of higher value agricultural commodities such as meat and dairy products (OECD-FAO, 2007). This trend is not confined to developing countries. Although the population in the EU and other developed regions of the world is not expected to increase as sharply, EU annual per capita consumption of meat, for example, is projected to increase from 84.5 kg/head in 2006 to 87.2 kg/head in 2014 (DG Agriculture, 2008). The growing global demand for meat and dairy products in turn increases the demand for soya and cereal based animal feed from the arable sector. The increasing demand for food creates an upward pressure on commodity prices, with the resulting market signals influencing farm management decisions regarding the area of land dedicated to particular uses as well as the intensity of land use.
An increase in the global demand for bioenergy feedstocks

The bioenergy sector, particularly biofuels, has created a new market outlet for cereals, sugar and oilseeds. In the EU, demand for wheat, as an ethanol feedstock, is expected to increase twelve-fold between 2007 and 2016. In 2007, less than one per cent of domestic cereal production was used for EU biofuel production (DG Agriculture, 2008), implying that demand for both domestic and imported feedstocks will increase over the next ten years. Currently, the EU accounts for about 60 per cent of global biodiesel production (OECD, 2008). Energy policy affects the demand for bioenergy feedstocks and is discussed in the policy drivers section below. The increasing demand for bioenergy feedstocks creates competition for land between food, industrial and fuel crops, affects commodity prices and the resulting market signals influence farm management decisions such as the area of land dedicated to particular uses as well as the intensity of land use.

Changes to the location of production of agricultural commodities arising from climate change

Climate change is expected to alter agricultural productivity and hence the supply of different agricultural commodities, as well as the location of production. The exact pace and magnitude of climate change, and the resulting impact on agricultural production, is difficult to predict at a global level (Cooper and Arblaster, 2007). Analysis by the IPCC (2007a) shows the potential for global production to grow with increases in local average temperature of one to three degrees Celsius, but to decrease at temperatures above this range. Although future temperature projections vary according to different emission scenarios, a minimum increase of 0.2 degrees Celsius can be expected over each of the next two decades (IPCC, 2007b). This means, for example, that in northern Europe, growing seasons will become longer, although drought will increase the possibility of crop failure in southern Europe.

In the long term, climate change is likely to result in stress on and occasional disruption to the global supply of agricultural commodities, despite any initial gains in yield and increases in production capacity. In the shorter term, adverse climatic conditions may result in harvest failure in different parts of the world. Over the past two years, poor harvests in various parts of the world, attributed to extreme climatic conditions, have impacted on the supply of cereals and resulted in extremely low public and private stocks (DG Agriculture, 2008; FAO, 2008), with knock-on effects for commodity prices. Over time, climate change will affect the capacity of different parts of the EU to produce particular agricultural commodities, resulting in shifts in the location of different production systems and consequential impacts on decisions regarding the area of land dedicated to particular uses as well as the intensity of land use.

6.3 Policy Drivers

Aside from the global drivers of agricultural change, policy drivers within the international arena and at the EU level may also result in pressures which impact on farmland features. In this section, the likely influence of international trade agreements and EU agricultural and energy policy, to the extent they are relevant to pressures on farming systems and farmland features, are discussed. Environmental policy is not discussed here as it is largely designed to alleviate pressures created elsewhere or to provide positive outcomes in the event of market failure. In certain
cases, agricultural or environmental policy may have perverse impacts on farmland features. The role of policy measures in protecting farmland features is discussed in the legislation chapter.

International trade agreements
The preamble to the Marrakesh Agreement that established the WTO in 1994 recognises the importance of sustainable development. The Agreement states that the means to protect and preserve the environment should be enhanced in accordance with the needs and concerns evident at different levels of economic development. As with much of European agriculture expenditure, measures for protecting farmland features must be compatible with the WTO Green Box. In addition, the disciplines established by the Uruguay Round Agreement on Agriculture in 1995 define what may be publicly funded as well as what the payments may cover. The Agreement on Agriculture presaged an increasing liberalisation of agricultural markets and played a vital role in the recent formulation of EU agricultural policy. The present WTO Doha Round will continue in this vein, providing a new agreement is reached concerning market access, domestic support and export subsidies. At the time of writing, in September 2008, the Round is at an impasse.

- The 2003 CAP Reform and the WTO
One of the primary EU responses to international trade commitments during the 2003 reform of the CAP, alongside the commitment to remove export subsidies, was to decouple direct support from production as part of a wider strategy to increase the market orientation of EU farmers. Three EU-15 Member States introduced fully decoupled direct payments, whilst the remainder, along with Slovenia, chose to apply partially coupled payments in a number of product sectors, including arable, sheep and beef. The other new Member States, aside from Malta which applies a regionalised version of the Single Farm Payment, apply the Single Area Payment Scheme, which is not coupled to production. The extent of decoupling is therefore partial.

The implementation of decoupled payments has presented different challenges for different farming systems across the EU, with extensive livestock systems particularly vulnerable. For example, between the period from 2004 and 2006, before and immediately after the introduction of the Single Payment, Member States that apply a fully decoupled Single Payment experienced a greater fall in beef cattle numbers than those that maintained a partially coupled payment (Alliance Environnement, 2007). Although there is a pre-existing downward trend in the EU’s total beef cattle herd, the increasing exposure of cattle farmers to the market may increase the vulnerability of some farming systems with consequences for the management of farmland features and the broader semi-natural habitats in which they are found.

- WTO Green Box Disciplines
The July 2004 Framework Agreement that established the work programme for the Doha Development Agenda, allowed for a review of the Green Box criteria to ensure, amongst other things, that non-trade concerns (such as the protection of the environment) are adequately taken into account. This review has not been a critical component of the Doha Round, and thus the disciplines established in the Agreement on Agriculture continue to set the rules for Green Box payments. Accordingly, domestic support measures must meet the ‘fundamental requirement that they have
no, or at most minimal, trade-distorting effects or effects on production’. The support should be provided through a publicly-funded government programme and not involve transfers from consumers. With specific reference to ‘payments under environmental programmes’ (paragraph 12 of the Agreement on Agriculture), ‘eligibility for such payments shall be determined as part of a clearly-defined government environmental or conservation programme and be dependent on the fulfilment of specific conditions under the government programme, including conditions related to production methods or inputs.’ In addition, ‘the amount of payment shall be limited to the extra costs or loss of income involved in complying with the government programme.’

The payment terms are critical (Swinbank, 2007; Matthews, 2006; Wiggerthale, 2004). If it is deemed appropriate for public payments to be disbursed to those responsible for protecting, maintaining or creating farmland features, the payment made should have, at most, a minimal effect on production (WTO, 2007). The current EU rules for agri-environment payments, set out in Article 39 of Regulation 1698/2005, allow payments to ‘cover the additional costs and income foregone resulting from the commitment made’ and, where necessary, ‘transaction costs’. In the preceding rural development Regulation (Article 24 of Regulation 1257/99), an incentive could also be paid. The current rules are more sensitive to the WTO disciplines, but the extent of flexibility a WTO dispute panel might extend in its interpretation of transaction costs, and of the impact on production of a payment which has been calculated on this basis, is not clear.

The requirements of the Agreement on Agriculture also show that the targeting of payments must be unambiguous if a programme is to be clearly defined. The requirements also underline the need for procedures and tools to determine whether the specified conditions are fulfilled, affirming the need for a robust monitoring and inspection system.

**EU Agricultural Policy**

The CAP remains an important driver of production decisions and land use intensity, but through cross compliance and some rural development measures seeks to provide environmental goods and services such as landscape, biodiversity, and improved soil and water quality, all of which can be provided, at least partially, by well managed farmland features. The elements of the CAP that support farmland features are discussed in the legislation chapter. Notwithstanding other factors such as market conditions and on-going restructuring, there are a number of elements of the CAP which may drive farm level pressures.

Several aspects of SPS/SAPS implementation potentially lead to farm level pressures with implications for the management and protection of farmland features. The impact on farmland features will vary across space, depending on a host of other factors. Relevant aspects include approaches to the calculation of payments, the implementation of full or partial decoupling and the use of Article 69, which are discussed below. The SPS and SAPS eligibility criteria are also relevant but are discussed in detail in Chapter 8.
- Approaches to calculating payments

The method of calculating SPS payments determines how much money individual farmers receive. Payments can be based on historic levels, a regional flat rate or a hybrid of the two. The level of payment received has the potential to affect management decisions at farm level which, in turn, may impact on the protection of farmland features. One argument put forward by Birdlife International (2007) is that where payments are made on a historical basis (as in the case in nine Member States and in Scotland and Wales), then intensive farmers are likely to receive higher payments than farmers which have historically practiced more extensive forms of agriculture. As a result, extensive farmers will have proportionately less capital to spend on the management of farmland features, although there is no guarantee that additional capital would be used in such a way. All other Member States in the EU-15 apply a hybrid model whereby payments either move from a historical to a flat rate basis (dynamic hybrid) over a period of time or fixed proportions of the SPS are based on historical and flat rates respectively (static hybrid). These hybrid models will result in a redistribution of funds between sectors, individual farmers and potentially between regions and are likely to favour areas which have historically been farmed more extensively.

In the new Member States, the total amount of direct payments a farmer receives (either through the SPS or SAPS coupled with CNDPs) are likely to be greater than prior to accession, with payments set to converge with levels in the EU-15 by 2013. The result may be that farmers will have more capital, which in many areas could be invested in modernisation linked to accelerated restructuring, resulting in negative outcomes for farmland features. In other cases, additional capital may enable more marginal farms to remain viable with potentially beneficial environmental effects for the farmland features associated with such farms.

- Decoupling and Partial Decoupling

In principle, the full decoupling of direct payments enables farmers to adjust production in response to market demands. Where market signals are favourable, this could result in changes in farming activity or changes to the level of farming intensity. An increase in the intensity of production may result in the removal of features to increase agricultural area or reduce the condition of features through a reduction or cessation in the management of features, increased stocking densities or increased application of nutrients and pesticides, for example. This underlines the need to protect features and to maintain their environmental quality through a strong regulatory baseline and appropriate standards for Good Agricultural and Environmental Condition.

The partial coupling of payments has been implemented in 13 Member States. Coupled payments to the beef sector are most common, followed by coupled payments to the sheep and goat sector. Where coupled payments exist, producers have an incentive to continue production in the sector concerned. In such cases, the associated farmland features are perhaps more likely to be maintained – or at the very least not removed, particularly if the agricultural function of the feature is retained. However, given other drivers at play, and the extensive characteristics of some of the supported sectors, the receipt of a partially coupled payment itself is unlikely to provide a sufficient guarantee of appropriate and continued management of farmland features. Additional ways to support the management of features in vulnerable
systems are therefore likely to be necessary, particularly as direct payments become further decoupled in the future.

- Article 69

Article 69 contains no specific provision for the protection of farmland features but does enable payments to be directed at specific sectors. Although subject to revision under the CAP Health Check proposals, the present Article 69 payments may be targeted at groups of specific producers within a sector, on the basis of ‘protection or enhancement of the environment’. Although the payments do not specifically require producers to maintain features, the additional payments may increase the viability of production activity and, through ongoing agricultural activity may contribute to the maintenance of associated landscapes. There is no direct relationship between farm viability and maintenance of landscape however, and no obligation beyond any relevant requirements within cross compliance to maintain farmland features. In some cases increasing the viability of less marginal systems could equally lead to the removal of features. Thus far the beef sector has been the main beneficiary of Article 69 payments, although there has been no assessment of the impact of the payments to date.

The causality between the SPS and SAPS and the eventual outcome for farmland features is not straightforward. There will be a lot of variation within a sector, and between regions and production systems in terms of the influence the direct payment system has on farm viability, its relationship with ongoing restructuring trends, and implications for farm management decisions and eventual outcomes for farmland features.

EU Energy Policy

The EU has set a reference value or indicative target of a 5.75 per cent mix of biofuels in transport fuels by 2010\(^{10}\). The proposal for a renewable energy Directive, launched as part of the Commission’s climate and energy package on 23 January 2008\(^{11}\), suggests a binding requirement for ten per cent of energy consumed by road transport to be from renewable sources by 2020. Separately, the proposed amendments to the 1998 Fuel Quality Directive\(^{12}\), if adopted, would be expected to increase demand for biofuel in order to meet a target to reduce the life cycle greenhouse gas emissions from road transport fuels (and that used for non-road machinery) by ten per cent by 2020 (with intermediary targets to ensure a systematic decline).


The adoption of both Directives would lead to an increase in demand for bioethanol and biodiesel (IEEP, 2008b) and the potential conversion of land used currently for food production to the production of bioenergy feedstocks. Since the ten per cent biofuel target was first proposed, concerns have grown over the possible impact of biofuels on world food prices, biodiversity and indirect land use change leading to very large releases of greenhouse gases into the atmosphere. As a result, there have been various proposals to water down the target, to bolster the rigour of review requirements, to tighten environmental safeguards and to include secondary targets to limit the proportion of first generation biofuels that can contribute to the target. It is anticipated that this target will be amended during the legislative process. It is, however, still reasonable to assume that the incentive to increase biofuel production will remain, albeit differently formulated, ultimately influencing farm management decisions such as the area of land dedicated to the production of bioenergy feedstocks as well as the intensity of land use\(^\text{13}\).

### 6.4 Other drivers

There are a number of other drivers, largely outside of the agricultural policy sphere, which may influence agricultural restructuring or land use decisions.

**Increasing technical capacity**

Technological progress and the increasing mechanisation and sophistication of agricultural management increase productivity levels. It is likely to be a particularly significant influence in areas where there has been historic underinvestment in agriculture, especially in the new Member States.

**Rising cost of oil, leading to higher production costs**

The increasing cost of fossil fuels increases the cost of production as a result of an increase in fuel prices and an increase in the cost of fertilisers and pesticides manufactured from fossil fuels. Certain farmers will be able to absorb such costs, and in some cases the costs may be able to be passed on to the consumer. In other cases, this may act to limit intensification trends.

**Demand for built infrastructure leading to the conversion of agricultural land to artificial surfaces.**

This is likely to create farm level pressures and negative outcomes for farmland features, especially in peri-urban areas, where there is pressure to switch agricultural land to residential housing, industrial or commercial use. In the Netherlands, for example, about three per cent of agricultural land changed to artificial surfaces between 1990 and 2000 (EEA, 2005). Similarly, the development of infrastructure, such as roads and railways, may threaten certain farmland features through the fragmentation of agricultural habitats. According to the Scenar 2020 study (ECNC, 2006), the built up area will remain constant or increase in all EU countries by 2020. In some cases, this is expected to result in a loss of agricultural land.

**The proliferation of diseases and pests**

\(^\text{13}\) With respect to meeting the existing 5.75% target, the EEA (2004) estimate that between 4 and 13 per cent of the EU-25’s agricultural land will be needed if the feedstocks were derived from domestic production alone.
Diseases and pests may affect the distribution, density and diversity of farmland features and in some cases, trigger a process of wider landscape change. The potential impact can be illustrated with the example of Dutch elm disease in Warwickshire, England during the 1970s. Figure 6-2 was taken from the same spot in 1972 and 1994, and shows the loss of many trees (Countryside Agency, 2006). The dead trees were cut down and removed, often along with the surrounding hedgerows. The removal of these features opened up the possibility for farmers to proceed with land drainage, the realignment of streams and the conversion of pasture to arable. In this instance, the initial pressure precipitated a chain of negative environmental impacts.

Figure 6-2: Impact of Dutch Elm Disease in Warwickshire, England.


Adaptation to the effects of climate change

A warming climate will affect the distribution of flora and fauna and ecological processes, such as species migrations and the distribution of particular pests which have implications for the natural components of landscapes and ecosystems, including farmland features. Carefully formulated policy measures are likely to be needed to aid the adaptive response to climate change.

An increase in alien invasive species

Alien invasive species can, when introduced into a new ecosystem, spread at a fast rate and out-compete local species. Their appearance may be linked to climate change. They are a leading cause of biodiversity loss (WRI, 2005) and alien species can change the functioning of farmland ecosystems. The growth of new tree species or shrubs could, for example, result in a decline in pollinators or natural enemies to pests, or change water balances, affecting farmland features. For example, Giant Hogweed is common in agricultural areas in the UK and can out-compete native plant species (Alberternst and Böhmer, 2006).
6.4.1 Influence of drivers on EU agricultural production

In this section, the key implications of these drivers on agricultural production in the EU are considered. Determining causality is complex, however, in the main, and in the absence of appropriate policy intervention, these drivers contribute to the process of structural change, which is associated with the intensification of production in more productive areas and the progressive marginalisation of production, generally in more marginal areas.

ECNC (2006) state that by 2020 structural change will be especially acute in the EU-12, because of the high share of agriculture in GDP and employment and the high number of small farm units. Over time, agricultural restructuring and the associated trends will increase the pressures on farmland features. These trends affect farm viability, production decisions and land use management choices, as well as the availability of a labour and skills base to manage features, and may result in or extenuate a number of negative externalities with respect to farmland features. Such negative externalities include the loss of environmental value associated with the removal of farmland features, the inappropriate management of farmland features or the cessation of their management. There are rather different prospects for arable and livestock farming systems, as explained further below.

The intensification of production

The intensification of production promotes existing patterns of the specialisation and concentration of production in particular areas in both arable and livestock systems.

In arable systems, intensification is associated with high agro-chemical input use, landscape simplification and monocultural production resulting in low biodiversity values and significant pressure on the natural resource base (Boatman et al., 1999). In particular, simplification results in a decrease in crop diversity, a decline in the use of rotational fallow and the loss of farmland features such as hedgerows and other field boundaries as witnessed in the more productive arable areas such as the Paris Basin, the Po Valley, Italy and eastern England.

Market projections show that EU cereal prices are likely to be sustained at higher levels than has been the case over the past decade. Higher cereal prices carry a number of implications for production and land use decisions. Market oriented farmers may be expected to increase the level of production and expand the area under production in order to take advantage of higher market returns where natural conditions allow. This is evidenced by headline projections, provided by DG Agriculture (2008), that the total cereal area in the EU-27 is expected to increase from 56.6 million hectares in 2007/08 to 60.3 million hectares in 2008/09, partly as a result of the removal of compulsory set-aside. The need to meet domestic targets for EU biofuel use may augment the pressure to increase the area under arable cultivation.

With livestock systems, intensification is related to the use of more intensive feeding systems where the cattle are kept indoors throughout the year and fed a predominantly non-grass diet such as cereals (DG Agriculture, 2004). Intensive cereal based cattle systems are generally found in southern and central Europe. This relates to a general decline from mixed livestock farming systems towards more specialised systems and
a related trend across Europe toward a smaller cattle herd. The implication is that the less viable extensive systems, typically located in more marginal areas, are increasingly vulnerable, raising the threat of land abandonment. This is explored further below.

The process of agricultural intensification is therefore likely to result in a number of outcomes for farmland features, each of which is context specific:

- Expansion of the UAA in order to increase productivity, resulting in the removal of farmland features including boundary features, in-field features and larger patch features.
- The agricultural function of farmland features becomes redundant, resulting in neglect, inappropriate management and the potential removal of features.
- The fragmentation of linear farmland features such as hedgerows and stone walls in order to make space for the movement of agricultural machinery.
- A trend towards the increasing specialisation of farms and the concomitant decline in mixed farms will have a negative impact on the diversity, density and/or quality of farmland features and the environmental benefits they confer.
- The increased use of chemical inputs may also result in the deterioration of the environmental benefits associated with farmland features, for example, the eutrophication of water bodies.
- The inappropriate management of farmland features, for example, ploughing too close to the base of a hedgerow in order to maximise the productive area.
- A reduced labour and time input for more peripheral activities that do not contribute to agricultural productivity. This is likely to lead to less time for the management of farmland features, many of which require appropriate management to maintain their environmental value.

Overall these outcomes will lead to a simplification of landscape structure and result in a decline in the distribution, diversity, density and quality of farmland features at the landscape scale. Possible environmental impacts include:

- A loss of farmland features resulting in a decline in species richness.
- A decline in the quality of farmland features, which may result in a loss of biodiversity.
- The increasing fragmentation of farmland features could increase the isolation of farmland features, and result in decreased species richness and a loss of migration corridors and access to forage areas. Fragmentation of farmland features could also reduce ecological coherence.
- A change in the character of traditional and cultural landscapes, with potential consequences for a qualitative ‘sense of place’ and potential ramifications for tourism.
- An increase in soil erosion and decline in soil organic matter and the quality of soil structure through the loss of farmland features with a resource protection function.
- A decline in water quality through the loss of farmland features with a resource protection function. This also relates to the contribution which farmland features can make to flood plain management.
- A reduction in the carbon storage capacity contributed by farmland features.
The marginalisation of agricultural activity

In contrast to the expected expansion and intensification of the EU cereals sector, the beef and veal, and sheep and goat sectors are expected to contract, raising concerns about the continued provision of the various environmental benefits provided by farmland features associated with these farming systems. Such systems may be expected to be associated with a higher density and diversity of farmland features than more intensive arable systems. They are mostly found in more peripheral or remote parts of the EU.

According to DG Agriculture projections (2008), higher cereal feed prices will reduce the profitability of the beef and veal sector and are predicted to contribute to a decline in beef production by 438,000 tonnes to 7.6 million tonnes over the 2007 to 2014 period. The EU dairy herd is expected to reduce from 24.2 million heads in 2006 to 21.9 million heads in 2014. Competition from external markets, such as Argentina and Brazil, further dampens the prospects for the EU’s beef sector. The outlook for the sheep and goat farming sectors is equally unpromising with the long term trend of a decline in sheep and goat production expected to continue (DG Agriculture, 2008). This analysis suggests that current market conditions will serve to underline the vulnerability and inherent fragility of extensive livestock systems in many parts of the EU.

Land abandonment is the eventual outcome of the declining viability of certain extensive livestock based farming systems. It is a trend most likely to affect more marginal parts of the EU and has, to date, been particularly pronounced in the new Member States (IEEP, 2007b). Whilst most arable land is not at risk of abandonment, extensive and traditional grazing systems with rough grasslands are (JRC-IES, 2008). According to model scenarios prepared for the Scenar 2020 study (ECNC, 2006), about 11.4m hectares of land across the EU-25 is projected to be abandoned by 2020, according to the study’s baseline scenario, although these projections may no longer be valid given changing market conditions. Land abandonment relates to a decline in the total number of farms and a concomitant decline in UAA.

Some of the contraction of the livestock sector will result in land use transitions, mainly the conversion of pasture to arable, rather than leading to abandonment of agricultural production. The trend towards fewer, larger farms is reflected by the Scenar 2020 scenario study, which predicts a decline in the number of arable crop

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14 The JRC-IES study calculates the scale of land abandonment in the EU through a series of case studies. It reports that farmland abandonment – in terms of UAA-loss - for the considered periods (1988-2000 for France, 1989-1999 for Spain and 1996-2002 for Poland) represented a total surface of 3.3 million hectares for the 3 countries; equivalent to 2% of the total UAA in France, 4% in Poland, and 8% in Spain.

15 The Scenar 2020 study, conducted in 2006 (ECNC, 2006), provides one indication of the prospective changes in land use at an EU level through an analysis of three different scenarios. It was conducted before the increase in commodity prices in 2007/08 and thus the predicted changes may not reflect those which actual occur. In any case, scenarios are illustrative of what may happen and are not definitive. However, the changes suggested by the Scenar 2020 baseline scenario suggest that agricultural restructuring will continue and result in changes to farm management and land use. The baseline scenario makes assumptions concerning drivers such as changes in demography and world economic growth and is based on the same set of policy measures as at present. The full liberalisation scenario is based on the abolition of all tariffs, export subsidies and income support.
farms of by 37% by 2020 but the maintenance of use of 91% of UAA under its baseline scenario (ECNC, 2006). Underlining the potential for some Member States to expand UAA, the same study predicts an increase to the arable area in Latvia, Lithuania, Bulgaria and Romania at the expense of forest cover. In addition, the total number of farms in the EU-25 is expected to decline by 25 per cent from a starting point of 10 million farms in 2003. The number of mixed livestock farms is expected to decline by 64 per cent, and mixed crops farms by 88 per cent. Whilst some of these farms will be merged with other farms, it may be expected that farms located in more peripheral areas or on poor quality soil would be abandoned. In a more extreme scenario setting used in a UK study (ADAS and SAC, 2008), in which the SPS and all trade barriers are removed, 15 per cent of land would fall out of production in England, with profound impacts for landscape character. In all three tested scenarios the loss of boundary features or a loss of management were identified, in both intensive and extensive farming systems.

The process of marginalisation is likely to result in a number of outcomes for farmland features, each of which is context specific:

- In many cases, the declining viability of these farming systems will result in the loss of management of those features that were formally integral to the farming system, such as stock proof stone walls.
- In extreme cases, the cessation of agricultural management means that the management or maintenance of farmland features will cease.
- There will be a loss of traditional skills and the human capacity to manage such areas and the associated farmland features.

Overall these outcomes will lead to a simplification of landscape structure and result in a decline in the distribution, diversity, density and quality of farmland features at the landscape scale. Possible environmental impacts include:

- A loss of farmland features resulting in a decline in species richness.
- The loss of management, or ability to manage, resulting in neglect and a decline in the quality of farmland features which may result in a loss of biodiversity.
- A key characteristic of abandonment is the encroachment of scrub, which means that there would be an increase in the density of certain features, leading to landscape closure.
- The increasing fragmentation of farmland features could increase the isolation of farmland features, and result in decreased species richness and movement pathways and access to different forage areas. Fragmentation of farmland features could also reduce ecological coherence.
- A change in the character of traditional and cultural landscapes, with potential consequences for a qualitative ‘sense of place’ and potential ramifications for tourism.
- In certain clearly qualified cases, natural succession to forest may provide another kind of environmental benefit in terms of increased carbon sequestration.

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both in the EU and the rest of the world and as a result presents some rather extreme results which would seem rather unrealistic given current policy settings.\textsuperscript{16} UNFCCC National Adaptation Programmes of Action (UNFCCC Decision 28/CP.7, 1 and UNFCCC Decision 28/CP.7) Relevant decisions include CBD Decision VII/15 and CBD Decision VIII/30.
potential, greater water absorption capacity - which may be desirable in flood plains - and reduced soil erosion.

6.5 **Summary of Pressures on Farmland Features**

In the absence of appropriate policy intervention, the pressures described above are likely to result in the following outcomes for farmland features, with varying environmental impacts:

1. Removal of farmland features.
2. Neglect of farmland features.
3. Inappropriate management of farmland features.
4. No change to farmland features.

**Removal of Farmland Features**

The progression towards fewer, larger farms implies that farmland features may be removed both in existing intensive arable areas in order to increase field size, but also in those arable areas which retain greater production potential. This could be expected to lead to a decline in environmental benefits, and may for example result in biodiversity loss. Elsewhere, a trend towards the increasing specialisation of farms and a concomitant decline in mixed farms may be expected to have a negative impact on the total distribution, density, diversity and quality of farmland features and the environmental benefits they provide. This is likely to be particularly true for farmland features which have lost their agricultural function. In other areas, where land abandonment is a threat, there is no risk of removal, but rather an increased threat of neglect and inappropriate management.

**Neglect of Farmland Features**

The neglect or under management of farmland features results from agricultural restructuring and a decline in the agricultural labour force. In many situations, this implies a reduced labour and time input for what may be considered more peripheral farming activities, such as the management of hedge rows. For example, the biodiversity value of coppiced hedgerows can decline as a result of a lack of management. In addition, and over time, the decline in labour is likely to be associated with a loss of traditional skills and hence the knowledge and expertise required to properly manage farmland features.

**Inappropriate Management of Farmland Features**

An alternative outcome to the complete neglect of farmland features is the inappropriate management of farmland features. This may arise due to time pressures, such that hedgerows, for example, are not cut in the most appropriate way. In addition, and with respect to the intensification trend, an increase in agricultural input use in the surrounding agricultural land could lead to a decline in the environmental quality of features such as ponds and streams through nutrient enrichment.

**No Change to Farmland Features**

Depending on the strength of the pressures in different geographical contexts and the relief provided by different policy interventions, it is possible that the outcome is simply the maintenance of the status quo.
6.6 Understanding the Level of Threat

The policy response, in part, will need to account for varying levels of threat in order to target those features which are inherently fragile as well as those farming systems that are increasingly vulnerable. Many of the pressures identified above are substantiated by the case studies conducted as part of this study. A summary of the main findings is provided in Table 6-1. No up to date literature regarding the kind of outcomes described above was found for this study, although the historic losses of farmland features, and the reasons for them (the losses were mostly attributed to pre-1992 CAP regimes) have been well documented in the past (see, for example Countryside Agency, 2006; Boatman et al., 1999).

The case studies show a variation in the threat of removal of farmland features. In some cases, it appears to be relatively low, largely because effective policy measures are in place. Despite historic losses of farmland features, the total number of farmland features is now stable or increasing in many situations (Denmark, UK). In these cases, maintaining the quality of the farmland feature resource is the key policy objective. Elsewhere, the threat of removal and neglect remain, as shown by examples provided in Spain, Romania and Sweden.

Issues identified by the case studies include:

- Inappropriate management of farmland features, such as inappropriate cutting of hedges or excessive use of herbicides on margins.
- Sporadic or occasional management due to lack of time or will, particularly on smaller units.
- Loss of management of farmland features where the economic function has been lost (for example, traditional orchards).
- Removal of features to make room for the operation of new machinery or to expand the productive area.
- Use of traditional breeds that cannot compete with more modern breeds, leading to abandonment and hence loss of management of associated features.
- Invasive species reducing the ecological quality of watercourses.
- With respect to commons and other extensively management land uses, pressures arise due to the part-time and small scale nature of associated farming activity, an inability to meet animal health and welfare regulations and low returns from farming activity. Pressures particular to common land arise from a decline in seasonal migrants/transhumance and changes in patterns of land ownership.

6.7 Implications for the Policy Response

In all agricultural production contexts, the pressures associated with ongoing agricultural restructuring are expected to result in the loss of farmland features, the neglect of farmland features or the inappropriate management of farmland features. As a whole, and before policy interventions are considered, the anticipated outcome is a decrease in distribution, density, diversity and quality of farmland features. In the majority of cases, this will result in a decline in environmental value. That said, a range of policy measures exist which aim to avoid or reduce the prospects of the identified outcomes arising. The capacity of existing policy measures to deal with
these outcomes needs to be understood as a precursor to developing policy recommendations and new policy options.
### Table 6-1: Pressures Identified through the Case Studies.

<table>
<thead>
<tr>
<th>MS</th>
<th>Pressures Identified</th>
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<tbody>
<tr>
<td><strong>Denmark</strong></td>
<td>Trend: Historic decline, followed by a stabilisation or increase in farmland features due to policy measures.  &lt;br&gt;  • Many small biotopes suffer from lack of continuity in maintenance.  &lt;br&gt;  • A more heavy-handed management of hedgerows is now being practised in order to minimise the space occupied by the hedgerow.  &lt;br&gt;  • Small farms are neglecting hedgerow management due to economic pressures.  &lt;br&gt;  • Watercourses and ponds are of poor quality due to leaching of animal manure.  &lt;br&gt;  • Invasive species - including hogweed and goldenrod - along watercourses are a major problem.  &lt;br&gt;  • Hedgerows removed without replanting due to investment in new bigger machines for the harvesting of maize (Sønder Omme).  &lt;br&gt;  • Permanent grasslands are being abandoned due to declining economic viability (Saltum Parish).  &lt;br&gt;  • Increasing grain prices and intensification of pig farming may result in the removal of some woodlots (Sønder Omme).</td>
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<tr>
<td><strong>France</strong></td>
<td>Trend: Historic decrease in area occupied by farmland features and loss of management, followed by increase in some farmland features due to policy measures.  &lt;br&gt;  • Mechanisation, linked with the increase of parcel size, has led to the removal of in-field trees and hedgerows.  &lt;br&gt;  • Function of features such as hedgerows (for firewood production) or ponds (for animal watering) in farming systems has been lost in many cases.  &lt;br&gt;  • Abandonment of management of stone walls and terraces.  &lt;br&gt;  • Abandonment of traditional orchards due to decline in consumption of cider. The TERUTI survey in France indicates that the main reasons for loss of traditional orchards between 1992 and 2000 were: abandonment of old trees with no replanting (49%); abandonment of farmland (19%); soil sealing (10%); and conversion to arable land with uprooting of trees (21%).</td>
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<tr>
<td><strong>Spain</strong></td>
<td>Trend: Lack of data to describe trends.  &lt;br&gt;  • Elimination of existing field boundaries for the expansion of intensive fruit-tree/olive/vine plantations.  &lt;br&gt;  • Increasing use of herbicides as a means of controlling field-boundary vegetation.  &lt;br&gt;  • In some areas land consolidation projects have removed hedges over considerable areas.  &lt;br&gt;  • In livestock areas many dry-stone walls are in a poor state of repair due to neglect. Marginalisation and very low economic returns leading to the abandonment of wall maintenance, and ultimately of the farming activity itself.  &lt;br&gt;  • On more viable holdings the use of barbed-wire fencing alongside a neglected wall is an easier solution than rebuilding the wall. Occurs due to the lack or high cost of skilled labour.  &lt;br&gt;  • The biodiversity value of semi-natural patches on intensive farmland is less significant due to factors such as isolation and the effects of nitrogen and pesticides from adjacent farmland.  &lt;br&gt;  • Excessive stock numbers can have a negative impact on nature values of riverine vegetation. Also run-off of soil and agro-chemicals from intensive cropping reduces environmental value.  &lt;br&gt;  • Olive groves are intensively managed and of limited environmental value.  &lt;br&gt;  • Decline in environmental value of drovers’ roads due to decrease in the movement of livestock.  &lt;br&gt;  • Collapse of terraces, or their disappearance under natural vegetation, due to land abandonment in more marginal upland areas.</td>
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## Chapter 6 Pressures on Farmland Features

<table>
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<tr>
<th>MS</th>
<th>Pressures Identified</th>
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| Germany | • Maintaining terrace walls is very labour-intensive. Many farmers do not carry out such maintenance, and walls gradually collapse. Relates to lack/high cost of skilled labour.  
• Excessive water extraction for irrigation causing ponds to dry out. Traditional open channels have also been replaced by plastic tubing.  
Trend: Lack of data to describe trends. |
| Romania | • Individual cases of hedgerow removal and woodland edges in order to enlarge farming areas were reported in the German case study area of Schorfheide-Chorin, indicating that cross compliance is overall not protecting those features effectively. The reason could be missing or ineffective controls.  
Trend: Lack of data to describe trends. |
| Sweden | • Intensification in the lowland plains is impacting upon farmland features such as ditches, as drainage systems are altered, and grassy strips, due to an increased use of machinery and agrochemicals.  
• Abandonment in marginal areas due to out-migration of younger members of farm families.  
• Urban encroachment threatens farmland with the creation of, for example, new suburbs etc.  
• Invasive species are outcompeting local species in streams and ponds and drainage channels, including, for example, north American ashes, shrubs and alien molluscs and crayfish.  
• Pre-accession communal village pastures experienced a decline in grazing levels. In some areas this led to a change in sward composition towards dominance by *Nardus stricta*, which decreases species diversity, and to a proliferation of scrub (Petretti, 1996).  
Trend: Historic removal, continuing downward trend in the number of farmland features, some stabilisation. |
| Italy | • Tocchetto and Borin (2005) note in the Italian case that hedgerows have been removed to increase field size.  
• Marginalisation and the abandonment of agricultural activity have lead to rural depopulation and the loss of traditional farming practices and the skills required to maintain features such as stone walls. This has resulted in a decline in the number of farmland features and, even, disappearance (Rocchini et al., 2006). This has been observed especially in southern regions and the islands (Marchetti et al., 2002), in mountain areas of the northern regions (Farina, 1995) and areas of }
In Sicily many hedgerows, particularly those growing along rivers, are decreasing, even though they play an important role in soil preservation. This may be attributed to the increasing levels of abandonment affecting Sicilian agriculture (Marchetti, et al. 2002).

According to a study of terraces in Liguria, more than 50% of terraced farmland is abandoned, with resulting degradation of the stone walls and increases in wooded area (Pappalardo, 2002).

The development of urban areas and infrastructure is the main threat to farmland features in the case study area of the Venice Lagoon watershed.

<table>
<thead>
<tr>
<th>MS</th>
<th>Pressures Identified</th>
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<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Trend: historic removal now ceased. Neglect and lack of management are prevailing threat rather than removal.</td>
</tr>
<tr>
<td></td>
<td>• Use of herbicides, pesticides and fertilisers up to the base of hedgerows and trees leads to nutrient enrichment and a decline in species diversity.</td>
</tr>
<tr>
<td></td>
<td>• Increased stocking rates leads to hedgerow damage and the need to fence fields. Presence of fences reduces the necessity for hedge maintenance and hastens their decline.</td>
</tr>
<tr>
<td></td>
<td>• Loss of livestock from the landscape reduces necessity to keep hedges.</td>
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<td></td>
<td>• High labour costs and loss of traditional skills leading to neglect of hedgerows.</td>
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<td></td>
<td>• Frequent and badly timed cutting of hedgerows leading to poor habitat conditions.</td>
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<td></td>
<td>• Loss of hedgerow trees through senescence and felling without replacement.</td>
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<tr>
<td></td>
<td>• Single trees, especially in-field trees, often unsympathetically managed, such as ploughing too close, or neglected as usually no longer serve a specific function. Removal of deadwood also a problem as is loss of traditional management e.g pollarding.</td>
</tr>
<tr>
<td></td>
<td>• Outside agri-environment schemes, few trees are being planted to replace single trees as they die.</td>
</tr>
<tr>
<td></td>
<td>• Threat of pests and diseases e.g. Sudden Oak Death is a serious problem in the South of the UK.</td>
</tr>
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<td></td>
<td>• Ploughing up of any suitable grassy margins or buffers due to higher cereal prices.</td>
</tr>
<tr>
<td></td>
<td>• Neglect and lack of management of dry stone walls, mostly located in marginal upland areas. As the economic viability of upland farming continues to decline farmers have less time and money to maintain stone walls outside of agri-environment schemes, and as more people leave the livestock farming industry, there is less reason to maintain dry stone walls (as shown by Cumbrian case study).</td>
</tr>
<tr>
<td></td>
<td>• Eutrophication of ditches.</td>
</tr>
<tr>
<td></td>
<td>• Loss of agricultural function of ponds, leading either to siltation, build up of organic material and plant succession or filling in to reclaim agricultural land.</td>
</tr>
<tr>
<td></td>
<td>• Streamside margins particularly vulnerable to colonisation by invasive species whose seeds are dispersed along watercourses e.g. Japanese Knotweed, Giant Hogweed and Himalayan Balsam. Also Signal Crayfish has decimated populations of the native BAP species white-clawed or Atlantic crayfish.</td>
</tr>
<tr>
<td></td>
<td>• Loss of fallow due to high cereal prices.</td>
</tr>
<tr>
<td></td>
<td>• Inappropriate grazing of common land.</td>
</tr>
<tr>
<td></td>
<td>• Small pockets of woodland threatened by uncontrolled livestock grazing, lack of coppicing, invasion by rhododendron, diffuse nutrient pollution and atmospheric deposition of acidifying pollutants.</td>
</tr>
</tbody>
</table>
7 Legal Protection of Farmland Features

There is a range of EU and national legislation which influences the density, diversity and quality of farmland features. A review of the existing legislative framework is a prerequisite to developing policy options in order to offer a greater level of protection of farmland features. It is possible in many situations that the farmland feature resource can be better protected by making amendments to existing instruments, particularly where they are failing to fully promote the protection and appropriate management of features. In other cases, an expansion of the use of existing instruments might be considered, especially where implementation issues mean that features are not protected to the extent possible by the legislation, as might be the case for those instruments where budgets are inadequate. The targeting of existing instruments may also be able to be improved in order to protect and manage features of greatest value (for example, to revise agri-environment schemes to ensure valuable features or groups of features are targeted).

In addition to a review of relevant international and pan-European environmental agreements which create a framework for the protection and positive management of habitats and associated resources, the relevant items of legislation, examined in this chapter, are:

- EU nature conservation legislation:
- EU agriculture legislation:
- EU rural development legislation:
  - Rural development measures provided by the European Agricultural Fund for Rural Development (EAFRD) as provided for by Council Regulation 1698/2005.
- EU water quality legislation
  - The Nitrates Directive (Directive (91/676/EC)
- Relevant items of national legislation.

For each piece of legislation or measure, the relevance to farmland features is described and an overview is provided of the implementation in the Member States, drawing on the case studies and other relevant literature. Particular issues with respect to the protection of farmland features arising from the design and implementation of each item of legislation, as appropriate, are also discussed.

7.1 International and Pan-European Environmental Agreements

There are a number of international agreements that lend support to the protection of habitats or landscape and which signal a political will to protect elements of the landscape in which farmland features could play an elemental role. A number of
multi-lateral environmental agreements (MEAs) also include actions to counter habitat fragmentation in the context of climate change.

At the international level, the Convention on Biological Diversity (CBD) provides the main framework for conserving the world’s biodiversity. One of the targets of the associated Programme of Work on Protected Areas, adopted in 2004, is to ensure that all protected areas and protected area systems are integrated into the wider landscape by 2015. This should be achieved by taking into account ecological connectivity and, where appropriate, the concept of ecological networks.

The need for connectivity conservation measures has been given added importance and urgency as a result of the recognition that habitat fragmentation may exacerbate the potential impacts of climate change. The requirements to take action to maintain the resilience of ecosystems to extreme climate events and to enhance habitat connectivity to facilitate the migration and dispersal of species are included in the UN Framework Convention on Climate Change\textsuperscript{16}.

At the pan-European level, the Convention on the Conservation of European Wildlife and Natural Habitats\textsuperscript{17} encourages the conservation and, where necessary, the restoration of ecological corridors, habitat types and landscape features that are important for wildlife conservation. The European Landscape Convention\textsuperscript{18} provides a European-wide framework for sustainable planning, management and protection of landscapes. Landscape is approached in a cultural sense by the Convention. For example, the Convention requires the conservation and maintenance of the significant or characteristic features of a landscape, justified according to heritage value. Both of these Conventions were developed and adopted by the Council of Europe and are not binding on signatory Member States.

The importance of these issues and the need to take action, particularly regarding climate change, has been widely accepted within the EU. As a result some new, mostly national actions are being instigated, such as the development of adaptation strategies. But the predominant response has been to further promote and/or strengthen relevant actions within existing instruments (e.g. connectivity measures within the Habitats Directive – see below).

The Commission’s Communication ‘Halting the loss of biodiversity by 2010 – and beyond’ and the new EU biodiversity Action Plan\textsuperscript{19} help to coordinate and encourage the implementation of biodiversity measures required under the various MEAs (as well as EU requirements). Amongst these, the Action Plan gives a high priority to promoting measures to enhance the coherence and connectivity of the protected areas network (e.g. both Natura and non-Natura areas). In particular, it recognises that in addition to ‘structural tools’ (such as flyways, stepping stone and corridors), enhancing the coherence, connectivity and resilience of the Natura 2000 network requires actions that support biodiversity in the wider environment. The Action Plan

\textsuperscript{17} Convention on the Conservation of European Wildlife and Natural Habitats, Bern, 19.09.1979.

\textsuperscript{18} Council of Europe, European Landscape Convention, Florence, 20.10.2000.

\textsuperscript{19} Communication from the Commission Halting the Loss of Biodiversity by 2010 – And Beyond. Sustaining Ecosystem Services for Human Well-Being, COM 2006 (216), 22.5.2006.
also includes a specific set of actions related to supporting biodiversity adaptation to climate change (which aim to substantially reduce the damaging climate change impacts on biodiversity). One of the listed actions specifically addresses the coherence, connectivity and resilience of the Natura 2000 network.

However, a recent review of the implementation of the EU Biodiversity Action Plan for DG Environment\(^20\), indicates that few Member States have developed climate change adaptation strategies or programmes of practical actions that go beyond existing measures (such as those described below).

### 7.2 Birds Directive and Habitats Directive and the Natura 2000 Network

The Habitats Directive\(^21\) and the Birds Directive\(^22\) form the main legal framework for the protection of nature and biodiversity in the EU. They are of relevance to the protection of farmland features because they provide the basis for the protection of species, habitats and particularly important sites within the EU, and many farmland features may benefit from these measures (though mostly indirectly). The Birds and Habitats Directives are also included among the Statutory Management Requirements that Member States have introduced under cross compliance (see next section).

The principal aim of the Birds Directive (Article 2) is to ensure that ‘Member States shall take the requisite measures to maintain the population of the species referred to in Article 1\(^23\) at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or to adapt the population of these species to that level’.

The Habitats Directive includes a number of requirements for Member States to implement conservation measures for habitats and species of Community interest\(^24\). The general purpose of such measures should be to achieve the overall aim of the Directive, which as stated in Article 2(1) ‘shall be to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States to which the Treaty applies.’

Article 2(2) then states that ‘Measures taken pursuant to this Directive shall be designed to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest.’

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\(^20\) Unpublished reports to DG Environment, by MRAG, IEEP, IUCN and UNEP-WCMC (2008). These were prepared as a contribution to the mid-term review of the EU Biodiversity Action Plan.


\(^23\) All species of naturally occurring birds in the wild state in the European territory of the Member States to which the Treaty applies.

\(^24\) These are habitats and species that are listed in Annex I and II of the Directive respectively.
and criteria that define favourable conservation status (FCS) are outlined in Article 1. In layman’s terms, ‘FCS can be described as a situation where a habitat type or species is prospering (in both quality and extent/population) and with good prospects to do so in future as well’\textsuperscript{25}.

Both Directives require two main types of action. Firstly, the protection and conservation management of sites that are particularly important for EU biodiversity. These include protection measures for sites of Community Importance (SCIs), which must be designated as Special Areas of Conservation (SACs) by Member States under Article 4 of the Habitats Directive (for habitats and species of Community interest), and Special Protection Areas (SPAs) designated under Article 4 of the Birds Directive (for birds listed in Annex I of the Directive and for migratory species). These SACs and SPAs are combined under Article 3 of the Habitats Directive with the intention of forming ‘a coherent ecological network’ referred to as the Natura 2000 network. The reference to ‘a coherent ecological network’ here is important because it implies that measures may be required in the wider environment to maintain ecological connectivity between some Natura 2000 sites, and farmland features may play a role in this.

The second type of action within both Directives, is the strict protection of listed species as well as their breeding sites and resting places, wherever they occur.

As shown in Annex 2, some farmland features may equate to, or be integral parts of habitat types listed in Annex 1 of the Habitats Directive. These habitats must therefore be maintained or restored to FCS. The principle mechanism for achieving this is the protection and management of a sufficient proportion of these habitats in each country through SAC designations. Reasonably good progress has been made towards the designation of SACs in most countries\textsuperscript{26}. Natura 2000 sites are also relatively well protected (under Articles 6.2, 6.3 and 6.4 of the Habitats Directive, which also apply to SPAs) from major developments that may have an impact on habitats and species of Community interest that are designated features within the sites.

Thus, those few farmland features that are Annex 1 habitat types and that occur within SACs should be well protected by the provisions of the Habitats Directive. However, a large proportion of most Annex 1 habitats will occur outside of SACs. These should still receive some protection in accordance with the overriding aim of maintaining or restoring FCS, but in practice such protection is probably weak outside of SACs. No information is readily available on the extent to which Annex I farmland features are covered by SAC designations or whether they are adequately protected, for example, from small scale or incremental impacts arising from agricultural improvements (such as ditch management or drainage improvements), both within and outside SACs (see further discussion below).

Most farmland features are not Annex 1 habitats that must be protected in SACs and maintained in FCS. Nevertheless, many farmland features occur in Natura 2000 sites

\textsuperscript{25} Assessment, monitoring and reporting of conservation status – Preparing the 2001-2007 report under Article 17 of the Habitats Directive (DocHabH04H03/03 rev 3).

\textsuperscript{26} http://ec.europa.eu/environment/nature/natura2000/barometer/index_en.htm
and may gain indirect protection. Moreover, some will contribute to the goals of the Habitats and Birds Directives by providing habitats (for example, for breeding, resting and foraging) for species of Community interest and by providing a connectivity function. Thus there are clear obligations for Member States to take necessary conservation measures for such features (irrespective of their own protection status), where they would support the maintenance or restoration of FCS of any habitat or species of Community interest. Consequently, many farmland features may gain protection and management indirectly through the following four principal measures contained within the Habitats and Birds Directives:

- Management measures for Natura 2000 sites.
- Protection measures for Natura 2000 sites.
- Connectivity measures for Natura 2000 sites and species and habitats of Community importance.
- Measures for strictly protected species.

These are, therefore, further described below.

**Management requirements for Natura 2000 sites**

The requirements for conservation management of habitats under the Birds Directive are rather general and vaguely defined. Article 3(3b) is most relevant, but this merely states that the preservation, maintenance and re-establishment of biotopes and habitats shall include, amongst other primary measures, their ‘upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones’. The conservation management measures that must be taken by Member States in SACs are outlined in Article 6(1) of the Habitats Directive. Reference is again made to ‘ecological requirements’ and a suggestion to prepare site management plans is made. Further clarification is provided in a European Commission report on Natura 2000 site management, which notes that Member States (in accordance with the principles of subsidiarity) may decide upon which measures are appropriate.

Neither the Birds nor the Habitats Directives define the meaning of “ecological requirements”, and their identification is the responsibility of Members States. However, the European Commission’s guidance on Article 6 of the Habitats Directive (European Commission, 2000) notes that ecological requirements should include all the abiotic and biotic requirements needed to ensure FCS (e.g. air, water, soil and vegetation). Requirements need to be defined from scientific knowledge for each habitat and species according to the conditions at each site.

The preparation of management plans for SACs is not obligatory, but where they are considered necessary by the Member State, they must, according to the Directive, be “appropriate and specifically designed for the sites”. Thus they should, at the very least, take into account farmland features where these are important ecological requirements of each habitat and species of Community interest that are listed for the site. The management plan should identify actions that are required to protect and appropriately manage the farmland features.

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The choice between statutory, administrative or contractual site management measures is left to Member States, in accordance with the principle of subsidiarity. There is no hierarchy between the three categories and they can be implemented singly or jointly in any combination (with or without a site management plan). A variety of measures can be considered to be appropriate to meet the requirements of the Directive, and all suitable EU funds (for example, LIFE, rural development and regional funds) should be considered as a means for implementing conservation measures. For example, appropriately designed agri-environment schemes may be a suitable and sufficient contractual measure to conserve farmland features where these are necessary to maintain FCS in many agriculturally managed habitats.

Protection measures for Natura sites

In addition to the positive conservation measures described above, Member States are obliged to protect sites and their features from disturbance, deterioration and damaging developments. An important principle of these elements of the Habitats Directive is the introduction of the precautionary principle with respect to the control of potential threats.

Under Article 6(2) Member States are required to take preventive measures to avoid deterioration and disturbances connected with a predictable event. These measures apply only to the species and habitats of Community Interest for which the sites have been designated, and should also be implemented, if necessary, outside the sites (European Commission 2000).

Articles 6(3) and 6(4) aim to assess and control projects on Natura sites that are not necessary for the management of the Natura features. Under these Articles projects will normally only be permitted if it has been ascertained by an appropriate assessment that they will have no adverse effect on the integrity of the site. Further guidance on the application of these measures is included within the European Commission guidance document on Natura 2000 management and in more specific guidance on Appropriate Assessment28. These measures have generally been well implemented in Member States as a result of the Commission’s guidance and a number of legal cases that have clarified and strengthened the legal basis of Natura 2000 site protection29.

In theory any project involving the loss or degradation of a farmland feature that may potentially have an impact on a species or habitat of Community interest that is a designated feature of a Natura 2000 site should be subject to an appropriate assessment. It is important to note that this requirement should also apply to farmland features that are outside Natura 2000 sites if they may potentially impact on any feature within the Natura site, e.g. because they provide connecting habitats or foraging habitats.


29 For example, see Nature and Biodiversity cases ruling of the European Court of Justice 2006 http://ec.europa.eu/environment/nature/legislation/caselaw/index_en.htm.
It has not been possible to carry out an analysis within this study of whether appropriate assessments are applied to farming operations that may lead to the loss of farmland features. However, it seems highly unlikely that such measures are routinely applied. This is primarily because most agricultural operations, such as the filling of a farm pond, will not normally require any official authorisation from a competent body that would normally advise a land owner/developer that an appropriate assessment is necessary. Nor is there likely to be the capacity in most countries for supporting appropriate assessment systems within agricultural habitats, which would normally involve screening of potentially damaging operations, the scoping of assessment requirements and the evaluation of assessments.

Thus it appears likely that some Natura 2000 features are being impacted as a result of the loss of farmland features that have not been subject to an appropriate assessment. If an appropriate assessment concluded that the proposed project (i.e. farming action) would lead to significant impacts on any feature, then the project must either be modified such that there will be no significant residual impacts on any Natura feature, or it must be abandoned. Although a project may go ahead if it is being carried out for imperative reasons of overriding public interest (under Article 6(4)), it seems highly unlikely that any individual farming project would be of such importance.

It should be remembered that an appropriate assessment might not protect the farmland feature itself, but merely its ecological function (as it is not the feature that is being protected per se). Nevertheless, in practice in most situations the farmland feature would be retained.

Connectivity measures for Natura 2000 sites and Species and Habitats of Community importance

As noted in Chapter 5, some farmland features can help to maintain ecological connectivity in the landscape. This is explicitly recognised in the Habitats Directive. Connectivity measures are required to maintain or restore the coherence of the Natura 2000 network, in accordance with Article 3, which states that Member States should:

‘Where they consider it necessary ... endeavour to improve the ecological coherence of Natura 2000 by maintaining, and where appropriate developing, features of the landscape which are of major importance for wild fauna and flora.’

(Our emphasis).

In addition, Article 10 includes the following further provisions for Natura 2000 and more general connectivity provisions for flora and fauna:

‘Member States shall endeavour, where they consider it necessary, in their land-use planning and development policies and, in particular, with a view to improving the ecological coherence of the Natura 2000 network, to encourage the management of features of the landscape which are of major importance for wild fauna and flora. Such features are those which, by virtue of their linear and continuous structure (such as rivers with their banks or the traditional systems for marking field boundaries) or their function as stepping stones (such as ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species.’

(Our emphasis).
Table 7-1: Summary of Implementation of Article 10 of the Habitats Directive in the EU-15.

<table>
<thead>
<tr>
<th>Member State</th>
<th>Implementation of Article 10</th>
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<tbody>
<tr>
<td>Austria</td>
<td>Three of the nine Länder stress the importance of voluntary nature conservation measures, to enhance the coherence and connectivity of the Natura 2000 network. Little information was included on the specific measures taken to encourage the management of features of the landscape.</td>
</tr>
<tr>
<td>Belgium</td>
<td>In the Brussels Region, Flanders and Wallonia, different network activities have been established to connect green spaces and watercourses. The Flemish ecological network covers most of the Natura 2000 network and includes inter-connecting zones such as small landscape elements. It is not clear how the networks of the different regions are interlinked to enhance Natura 2000.</td>
</tr>
<tr>
<td>Denmark</td>
<td>Most county councils have planned to encourage the linking of ecological areas in open country through measures such as the creation of ecological corridors.</td>
</tr>
<tr>
<td>Germany</td>
<td>The concept of the ‘Biotopverbund’ (stepping stones and wildlife corridors) is transposed into federal law. In order to support a coherent system of habitat and species protection, a number of programmes (wildlife, water courses), plans (species and habitats recovery plans) and conservation measures have been established.</td>
</tr>
<tr>
<td>Greece</td>
<td>In accordance with Law 1650/86 a programme for the identification and recording of landscapes is under construction. The programme aims for the creation of a network of ‘protected landscapes’, including landscapes which could function as pathways.</td>
</tr>
<tr>
<td>Ireland</td>
<td>The National Biodiversity Plan and management programmes and policies for the coastal zone, rivers, lakes, wetlands and woodlands will support biodiversity conservation in general and serve to reinforce the Natura 2000 network.</td>
</tr>
<tr>
<td>Netherlands</td>
<td>The Structural Plan for the Rural Areas (SGR) stipulates that species which are subject to international agreements must be taken into account in district and land-use plans. Spatial planning and development activities have to consider the conservation and development of the habitats of such species. If disruption is unavoidable, compensation measures have to be taken (e.g. by minimising fragmentation and barrier effects). The SGR also provides for the implementation of the Main Ecological Structure (EHS), which aims to provide greater cohesion between spatially dispersed designated areas, under which 95% of the Dutch Natura 2000 network is being established. The EHS is evolving through the acquisition and development of farmland and management of nature areas.</td>
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<tr>
<td>Spain</td>
<td>The national law on nature conservation states that the public authorities should promote the management of landscape elements that are of fundamental importance for wildlife, in particular those which, due to their linear and continuous structure (such as drovers’ roads, rivers and their riparian vegetation, traditional field margins) or their function as stepping stones (ponds, patches of vegetation) are essential for the migration, geographic distribution and genetic interchange of wild species”.</td>
</tr>
<tr>
<td>UK</td>
<td>The development of networks of statutory and non-statutory sites, and the landscape features which provide links from one habitat to another, is transposed into the Conservation Regulations. All Planning Authorities have to make such provisions in local and structure plans.</td>
</tr>
</tbody>
</table>


Member States can exercise discretion as to whether it is appropriate or not to maintain and develop landscape features to meet the objective of ecological coherence. It is not a compulsory requirement, although a study found that as of 2000 a number of the EU-15 Member States had taken steps to respond to Article 10 (see Table 7-1).
A more recent study by IEEP (Kettunen *et al.*, 2007) found that both the Community and national legal/policy frameworks provide opportunities to address ecological coherence and connectivity within the EU. In addition, a number of practical national and regional measures are in place. These included, for example, supporting the maintenance of connectivity as a part of the national legal framework for nature conservation, measures related to establishment of national/regional ecological networks, integrated approaches to land-use planning and management, enhancing connectivity within the agricultural landscapes (for example, through agri-environment schemes) and mitigation of fragmentation impacts (for example, from transport infrastructures). However, actual implementation of such measures is patchy and inconsistent. For example, progress has been particularly slow with regard to practical implementation of ecological networks in most countries, primarily as a result of limited legal powers and the costs of large-scale land purchase and long-term management (see, for example Bennett and Mulongoy, 2006).

Furthermore, there was little evidence that new policies or measures are being implemented to address Article 10 requirements. The study therefore concluded that further efforts are needed to secure the maintenance of ecological connectivity amongst Natura 2000 sites and the wider European landscape.

**Measures for strictly protected species**

Article 12 of the Habitats Directive requires Member States to prohibit the deterioration or destruction of breeding sites or resting places of strictly protected animal species listed in Annex IV. However, as with the protection of sites, the measures are qualified by the possibility for derogations, in this case under Article 16 of the Directive. Such derogations may be allowed if there is no satisfactory alternative and they are not detrimental to the conservation status of the species. Guidance on required protection systems and appropriate allocation of derogations has been provided by the Commission Services.

Some farmland features may be protected under Article 12 measures because they provide breeding sites, foraging habitats or resting places for Annex IV species. For example, old hedges are may be important for foraging bats, old trees for breeding and roosting bats and many insect species, ponds for amphibians, dragonflies and other aquatic invertebrates, ditches for a variety of fish and amphibians and patches of rock, semi-natural grassland and shrubs for many reptiles and invertebrates (see Annex 1). However, as noted in the Commission guidance, application of Article 12 measures to agricultural habitats is complex, because the majority of agricultural activities are not subject to prior approval or consent. Thus practical protection is probably constrained (as it is for appropriate assessments – see above) by the limited regulation of agricultural operations and probable limited awareness amongst land owners of the potential biodiversity impacts of their operations and their legal consequences.

Measures taken by Member States to implement the Directive should always be proportionate and appropriate to the objective pursued, i.e. maintaining and restoring...
FCS. Thus it would be disproportionate to impose a comprehensive set of controls that require all agricultural operations to be assessed with respect to potential impacts on strictly protected species, especially bearing in mind that this would affect all areas, not just Natura 2000 sites. Nevertheless, the Directive applies to the agricultural sector (and all others) and therefore, as the Commission guidance states, ‘Member States have to ensure that the strict protection requirements are adequately met’.

According to the Commission, many Member States have developed and promoted guidance and codes of conduct to prevent impacts of agricultural activities on strictly protected species. The aim is to increase awareness of the potential impacts and measures that can be taken to avoid them, as well as the legal consequences of damaging actions. These must complement legal measures and not replace them. Occasional accidental disturbance or killing of individuals as a result of activities that maintain the species habitats (e.g. pond management) may be acceptable where these do not harm populations as a whole. But the Commission guidance clearly states that “Where however an ongoing land use (due to changes of practices, intensification, etc.) is clearly damaging to a species, leading to decreases in its population in the area, a Member State is required to find ways to avoid this”. Thus, for example, a loss of a farmland feature such as a hedge that is important for a strictly protected species should normally be prohibited.

Information on the extent to which Article 12 is applied and its actual effectiveness in protecting habitats for strictly protected species is not readily available. However, it is clear that progress has been inadequate or slow with the transposition and implementation of Article 12 measures in some Member States, in part as a result of a focus on the establishment of the Natura 2000 network. As a result infringement procedures have been taken against some Member States, such as Germany.

Some countries such as the UK have established a planning based system of protection that appears to be effective in regulating direct impacts on strictly protected species from developments (e.g. housing, roads etc). The UK is also promoting good practice guidance amongst farmers (e.g. through leaflets and websites), which aim to reduce the likelihood of impacts on species. However, it is uncertain if such measures, in the UK and elsewhere, are adequately protecting farmland features that are habitats for strictly protected species from farming improvements.

**Issues for future policy development**

There are a number of points to consider in order to improve the potential of the Birds and Habitats Directives to protect farmland features:

- The adequacy of the designation of Annex 1 habitats that are farmland features (see Annex 2) and other Annex 1 agricultural habitats that are likely to contain farmland features should be checked and responded to accordingly.
- The importance of farmland features in supporting species and habitats of Community interest within Natura 2000 sites and the wider environment should be further assessed and the results widely disseminated to competent nature conservation, agriculture, and other land-use related authorities, as well as farming communities and other key stakeholders.
- Guidance on Article 6(1) should indicate that management plans and other management measures should properly assess the role of farmland features in maintaining habitats and species of Community interest within Natura 2000 sites.
(including their potential connectivity functions between sites), and implement adequate protection and appropriate management measures for them where necessary.

- Measures should be taken to ensure that Articles 6(2) and 6(3) are properly applied to agricultural activities that may potentially have a significant impact on designated habitat and species features within Natura 2000 sites. In particular, appropriate systems should be established for screening proposed agricultural operations with respect to the need for an appropriate assessment (e.g. by publishing lists of operations within the Natura 2000 site that would definitely require an appropriate assessment, or a screening opinion from a competent authority). Capacity should also be increased within competent authorities such that they can provide screening and scoping opinions and process appropriate assessments adequately within suitable time-frames.

- The implementation and effectiveness of Article 12 measures with respect to the protection of strictly protected species from agricultural operations need to be properly evaluated. If necessary, appropriate actions should then be taken to implement Article 12 protection measures within agricultural habitats, initially through preventative awareness and educational measures outlined in the Commission’s guidance. However, it is likely that a simplified regulatory system will be required to ensure that adequate protection is given whilst enabling farmers and landowners to maintain their livelihoods and their beneficial farming operations.

- Increase the implementation of Article 3 of the Birds Directive and Articles 3 and 10 of the Habitats Directive, particularly with respect to maintaining existing farmland features that may provide an important connectivity function (especially within or amongst Natura 2000 sites).
  - Most importantly measures should be introduced that effectively implement the precautionary principle, such that farmland features are retained if they may have a significant connectivity function. If there is any significant doubt over their connectivity value, then reasonable evidence should be provided that it will not have a significant connectivity, or other ecological impact, on any habitat or species of Community interest before it can be destroyed or modified.
  - Further practical measures are required to enhance, restore or create farmland features in Natura 2000 sites and the wider landscape where these are necessary to maintain or restore FCS in habitats and species of Community interest. Such measures should:
    - focus on species that are most at risk from fragmentation, especially if they are also threatened by the added impacts of climate change.
    - be based on well-founded ecological science and supporting evidence.
    - be integrated with other necessary conservation measures to ensure that other significant threats are reduced as necessary.
    - only increase connectivity where it is necessary and carefully consider the possible risks from such actions (e.g. facilitating the spread of alien species, pests, predators and diseases, and reductions in genetic diversity and fitness).
    - consider all options for increasing functional connectivity and take their cost-effectiveness into account, remembering that the effectiveness and efficiency of measures will vary according to the habitats and species being targeted and the landscape configuration that is present.
treat landscape connectivity as a dynamic property, and therefore follow an adaptive management approach, which responds to future changes in climate and land-use.

7.3 Cross Compliance

7.3.1 Introduction

Beneficiaries of the CAP’s Single Payment Scheme (SPS) and Single Area Payment Scheme (SAPS) need to comply with a range of standards, or in the event of a non-compliance being identified, risk a reduction to the Single Payment.31

One set of standards is collectively referred to as ‘Statutory Management Requirements’ (SMRs). The other set of standards set the framework for Good Agricultural and Environmental Condition (GAEC). The SMRs and GAEC standards that may influence the level of protection provided to farmland features are explained below.

Cross compliance applies to agricultural land on the holding that is in receipt of direct payments (according to Article 6 of Regulation 1782/2003). If a payment is received for participating in one of eight (or more)32 Axis 2 rural development measures, cross compliance and the potential for payment reductions extends across the whole holding (according to Article 51 of Regulation 1698/2005).

Member States must also provide a Farm Advisory System to inform farmers of their obligations under cross compliance (according to Chapter 3 of Regulation 1782/2003).

7.4 Statutory Management Requirements

Relevance to Farmland Features

Annex III of Regulation 1782/2003 lists the SMRs which Member States must introduce and farmers must respect. The SMRs apply to Member States applying the SPS (i.e. the EU-15, Malta and Slovenia) and will be introduced in the new Member States that operate SAPS over a three year period from 2009, or 2012 in the case of Bulgaria and Romania. The SMRs are based on the underlying legislation as transposed by the Member State, and are not new standards. Farmers would be obliged to comply with this legislation if cross compliance was not in place, and the underlying legislation still applies to those farmers who have opted out of the SPS. However, the added value of cross compliance is to reinforce existing legislation by creating the potential for reductions to be made to the single payment received by non-compliant farmers.


32 The relevant measures are: natural handicap payments, Natura 2000 payments and payments linked to Directive 2000/60/EC; agri-environment payments; animal welfare payments; first afforestation of agricultural land; Natura 2000 payments for forests and forest environment payments.
The three SMRs that most directly relate to the protection of farmland features are the Birds Directive, the Habitats Directive and the Nitrates Directive. Only certain Articles, and not the entire legislation, are included as SMRs. The selected Articles for the Birds Directive, the Habitats Directive are shown in Box 7-1.

**Box 7-1: SMRs for the Birds Directive and for the Habitats Directive.**

**SMRs for the Birds Directive**
- Create protected areas and biotopes, management of habitats to preserve, maintain and re-establish sufficient diversity/habitats for wild birds (Article 3).
- Designate Special Protection Areas for Annex I species and for migratory species not in Annex I and take steps to prevent the pollution or deterioration of these areas (Article 4 (1), (2) and (4)).
- A general system for the protection of birds including prohibiting deliberate killing or capture by any method, deliberate destruction of, or damage to, their nests and eggs or removal of their nests and; deliberate disturbance of these birds particularly during the period of breeding and rearing etc. (Article 5).
- Ensuring that the hunting of Annex II species does not jeopardise conservation efforts in their distribution area (Article 7).
- Prohibiting the large-scale or non-selective capture of birds (Article 8).

**SMRs for the Habitats Directive**
- Establish necessary conservation measures for special areas of conservation, including, if necessary appropriate management plans or statutory, administrative or contractual measures (Article 6).
- Take requisite measures to protect plant species in Annex IV including prohibiting the deliberate picking, collecting, cutting, uprooting or destruction of such plants in their natural range in the wild (Article 13).
- Prohibit the use of all indiscriminate means (gassing, explosives etc) capable of causing local disappearance of, or serious disturbance to, populations of such species listed in Annex V (Article 15).
- Ensure that the deliberate introduction into the wild of any species which is not native to their territory is regulated so as not to prejudice natural habitats within their natural range or the wild native fauna and flora and, if they consider it necessary, prohibit such introduction (Article 22b).


The most relevant Articles of the Birds Directive SMR are those related to the creation of protected areas (i.e. Articles 3 and 4), which in principle may include farmland features that provide a habitat for bird species. Article 5 is relevant in so far that birds should not be disturbed during the period of breeding and rearing. This has implications for the appropriate management of farmland features such as hedgerows and field margins. The other included Articles (7 and 8) refer to the hunting of birds and are thus less relevant to farmland features.

The relevant Articles of the Habitats Directive SMR for farmland features are 6, 13 and 22b. Articles 6 and 13 are relevant since if implemented and enforced they can help maintain the habitat quality of farmland features. Article 22b is relevant as it

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33 The SMRs are derived from 19 items of EU legislation in the areas of the environment, public health and animal health and welfare. Only certain articles from these pieces of legislation are included as cross compliance SMRs. These are Articles which are relevant to farmers or farmland.
requires restrictions to be placed on invasive species, which may reduce the habitat quality of certain farmland features. Notably Article 10, regarding the use of landscape features to promote ecological coherence, is not included as a Statutory Management Requirement.

Implementation in the Member States

Table 7-2 shows the standards that have been set at the farm level for these two SMRs and which may influence the level of protection provided to farmland features. This overview is provided by the evaluation of cross compliance conducted for DG Agriculture in 2007 (Alliance Environnement, 2007). From the available information it is difficult to get a consistent overview of the implications for farmland features. There are examples of SMRs referring to landscape features or landscape elements, including Wallonia where the destruction of native trees and hedges is prohibited, and Germany where landscape features cannot be removed without prior authorisation. In Denmark and Greece the SMRs require the introduction of a protective area; in the Danish case a 2 metre wide strip around natural lakes and water courses must be in place, whilst in Greece a conservation area for trees, equivalent to the area of the crown, must be created. Where relevant standards have been implemented, appropriate enforcement activity must take place. In most cases the requirements are more general, requiring farmers to comply with SPA management plans or to avoid the deterioration of habitats.

Articles 4 and 5 of the Nitrates Directive apply as SMRs. Article 4 refers to the establishment of a code of good agricultural practice, the aim of which is to provide all waters with a general level of protection against pollution. Article 5 requires Member States to establish action programmes in respect of designated vulnerable zones. Most Member States include SMRs for closed periods for manure and fertiliser application, rules for the storage of manures and requirements for storage capacity, rules for the application of manures and nitrogen application limits (Alliance Environnement, 2007).

The effectiveness of cross compliance in improving protection to any farmland features that may be provided for by the Birds and Habitats Directive SMRs may be hampered by the limited ability of inspectors to identify instances of non-compliance, as exemplified by the small number of breaches identified during the first year of cross compliance inspections. Rather more breaches of the Nitrates Directive SMRs have been identified.\(^{34}\)

The effectiveness of these SMRs is dependent on the effective implementation and enforcement of the underlying Directives. With respect to the Habitats and Birds Directives, the suitable designation of a network of protected sites and the design of appropriate management plans and action programmes is particularly important. Cross compliance adds an additional layer of protection if, through the threat of a reduction to the Single Payment and increased awareness of the requirements through the Farm Advisory System, the farmer continues to be compliant or becomes compliant.

\(^{34}\) An evaluation of cross compliance for DG Agriculture indicates that a very small number of breaches were identified in eight Member States in 2005. For example, no inspections were carried out for the Birds and Habitats Directive SMRs in Sweden. Breaches of the Nitrates Directive accounted for 10 per cent of all breaches in 2005 (Alliance Environnement 2007).
## Table 7-2: Protection of Farmland Features Provided for by the SMRs for the Birds Directive and the Habitats Directive

<table>
<thead>
<tr>
<th>MS</th>
<th>Birds Directive</th>
<th>Habitats Directive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Constraints on agricultural activities for Natura 2000 sites according to site objectives plus constraints outside Natura 2000 sites e.g. no damage or removal of landscape features.</td>
<td>No national farmers’ obligation. Obligations implemented at a regional level by nature conservation laws. Constraints on agricultural activities for Natura 2000 sites according to site objectives plus constraints outside Natura 2000 sites e.g. no damage or removal of landscape features.</td>
</tr>
<tr>
<td>Belgium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flanders</td>
<td>Changes to vegetation and small landscape elements are subject to special conditions (which are either forbidden or permitted only after prior authorisation).</td>
<td>List of protected species. Special management schemes exist in some areas. Changes to vegetation and small landscape elements are subject to special conditions (which are either forbidden or permitted only after prior authorisation).</td>
</tr>
<tr>
<td>Wallonia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Changes to vegetation and small landscape elements are subject to special conditions (which are either forbidden or permitted only after prior authorisation).</td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>2 metre wide strips around natural lakes and water courses must be in place; trees used for nesting must not be felled illegally.</td>
<td>Detailed rules for the protection of Natura 2000 areas by type.</td>
</tr>
<tr>
<td>Greece</td>
<td>Farmers should not destroy sections of natural native vegetation where agricultural areas border on roads and natural bodies of water. The minimum width of the conservation area: for bushes 0.50 m around the root of the bush, and for trees, the surface area corresponding to the radius of the crown.</td>
<td>Obligation to avoid destruction of natural vegetation within agricultural areas. Within Natura 2000 zones, farmers must comply with management requirements.</td>
</tr>
<tr>
<td>Finland</td>
<td>The bird species or their habitats, used as a basis for establishment of Natura 2000 site on the farm, must not be damaged.</td>
<td>Farmers must follow management plans for protected sites based on the Nature Conservation Act. Farmers having NATURA 2000 areas have detailed special provisions based on this framework</td>
</tr>
<tr>
<td>France</td>
<td>Habitats mapped or designed by the DDAF should not be destroyed. Respect of the procedures of authorisation of activities: these procedures are applicable only in the Natura 2000 sites. This involves in particular the assessment of the impact in relation to the aims of conservation of the site.</td>
<td>Destructive practices defined in departmental notices. In Natura 2000 areas authorisation is required before undertaking work likely to impact on the habitat. To be eligible for AES farmers must not have been fined for destruction of plant or animal species or their habitats or for introducing non-native species.</td>
</tr>
<tr>
<td>Ireland</td>
<td>Farmers must comply with the general requirements listed for Special Protection Areas (SPAs) and other land.</td>
<td>Obligation to observe management requirements on protected areas or in commonages.</td>
</tr>
<tr>
<td>Italy</td>
<td>Where no specific Regional Acts and Management Plans for SPA areas exist, farmers must adopt GAEC standards for the management of areas no longer in</td>
<td>Farmers must comply with regional acts and management plans for protected areas. Structural interventions require public authorisation based on EIA.</td>
</tr>
</tbody>
</table>
### Chapter 7 Legal Protection of Farmland Features

<table>
<thead>
<tr>
<th>MS</th>
<th>Birds Directive</th>
<th>Habitats Directive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luxembourg</td>
<td>agricultural use and the maintenance of landscape features. Structural interventions require public authorisations based on impact environmental assessment.</td>
<td>Natural habitats and landscape features to be protected. Management restrictions apply.</td>
</tr>
<tr>
<td>Malta</td>
<td>Checks carried out for: evidence of activities likely to damage an SPA including development which requires consent from MEPA; evidence of non-compliance with management agreements/plans/considerations in SPAs</td>
<td>Farmers must: not damage a Natura 2000 site and have consent from MEPA for certain development; comply with management agreements/plans/considerations</td>
</tr>
<tr>
<td>Portugal</td>
<td>Statutory measures under management plans.</td>
<td>Management requirements for protected areas. Requirement to maintain balance of habitats.</td>
</tr>
<tr>
<td>Slovenia</td>
<td>Management requirements for protected areas. Requirement to maintain balance of habitats.</td>
<td>Management requirements for protected areas. Requirement to maintain balance of habitats.</td>
</tr>
<tr>
<td>Spain</td>
<td>No damage to natural structural elements on the ground.</td>
<td>Protected areas designated at regional level. Farmers must avoid deterioration of habitats and ask regional authorities before undertaking work likely to cause damage in these areas.</td>
</tr>
<tr>
<td>Sweden</td>
<td>Farmers must comply with Natura 2000 site management plans and seek permission for those activities which may damage the site; farmers must not undertake any measures that may lead to failure or reduced success of breeding of wild birds.</td>
<td>England: In protected areas farmers must comply with requirements. N Ireland: In protected areas farmers must avoid damaging the habitats and follow management measures. Scotland: Within protected areas farmers must avoid causing damage and meet terms of management agreements and other conditions. Wales: Farmers must not carry out activities likely to damage protected areas. Farmers must comply with management agreements.</td>
</tr>
<tr>
<td>UK</td>
<td>England: Farmers must comply with requirements for SPAs; N. Ireland: farmers must not damage fauna or the interest of an SPA where they apply; Scotland: farmers must comply with nature conservation order, management agreement, byelaw for protection of SSSI; Wales: farmers must not flail, lay or coppice hedges within the prohibited period.</td>
<td>England: In protected areas farmers must comply with requirements. N Ireland: In protected areas farmers must avoid damaging the habitats and follow management measures. Scotland: Within protected areas farmers must avoid causing damage and meet terms of management agreements and other conditions. Wales: Farmers must not carry out activities likely to damage protected areas. Farmers must comply with management agreements.</td>
</tr>
</tbody>
</table>


**Issues for future policy development**

The inclusion of certain Articles of the Birds and Habitats Directives within the SMRs may reinforce the legislation at the farm level. However, the SMRs, in most Member States, do not explicitly target farmland features - due to the way the underlying legislation is designed and has been implemented - and hence play a limited role in protecting farmland features. The effectiveness of SMRs in providing an additional layer of protection is dependent on the suitable implementation and enforcement of the underlying legislation, which remains incomplete in many cases. In addition, for the purposes of cross compliance, SMRs need to be translated into standards that farmers can understand and with which compliance can be verified during control visits. The Nitrates Directive SMRs are important for reinforcing the appropriate regulations.
management of the wider agricultural landscape in order to help maintain the water quality of farmland features such as ponds, ditches and other water bodies.

7.5 Good Agricultural and Environmental Condition

Relevance to Farmland Features

Member States must define minimum requirements for good agricultural and environmental condition on the basis of the rules provided in Article 5 and Annex IV of Regulation 1782/2003 (as shown in Figure 7H1). Annex IV lists a total of four issues and ten standards for good agricultural and environmental condition. Member States must define obligations at the farm level for all of these standards, unless they are not relevant to the national context (DG Agriculture, pers. comm.) Three of these issues relate to soils, specifically soil erosion, soil organic matter and soil structure. The fourth relates to the minimum level of maintenance of agricultural land and avoiding the deterioration of habitats. Two Annex IV standards directly relate to the protection of farmland features and are the focus of this section. The other Annex IV standards may influence surrounding agricultural management and therefore play a more indirect role in influencing the quality of farmland features. The most relevant standards are:

- The retention of terraces, in order to protect soil from erosion.
- The retention of landscape features, including, where appropriate, the prohibition of the grubbing up of olive trees, in order to ensure a minimum level of maintenance and avoid the deterioration of habitats.

A further Annex IV standard, regarding avoiding the encroachment of unwanted vegetation on agricultural land, has specific implications for those situations where some natural succession and, in effect, the creation of a new farmland feature, may be desirable for environmental reasons.

Article 5 of Regulation 1782/2003 provides Member States with some discretion as to how these standards should be designed to best reflect national circumstances. It states that Member States should take into account the specific characteristics of the areas concerned, including soil and climatic conditions, existing farming systems, land use, crop rotation, farming practices and farm structures. In addition, agri-environment schemes should take into account the baseline set by the GAEC standards. Farmland features, nor the landscape features of Annex IV, are explicitly referred to in Article 5, although they may be considered to be parts of farming systems, land use, farming practices and farm structures.

As part of cross compliance, Member States are obliged to ensure that the total area of permanent pasture does not drop below 90 per cent of a 2003 reference level in the case of the EU-15, or a 2004 reference level in the case of the EU-10. This rule does not relate to a specific farmland feature as environmentally valuable semi-natural grasslands fall outside the scope of the study. However, by restricting the conversion of grassland to arable land the rule lowers the potential for negative impacts on

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35 Areas of intensively farmed olive trees are not relevant to this study as they are of low environmental value. Traditional, extensively managed olive groves are of interest due to associated high nature values and a high level of threat of neglect or abandonment.
farmland features that are associated with more intensive forms of arable production (see section 6 for a discussion of the related pressures).

GAEC provides three layers of protection for farmland features. Firstly, through Article 5 and Annex IV of Regulation 1782/2003, it provides a framework for Member States to introduce standards to ensure existing landscape features are protected from removal. Second, other GAEC standards may indirectly support the environmental value provided by farmland features. Third, all farmland features protected through GAEC are included in the eligible area for direct payments under the SPS and SAPS, which for the reasons discussed in Chapter 8 affords additional protection. The level of protection actually provided depends on the implementation of the above rules by the Member States.

Figure 7-1: Annex IV of Regulation 1782/2003.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Standards</th>
</tr>
</thead>
</table>
| Soil erosion: Protect soil through appropriate measures | — Minimum soil cover  
— Minimum land management reflecting site-specific conditions  
— Retain terraces |
| Soil organic matter: Maintain soil organic matter levels through appropriate practices | — Standards for crop rotations where applicable  
— Arable stubble management |
| Soil structure: Maintain soil structure through appropriate measures | — Appropriate machinery use |
| Minimum level of maintenance: Ensure a minimum level of maintenance and avoid the deterioration of habitats | — Minimum livestock stocking rates or land appropriate regimes  
| | — Protection of permanent pasture  
| | — Retention of landscape features, including, where appropriate, the prohibition of the grubbing up of olive trees  
| | — Avoiding the encroachment of unwanted vegetation on agricultural land  
| | — Maintenance of olive groves in good vegetative condition |
Box 7-2: Article 5 of Regulation 1782/2003.

(1) Member States shall ensure that all agricultural land, especially land which is no longer used for production purposes, is maintained in good agricultural and environmental condition. Member States shall define, at national or regional level, minimum requirements for good agricultural and environmental condition on the basis of the framework set up in Annex IV, taking into account the specific characteristics of the areas concerned, including soil and climatic condition, existing farming systems, land use, crop rotation, farming practices, and farm structures. This is without prejudice to the standards governing good agricultural practices as applied in the context of Council Regulation (EC) No 1257/1999 and to agri-environment measures applied above the reference level of good agricultural practices.

(2) Member States shall ensure that land which was under permanent pasture at the date provided for the area aid applications for 2003 is maintained under permanent pasture. The new Member States shall ensure that land which was under permanent pasture on 1 May 2004 is maintained under permanent pasture.

7.5.1 Implementation in the Member States

Farmland Features Specifically Addressed by GAEC Standards

According to an evaluation for DG Agriculture conducted by Alliance Environnement (2007) and information collected for this study, 14 Member States have standards that appear to offer protection to farmland features, as shown in Table 7H3. A total of 12 Member States have not introduced obligations for farmers to retain landscape features (Belgium, Denmark, Estonia, Hungary, Lithuania, Luxembourg, Latvia, Netherlands, Poland, Portugal, Slovenia and Slovakia). France has not introduced standards to retain existing farmland features, but has introduced one standard to create an ‘environmental cover’.

Some Member States target the retention of specific features such as stone walls, hedgerows, small woods and terraces, with the most comprehensive implementation – in terms of GAEC standards corresponding to the actual diversity of farmland features present in the country – being Germany and the UK. Many of these obligations are based on previously existing national laws and are reinforced through cross compliance via the threat of a reduction to the direct payment received by non-compliant farmers.

Other Member States have more general requirements, referring to examples of farmland features rather than listing those which specifically need to be retained, as is the case in Cyprus. The Spanish national law establishing GAEC refers to the ‘maintenance of the structure of the terrain’, although it only explicitly mentions field margins (linderos) as an example of elements to be maintained (Beaufoy, 2008).

Nine Member States have farmers’ obligations relating to the retention of terraces (Austria, Cyprus, Czech Republic, Germany, Greece, Spain, Italy, Luxembourg and Romania), although Romania and Spain also require terraces to be maintained.

In a small number of cases some form of management has been specified within the relevant GAEC standards for farmland features and so provide a slightly higher baseline level of protection. For example, the UK countries include specific
prescriptions relating to the timing of the cutting of hedgerows, included to protect bird species during the main breeding season. In addition, whilst most of the farmers’ obligations require that terraces are not destroyed or removed, in Romania, Spain and Italy there is a requirement to maintain terraces. For example in Spain, GAEC requires maintenance of terraces and their retaining walls in good condition, and their repair in case of collapse (Beafoy, 2008). Research has shown that Member States are generally reluctant to include GAEC standards that require management (rather than simply obliging farmers to simply not remove a feature) or may result in a loss of income (such as the protective buffers required in England and France which reduce the total field area that can be farmed) (Jongeneel et al., 2008). However, the GAEC mechanism can be extremely effective because of the threat of payment reduction in the event of non-compliance. For example, the authors of the French case study estimate that approximately 423,000 ha of grassy buffer strips have been created next to watercourses since the introduction of the national GAEC standard for ‘environmental cover’ (Pointereau and Coulon, 2008).

In other cases, features commonly found in some Member States are not included in the national implementation of GAEC. As summarised by Table 7-3, the most notable example is France, where there is a rich diversity of farmland features such as hedgerows, trees and stone walls. In Sweden, many farmland features are included in GAEC, but one of the most common, field islets, is not (Herodes, 2008).

**Table 7-3: Summary of Farmland Features Protected by Member State GAEC Standards.**

<table>
<thead>
<tr>
<th>MS</th>
<th>GAEC Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Landscape features protected under nature protection regulations must not be removed. Terraces must not be cleared without authorisation.</td>
</tr>
<tr>
<td>Cyprus</td>
<td>Farmers to protect the main characteristics of the rural landscape including trees, bushes, stone walls, paths, etc. Soil steps (terraces) should be protected.</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>No destruction of landscape features including field banks / hedgerows, terraces, windbreaks, grasslands in alluvial plains, field paths, surface water streams and water bodies.</td>
</tr>
<tr>
<td>Finland</td>
<td>Small groups of trees and bushes as well as patches of rocks located in fields must be retained.</td>
</tr>
<tr>
<td>Germany</td>
<td>Certain landscape features must be retained – including single trees, rows of trees, hedgerows, small woods and small wetlands. Terraces must not be removed unless authorised.</td>
</tr>
<tr>
<td>Greece</td>
<td>Terraces, walls, dykes and natural banks bordering parcels must not be destroyed.</td>
</tr>
<tr>
<td>Ireland</td>
<td>Habitats designated under national and EU legislation must not be damaged. No burning of vegetation on uncultivated land or in any hedge or ditch between the dates of 1 March to 31 August. External farm boundaries on land occupied by livestock must be maintained (exceptions apply).</td>
</tr>
<tr>
<td>Italy</td>
<td>Maintain terraces. (A standard to retain ‘natural elements’ such as rows of trees, hedgerows, thickets and ponds was considered, but not implemented because retention was judged not easily verifiable (Povellato and Trisorio, 2008)).</td>
</tr>
<tr>
<td>Luxemburg</td>
<td>Present terraces have to be retained.</td>
</tr>
<tr>
<td>Malta</td>
<td>Terraced rubble walls should be preserved and maintained in good state. Indigenous trees listed in the guidance document should not be uprooted.</td>
</tr>
<tr>
<td>Romania</td>
<td>Retain terraces, single trees and groups of trees.</td>
</tr>
<tr>
<td>Spain</td>
<td>Maintenance of terrain structure and topographic features. Retention terraces should be kept in good condition.</td>
</tr>
<tr>
<td>Sweden</td>
<td>Do not damage or move the following landscape elements: wells, springs, foundations</td>
</tr>
</tbody>
</table>
Chapter 7 Legal Protection of Farmland Features

<table>
<thead>
<tr>
<th>MS</th>
<th>GAEC Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>of buildings, ancient remains, cattle paths, traditional wooden fences (‘gärdesgårdar’), earthen walls, ditched walls, clearance cairns, stone dumps, stone walls, open ditches, and traditional buildings.</td>
</tr>
<tr>
<td>UK</td>
<td>England: Rules for protection of stone walls, protection of hedgerows and watercourses (rules for 2 metre margins), rules on protection and management i.e. closed periods for hedge cutting, rules on felling of trees. Northern Ireland: Maintain field boundaries and respect hedge cutting rules. Scotland: rules for field boundaries and non-productive landscape features. Wales: Retention of field boundaries (e.g. hedges and stone walls) and rules for hedge management.</td>
</tr>
</tbody>
</table>

Source: Case Study Reports; Alliance Environnement, 2007.

There are a limited number of cases where GAEC standards result in the creation of new farmland features, as summarised in Box 7-3. In each case, the standard requires the creation of a new feature, such as a buffer, in order to protect another feature, such as a hedgerow or a water feature. These ‘new’ features are likely to provide a range of environmental benefits depending on where they are located, how they are managed and how long they are in place for.

**Box 7-3: Use of GAEC to Create Environmentally Beneficial Farmland Features.**

**Austria**
No tillage operations next to watercourses, or 10m adjacent to stagnant water bodies and 5m next to other watercourses.

**England**
A strip of land must be left uncultivated adjacent to hedgerows and watercourses. The strip should measure two metres from the centre of a hedge and a minimum of one metre from the top of the ditch bank. The strip must not be cultivated nor have fertilisers, herbicides or pesticides applied to it. The standard targets two key habitats (watercourses and hedges) and does not apply to small fields (defined as being of two hectares or less) or to newly planted hedgerows less than five years old.

**Finland**
There must be a 60cm wide, untilled verge between fields and major ditches and/or watercourses, where no fertiliser or pesticide application is allowed.

**France**
Three per cent of the area declared in order to obtain CAP subsidies must be sown with an environmental cover. This strip should have a minimum width of 5m, a maximum width of 10m and a minimum surface area of 5m². Strips alongside watercourses should be prioritised, although if this is insufficient to reach the 3% requirement, strips alongside linear features should also be targeted. The sowing of an environmental cover with species authorised by each department is obligatory between 1 May and 31 August. Fertilisers and pesticides cannot be applied to the strip. Small producers (defined as those with a cultivated area less than that needed to produce 92 tonnes of cereal) are exempt. Exemptions also apply when no water courses are present on the holding.

Source: Case Study Reports; IEEP, 2008a; Alliance Environnement, 2007.

**GAEC and Selective Natural Regeneration on Farmland**
The need to secure the potential use of agricultural land was a major objective for GAEC following decoupling. The Annex IV standard to avoid the encroachment of
unwanted vegetation on agricultural land seeks to maintain an open agricultural landscape and maintain the production potential of farmland. General obligations to remove unwanted vegetation on agricultural land have been established by the majority of Member States. In eight Member States the farmer can choose to meet the obligation through grazing or cutting, with the frequency of required management ranging from yearly to every five years (Alliance Environment, 2007).

Two key issues arise for farmland features (following Alliance Environment, 2007). The first is that the standards, as introduced by the Member States, could lead to the increased use of chemical plant protection products. Secondly, the rules have specific implications for those situations where some highly targeted natural regeneration, underpinned by a strong evidence base, may be desirable for example, to increase habitat heterogeneity to support biodiversity, to benefit the protection of soil and water resources, or to increase carbon sequestration. Natural regeneration is regarded as more environmentally beneficial than human induced afforestation, which is supported in the rural development programmes of some Member States. It would be undesirable, however, where the development of scrub would pose a fire risk or result in a net loss of biodiversity.

Permitting natural regeneration, albeit in a selective way where it would result in a net environmental benefit (in a similar way to how the afforestation of agricultural land is justified in rural development programmes), leads to a number of questions regarding future policy design. Allowing natural regeneration to shrubs and trees, on present terms, for example at the edge of parcels adjoining existing woods, could result in the parcel concerned becoming ineligible for the SPS. A flexible interpretation of GAEC and the eligibility rules of parcels for the SPS could allow for the regeneration of low density trees and shrubs, up to a maximum density of 50 trees/ha. This is the limit set in the Regulations concerning the eligibility of parcels for the SPS, and a higher density can be permitted for justifiable environmental reasons (see Chapter 8 for a detailed description). This is a position advocated in the UK by the Land Use Policy Group (LUPG, 2007). However, to gain momentum, it would require something of a paradigm shift in terms of what the Single Payment should be used to pay for, and would need to be balanced against the relative merits of using the rural development measures to reward natural reforestation (see Chapter 7.12).

**Permanent Pasture Rules**

The design and environmental implications of the permanent pasture rules have been investigated by Alliance Environment (2007). In nearly all Member States, measures are in place in order to prevent decreases in the ratio of permanent pasture to arable land. Different threshold values (for example, a decrease of the ratio of permanent pasture by 5 or 10 per cent) are linked to warnings, restrictions on conversion, or obligations for reconversion.

The main criticism of the permanent pasture rules from an environmental perspective is the poor targeting of environmentally important permanent pasture. The rules focus on the maintenance of permanent pasture in purely quantitative terms. For example, the rules do not discriminate between the conversion of high biodiversity quality semi-natural pastures and the conversion of biodiversity poor fertilised grasslands. Rather, the protection of the environmentally valuable pasture relies on adequate requirements in the national legislation transposing the Habitats Directive and/or the
suitable implementation of GAEC standards (Farmer et al., 2007). In addition, the rules cannot prevent permanent pasture from declining unequally over the Member State or may not to detect rapid conversions, particularly if farmers consider the rules as an incentive to plough before further conversion becomes restricted.

The most valuable semi-natural pasture is often protected by nature protection and/or environmental impact assessment legislation. However, the conversion of less environmentally valuable habitats could have implications for farmland features since the expansion of UAA may, in the absence of suitable restrictions, result in the removal of farmland features or a decline in the quality of farmland features as a result of increasing levels of fertiliser and pesticide usage. There is no recent evidence as yet of the rate of conversion or the related environmental implications.

7.5.2 Recommendations for Future Policy Development

GAEC can protect the existing distribution, density and diversity of farmland features if features are included in the national implementation of the EU GAEC framework. The available evidence suggests that the protection of farmland features through GAEC is inconsistent at the moment, but may be potentially improved by considering the additional protection each of the following might offer:

- Revise the ‘retention of landscape features’ standard in Annex IV of Regulation 1782/2003 to refer to specific farmland features.
- Revise the ‘retention of landscape features’ standard in Annex IV of Regulation 1782/2003 to refer to the creation of new farmland features, primarily buffer strips, where this would protect an existing farmland feature, such as a hedgerow, or where the creation of a new feature would be beneficial for soil or water conservation.
- Revise Article 5 of Regulation 1782/2003 to include a specific reference to farmland features of environmental value.
- Improve data collection on the presence of farmland features to enable enforcement of penalties under cross compliance in the event of removal.

The proposed amendments to Regulation 1782/2003 by the 2008 CAP Health Check address the first point. The draft legislation, subject to adoption by the Member States, updates the ‘retention of landscape features’ GAEC to now refer to the ‘Retention of landscape features, including, where appropriate, hedges, ponds, ditches, trees in line, in group or isolated and field margins’. In addition, a new GAEC issue is introduced for the ‘protection and management of water’ with a corresponding standard for the ‘establishment of buffer strips along water courses’. This partly addresses the second point. In order to afford greater protection of farmland features, these proposals should be strongly supported.

Increasing the flexibility of the ‘encroachment of unwanted vegetation’ GAEC standard and the SPS and SAPS eligibility rules would create the opportunity for new farmland features - i.e. trees or small groups of trees - to develop through natural regeneration whilst maintaining the eligibility of the affected land for the SPS. This could provide environmental benefits by increasing habitat heterogeneity, increasing carbon sequestration potential and responding to soil and water conservation problems. To be effective, natural regeneration would need to be targeted to ensure no net loss of environmental benefit. Farmers and land managers would therefore require
expert guidance. This is an idea requiring a substantial shift in the focus of agricultural policy to permit direct payments to be received on land with new woody growth (or ‘unwanted vegetation’ using current terminology).

The environmental implications, including those related to the stock of farmland features, arising from any increase in the rate of conversion of permanent pasture to arable land requires close observation. Other legislation, such as nature conservation legislation and environmental impact assessment legislation should prevent the removal of or deterioration in the quality of farmland features, if adequately implemented and enforced.

7.6 The European Agricultural Fund for Rural Development (EAFRD)

Relevance to Farmland Features

The rural development Pillar of the CAP, as provided for by Council Regulation 1698/2005\(^{36}\), provides a number of measures which, if suitably designed and appropriately funded, may maintain or enhance the diversity, density and quality of farmland features. EU rural development policy follows a programmed approach, meaning Member States undertake an ex-ante evaluation, a strategic environmental assessment, draft a national strategy plan and justify the choice of national or regional priorities with respect to those set out in the EU Strategic Guidelines\(^{37}\). The rural development programme (RDPs) is produced by the Member State or, where relevant, the regional government, and approved by the European Commission. There are a total of 94 RDPs.

In this section, the relevance of the Strategic Guidelines to farmland features is set out, before the relevant specific rural development measures are described. Information on implementation is provided in the case study reports and other literature. Particular issues relevant to bolstering the use of each measure for the protection of farmland features are also set out. The relevance of the Common Monitoring and Evaluation Framework (CMEF) to farmland features is also described.

Strategic Guidelines

Each Member State’s national strategy plan must be consistent with the Community Strategic Guidelines\(^{38}\). The guidelines help to set out where EU support for rural development creates the most added value and how measures should be used to meet the EU’s Göteborg Agenda. These guidelines require that the resources devoted to Axis 2 of the EAFRD, which includes measures for ‘Improving the environment and the countryside’, contribute to three EU priority areas: biodiversity and the


preservation of high nature value farming and forestry systems and traditional agricultural landscapes; water and climate change. Axis 2 measures should also support the implementation of the Natura 2000 network, the Göteborg commitment to reverse biodiversity decline by 2010, the objectives for water policy and the Kyoto Protocol targets for climate change mitigation. Farmland features can play a role in responding to these priorities, not least because of their function in HNV farming systems and their association with traditional agricultural landscapes.

**Rural Development Measures**

Regulation 1698/2005 sets out a total of 46 rural development measures, grouped according to one of four Axes. Each Axis contains a number of measures under which support payments of different kinds such as investment grants and annual payments can be offered on a voluntary basis to recipients including farmers, landowners and foresters. Axis 2 contains thirteen measures that can be used to address environmental needs and to bring about improvements over and above the baseline level of protection provided by legislation and cross compliance. The key measures for maintaining or enhancing the diversity, density and quality of farmland features are:

- Agri-environment payments (Article 39).
- Natura 2000 payments and payments linked to Directive 2000/60/EC (Article 38).
- Non-productive investments (Article 41 and Article 49).
- Forest-environment payments (Article 47).
- The agro-forestry measure (Article 44).
- The natural handicap payments (i.e. the LFA measure) (Article 37).
- The afforestation measures (Article 43 and Article 45).
- Conservation and upgrading of the rural heritage (Article 57), provided by Axis 3 (‘The quality of life in rural areas and diversification of the rural economy’).

Axis 1 includes measures for ‘Improving the competitiveness of the agricultural and forestry sector’ that target the modernisation and competitiveness of the agriculture and forestry sectors. However, the measures relating to the use of advisory services (Article 24), the setting up of advisory services (Article 25), along with the skills acquisition measure in Axis 3 (Article 59) may play a positive role in supporting the farmland feature resource, depending on implementation. Axis 4 is dedicated to the Leader approach of bottom-up, community inspired initiatives and can be delivered across a combination of Axes, and offers some potential for the protection of the

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39 At least 25% of the EAFRD budget must be spent on Axis 2, 10% on Axes 1 and 3, and 5% on Axis 4. The EAFRD contributes a portion of funding to the total rural development budget with national, and in some cases regional, governments co-financing the remaining percentage. The EAFRD contributes up to 55% of total public expenditure in the case of Axis 2 (and up to 50% for Axes 1 and 3). The rate of Community funding increases to a maximum rate of 80% in the Convergence Objective regions (or up to 70% for Axes 1 and 3). These are poorer regions of the EU entitled to higher levels of support under the Community’s cohesion objectives. Member States can also provide additional state aid known as ‘additional national financing’, subject to various restrictions, for a number of rural development measures, so long as these are specified in the RDP and agreed by the European Commission. Certain measures may also require the input of private funds by the beneficiary, for example, in order to fund farm modernisation projects.
farmland feature resource, depending on the make up of the Local Action Group and its priorities.

7.7 The Agri-Environment Measure

Overview of the Measure

The agri-environment measure is the only measure that must be included in all programmes. The preamble of Regulation 1698/2005 may be interpreted as including a reference to farmland features, which states that agri-environment payments ‘should further encourage farmers and other land managers to serve society as a whole by introducing or continuing to apply agricultural production methods compatible with the protection and improvement of the environment, the landscape and its features, natural resources [and] the soil and genetic diversity’ (our emphasis).

According to Article 39 of Regulation 1698/2005, agri-environment payments can be granted to farmers and other land managers who make a voluntary agri-environment commitment. The payment, made annually, can cover additional costs, income foregone and where necessary, transaction costs. Agri-environment agreements with farmers are made for a period of between five and seven years. The commitments must also go beyond those provided for by cross compliance as well as minimum requirements for fertiliser and plant protection product use and other relevant mandatory requirements established by national legislation and identified in the programme. Spending under the agri-environment measure may be further supplemented by use of the non-productive investments measure (see separate section).

Relevance to Farmland Features

The agri-environment measure is the key EU measure for targeting the active management of farmland features in order to secure environmental benefits (i.e. an improvement to the quality of the feature), or the restoration and creation of farmland features in order to increase overall density and diversity for environmental reasons.

Implementation in the Member States

According to a recent analysis by IEEP (2008c), almost €34.4bn is planned to be spent on the agri-environment measure40. This is the most for any measure and twice that directed towards the Axis 1 modernisation measure, which is the next most well-funded. Sweden allocates the greatest proportion of any Member State to this measure (54% of total public expenditure (TPE))41, with the UK, Ireland, Denmark, Austria and Finland each allocating in excess of 30% of TPE. Within the UK, England allocates two-thirds of TPE to this measure. At the other extreme, 11 Member States allocate less than 20% of TPE to the agri-environment measure, including Greece, Spain, Portugal and Romania. Spending on environmental objectives under the agri-environment measure may be further supplemented by use of the non-productive investments measure, which is set to be used in 39 of the RDPs examined by IEEP.

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40 The analysis was based on an examination of 76 examined programmes.

41 TPE refers to total public expenditure i.e. EAFRD contribution + amounts raised through modulation + national co-financing for the entire 2007-2013 programming period.
Table 7-4 provides examples of the way in which agri-environment schemes are used to target eight farmland features, as identified by the case studies. In most Member States there are payments targeting either the maintenance, restoration or creation of farmland features. The most effective options are likely to be those with clearly defined management prescriptions, as well as those that sit within an overarching strategic approach to land management.

With respect to overall scheme design it is particularly worth noting:

- The case of France, where farmers can receive an agri-environment payment for putting in place wider buffer strips than those required under GAEC. The agri-environment measure therefore builds upon the baseline standard included in GAEC.
- The case of England, which takes a tiered approach to agri-environment, by including more basic maintenance standards in one scheme, and more demanding options in another.

The following examples of agri-environment options underline the importance of clearly defined management prescriptions:

- In Denmark, 75% of trees in new small areas of woodland (<0.5ha) must be broadleaved. The planting of appropriate species is important for biodiversity reasons.
- In Spain, there are requirements to use native trees when planting new trees. The use of herbicides, pesticides and fertilisers under tree canopies is also prohibited and annual pruning is required, although deadwood must be removed.
- In the UK, a basic measure protects in-field trees, by limiting the application of fertiliser, manure and pesticides etc., and fallen timber must be left. The higher level scheme protects older trees through the creation of an unfertilised buffer around the base of the tree and all fallen deadwood must be retained.

Overall scheme design as well as the design of individual options will help to determine the environmental value provided. Whilst the agri-environment measure is used to target farmland features to varying degrees, its potential to provide for more features may be limited by the overall financial and administrative resources available for the measure, and rural development more generally.

**Issues for Future Policy Development**

The agri-environment measure is the leading measure to target the maintenance, restoration and creation of farmland features, and hence to maintain or increase the density, diversity and quality of farmland features. Because of this, examples of best practice – in order to improve targeting and effectiveness - should be identified and shared among the Member States. Innovative examples should also be identified or piloted. Finding ways to reward the contribution of farmland features to enhance ecological connectivity, whilst reducing the hostility of the wider environment (e.g. less pesticide usage) is one approach. In certain situations, there is a strong case for augmenting the use of the agri-environment measure in Natura 2000 sites, given some farmland features in these areas may support species of European importance (see Birds and Habitats Directive sections). The Rural Development Network provides one opportunity to identify and disseminate best practice.
### Table 7-4: Examples of Agri-Environment Scheme Options for Farmland Features.

<table>
<thead>
<tr>
<th>MS</th>
<th>Hedgerows</th>
<th>Stone Walls</th>
<th>Trees</th>
<th>Small Pockets of Woodland</th>
<th>Buffer Strips and Field Margins</th>
<th>Ditches</th>
<th>Terraces and Terrace Walls</th>
<th>Unutilised Land on Farm Land</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>Refunds of 40 to 60% of the establishment cost of 1-7 rowed hedges.</td>
<td>Information not presented</td>
<td>Information not presented</td>
<td>Refunds of 40 to 60% of the cost for establishing woodlots smaller than 0.5 ha.</td>
<td>10 to 20 metre broad buffer zones along water courses or lakes.</td>
<td>Information not presented</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>France</td>
<td>Measures for planting, maintenance &amp; restoration.</td>
<td>Information not presented</td>
<td>Planting and maintenance of trees rows</td>
<td>Establishment or rehabilitation &amp; maintenance of groves</td>
<td>Implementation of a buffer strip on arable land with a minimum width of 5m.</td>
<td>Maintenance or rehabilitation of ditches</td>
<td>Information not presented</td>
<td>Information not presented</td>
</tr>
<tr>
<td>Germany*</td>
<td>No AEM to directly protect hedges or hedgerows.</td>
<td>Not applicable</td>
<td>No AEM to directly protect rows of trees.</td>
<td>No relevant measure.</td>
<td>No relevant measure.</td>
<td>No information for the current RDP period.</td>
<td>Not applicable</td>
<td>Feature not present/reported</td>
</tr>
<tr>
<td>Italy**</td>
<td>14 Regions have measures for the restoration and maintenance of hedgerows. Most regions also support creation.</td>
<td>14 Regions have sub-measures for the restoration and maintenance of lines of trees</td>
<td>Maintenance of small woodlands.</td>
<td>6 regions have implemented a measure to create grassy strips or strips with trees.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Romania</td>
<td>Measures aimed at ensuring farmers maintain high nature value grassland maintain traditional farming practices may indirectly support farmland features.</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Spain***</td>
<td>Payments for planting and maintaining hedges.</td>
<td>Payments for maintaining dry-stone walls.</td>
<td>Payments for planting and maintaining new farmland trees.</td>
<td>Information not presented</td>
<td>Information not presented</td>
<td>Feature not present/reported</td>
<td>Very limited use of agri-environment for maintaining terraces.</td>
<td>Feature not present/reported</td>
</tr>
<tr>
<td>Sweden</td>
<td>Feature not present/reported</td>
<td>Payments for maintaining stone walls.</td>
<td>Payments for maintenance and planting of trees; higher payments for pollarded trees. Payment for managing trees on grazing land.</td>
<td>Feature not present/reported</td>
<td>Payment for field verges.</td>
<td>Payment for maintenance of field ditches.</td>
<td>Feature not present/reported</td>
<td>Payments for clearance cairns and field islets.</td>
</tr>
<tr>
<td>UK</td>
<td>Payments for management, and enhanced management; and for restoration.</td>
<td>Payments for protection and maintenance, restoration.</td>
<td>Payments for protection of in-field trees and maintenance of ancient trees.</td>
<td>Management of woodland edges &amp; creation of new small areas of woodland.</td>
<td>Payments for creation and management of buffer strips.</td>
<td>Payments for ditch management.</td>
<td>Not applicable</td>
<td>Payments to create unsown areas in arable fields (aka skylark plots)</td>
</tr>
</tbody>
</table>

Source: Case Study Reports.

* Only the RDP for Brandenburg/Berlin has been examined; ** Based on rapid overview of 21 RDPs; *** Based on examination of RDPs for Catalonia and Basque Country.
Strategic approaches to agri-environment also need to be further developed, drawing on good examples. Tiered approaches to land management may be more effective since they present a route for the farmer to progress to more demanding and environmentally beneficial options. A co-ordinated, strategic approach is also necessary to ensure that agreements on different farms within a region contribute to overarching national and EU goals. This could in part be achieved by realising multiple agreements between farmers in a region. This is explored further in the policy options developed for this study.

The future use of the agri-environment measure must be considered against the backdrop of rising commodity prices and the potential that participation in agri-environment schemes becomes less financially desirable for some farmers. There is a well founded case to revisit the rural development budget as a whole in order to ensure there is sufficient funding available to maintain, restore and create farmland features, as necessary for meeting overarching environmental objectives.

### 7.8 The Natura 2000 measures

#### Overview of the measures

There are two measures which can support the implementation and achievement of objectives relating to Natura 2000. One measure relates specifically to forests (Article 46) and another to agricultural land (Article 38). Article 38 also refers to the Water Framework Directive (WFD).

Article 38 allows payments to be made to farmers to compensate for costs incurred and income foregone resulting from disadvantages, such as a restriction on agricultural management, arising from implementation of the Birds, Habitats and Water Framework Directives. The maximum permitted rate of payment is €500 per hectare of UAA for the first five years, followed by a rate of €200 per hectare of UAA.

Article 46 allows payments to be made to private forest owners or associations to compensate for costs incurred and income foregone resulting from the restrictions on the use of forests and other wooded land due to the implementation of the Birds and Habitats Directives. The minimum payment is €40 per hectare, to a maximum of €200 per hectare.

#### Relevance to Farmland Features

This measure could enable farmers to meet the requirements of any Natura 2000 management plans applicable to their farm holding, as well as any requirements arising from the WFD. Natura 2000 management plans for agricultural land may include requirements relevant to farmland features. Although these payments could facilitate the implementation of management plans and the achievement of overarching objectives, the level of protection offered is very much dependent on the status of the Natura 2000 network and the existence of associated management plans. Although forests are not considered a farmland feature for the purposes of this study, using both Natura measures would be of use to supporting the resilience of species across both agricultural and wooded landscapes.
Chapter 7 Legal Protection of Farmland Features

Implementation in the Member States

Expenditure and uptake on the two Natura 2000 measures is rather low with limited uptake across the EU (IEEP, 2008c). According to research by IEEP (2008c), based on 76 RDPs, a total of 25 programmes will use the measure for Natura 2000 payments and Water Framework Directive (WFD) payments for agricultural land, with an allocated expenditure of €786m. It is understood that this money will be entirely directed to Natura 2000 since, at the time of writing, no implementing rules regarding the application of the rule for the WFD yet exist (pers. comm., DG Environment).

Indicating the low priority given to the measure by the Member States, in 15 of the programmes, the measure accounts for 1% or less of total public expenditure, falling as low as 0.04% of TPE in Austria. Ireland, however, allocates just over 9% of TPE to the measure. In countries with a federal structure, some regions spend more on the measure than others. In Italy for example, Marche has allocated one per cent of TPE, whilst Friuli Venezia Giulia has allocated 0.4 per cent of TPE, whilst other regions have not implemented the measure, thus distorting the picture at the national level. Natura 2000 payments for forests are used in 13 programmes and are set to receive almost €1154m of funding. The most public money allocated to this measure is in Estonia, which plans to spend €31m, about 3.5% of TPE. The Natura 2000 measure is not used to support farmland features in the case study countries. Elsewhere, there are concerns that the funding available is insufficient to meet the objectives set, as in Bulgaria and Romania (FERN, 2008).

Issues for Future Policy Development

Natura 2000 designation may pose potentially strict limitations on land management which may be hard to formulate, particularly with respect to the role of farmland features. In many cases, management requirements in Natura 2000 areas are still not fully specified and thus the prescriptions needed and control of compliance can be difficult. Any delay in the preparation and legal adoption of detailed Natura management plans, and hence the obligations for landowners, could limit the use of this measure (especially in EU 12).

However, it is also clear that many Member States prefer to use the agri-environment measure to provide for the appropriate management of Natura 2000 sites, perhaps because the agri-environment measure permits potentially higher payments to protect Natura 2000 sites. In some instances, Member States may have concerns about paying for compulsory requirements. There is also some reluctance by Member States to compensate forest owners – a group with potentially large claims. The set ceilings to the payment could lead to under-compensation in those Natura 2000 areas with potential for intensification where farmland features may be at risk of removal. There is also a risk of land abandonment in some Natura 2000 areas, and hence loss of management of farmland features, due to insufficient incentives to stay in farming, given the strict constraints upon management. For these reasons, there appears to be a case to support the strengthening of the use of this measure in order to secure the desired management of both Natura 2000 sites and any associated farmland features, although this should be balanced against a consideration of using the agri-environment measure to meet the same objectives.
7.9 The Forest Environment Measure

Overview of the Measure

This measure (Article 47) is similar to the agri-environment measure, but applies to forests. Forest-environment payments can be granted to beneficiaries who make a voluntary forest-environment commitment for a period of between five and seven years. The payment, made annually, can cover additional costs and income foregone. The commitments must also go beyond mandatory requirements.

Relevance to Farmland Features

The measure, depending on implementation, may help maintain the quality of farmland features such as small pockets of woodland found between or at the edge of fields. The relevance of the measure to farmland features depends on the definition of forests used by the Member States.42

Implementation in the Member States

The measure is included in 28 programmes, according to IEEP’s overview of 76 rural development programmes. The measure receives the greatest share of funding in Scotland (3% of TPE) whilst Hungary allocates the most in absolute terms (€89m). The measure is not used to support farmland features, such as small pockets of woodland, in the case study countries. In Portugal, the measure will be used in eight Natura 2000 sites in order to ‘renaturalise’ holm oak plantations and enhance the recovery of tree diversity (FERN, 2008).

Issues for Future Policy Development

The ability to target small areas of woodland found on farmland is important for maintaining the quality of these farmland features. In many cases, some form of low intensity management may be required. The use of the forest-environment measure should be encouraged in this regard, as should the integrated delivery of this measure alongside other measures that may benefit farmland features.

7.10 The Non-Productive Investment Measures

Overview of the measures

There are two measures for non-productive investments, one related to agriculture (Article 41) and one related to forests (Article 49). They complement the agri-environment measure and the forest-environment measure by providing support for investment related to agri-environment and forest-environment objectives. The measures can also be used to enhance the public amenity value of Natura 2000 sites or other high nature value areas, to meet other environmental objectives related to forests.

42 Forests are defined as ‘land spanning more than 0.5 hectare with trees higher than 5 metres and a canopy cover of more than 10 per cent, or trees able to reach those thresholds in situ. Areas under reforestation that have not yet reached but are expected to reach a canopy cover of 10 per cent and a tree height of 5 metres are included, as are temporarily unstocked areas, resulting from human intervention or natural causes, which are expected to regenerate.’ (Article 30 of Commission Regulation 1974/2006 laying down detailed rules for the application of Council Regulation (EC) No 1698/2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), OJ L 368, 23.12.2006.)
or to enhance the public amenity value of forests and wooded land. ‘Non-productive investments’ are those not leading to any significant increase in the value or profitability of the holding.

**Relevance to Farmland Features**

The measures are of potential relevance to farmland features, and their value to enhancing the farmland feature resource depends on implementation by the Member States. They are likely to be particularly useful in an agricultural context where the creation of a new farmland feature forms part of an agri-environment scheme, and capital investment, in addition to any income foregone, is needed to plant a hedgerow or rebuild a stone wall, for example. The measure may also be useful to provide the capital necessary to protect a farmland feature, for example for paying for fencing to protect an overgrazed field margin next to a watercourse. Farmland features may especially benefit from a favourable interpretation of ‘public amenity value’, which could encapsulate landscape and the notion of sense of place.

**Implementation in the Member States**

The measure for forests is used in 60 programmes, among the 76 examined by IEEP (2008c), with La Rioja, Andalucia and Navarra in Spain allocating the most, more than 5% of TPE. The measure for agriculture is used in rather less, in just 39 of the programmes examined by IEEP, with the measure more significant in the RDPs for Wales, England and Puglia, Italy (each of which allocate more than 5% of TPE). The case studies did not refer to the use of this measure to support objectives related to farmland features.

**Issues for Future Policy Development**

Whilst farmland features may benefit from this measure, its full potential may not be realised through a failure to identify and prioritise areas of HNV farmland and forests, outside of the Natura 2000 network. There is also some potential for a lack of coherence between support for non-productive investments and agri-environment, Natura and forest-environment payments, and may reduce uptake of these measures. However, it is essential to support this measure in providing investments which enable delivery of agri- and forest-environment measures, Natura 2000 management plans, landscape improvement, and other public benefits.

**7.11 The Agro-Forestry Measure**

**Overview of the Measure**

This measure provides support to cover the establishment costs of creating agro-forestry systems, which are defined as combining extensive agriculture and low density forestry on the same land. Member State need to specify the type of agro-forestry systems and maximum density of trees taking account of local conditions, forestry species and the need to ensure continued agricultural use of the land. The measure excludes Christmas trees and fast-growing species for short-term cultivation. The maximum aid intensity is 70-85 per cent of eligible costs. There is no subsequent aid for maintenance, although this could potentially be rewarded by the agri-environment measure if the agro-forestry systems created are of environmental value.
Relevance to Farmland Features

The measure can be used to create new farmland features, with the trees planted likely to have a productive function. There are environmental risks, associated with whether introducing agro-forestry will result in a net-environmental loss. The intensity of management for timber is therefore an important consideration, and traditional management should be encouraged. Traditional agro-forestry systems are beneficial to biodiversity (e.g. montado, dehesa) but are a productive land use rather than a farmland feature as such. Where management of the trees has ceased or is under threat of cessation there is a case to support on-going management of extensive systems through maintenance payments (under the present measure, only establishment costs can be covered).

Implementation in the Member States

The measure to support the establishment of agro-forestry systems is the least well funded Axis 2 measure and will be used in 11 programmes (IEEP, 2008c). It will be used in a range of Spanish and Italian regions as well as Portugal, Cyprus and Hungary.

Issues for Future Policy Development

The trees found in agro-forestry systems are not considered farmland features in this study since they have a productive function. When this function is lost, the trees may more rightly be considered farmland features. In such cases there is a case for some form of ongoing support in order to maintain the associated environmental values. The environmental benefits that may arise from revising this measure to support maintenance, *vis à vis* the sensitive use of the agri-environment measure need to be considered.

7.12 Afforestation Measures

**Overview of the Measures**

There are two afforestation measures, one for the first afforestation of agricultural land (Article 43) and one for the first afforestation of non-agricultural land (Article 45). In both cases, afforestation must be suited to local conditions and compatible with environmental requirements, particularly biodiversity. Support for the afforestation of agricultural land may cover establishment costs (at an aid rate of 70-85 per cent), maintenance costs for a maximum of five years and compensation costs for income foregone for up to 15 years. On publicly owned land, only establishment costs may be paid. Christmas trees are excluded, and support for short rotation (15 years), fast-growing species is limited to establishment costs only. Support on non-agricultural land shall support establishment costs, as well as an annual maintenance payment for five years if the afforested land is abandoned farmland. Natural reafforestation can be supported in certain circumstances.

Relevance to Farmland Features

These measures can be used to create small woodland patches on or adjacent to farmland and hence increase the density and diversity of farmland features across a given area. Afforestation can provide benefits for biodiversity, as well as for carbon sequestration, and achieve benefits for soil and water resources. These measures need to be implemented in a sensitive way, with respect to species composition and the
choice of location for afforestation. There is some debate as to whether exotic species should be introduced into native stands in order to improve the resilience of forests as the impacts of climate change begin to take effect.

As with other forest related measures, the scale of afforestation is important in the farmland features context. Using afforestation to create small areas of woodland in order to increase habitat heterogeneity in order to benefit biodiversity may be desirable, for example. In certain circumstance, natural regeneration may be preferable, and this can be permitted on non-agricultural land where there are already some trees present (pers. comm., DG Agriculture Unit D1). The potential benefits arising from afforestation need to be placed in the context of the prevailing environmental value of the land to be afforested and the choice of species to be planted.

Implementation in the Member States

The measure for the first afforestation of agricultural land will be used in 59 of the 76 programmes examined by IEEP (2008c). The Italian region of Lombardia allocates the greatest proportion to the measure at 13% of TPE, followed by Castilla La Mancha in Spain (10% of TPE). Poland allocates €653m to this measure, the most of any programme. The measure also features strongly, in terms of proportion of TPE, in the programmes of a number of Italian and Spanish regions, as well as in Portugal, Denmark and Scotland. The measure for the first afforestation of non-agricultural land is to be used less widely, in 34 programmes. The Spanish regions of Asturias and La Rioja will spend about 2% of TPE on the measure, rising to 6% of TPE in Galicia. The measure is also being used in 13 Italian regions, and features prominently in the Scottish programme (where it accounts for 6% of TPE).

The appropriate design of the measure is essential to avoid environmentally damaging outcomes. An example of a measure from the previous programming period shows that a poorly defined scheme may lead to a pejorative impact on existing biodiversity (see the example of farmland afforestation in Extremadura, Spain, provided by Beaufoy et al., 2005). The requirement provided by Regulation 1698/2005 for Member States to ensure schemes in the current period are compatible with environmental requirements should provide the necessary safeguard. However, evidence from Hungary provided by FERN (2008) shows that negative impacts on biodiversity may arise over the 2007-2013 period. In the 2007-2013 RDP for Hungary, part of the budget for afforestation will be used to create new plantations of non-native black locust trees, even though the RDP states that black locust, along with other non-indigenous tree and shrub species, endanger indigenous species. Although the RDP states that the afforestation of black locust is not permitted in Natura 2000 areas, and it is stipulated that plans must be produced to ensure that afforestation does not result in negative effects to the environment, the potential nevertheless arises for a negative impact on biodiversity. Whilst afforestation may result in other environmental benefits such as soil protection and carbon sequestration, this example serves to highlight that afforestation should be implemented in a way that is compatible with biodiversity values and so helps to achieve multiple environmental benefits.
**Issues for Future Policy Development**

Afforestation can increase the density and diversity of farmland features and may be beneficial to some species populations. However, it should not be used where net environmental losses might occur, for example, through afforesting biodiverse areas, unless the advantages for carbon sequestration or mitigating extreme weather events, such as flooding, are compelling. The possibilities for rewarding natural regeneration should be underlined, where this might be environmentally more desirable than human-induced afforestation. Where maintenance is conducive to meeting the desired environmental outcomes, there is also a case for extending maintenance payments beyond the current five year limit.

### 7.13 Conservation and Upgrading of the Natural Heritage

**Overview of the Measure**

This is an Axis 3 measure which provides support for actions concerning rural natural and cultural heritage. The actions listed in the Regulation are: the drawing-up of protection and management plans relating to Natura 2000 sites and other places of high natural value; environmental awareness actions; investments associated with maintenance, restoration and upgrading of the natural heritage; the development of high natural value sites; studies and investments associated with maintenance, restoration and upgrading of the cultural heritage such as the cultural features of villages and the rural landscape. Grants are approved in advance, paid once work is completed, direct to the final beneficiary.

**Relevance to Farmland Features**

The measure presents multiple opportunities to target farmland features in order to bring about environmental benefits. Support for the drawing up of management plans for Natura 2000 sites could provide for farmland features. The relevance of the other actions depends on the interpretation of the terms natural heritage, cultural heritage and high nature value sites in RDPs. Farmland features arguably form part of both natural and cultural heritage, and in this sense are likely to contribute to quality of life and act as a soft factor in economic development.

**Implementation in the Member States**

This measure is used in 62 of the 76 programmes examined by IEEP (2008c) with Malta and Mecklenburg Vorpommern allocating in excess of 15% of TPE to the measure. Without further detailed examination of these programmes, it is not possible to gauge the extent to which farmland features are taken into account.

**Issues for Future Policy Development**

The synergy of this measure with Axis 2 measures in supporting farmland features requires consideration. The payment terms – once and when work is complete – may limit the usefulness of the measure for the ongoing management of farmland features.
7.14 The Less Favoured Area (LFA) Measure

Overview of the Measure

The two natural handicap payment measures (i.e. the LFA measure, Article 37) compensate farmers for the additional costs and income forgone related to the handicap for agricultural production. The LFA measure aims to maintain the countryside and promote sustainable farming systems through the continued use of agricultural land. Although not an explicit aim of these measures, they have been shown to support farming systems in marginal areas that are associated with the maintenance of extensive semi-natural pastures (IEEP, 2006a).

Relevance to Farmland Features

The LFA measure may help to maintain the existing diversity, density and quality of farmland features through the support of farming systems. By maintaining the agricultural function of farmland features through continued agricultural land use, the potential for features to become neglected and to lose environmental value is reduced. However, the LFA classification and eligibility criteria may pose a limit to the number of farms that can receive LFA support, and hence the potential for farmland features to be positively affected by this measure. Inappropriately designed eligibility criteria could exclude certain farmers - such as older farmers, those with very small holdings, or those where agriculture does not provide the main income source - many of whom may manage HNV farmland with farmland features that perform an important environmental function.

Implementation in the Member States

The measure to provide natural handicap payments to farmers in mountain areas will be used in 50 of the 76 programmes examined by IEEP, whilst 62 programmes will use the measure for payments to farmers in other areas with handicaps. The LFA measure has helped to maintain extensive, typically livestock systems, which in turn have delivered environmental and landscape benefits in those Member States where the payment is relatively high and form a reasonable proportion of farm income, it. However, the proportion of farmers receiving an LFA payment varies significantly between Member States. In some as many as 85 per cent of farmers in the LFA do not receive a payment meaning there is not a comprehensive coverage of the instrument in classified areas. In other cases, payments are small and so have little impact on farm incomes, so the policy has limited impact.

Issues for Future Policy Development

The ‘other LFA’ area classification is due to be reclassified in 2009 – 2010. A focus on revising eligibility criteria and payment levels, so that they are more clearly aligned to environmental and cultural objectives, may help to capture the maintenance of High Nature Value farming and associated features. The role of farmland features does not necessarily need to be more clearly articulated in the implementation of the LFA measure since they indirectly benefit through the support provided to the farming systems in which they are found.
Chapter 7 Legal Protection of Farmland Features

7.15 Farmland Features and the Common Monitoring and Evaluation Framework

A set of indicators, collected together under the ‘Common Monitoring and Evaluation Framework’\(^\text{43}\), is used to measure the contribution of each rural development measure to specific outputs and results. This framework is binding on Member States and is part of a Commission effort to improve the quality and consistency of monitoring and evaluation. Two of the output indicators (35 and 37) for agri-environment support refer to farmland features. Data needs to be presented on the number of hectares of UAA and the total number of contracts where the agri-environment measure is used for the:

- ‘Creation or upkeep of ecological features (e.g. field margins, buffer areas, green cover, hedgerows, trees)’
- ‘Upkeep of the landscape and maintenance of high nature-value farmland areas, including the conservation of historical features (e.g. stonewalls, terraces, small woods)’

This places a requirement on Member States to collect detailed information on farmland features which fall under the scope of agri-environment schemes. The monitoring information collected should provide valuable information on farmland features, provided there is an understanding of the baseline situation, and the role of agri-environment schemes in supporting the benefits provided by features. However, given the current lack of comprehensive data on the presence of farmland features in most Member States, as highlighted by Chapter 4, the ability to inform these indicators appears rather weak. There is an urgent need to collect data on the presence of environmentally beneficial farmland features in order to feed these indicators, and to realise a number of other policy objectives. This is taken up as a policy option in Chapter 9.4.

7.15.1 Issues for Future Policy Development

Rural development measures offer a lot of scope to maintain or enhance the density, diversity and condition of farmland features. There are positive examples of the agri-environment measure being used to meet such goals. There is likely to be a case to coordinate the application of different agri-environment options at the landscape scale by the relevant authorities to ensure farmers do not undertake beneficial management options in isolation, but rather as part of a coherent approach in order to realise overarching environmental goals, such as functional connectivity.

The LFA measure can be used to support the viability of high nature value farming systems, which in turn support the maintenance of the existing landscape structure, including farmland features. Supporting systems, as well as targeting specific outcomes, provide two ways to support farmland features.

An expansion of the use of existing instruments, such as the Natura 2000 measures, might be considered appropriate for supporting the farmland features resource. The

possibility of amending existing measures, where this might improve the use of measures for targeting farmland features, also needs to be explored to see if this provides an effective way of achieving the desired environmental benefits. For example, the measure to conserve the rural heritage only permits a one-off payment to be made when the required work is completed, which is likely to be restrict the type of projects that can be undertaken as well as up-take levels. Finding ways to make the forest environment and afforestation measures work in an effective way for small areas of woodland is also worth investigating further.

The need to secure a suitable level of financing to fund the environmental measures in the EAFRD in order to achieve the demanding environmental objectives set by the Community Strategic Guidelines remains. The Commission’s 2008 CAP Health Check proposals highlight the need for greater and renewed effort to respond to new and ongoing environmental challenges facing rural areas in relation to climate change, renewable energy, water management and biodiversity. The proposals require Member States to meet these challenges by using the additional resources generated through the proposed increases in compulsory modulation. If these proposals are adopted, Member States will be obliged to revise their National Strategy Plans and amend their rural development programmes to demonstrate how they will use these additional resources which will be available from 1 January 2010. This provides Member States with a new opportunity to consider how farmland features may contribute to meeting ongoing environmental challenges.

7.16 The Nitrates Directive

Overview

This Directive seeks to reduce or prevent the pollution of water caused by the application and storage of inorganic fertiliser and manure on farmland. It is intended both to safeguard drinking water supplies and to prevent wider ecological damage through the eutrophication of freshwater and marine waters. Member States are required to identify waters actually or potentially affected by pollution from nitrates and to designate these as Nitrate Vulnerable Zones (NVZs). They must also establish Action Programmes, revised at least every four years, defining periods when the application of fertilisers to fields is prohibited, limits to the application of fertiliser and manure, storage requirements for livestock manure as well as a code of good agricultural practice. Certain Articles from the Directive are included as cross compliance SMRs.

Relevance to Farmland Features

The proper implementation of the Nitrates Directive and compliance with national requirements by farmers should result in the protection of farmland features, such as ponds, from eutrophication. Farmland features, because of their capacity to limit the transfer of nitrates to water bodies, may also be used to meet the objectives of the Directive. This also helps to reduce N₂O emissions.

Implementation in the Member States with respect to Farmland Features

By 2003 seven Member States (Austria, Denmark, Finland, Germany, Luxembourg, the Netherlands and Ireland) had applied NVZ action programmes throughout their territories, whilst the area of territory in the EU-15 designated as NVZs increased
from 35.5 per cent in 1999 to 44 per cent in 2003, with further designations thereafter in Northern Ireland, Italy, Spain, Portugal and Belgium\(^{44}\). Despite this, the implementation of the Nitrates Directive remains partial. Numerous derogations have been approved\(^{45}\). The European Court of Justice has issued judgements against a range of Member States regarding their interpretation of the Directive\(^{46}\).

The case studies demonstrate the role of farmland features in the implementation of the Directive. The most comprehensive reference to features is in France. In 15 of the 56 departments where the Directive applies, and where the nitrate level of the water is intolerably high (>50 mg/l), all grass field margins, trees, hedges and forested areas must be retained in order to limit the transfer of nitrogen in vulnerable river catchments (Pointereau and Coulon, 2008). In Denmark, it is compulsory for a two metre uncultivated buffer strip to be placed alongside all natural watercourses (Kristensen and Andersen, 2008), whilst in Romania a World Bank sponsored Integrated Pollution Control Project will support the implementation of Action Programmes and include support to plant buffers strips (Arblaster, 2008). In Germany and the UK there are restrictions to the application of organic manure and inorganic fertiliser within a certain distance of watercourses (for example, within 10 metres of a watercourse in the England and Scotland (Eaton, 2008)). In Scotland, it is also prohibited to apply organic manure and inorganic fertiliser to hedges.

**Issues for Future Policy Development**

The Nitrates Directive plays a key role in minimising the pollution by nitrates of water bodies that may be found both on and off the farm. The role farmland features can play in supporting the achievement of the objectives of the Directive in vulnerable zones needs to be more widely recognised. Voluntary codes of good agricultural practice may provide one opportunity to underline the role features can play. In many cases, the need for Member States to implement proper provisions remains.

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\(^{46}\) Over the past five years, this includes France (Case C-147/07, OJ C 79, 29.3.2008), Belgium (Case C-221/03, OJ C 296, 26.11.2005), Spain (Case C-416/02), Ireland (Case C-396/01) and the Netherlands (Case C-322/00, OJ 275 , 15/11/2003)
7.17 The Water Framework Directive

Overview

The Water Framework Directive could play a role in the protection of farmland features, and, potentially in the creation of new farmland features, in order to meet the objectives of the policy. The aim of the Directive is to establish a framework to protect inland surface waters, transitional waters, coastal waters and groundwater in order to prevent the deterioration of aquatic ecosystems and protect and enhance the status of aquatic ecosystems. The Directive should also promote sustainable water use, a reduction in the pollution of groundwater and contribute to mitigating the effects of floods and droughts. The key aim is to put in place measures to achieve the ‘good status’ of all waters by December 2015. The implementation of obligations at the river basin level, through River Basin Management Plans which must be established by December 2009, is currently at an early stage, and means that an assessment of the extent to which farmland features and the Water Framework Directive interact is not feasible for this study. It is, however, possible to speculate on the potential requirements that might be placed on farmers in relation to farmland features.

Relevance to Farmland Features

A programme of measures must be specified in each River Basin Management Plan. The programme of measures should include those that relate to the protection of water in eleven other pieces of EU legislation, including the Birds Directive and the Habitats Directive. Member States should also consider whether supplementary measures are necessary. With respect to the protection or maintenance of farmland features, the following supplementary measures, as drawn from Part B of Annex VI of the Directive, may be appropriate:

- Legislative instruments;
- Negotiated environmental agreements;
- Recreation and restoration of wetland areas, and;
- Rehabilitation projects.

Member States can use the EAFRD to compensate farmers for the costs incurred and income foregone arising from the implementation of the Directive.

Implementation in the Member States

Given that implementation of the WFD is ongoing, there is little precise information available from the case studies regarding the likely role of farmland features in meeting the Directive’s objectives. In the UK and Sweden it is likely that the creation of buffer zones in some areas will be advocated in order to help reduce diffuse pollution (Eaton, 2008; Herodes, 2008). The Department for Food, Environment and Rural Affairs (Defra) in England has considered measures for the establishment of in-field grass buffer strips, the establishment of new hedges and the establishment of riparian buffer strips in order to reduce diffuse pollution from agriculture in order to meet the objectives of the Water Framework Directive (Defra, 2007). Similarly, the RSPB/WWF (2006) underline the role that the creation of semi-natural habitats (e.g.

woods and wetlands) and buffer strips of at least 9m in width can play in River Basin Management Plans.

Issues for Future Policy Development

The limited evidence available suggests that the Water Framework Directive may result in new obligations on farmers to create new farmland features in order to meet the objectives of the WFD. There is also a strong case for maintaining the existing farmland features, such as uncultivated margins and hedgerows, in order to contribute to the achievement of the good ecological status of water bodies. In addition, there may be a case for enhancing the role of existing farmland features, for example by increasing the width of buffer margins, where these already exist. The role of farmland features in meeting the objectives of the Water Framework Directive should be further explored, and supported as appropriate.

7.18 Environmental Impact Assessment Legislation

Overview

The Environmental Impact Assessment (EIA) Directive\(^{48}\) takes a preventative approach to environmental protection. It applies to a wide range of sectors, including agriculture, and requires an assessment is made of the impacts a ‘development project’ may have on the environment. The Directive does not require Member State authorities to refuse projects that are damaging to the environment. It is therefore better characterised as a procedural obligation that does not necessarily provide a complete environmental safeguard.

Agriculture projects only require an environmental impact assessment if they are likely to have a significant effect on the environment. Agriculture projects, as defined by Annex II of the Directive and that are relevant to farmland features, include those that involve the restructuring of rural land holdings, the use of uncultivated land or semi-natural areas for intensive agricultural purposes, water management projects, initial afforestation where this may lead to adverse ecological changes and land reclamation for the purposes of conversion to another type of land use.

Member States apply screening criteria to determine whether an EIA is necessary. These criteria differ between Member States, but most often take the form of size/area or financial value thresholds. This means that not all projects are subject to an EIA. When an EIA takes place, the anticipated effects on fauna and flora, soil, water, air, climate and landscape, material assets and cultural heritage, as well as the interaction between all these factors, need to be identified, described and assessed, as appropriate.

Relevance to Farmland Features

The restructuring of agricultural holdings, the use of uncultivated land or semi-natural areas for intensive agricultural purposes, water management projects, and afforestation all carry implications for farmland features. The extent to which the environmental value of the farmland feature resource or specific features is taken into account is currently unknown.

account depends on the suitability of the screening criteria as well as the criteria used to assess the potential environmental impacts in the subsequent assessment.

**Implementation in the Member States**

According to the Commission’s most recent five year report on the application and effectiveness of the EIA Directive, published in 2003\(^49\), implementation by Member States has been poor. There are problems regarding the delayed transposition of the Directive and there have been a series of infringement proceedings against Member States for the use of inappropriate screening and assessment criteria\(^50\).

The case studies demonstrate that the EIA rules, as implemented by the Member States, provide rather mixed levels of protection for farmland features. There are examples of where an EIA may address features as part of a wider assessment of the impacts a (normally large scale) project may give rise to. In Italy, a check-list is used to assess the impact of a project on natural and semi-natural features and other landscape features (Povellato and Trisorio, 2008). In Spain, regional EIA legislation requires a simplified EIA study (this involves completing a standard two-page form) for removing any natural vegetation, although farmland features such as field boundaries are not subject to this requirement. In many cases permission is given, while in many others actions are undertaken without permission (Beaufoy, 2008).

The UK provides an example of where an EIA may be necessary for specific farmland features (Eaton, 2008). However, an EIA is only required for the largest or most lengthy features. To date, there has been some debate as to the way ‘intensive agricultural purposes’ should be defined in determining which projects need to be subject to an EIA, as well as the extent to which high size/area thresholds within the screening criteria may exclude certain environmentally damaging activity from the EIA process.

**Table 7-5: Thresholds for application of EIA (Agriculture) Legislation in the UK.**

<table>
<thead>
<tr>
<th>Type of Project</th>
<th>England</th>
<th>Northern Ireland</th>
<th>Scotland</th>
<th>Wales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncultivated land (ha)</td>
<td>2 (2)</td>
<td>2 (2)</td>
<td>Case by case</td>
<td>Case by case</td>
</tr>
<tr>
<td>Restructuring – linear features (km)</td>
<td>4 (2)</td>
<td>4 (2)</td>
<td>0.5 (hedge or dry stane dyke)</td>
<td>4 (2)</td>
</tr>
<tr>
<td>Restructuring – area of land (ha)</td>
<td>100 (50)</td>
<td>100 (50)</td>
<td>200 ha (case by case)</td>
<td>100 (50)</td>
</tr>
<tr>
<td>Forestry (ha)</td>
<td>Afforestation - 5 (2)</td>
<td>Deforestation - 1 (0.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes – Figures in brackets indicate thresholds for “sensitive” designated areas.

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\(^50\) All European Court of Justice cases relating to the EIA can be viewed at: http://curia.europa.eu/jurisp/
Hedges, dry stone walls, ditches and ponds are all captured by the legislation, as are permanent grass margins if they qualify as semi-natural or uncultivated land. Table 7-5 shows the minimum size thresholds that need to be satisfied. Dry stone walls, for example, are only captured by an EIA in the case of very large structuring projects, with thresholds of 4 km (or 2 km in sensitive areas) in England, Wales and Northern Ireland and 0.5 km in Scotland. In England, Wales and Northern Ireland hedgerows are excluded from EIA legislation because of the existence of the Hedgerow Regulations (1997) which protect against the removal. Ditches are afforded protection where their removal would result in significant regional or national environmental impacts, although the thresholds (ranging from 2 km to 6 km) mean legislation only offers protection to ditches in the case of very large restructuring projects. Any projects involving ponds are likely to escape an EIA since they would fall below the two hectare threshold applied in England and Northern Ireland. The Regulations also offer little protection to small woodland patches, since an EIA is only required for projects involving the removal of trees over an area of one ha or more, or 0.5 ha in protected areas. The environmental impacts of afforestation only need to be considered if the area involved is at least five hectares in size, or two hectares in protected areas.

In the event of projects being approved, the results of an EIA may result in a requirement for compensation measures to be put in place, as required by Article 6 of the Habitats Directives. For example, in Sweden compensation measures may be necessary in response to road building projects. Examples of remedial measures include the moving of stone walls and dead wood in order to create new biotopes and the restoration of streams, although they are considered insufficient in comparison to the damage caused by the project.

**Issues for Future Policy Development**

According to the evidence collected for this report, the EIA Directive, as transposed by the Member States, offers little protection for farmland features. This is because the EIA rules do not explicitly address farmland features, or, where they do, the size thresholds applied mean smaller features are excluded from the assessment process.

The relevance of the EIA Directive to farmland features can be improved, if desirable, by reviewing the definition of ‘agriculture projects’ and, therefore, the extent to which the EIA procedure applies to farmland features. In addition, it would be necessary to consider the suitability of the screening criteria in ensuring that projects that might damage or result in the removal of farmland features are subject to an EIA and to review the suitability of the assessment criteria used to assess the type and scale of negative environmental impact that might arise if features were to be removed. This review could also involve an examination of the frequency with which consent is given to remove farmland feature, even where the EIA concludes the intended project is likely to be environmentally damaging. Finally, the interaction between the EIA Directive and other policy tools, such as the compensatory measures required by Article 6 of the Habitats Directive could be examined further.
7.19 Proposal for a Soil Framework Directive

The proposal for a Soil Framework Directive\textsuperscript{51} was a key component of the Soil Thematic Strategy\textsuperscript{52} with the objective of protecting soils across the EU and integrating soil protection into national and EU policies. If adopted, the Directive will become the primary implementing measure of the Thematic Strategy, and will be the first EU-wide measure to systematically investigate and protect soils, in both rural and urban settings. The adoption of the proposed Directive is currently stalled on the grounds of subsidiarity, proportionality and cost.

The Soil Thematic Strategy identifies eight overarching threats to soil. Its overall objective is the protection and sustainable use of soil, based on the following guiding principles:

- preventing further soil degradation and preserving its functions;
- restoring degraded soils to a level of functionality consistent with current and intended use.

The measures included in the proposal for a Directive include obligatory identification by Member States of areas at risk of erosion, organic matter decline, compaction, salinisation and landslides, or where the degradation process is already underway. This will be done on the basis of criteria set out in the proposal. Member States must then set objectives and adopt programmes of measures to reduce these risks and to address the effects they have.

Farmland features play a role in helping to address these threats, particularly in relation to erosion, a decline in organic matter and landslides, although they can also play a role in preventing salinisation and remediating compaction. Linear features, such as walls, hedges, lines of trees, are particularly valuable in helping to reduce erosion, where they occur across run-off and erosion pathways (Pretty, 1998). Trees, woody linear features, walls and terraces can all help to prevent landslides and have long been used to stabilise agricultural soils in steep and mountainous areas. Patch features such as fallow land, common land, unutilised agricultural land and small patches of woodland may help to improve soil structure and organic content. They can all serve to enhance soil biodiversity, which in turn can have a positive effect on soil structure. These improvements in organic matter and structure can in turn help to prevent run-off and soil erosion due to increased filtration and prevention of surface capping (Pretty, 1998). Finally, features such as field margins and buffer strips which allow leguminous plants to flourish, can help to boost soil fertility. Trees, hedges and small patches of woodland can all help to stabilise unstable soils and reduce the risk of landslides in steep terrain.

If adopted, the Soil Framework Directive would lend weight to measures aimed at the protection and creation of those features that would contribute to meeting its objectives.


7.20 Proposal for a Directive to Establish a Framework for the Sustainable Use of Pesticides

The proposed Directive to establish a framework for the sustainable use of pesticides\(^{53}\) is a key component of the Thematic Strategy on the Sustainable Use of Pesticides\(^{54}\), which provides an objective to reduce the risks from pesticides to humans and the environment. One of the proposals in the Directive is to seek improvements to the aquatic environment through the use of farmland features such as buffer strips and hedgerows. It is stated ‘that particular attention is paid to avoid pollution of surface water and groundwater by taking appropriate measures such as, the establishment of buffer strips or planting hedges along surface waters to reduce exposure of water bodies to spray drift. The dimensions of buffer zones should depend in particular on soil characteristics, climate, size of the watercourse, as well as agricultural characteristics of areas concerned.’

The proposal is scheduled for a second Reading at a Plenary of the European Parliament in early 2009. The proposal for buffer zones shares some common ground with the proposed changes to GAEC (see section 7.5.2), and the establishment of buffers could also help meet the objectives of the Nitrates Directive (see section 7.16) and the Water Framework Directive (see section 7.17). The requirement to create new features such as hedges would presumably draw a link with the agri-environment measure (see section 7.7), which would provide the obvious source of funding for habitat creation.

7.21 National and Regional Nature Conservation and Landscape Legislation

Overview

In addition to legislation originating at the EU level, some Member States also protect features through specific pieces of national legislation. The relevant pieces of national legislation as reported by the case studies are summarised in Table 7-6. Although there are variations between countries, it is worth noting:

- National legislation may be cross-cutting and seek to safeguard a range of features or may be specific to particular features.
- In countries with a federal structure, regional governments may establish their own nature protection legislation, which may be relevant to farmland features.
- Legislation to protect certain landscapes may include requirements to retain or maintain characteristic landscape features.
- In some Member States, land may be purchased in order to achieve nature conservation objectives.

Examples to illustrate each of these points are provided below.


Examples from the Case Study Member States

There are several examples of cross-cutting national legislation used to safeguard a range of features, including two examples from Sweden. The first is the Biotope Protection Law (1994). It offers general protection for a number of farmland features including avenues of trees, ditches, stone walls and field islets. The second is the ‘Regulation on Consideration of Natural and Cultural Values in Agriculture’ which prohibits damage to or the removal of culturally or ecologically valuable features, such as certain trees. Since the introduction of legal protection of farmland features in the early 1990s, the rate of removal has slowed down to an annual decrease of 0.5 per cent over the period 1996 to 2001 (Herodes, 2008). Elsewhere, in France, the ‘plan local d’urbanisme’ (PLU) offers the possibility for local authorities to protect any landscape element such as hedges, terraces, traditional orchards, farming trees, stone walls, although implementation is judged to be poor (Pointereau and Coulon, 2008).

In Germany a variety of legislation protects landscape features. German Federal Nature Conservation Act (2002) is the most relevant to the protection of landscape features. It prohibits the removal of ‘natural monuments’ and ‘protected components of landscapes’. In addition, the Federal Soil Protection Act (1998) sets provisions to preserve ‘the predominantly natural structural elements of field parcels that are needed for soil conservation, especially hedges, field shrubbery and trees, field boundaries and terracing’ (Landgrebe and Naumann, 2008). There are variations in implementation, however, among the federal states. For example, hedges are protected throughout Bavaria and Mecklenburg-Western Pomerania, but coverage is incomplete elsewhere, as in Brandenburg and Rhineland-Palatinate (Landgrebe and Naumann, 2008).

There are examples of national legislation which addresses the protection of specific features. The Hedgerow Regulations (1997) in the UK protect against the removal of important hedgerows on the basis of criteria for biodiversity and historic importance. However, they have been criticised for being cumbersome and complicated to implement and for failing to protect the majority of hedgerows in England and Wales (CPRE, 1999). In Denmark, the Museum Act prohibits the removal of earth and stone walls as well as soil cultivation within two metres of the wall (Kristensen and Andersen, 2008).

In Member States with a federal structure, regional governments may have their own legislation. For example, in Spain, within the framework of national legislation, Andalucía, has its own nature conservation legislation, which states that the regional government will promote the conservation of landscape elements such as copses, vegetation patches, drovers’ roads, hedges, and other traditional field boundaries, in order to prevent the isolation of wildlife species and the fragmentation of their habitats (Beaufoy, 2008). In Germany, the federal states are able to make nature conservation contracts with farmers which are supported financially by the federal state, although they may be used to broaden and complement EU co-financed agri-

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55 In Sweden, the County Administrative Boards may grant exemptions under certain conditions. According to experts there are about 200 cases per year and exemptions may only concern part of a feature; for instance, to create or broaden an opening in a stone wall to facilitate the passage with large machines (Herodes, 2008).
environmental measures. The measures to be included are under discussion, but may include a measure for buffer strips (Landgrebe and Naumann, 2008).

National water law may help protect riparian vegetation and watercourses. For example, the Spanish Law on Water (1985) stipulates that natural vegetation should not be removed within five metres of a water course (Beaufoy, 2008). In Denmark, farmers must maintain a two metre wide buffer zone along all natural watercourses (Kristensen and Andersen, 2008). The federal states in Germany require a vegetated 5-7m wide buffer margin to be maintained adjacent to watercourses (Landgrebe and Naumann, 2008).

Member States may designate protected areas or landscapes, through which typical farmland features may receive additional protection. The UK case study describes the cases of the Lake District National Park and the Yorkshire Dales national park, both of which are characterised by their upland pastoral landscapes and strong field patterns marked by dry stone walls (Eaton, 2008). In Germany, the Biosphere Reserve Decree (1990) prohibits the damage or removal of banks of trees, field copses, hedges, single trees, rows of trees and groups of trees (Landgrebe and Naumann, 2008).

There is one example of a Member State adopting a national strategy to support the farmland feature resource. In Sweden there are 16 Environmental Quality Objectives. One of these targets a 70 per cent increase in the number of ‘managed culturally significant landscape features’ on or next to arable land between 2000 and 2010. This target is considered to be ambitious, and may be difficult to meet given variations in regionally set targets (Herodes, 2008).

Some Member States provide the means to permit the public purchase of land for environmental reasons. In France, for example, the “Conservatoire du Littoral et des Rivages Lacustres” can buy land in municipalities located close to the sea and large lakes (Pointereau and Coulon, 2008). In Denmark, public land purchase for nature has been used since 1989 (through the Nature Development Act 1989). It has been used mainly for the development of wetland areas including restoration of lakes and water courses. Landscape conservation orders are also used on a prescriptive basis and may include management requirements for farmland features such as hedgerows (Kristensen and Andersen, 2008). NGOs, some of which are significant landowners, can also guide sensitive land management, as is the case with the National Trust in the UK (Eaton, 2008).

There are examples of the protection of common land through national legislation. The Baldios of Portugal are protected by Regulations created in 1917. These state that commoners cannot burn uncultivated weeds, enclose any area of the Baldio, allow sheep onto the pasture without a shepherd and maintain the water system on their land. Common land in Britain is protected from development, cultivation and certain other major land use changes by national legislation. In Romania a law was introduced in 1971 that required owners of animals using communal pastures to

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56 This ambitious target corresponds to an increase in the number of managed point features by 620,000 units and of managed line features by 80,000 km (Herodes, 2008).
Chapter 7 Legal Protection of Farmland Features

Contribute a certain number of days per year to pasture maintenance, as defined by the local council. This was replaced by a new law in 2002 which no longer included this requirement, resulting in the deterioration of some communal pastures (Aitchison et al., 2000).

Table 7-6: Examples of Farmland Features Protected through National Legislation.

<table>
<thead>
<tr>
<th>MS</th>
<th>Examples of Farmland Features Protected Through National Legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>Stone Walls – Protection from damage/removal; management - Museum Act (Heritage Act). Unutilised Land on Farm Land – ‘Production’ of nature is permitted as an activity on agricultural land - Agricultural Act Buffer Strips - The Watercourse Act requires farmers to keep a 2 metre unfarmed buffer zone along all natural watercourses and lakes.</td>
</tr>
<tr>
<td>France</td>
<td>Protection of landscape elements is possible through the French Urbanism Code, although information on implementation is lacking.</td>
</tr>
<tr>
<td>Italy</td>
<td>As from March 2008, the new national “Code for cultural and environmental goods” includes monumental trees among the protected features. State aids used under the 2002 ‘Special Law for Venice’ in the Venice Watershed Lagoon to create and maintain buffer strips for 10 years. The ‘Galasso Law’ (1985) requires regional administrations to develop landscape plans and to protect features of cultural and natural interest. There are serious delays in the development of these plans.</td>
</tr>
<tr>
<td>Spain</td>
<td>Promote the management of ‘landscape elements’ - National law on nature conservation (RD 1997/1995).Spain’s Act of Parliament no.3, March 23rd 1995, was designed to protect 120,000 kilometres of cattle trails and transhumance corridors across the country. In Andalucia, Article 18 of Law 8/2003 states that the regional government will promote the conservation of landscape elements such as copses, vegetation patches, drovers’ roads, hedges, and other traditional field boundaries, in order to prevent the isolation of wildlife species and the fragmentation of their habitats.</td>
</tr>
<tr>
<td>Sweden</td>
<td>Buffer Strips and Field Margins - Damage/removal prohibited (Regulation on Consideration of Natural and Cultural values in Agriculture) Ditches – Protection - Biotope Protection Law Stone Walls – Protection, management - Biotope Protection Law; Environmental Quality Objectives Trees - Biotope Protection Law; Regulation on Consideration of Natural and Cultural values in Agriculture; Environmental Quality Objectives Unutilised Land on Farm Land - Biotope Protection Law Local Roads and Tracks - Regulation on Consideration of Natural and Cultural values in Agriculture</td>
</tr>
<tr>
<td>UK</td>
<td>Buffer Strips and Field Margins – Pesticide restrictions - Food and Environment Protection Act 1985; UKBAPSG 1999; Hedgerows – The Hedgerow Regulations prevent removal of many hedgerows; All hedgerows are the subject of an Habitat Action Plan as part of the UK’s Biodiversity Action Plan; Illegal to spray pesticides into hedge bases. Small Pockets of Woodland – BAP; Trees – Tree Preservation Orders (TPO) require anyone wishing to cut down, top, lop, wilfully damage or wilfully destroy a tree to gain permission from the Local Planning Authority. A TPO can cover any type of tree from a single tree, to a hedgerow tree to a woodland, but does not cover hedges, bushes or shrubs.</td>
</tr>
</tbody>
</table>

*Only legislation for Brandenburg/ Berlin has been examined.

Source: Case Study Reports.
**Issues for Future Policy Development**

The range of farmland features protected by national law, and the quality of the level of protection, must be taken into account when considering whether it is appropriate to define new policy measures at the EU level. This involves a consideration of the mutual role of the EU and national governments in legislating for the protection of farmland features, the current extent of coverage and interaction of European and national legislation.

### 7.22 Conclusions

Across the Member States, there is a complex matrix of policy interventions, seeking a range of environmental outcomes, and offering various levels of protection to different farmland features. The most relevant items of legislation for maintaining and enhancing the density, diversity and quality of farmland features are those which directly target them, such as GAEC, the agri-environment measure and items of national legislation. The Birds and Habitats Directives provide a number of mechanisms to protect farmland features, but implementation with respect to agricultural land and agricultural activities needs to be improved.

The LFA measure, which targets specific farming systems, may indirectly support farmland features. Other items of legislation provide limited protection, as is the case with the EIA Directive, or indirectly support the provision of associated environmental benefits, as is the case with the Nitrates Directive and potentially, with the Water Framework Directive. These pieces of legislation also intervene at a larger geographical scale and thus are rather indirect in their influence on farmland features. There are likely to be synergies between these various areas of legislation and need to be maximised in order to provide positive outcomes across a range of environmental priorities at various geographical scales.

The farmland feature resource can be better protected by making amendments to existing instruments, particularly where they are failing to fully promote the protection and appropriate management of features. This may involve revising EIA screening criteria, for example. In other cases, an expansion of the use of existing instruments might be considered, especially where implementation issues mean that features are not protected to the extent possible by the legislation, as might be the case for those instruments where budgets are inadequate, such as the Natura 2000 measure. The targeting of existing instruments may also be able to be improved in order to protect and manage features of greatest value, for example, by revising agri-environment schemes to ensure valuable features or groups of features are targeted.
8 The Implications of SPS and SAPS Eligibility Criteria for the Protection of Farmland Features

This chapter describes how farmland features are accounted for by the CAP Single Payment Scheme (SPS) and the Single Area Payment Scheme (SAPS), along with the implications this may have for creating a financial motivation to remove farmland features. The rules regarding the definition of the area eligible for direct payments are the most relevant to farmland features. Other elements associated with the implementation of the SPS and the SAPS may affect broader trends in farm restructuring with implications for farm viability, farm management and therefore the continued presence of farmland features. These are discussed separately in Chapter 6.

Our understanding of the causal chain linking the eligible area to the protection of farmland features is founded on the following hypothesis. If features are included in the area eligible for payments under the SPS and the SAPS, it is assumed that they will not be removed in order to maximise the eligible area and therefore the value of the payment received. Conversely, if features must be excluded from the eligible area, there may be a financial motivation to remove the feature in order to increase the eligible area and therefore the value of the payment received. As such, it is assumed that those rules that allow for the inclusion of features in the eligible area afford greater protection.

8.1 Analysis of Rules Regarding Eligible Area

The rules defining the eligible area for the SPS and the SAPS have implications for the protection of farmland features. Together they seek to determine:

(a) whether a parcel is eligible for payments; and,
(b) whether the area occupied by farmland features within the eligible parcel is also eligible for payments.

The most relevant rules are reproduced in Box 8-1, as extracted from Articles 8 and 30 of Commission Regulation 796/2004 and Article 43 of Council Regulation 1782/2003. In addition, guidelines published by the Commission Services on the Wikicap web portal, provide guidance on the interpretation of the rules. Whilst the


rules are set at the EU level, some discretion is conferred to the Member States in their application. In essence, the rules determining the calculation of the number of hectares eligible for payments under the SPS and the SAPS can be divided into four groups:

1. The rules defining whether agricultural parcels are eligible for the SPS and the SAPS.
2. The rules regarding whether the area occupied by trees may be included within the eligible area of the parcel.
3. The rules regarding whether the area occupied by other farmland features, such as hedges, may be included within the eligible area of the parcel.
4. The rules regarding which farmland features are protected through cross compliance, and how these features may be included within the eligible area of the parcel.

Each set of rules is described in turn along with an analysis as to whether they create any pressure on farmland features or afford protection. Examples from the project case studies are provided, with the variation in the way farmland features are taken into account in terms of parcel eligibility summarised by Figure 8H2.

Box 8-1: Relevant Rules for Defining the Eligible Area for the Single Payment Scheme.

**Article 44 of Regulation (EC) No 1782/2003**
‘Eligible hectare’ shall mean any agricultural area of the holding taken up by arable land and permanent pasture except areas under permanent crops, forests or used for non agricultural activities.

**Article 8 of Regulation (EC) No 796/2004**
An agricultural parcel can contain trees and remain eligible for aid payments provided that:
- agricultural activities referred to in Article 51 of Regulation (EC) No 1782/2003* can be carried out in a similar way as on parcels without trees in the same area.
- or, where applicable, the production envisaged can be carried out in a similar way as on parcels without trees in the same area.

* Article 51 states that any agricultural activity may take place on a parcel on which a payment has been activated, except for permanent crops (although older olive trees are permitted) and fruits and vegetables.

**WikiCAP Website**
Areas of trees inside an agricultural parcel with a density of more than 50 trees/ha should, as a general rule, be considered ineligible. Exceptions, justified beforehand by the Member State, may be envisaged for tree classes of mixed cropping such as for orchards and for ecological/environmental reasons.

Ineligible areas of significant size (>100m²) should be deducted.

**Article 30 of Regulation (EC) No 796/2004**
The total area of an agricultural parcel may be taken into account provided that it is fully utilised in accordance with the customary standards of the Member State or region concerned.

In respect of the regions where certain features, in particular hedges, ditches and walls, are traditionally part of good agriculture cropping or utilisation practices, the Member States may decide that the corresponding area is to be considered part of the fully utilised area on condition that it does not exceed a total width to be determined by the Member States. That width must correspond to a traditional width in the region in question and shall not exceed two metres.

Member States may, after prior notification to the Commission, allow a width greater than two metres if the arable crop areas concerned were taken into account for the fixing of the yields of the regions concerned.
In the case of parcels being declared for the purposes of the single payment scheme, any features referred to in the acts listed in Annex III to Regulation (EC) No 1782/2003 or which may form part of the good agricultural and environmental condition as referred to in Article 5 and Annex IV of that Regulation shall form part of the total area of an agricultural parcel.

WikiCAP Website
Areas taken up by non agricultural activities such as buildings, woods, ponds and paths are to be excluded from the agricultural parcel. The Commission services take the view that:

- "Woods" should be interpreted as areas within an agricultural parcel with tree-cover (including bushes etc.) preventing growth of vegetative under-storey suitable for grazing.
- In accordance with Art.8(1) of R.796/2004, areas of trees inside an agricultural parcel with density of more than 50 trees/ha should, as a general rule, be considered ineligible. Exceptions, justified beforehand by the Member States, may be envisaged for tree classes of mixed-cropping such as for orchards and for ecological/environmental reasons.
- With regards to ponds, only permanent ponds are to be excluded. 
- Paths, other than those created by animal access, are to be excluded.
- With regards to shrubs, the conditions (e.g. land cover type, maximum area percentage) under which shrubs can be considered as part of the agricultural parcel should be defined and justified by the Member State, e.g. on the basis of the customary standards of the Member State or region concerned.

Features of up to 4m wide (walls, ditches, hedges) serve as boundaries between agricultural parcels and are traditionally part of good agricultural practice in the region concerned (e.g. terrace walls, drainage ditches), such features may be considered as being included; a 2m width can be attributed to each adjacent agricultural parcel. Internal features are, under the same conditions, accepted as forming part of the agricultural parcel where their width is less than or equal to 2m. Where the feature is >4m wide (or >2m wide if internal to the parcel), the feature should be removed from the eligible area, unless the feature is recognised by the national implementation of cross compliance.

Sources:


1. The rules defining which agricultural parcels are eligible for the SPS and the SAPS.

Eligible hectares are generally made up of the agricultural area of the holding taken up by arable land or permanent pasture. Land used for permanent crops, forest or non-agricultural activities is excluded. The total area of the agricultural parcel may be considered eligible, as long as the parcel is fully utilised in accordance with the ‘customary standards’ of the Member State or region concerned. A parcel containing shrubs may be eligible so long as the tolerable growth is defined and justified by the Member State. These standards may include, but not be limited by those standards defined for GAEC (pers. comm., DG AGRI Unit D1).

The reference period used to determine eligible parcels is important to understanding whether these eligibility rules pose a threat to farmland features or not. As argued below, the historic reference period used to determine SPS payment entitlements does
not result in pressure on farmland features. A potential pressure exists in Romania and Bulgaria, but not in other countries applying the SAPS.

- **SPS**
In those Member States applying the SPS, each hectare of eligible land must correspond to one payment entitlement. Payment entitlements were calculated by taking the three year average of the total direct payments each farmer received during the 2000-2002 reference period, and dividing this by the three year average number of hectares which gave rise to direct payments in the same reference period. Where regionalised models are used, the total aggregate entitlement accruing to farmers in any region was averaged out over the total number of eligible hectares in that region, with all farmers receiving the same flat-rate aid payment. Entitlements were allocated at the point of the scheme’s introduction, either 2005 or 2006, depending on the Member State. The full Single Payment was then received only if the farmer holding the payment entitlements also held an equivalent number of eligible hectares (Agra Informa, 2008).

These rules presented a minimal threat to the removal of farmland features since the payment entitlements were established according to a historic reference period. Removing farmland features to increase the eligible area in the year of the scheme’s introduction, or at any point thereafter, would have made no difference to the payment received due to the way entitlements were calculated. No evidence of pre-emptive removal, in anticipation of the introduction of the scheme, has been identified in this study.

- **SAPS**
The SAPS was introduced for a limited time period in the new Member States from 2004, and was due to expire at the end of 2008. The SAPS has been extended until the end of 2010, or 2011 in the case of Bulgaria and Romania. The eligibility criteria may create a pressure on farmland features in the case of Bulgaria and Romania, but not in the other Member States applying the scheme.

The eligible area for the SAPS in all countries applying the scheme, with the exception of Romania and Bulgaria, is equal to the utilised agricultural area of the Member State maintained in good agricultural condition as of 30 June 2003. Land which did not meet this criterion cannot become eligible at a later stage (pers. comm., DG AGRI Unit D1). This SAPS eligibility rule is unlikely to have created an incentive for farmers to remove features in order to increase the area of land eligible for the SAPS. This is because the Act of Accession specifying the 30 June 2003 reference date was not published in the Official Journal until 23 September 2003, after the 30 June 2003 reference date. It is therefore improbable that farmers would have

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60 All EU-15 Member States, Malta and Slovenia apply the SPS.
61 The relevant rules are set out in Articles 37 and Chapter 3 of Regulation 1782/2003.
62 A regional approach is used in Belgium, Finland, Germany and the UK.
63 Act concerning the conditions of accession of the Czech Republic, the Republic of Estonia, the Republic of Cyprus, the Republic of Latvia, the Republic of Lithuania, the Republic of Hungary, the
been aware of such details and taken action to ensure more of their land would qualify.

In contrast, there is no reference date for Bulgaria and Romania. According to Annex III of the Act of Accession:\(^64\):

‘for Bulgaria and Romania, the agricultural area under the single area payment scheme shall be the part of its utilised agricultural area which is maintained in good agricultural condition, whether in production or not, where appropriate adjusted in accordance with the objective criteria to be set by Bulgaria or Romania after approval by the Commission.’

This means new areas of land can become eligible for inclusion in the SAPS each year, so long as they meet the standards set for ‘good agricultural condition’ as defined by the Member States and agreed to by the Commission. This could result in both positive and negative consequences for the environment, depending on the type and structural characteristics of the farming system and the local context.

The absence of a reference year for Bulgaria and Romania may result in negative environmental outcomes in more intensive farming systems, as farmers are presented with the opportunity to increase the eligible area each year. This may, potentially, occur through the removal of farmland features or the conversion of other habitats. Unless appropriate regulatory safeguards are in place, relating both to the eligibility criteria and the thorough implementation of GAEC (see below), this would appear to create a significant pressure to remove farmland features.

However, both Bulgaria and Romania also have large swathes of high nature value farmland that is under significant pressure of abandonment (Keenleyside and Baldock, 2006). In order to support the continued delivery of the environmental goods and services associated with these extensive farming systems, and to protect against the loss of the farming practices that maintain them, CAP payments are likely to be critical in ensuring their continued viability. As such, it is generally desirable to capture this land within the system of CAP support. This would allow appropriately designed measures, such as the agri-environment measure and the LFA measure (and relevant Axis 1 and 3 measures) to support these systems, and therefore underpin the continued existence and management of farmland features which would otherwise fall into neglect as farming is abandoned. The density of trees or scrub will increase as land is abandoned, with the concomitant loss of features associated with traditional farming systems. There is, therefore, likely to be a trade-off between the preservation of different types of features. There are, of course, associated risks of more land coming under the influence of the CAP, as the receipt of direct payments may accelerate restructuring with potentially negative consequences for farmland features in some areas. If the long-term existence and maintenance of features is to be

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encouraged as a strategic environmental objective, it is important that the process of restructuring in places such as Bulgaria and Romania is directed and shaped through sensitively designed rural development measures.

Despite the possibility for more land to qualify for the SAPS each year, there is evidence to suggest that much HNV farmland does not meet the eligibility criteria regarding the presence of trees and other features (the relevant rules are presented below), or because the holdings or parcels are too small to meet the minimum eligibility thresholds, and as such, the type of farming systems that could benefit from CAP support, are de facto, excluded from the system.

For example, in Romania, for a farm to be listed in the Farm Register and to receive payments through the SAPS, at least one hectare must be farmed\footnote{The EU rules allow for a minimum holding size of between 0.3 and 1 ha, indicating that the higher threshold may have been taken in the Romanian case for administrative/institutional reasons.}, and it must be composed of parcels no smaller than 0.3 hectares. Since many subsistence holdings are smaller than these pre-requisites, they are not officially classed as farms and do not receive support. This contrasts with the large commercial holdings, of which there are approximately 18,000 which are made up of leased or rented plots and have relatively high yields. Out of the total number of agricultural holdings, only 29 per cent were registered on 1 June 2007, operating 9,705,502 hectares (70 per cent) of the UAA. The remaining units (almost three million) largely fall under the subsistence category (Arblaster, 2008).

In a similar vein, a case study of HNV farming in Bulgaria highlights that only 45 per cent of utilised farmland is eligible for the SAPS in the upland case study area of Western Stara Planina (Jones, 2008). The remaining land - largely scrubby forage area - is not included because it does not meet the requirements regarding woodland on agricultural land. Other land is understood to be ineligible because of the small size of holdings or where joint ownership structures (for example, land held in common ownership) restrict the ability of farmers to access the SAPS.

However, Member States have a degree of flexibility in defining the constitution of eligible areas in terms of the ‘customary standards’ for the utilisation of agricultural parcels, either at the regional or national level. Derogations can be made so as to allow agricultural parcels with a high density of trees to be eligible and land held in common and through shared ownership structures is not excluded\footnote{Article 8(2) of Regulation 796/2004 states that where land is held in common, the competent authorities shall notionally allocate it between the individual farmers in proportion to their use or right of use of it.}, although this may present an administrative challenge to the paying agency and competent control authority in distributing payments. Whilst a more flexible interpretation of the rules governing the eligibility criteria is possible, in such a way as they support the protection of farmland features, the propensity for institutional inertia may be high, given the administrative costs of bringing in a large number of currently excluded holdings into the system and the impact this will have on the size of individual annual payments.
This analysis suggests that some refinement of the rules may be required to balance the need to restrict any tendency towards the removal of features in more intensive systems whilst retaining the possibility for more marginal or extensively managed farmland to come under the influence of appropriately designed measures that can support associated farmland features. This may also involve lowering the holding/parcel thresholds and adopting a more inclusive definition of eligible land in the countries concerned.

2. The rules regarding whether the area occupied by trees may be included within the eligible area of the parcel.

The second relevant set of rules relates to the presence of trees on agricultural parcels. An agricultural parcel containing trees is eligible for aid so long as agricultural production can take place in a similar way as on parcels without trees. The guidance provided by the Commission Services on the Wikicap website states that the area occupied by trees in parcels with a density of more than 50 trees/hectare should be considered ineligible. In other words, in those parcels where tree density exceeds 50 trees per hectare, the payment is calculated on the basis of the area of the parcel, once the area occupied by the trees is subtracted. Member States may allow a higher density for orchards or for environmental reasons. Woods should be excluded if the area of tree cover on the holding, including bushes, prevents the growth of a vegetative understorey.

The case studies indicate that the tree density rules appear to be interpreted and implemented in different ways with implications for the preservation and protection of trees. Three contrasting examples are provided by the case studies for Denmark, England and Italy. In Denmark, parcels with more than 50 trees per hectare are not eligible for a single payment, and for those parcels with less than 50 trees per hectare the area occupied by the trunks (rather than the crowns) is deducted. In England, grazed parcels containing trees at a density of more than 50 trees per hectare are eligible for the single payment as long as there has been a history of grazing practice and the grazing does not damage the ecological value of the site. In England, due to the successful lobbying by environmental groups, orchards with up to 150 trees per hectare are eligible so long as low intensity management methods are used. In Italy, the area occupied by trees in parcels with fewer than 50 trees per hectare is eligible, although the area occupied by any close clusters of trees (up to 10m²) present within the parcel is not eligible. Although the rules are ostensibly the same, the way in which they have been interpreted and implemented in Denmark, for example, and to a lesser extent, Italy, provides a greater incentive to remove trees compared to in England. This implies that there is a need for the rules to be interpreted in a more systematic way across Europe.

These rules provide a modest risk to trees on agricultural parcels. Duprez et al. (2005) state that trees have been removed from cultivated or grazing land to maximise the value of the direct payment received, particularly in the new Member States. Anecdotal evidence from BirdLife suggests similar outcomes occurred due to the introduction of the SAPS (pers. comm., BirdLife International). OTOP (2006), for example, monitored sample plots in Poland between 2002 and 2006 and recorded instances of the removal of features (see Figure 8H1). The case study reports produced for this study provide no further evidence of the removal of trees. That said, the
eligibility rules are only likely to have triggered the removal of a certain proportion of trees. The influence of other pressures, such as changing market circumstances often leading to land consolidation and the associated removal of in-field and boundary features are likely to have a much more profound effect.

Figure 8-1: Removal of In-field Tree, Poland.


3. The rules regarding the inclusion of the area occupied by other farmland features, such as hedges, within the eligible area of the parcel.

The third relevant group of rules refers to the inclusion of the area occupied by farmland features, other than trees, in the eligible area of the parcel. The area occupied by certain farmland features - up to a limit determined by the Member State - can be included in the parcel’s eligible area on the condition that they are a traditional component of good agricultural practice. Hedges, ditches and walls are specifically mentioned in the legislation. Permanent ponds should be excluded, as well as paths, other than those created by animal access, as stated by the Commission Services on the Wikicap website.

There is a maximum permissible limit to the total area occupied by features that can be included in the eligible area, although this limit may be transcended by the cross compliance rules (see next section). The width set for hedges, ditches and walls, for example, should be typical of the region concerned, and normally may not exceed 2m. The guidance provided by the Commission services on the Wikicap website specifically refers to a maximum width of 4m for boundary features such as walls, ditches, hedges and terrace walls, of which 2m may be attributed to each adjacent parcel. Features located within the parcel may also be included, again provided their width is less than 2m, although a greater width may be permitted by derogation. There are no additional rules, for instance, detailing whether the permitted maximum size of the feature should be linked to the size of the parcel.

The size thresholds may create an incentive for farmers to cut back or reduce the width of features which exceed 2m. The scale of the threat is partly dependent on implementation of the rules by the Member State, both with respect to those features which may be considered part of traditional agricultural practice, and in terms of what may be considered to be a typical width. In England, for example, an exception was made to allow hedges up to 3m to be eligible, thus lowering the potentially
environmentally damaging incentive to cut back hedgerows. In Spain, it is reported that the introduction of SPS led some farmers to remove patches of vegetation that might have resulted in a reduction in payment rights, as these may be excluded from the calculation of the eligible area (see Spanish case study). By contrast, in Sweden features such as stone walls cannot be included in the eligible area, but these features would seem to be otherwise protected by two items of national legislation (see Chapter 7.21).

The example of France, provided in Box 8-2, highlights the variation in the application of the rules and provides some anecdotal evidence of the removal of hedgerows. A positive characteristic of the scheme is that those features that may be included in the eligible area are identified at a regional scale, however, the process of changing which features are included on an annual basis is potentially destabilising. In Normandy, for example, it is reasonable to suggest that the rules themselves did not result in the removal of the hedgerows, rather, farmers acted pre-emptively on the basis of fears which were not alleviated by information or assurance.

**Box 8-2: Eligibility of Farmland Features in France.**

The rules vary between départements (NUTS3) in France. Each “arrêté préfectoral” describes the characteristic features of the local region in a ‘local order’ on an annual basis. Only those features described in the order can be included in the eligible area. However, features which are not referred to but occupy less than 0.01 hectares of the parcel may be included. About 54 per cent of the départements applied a maximum width of 4m for boundary features in 2005. Other départements permitted a maximum width of 3 metres. Some actually excluded hedgerows from the eligible area and most did not specify how the rules are applied in the event of joint ownership (for example, if the hedgerow separates two farms). Taking the example of field trees, most départements did not refer to the feature at all in the eligibility rules, with just six per cent including the tree in the eligible area.

In Normandy, farmers apparently unclear as to the eligibility criteria, destroyed hedgerows in an attempt to expand the eligible area.


It may be concluded that any misunderstanding or miscommunication of these rules may present a risk to the removal of farmland features. The appropriate definition of features that are a traditional component of good agricultural practice is important, as are derogations to allow the inclusion of features wider than the limits imposed by the legislation. The example of the definition of characteristic features at a local level in France presents one way to identify regionally specific and valuable features, although additional measures may be needed to assure their protection as factors other than SPS eligibility criteria may incentivise their removal.

4. **The rules regarding farmland features protected through cross compliance, and how these may be included within the eligible area of the parcel.**

The fourth rule refers to the inclusion of features in cross compliance. Any feature protected by the cross compliance SMRs or GAEC standards in a Member State should form part of the total area of the agricultural parcel. The GAEC standard to retain landscape features is the most relevant. Importantly, this rule overrides the
2m/4m rule summarised in the previous point and means that boundary features wider than 4m and internal features wider than 2m are eligible for the Single Payment.

Whilst Member States are required to include GAEC standards for the retention of landscape features (see Chapter 7.5), there is wide variation amongst the Member States in terms of the features protected. Some Member States have extensive lists of features, whilst others do not include any landscape features in their national GAEC standards. As such, the protection afforded through cross compliance is not systematic across Europe. In those Member States where landscape features are not included in their GAEC standards, or coverage is incomplete, the eligibility rules therefore assume extra significance.

Many features are included in the eligible area in those Member States which include a lengthy list of features in national GAEC standards, such as Germany and Sweden. In several Member States, uncropped patches may be included so long as GAEC rules are respected. Conversely, if farmland features are not included in national GAEC standards, the level of protection may be lower in the absence of national legislation to prevent removal. In Denmark, for example, no landscape features are included in national GAEC standards. In Sweden, field islets, a common farmland feature, cannot be included in the eligible area and they are not protected through GAEC. In Romania, although single trees and groups of trees are included in GAEC, other features such as grassy margins and hedgerows are not.

The inclusion of appropriate GAEC standards on landscape features provides a two-fold safeguard against the removal of features, first by preventing removal as a GAEC standard, and second, through the inclusion of the area occupied by the feature within the eligible area of the parcel. These benefits must be considered in relation to the additional costs for farmers conferred by the maintenance of landscape features under GAEC. In practice, Member States are usually reluctant to include wider features in GAEC as they may impinge on productive capacity or on farm income (Jongeneel et al., 2008).

8.2 Conclusions

We hypothesised that if features are included in the area eligible for payments under the SPS and the SAPS, they are less likely to be removed by farmers in order to maximise the eligible area and therefore the size of payment received. Conversely, we suggested that if features cannot be included, the temptation may be to remove the feature in order to maximise the area of land eligible for payment. As such, it is assumed that those rules that allow for the inclusion of features in the eligible area in principle, at least, afford greater protection. This hypothesis is broadly correct, although these rules form part of a system in its infancy. There are clear differences in the interpretation and subsequent implementation of the rules leading to differing magnitudes in the protection of features. Even if all of the inconsistencies in interpretation and implementation are addressed, they do not provide a fail-safe mechanism in the protection of features because of other economic and structural factors in play.

It is our judgement that the rules do not present an incentive to remove farmland features so long as a flexible approach is taken to interpreting the rules. Although size
restrictions mean that the area occupied by wider features beyond the specified threshold of 2m must be deducted, as should the area occupied by trees in parcels with more than 50 trees per hectare, derogations can be made in both cases. The rule permitting all features protected through cross compliance to be included in the eligible area affords the greatest protection, particularly since larger features (i.e. those wider than 2m) can be included within the eligible area. However, an examination of national GAEC standards suggests that landscape features are not being systematically included by many Member States, with some exceptions.

The rules determining the calculation of the number of hectares eligible for payments under the SPS and the SAPS do not dispel all threats to the removal of farmland features. Many of these will be broad processes of structural change, which will continue to unfurl regardless of these specific rules. That said, most of the rules will not provide an incentive to remove features, although the rule governing eligibility for the SAPS in Bulgaria and Romania may have a mixed or contradictory effect. Unlike other countries applying the SAPS, no reference date was set for the maximum permissible eligible area. This means new areas can become eligible for the SAPS on an annual basis which suggests that in intensively farmed areas, features that are not protected through GAEC or other national legislation are under threat of removal if farmers choose to expand the area eligible for the direct payment. On the other hand, the absence of a reference date after which no further land can be included, allows more land to come under the influence of the CAP each year. This will be particularly advantageous in those cases where land currently not registered is at risk of abandonment and which by being included in the future, may be targeted by appropriately designed measures to the benefit of the maintenance of the associated farmland features.

The way in which farmers perceive or interpret these rules poses an additional risk, despite the precautions taken to include features within the eligible area. Farmers may choose to remove features if they believe the land occupied by features is not eligible for the Single Payment. There is some anecdotal evidence to support this, although such damaging actions appear to relate more to a lack of communication of the rules and their subsequent misinterpretation, rather than to the SPS and SAPS rules themselves. However, causality is not easy to determine as any removal of features may be explained by other factors such as ongoing agricultural restructuring as well as shorter term market signals which may encourage increased productivity, and potentially result in the removal of environmentally valuable farmland features.

8.3 Issues for Future Policy Development

In the analysis above, it is concluded that the absence of a reference year for Bulgaria and Romania may result in the removal of features in more intensive farming systems but may also present an opportunity to include more extensively managed HNV farmland into the system of CAP support. This presents a policy challenge in terms of the design and implementation of the relevant rules. It crucially involves the need to balance two different types of environmental threat – potentially the loss of features in more intensive systems and the neglect of features in more extensive systems that are under threat of abandonment.
To resolve this tension, Bulgaria and Romania should be encouraged to implement the eligibility rules in a sensitive fashion to allow more farmed land to fall under the scope of agricultural policy. This may mean identifying and justifying customary land uses at the regional, rather than national level, and allowing parcels with a higher density of trees or shrubs to be eligible, so long as this is typical of the areas concerned. In order to render small farms that may be under threat of abandonment eligible for a payment, the minimum holding size rule of 0.3 ha could be revisited following an analysis of how many farms are presently excluded on account of this rule. Whilst a proper implementation of GAEC should protect features in Bulgaria and Romania, it may be advisable to set a retrospective reference date for the total agricultural area that is eligible for the SAPS in intensive farmed areas, if these areas can be zoned in a suitably rigorous fashion. A future date should not be used as this could stimulate farmers to remove features in order to expand the utilised agricultural area.

Given the threefold protection against the removal of features provided by cross compliance - first by preventing removal as a GAEC standard, second, through the inclusion of the area occupied by the feature within the eligible area of the parcel, and third by communicating the importance of retaining features through the Farm Advisory System - the implementation of GAEC standards for the retention of landscape features should be encouraged. This is particularly pertinent to more intensive areas, whilst the inclusion of a large number of features under GAEC may constitute an unacceptably high cost for certain marginal farmers, particular if there are any maintenance requirements. The effectiveness of exacting GAEC standards is not yet understood and therefore, the inclusion of features within GAEC will need to be complimented by incentive payments for the further protection and maintenance of certain features. This is discussed as a policy option in Chapter 9.5.4.

Since there is some reluctance among many Member States to further the implementation of cross compliance, it is critical to ensure that the implementing authorities in all countries are aware of the importance of allowing farmland features to be included in the eligible area, including those that are typical of different regions (for example, in France ‘local orders’ are made every year defining eligible features), and of seeking derogations where appropriate to permit the area occupied by trees in parcels with more than 50 trees per hectare and features wider than 2m to be eligible for payment. Proper communication is also required with farmers in order to avoid the misinterpretation of the rules and hence the misguided removal of features.

The way in which farmers interpret these rules poses an additional threat, despite the precautions taken to include features within the eligible area. Farmers may choose to remove features if they believe the land occupied by features is not eligible for the Single Payment. The reinforcement of existing regulatory safeguards, primarily cross compliance, where necessary, will help to provide a sufficient level of protection. There remain a lot of scope to improve the implementation and communication of the eligible areas rules to farmers in the Member States. Given that the implementation of cross compliance is supported by a Farm Advisory System in all Member States, the inclusion of all valuable features within national GAEC standards would be one way to advise farmers on the importance of retaining features.
### Figure 8.2: Treatment of Farmland Features for the Calculation of the Eligible Area for Direct Payments.

<table>
<thead>
<tr>
<th>MS</th>
<th>Cross Compliance Features included in GAEC</th>
<th>Farmland features included in GAEC</th>
<th>Farmland features excluded from GAEC</th>
<th>Eligible area for Direct Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>DK</td>
<td>MS Rules for Defining the Eligible Area</td>
<td>Farmland features included: DK Land with more trees than 50 per hectare is not eligible for SP. If fewer trees and groups of trees than 50 per hectare, the area under trees has to be deducted.</td>
<td>Farmland features excluded: Uncultivated areas kept in GAEC.</td>
<td>Eligible area for Direct Payments: Farmland features included in GAEC.</td>
</tr>
<tr>
<td>FR</td>
<td>Hedges, ditches, stone walls and field margins.</td>
<td>Farmland features included: FR Area occupied by trees, up to 50 trees/ha is eligible. However, area of 5 square metres of more for small trees and areas of 10 square metres for large trees, excluding the area covered by the crown has to deducted from the eligible area.</td>
<td>Farmland features excluded: None.</td>
<td>Eligible area for Direct Payments: Farmland features included in GAEC.</td>
</tr>
<tr>
<td>DE</td>
<td>As per GAEC standards, plus: single trees and groups of trees than 50 per hectare, the area under trees has to be deducted.</td>
<td>Farmland features included: DE All features that occupy &gt;0.1ha Land set-aside for arable land with permanent crops.</td>
<td>Farmland features excluded: Hedges, ditches, stone walls and field margins.</td>
<td>Eligible area for Direct Payments: Farmland features included in GAEC.</td>
</tr>
<tr>
<td>IT</td>
<td>Farmland features included: IT Area occupied by trees, up to 50 trees/ha is eligible. However, area of 5 square metres of more for small trees and areas of 10 square metres for large trees, excluding the area covered by the crown has to deducted from the eligible area.</td>
<td>Farmland features included: IT Areas with 51 to 100 trees/ha are not eligible. Where there are more than 100 trees/ha, the area is not considered a special area of economic importance (SIE), neither arable land with permanent crops, nor the area covered by the crown has to deducted from the eligible area.</td>
<td>Farmland features excluded: Hedges, ditches, stone walls and field margins.</td>
<td>Eligible area for Direct Payments: Farmland features included in GAEC.</td>
</tr>
<tr>
<td>RO</td>
<td>All features that occupy &gt;0.1ha.</td>
<td>Farmland features included: RO Terraces.</td>
<td>Farmland features excluded: None.</td>
<td>Eligible area for Direct Payments: Farmland features included in GAEC.</td>
</tr>
<tr>
<td>ES</td>
<td>Terraces, single trees and groups of trees.</td>
<td>Farmland features included: ES Terraces, single trees and groups of trees.</td>
<td>Farmland features excluded: None.</td>
<td>Eligible area for Direct Payments: Farmland features included in GAEC.</td>
</tr>
</tbody>
</table>
### MS Rules for Defining the Eligible Area

<table>
<thead>
<tr>
<th>MS</th>
<th>Tree density</th>
<th>Farmland features included</th>
<th>Farmland features excluded</th>
<th>Cross Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW</td>
<td>According to Herodes (2008) the Swedish government negotiated with the European Commission regarding the permissible number of trees on grazing land. In Sweden the eligibility criteria was seen to exclude potentially valuable trees such as pollarded trees.</td>
<td>Buffer zones, Fallow land, Grazed land: all features which can be grazed including stone walls and farm tracks.</td>
<td>Arable land only: Field islets, clearance cairns and stone walls.</td>
<td>Wells, springs, ancient remains, cattle paths, traditional wooden fences, earthen walls, ditched walls, clearance cairns, stone dumps, stone walls, open ditches.</td>
</tr>
<tr>
<td>UK</td>
<td>Grazed woodland with more than 50 trees per ha eligible if there has been a history of acceptable grazing practice and grazing is not damaging the ecological value of the site.</td>
<td>Hedges and other boundary features &lt;3m wide. Uncropped areas such as margins and banks are eligible if they are kept in GAEC/or capable of being grazed. Trees provided area occupied by trunk &lt;0.01ha. Orchards managed using low intensity methods.</td>
<td>Hedges or other boundary features &gt; 3m wide. Exceptions apply for characteristic wide landscape features. Ponds. Woodland/total area occupied by trees &gt;0.01ha</td>
<td>Stone walls, hedgerows, 2m margins adjacent to watercourses and hedgerows, felling of trees.</td>
</tr>
</tbody>
</table>

Source: Case Study Reports.
9 Policy Options for Farmland Features

This chapter discusses the legislative and policy framework required to ensure the protection of farmland features, including a list of policy outcomes and associated objectives. It begins by discussing the interacting levels of governance that are necessary for the maintenance of farmland features which forms the context for a more detailed presentation of potential policy options in Section 9.5. The chapter concludes with a general presentation of a broad hypothetical frame for future agricultural policy which embeds sustainable land management - and thus the maintenance of farmland features - at its core. This is based on a consideration of the prevailing environmental needs and priorities facing Europe and of the potential change in direction of the CAP up to the end of the current EU budget period in 2013 and beyond.

9.1 Protecting Farmland Features: The Appropriate Scale of Governance

As illustrated in Chapter 7, a range of different measures, including legislation, policies and local initiatives, are important in affording protection to farmland features and action is needed at both the European and the national/regional scales if this resource is to be properly maintained. There is no singular case for action at the EU or at the national/regional scales respectively.

There are relatively few EU obligations relating directly to farmland features, as opposed to habitats or biotopes, and this is an area where national policy is more dominant, with national measures making an important contribution to the protection, maintenance and restoration of farmland features. As shown in this report, certain pieces of national legislation are cross-cutting and seek to safeguard a range of features, whilst others are specific to particular features. In countries with a federal structure, regional governments may establish their own nature protection legislation, which may be relevant to farmland features. In other countries, legislation to protect certain landscapes may act to maintain characteristic farmland features. These commitments are expressed through measures such as national parks, protected landscape areas, protected coastlines, registers of historic landscapes and controls on infrastructure development. Many Member States have policies concerned with historic landscapes that are not addressed by EU measures.

Development control and land use planning fall clearly within the competence of Member States, although they do intersect with EU policy, for example, in the implementation of the Birds and Habitats Directives and the EIA Directive. In most Member States, development control offers rather limited protection to features on farmland as agriculture generally falls outside the main control structure. However, there are exceptions to this, particularly for built structures or features of particular interest in some Member States and controls are often stronger in protected areas. Individual trees or woodland may be protected in some cases.

In spite of certain national measures focusing specifically on farmland features, national sources of funding for protecting or maintaining features are relatively limited, although there are state aids or more local funding sources in some cases. For example in national parks, state aids are sometimes used to complement EU funded
measures, such as agri-environment payments. Whilst the importance of national measures is clear, there are a number of arguments for why the protection of farmland features should sit within an overarching European framework.

First, it is clear that the retention and appropriate management of farmland features contributes significantly to a number of environmental objectives set out in EU policies and international commitments. This is particularly the case for biodiversity objectives, including the target of halting the loss of biodiversity by 2010. Farmland features not only constitute significant habitats in their own right but also contribute to the connectivity of larger sites and islands. Many farmland species rely heavily on field margins for their survival. Beyond this, many features represent an important element in farming systems classified as High Nature Value, the protection of which is now recognised as a key objective of rural development measures. Similarly, the goal of improving the ecological quality of water under the Water Framework Directive demands a significant level of action in many farmed areas to reduce diffuse water pollution and soil erosion. In nearly every case, farmland features, including field boundaries, buffer strips and terraces can be expected to be an integral part of any strategy to address pollution and erosion. In addition to this, some categories of feature contribute directly to reducing nitrate pollution, increasing carbon storage on farms and improving soil management. If the management of features continues to decline there will be corresponding difficulties in meeting EU objectives in all these areas. With the withdrawal of mandatory set-aside, which created some variation and ecological interest in arable landscapes, the significance of features in meeting environmental goals is even greater.

Second, farmland features are an integral component of rural landscapes, valued not only by local people but at a broader European scale. Europeans have a legitimate interest in the landscapes of Tuscany, Normandy and the Lake District wherever they live. The support for concepts such as ‘multifunctional farming’, underline this point. In more theoretical terms, features and the landscapes of which they are a part have an ‘existence value’ at different levels, from the local to the international which transcends national boundaries.

Third, is the more concrete and immediate fact that the management of features is shaped partly by European policies, particularly within the CAP. The CAP in turn offers the instruments to address some of the management challenges, particularly finance, for incentive based measures where Member States have limited scope for action outside the framework set by the EAFRD Regulation. In effect, many of the policy levers for influencing the management of features, including the requisite funding, lie within the ambit of the CAP.

9.2 Policy Objectives and Desired Outcomes

If Europe’s stock of farmland features is to be protected and maintained in a consistent and systematic manner, three broad outcomes would need to be achieved:

1. The maintenance - in broad terms - of the density and distribution of farmland features, while accepting that some change will occur over time;
2. An increase in the density and distribution of farmland features, where necessary for environmental reasons;
3. The sympathetic management of farmland features to maximise environmental benefits.

These strategic outcomes translate into a number of objectives with action required both at the more local level and at the European level.

**Objectives related to the density, distribution and diversity of features**

1. To maintain, in broad terms, the density, distribution and diversity of farmland features necessary for the provision of the associated environmental values. Whilst adopting a precautionary approach to retain the most valuable elements of the network\(^{67}\) that already exist, some flexibility is needed to allow some removal or change, consistent with a ‘living landscapes’ approach.

2. To increase the density, distribution and diversity of farmland features as necessary for the provision of the associated environmental values. This would include reinstating certain farmland features that have been lost or where the introduction of new farmland features is important for environmental reasons (for example, to provide resilience to climate change).

**Objectives related to the management of features**

3. To secure the appropriate management of farmland features in order to achieve the desired level and range of associated environmental values.
4. To restore farmland features in poor condition in order to achieve the desired level and range of associated environmental values.

**Objective related to wider agricultural management**

5. To secure the sustainable environmental management of the wider agricultural area and in so doing to maintain or enhance the level and range of environmental values provided by farmland features (for example, to maintain the environmental value of ditches and ponds by reducing nitrogen input on neighbouring land).

**9.3 Improving the Policy Framework for the Protection of Features**

The protection of farmland features is not currently an explicit priority of EU agricultural policy. Where the protection of features is an objective of individual measures or schemes, the effectiveness of existing measures is sometimes undermined by a rather low level of enforcement and this is a pervasive problem affecting the proper implementation of both EU measures and national policies. If there is a commitment across Europe to maintain the stock of farmland features because of the

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\(^{67}\) A precautionary approach is essential since the creation of a new feature does not necessarily make up for the removal of a similar feature elsewhere, especially where the removed feature is of historic or landscape value. New features can also take a long time to reach the same levels of biodiversity as those that are well established.
important environmental benefits that they deliver, the existing legislative and policy framework will need to be improved to protect them. This can be achieved either through modifications to the existing framework or through the introduction of new instruments as follows:

1. Amending existing instruments where they do not fully promote the protection and appropriate management of features, or have perverse effects. The protection of farmland features may not be a core objective of some measures, and yet if modified, they may be more effective in achieving favourable outcomes for farmland features.

2. Expanding the use of existing instruments where budgetary constraints or implementation issues mean that features are not protected to the extent possible. With adequate funding, such instruments may be more effective in protecting farmland features.

3. Improving the targeting of existing instruments to protect and manage the features of greatest value. This may, for example, involve revising agri-environment schemes to ensure valuable farmland features are targeted.

4. Developing new instruments where necessary.

Since developing and introducing new policy measures is time consuming and expensive, it is often more cost effective - in the first instance - to seek adjustments to existing policy instruments. It is unlikely that the funds available will be adequate to secure the protection and sympathetic management of all farmland features, and therefore the most vulnerable features, or those which provide greatest environmental benefit, should be prioritised, both as an objective of policy, as well as in data collection and monitoring. Achieving the desired outcomes in the most effective and efficient way therefore requires appropriate design of policy, precise targeting, effective monitoring and evaluation schemes, the availability of data to establish a baseline against which to detect declines, and the sharing of best practice. Whilst the options presented below refer to specific instruments, they will be most effective if they are administered through a broad framework for policy intervention in sustainable land management.

In the remainder of this chapter we introduce eight policy options that have the potential to safeguard the environmental benefits of farmland features. Five of these include revisions to existing measures and three are new measures (see Table 9-1). Three frame conditions or tools are also discussed, which if they are in place, are likely to maximise the benefits of any implemented option or group of options (see Table 9-2).

These options are grounded in the research and analysis conducted as part of this study. They are informed by an examination of policy need and of the existing legislative and policy framework currently in place to protect farmland features. They were discussed and elaborated at a workshop convened by IEEP in which policy experts, economists and members of the project consortium participated.
Table 9-1: Policy Options for Strengthening the Protection of Farmland Features.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| Revisions to Existing Measures | 1.1 Optimising the use of rural development measures.  
1.1A A Farmland Features Scheme within an Agri-Environment Programme: Payment by Outputs  
1.1B A Farmland Features Scheme within an Agri-Environment Programme: Payment by Results  
1.2 Retain all environmentally beneficial farmland features under GAEC  
1.3 Improve the implementation of the Birds and Habitats Directives on agricultural land  
1.4 Retain and create farmland features as part of River Basin Management Plans under the WFD  
1.5 Tighten the criteria and thresholds used by Member States to define which projects require an EIA |
| New Policy Options | 2.1 An Environmental Priority Area (EPA)  
2.2 Land Purchase  
2.3 Covenants |

An outline of the associated costs is provided for the eight described options following the methodology set out in Annex 3. We outline the types of costs involved in implementing each option, review the relevant cost evidence for each option and make an outline cost assessment for the implementation of the option. Our intention is not to carry out a cost-benefit analysis of these options, but rather to present a range of broad options from which preferred options can be drawn on the basis of different criteria and priorities.


The effectiveness of these policy options could be enhanced if a number of frame conditions are in place. These are set out in Table 9-2.


<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
</tr>
</thead>
</table>
| Tools for maximising the benefits provided by policy options | 1 Creating a robust database on the presence and condition of farmland features.  
2 Adopting a landscape scale approach to sustainable land management.  
3 Encouraging collective action. |
9.4.1 Tool 1: Creating a pan-European database on the presence and condition of farmland features.

A pan-European database of farmland features does not exist at present. As rehearsed in Chapter 4.3, there is a clear rationale for investing in such a database containing information on the presence, and if possible, the condition of farmland features. Given the important environmental functions performed by features, the absence of comparable data seriously impedes the EU’s ability to monitor any long-term trends in the total stock of farmland features and to take pre-emptive action to counter threats to features and to stem any declines in density or condition. As such, we include an investment in data collection as a cross-cutting need to underline the importance of predicating policy development on robust and reliable data in order to ensure that a number of EU environmental policy objectives are achieved.

Data are needed on the location of a majority of farmland features in order to develop a baseline against which to record trends in the distribution, density and condition (where possible) of farmland features. This database could be used to facilitate the implementation of cross compliance, regulatory or agri-environment based approaches to protecting and managing farmland features. In particular, this data would be integral to the control system, for example, with respect to identifying breaches of the cross compliance GAEC standards for landscape features. It could, for example, feed the relevant CMEF indicators and assist in evaluating the impact of rural development programmes in order to inform future policy design.

In Chapter 4.3, we presented two approaches to collecting data on farmland features. One proposed method would be to expand the field survey approach and develop an intensive monitoring system based on a combination of high resolution satellite images and field surveys. This would provide data on the presence of farmland features based on the examination of randomly selected sample squares of 1 km². Field visits would allow some data to be collected on the condition of farmland features.

The second proposed approach is to collect information on farmland features through the Land Parcel Identification System (LPIS). The LPIS uses aerial photography (referred to as ‘orthophotos’) to identify and control agricultural parcels for the purpose of managing the distribution of direct payments under the CAP. The approach could be extended to allow features to be identified and recorded. It would provide comprehensive data on the presence of farmland features on all agricultural parcels. However, the opportunity to collect data on the condition of farmland features would be more limited in the absence of field visits.

9.4.2 Tool 2: A landscape scale approach to sustainable land management.

Greater environmental benefits are likely to be achieved if policy delivery is planned at the appropriate geographical scale. Many agricultural and rural development policy measures currently take a compartmentalised approach, targeting a particular land use or a particular beneficiary. The management of farmland features is likely to be more effective if it forms part of a broader initiative which ties together different sustainable land management activities and policy instruments. The aim would be to
develop a landscape scale approach, characterised by integrated policy delivery, and to move away from an atomised approach to farm or field based management.

This approach would seek to develop the coordinated dimension of rural development programmes, which draw links between measures, in concert with the approach of river basin management plans, as required by the Water Framework Directive, in order to deliver policy at a broader, but manageable geographic unit. The protection of farmland features would be prominent in such an approach, with characteristic features identified and mapped at the appropriate scale in order to capture the regional distinctiveness of certain farmland features and the landscapes within which they are located. As a result, this approach would seek to ensure that different policy approaches work together to secure the environmental benefits provided by farmland features by prioritising appropriate action at the regional, national and EU level, and identifying and implementing the most appropriate and cost-effective policy responses.

It would be possible to achieve a more strategic and coordinated approach to policy simply through better practice in the design and delivery of existing policy. Some of the main costs for managing authorities in implementing a landscape scale approach would be in administering and commissioning research and policy appraisal work, and in the time involved in determining, coordinating and implementing appropriate policy responses. Robust data would be required on which to base policy design, which may be costly to collect, as described above.

9.4.3 Tool 3: Encouraging collaborative action.

If the environmental benefits of coordinated policy design at the European and national levels are to be realised, appropriate methods of policy delivery need to be encouraged. One potentially useful tool would be to secure the cooperation of farmers in the implementation of the relevant policy measures. For example, it might be desirable to create a buffer strip alongside a watercourse which traverses a number of holdings, or to restore degraded features over a wide area where there is strong scientific evidence that this would increase the population of a threatened species. Both of these objectives could be achieved through the collaboration of farmers.

There are a number of barriers to collaborative action, but there are also examples of where this has been achieved, and some literature to demonstrate how it might be incentivised. These are discussed briefly below.

One review of the literature suggests that the barriers to collaborative action include the preference of farmers for individual management, a reluctance to interact with peers in order to maintain a competitive advantage, the inability to interact with neighbours due to isolation and the presumption that cooperation would require additional management effort, with negotiating activity, for example, resulting in increased transaction costs (Mills et al., 2006). Collaboration may also lead to problems associated with ‘free riders’, who capitalise on the actions of others but do little themselves and ‘holdouts’, who refuse to cooperate at all (Goldman et al., 2007). The advantages of collaboration are also recognised in the literature, for example,
with respect to the benefits realised through mutual learning amongst farmers, alongside increased social interaction.

Collaboration can be encouraged through the appropriate facilitation of groups of local farmers, and the encouragement of dialogue. This may involve tapping into existing networks, and encouraging the engagement of all farmers that are integral to meeting the desired environmental objective. Allowing farmers to actively plan and implement measures, rather than rely on prescriptive management measures, is also seen to garner the support of farmers (Mills et al., 2006).

Financial incentives can play a key role in achieving collaborative action. There is some literature to show how a ‘collaboration bonus’ or ‘agglomeration bonus’ might work, but very few examples of functioning schemes employing such an approach. We include one operational example – of direct relevance to farmland features – from Scotland (see Box 9-1). We also summarise how this approach might work, and comment on its compatibility with WTO rules.

**Box 9-1: Rewarding Cooperation and Ecological Function: The Example of the Highland Locational Premium.**

The aim of this scheme, which ran from 2006 to 2008, was to reward landowners for reducing the fragmentation of semi-natural woodland. It combined an area-based payment for the creation of new woodland with an additional payment for the amount of connectivity provided by the new woodland. Stone (2007) refers to this as ‘a payment for ecological function’. The scheme calculated the size of the habitat network which would be created by a proposed planting, and the level of payment applicants could expect for the size of network created, with small proposed schemes linking large habitat networks attracting proportionately higher payments. All proposed plantings needed to satisfy a number of criteria regarding the biodiversity benefits provided by new woodland. Adjacent landowners were required to employ a collaborative approach in order to create more effective and better value networks linking several holdings. No information is yet available on whether the intended biodiversity benefits have been realised, due to the time lag between management changes and environmental outcomes. However, the scheme is judged to be a success in terms of uptake and acceptance amongst landowners.


Most of the literature on incentive based approaches to collaboration is from the USA (Goldman et al., 2007; Parkhurst and Shogren, 2007; Parkhurst et al., 2002). In the US context, the agglomeration bonus, as described by Parkhurst and Shogren (2007) would be used to encourage landowners to voluntarily retire land from agricultural use and so create contiguous ‘reserves’ across neighbouring holdings. An additional bonus would be paid when land adjacent to other conserved parcels is retired, with the value of each landowner’s payment dependent on the area they conserve, the area conserved by their neighbour, as well as the location of the conserved areas within the overall landscape. Location is seen as important, since land retired either side of a holding’s boundary could create a larger area in total. Goldman et al. (2007) develop the approach further in their descriptions of the ‘entrepreneur incentive’ and the ‘ecosystems service districts’ approach. The approach underlying the ‘entrepreneur incentive’ provides landowners with the opportunity to create their own ‘landscape designs’ in order to realise overarching, desired environmental goals. It would be
competitive, with applications from groups of landowners ranked. The ‘ecosystems service district’ approach would require landowners to form a body that would have the legal authority to receive incentive payments to finance voluntary measures within the district. Whilst forming the district would be voluntary, once a majority agrees participation would be obligatory.

There are few examples of the costs involved with collaborative approaches in the EU. The Highland Locational Premium Scheme, described above, had a total budget of £1,500,000 for a three year period. However, promoting co-operation amongst farmers might incur higher transaction costs than those associated with individual agreements. These costs might arise from the time required to negotiate agreements with other farmers, as well as with the responsible authority. The involvement of more stakeholders leads to higher transaction costs, as do free riders and holdouts (Goldman et al., 2007). However Falconer (2002, in Mills et al., 2006) suggests that transaction costs might be lower, for a number of reasons. First, the managing authority would negotiate one, rather than many, agreements. In the EU context, however, it is likely that agreements with individual beneficiaries would still need to be made. Second, social sanctioning might also take place, with pride and reputation deterring breaches amongst those involved. The same social forces might also mean that individuals are less likely to drop out of the scheme.

The potential for these types of approaches to be adapted to the European context could be explored further given the additional environmental benefits cooperation between neighbouring farmers and landowners could provide. In order to be operationalised in an EU context and to ensure compatibility with WTO rules (as discussed in Section 6.3), the payment should, as with current agri-environment schemes, continue to be tied to a management prescription. Eligibility for this payment could be made conditional on cooperation with other farmers. If the time taken to cooperate and reach agreement could be regarded as a legitimate transaction cost, this could be factored into the payment the beneficiary receives.

Schemes which reward collaboration amongst farmers could be piloted in order to gauge the feasibility of such an approach. These pilots could be funded via state aided rural development measures (which must be approved by the Commission) or through LIFE+ projects.

9.5 Policy Options for Strengthening the Protection of Farmland Features.

9.5.1 Option 1.1 – Improving the use of Rural Development Measures.

This option involves making the protection, management and creation of farmland features a more explicit objective of rural development programmes. Specifically, this could include:

- Referring in the Community Strategic Guidelines to the role farmland features can play in biodiversity conservation, the preservation of High Nature Value farming and forestry systems and traditional agricultural landscapes; and in addressing water pollution and climate change.
The identification and sharing of best practice among the Member States in order to improve the design, targeting and effectiveness of different measures.

Expanding the scope of the agri-environment measure, where necessary, to target the maintenance, restoration and creation of farmland features, and hence to maintain or increase the density, diversity and quality of farmland features. This could involve:

- The inclusion of a farmland features scheme in agri-environment programmes explicitly designed to encourage the beneficial management of existing features and the creation of new features. It could be a horizontal or zoned scheme depending on the environmental issues to be addressed and payments could be calculated according to outputs or results. A payment by outputs scheme would compensate for the additional costs involved in the beneficial maintenance and creation of features. A payment by results scheme would reward beneficiaries for the environmental goods provided associated with farmland features.
- The piloting of innovative options. For example, to find ways to reward the contribution of farmland features to enhancing ecological connectivity, whilst reducing the hostility of the wider environment (for example, less pesticide usage). See Box 9-1 for an example of such an approach.
- Developing co-ordinated approaches to the delivery of agri-environment schemes, for example, by ensuring that agreements on different farms within a region contribute to overarching national and EU goals. This could in part be achieved by realising multiple agreements between farmers in a region.
- Improving the use of the agri-environment measure in Natura 2000 sites given that farmland features in these areas form part of the habitat of species of European importance.

Encouraging the use of the forest environment measure so that it is used to target small areas of woodland on or adjacent to farmland. Ensure the integrated delivery of this measure alongside other measures that may benefit farmland features, particularly the agri-environment measure.

Ensuring the two afforestation measures are used to develop small areas of woodland on or adjacent to farmland. If used in a sensitive and strategic way (i.e. use of appropriate tree species in well chosen locations) they can increase the density and diversity of farmland features in order to improve environmental benefits for biodiversity, including the improvement of functional connectivity, as well as for carbon sequestration and to achieve benefits for soil and water resources. At the same time, ensure safeguards are in place to avoid the afforestation of biodiverse areas.

Considering adapting the payment rules for the conservation and upgrading of the natural heritage measure to permit staged payments in order to facilitate uptake of restoration projects involving farmland features.

Cost Assessment

The agri-environment measure has significant potential to realise the objectives set out for the protection of farmland features. Given that there is reasonably good cost data for the agri-environment measure, an assessment of the costs involved in using
an incentive style payment is provided. This also provides a basis against which to compare the costs of other options.

The main costs involved include:

- The cost of payments made to farmers. These should reflect (but not necessarily equate to) the establishment, management and opportunity costs relating to the creation, maintenance and management of features.
- The costs to the authorities of administering agri-environment payments. These include the costs of scheme design, publicity and communications, provision of advice and guidance, handling of applications, administration of payments, compliance monitoring and inspection, and monitoring of results.
- The transaction costs at the farm level. These include the time and cost involved in understanding requirements, making applications, hosting inspections and keeping records.

**Agri-Environment Payment Rates**

Current payment rates for a variety of farmland features under different agri-environment programmes in different Member States are summarised in Annex 3. The figures indicate that there is a wide range of payment rates for different features in different Member States. For some features, the whole basis for payments also varies. For example, and as shown in Box 9-2, in Denmark, payments for planting hedges are made on the basis of reimbursing a percentage of costs incurred by farmers, while in France there is a set payment per metre of hedge established.

**Box 9-2: Agri-Environment Payments for Planting and Managing Hedgerows.**

<table>
<thead>
<tr>
<th>Payments for planting hedgerows</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Denmark</strong></td>
<td>Farmers can get refunds of 40% to 60% of the cost for establishing 1 - 7 rowed hedges or woodlots smaller than 0.5 ha. At least 75% of the plantings must be broad-leaved.</td>
</tr>
<tr>
<td><strong>France (Normandy)</strong></td>
<td>€1.49 per metre.</td>
</tr>
<tr>
<td><strong>Italy (Veneto)</strong></td>
<td>€2.70 per metre for 6m wide hedge and margins. This includes costs of planting and maintenance of hedge and grass strip, plus income foregone and transaction costs.</td>
</tr>
<tr>
<td><strong>UK - England</strong></td>
<td>£5 (€6.3) per metre.</td>
</tr>
<tr>
<td><strong>UK - Wales</strong></td>
<td>£2.40 (€3.0) per metre.</td>
</tr>
</tbody>
</table>

**Payments for managing hedgerows**

<table>
<thead>
<tr>
<th><strong>France (Normandy)</strong></th>
<th>€0.43/metre for trimming to €3.32/metre for restoration.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Italy</strong></td>
<td>Payments and the methods for calculating them vary significantly by region and depend on the age of the hedgerow, but average €250-400 per hectare. The overall range is €50-900 per hectare. In Veneto region payments are €0.80 to €1.29 per metre, based on a 6m wide hedge and margins.</td>
</tr>
<tr>
<td><strong>Spain (Catalonia)</strong></td>
<td>€110/ha for maintaining a minimum of 100m of hedges on banks per hectare of farmland, including costs of maintenance of hedge and management of native vegetation.</td>
</tr>
</tbody>
</table>
UK - England

Higher Level Stewardship - £2.70 (€3.4) per metre for maintenance of hedgerows of very high environmental value through; £5 (€6.3) per metre – restoration by laying, coppicing or gapping up; additional supplements available.

Entry Level Stewardship – farmers need to earn 30 points per hectare from various practices to gain a payment of £30 (€38) per hectare. Hedgerow management gains 11 - 42 points per 100 metres, with an equivalent value of £1.1 - £4.2 (€1.4 to 5.3) per metre.

UK - Wales

£2.40 (€3.0) per metre – laying or coppicing.

Source: Case Study Reports.

Expanding the scope of the agri-environment measure so that the maintenance, restoration and creation of farmland features is better targeted will need to take into account the influence of the drivers identified in Chapter 6 on the attractiveness of agri-environment schemes or other payments incentivising the appropriate management of farmland features. This in turn provides a budgetary challenge for policy makers as income foregone calculations used in EU rural development policy may have to be recalibrated to take account of higher market prices. There is some evidence to support this from a study undertaken by ADAS and SAC (2008) for Defra in England. It shows that the cost of the basic entry level stewardship scheme in England would increase due to higher opportunity costs as a result of a reform scenario that is characterised by the removal of the Single Payment and higher commodity prices. Experiences in Germany show that support payments within agri-environmental measures are generally too low to encourage farmers to take land out of production, particularly when commodity prices are high (Berger et al., 2006).

Public Administration Costs

The costs of administration are substantial for some agri-environment schemes. For example, in the UK, Falconer and Whitby (1999) estimated that public administrative costs averaged 48 per cent of the compensation paid. Reporting the results of research into the administrative costs of 37 agri-environmental schemes in eight European Member States, they estimated that average annual administration costs ranged from €9 to €75 per hectare and from €140 to €2,446 per participant. Administration costs as a proportion of total payments to landholders varied from as little as 6 per cent to 87 per cent in one exceptional case. In the case of England, the mid-term evaluation of the English Rural Development Programme in 2003 estimated that the administration costs amounted to 16 per cent of the total scheme costs in the case of Environmentally Sensitive Areas and 28 per cent of the total in the case of the Countryside Stewardship Scheme. This indicates that public administrative costs have come down as agri-environment schemes have become more established and administrative procedures more streamlined, but the evidence indicates that administrative costs are significant relative to payments made for management costs and income foregone.

Farm Administration Costs

The total administrative costs at the farm level for rural development and agri-environment programmes have been estimated at €4.7 million in the Netherlands, €3.3 million in Sweden, €13.3 million in the UK and €0.75 million in Belgium (Defra-McInnes, 2007). Falconer (2000) found that farm level transaction costs in agri-environment schemes in Europe were significant, and argued that if such costs are not
taken into account in policy evaluation, there is a risk of sub-optimal policy prescription. These costs were found to be highly variable but on average added around five per cent to the compensation payments required to elicit participation.

In Veneto, Italy, an allowance is made for farm transaction costs in agri-environment payments for hedgerow creation and maintenance. These amount to €0.20 per metre out of the €2.70 per metre payment for hedgerow creation and €0.10 per metre out of the payment for hedgerow maintenance of €0.80 to €1.29 per metre. This suggests farm transaction costs of between 7% and 12.5% of payment rates.

Outline Cost Assessment

The costs of expanding the creation and management of features under the agri-environment programme can be assessed using current agri-environment payment rates in different Member States. The overall costs would depend on the extent, type and distribution of features to be created or maintained. Expanding the agri-environment programme would increase administrative costs both in public administration and at the farm level. However, as systems are already in place, while there would be some increase in administrative costs, there would also be some economies in scaling up existing approaches. The total costs, and success of the approach, are also dependent on the willingness of intended beneficiaries to participate.

9.5.2 Option 1.A – A Farmland Features Scheme within an Agri-Environment Programme: Payment by Outputs.

A farmland features scheme which incentivises the appropriate management, restoration and creation of farmland features could be delivered under agri-environment programmes. Payments would be calculated in relation to scheme outputs – measured in terms of the extent of farmland features under beneficial management.

The level of payment would increase incrementally according to the density of appropriately managed farmland features present. Under this option the farmer would restore or create new features following guidance from the appropriate authority who advise on the basis of landscape scale environmental needs. This pays for the management of those features protected under GAEC.

9.5.3 Option 1.B – A Farmland Features Scheme within an Agri-Environment Programme: Payment for Results.

This option differs from Option 1.A above in that agri-environment payments are calculated on the basis of environmental results, such as an increase in the population of a threatened species associated with features, rather than in terms of the extent of features managed and created. In theory, this should harness the local knowledge of farmers and encourage them to adopt innovative approaches designed to maximise effectiveness.
Realistic and achievable environmental goals would be set at the regional level with farmers and land managers provided with some flexibility as to how the goals should be achieved. For example, an objective could be set to improve the ecological status of water bodies within the region. With advice from appropriate authorities, farmers would choose to implement appropriate measures in order to meet the objective. This could include the creation of new farmland features such as buffer strips. Another goal could be to improve biodiversity, such as farmland bird populations, which could involve the appropriate management, restoration and creation of farmland features on a specific holding. In both cases, farmland features would form one part of a wider toolkit of options to achieve desired results. A system of monitoring would be required in order to assess the baseline situation and to determine if the result has been achieved.

A key advantage of this approach is that, given a substantial element of the payment received is tied to an agreed outcome, there is greater transparency with regard to what the farmer is paid for. Permitting farmers some flexibility as to how the results could be achieved is exemplary of a less prescriptive approach which may be appreciated by farmers.

The suitability of this option for implementation in the EU is significantly constrained by WTO rules (as discussed in Section 6.3). If the payment is to be genuinely based on the achievement of a desired result, a question is raised as to what action would be taken if the result is not provided. The payment could not be withheld or reduced, as the beneficiary would then be undercompensated for the costs involved in undertaking the required management. A bonus for delivering the desired result cannot be made, as this would not be in accordance with a calculation that is limited to income foregone and additional costs. There may also be potential for free-riding and holdouts as described in Chapter 9.4.3.

To be operationalised in an EU context, results-oriented action on the part of the payment beneficiary could be encouraged. Realistic targets would be established, and the farmer provided with some degree of flexibility as to the appropriate management changes required in order to meet the target. A rigorous monitoring scheme would be required to check on progress towards meeting the result, and ultimately, whether the target has been met. Advice could be given as to the type of actions needed to meet the result. The payment could be paid at intervals as particular milestones are reached rather than as an annual payment. Ultimately, the attractiveness of such an approach rests on its cost effectiveness when compared to other approaches. As discussed in the cost assessment below, the administration costs are likely to be high, but the environmental benefits may, potentially, be greater at a relatively lower cost.

Cost Assessment

The main items of costs would be similar to those for existing agri-environment schemes. We might expect results based payment systems to incur additional administrative costs because of the more flexible approach required. The costs of monitoring and calculation of payments may also be higher, depending on the result specified and the ease of assessing and verifying outputs. At the farm level, this option is designed to encourage farmers to adopt more cost effective approaches which maximise the outputs per unit of input, but there may be additional costs in
devising management strategies, trialling different approaches and notifying the authorities of the results.

The payment by results approach is likely to be applicable in particular circumstances where a specific result is required, where different possible approaches may be adopted to obtain this result, and where the result itself is relatively easy to measure and verify within a reasonable time period. It could be encouraged as an option within the agri-environment portfolio, to be applied in suitable cases. It is unlikely therefore that encouraging this option would have a significant impact on the overall agri-environment budget. There may be increases in administrative costs in the circumstances where a payment by results approach is adopted. However, to be worthwhile, there should be an expectation that these would be more than offset by an increase in the cost effectiveness of the management procedures adopted in order to achieve the result required.

9.5.4 Option 1.2 – Including all environmentally beneficial farmland features under GAEC.

Given the threefold protection against the removal of features provided by cross compliance - first by preventing removal of the feature as a GAEC standard, second, through the inclusion of the area occupied by the feature within the eligible area of the parcel under the SPS and SAPS, and third by communicating the importance of retaining features through the Farm Advisory System - a more ambitious implementation of the relevant GAEC standards is proposed under Option 1.2.

Requiring Member States to set out the rationale for including and excluding environmentally beneficial farmland features, perhaps as part of a programmed approach to cross compliance, could add further rigour. Even in its existing formulation, the effectiveness of cross compliance in relation to the protection and basic management of farmland features could be bolstered by improving the enforcement of the existing cross compliance standards and improving the delivery of advice through Farm Advisory Systems.

Cost Assessment

In this section, an assessment is made of the costs involved in extending GAEC to include all environmentally beneficial farmland features.

The use of GAEC involves a variety of costs (Alliance Environment, 2007):

- Administrative costs to the authorities – these include developing and communicating the rules, preparing and distributing advisory materials, handling enquiries, inspection of farms, and dealing with non compliance;
- Opportunity costs to farmers – the lost income from the land occupied by the protected feature;
- Farm management costs – where GAEC requires additional management activity such as the maintenance of a terrace or creation of a buffer strip;
- Administrative costs to farmers in understanding the rules, devising management strategies, keeping records and hosting inspections.
An evaluation of cross compliance by Alliance Environment (2007) for DG Agriculture found that data on the costs of GAEC are patchy but made the following observations:

- The costs imposed by GAEC vary between Member States - some have taken an ambitious approach to raising environmental performance, with significant impacts on costs, while others have taken a simpler, lower cost approach focusing on the enforcement of minimum obligations and the enforcement of good agricultural practice.

- Introduction of grass margins to protect watercourses has resulted in significant financial, managerial and opportunity costs in Denmark, Finland and England.

- Registering and/or maintaining landscape features has resulted in significant costs in Austria, Germany, Greece, Spain and France.

- In some Member States, GAEC has imposed significant managerial and administrative costs on farm businesses. This is particularly true of time intensive activities, including the registration of landscape features in Austria and Germany.

In Italy, the costs of maintaining terraces imposed by GAEC have been estimated at €55,680,000 annually, or €1,740 per hectare (de Roest, 2007, see Box 9-3), although the extent to which active maintenance actually takes place is unclear.

**Box 9-3: Costs of Maintaining Terraces in Italy under GAEC.**

Terracing is a key feature of the Italian farmed landscape, and has great environmental and landscape importance. It is particularly useful for reducing the risk of hydrogeological instability, and in particular, erosion and landslides. GAEC requires farmers to retain and manage terraces to maintain their contribution to the landscape. The costs of meeting GAEC standards are estimated as follows:

- Capital costs of terrace maintenance – 400 m$^3$ of terrace wall per ha at a cost of €200 per m$^3$, with 1.5% maintained/restored each year – average cost of 1200 euro per hectare.
- Annual maintenance costs – 30 hours work per hectare at labour cost of €18 per hour – average cost of 540 euro/ha.
- Surface affected = 30% of terraced surfaces = 32,000 ha.
- Annual cost of terrace maintenance in Italy = €55,680,000.


Further details of the costs of maintaining terraces (made up of dry stone walls) in olive oil producing areas are given by Torquati et al. (2006). These are estimated to vary from 9 to 17 per cent of the total cost of olive oil produced on sloped land (see Table 9-3). The cost of restoring a terrace was estimated at €71.1 per cubic metre in 2002. Based on an estimated average of 70 m$^3$ of terraces per hectare in hill areas, with an estimate of 35% being damaged and requiring restoration, the cost of restoration is about €1,742/ha every 5 years. In mountain areas, the cost increases to €3,200/ha. The maximum price of olive oil to farmers is around €10 per kg. The cost of maintaining terraces therefore, on these terms, makes olive oil production unprofitable in terraced areas. These calculations fail, however, to take into account the value of the Single Payment.
Table 9-3: Cost of Production of Olive Oil in Terraced Area.

<table>
<thead>
<tr>
<th></th>
<th>€/kg olive oil</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hill</td>
</tr>
<tr>
<td>Cultivation costs</td>
<td>9.69</td>
</tr>
<tr>
<td>Olive Processing costs</td>
<td>1.96</td>
</tr>
<tr>
<td>Maintenance of terraces</td>
<td>1.16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12.81</strong></td>
</tr>
</tbody>
</table>

Procedure for cost estimation:

<table>
<thead>
<tr>
<th></th>
<th>€/per m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of restoration</td>
<td>71.1</td>
</tr>
<tr>
<td>Volume of terraces per ha</td>
<td>70</td>
</tr>
<tr>
<td>Potential damage (%)</td>
<td>35%</td>
</tr>
<tr>
<td>Total cost per ha (€)</td>
<td>1,742</td>
</tr>
<tr>
<td>Years</td>
<td>5</td>
</tr>
<tr>
<td>Total annual cost per ha (€)</td>
<td>348</td>
</tr>
<tr>
<td>Olive oil yield (kg)</td>
<td>300</td>
</tr>
<tr>
<td>Maintenance of terraces (€/kg)</td>
<td>1.16</td>
</tr>
</tbody>
</table>


In England, GAEC requires farmers to protect stone walls, hedges and watercourses. For stone walls, there is a cost of applying for derogations as well as a potential opportunity cost associated with the land involved and the use of the stone itself. Hedges are protected by existing legislation but the GAEC standards require establishment of a 2 metre margin. Estimates of the capital cost of establishing 2 metre uncultivated, unfertilised strips range from £4.80 (€6.70) to £7.00 (€9.80). However, much will depend on the size of the hedge with thinner hedges incurring higher costs, whilst hedges of 4 metre width will require minimum changes to management. Farms with a large number of smaller fields (subject to a 2 hectares minimum) will incur greatest costs (Farmer et al., 2007).

Annual costs of maintaining 2 metre margins have been estimated at £7 per 100m of margin (Defra, 2004) and £5.4 to £9.2 per 100m of margin (Wills and Manley, 2004), with opportunity costs accounting for variations between farms. Wills and Manley found that costs per 100m of margins and costs per hectare were broadly similar in case study cereal farms.

A Regulatory Impact Assessment by Defra (2004) estimated that the cost to farmers of complying with cross compliance standards would equate to about 0.5% to 1% of total farm costs and 1.5 to 2.5% of the single payment. There is some variability around these margins according to size and type of farm, as well as each farmer’s individual response to cross compliance requirements. Nationally, the costs of cross compliance measures are in the region of £40 million per year in England, though this is likely to be offset somewhat by adjustments in business practices and agri-environment payments. The RIA, as well as a study by Wills and Manley (2004), found that the GAEC requirement for 2 metre margins accounted for a significant proportion of these costs, especially for arable farms.
Outline Cost Assessment

The cost of extending the use of GAEC depends on:

- The type of features to be protected;
- The extent of protection granted;
- The current extent and distribution of the features protected among the affected Member States;
- The method of implementing the rules, including the arrangements for recording landscape features and providing information to the authorities.

The examples from Italy and the UK give some indication of the unit costs of protecting different features. An overall assessment of the costs of extending GAEC rules is not possible in the absence of overall estimates of the extent of different types of features to be protected. Overall, the costs are likely to be fairly similar to those of regulation, and cross compliance may be seen as a means of enforcing the stated rules. Since there is an existing infrastructure for cross compliance, which includes systems of communication, inspection and enforcement, the use of GAEC to protect features may reduce certain costs. However, there may be significant extra costs involved where it requires establishment of new systems for recording and sharing information about features (see Chapter 4.3). Costs may be lower than for agri-environment schemes, which may impose greater requirements in terms of management of features, with correspondingly higher management and administrative costs. However, the benefits of GAEC may be less than for agri-environment schemes if the rules focus on protection rather than requiring sympathetic management.

9.5.5 Option 1.3 – Improving the implementation of the Birds and Habitats Directives on agricultural land.

In Chapter 7.2, a number of options are presented for improving the effectiveness of the Birds and Habitats Directives in protecting farmland features. One of the options put forward is to extend the area of agricultural land covered by the Natura 2000 network so that this land and its associated farmland features are brought under sympathetic management.

Cost Assessment

In this section, the following costs are considered:

- The costs of increasing the areas of agricultural land covered by the Natura 2000 network;
- The costs of developing management plans for farmed areas within the network, in order to guide sympathetic management and promote the maintenance of farmland features.

The costs of designating and managing Natura 2000 sites have received substantial attention at the EU level. For example, DG Environment convened an expert group to advise on the financing of the network and has collected data on costs from governments of individual Member States. The costs include:

- The administrative costs to the authorities of designating new sites, conducting ecological surveys, developing management bodies, consultation with
stakeholders, development of management plans, overseeing management actions and ongoing monitoring;

- The administrative costs to farmers of understanding requirements, devising appropriate actions, obtaining permissions and applying for grants;
- The opportunity costs of protecting sites and features;
- The costs of managing sites and features in Natura 2000 areas.

Developing management plans involves a variety of costs to the authorities and participating stakeholders, including survey and research work, design of appropriate actions, consultation with stakeholders, communication of preferred options, and development of instruments for implementation. Further details are given in an extended impact assessment on the financing of the Natura 2000 network (European Commission, 2004).

The extended impact assessment on financing Natura 2000 estimated that agricultural land accounted for 5.6 per cent of the network in the EU-15 in 2004, spanning a total area of 2.4 million hectares, while pastures, heath, scrub and grasslands covered a further 26.3 per cent (11.2 million hectares). The annual costs of managing the Natura 2000 network are estimated at €6.1 billion, covering an area in the region of 710,000 km$^2$. This represents an average cost of €86 per hectare per year.

Information about management costs for different habitats is given for most Member States. The available data indicate that the annual costs for managing agricultural land and pasture are proportionately higher than for other habitats, reflecting the high opportunity costs and management costs involved. These costs average 48 per cent of total identified annual costs for Member States for which data are available. This suggests an annual cost in the region of €130 per hectare for agriculture and pasture habitats. This figure is assumed to include all costs (opportunity, management and administrative) for the authorities and farmers.

Several German Länder offer compensation for restrictions placed on farmers in Natura 2000 areas. For instance, in Saxony-Anhalt, farmers are paid subsidies of €105/ha for grassland area and €189/ha for crop land in protection areas where the use of fertiliser is not permitted. In Thuringia, up to €200 per hectare of grassland may be paid per year, the actual amount depending on the specific constraints in a given Natura 2000 area; in Schleswig-Holstein compensation payments of €77 per ha per year are paid (Müssner et al., 2007). A synthesis by Jongeneel et al. (2007) of country case studies for the same study identified typical annual costs of €190 per hectare in France and €160 per hectare in Netherlands.

The Commission’s survey of Member States gathered some information about the costs of different Natura 2000 related actions, including costs of developing and reviewing management strategies. The extended impact assessment does not give any information on unit costs, but presents overall estimates for different Member States. For the EU-15, these costs range from €267,000 in Portugal to €7.2 million in Austria, and for the EU-10 from €119,000 in Latvia to €2.0 million in Poland. Anticipated expenditures on management plans vary widely by Member State, and are considerably greater in the EU-15 than in the new Member States.
Outline Cost Assessment

The area of agriculture and pasture land in the Natura 2000 network is in the region of 23 million hectares. Based on an assumed annual cost of €130 per hectare per year, extending the area of agriculture and pasture included in the network by 10 per cent would incur an additional annual cost of €300 million. It is assumed that the average cost of developing a new management plan is likely to be in the order of €25,000 per Natura 2000 site. No precise figures are available for the number of sites involved, but it is likely that there are around 8,000 sites comprising mainly agriculture or pasture land in the network. The cost of developing new management plans is estimated at €25 million per 1,000 sites covered. Assuming that plans are revised on average every eight years this is the assumed annual cost of management planning for sites in the network comprising predominantly agriculture and pasture land.

9.5.6 Option 1.4 – Retaining and creating farmland features as part of River Basin Management Plans under the WFD.

This option involves encouraging the retention and creation of those farmland features, such as buffer strips, hedgerows and patches of woodland, that help to protect the water environment through River Basin Management Plans (RBMPs), developed under the Water Framework Directive.

The WFD does not itself provide the mechanism for protecting, managing and creating such features. Instead it provides an overall framework designed to secure minimum standards in the management of the water environment. RBMPs may help to identify the role of farmland features in water management and inform strategies for the protection, management and creation. These will then need to be implemented through other measures such as regulation, cross compliance or agri-environment incentives.

Cost Assessment

The costs of using the WFD to protect farmland features are likely to include:

- Administrative costs at the river basin level, associated with identifying the role of farmland features and specifying strategies for their protection, management and expansion;
- Additional costs of protecting, managing and expanding features, through relevant regulatory, cross compliance or incentive measures. This effectively involves targeting the other options identified in this report to achieve priorities identified under the WFD.

The role of farmland features would need to be determined at the River Basin District level however, it may be appropriate to situate this within a European context and to highlight the role of farmland features in the management of the water environment, and the synergies between this and other areas of agricultural and environmental policy. This would incur some administrative costs at the EU level and would encourage Member States to undertake their own promotional and advisory activities highlighting the positive role that features can play in contributing to the objectives of the WFD.
Similarly, a greater focus on the role of farmland features would incur administrative costs at the River Basin District level as the authorities seek to integrate policies for the protection, management and expansion of features into River Basin Management Plans. There would be administrative costs in coordinating and targeting the application of existing policy instruments (such as agri-environment schemes, cross compliance, regulation and advisory efforts) to deliver RBMPs.

The costs of protection, management and creation of the features themselves would be as set out under the different options identified in this report – this option might concentrate these costs in areas where they help to deliver WFD priorities.

9.5.7 Option 1.5 – Tightening the criteria and thresholds used by Member States to define which projects require an EIA.

The EIA Directive requires certain agricultural projects, including those which involve the restructuring of rural land holdings and the use of uncultivated land or semi-natural areas for intensive agricultural purposes, to be subject to an environmental impact assessment. It therefore has the potential to play a role in protecting farmland features, such as boundary features or patches of semi-natural habitat found on farmland. However, its effectiveness is currently understood to be limited by the thresholds and screening criteria applied at Member State level. Greater protection could be given to farmland features by tightening the criteria and thresholds used by Member States in defining which projects require an EIA. This could be achieved by issuing guidance and requiring its enforcement in regulations at the national or regional level.

Cost Assessment

The costs involved would include:

- The administrative costs at the EU level in developing further guidance for Member States and ensuring that this is implemented at the Member State or regional level;
- The administrative costs at the Member State or regional level in developing new regulations redefining the types of agricultural projects covered and the thresholds involved, publicising the changes in the rules, and enforcing these;
- The administrative costs to farmers in understanding the new requirements, applying for permissions, and where necessary, commissioning the EIA;
- The opportunity costs of protection of features where the new rules discourage restructuring or intensification of agricultural holdings.

Some evidence on the costs is available from the UK, where new regulations transposing the Directive in the agricultural sector have been subject to Regulatory Impact Assessment (RIA). In England, the RIA (Defra, 2006) noted that it is difficult to give an accurate forecast of the likely costs and benefits of the new rural restructuring rules because of a lack of figures on the extent to which projects for the restructuring of rural land holdings occur in England each year. However, it noted that:
• The new restructuring rules will impose a new regulatory burden on some land managers, but this was expected to be low because the thresholds applied mean that few farmers will be affected.
• The EIA process is relatively inexpensive at the screening stage (i.e. it might take approximately 3 - 8 hours to read guidance and make an application, followed by a wait of a maximum of 35 days for a screening decision).
• Costs would rise if Natural England, the statutory nature conservation body, required the land manager to produce an environmental statement – and the land manager wished to do so. Often the land manager would need to hire a qualified consultant to do this – for a cost of around £2000 - £5000. The land manager may have to wait some months for a decision (e.g. while a public consultation is carried out).
• Experience suggests that the requirement to produce an environmental statement is a significant deterrent to projects proceeding. Where the project does not proceed, there may be an opportunity cost.
• The new rules have the potential to affect land value and to limit land managers’ ability to restructure their businesses to adapt to changing market demands
• The new restructuring rules will also impose a new burden on Natural England which may have to devote up to two staff years to run the rules.

The RIA stated that the rules on uncultivated land and semi-natural areas had protected several hundred hectares of land since their introduction. The administrative costs of the regulations for businesses had been estimated at £180,000 per year, and they had required nine staff to enforce them. Changes in the rules, to introduce a new two hectare limit, were expected to reduce farm administrative costs by 20 - 40% and the number of administrators required by two to four. The regulations are also enforced as a GAEC standard, though this in theory should not impose any additional costs above those of compliance with the regulations themselves.

In Scotland, the RIA (SEERAD, 2005) suggested that relatively small numbers of businesses would be expected to be affected by the regulations. Costs might include:
• The cost of preparing an application form (say two hours, depending on the level of detail required).
• If required the cost of employing a consultant to complete an Environmental Assessment where there is a risk of significant effect. This might vary from £500 - £800 for a small scale project with relatively simple albeit significant impacts to £10,000 - £15,000 for a complex or large scale project with a number of impacts. It would not be necessary for a consultant to be employed for every project.
• Implementation costs in total for Scotland might be in the range of £2,000 - £4,000 per annum for enquiries and applications, with anything between £2,000 - £180,000, depending on the number and content of environment statements produced.

**Outline Cost Assessment**

Any tightening of the rules governing the implementation of the EIA Directive for farmland features could be expected to result in significant additional administrative costs at the EU, Member State and regional level. The costs on farm businesses would depend on the extent to which there were changes in the thresholds applied, which
would affect the numbers of farmers required to notify the authorities of intended projects, and potentially to commission environmental statements or withdraw their proposals, with resultant opportunity costs.

In the remainder of this chapter we introduce and describe the costs of three policy options which we understand have not been implemented before in the EU arena.

**9.5.8 Option 2.1 – An Environmental Priority Area (EPA)**

This option would involve placing a requirement on farmers to designate a proportion of the total farm area as an Environmental Priority Area (EPA). Appropriate management would need to be undertaken on the EPA, supported by advice on its appropriate location.

The appropriate proportion of land that should be designated an EPA is likely to be dependent on a range of factors, including the amount of unutilised land currently on the farm, the size of the farm, the incidence of features such as watercourses and hedges that could be buffered by part of the EPA and those situations where the use of an EPA would be necessary to address natural resource management issues, such as soil erosion. Member States would need to be provided with some discretion in defining a higher or lower ratio depending on the scale of the environmental challenges to be addressed. An EPA in the region of 3-5 per cent of UAA may be politically acceptable and sufficient to realise environmental benefits, given the experience in France of introducing a three per cent ‘environmental cover’ requirement under cross compliance GAEC (see Chapter 7.5).

It is envisaged that the EPA would primarily be targeted at arable farms. If this requirement is extended to mixed farms or livestock systems, it raises questions about the application of the EPA. For example, additional investment may be required in order to provide fencing and gates to allow for the suitable management of the area, and to avoid overgrazing and erosion of stream banks.

There are a number of potential means to introducing this measure, including cross compliance, within agri-environment schemes and also through regulation.

The establishment of an EPA could be included as a GAEC standard within the current Annex IV of Council Regulation 1782/2003. The EPA would provide for the protection of soils and for a minimum level of maintenance as currently required by cross compliance GAEC. Member States would then be obliged to include a relevant standard taking account of the national context. The Member State could use this measure to target the protection of certain valuable farmland features, for instance, by creating a protective buffer next to hedgerows or infield trees. Alternatively, the EPA could be used to create a buffer strip adjacent to watercourses. The clearest precedent for this approach is the French implementation of GAEC, which requires three per cent of the farmed area to be set aside as environmental cover, with priority give to land adjacent to watercourses. The inclusion of the EPA in GAEC would also mean that it would form a baseline requirement for entry into agri-environment schemes.
The creation of the EPA could be regulated in a similar way in which Member States are obliged - under current legislation - to monitor the area of permanent pasture. Thus, rather than including the standard in Annex IV GAEC, a separate Article or sub-paragraph within the current Article 5 of Regulation 1782/2003 might require Member States to impose requirements to create the EPA and subsequently to monitor the size of the EPA over time.

In certain situations, the EPA may warrant a low level incentive payment to encourage uptake. This might be appropriate for more intensive arable systems, due to the significant nature of the threat of removal of features and inappropriate management which could undermine the provision of environmental benefits. Additional investment aid may be required in the case of parcels used for livestock grazing.

A more ambitious approach would be to use the EPA as the basis for stimulating the creation of new farmland features, so long as there is robust evidence to suggest that this would result in an overall positive effect. Whilst targets could be set at the national or regional level for the total desired size of the EPA, Member States would need to use a range of appropriate policy instruments (such as the agri-environment measure) to reach the desired target. Under this approach, the area occupied by farmland features would count towards the EPA.

A range of management options relating to the EPA could be determined at the regional level. There could be requirements regarding fertiliser and pesticide application on these areas, with a minimum period for rotation of fallows - as these could count towards the EPA - to be specified, based on the characteristics of the farming system. Vegetation control, as a rule, would need to be carried out only by mowing and outside of the breeding season to avoid negative impacts on wildlife.

**Cost Assessment**

The costs of this option would include:

- The opportunity costs involved in protecting existing features;
- The costs involved in the appropriate management of features;
- The administrative costs to the farmer in understanding requirements, deciding on appropriate responses, and demonstrating compliance;
- The costs to the authorities of designing the system, communicating requirements, providing advice and guidance, and undertaking appropriate monitoring, inspection and enforcement action.

It is important to note that the EPA merely sets the overall requirement regarding the area of features to be protected and appropriately managed, and that other policy instruments (such as regulations, agri-environment schemes and cross compliance measures) would be required to achieve these targets. Thus many of the costs would be common to those associated with other options identified in this report, though delivery of the EPA would itself carry some administrative costs. The choice of the implementing options would determine the incidence of costs on farmers and the authorities. For example, if agri-environment schemes were to be used to deliver the targets then the public authorities would bear the brunt of the costs, whereas a cross compliance based approach would shift this cost burden to the farmer.
The arable area of the EU-27 currently spans a total of 100 million hectares (Eurostat, 2007). Achieving an Environmental Priority Area of three per cent of the overall arable area would therefore require protecting and managing three million hectares of farmland; this would increase to five million hectares under a five per cent target. Annual management costs vary widely by feature and by Member State (see Annex 3). However, assuming an average cost of €150 per hectare would give annual management costs of €450 million for a three per cent target and €750 million for a five per cent target (Table 9-4). Farmers may be expected to bear some of the cost of basic management, as the EPA is a baseline requirement, resulting in lower costs.

Table 9-4: Illustrative Area and Costs of Arable EPA in the EU-27.

<table>
<thead>
<tr>
<th>EPA as % of arable area</th>
<th>3%</th>
<th>5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (million ha)</td>
<td>3.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Annual Management Cost (€m)</td>
<td>450</td>
<td>750</td>
</tr>
</tbody>
</table>

No accurate assessment of the capital costs of establishing EPAs is possible in the absence of estimates of the current areas of qualifying features in different Member States. However, an illustrative example of possible establishment costs is given in Table 9-5, based on assumptions that qualifying features currently represent three per cent of the EU arable area and that there is an average capital cost of €1,000/ha for establishment. Under these assumptions the capital cost of establishing the arable EPA is between zero (with a three per cent target) and €2.0 billion (with a 5 per cent target).

Table 9-5: Illustrative Establishment Costs of Arable EPA in the EU-27.

<table>
<thead>
<tr>
<th>EPA as % of arable area</th>
<th>3%</th>
<th>5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional Area (million ha)</td>
<td>0.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Establishment Cost (€m)</td>
<td>0</td>
<td>2,000</td>
</tr>
</tbody>
</table>

9.5.9 Option 2.2 – Land Purchase

This option recognises that some features, such as small scale woodlands or traditional orchards, might be at risk of neglect or removal under their current ownership, and that a change of ownership may help to secure their future. Grant aiding the purchase of land to enable it to be managed by a local group for community benefit may be an attractive option in these cases. The option would involve grant aiding the purchase of land, then legally transferring or leasing it to a local community group prepared to take on its long term protection and management. The public purchase of land is often regarded as an efficient way to provide for appropriate and sustainable land management. This would include the appropriate
management, restoration and creation of farmland features. This approach may better lend itself to implementation at the Member State level.

Cost Assessment

As the anticipated benefits to the local group assuming management would exceed the ongoing costs, the main net cost incurred would be in the purchase of the land itself. There would also be costs in administering the grant scheme.

The costs of land vary widely by Member State and according to a variety of criteria such as productivity, location, amenity value and development potential. According to the Financial Times, the average price of a hectare of agricultural land in 2006 varied from €734 in Lithuania to €164,340 in Luxembourg. Savills (2007) recorded farmland prices as being highest in Ireland (€58,000/ha), followed by Luxembourg (just over €30,000/ha); the Netherlands, Northern Ireland and Spain (€20-30,000/ha); England, Belgium, Italy and Denmark (€10-20,000/ha); Greece, Finland, Scotland, Wales and Germany (€5-10,000); Latvia, Sweden, Poland, France and the Czech Republic (€1,000-5,000) and Bulgaria, Romania and Lithuania (less than €1,000/ha).

The cost of acquiring land containing farmland features as a means of promoting their protection and local management would clearly vary significantly depending on the types of features involved and their location. The above figures suggest that the average cost is likely to be in the region of €10,000/ha for the EU as a whole, but could be significantly higher or lower than this in some Member States. Based on this assumed average figure, an annual budget of €10 million would grant fund the purchase of 1,000 hectares of land each year. There would be additional costs for the authorities in administering the grant scheme, and for applicants in making funding applications.

9.5.10 Option 2.3 – Covenants

This option encourages the wider use of covenants as a legal mechanism to secure the protection of features on private land. Covenants would be encouraged at the Member State level rather than as an EU wide scheme. Each covenant would be voluntary, but once in place, would become a legally binding requirement registered on the title of the land that binds the current and all subsequent landowners. The covenant would apply to the whole of the holding and could specify particular conditions for the different farmland features present on the holding. Payments could be available for management and monitoring would need to take place.

The key merit of this approach is that it would provide indefinite protection of features. However, whilst the approach could safeguard features from removal, it may not necessarily provide for appropriate management, and therefore accompanying measures would be required. The attachment of covenants to land titles may also impact on land and rent values. Care would need to be taken when writing the supporting legal text for covenants to ensure a good level of coherence with relevant EU level policy such as Natura 2000. This approach may better lend itself to implementation at the Member State level.

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Cost Assessment

Costs would include:

- Administrative and legal costs – in drawing up the covenant and entering into the legal agreement. Typically the costs incurred by the landowner are met by the authorities, though there may be non-financial costs in terms of the time involved;
- Opportunity costs – in terms of the income foregone from alternative uses of the land. Covenants restrict the options for using the land and are therefore likely to impact negatively on land prices;
- Management costs – where there is a requirement in the covenant to manage land sympathetically. These may be covered by management payments from the authorities.

Covenants have been applied in several overseas countries including Australia, Canada and New Zealand (IEEP, 2005). Some information is available on the cost of establishing covenants. For example, in British Columbia it is estimated that conservation covenants generally cost about CAN$10,000 to complete, and so for sizeable land areas are much more cost-effective than outright purchase of land (Habitat Acquisition Trust, 2006).

The legal and administrative costs of covenants make them most applicable to larger farms with particularly important landscape features. This option is likely to be applied at the Member State level, and no EU wide cost assessment can be made.

9.6 Situating Policy Options in the Context of a future CAP

In order to develop durable policy options, the future development of the CAP needs to be considered. One potential reform pathway, outlined here, shows that policy options for farmland features would sit in a multi-layered framework that targets sustainable land use across agricultural areas.

To meet the objectives relating to the protection and maintenance of farmland features, as well as the delivery of other environmental objectives, a combination of instruments is likely to be required, some of which apply across the entire EU agricultural landscape whilst others are more precisely defined for specific geographical areas. If the aim is to promote a landscape wide approach, it is important that the mix of policy mechanisms used ensures coverage across the full extent of the farmed countryside. These policy measures can draw from national level, as well as European level, action and a combination is likely to be appropriate. They will be most effective if they are applied in a strategic and complimentary way to deliver the range of benefits required at various geographical scales. The tiers in the pyramid (shown in Figure 9-1) are associated with increasingly targeted interventions and higher levels of payment (and potentially, higher implementation costs).
The dissemination of good practice and the voluntary adoption of beneficial practices by farmers is extremely important to encourage behavioural change to ensure the appropriate management of farmland features. Advice can be channelled through the Farm Advisory System, a requirement of Council Regulation 1782/2003, and which must provide advice on cross compliance requirements as a minimum, and hence the retention of features included in national GAEC implementation. Outside of the EU frame, more locally centred initiatives, such as those of the bodies responsible for managing protected areas or local conservation bodies may advise and equip farmers with the appropriate skills to maintain valued cultural landscapes.

In determining which tools are the most effective in achieving the desired outcomes, a balance has to be struck between the need to retain some level of leverage over a large proportion of land managers (particularly at times of high commodity prices), and the need for more targeted intervention which is inevitably accompanied by higher transactions costs. Regulatory approaches - in line with the Polluter Pays Principle (OECD, 1974) - will play a critical role in preventing the removal of features across all agricultural land. There will also be a need for policy instruments such as cross compliance, which are likely to be effective as long as they are adequately enforced. There will also continue to be a need to protect the most valuable features or the sites containing valuable features through special legal designations. Regulatory and basic standards could, alternatively, be enforced through requiring farmers to obtain a ‘licence to farm’, whereby receipt of such a licence is conditional on meeting the specified standards.
The maintenance of a feature in good environmental condition will be predicated on an appropriate type of management. The level, intensity and type of management required to maintain optimal environmental benefits will often be regionally specific. Supporting the management of features can be achieved through a range of instruments, depending on how prescribed this management needs to be to achieve the desired outcomes.

In certain cases, where the loss of extensive farming is a threat, there will be a case to provide financial support to the managers of the associated farming systems, and thereby, underpin their capacity to continue to engage in sustainable land management. This would prevent farmland features from falling into neglect, and will be particularly important for High Nature Value farming systems.

In all areas, further incentive payments will be needed to target particular management regimes, and in particular in the management of features. These payments are equally applicable to both intensively and extensively managed farmland, whereby land managers have a right to receive payments for the provision of public benefits, whether or not these would have been provided in the absence of payments (Hodge and Reader, 2007). All those who are able to provide benefits, including those that can be delivered through well managed and well placed farmland features, are thus eligible for support.

To achieve more geographically specific and complex outcomes, such as the restoration and creation of new farmland features in order to achieve a greater supply of environmental benefits, more targeted approaches are appropriate. In these situations, management should be tailored to the needs of a particular habitat or species and the management required will differ depending on local circumstances. Payments of this sort need to be discretionary and dependent on the delivery of the specific management required. This type of highly targeted intervention is most effective when it is accompanied by site based advice and support.

For all instruments there are limits to what can realistically be achieved. It is therefore reasonable to assume that a range of instruments will need to be deployed to maintain and protect farmland features in order to meet current environmental objectives. The critical questions therefore concern the relative weight placed on advice, regulation, support for specific systems and incentive based payments, alongside a consideration of their relative cost effectiveness in securing the adequate protection of farmland features.
10 Conclusions and Recommendations

The principal conclusions and recommendations of this study are as follows.

i. There is a need to invest in a pan-European database on farmland features with data collected according to a standardised methodology and at regular intervals.

A robust evidence base contributes greatly to the design, delivery and evaluation of effective policy interventions and is particularly relevant to support the continued protection and maintenance of farmland features given the gaps in current data. Trends in the integrity of farmland habitats and in the extent of High Nature Value farming could be captured more readily and policies subsequently better targeted. Compliance with relevant GAEC standards is difficult to establish without data being available on the presence and distribution of features. Over time, trend data will be built up which will allow any declines in the total stock and condition of farmland features to be detected before the farmland features resource falls below a critical level. Information on trends is necessary to precipitate pre-emptive action and to inform future policy design.

At the pan-European level, there is no consistent database providing information on the location of farmland features. National scale landscape surveys exist in Austria, France, the Netherlands, Sweden and the UK, but these differ in the way in which data are collected - relying on different sampling techniques and taking place at irregular intervals - as well as in the way that farmland features are recorded, and hence are not comparable. There is an absence of data on the distribution and density of farmland features in most Member States. Qualitative data on the condition of farmland features is generally not collected.

The Land Parcel Identification System (LPIS) offers huge potential to collect data on the presence or absence of farmland features in a consistent way across the EU-27. Through the use of aerial photography the LPIS marks the boundaries of agricultural parcels for the purpose of controlling the claims of farmers under the Common Agricultural Policy’s Single Payment Scheme (SPS) and Single Area Payment Scheme (SAPS). However, it is our understanding that very few Member States use the aerial photographs produced for the LPIS to identify and record non-agricultural elements, i.e. farmland features, a practice already recommended by the Commission Services.

Extending the use of the LPIS to systematise the collection of data on the presence of farmland features would enable the quantification of a large component of Europe’s ‘green infrastructure’, and allow trends over time to be captured. It would also underpin the capacity of the Member States to verify compliance with national GAEC standards for the retention of landscape features, and to develop landscape scale policy interventions that target features in a co-ordinated and strategic way. The LPIS does not necessarily need to be adapted to collect information on all farmland features, but only those that are protected in some way by the legislative baseline or are otherwise the attention of policy, such as the agri-environment measure.
Chapter 10 Conclusions and Recommendations

The strength of aerial photography and the LPIS is that it presents a ready-made approach to the identification of the presence or absence of farmland features. However, as a tool it needs to be married to other techniques, such as sample based habitat surveying, in order to determine the condition of farmland features in a consistent way. Another approach to explore would be to require farmers to record the general condition of features, but to be successful this would need to be underscored by a large scale training exercise, and motivated in some way, perhaps by linking the approval of SPS and SAPS claims to the completion of a farm environment plan, which would include information on the quality of farmland features. Further research and a feasibility study on developing the role of LPIS is needed.

ii. There is a need to maintain the broad stock of farmland features, in order to support Europe’s biodiversity, protect natural resources and contribute to climate change adaptation and mitigation.

The weight of evidence shows that farmland features provide a range of environmental benefits. In both intensive and extensive agricultural landscapes, features such as hedges, small groups of trees and other patches of semi-natural vegetation, provide a habitat for foraging, nesting and breeding. Features such as grassy margins and lines of trees can help reduce soil erosion and improve water quality. Farmland features can also help to sequester carbon, and through covering soil, reduce the loss of N$_2$O. Farmland features therefore provide multiple environmental benefits.

Some landscapes are relatively rich in farmland features, whilst others are comparatively denuded, as a result of historic and ongoing agricultural restructuring. Irrespective of policy drivers, agricultural restructuring will continue, and be marked by further intensification in some places, and marginalisation, and potentially land abandonment, in others. Unless appropriate legal safeguards are in place, the risks of inappropriate management or the removal of features - particularly if they no longer retain an agricultural function - will increase as a result of intensification. Where marginalisation is occurring, features are at substantial risk of falling into neglect, which could reduce the ecological value of some. Land abandonment itself results in complex ecological changes, which can include the loss of some species that are closely associated with farmland features and the wider semi-natural habitat in which they are situated. In both cases, there are negative impacts on landscape and the associated cultural values placed on it.

A guiding principle should be to retain and appropriately manage the majority of existing farmland features and to prioritise the creation and restoration of features where the environmental need is greatest. Some loss of low-value features should be tolerated, although the most valuable features, such as very old trees, traditional orchards and patches of species rich semi-natural vegetation should be protected. Appropriate features should be re-created in order to restore greater diversity to artificially simplified agricultural landscapes, but only where this will provide a demonstrable overall environmental benefit. Whilst new features will provide refuges for farmland biodiversity, the introduction of features in intensively farmed environments will be guided by the need to address soil and water quality problems in many cases.
Farmland features may play a role in helping species adapt to climate change, with the long-term survival of many species strongly dependent on maximising the resilience of their populations, whilst also enabling them to disperse in response to changing conditions. Enabling the dispersal of individuals between different habitat patches can increase the resilience of populations and enable species to move in the face of climate change. The ability of a species to move between patches and potentially across the intervening habitat matrix is called functional connectivity. Some farmland features are likely to play an important role in maintaining functional connectivity. The evidence suggests that farmland features characterised by large and/or wide semi-natural habitats with high vegetation diversity and structural complexity are likely to be of highest connectivity value, although smaller patches of semi-natural habitat are also of value. A focus of policy should therefore be to protect the existing resource of farmland features in order to support the provision of functional connectivity. At present, there is rather less evidence available to support a policy that promotes simple wide-scale restoration of poorer quality features or the creation of new farmland features simply in order to improve connectivity. Until further evidence is available, the rationale for increasing connectivity should be balanced against a consideration of cost-effectiveness (for example, compared to increasing the quality and size of core habitats) and the potential risks (such as encouraging the spread of alien invasive species).

iii. There is a need to seek the sensitive implementation of the SAPS eligibility rules in Bulgaria and Romania so as to capture feature-rich HNV farmland within the CAP and to reduce the threat of removal of features in more intensive areas.

The SAPS eligibility rules, as they apply to Bulgaria and Romania, could result in both positive and negative consequences for the environment, depending on the type and structural characteristics of the farming system and the local context. Some of these negative consequences can be avoided by making amendments to the eligibility rules for farms and agricultural parcels under the SAPS.

Unlike other countries applying the SAPS, no reference date was set at the point of Bulgaria’s and Romania’s Accession for the maximum permissible eligible area which could give rise to claims under the scheme. This means new agricultural areas can become eligible for the SAPS on an annual basis. The likely consequence is that in intensively farmed areas, where there is a dual incentive among farmers to expand the productive area in order to take advantage of market returns and to increase the area eligible for the SAPS, farmland features that are not protected through GAEC or other national legislation are under threat of removal.

On the other hand, the absence of a reference date after which no further land can be included in the SAPS, allows more land to come under the influence of the CAP each year\textsuperscript{69}. This will be particularly advantageous in those cases where land currently not

\textsuperscript{69} In Romania, for example, only 29 per cent of all holdings, accounting for 70 per cent of the UAA were registered on 1 June 2007. The remaining holdings, almost three million, are largely subsistence farms, and many are likely to be High Nature Value (Arblaster, 2008).
registered for the SAPS is at risk of abandonment and which by being registered in the future, may be targeted by appropriately designed measures to the benefit of the maintenance of the associated farmland features.

Any policy response therefore needs to balance two different types of environmental threat – potentially the loss of features in more intensive systems and the neglect of features in more extensive systems that are under threat of abandonment. To counteract the threat of the removal of features in more intensive areas, it may be advisable to set a retrospective reference date for the total agricultural area that is eligible for the SAPS. This would require the more intensive areas to be zoned in a suitably rigorous fashion. A thorough implementation of GAEC standards should also help to protect the most valuable farmland features.

In areas under threat of abandonment and which are not currently eligible for CAP support, the eligibility rules could be revisited, including those relating to a minimum holding size of 0.3 hectares, and to the density of trees or shrubs allowed. The advantage of this would be to increase the area of land under the influence of the CAP, to channel payments to marginal and extensive farming systems thereby providing some safeguards for farmland features that may otherwise fall into neglect as land is abandoned. Although receipts under the SAPS may be low for such small farms, this opens up the possibility to target these farms with measures that seek to reward the provision of environmental benefits.

iv. There is a need to encourage the protection of farmland features through cross compliance standards for ‘Good Agricultural and Environmental Condition’ (GAEC).

In most parts of Europe, farmland features are an integral environmental resource, under pressure from farming activity, but are a critical element of the environmental value of farmland. Consequently, their protection should form part of the legislative baseline affecting farmers. Alongside the setting and enforcing of legal obligations by Member States to prevent the removal of the most valuable features, cross compliance GAEC, if implemented in a rigorous way, affords three layers of protection against the removal of features. First, the framework for the implementation of GAEC provided by Article 5 and Annex IV of Council Regulation 1782/2003 includes standards for the retention of landscape features, the retention of olive trees and the retention of terraces, although no further features are specified by name. The requirement to retain specific features as part of the national set of GAEC standards, therefore affords one level of protection. In addition, the protection of a feature through GAEC results in the area occupied by the feature forming part of the eligible area for the purpose of calculating claims made under the SPS and the SAPS. This provides a second layer of protection, removing the incentive that otherwise exists to remove the feature in order to receive a higher payment. Thirdly, the Farm Advisory System, which must, as a minimum, provide guidance on all cross compliance standards, and be implemented by all Member States, should also provide further protection through awareness-raising.

Thus while GAEC standards alone are not sufficient to protect features, particularly as annual inspection rates are low, in combination with advice, encouragement and
incentives they offer a valuable component of a balanced policy package for addressing features.

According to an evaluation for DG Agriculture (conducted in 2007) and information collected for this study, 14 Member States have implemented standards that offer protection to farmland features. Although the situation may have changed since 2007, the evidence suggests that the implementation of GAEC standards for the retention of landscape features is incomplete across the Member States. It is recommended, therefore, that Member States are encouraged to observe the requirements of Article 5 and Annex IV of Regulation 1782/2003 and define GAEC standards for the retention of landscape features at the farm level. The monitoring of compliance against the baseline stock of farmland features can be achieved by developing the role of the LPIS, as argued above.

v. There is a need to ensure Agri-Environment Schemes take adequate account of the management, restoration and creation of farmland features.

Whilst the full implementation of GAEC provides an important baseline in the protection of farmland features, this is not an appropriate instrument to deliver the active management of features given the costs incurred by farmers. Farmers in Spain and Italy are obliged to maintain terraces in order to meet national GAEC standards, however, given that costs are high, many farms with terraces are part of marginal farming systems, and enforcement levels are low, these standards are unlikely to be effective in practice. These features could be better safeguarded by supporting maintenance through the agri-environment measure, with GAEC used simply to prevent removal.

Agri-environment payments are essential for compensating farmers for the costs incurred in the sympathetic management or restoration of features. In areas of highest environmental need, either where features are under particular threat, or where the environmental benefits from features are most concentrated, it is recommended that specific farmland features are adequately accounted for in agri-environment schemes.

vi. There is a need to promote new approaches to policy delivery in order to enhance the effectiveness of intervention.

The scope for improved coordination and targeting of the multiple measures affecting features is particularly strong at the relatively local scale, whether it is a large landscape, a watershed or administrative unit. The adoption of a strategic landscape approach for guiding a suite of policy measures on landscape, biodiversity, water management and farmland features in a coherent and more integrated way would add value to measures pursued in isolation. The protection and maintenance of farmland features should be one of the objectives of such an approach, but not form its sole focus. Member States should be encouraged to develop more integrated delivery systems of this kind and could be incentivised to do so through measures offered via the EAFRD Regulation.
Chapter 10 Conclusions and Recommendations

Moving beyond a compartmentalised approach to policy design and delivery would also involve encouraging collaborative action alongside the endeavours of individual farmers. There is evidence to suggest that greater environmental benefits might be achieved if the cooperation of neighbouring farmers or landowners in implementing complementary actions, such as the introduction of a buffer strip alongside a watercourse which traverses several holdings, could be secured. A number of examples of this approach can be found both within the EU and the USA, and thus there is a precedent for these sorts of actions. However, techniques for encouraging collaborative action would benefit from further piloting and any proposed payment terms would need to be thoroughly examined for WTO compatibility.

vii. There is a need to identify and develop new policy measures that can safeguard Europe’s farmland features resource.

Whilst it is generally more cost effective to introduce amendments to existing policy measures to address threats, some innovative approaches, suitable for implementation at the European level, may further enhance the protection of farmland features. To this end, it is recommended that the benefits of introducing an Environmental Priority Area (EPA) requirement on farms receiving CAP payments are explored further. Whilst there are various ways to develop the EPA approach, it essentially requires farmers to designate a proportion of the total farm area as an EPA, to follow advice and locate the EPA where it would address pressing environmental concerns, and to undertake appropriate management. The appropriate proportion of land that should be designated an EPA would depend on a range of factors, including the size of the farm, the amount of unutilised land currently on the farm, the incidence of features such as watercourses and hedges that could be buffered by the EPA and the scale of pressing environmental problems to be addressed, such as soil erosion. The EPA would therefore create an obligation to safeguard existing features, by creating a protective buffer around the feature, and in some cases result in the creation of new features, such as buffer strips, where these aid the protection of soils and improve water quality. Whilst the EPA has support from some quarters, the detail of how it might work in practice requires development, not least to identify a viable model that could be applied in a consistent way across Europe.

viii. An adequate budget is needed to satisfactorily implement agri-environment measures and to undertake systematic monitoring of Europe’s farmland features resource.

This study has identified the need to retain Europe’s existing farmland features resource. The retention of features can be achieved through existing European policy instruments, including GAEC, in combination with national measures designed to protect the most valuable features. However, the longer term management and restoration of farmland features, and the creation of new farmland features, where necessary to meet environmental goals, is likely to rest on compensation payments, and hence the appropriate use of a suite of rural development measures. In particular, the agri-environment measure and the non-productive investment measure can be used to maintain and increase the overall farmland features resource. However, to be
effective and to be implemented at the scale that might be necessary as pressures on farmland increase, an adequate European rural development budget is needed.

Steps to increase the budget devoted to agri-environment management, whether by modulation or otherwise, are central to a strategy for maintaining the stock and improving the condition of farmland features in Europe.
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Annex 1: Examples of mammals, birds, reptiles and amphibians species of Community interest that significantly utilise farmland features.

Note: Species of Community interest are birds listed in Annex I of the Birds Directive and other species listed in Annex II of the Habitats Directive.

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Annex 1 Examples of mammals, birds, reptiles and amphibians of Community interest that significantly utilise farmland features.

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<tr>
<td><em>Testudo hermanni</em></td>
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<tr>
<td><em>Testudo marginata</em></td>
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<tr>
<td><em>Emys orbicularis</em></td>
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<tr>
<td><em>Mauremys caspica</em></td>
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<tr>
<td><em>Mauremys leprosa</em></td>
<td></td>
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<tr>
<td>Lizards</td>
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<tr>
<td><em>Lacerta bonnali</em></td>
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<tr>
<td><em>Lacerta schreiberi</em></td>
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<tr>
<td><em>Podarcis pityusensis</em></td>
<td>*</td>
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<tr>
<td><em>Chalcides simonyi</em></td>
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<tr>
<td><em>Phyllodactylus europaeus</em></td>
<td>*</td>
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<tr>
<td>Snakes</td>
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<tr>
<td><em>Elaphe quatuorlineata</em></td>
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<tr>
<td><em>Elaphe situla</em></td>
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<tr>
<td><em>Natrix natrix cypriaca</em></td>
<td>*</td>
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<tr>
<td><em>Macroovipera schweizeri</em></td>
<td>*</td>
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<tr>
<td><em>Vipera ursinii</em></td>
<td>*</td>
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<tr>
<td>Amphibians</td>
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</tr>
</tbody>
</table>
Annex 1 Examples of mammals, birds, reptiles and amphibians of Community interest that significantly utilise farmland features.

<table>
<thead>
<tr>
<th>Species</th>
<th>Hedges, banks &amp; walls</th>
<th>Trees &amp; woodland</th>
<th>Ponds, ditches &amp; streams</th>
<th>Unutilised land including relict semi-natural patches</th>
<th>Fallow land (including set-aside) &amp; uncultivated patches in arable land</th>
<th>Sown grass margins</th>
<th>Abandoned agricultural land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newts and salamanders</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><em>Mertensiella luschani</em></td>
<td></td>
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<tr>
<td>(Salamandra luschani)</td>
<td>*</td>
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<td></td>
</tr>
<tr>
<td><em>Triturus carnifex</em></td>
<td></td>
<td>*</td>
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</tr>
<tr>
<td><em>Triturus cristatus</em></td>
<td>*</td>
<td>*</td>
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</tr>
<tr>
<td><em>Triturus dobrogicus</em></td>
<td>*</td>
<td>*</td>
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<tr>
<td><em>Triturus montandoni</em></td>
<td>*</td>
<td>*</td>
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</tr>
<tr>
<td><em>Triturus vulgaris ampeleensis</em></td>
<td>*</td>
<td>*</td>
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<td></td>
</tr>
<tr>
<td>Frogs and toads</td>
<td></td>
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<tr>
<td><em>Bombina bombina</em></td>
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<tr>
<td><em>Bombina variegata</em></td>
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<tr>
<td><em>Discoglossus galganoi</em></td>
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</tr>
<tr>
<td><em>Rana latastei</em></td>
<td>*</td>
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</tr>
<tr>
<td><em>Pelobates fuscus insubricus</em></td>
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</tbody>
</table>
Annex 2: Natural habitat types of Community interest (i.e. listed in Annex 1 of the Habitats Directive) that may be farmland features in some situations.

See the ‘Interpretation Manual of European Union Habitats’ as approved by the committee set up under Article 20 (‘Habitats Committee’) and published by the European Commission for further information on habitat types. The code corresponds to the NATURA 2000 code. ‘*’ indicates priority habitat types.

### 1. COASTAL AND HALOPHYTIC HABITATS

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.</td>
<td>Atlantic and continental salt marshes and salt meadows</td>
</tr>
<tr>
<td>1340</td>
<td>* Inland salt meadows</td>
</tr>
<tr>
<td>14.</td>
<td>Mediterranean and thermo-Atlantic salt marshes and salt meadows</td>
</tr>
<tr>
<td>1410</td>
<td>Mediterranean salt meadows (Juncetalia maritimi)</td>
</tr>
<tr>
<td>1420</td>
<td>Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)</td>
</tr>
<tr>
<td>1430</td>
<td>Halo-nitrophilous scrubs (Pegano-Salsoletea)</td>
</tr>
<tr>
<td>15.</td>
<td>Salt and gypsum inland steps</td>
</tr>
<tr>
<td>1510</td>
<td>* Mediterranean salt steppes (Limonietalia)</td>
</tr>
<tr>
<td>1520</td>
<td>* Iberian gypsum vegetation (Gypsophiletea)</td>
</tr>
<tr>
<td>1530</td>
<td>* Pannonic salt steppes and salt marshes</td>
</tr>
</tbody>
</table>

### 2. COASTAL SAND DUNES AND INLAND DUNES

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.</td>
<td>Sea dunes of the Atlantic, North Sea and Baltic coasts</td>
</tr>
<tr>
<td>2130</td>
<td>* Fixed coastal dunes with herbaceous vegetation (“grey dunes”)</td>
</tr>
<tr>
<td>2140</td>
<td>* Decalcified fixed dunes with Empetrum nigrum</td>
</tr>
<tr>
<td>2150</td>
<td>* Atlantic decalcified fixed dunes (Calluno-Ulicetea)</td>
</tr>
<tr>
<td>2160</td>
<td>Dunes with Hippophaë rhamnoides</td>
</tr>
<tr>
<td>2170</td>
<td>Dunes with Salix repens ssp. argentea (Salicion arenariae)</td>
</tr>
<tr>
<td>2180</td>
<td>Wooded dunes of the Atlantic, Continental and Boreal region</td>
</tr>
<tr>
<td>2190</td>
<td>Humid dune slacks</td>
</tr>
<tr>
<td>21A0</td>
<td>Machairs (* in Ireland)</td>
</tr>
<tr>
<td>22.</td>
<td>Sea dunes of the Mediterranean coast</td>
</tr>
<tr>
<td>2210</td>
<td>Crucianellion maritimae fixed beach dunes</td>
</tr>
<tr>
<td>2220</td>
<td>Dunes with Euphorbia terracina</td>
</tr>
<tr>
<td>2230</td>
<td>Malcolmietalia dune grasslands</td>
</tr>
<tr>
<td>2240</td>
<td>Brachypodietalia dune grasslands with annuals</td>
</tr>
<tr>
<td>2250</td>
<td>* Coastal dunes with Juniperus spp.</td>
</tr>
<tr>
<td>2260</td>
<td>Cisto-Lavenduletalia dune sclerophyllous scrubs</td>
</tr>
<tr>
<td>2270</td>
<td>* Wooded dunes with Pinus pinea and/or Pinus pinaster</td>
</tr>
<tr>
<td>23.</td>
<td>Inland dunes, old and decalcified</td>
</tr>
<tr>
<td>2310</td>
<td>Dry sand heaths with Calluna and Genista</td>
</tr>
<tr>
<td>2320</td>
<td>Dry sand heaths with Calluna and Empetrum nigrum</td>
</tr>
<tr>
<td>2330</td>
<td>Inland dunes with open Corynephorus and Agrostis grasslands</td>
</tr>
<tr>
<td>2340</td>
<td>* Pannonic inland dunes</td>
</tr>
</tbody>
</table>

### 3. FRESHWATER HABITATS

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>31.</td>
<td>Standing water</td>
</tr>
<tr>
<td>3170</td>
<td>* Mediterranean temporary ponds</td>
</tr>
<tr>
<td>3180</td>
<td>* Turloughs</td>
</tr>
</tbody>
</table>

### 4. TEMPERATE HEATH AND SCRUB

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4010</td>
<td>Northern Atlantic wet heaths with <em>Erica tetralix</em></td>
</tr>
<tr>
<td>4020</td>
<td>* Temperate Atlantic wet heaths with *Erica ciliaris and <em>Erica tetralix</em></td>
</tr>
<tr>
<td>4030</td>
<td>European dry heaths</td>
</tr>
<tr>
<td>4040</td>
<td>* Dry Atlantic coastal heaths with *Erica vagans</td>
</tr>
<tr>
<td>40A0</td>
<td>Subcontinental peri-Pannonic scrub</td>
</tr>
<tr>
<td>40C0</td>
<td>* Ponto-Sarmatic deciduous thickets</td>
</tr>
</tbody>
</table>

### 5. SCLEROPHYLLIOUS SCRUB (MATORRAL)

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>51.</td>
<td>Sub-Mediterranean and temperate scrub</td>
</tr>
<tr>
<td>5110</td>
<td>Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)</td>
</tr>
<tr>
<td>5130</td>
<td>Juniperus communis formations on heaths or calcareous grasslands</td>
</tr>
<tr>
<td>5140</td>
<td>* Cistus pathiniae formations on maritime wet heaths</td>
</tr>
</tbody>
</table>

### 52. Mediterranean arborescent matorral (cont.)

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
</table>

Annex 2 Natural habitat types of Community interest that may be farmland features in some situations

5210 Arborescent matorral with *Juniperus* spp.
5220 * Arborescent matorral with *Zyziphus*
5230 * Arborescent matorral with *Laurus nobilis*

53. Thermo-Mediterranean and pre-steppe brush
5310 * *Laurus nobilis* thickets
5320 Low formations of *Euphorbia* close to cliffs
5330 Thermo-Mediterranean and pre-desert scrub

54. Phrygana
5420 Sarcopoterium spinosum phryganas
5430 Endemic phryganas of the *Euphorbio-Verbascion*

6. NATURAL AND SEMI-NATURAL GRASSLAND FORMATIONS

No grasslands are listed here, as they are either likely to be grazed and therefore under some form of agricultural use, or are outside farmland landscapes (e.g. montane grasslands). However, a wide variety of grasslands may occasionally occur as ungrazed (i.e. unframed) patches within farmland landscapes.

7. RAISED BOGS AND MIRES AND FENS

71. Sphagnum acid bogs
7110 * Active raised bogs
7120 Degraded raised bogs still capable of natural regeneration
7130 Transition mires and quaking bogs
7150 Depressions on peat substrates of the *Rhynchosporion*
7160 Fennoscandian mineral-rich springs and springfens

72. Calcareous fens
7210 * Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
7220 * Petrifying springs with tufa formation (Cratoneurion)*
7230 Alkaline fens

8. ROCKY HABITATS AND CAVES

82. Rocky slopes with chasmophytic vegetation
8210 Calcareous rocky slopes with chasmophytic vegetation
8220 Siliceous rocky slopes with chasmophytic vegetation
8230 Siliceous rock with pioneer vegetation of the *Sedo albi-Veronicion dillenii*
8240 * Limestone pavements

9. FORESTS

No forests are listed here, although many forest types of Community interest could potentially occur in small patches within farmland landscapes. However, such small patches are unlikely to be of high ecological quality and would not therefore qualify as SACs.
Annex 3: Assessing the Costs of Policy Options

In Chapter 9, an outline of the costs associated with each policy option is provided. In this Annex, we provide an overview of the types of costs that might be involved in the protection and management of farmland features. This Annex reviews the types of costs involved and the issues involved in their measurement, with reference to a range of broad policy instruments.

Types of Costs

The cost assessment considers the following categories of costs:

- **Opportunity costs**
  The income foregone from retaining farmland features, which reflects the productive potential of the land they occupy. An example would be the loss of income from not growing a crop on land occupied by a hedgerow or patch of woodland.

- **Establishment costs**
  The costs of establishing new features. This might include, for example, the labour and materials required to plant new hedgerows or establish buffer strips.

- **Management costs**
  The cost of maintenance and management of features. An example would be the costs of labour and machinery required to trim hedges or maintain walls or terraces.

- **Public administrative costs**
  The costs to the authorities of administering and enforcing the policy, including provision of information and advice, administration of applications and permits, management of financial transactions, monitoring of compliance, enforcement action etc. Examples include the costs of time and materials required to prepare and distribute advisory booklets to farmers, and the costs of time involved in monitoring compliance with legislation to protect hedgerows and taking any enforcement action required.

- **Farm administrative and transaction costs**
  The costs to the farmer of complying with the policy, including the time taken to understand requirements and keep records, and the financial cost of any advice taken. This may include, for example, the time taken to read advisory booklets, complete application forms, keep records about management of features, host official visits, and the cost of employing consultants to advise about appropriate management regimes.

Factors Affecting Costs

A number of factors affect the cost of a policy option. The cost assessment needs to distinguish between:

- The **unit costs** of different options – for example, the cost per metre of hedge protected or hectare of habitat maintained;
- The **aggregate extent** of costs incurred – which depends also on the overall extent and distribution of protection and management secured. I.e. the overall number of metres of hedge protected and hectares of habitat maintained;
• The incidence of the costs – the extent to which they fall on farmers and the authorities.

The assessment also recognises that different instruments can be expected to deliver different types and levels of benefits. As such, an assessment of costs alone is likely to be inadequate and therefore it is necessary to take account of variations in benefits in order to assess cost effectiveness.

These issues are examined firstly with regard to the following broad policy instruments: Advice and Information; Regulation; Cross Compliance; Compensation Payments, and; Voluntary Incentive Payments.

Variations in Unit Cost by Broad Policy Instrument

Opportunity costs may be expected to be relatively constant whatever instrument is used to protect a particular feature. Any instrument that protects a farmland feature is likely to involve opportunity costs where there is an alternative productive use of the land affected. For example, the loss of income from crop production from retaining a hedge is likely to be similar whether a regulatory or incentive approach is adopted. However, a key variable will be the amount of effective protection secured (for example, regulations may be expected to protect more hedgerows than advisory initiatives). There may also be variations in costs where different instruments permit different management regimes. For example, where different instruments allow different levels of application of inputs, grazing pressure etc, they will vary in terms of their effects in limiting farming output and hence their opportunity costs.

Management costs may vary markedly between instruments, depending on the extent to which the instrument requires a particular management regime. For example, regulatory approaches are best suited to protecting a feature rather than promoting positive management, so the main costs are likely to be opportunity costs rather than management costs. Incentive measures, however, are more likely to specify management prescriptions and therefore impose costs on farmers.

Establishment costs will similarly only be incurred under some of the instruments, since only certain instruments are suited to encouraging the establishment of features. For example, agri-environment incentives can be used to meet the costs of establishing new hedges or fallow areas, whereas this is unlikely to be achieved through regulation.

Public administration costs are common to all instruments and are likely to vary widely in their nature and extent. For example, advisory approaches require substantial time inputs as well as the cost of preparing, printing and distributing advisory material. Regulations may involve substantial time inputs and legal costs in their establishment, after which the main costs will be in enforcement. Agri-environment schemes tend to be costly to design, promote, administer, support and enforce, with some studies (e.g. Falconer and Whitby, 1999) indicating that they can be a significant proportion of the overall budget available.

Farm administrative and transaction costs also vary by instrument. Key variables are the degree to which farmers are required to take action to participate (for example, in making applications for agri-environment payments, as opposed to merely being aware of regulations); the level of complexity of the instrument; and the degree of management required and hence the need to understand specific management requirements (again higher for agri-environment schemes than for regulations).
Overall Distribution and Extent of Costs

The overall scale of costs also depends on the extent and distribution of protection/maintenance achieved by the instrument. For example, regulations apply to all farmers and therefore the costs are widespread, whereas incentive schemes are voluntary and therefore apply only to certain farms, as do advisory and information schemes. The overall costs of advisory and incentive schemes depend on the design of the schemes themselves, the degree of targeting, and the budgets allocated.

Incidence of Costs

The incidence of costs will also vary from one policy instrument to another, even where the overall level of costs does not vary greatly. For example, regulatory approaches may require the farmer to bear a large proportion of costs, whereas agri-environment schemes may compensate farmers for the costs incurred and transfer the cost burden to the authorities.

Table A 3-1 provides a simple assessment of the variations in these costs between different instruments.

Table A 3-1: Variations in the Magnitude of Costs by Broad Policy Instrument.

<table>
<thead>
<tr>
<th></th>
<th>Advice and Information</th>
<th>Regulation</th>
<th>Cross Compliance</th>
<th>Compensation Payments</th>
<th>Incentive Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unit Costs</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunity Costs</td>
<td>**</td>
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<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Management Costs</td>
<td>*</td>
<td>*</td>
<td>**</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>Establishment Costs</td>
<td>**</td>
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<td>***</td>
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<tr>
<td>Public Administrative Costs</td>
<td>***</td>
<td>**</td>
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<td>**</td>
<td>***</td>
</tr>
<tr>
<td>Farm Administrative Costs</td>
<td>*</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td>Overall distribution/extent of costs</td>
<td>Voluntary, costs may be limited by scale of initiative.</td>
<td>***</td>
<td>Applies to all farms receiving SP.</td>
<td>Depends on scale of compensation scheme.</td>
<td>Depends on budgets, targeting and uptake.</td>
</tr>
</tbody>
</table>

Benefits of Different Instruments

In comparing the costs of different instruments, the variations in the benefits that they produce also need to be taken into account. For example:

- Voluntary incentive schemes may have a high unit cost but deliver relatively high levels of benefits by influencing the management as well as the protection of features. For example, including management prescriptions for hedgerows may incur greater unit costs than a regulation designed merely to protect the hedge.
from removal, but also deliver greater benefits through a beneficial management regime.

- Instruments such as regulations which are wide in their scope may incur high aggregate costs, but protect features on a larger scale than alternatives such as advisory programmes. This suggests the need to examine unit as well as aggregate costs.

These variations in benefits need to be examined alongside the costs, suggesting a need to develop some measure of cost effectiveness, i.e. measuring cost per unit of benefit achieved. However, this may be complicated by the difficulty of defining a standard unit of benefit, especially where different options affect the quality and management as well as the quantity of the resource. For example, where the only variation is in the number of hectares of hedge protected or hectares of habitat maintained, there is little difficulty in assessing the costs per unit. However, where there are also variations in quality any comparison is less straightforward. For example, where an incentive pays for particular management prescriptions, its unit cost will be difficult to compare with that of a regulation which merely protects the feature.

**Sources of Evidence**

The sources of evidence for an assessment of the costs of different policy options include:

- Dedicated cost assessments – for example, studies of the costs of protecting and managing particular features at a local, regional or national level.
- Policy studies – for example, evaluations of particular policy instruments such as cross compliance, which include some assessment of the costs of the instrument.
- Regulatory impact assessments – these may include assessments of the costs of new regulations to protect particular types of features.
- Agri-environment payment rates – these give information about the unit costs of protecting and managing particular features. They are directly applicable to any assessment of the costs of implementing incentive measures, but may also be relevant to assessing the costs of other instruments, where they provide accurate assessments of the overall farm level costs involved.

Evidence of the actual costs of protecting and managing farmland features is limited, for a number of reasons:

- Costs vary widely from one farm to another, depending on local conditions, management requirements and variations in the structure of farm businesses, and can therefore be difficult to generalise;
- Some aspects of costs such as farm administrative costs are difficult to assess, so most cost estimates are partial in their scope;
- The variety of different policy approaches at regional and national level mean that available data are fragmented;
- The costs of some policies in some regions have simply not been assessed in any quantitative way.

Hedgerows are probably the features for which the costs of establishment and management have received greatest attention in different Member States. A summary of evidence on the costs of hedgerow establishment and management in different Member States is given in Box A 3-1.
Box A 3-1: Costs of Hedgerow Management.

A review of data from different Member States for 1999/2000 found estimates of the capital costs of planting a hedge at €4.5 - €5.8 per metre in France, €4.8/m in Italy, €6.8 - €7.1 in the UK and €10.8 in Germany (the latter for a three row windbreak). Unit costs vary according to the type and structure of the hedge (including the numbers of rows of plants), the density of planting, and the additional items included (e.g. fencing, mulching and weeding).

Annual data on the costs of different management operations in the UK and France are also given. These suggest annual management costs per km range from between €15 and €75 for various flailing operations to €33 - €242 for coppicing, €150 - €450 for traditional pollarding, and €300 - €750 for hedgelaying.


Agri-environment payment rates often provide the most comprehensive estimates of costs at the farm level because they should, in theory, take account of average opportunity costs and management costs and may include transaction costs. However, payment rates need not equate precisely to actual estimates of income forgone and costs incurred – they may, for example, be set at lower levels if it is deemed that full compensation need not be paid. Agri-environment payments have the advantage that they can be compared between Member States and regions for particular features.

Agri-environment payments for farmland features may be set in different ways. For example, they may be based directly on the cost per unit of feature maintained, with a payment set per metre of hedge or per hectare of habitat. Alternatively, there may be a more general area payment, and to qualify farmers are required to achieve a minimum level of protection and management of the features on that land. For example, in England, the Entry Level Stewardship (ELS) scheme involves a basic area payment which is conditional on achieving a certain number of points per hectare, based on the protection and maintenance of different features, while the Higher Level Stewardship (HLS) scheme links payments directly to individual habitats and features. In this case, HLS gives a more transparent measure of the costs of individual features while the ELS scheme may provide an indication of the overall aggregate costs of maintaining features on farmland.

Overall, the available evidence enables us to provide some examples of costs but does not give comparable, consistent and complete data to enable comparison of costs of different options. There is, in general, a shortage of cost data for all options except those involving agri-environment payments. In addition, policy options need to be precisely defined identifying exactly what they would involve and over what area they would be implemented. A full cost assessment would require the policy options presented in the next chapter to be taken a step forward and defined in more detail. Nevertheless, a semi-quantitative assessment, providing some examples of the costs of different options, is provided in the following chapter.
Summary of Agri-Environment Payments for Different Farmland Features in Selected Member States.

Denmark

In Denmark, the new rural development programme (2007 – 2013) includes several schemes of relevance for farmland features:

- Hedgerows and woodlots: The farmers can get refunds of 40 to 60% of the cost for establishing 1-7 rowed hedges or woodlots smaller than 0.5 ha. At least 75% of the plantings must be broad-leaved. There is no target, other than the amount of money allocated to the measure has to been spend.
- Management of grassland: 5 year agreements on management. The management does not have to have an agricultural output. Support is 110 to 190 € depending on management.
- Buffer zones: 10 to 20 meter broad buffer zones along water courses or lakes. Support 160 € per hectare.
- Wetlands: Establishment of wetlands and management. Support: Cost of establishment can be refunded 100%, but a maximum of 2 010 € per hectare apply. A yearly payments of 240 to 470 € per hectare is given for 20 years depending on former use. Finally, different types of management can be supported with 110 to 750 € per hectare per year.

France

Agri-environment payments for France and Normandy for the period 2000 to 2006 are given in Table A 3-2. The first column gives the expected payment rate, based on national level calculations, and the second the payment rate that was actually applied in Normandy.

Table A 3-2: Agri-Environment Payments, Normandy, 2000-2006.

<table>
<thead>
<tr>
<th>Agri-environmental measures</th>
<th>unit</th>
<th>expected* costs in €/unit and per year</th>
<th>applied costs in €/unit and per year in Normandy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plantation of new landscape element</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hedgerow plantation</td>
<td>m</td>
<td>2.9</td>
<td>1.49</td>
</tr>
<tr>
<td>line of tree and field tree plantation</td>
<td>m</td>
<td>15.24</td>
<td>12.65</td>
</tr>
<tr>
<td>tree plantation on bank</td>
<td>m</td>
<td>27.44</td>
<td>12.65</td>
</tr>
<tr>
<td>pool implantation</td>
<td>unit</td>
<td>121.96</td>
<td>121.96</td>
</tr>
<tr>
<td>small wood plantation (1000m²)</td>
<td>unit</td>
<td>91.47</td>
<td>N/a</td>
</tr>
<tr>
<td><strong>Management of existing landscape element</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>old hedgerow management (restoration)</td>
<td>m</td>
<td>1.37</td>
<td>3.32</td>
</tr>
<tr>
<td>hedgerow management (trimming)</td>
<td>m</td>
<td>0.76</td>
<td>0.43</td>
</tr>
<tr>
<td>ditch management</td>
<td>m</td>
<td>0.84</td>
<td>0.31</td>
</tr>
<tr>
<td>river bank management</td>
<td>m</td>
<td>1.42</td>
<td>0.41</td>
</tr>
<tr>
<td>stone wall management</td>
<td>m</td>
<td>0.76</td>
<td>0.76</td>
</tr>
<tr>
<td>abandoned stone wall restoration</td>
<td>m</td>
<td>1.98</td>
<td>N/a</td>
</tr>
<tr>
<td>pond management</td>
<td>ha</td>
<td>106.71</td>
<td>N/a</td>
</tr>
<tr>
<td>abandoned pool management (restoration)</td>
<td>unit</td>
<td>106.71</td>
<td>106.71</td>
</tr>
<tr>
<td>pool management</td>
<td>unit</td>
<td>45.73</td>
<td>30.49</td>
</tr>
<tr>
<td>abandoned traditional irrigation system management</td>
<td>m</td>
<td>146.35</td>
<td>N/a</td>
</tr>
<tr>
<td>traditional irrigation system management</td>
<td>ha</td>
<td>121.96</td>
<td>N/a</td>
</tr>
<tr>
<td>mechanical management of bank</td>
<td>100m</td>
<td>15.24</td>
<td>15.24</td>
</tr>
<tr>
<td>field tree management</td>
<td>tree</td>
<td>4.57</td>
<td>4.52</td>
</tr>
<tr>
<td>small wood management (1000m²)</td>
<td>unit</td>
<td>45.73</td>
<td>12.20</td>
</tr>
<tr>
<td>management of abandoned traditional orchards</td>
<td>tree</td>
<td>2.44</td>
<td>N/a</td>
</tr>
</tbody>
</table>

*proposed in the French Rural development Plan
N/a – not applicable
Germany

The case study for Brandenburg and Berlin identifies the following payments for management of farmland features:

- **Trees and woodland** – maximum of €850/hectare/yr comprising the following payments per tree:
  a) Maintenance until the end of the 15th existence year of the tree: € 10
  b) Maintenance from the 16th existence year of the tree: € 15
  c) Plantation of new tree in an existing installation: € 38 (one time payment)

- **Water (ditches, ponds, streams and margins adjacent to the streams):**
  a) Extensive cultivation and maintenance in the pond region: € 100/hectare pond acreage
  b) Addition for special biotope conservation: € 50/hectare pond acreage

Yearly payments for maintaining the water table close to the surface (Oberflächennahe Grundwasserstände mit Blänkenbildung) (Land Brandenburg, 2005):
  a) Until the 30th of April: € 10/hectare
  b) Until the 30th of May: € 30/hectare
  c) Until the 30th of June: € 60/hectare

- **Grassy margins and buffers** - €120/hectare of margins created

- **Fallow land, unutilised land and abandoned land:**
  a) Mowing with technical appliances (Technikeinsatz) and transportation: € 75/hectare
  b) Same as a), but for fields that are only accessible via waterway: € 180/hectare
  c) Permanent pasture (Standweide): € 50/hectare

If needed, compensation payment can be made in order to leave land fallow for the protection of wild herbs on all types of fields:
  a) For acres without activated bonus payment for agricultural fields (Ackerprämienanspruch in der Agrarförderung): € 390/hectare
  b) For acres with activated bonus payment for agricultural fields: € 120/hectare

- **Grassland of particularly high natural value – Natura 2000 and Water Framework Directive:**
  a) No usage of chemical-synthetical nitrogen fertiliser or pesticide: € 120/hectare
  b) In addition to a), no usage of mineral fertiliser: € 41/hectare
  c) In addition to a), no usage of liquid manure: € 30/hectare
  d) In addition to a), no usage of any fertiliser of any kind: € 65/hectare
  e) No usage of grassland before the 16th of June: € 45/hectare
  f) No usage of grassland before the 1st of July: € 85/hectare
  g) Usage of grassland only before the 15th of June and after the 31st of August: € 95/hectare
  h) Usage of grassland only after the 16th of August: € 200/hectare

Italy

**Hedgerows and Woodland Patches**

The 21 Italian Rural Development Plans (RDP) indicate that 14 Regions have sub-measures for restoration and maintenance of hedgerows and small woodland patches...
(generally not more than 0.5 ha) under Measure 214 (Agri-environmental payments). Woodland patches are usually no more than 0.5 ha.

The levels of premia are quite variable from €50 to €900/ha depending on the form of calculation made by the regional administration. In many cases the conversion from linear metre to square metre or hectares takes into account specific limitations (e.g. the maximum of 10% of agricultural area potentially devoted to these features). Average payment levels are estimated at €250-€400/ha, with lower payments for the maintenance of old features and higher ones for the maintenance of features created since 1992.

New planting of hedgerows and small woodlands is expected under Measure 216 (Support for non-productive investments), with payments generally set at 80-100% of specified cash expenses.

The calculation made for the RDP of Veneto Region is an example of the estimated costs for the recreation and conservation of a hedgerow (Table A2).

A "young hedgerow" is an almost new plantation, re-created by the implementation of 2078 measures or 2000-2006 RDPs. An "old hedgerow" is a feature already present in the farm in recent decades.

The calculation is based on a linear feature with a width of 6 metres (2.5 metres on each side plus 1 metre for the land occupied by trees).

**Table A 3-3: Estimated Annual Costs for re-creation or conservation of a hedgerow (euro).**

<table>
<thead>
<tr>
<th></th>
<th>Young hedgerow (1 linear metre x 6 metres)</th>
<th>Old hedgerow (10,000 square metre)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Re-creation (5 years contract)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Plantation</td>
<td>1.09</td>
<td>1.817</td>
</tr>
<tr>
<td>b) Maintenance</td>
<td>0.72</td>
<td>1.200</td>
</tr>
<tr>
<td>c) Income foregone</td>
<td>0.08</td>
<td>136</td>
</tr>
<tr>
<td>d) Grassy strip</td>
<td>0.61</td>
<td>1.014</td>
</tr>
<tr>
<td>e) Transaction costs</td>
<td>0.20</td>
<td>330</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td>2.70</td>
<td>4.497</td>
</tr>
<tr>
<td><strong>Conservation (5 years contract)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Maintenance</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>b) Income foregone</td>
<td>0.08</td>
<td>-</td>
</tr>
<tr>
<td>c) Grassy strip</td>
<td>0.61</td>
<td>0.20</td>
</tr>
<tr>
<td>d) Transaction costs</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td>1.29</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Sources: Rural Development Plan of Veneto Region. Annex 2: Justification of AE premia

*a The income foregone is taken into account only for the young hedgerow

The maximum payment is permitted for up to 20% of the agricultural land. So the level of the premia does not exceed €450 /ha (ceiling of the reg. 1698/03 for this kind of feature).
Table A 3-4 provides an example of estimated costs for the re-creation and conservation of small woodlands. The contract for conservation is intended for almost new plantations made during the 2000-2006 RDP period.

**Table A 3-4: Estimated Annual Costs for re-creation or conservation of a small woodland.**

<table>
<thead>
<tr>
<th></th>
<th>euro per sq.m</th>
<th>euro per ha</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Re-creation (5 years contract)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Plantation</td>
<td>0.17</td>
<td>1.662</td>
</tr>
<tr>
<td>b) Maintenance</td>
<td>0.12</td>
<td>1.248</td>
</tr>
<tr>
<td>c) Income foregone</td>
<td>0.08</td>
<td>0.817</td>
</tr>
<tr>
<td>d) Transaction costs</td>
<td>0.05</td>
<td>0.464</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td>0.42</td>
<td>4.191</td>
</tr>
</tbody>
</table>

**Conservation (5 years contract)**

<table>
<thead>
<tr>
<th></th>
<th>euro per sq.m</th>
<th>euro per ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Maintenance</td>
<td>0.02</td>
<td>190</td>
</tr>
<tr>
<td>b) Income foregone</td>
<td>0.08</td>
<td>817</td>
</tr>
<tr>
<td>c) Transaction costs</td>
<td>0.02</td>
<td>200</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td>0.12</td>
<td>1.207</td>
</tr>
</tbody>
</table>

Sources: Rural Development Plan of Veneto Region. Annex 2: Justification of AE premia

**AE measures for wetlands**

Aids for wetlands (creation or restoration of ponds, restoration of the ditches network for environmental purposes) are included in Measure 214 and 216. Premia are set at around €400/ha.

**Spain**

The Spanish case study presents some data on the cost of maintaining features through agri-environment schemes. Table A 3-5 gives figures for Catalonia.

**Table A 3-5: Catalonia Agri-Environment Scheme – Payments for Maintaining Features, 2007-13.**

<table>
<thead>
<tr>
<th>Basic requirement</th>
<th>Commitments</th>
<th>Payment calculation €/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dry-stone walls</strong></td>
<td>No removal of walls. Maintain walls and other elements and drainage points. Rebuild where necessary. Prevent unwanted vegetation on walls.</td>
<td>Keep farm records 6</td>
</tr>
<tr>
<td>Minimum height 1m, minimum length 100 m/ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hedges on banks</strong></td>
<td>No herbicides or pesticides. Re-establish native vegetation on banks. Annual cutting of unwanted vegetation on margins.</td>
<td>Keep farm records 6</td>
</tr>
<tr>
<td>Minimum height 2m, minimum length 100 m/ha</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maintenance of individual farmland trees</strong></td>
<td>Maintain all native, non-productive trees on farm. No use of herbicides, pesticides or fertiliser under tree canopies. Annual pruning, removal of</td>
<td>Maintain trees 34</td>
</tr>
</tbody>
</table>
Planting of individual farmland trees

- Diameter 30 cm over height of 1.3 m.
- Deadwood.
- Replacement of dead and sick trees.

<table>
<thead>
<tr>
<th>Minimum 10 trees on field margins, not same production as on field.</th>
<th>Native non-productive trees, minimum height 1.5 m.</th>
<th>Plant minimum 10 trees/ha and/or per parcel.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement of dead and sick trees.</td>
<td>No use of herbicides, pesticides or fertiliser under tree canopies.</td>
<td>Annual pruning, removal of deadwood.</td>
</tr>
<tr>
<td></td>
<td>Plant trees</td>
<td>Maintain trees</td>
</tr>
<tr>
<td></td>
<td>Prune (etc.) trees</td>
<td>TOTAL</td>
</tr>
<tr>
<td></td>
<td>86</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>170</td>
</tr>
</tbody>
</table>

Source: Data extracted from Cataluña RDP 2007-13

In Castilla y León, there is a lower payment of €80/ha for the maintenance of stone walls.

Sweden

In Sweden, payments are available for a variety of farmland features and grassland types under the KULT agri-environment programme (Tables A 3-6, A 3-7).


<table>
<thead>
<tr>
<th>Feature/Item</th>
<th>Payment (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Payment</td>
<td>107</td>
</tr>
<tr>
<td>Basic Payment</td>
<td>10.7 per type of feature</td>
</tr>
<tr>
<td>Open Ditches</td>
<td>0.64 per 10m</td>
</tr>
<tr>
<td>Field Verges</td>
<td>0.64 per 10m</td>
</tr>
<tr>
<td>Earthen Walls</td>
<td>0.64 per 10m</td>
</tr>
<tr>
<td>Tracks</td>
<td>0.64 per 10m</td>
</tr>
<tr>
<td>Stone Walls</td>
<td>2.78 per 10m</td>
</tr>
<tr>
<td>Traditional Fences</td>
<td>2.78 per 10m</td>
</tr>
<tr>
<td>Planted Wind Break</td>
<td>2.78 per 10m</td>
</tr>
<tr>
<td>Cattle Paths</td>
<td>6.21 per 10m</td>
</tr>
<tr>
<td>Clearance Cairns/Piles of Stones</td>
<td>6.42 per unit</td>
</tr>
<tr>
<td>Ancient Remains</td>
<td>6.42 per unit</td>
</tr>
<tr>
<td>Foundations of Buildings</td>
<td>6.42 per unit</td>
</tr>
<tr>
<td>Wells and Springs</td>
<td>6.42 per unit</td>
</tr>
<tr>
<td>Avenue Trees</td>
<td>6.42 per unit</td>
</tr>
<tr>
<td>Solitary Trees</td>
<td>6.42 per unit</td>
</tr>
<tr>
<td>Pollarded Trees</td>
<td>19.26 per unit</td>
</tr>
<tr>
<td>Small Waters</td>
<td>19.26 per unit</td>
</tr>
<tr>
<td>Field Islets</td>
<td>19.26 per unit</td>
</tr>
<tr>
<td>Traditional Buildings</td>
<td>19.26 per unit</td>
</tr>
<tr>
<td>Small Fields, Difficult to Cultivate</td>
<td>19.26 per unit</td>
</tr>
<tr>
<td>Traditional Hay Racks</td>
<td>214 per hectare</td>
</tr>
</tbody>
</table>
Table A 3-7: Annual Payments for Grazing Land, including Farmland Features, KULT Programme, Sweden.

<table>
<thead>
<tr>
<th>Feature/Item</th>
<th>Payment (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grazing Land</td>
<td>118/ha</td>
</tr>
<tr>
<td>Grazing Land with High Ecological/Cultural Value (e.g. including features)</td>
<td>268/ha</td>
</tr>
<tr>
<td>Mown Meadows</td>
<td>118/ha</td>
</tr>
<tr>
<td>Mown Meadows with High Ecological/Cultural Value (e.g. including features)</td>
<td>375/ha</td>
</tr>
<tr>
<td>Management of Trees</td>
<td>10.7/tree, max 214/ha</td>
</tr>
</tbody>
</table>

**UK**

**England**

The Entry Level Stewardship Scheme offers a basic payment of £30 per hectare which is conditional on achieving a minimum standard of management, measured in terms of points per hectare. Farmers can gain points by protecting and managing farmland features, as well as undertaking other beneficial practices. Points are awarded for farmland features as follows (Table A 3-8).

Table A 3-8: Points Awarded for Farmland Features through Entry Level Stewardship.

<table>
<thead>
<tr>
<th>Option</th>
<th>Unit</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedgerow management (on both sides of hedge)</td>
<td>100m</td>
<td>22</td>
</tr>
<tr>
<td>Hedgerow management (on one side of hedge)</td>
<td>100m</td>
<td>11</td>
</tr>
<tr>
<td>Enhanced hedgerow management</td>
<td>100m</td>
<td>42</td>
</tr>
<tr>
<td>Stone-faced hedgebank management on both sides</td>
<td>100m</td>
<td>16</td>
</tr>
<tr>
<td>Stone-faced hedgebank management on one side</td>
<td>100m</td>
<td>8</td>
</tr>
<tr>
<td>Ditch management</td>
<td>100m</td>
<td>24</td>
</tr>
<tr>
<td>Half ditch management</td>
<td>100m</td>
<td>8</td>
</tr>
<tr>
<td>Combined hedge and ditch management</td>
<td>100m</td>
<td>26-56</td>
</tr>
<tr>
<td>Stone wall protection and maintenance</td>
<td>100m</td>
<td>15</td>
</tr>
<tr>
<td>Protection of in-field trees – arable</td>
<td>Tree</td>
<td>12</td>
</tr>
<tr>
<td>Protection of in-field trees – grassland</td>
<td>Tree</td>
<td>8</td>
</tr>
<tr>
<td>Maintenance of woodland fences</td>
<td>100m</td>
<td>4</td>
</tr>
<tr>
<td>Management of woodland edges</td>
<td>ha</td>
<td>380</td>
</tr>
<tr>
<td>Take archaeological features out of cultivation</td>
<td>ha</td>
<td>460</td>
</tr>
<tr>
<td>Reduce cultivation depth for archaeological features</td>
<td>ha</td>
<td>60</td>
</tr>
<tr>
<td>Management of scrub on archaeological sites</td>
<td>ha</td>
<td>120</td>
</tr>
<tr>
<td>Archaeological features on grassland</td>
<td>ha</td>
<td>16</td>
</tr>
<tr>
<td>2 m buffer strips on cultivated land/grassland</td>
<td>ha</td>
<td>300</td>
</tr>
<tr>
<td>4 m buffer strips on cultivated land/grassland</td>
<td>ha</td>
<td>400</td>
</tr>
<tr>
<td>6 m buffer strips on cultivated land/grassland</td>
<td>ha</td>
<td>400</td>
</tr>
<tr>
<td>Buffering in-field ponds</td>
<td>ha</td>
<td>400</td>
</tr>
<tr>
<td>Arable field corner management</td>
<td>ha</td>
<td>400</td>
</tr>
<tr>
<td>Wild bird seed or flower mixture</td>
<td>ha</td>
<td>450</td>
</tr>
<tr>
<td>Wild bird seed or flower mixture on set-aside land</td>
<td>ha</td>
<td>85</td>
</tr>
</tbody>
</table>
The Higher Level Stewardship Scheme has a long menu of payments for the creation, restoration and management of various features and habitats. Selected options include:

- Maintenance of hedgerows of very high environmental value - £27 per 100m
- Ancient trees in arable/intensive grass fields - £25 per tree
- Maintenance/restoration/creation of wood pasture and parkland - £180 per ha
- Maintenance/restoration of woodland/scrub - £100 per ha
- Creation of woodland - £200-£315 per ha
- Maintenance/restoration of high value traditional orchards - £250 per ha
- Maintenance/restoration of species-rich, semi-natural grassland - £200 per ha
- Maintenance/restoration of moorland - £40 per ha
- Maintenance/restoration of lowland heathland - £200 per ha
- Creation of lowland heathland from arable or improved grassland - £450 per ha
- Maintenance/restoration of coastal saltmarsh - £30 per ha
- Maintenance of ponds of high wildlife value < 100 sq m - £90 per pond
- Maintenance of ponds of high wildlife value > 100 sq m - £180 per pond
- Protection of in-field trees – arable - £12 per tree
- Protection of in-field trees – grassland - £8 per tree
- Buffer strips on arable/grassland - £300-£400 per ha

<table>
<thead>
<tr>
<th>Feature</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over-wintered stubbles</td>
<td>120</td>
</tr>
<tr>
<td>Beetle banks</td>
<td>580</td>
</tr>
<tr>
<td>Skylark plots</td>
<td>5</td>
</tr>
<tr>
<td>Conservation headlands in cereal fields</td>
<td>100</td>
</tr>
<tr>
<td>Conservation headlands in cereal fields</td>
<td>300</td>
</tr>
<tr>
<td>6m uncropped, cultivated margins on arable land</td>
<td>400</td>
</tr>
<tr>
<td>Under sown spring cereals</td>
<td>200</td>
</tr>
<tr>
<td>Cereals for whole crop silage followed by overwintered stubbles</td>
<td>230</td>
</tr>
<tr>
<td>Brassica fodder crops followed by overwintered stubbles</td>
<td>90</td>
</tr>
<tr>
<td>Take grassland field corners out of management</td>
<td>400</td>
</tr>
<tr>
<td>Permanent grassland with low inputs</td>
<td>85</td>
</tr>
<tr>
<td>Permanent grassland with very low inputs</td>
<td>150</td>
</tr>
<tr>
<td>Management of rush pastures (outside the LFA)</td>
<td>150</td>
</tr>
<tr>
<td>Field corner management (LFA land)</td>
<td>100</td>
</tr>
<tr>
<td>Manage permanent LFA in-bye grassland with low inputs</td>
<td>35</td>
</tr>
<tr>
<td>Manage LFA in-bye pasture/meadows with very low inputs</td>
<td>60</td>
</tr>
<tr>
<td>Management of rush pastures (LFA land)</td>
<td>60</td>
</tr>
<tr>
<td>Enclosed rough grazing</td>
<td>35</td>
</tr>
<tr>
<td>Moorland and rough grazing</td>
<td>5</td>
</tr>
</tbody>
</table>

Wales
Under the Tir Gofal Scheme farms receive a whole farm payment, starting at £35 per hectare for the first 20 hectares then tapering down to zero above 410 hectares. This is
conditional on preparation of a Resource Management Plan. Additional payments are available for particular features and habitats. Examples include:

- Broadleaved Woodland - Ungrazed £125 per ha per year; Lightly grazed £95 per ha per year; Existing grazing £10 per ha per year
- Scrub - £30 per ha per year
- Semi-improved and improved grassland - £70 per ha per year
- Upland Heath - £50 per ha per year
- Lowland and Coastal Heath - £80 per ha per year
- Unimproved Acid Grassland - enclosed £50 per ha per year, unenclosed under 200 ha - £37.50 per ha per year, 200-500 ha - £30 per ha per year, over 500 ha - £15 per ha per year
- Commons - under 200 ha £37.50 per ha per year, over 200 ha £30 per ha per year
- Unimproved Neutral Grassland - £80 per ha per year
- Unimproved Limestone Grassland £110 per ha per year
- Raised and Blanket Bog £35 per ha per year
- Reedbeds, Fens and Swamps - £40 per ha per year
- Saltmarsh - £35 to £170 per ha per year
- Sand Dunes £65 per ha per year
- Uncropped Fallow Margins (max of 3ha) - £425 per ha per year
- Wildlife Cover Crops (max of 3ha) - £365 per ha per year
- Broadleaved Woodland & Scrub (less than 0.25 ha) - Establishment £1600/ha single payment, annual management of restored plantations, newly planted and naturally
- regenerating woodland - £140 per ha per year
- Hedging (planting, laying and coppicing) - £2.40 per metre
- Dry stone walls - £22.50 per sq metre