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High nature value farmland

Characteristics, trends and policy challenges

European Environment Agency

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Contents

Foreword

Europe's rich cultural and natural heritage is reflected in its traditional agricultural landscapes. A wide variety of natural conditions and farming traditions has created unique landscapes that are not only pleasing to the eye but provide the living conditions for many plants and animals. High nature value farmland comprises the hot spots of biological diversity in rural areas and is often characteristic of extensive farming practices.

Over the last few decades, however, biodiversity on farmland has declined seriously. Large scale rationalisation and intensification of agricultural production has taken its toll. Many marginal and extensively farmed areas were either improved or abandoned, resulting in considerably reduced habitat and species diversity. Semi-natural vegetation has declined rapidly and roughly two thirds of the currently endangered bird species depend on agricultural habitats.

This has not gone unnoticed and the conservation of biodiversity on agricultural land is now high on the political agenda. Of the many relevant conservation efforts at European level, we would like to mention the pan-European Biological and Landscape Diversity Strategy (PEBLDS), the Bern Convention, the European Landscape Convention, and, at EU level, the habitats and birds directives and the biodiversity action plan for agriculture.

In the sixth environment action programme, the EU has committed itself to halt biodiversity decline by 2010. Conserving high nature value farmland is key to achieving this target. Pan-European data on distribution and conservation status of high nature value farmland are currently lacking, however. In the Kyiv Resolution on Biodiversity, the European environment ministers therefore agreed to identify high nature value farmland and take adequate conservation measures.

As a contribution to this process, EEA and UNEP have commissioned a study on agriculture and biodiversity and a study to quantify and delineate high nature value farmland areas. The outcome is this joint report, in which preliminary data on the distribution and conservation status of high nature value farmland and the current targeting of policy instruments are presented.

At a time when the EU common agricultural policy is increasingly focused on non-trade concerns, and sustainability is a keyword, we would like to draw attention to those rural areas in Europe that represent the highest nature value. We sincerely hope that this joint report will spur the policy debate and encourage countries and institutions to elaborate and refine the high nature value farmland concept, and further focus their conservation efforts.

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Executive summary

Traditional agricultural systems have shaped the European landscape and created habitats for a wide range of species, many of which are of particular conservation concern. High nature value farmland comprises hot spots of biodiversity in rural areas and is usually characterised by extensive farming practices. Its conservation value is acknowledged in several EU policy documents such as the EU Regulation on rural development (EC 1257/1999). Distribution and conservation status of high nature value farmland, however, has not yet been assessed at the pan-European level.

In their Kyiv Resolution on Biodiversity, the European environment ministers agreed to complete the identification of all high nature value farmland areas by 2006 and committed themselves to support their economic and ecological viability. The target is to cover 'a substantial proportion' of such areas with rural development and agri-environment measures by 2008. A high nature value farmland indicator is currently under preparation within the framework of IRENA[1]. This joint report highlights the preliminary results of this indicator and analyses the current targeting of high nature value farmland by policy measures.

According to our preliminary estimates, roughly 15–25 % of the European countryside qualifies as high nature value farmland. The largest areas are found in eastern and southern Europe. They consist of habitats such as semi-natural grasslands, *dehesas*, *montados* and steppe areas. High nature value farmland is also relatively abundant in mountainous regions. Examples are grazed uplands in the United Kingdom and alpine pastures and meadows. Agriculture in these areas is usually extensive and vulnerable to change.

High nature value farmland areas are generally under severe pressure due to a vulnerable economy and depopulation. Predominant agricultural trends are intensification on the one hand and land abandonment on the other. Both are considered detrimental to biodiversity. Little information exists on the exact conservation status of high nature value farmland areas, but the overall population trends of characteristic species, such as the great bustard *Otis tarda*, black grouse *Tetrao tetrix* and corncrake *Crex crex* are negative.

Policy responses in the EU include site protection under the habitats and bird directives and environment measures under the common agricultural policy. The Natura 2000 sites, as proposed by the Member States, cover less than one third of high nature value farmland area. Their conservation status is again largely unknown. A monitoring system is under development but not yet operational.

Conservation of high nature value farmland areas relies to a large extent on measures under the so-called 'second pillar' of the common agricultural policy, notably support to less favoured areas and agri-environment schemes. Less favoured areas overlap largely with the high nature value farmland areas, but there is no relation between actual expenditure in the different countries and their share of high nature value farmland. Agri-environment schemes do not appear to be specifically targeted at high nature value farmland either. In countries with a high share of high

[1] IRENA: Indicator reporting on the integration of environmental concerns into agriculture policy. Joint project between DG Agriculture, DG JRC, DG Environment, Eurostat and EEA, operationalising the agri-environment indicators mentioned in COM(2000)20 and COM(2001)144.

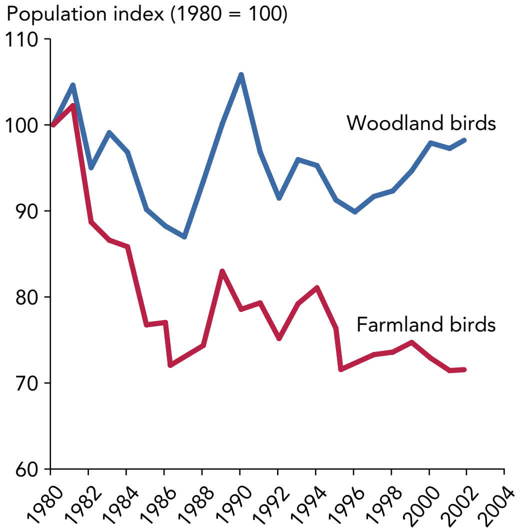
nature value farmland, especially in southern Europe, agri-environment expenditure is relatively low.

Current policy measures appear insufficient to prevent further decline in high nature value farmland areas and thus to reach the 2010 biodiversity target. The geographical targeting of agriculture subsidies, especially of less favoured area support and agri-environment schemes, needs to be reconsidered. It should be kept in mind, though, that the current data do not allow for detailed geographical analysis. A major effort is needed to fill the data gaps on habitat and species distribution and the targeting and effectiveness of support measures.

What is high nature value farmland and why is it important?

Europe is famous for its unique rural landscapes that represent a rich cultural and natural heritage. Regionally differing farming practices have led to a variety of agricultural habitats that host a large number of plant and animal species. The biodiversity of farmland, however, has rapidly declined across Europe in the last few decades, as illustrated here for common birds of the countryside (Figure 1, see also Donald *et al.*, 2001).

Figure 1 **Population trend common birds**



Source: Birdlife International 2004 (see Appendix B for details).

That agriculture-related biodiversity is under relatively high pressure is also evident from the fact that roughly two thirds of the threatened and vulnerable bird species in Europe occur on farmland (Tucker and Heath, 1994). Maintaining adequate farming practices is therefore key to biodiversity conservation.

Biodiversity generally decreases when the intensity of farming increases (in terms of nutrient and pesticide inputs, use of machinery and overall productivity) (see Figure 2). The most intensive arable and grassland systems are virtually monocultures. Despite their low intrinsic biodiversity, however, they may still provide wintering grounds for migratory waterfowl.

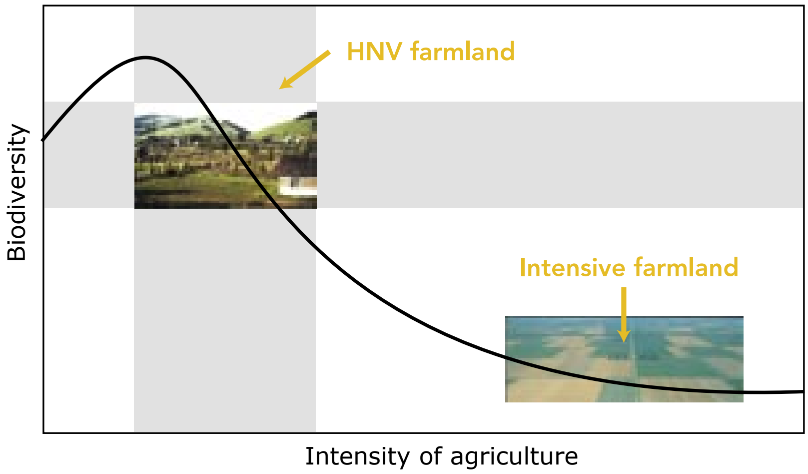
Highest biodiversity coincides with low agricultural inputs. Although extensive mixed arable systems may also support high biodiversity, the majority of high nature value farmland consists of semi-natural grasslands. They are the true hot spots for biodiversity. In the Dutch province of Friesland, for example, only 1.5 % of the land area is unfertilised semi-natural grassland, yet 60 % of terrestrial plants are more or less confined to this habitat (Schotsman, cited in Baldock and Bennett, 2002).

Baldock *et al.* (1993, 1995) described the general characteristics of low-input farming systems in terms of biodiversity and management practices and introduced the term high nature value farmland. Most of these farming systems are characterised by low stocking densities, low use of chemical inputs and often labour intensive management practices, such as shepherding.

Typical examples of high nature value farmland are extensively grazed uplands in the United Kingdom, alpine meadows and pasture, steppic areas in eastern and southern Europe and *dehesas* and *montados* in Spain and Portugal. Particularly important for biodiversity are small-scale agricultural farming systems in central and eastern Europe, responsible for creating and maintaining species-rich semi-natural grasslands (see Figure 3).

The need for measures to prevent the loss of high nature value farmland is widely acknowledged. Its conservation is an explicit objective in the framework

Figure 2 **General relationship between agricultural intensity and biodiversity**



Source: after Hoogeveen *et al.*, 2001 (see Appendix B for further explanation).
Photos: Peter Veen (left); Vincent Wigbels (right).

of EU rural development policy. Article 22 of the EU regulation on rural development (1257/99) states that support shall be given to 'the conservation of high nature value farmed environments which are under threat'. Unfortunately, until now high nature value farmland has been only loosely defined. A lack of distribution and monitoring data has prevented insight into the targeting and effectiveness of policy measures. In May 2003, this was recognised by the European ministers of environment in Kyiv. In their final resolution (UN/ECE 2003), they declared the following on agriculture and biodiversity:

'By 2006, the identification, using agreed common criteria, of all high nature value areas in agricultural ecosystems in the pan European region will be complete. By 2008, a substantial proportion of these areas will be under biodiversity-sensitive management by using appropriate mechanisms such

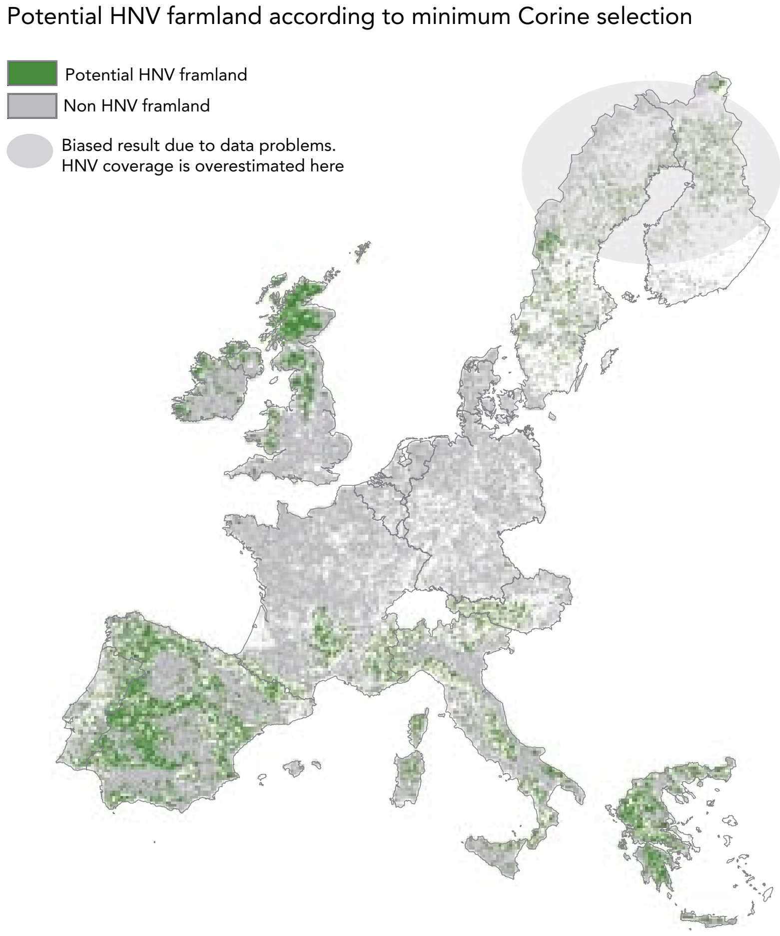
Figure 3 **Typical HNV farmland and some associated species in Europe**

Photos: Niall Benvie/RSPB-images (black grouse, top left), Ybele Hoogeveen (moorland, top left); Peter Veen (small scale landscape, orchid, top right); Olavi Hiiemäe (great bustard, bottom left; Jesus Valiente (steppe, middle left; *dehesa*, crane, bottom right).

as rural development instruments, agri-environmental programmes and organic agriculture, to inter alia support their economic and ecological viability. By 2008, financial subsidy and incentive schemes for agriculture in the pan European region will take the conservation and sustainable use of biodiversity in consideration'.

Preliminary data on the distribution and conservation status of high nature value farmland are obtained on the basis of a European[2] indicator developed for the European Environment Agency. The concept builds on analyses of land cover, farm systems (including scale, products, input use and management) and species distribution. Figure 4 shows the estimated distribution for the current EU Member States on the basis of land cover data only[3]. Although the other aspects modify the picture to a certain extent, it is clear that the prevalence of high nature value farmland is in less productive areas, for example in southern Europe and mountainous regions.

Figure 4 **Initial estimate of distribution of HNV farmland in Europe (EU-15, minimum estimate)**



Source: Andersen, 2003 (see Appendix A and B for details).

2 The initial data cover EU-15 only, but the ongoing project aims at extending it to accession countries. See Appendix B for additional (but spatially non explicit) data for central and eastern European countries.

3 A combined map of all three types of HNV is not possible at this stage due to various methodological problems (see Appendix A).

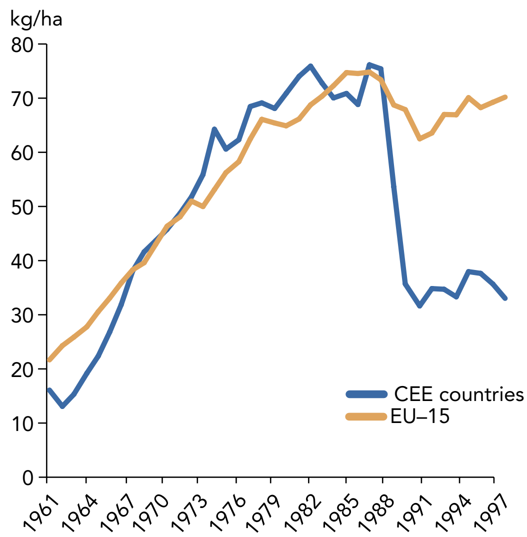
Trends in high nature value farmland

The extensive character of most high nature value farming systems can be explained by natural conditions which prevent the use of modern techniques and machinery, general socio-economic constraints, or a combination of both. High nature value farmland is threatened by two contrasting trends: intensification and abandonment.

Intensification

Where natural and economic conditions allow, farming will intensify in order to increase yields and overall efficiency. This has been a continuous process in most parts of western Europe for decades, reflected in a steady increase in fertiliser inputs and milk and cereal yields. In eastern Europe investment in the agricultural sector has dropped substantially due to the political and economical changes during the 1990s.

Figure 5 **N-fertiliser consumption in selected central and eastern European countries* and the EU**



* Bulgaria, Czech Republic, Hungary, Poland, Romania and Slovakia.

Source: FAO, 2002.

This is reflected in the sudden drop in the use of nitrogenous fertilisers (Figure 5).

Fertiliser use in western Europe appears generally to have levelled off. In central and eastern Europe, current input rates are comparably low, but the new agro-economic framework after accession is expected to lead to some intensification in the new EU Member States from 2004 onwards (EEA, 2004).

Environmental pressures are expected to decrease somewhat in western Europe, whilst many areas in central and eastern Europe will experience increasing agricultural intensity. This means that some of the high nature value farmland will probably be exposed to intensification in the near future.

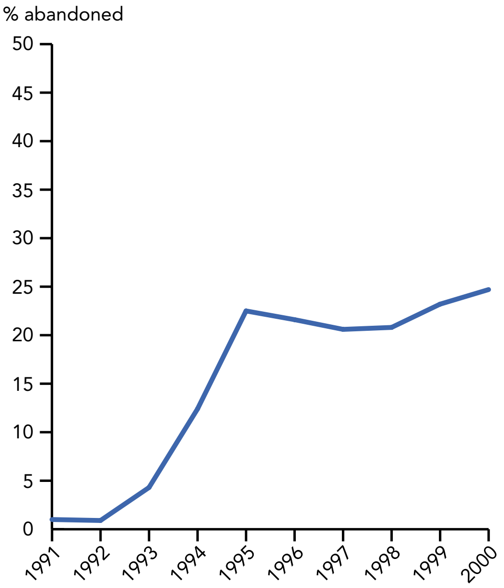
Abandonment

The socio-economic conditions in rural areas with extensive agriculture are generally unfavourable. Depopulation is occurring in many rural areas, affecting the countryside and the environment profoundly. Low incomes, hard working conditions and a lack of social services in many areas make farming a less attractive option for young people. The proportion of the elderly is already very high amongst farmers. As a result, land abandonment is to be expected (Heilig 2002a, b).

Land abandonment is already a common phenomenon in regions where agricultural productivity is relatively low (Baldock *et al.*, 1996). The situation is particularly worrying in central and eastern Europe, where political and economic change has negatively affected the conditions for farming (EEA, 2004).

Figure 6 shows the trend for abandoned arable land in Estonia, where the current level is over 25 %. The corresponding figure for permanent grasslands is as high as 56 % (Mägi and Lutsar, 2001). Similar data sets for other countries are rare, since land abandonment is not easily detected in general agricultural statistics. Therefore no picture can be drawn up for Europe as a whole, but on the basis of their generally lower viability (see Hellegers and Godeschalk, 1998) it is to be expected that extensive farming systems are most vulnerable to abandonment.

Figure 6 **Percentage of abandoned arable land in Estonia**



Source: Statistical office of Estonia, 2000.

Impacts on nature value

Loss of semi-natural vegetations is a consequence of the above agricultural trends. Although many case studies exist (see for example Veen and Seffer, 1999), no reliable pan-European trend data are currently available for plant communities and habitats. The best data available are for birds. Farmland birds are indicative of overall biodiversity, since they depend on a variety of plant and animal food and diverse vegetation structures for feeding, nesting and shelter against predators (see for example Potts, 1986). Tucker and Heath (1994) estimate that more than 40 % of all declining bird species in Europe are affected by agricultural intensification, whereas more than 20 % are affected by abandonment.

Figure 7 shows the cumulative distribution of 102 priority bird species that are connected to farmland habitats and that have an unfavourable conservation status (selection according to Andersen, 2003, based on Tucker and Heath, 1994 and Tucker, 1997). Farmland species of particular conservation concern appear to occur throughout Europe, but many of them are associated with extensive farmland, particularly in southern Europe[4]. The following cases illustrate the conservation issues in some of these systems.

The black grouse *Tetrao tetrix* occurs on grazed heaths and moorland, and is showing a rapid and almost Europe-wide decline (Tucker and Heath, 1994). Upland habitats in the United Kingdom suffer from overgrazing and afforestation, causing moderate population decline. In lowland western Europe, this once rather common species is now practically extinct because of habitat destruction and agricultural intensification. In the Netherlands, for example, black grouse numbers fell from several thousands in the 1950s to less than 100 today (see Niewold, 1990).

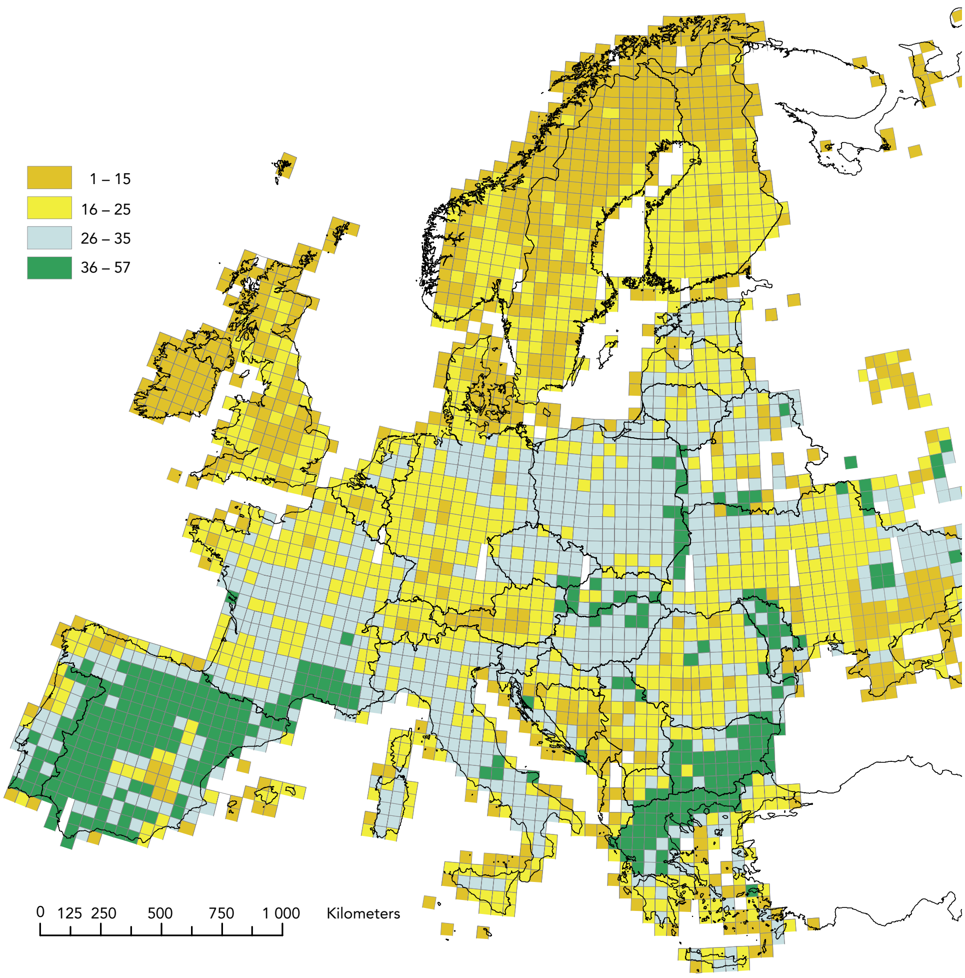
Loss of extensive grassland habitat is reflected by the large-scale decline of the corncrake *Crex crex*. Its numbers have fallen by more than 50 % in 10 countries. Drainage of wet grasslands, intensification and the conversion of hay meadows into silage grasslands are the main causes (Tucker and Heath, 1994). The corncrake is most common in central and eastern Europe, but habitat

[4] The relatively small number of species in northern Europe does not necessarily reflect low nature value or absence of conservation problems, since species richness generally decreases with latitude.

loss and population decline also occurs there (Veen *et al.*, 2000; Tucker and Heath, 1994).

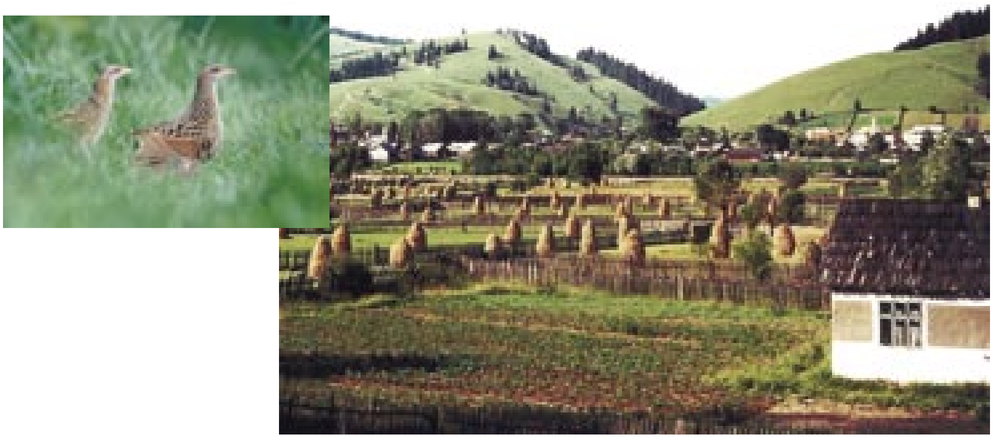
The great bustard *Otis tarda* is characteristic of steppe habitats in southern and eastern Europe. The species has declined seriously throughout its range (Tucker and Heath, 1994). In Hungary, the great bustard population dropped from 2 500 individuals in 1985 to 1 100 individuals in 1990 (Fésüs *et al.*, 1992). Reasons for this are intensified agricultural use of meadows and pastures, as well as increasing cultivation of maize and sunflowers. In the 1990s the Hungarian great bustard population was stable (Faragó, 2003).

Figure 7 **Cumulative distribution of 102 bird species with unfavourable conservation status occurring on farmland**



Note: see Appendix A for details.

Black grouse: Species found on moor- and heathland.
Photos: Ybele Hoogeveen, Niall Benvie/RSPB-images (insert).



Corncrake: Species found in extensive grassland.
Photo: Peter Veen, Andy Hay/RSPB-images (insert).

Great bustard: Species found in steppic habitats.
Photo: Jesus Valiente, Olavi Hiiemäe (insert).

Policy responses

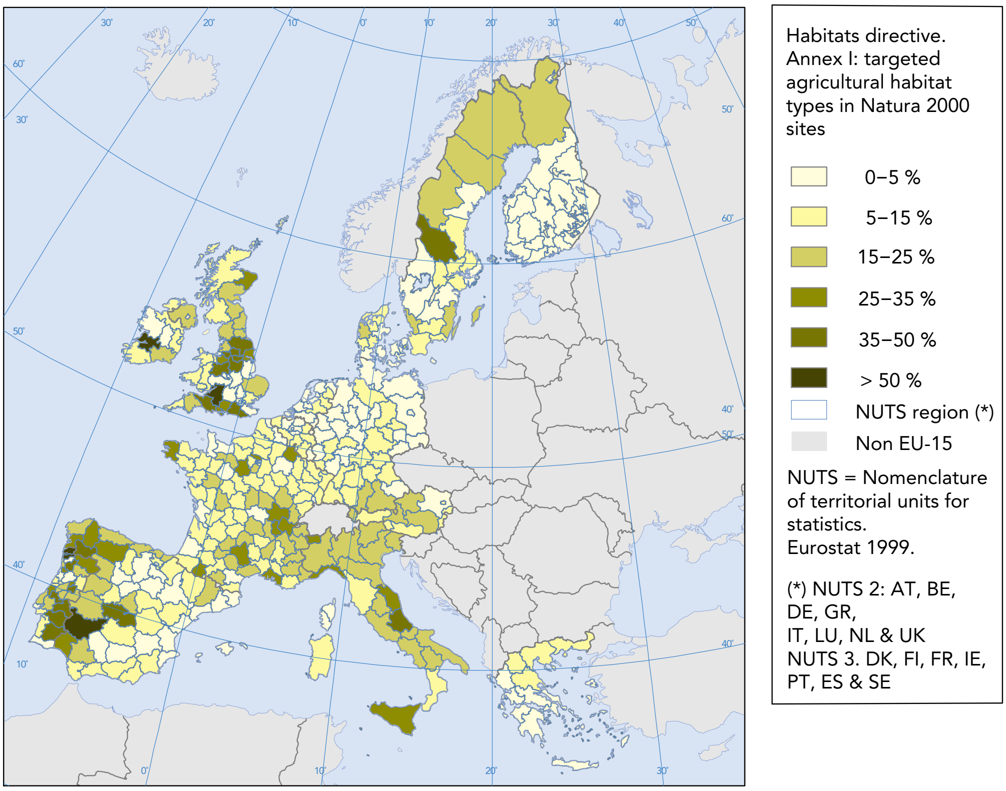
Agriculture in Europe is affected by a wide range of policies at both regional and national levels, including strategic initiatives such as the Pan-European biological and landscape diversity strategy and the EU biodiversity action plan for agriculture, environmental legislation such as the EU nitrates, birds and habitats directives, and sectoral support under the EU. They are either aimed at obligatory site protection or based on voluntary measures in the wider countryside.

Site protection

The main policy instruments for site protection at EU level are the birds and habitats directives (79/409/EEC, 92/43/EEC). Annex I of the habitats directive lists natural and semi-natural habitat types that must be maintained in a favourable conservation status by the Member States. The Natura 2000 network will build on the proposed sites of communal interest (pSCIs [5]) that have been listed by the Member States. Out of the 198 habitat types listed in Annex I of the habitats directive, 28 require extensive agricultural management and can be regarded as high nature value farmland.

Figure 8 gives an overview of the share of these agricultural habitat types within the Natura 2000 network. The pattern is rather consistent with the distribution

Figure 8 **Extensive farmland within proposed Natura 2000 sites**



Source: EEA.

[5] The pSCIs have to be further designated as Special Area of Conservation (SAC).

of high nature value farmland (compare with Figure 4). The average share of extensive agricultural habitats within pSCIs is 15 %, even exceeding 50 % in parts of Spain and the United Kingdom (see Figure 8). This underlines their conservation value.

Nonetheless, less than one third of the high nature value farmland areas is covered by pSCIs (see Appendix B). Furthermore, the formal designation of protected areas is not a guarantee for a favourable conservation status. Currently, there are no good monitoring data available about trends within the Natura 2000 sites. All in all, it can be concluded that the site protection measures will at best conserve a minority of high nature value farmland.

Wider countryside

At an EU level the common agricultural policy (CAP) is the most relevant policy framework with regard to conservation of high nature value farmland, in particular outside protected areas. The CAP is composed of two 'pillars'.

The first pillar is a commodity-based regime. Originally it was a market intervention mechanism, providing price guarantees, production incentives and export subsidies for certain crops and livestock products. As such it was a catalyst of agricultural productivity. Through successive reforms, the first pillar subsidies have become more and more decoupled from production. Subsidies are now provided through direct payments on the basis of historic production levels. Since the 2003 CAP reform, first pillar payments are subject to environmental conditions. The reformed first pillar regime is less damaging to the environment, especially when providing incentives for farming in marginal areas (Hellegers and Godeschalk, 1998).

The second pillar of the CAP allows Member States to implement measures for alleviating or improving the ecological impacts of agriculture. There is an array of measures that can be used to support environmentally friendly farming systems. However, the main elements relevant to high nature value farmland conservation are agri-environment schemes and less favoured area payments[6]. The following sections will analyse the geographical targeting of these policy measures.

Agri-environment schemes

Under the current rural development regulation, adopted in 2003[7], Member States are obliged to put agri-environment schemes in place. Support can be granted to farmers for environmentally favourable measures, including conservation of high nature value farmed environments which are under threat.

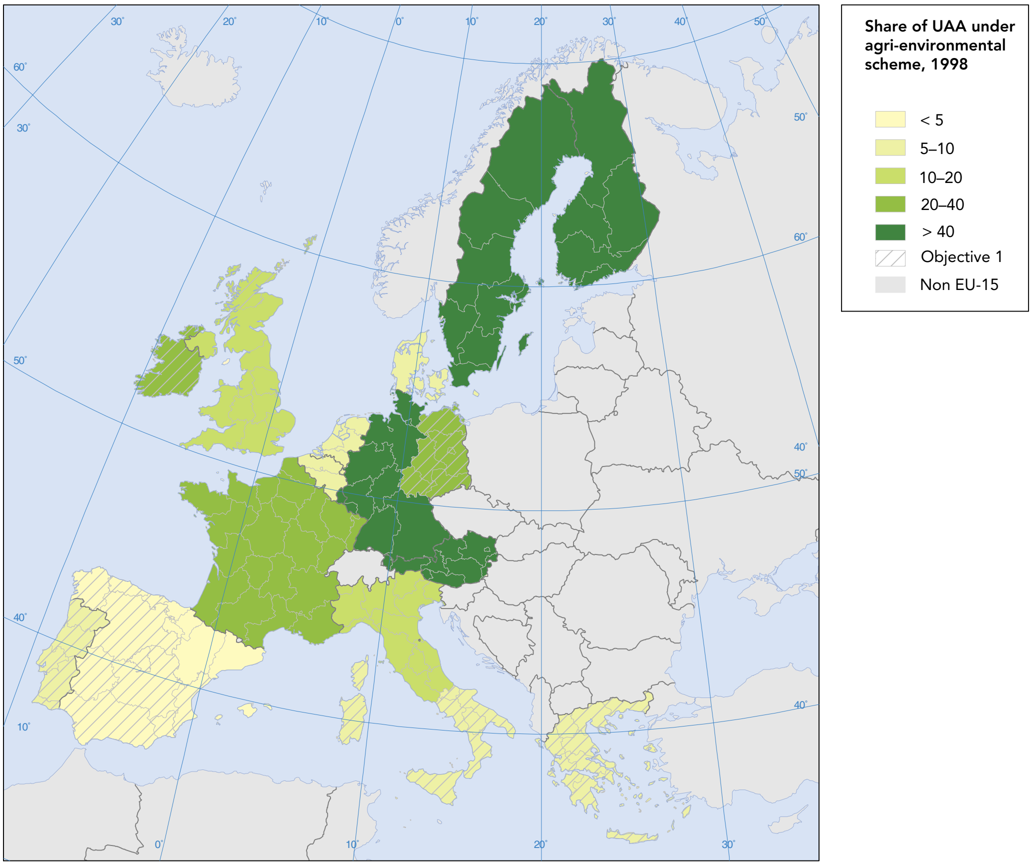
The regulation is flexible, allowing Member States to design tailor-made schemes for regional environmental issues. As a consequence, agri-environmental schemes are highly variable and generally not targeted at distinct geographical areas on the basis of commonly agreed criteria. Figure 9 shows the coverage of agri-environment schemes in the EU Member States.

The level of implementation of agri-environment schemes in the different countries varies considerably. In Finland, Sweden, Luxembourg, Austria and Germany, relatively large proportions of the utilised agricultural area are under agri-environment schemes, in contrast with Belgium, the Netherlands, Spain, Italy and Greece.

In general, there is no clear relationship between the overall agri-environment expenditure per hectare and the share of high nature value farmland (Figure 10, see Appendix B for

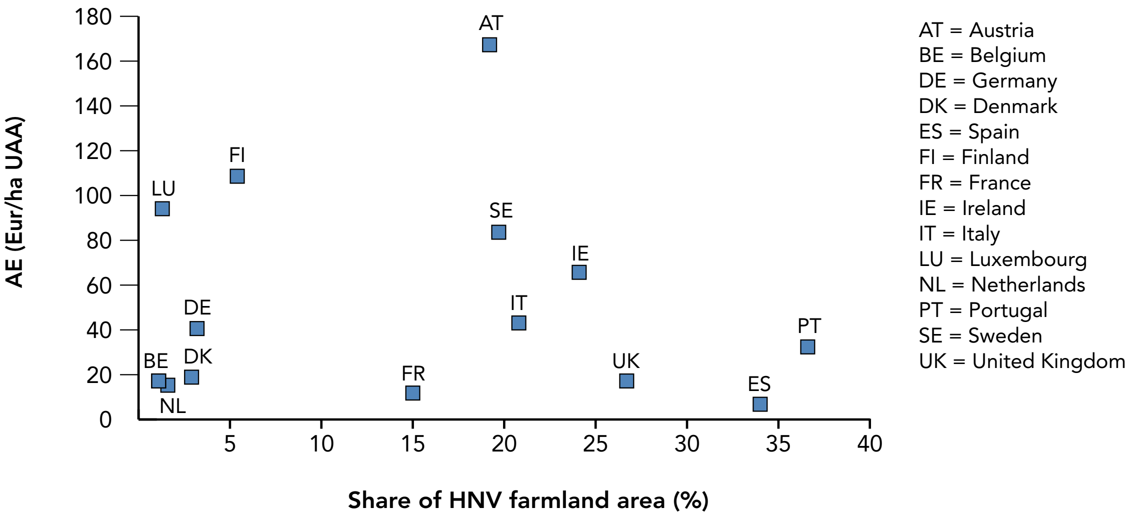
6 Further information can be found in EEA (2004) and Dwyer *et al.* (2002).
7 Regulation 1783/2003, replacing Regulation 1257/99.

Figure 9 **Share of utilised agricultural area under agri-environment schemes (1998 figures)**



Source: EEA 2001, on the basis of data of the European Commission, DG Agriculture.

Figure 10 **Agri-environment spending in relation to share of high nature value farmland per country (% of utilised agricultural area)**



Note: Minimum estimate of HNV coverage is used (see Appendix A). AE spending figures according to proposed budgets 2000–2006.
Source: Dwyer *et al.*, 2002.

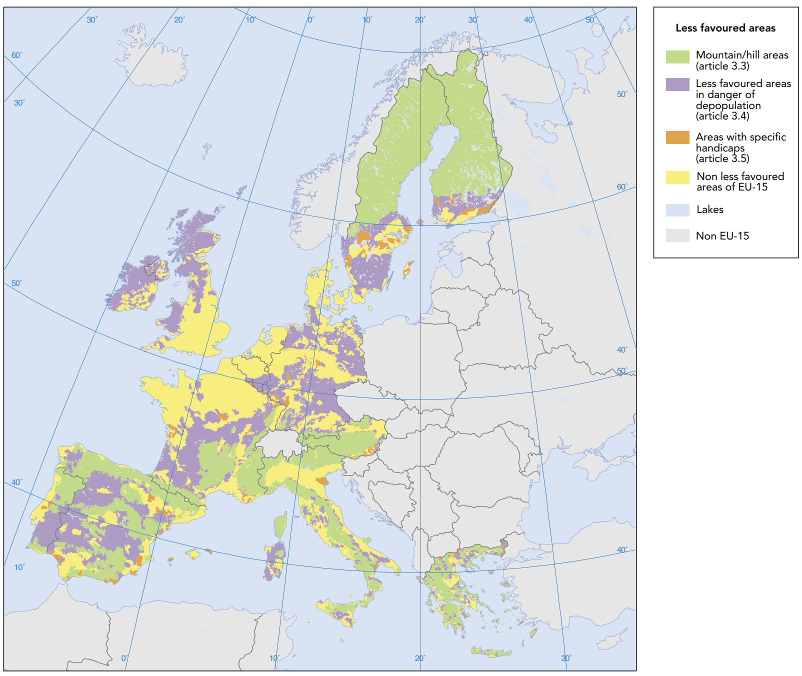
details). Countries with large areas of high nature value farmland, such as Spain, have small budgets per hectare for agri-environment schemes. Although no precise data are available on geographical spending patterns within countries, the targeting of agri-environment measures at a European level seems far from optimal from a biodiversity conservation perspective. Furthermore, recent research shows that current agri-environment schemes aimed at biodiversity are not necessarily effective and that their monitoring is mostly insufficient (Klein and Sutherland, 2003).

Less favoured areas

Farmers in less favoured areas are eligible for payments per hectare in addition to conventional CAP support. These compensatory payments have a combination of social and environmental objectives and are part of the second pillar of the CAP. They will generally increase profitability of farming in marginal areas under natural constraints. As such they are potentially an effective tool for preventing abandonment of high nature value farmland, provided that they do not create incentives for intensification and particularly overgrazing. The receipt of less favoured area support requires compliance with good farming practice as defined by Member States. In addition, there are ceilings on stocking densities in many regions, but these are often set at a level that is too high from a conservation point of view. For example, in France ceilings of 1.8 livestock units per hectare apply in mountainous less favoured areas (Baldock and Bennett, 2002).

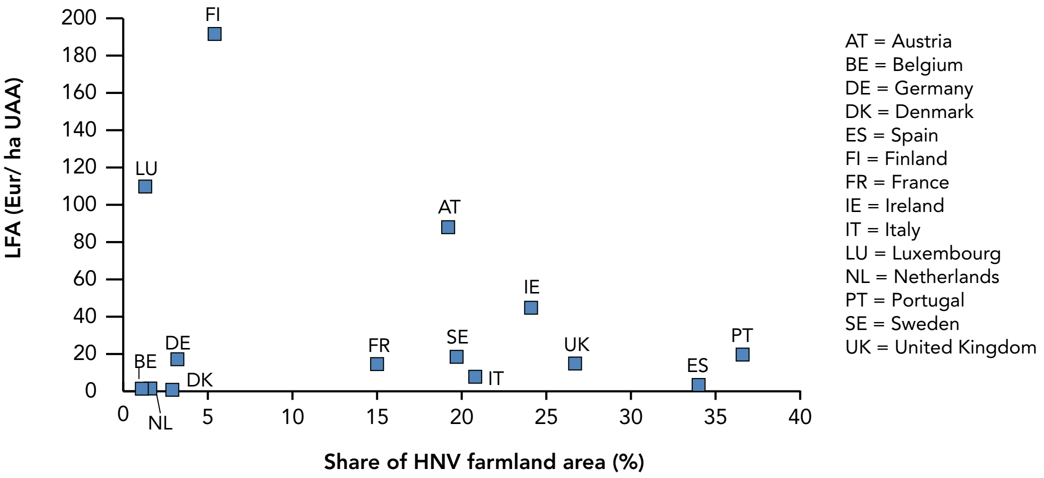
Member States have considerable discretion both in the level of expenditure they commit and in the precise design of the less favoured area support payments. Figure 11 shows the distribution of designated less favoured areas. They cover more than half the utilised agricultural area in the EU, including all the higher and more mountainous ground. Some high nature value farmland is within the more productive areas outside less favoured areas, such as saltmarshes, wet grasslands and hay meadows. However, the great majority falls within the less favoured areas (compare with Figure 4).

Figure 11 **Less favoured areas**



Source: Baldock and Bennett, 2003 on the basis of European Commission data.

Figure 12 **Less favoured area spending in relation to share of high nature value farmland per country (% of utilised agricultural area)**



Note: Minimum estimate of HNV coverage is used (see Appendix A). Proposed budgets 2000–2006.
Source: Dwyer *et al.*, 2002.

Despite this large spatial overlap there is no clear relationship between the share of high nature value farmland and actual expenditure on less favoured area (Figure 12, see Appendix B for details). This suggests that the potential of less favoured area support for preventing abandonment of high nature value farmland is not fully utilised.

Considerations

The geographical targeting of subsidies should be reconsidered in view of the changed rationale of the common agricultural policy. The increased focus on sustainability and non-trade concerns justifies more investment in those areas that represent the highest environmental quality and are most vulnerable to change. The targeting of high nature value farmland areas should be improved.

In this respect, less favoured area payments and agri-environment schemes are not the only relevant instruments. The potential of the (now largely decoupled) first pillar support to enhance economic viability in high nature value farmland areas is considerable, provided that the minimum environmental standards introduced with the 2003 CAP reform are sufficient to avoid environmental damage and/or undergrazing. The current practice of providing support on the basis of historic production levels, however, is not optimal in this respect.

It should be kept in mind, though, that the current datasets still show large gaps that prevent a detailed analysis of recent trends in high nature value farmland and effectiveness of policy measures. There is a great need for:

- updating and refining the data on distribution of high nature value farmland (preferably on the basis of detailed national data sets);
- spatially explicit data on expenditure and corresponding environmental objectives of CAP instruments;
- pan-European monitoring of habitat and species abundance;
- sound comparative and analytical research into the effectiveness of individual agri-environment schemes;
- comparable data on the situation in non-EU countries (both occurence of high nature value farmland and policy measures).

Conclusions

- High nature value farmland has been widely recognised as a valuable asset of the European countryside, providing habitat for a wide range of species. Maintaining a good conservation status is key to reaching the 2010 target of halting the loss of biodiversity.

- High nature value farmland makes up about 15–25 % of the utilised agricultural area in Europe. It is unevenly distributed, with concentrations in peripheral parts of Europe.

- The conservation status of high nature value farmland is insufficiently known, but case studies indicate serious biodiversity decline. The main threats are intensification and abandonment.

- Site protection under the birds and habitats directives is an appropriate but insufficient conservation tool. At best about one third of the high nature value farmland area will benefit from this measure.

- Outside protected areas, conservation of high nature value farmland depends mainly on the application of instruments within the common agricultural policy, notably less favoured area support and agri-environment schemes. These instruments, however, do not appear to be well targeted at high nature value farmland areas. Southern European high nature value farmland areas in particular get relatively little support.

- Overall, the 2010 biodiversity target is unlikely to be reached without additional policy efforts with regard to the conservation of high nature value farmland.

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Appendix A: High nature value farmland definition

General concept

The high nature value farmland indicator cf. Andersen (2003) distinguishes the following types of high nature value farmland:

Type 1: Farmland with a high proportion of semi-natural vegetation.

Type 2: Farmland dominated by low intensity agriculture or a mosaic of semi-natural and cultivated land and small-scale features.

Type 3: Farmland supporting rare species or a high proportion of European or world populations.

Type 1 and Type 2 areas are identified on the basis of land cover data (Corine database) and agronomic and economic farm-level data (FADN). Combined, these two approaches give information on distribution and farming characteristics. Type 3 areas can be identified only on the basis of species distribution data. Due to data limitations this was possible for breeding birds only (see Andersen, 2003, for details on species selection and aggregation method). It is not possible at this stage to merge fully the different results into one map, or to produce separate maps for the different high nature value farmland types.

Each of these approaches has its strengths and weaknesses. The species approach suffers from data gaps and should be regarded as an additional information source rather than a tool for delineating high nature value farmland. The land cover data give the best impression of the spatial distribution of high nature value farmland, whereas the farm data are considered a more reliable indicator for the total share of high nature value farmland.

Land cover approach

For the land cover analysis, a regionally differentiated selection was made of agricultural habitats where high nature value farmland may be expected (see Table A1 for all farmland habitats considered, for details see Andersen, 2003). Both maximum and minimum estimates were made. In the maximum estimate all land cover classes with potential high nature value farmland were included. In the minimum estimate only those land cover classes were included that have the highest probability of containing high nature value farmland. The map in Figure 4 is based on the **minimum** estimate.

Farm system approach

The farm system classification builds on production, input and management characteristics and distinguishes the following main types:

- high nature value cropping systems: low intensity arable systems. Might have livestock, but this is not the dominant income source;
- high nature value permanent crop systems: low intensity olives and other permanent crop systems;
- high nature value off-farm grazing systems: systems with cattle, sheep or goats grazing outside the farm, for example on common land;
- high nature value permanent grassland systems: cattle, sheep or goat systems where the main forage resource is grass from permanent or rough grassland;
- high nature value arable grazing livestock systems: cattle, sheep or goat systems where the main forage resource is arable crops;

- high nature value other systems: mainly low intensity pigs or poultry systems.

Analogous to the land cover approach, the farm system classification was differentiated in a minimum and maximum variant. For the calculations in this joint report only the minimum figures were used (see also Table A2 and Figure A1).

Species approach

Tucker and Heath (1994) conducted an assessment of the conservation status of all Europe's birds and provided a list of species of European conservation concern (SPECs). Four categories of species of European conservation concern were identified according to their global and European status, and the proportion of their total of their world population occurring in Europe (Tucker, 1997, see Table A3). The SPEC designation has become accepted as highlighting bird species of especially high conservation concern.

A total of 102 species were chosen for inclusion in the analyses. This list included all category 1–3 species which were considered to be potentially associated with farmland throughout Europe (see Andersen, 2003, and Tucker, 1997 for details). A cumulative distribution map was then drawn up on the basis of the EBCC Atlas of European Breeding Birds (Hagemeijer and Blair, 1997).

Table A1 **The 19 Corine land cover classes (LCCs) which were regarded as being potentially associated with agricultural land**

Code	Land cover class
2.1.1	non-irrigated arable land
2.1.2	permanently irrigated land
2.1.3	rice fields
2.2.1	vineyards
2.2.2	fruit trees and berry plantation
2.2.3	olive groves
2.3.1	pastures
2.4.1	annual crops associated with permanent crops
2.4.2	complex cultivation patterns
2.4.3	land principally occupied by agriculture with significant natural vegetation
2.4.4	agro-forestry areas
3.2.1	natural grasslands
3.2.2	moors and heath lands
3.2.3	sclerophyllous vegetation
3.2.4	transitional woodland-scrub
3.3.3	sparsely vegetated areas
4.1.1	inland marshes
4.1.2	peat bogs
4.2.1	salt marshes

Note: Subsets were chosen for different environmental regions.

Table A2 **Definition of high nature value farming types (minimum estimate)**

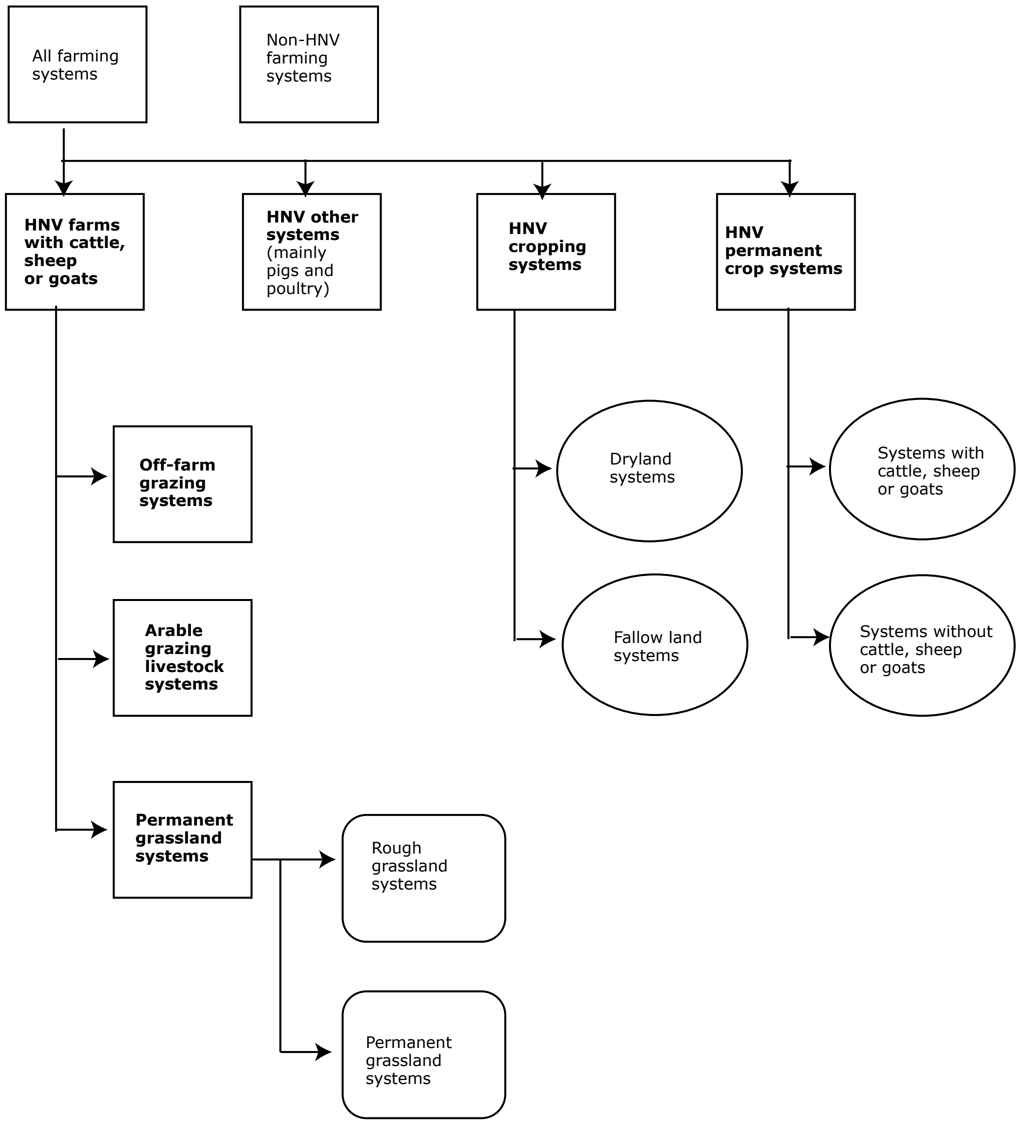
	Western Europe and Scandinavia	**Southern Europe**
HNV cropping systems	Input cost < 40 Euro/ha	Fallow systems: > 20.5 % of UAA in fallow and input cost < 40 Euro/ha Dryland systems: Not fallow systems and < 10 % of UAA irrigated and input cost < 40 Euro ha
HNV permanent crops	No data	Systems with grazing livestock: Input cost on crop protection < 10 Euro/ha and no irrigation and ≥ 5 grazing livestock units Systems without grazing livestock: Input cost on crop protection < 10 Euro/ha and no irrigation and < 5 grazing livestock units
HNV off-farm grazing systems	≥ 150 grazing days outside UAA	≥ 150 grazing days outside UAA
HNV permanent grassland systems	Rough grassland systems: rough grassland ≥ 66 % of UAA and stocking density < 0.3 livestock units/ha Permanent grassland systems: rough grassland < 66 % of UAA and stocking density < 1.0 livestock units/ha	Stocking density < 0.2 livestock units/ha
HNV arable grazing livestock systems	Input cost < 40 Euro/ha	Input cost < 40 Euro/ha and ((≥ 20 % of UAA in fallow) or (0 % of UAA irrigated))
HNV other systems	Input cost < 40 Euro/ha	Input cost < 40 Euro/ha and ((≥ 20 % of UAA in fallow) or (no irrigation))

Note: UAA = utilised agricultural area.
HNV = high nature value.

Table A3 **Categories of species of European conservation concern (SPEC), from Tucker (1997)**

Category 1	Species of global conservation concern because they are classed as globally threatened, conservation dependent or data deficient
Category 2	Species whose global populations are concentrated in Europe (i.e. more than 50 % of their global population or range in Europe) and which have an unfavourable conservation status in Europe
Category 3	Species whose global populations are not concentrated in Europe, but which have an unfavourable conservation status in Europe
Category 4	Species whose global populations are concentrated in Europe (i.e. species with more than 50 % of their global population or range in Europe) but which have a favourable conservation status in Europe

Figure A1 **High nature value farming systems typology**



Note: HNV= high nature value.

Appendix B: Addenda to the figures

Figure 1
Contributing countries:
EU: Austria, Belgium, Denmark, France, Germany, Ireland, Italy, the Netherlands, Spain, Sweden and United Kingdom.
Accession countries: Estonia, Latvia, Poland, Czech Republic and Hungary.
Others: Norway and Switzerland.

Agricultural species:
skylark *Alauda arvensis*, little owl *Athene noctua*, linnet *Carduelis cannabina*, goldfinch *Carduelis carduelis*, greenfinch *Carduelis chloris*, wood pigeon *Columba palumbus*, carrion crow *Corvus corone*, jackdaw *Corvus monedula*, quail *Coturnix coturnix*, yellowhammer *Emberiza citrinella*, reed bunting *Emberiza schoeniclus*, hobby *Falco subbuteo*, kestrel *Falco tinnunculus*, swallow *Hirundo rustica*, red-backed shrike *Lanius collurio*, corn bunting *Miliaria calandra*, yellow wagtail *Motacilla flava*, tree sparrow *Passer montanus*, magpie *Pica pica*, whinchat *Saxicola rubetra*, Eurasian turtle dove *Streptopelia turtur*, European starling *Sturnus vulgaris*, greater whitethroat *Sylvia communis*, northern lapwing *Vanellus vanellus*.

Woodland species:
Eurasian sparrowhawk *Accipiter nisus*, long tailed tit *Aegithalos caudatus*, tree pipit *Anthus trivialis*, buzzard *Buteo buteo*, great spotted woodpecker *Dendrocops major*, European robin *Erithacus rubecula*, chaffinch *Fringilla coelebs*, jay *Garrulus glandarius*, Eurasian wryneck *Jynx torquilla*, spotted flycatcher *Muscicapa striata*, gray tit *Parus afer*, blue tit *Parus caeruleus*, great tit *Parus major*, common redstart *Phoenicurus phoenicurus*, chiffchaff *Phylloscopus collybita*, willow warbler *Phylloscopus trochilus*, dunnock *Prunella modularis*, goldcrest *Regulus regulus*, blackcap *Sylvia atricapilla*, garden warbler *Sylvia borin*, winter wren *Troglodytes troglodytes*, Eurasian blackbird *Turdus merula*, song thrush *Turdus philomelos*, mistle thrush *Turdus viscivorus*.

Figure 2
This is a conceptual graph, not directly derived from empirical data. Hence the axes do not mention concrete variables. However, empirical data that support this general relationship between agricultural intensity and biodiversity do exist. Baldock *et al.* (1995) presented a rather similar graph of the relationship between plant diversity and productivity, based on vegetation research by Peeters *et al.* (1993). Furthermore, the relationship depicted in Figure 2 suggests a low cost effectiveness of agri-environment measures in intensive farming systems (large input cuts will result in little increase in biodiversity). This is consistent with the findings of Klein *et al.* (2001), who reported low effectiveness of agri-environment measures in relatively intensive Dutch agricultural landscapes, and the theoretical graph of biodiversity against agricultural intensity as presented in Klein and Sutherland (2003). A second implication of the graph in Figure 2 is that biodiversity may gain from abandonment in intensive systems. This is consistent with the success of nature development in the Netherlands on former intensive agricultural land (LNV, 2000; RIVM, 2001).

Of course, the depicted relationship is simplified and scale dependent. Instead of generally reducing inputs for increasing plant diversity, one might take small-scale measures in intensive farming systems, such as leaving cereal headlands unsprayed. This can be effective for increasing the abundance of wildlife, such as weeds, insects and gamebirds (Boatman and Wilson, 1988). The more critical species, however, will not benefit.

At the other end of the land use intensity scale, land abandonment may lead to lower species diversity at field level, but natural habitats and ecosystems may add to overall biodiversity in the wider landscape (Baldock *et al*., 1995). This is why conservation strategies should ideally be geographically differentiated and geared to local circumstances. Spatial optimisation (through creation of small-scale landscape elements or large-scale nature developemt) is generally the most valid in intensive systems, whereas maintenace of low-input farming is more appropriate in extensive systems. See Hoogeveen *et al.* (2001) for a more in-depth discussion of these issues.

Figure 4
The map in Figure 4 is based on the minimum Corine estimate (see Appendix A for details). Although useful for a general impression of the distribution of high nature value farmland, the map should be regarded as indicative only. There is a need for future revisions on the basis of updated and more detailed data, and for refinements on the basis of national datasets.

Due to the limitations of the Corine land cover data, Type 2 high nature value farmland tends to be underrepresented in the minimum estimate (for example bocage landscapes in France). Type 3 farmland is also only partially included. Intensively used grassland may be important as wintering grounds for waterfowl but these areas, mainly concentrated in lowland western Europe, do not show up on the map in Figure 4.

Land cover data do not indicate local pressures such as overgrazing. The indicated distribution of high nature value farmland in the uplands of the UK, for example, may be optimistic because overgrazing is reported from a number of locations. For Finland and Sweden, the distribution pattern of potential high nature value farmland is also optimistic due to interpretation problems of actual agricultural use. National data sources for Finland indicate a concentration in the southern part of the country.

Figure 7
(See Appendix A for details on the species approach)
Included bird species:
Levant sparrowhawk *Accipiter brevipes*, aquatic warbler *Acrocephalus paludicola*, cinereous vulture *Aegyptius monachus*, skylark *Alauda arvensis*, barbary partridge *Alectoris barbara*, chukar *Alectoris chuka*r, rock partridge *Alectoris graeca*, red-legged partridge *Alectoris rufa*, garganey *Anas querquedula*, lesser-white-fronted goose *Anser erythroptus*, tawny pipit *Anthus campestris*, Spanish imperial eagle *Aquila adalberti*, golden eagle *Aquila chrysaetos*, greater spotted eagle *Aquila clanga*, imperial eagle *Aquila heliaca*, lesser spotted eagle *Aquila pomarina*, steppe eagle *Aquila rapax*, short-eared owl *Asio flammeus*, little owl *Athene noctua*, eagle owl *Bubo bubo*, trumpeter finch *Bucanetes githagineus*, stone-curlew *Burhinus oedicnemus*, long-legged buzzard *Buteo rufinus*, short-toed lark *Calandrella brachydactyla*, lesser short-toed lark *Calandrella rufescens*, dunlin *Calidris alpina*, nightjar *Caprimulgus europaeus*, great rosefinch *Carpodacus rubicilla*, kentish plover *Charadrius alexandrinus*, Caspian plover *Charadrius asiaticu*, greater sand plover *Charadrius leschenaultii*, dupont's lark *Chersophilus duponti*, sociable plover *Chettusia gregaria*, houbara bustard *Chlamydotis undulata*, white stork *Ciconia ciconia*, black stork *Ciconia nigra*, short-toed eagle *Circaetus gallicus*, hen harrier *Circus cyaneus*, pallid harrier *Circus macrourus*, roller *Coracias garrulu*s, quail *Coturnix coturnix*, corncrake *Crex crex*, cream-coloured courser *Cursorius cursor*, black-winged kite *Elanus caeruleus*, ortolan bunting *Emberiza hortulana*, black-headed bunting *Emberiza melanocephala*, lanner falcon *Falco biarmicus*, saker falcon *Falco cherrug*, lesser kestrel *Falco naumanni*, peregrine *Falco peregrinus*, kestrel *Falco tinnunculus*, red-footed falcon *Falco vespertinus*, crested lark *Galerida cristata*, thekla lark *Galerida theklae*, great snipe *Gallinago media*, black-winged pratincole *Glareola nordmanni*, collared pratincole *Glareola pratincola*, crane *Grus grus*, lammergeier *Gypaetus barbatus*, griffon vulture *Gyps fulvus*, white-tailed eagle *Haliaeetus albicilla*, bonelli's eagle *Hieraaetus fasciatus*, booted eagle *Hieraaetus*

pennatus, olive-tree warbler *Hippolais olivetorum*, olivaceaous warbler *Hippolais pallida*, swallow *Hirundo rustica*, wryneck *Jynx torquilla*, red-backed shrike *Lanius collurio*, great grey shrike *Lanius major*, lesser grey shrike *Lanius minor*, masked shrike *Lanius nubicus*, woodchat shrike *Lanius senator*, black-tailed godwit *Limosa limosa*, woodlark *Lullula arborea*, calandra's lark *Melanocorypha calandra*, black lark *Melanocorypha yeltoniensis*, bee-eater *Meropus apiaster*, black kite *Milvus migrans*, rock thrush *Monticola saxitilis*, Egyptian vulture *Neophron percnpterus*, curlew *Numenius arquata*, night heron *Nycticorax nycticorax*, black-eared wheatear *Oenanthe hispanica*, great bustard *Otis tarda*, scops owl *Otus scops*, grey partridge *Perdix perdix*, grey-headed woodpecker *Picus canus*, green woodpecker *Picus viridis*, radde's accentor *Prunella ocularis*, pin-tailed sandgrouse *Pterocles alchata*, black-bellied sandgrouse *Pterocles orientalis*, red-billed chough *Pyrrhocorax pyrrhocorax*, stonechat *Saxicola torquata*, turtle dove *Streptopelia turtur*, orphean warbler *Sylvia hortensis*, Dartford warbler *Sylvia undata*, black grouse *Tetrao tetrix*, Caspian snowcock *Tetraogallus caspius*, Caucasian black grouse *Tetraogallus caucasicus*, little bustard *Tetrax tetrax*, redshank *Tringa totanus*, barn owl *Tyto alba*.

Figure 8
Figure 8 was drawn up within the IRENA indicator project and builds on data from the Natura 2000 database of the European Topic Centre for Nature Protection and Biodiversity, Paris (see also Table B1). The picture for Finland is believed to be biased, with too little representation of extensive agriculture in the southern part of the country.

Figure 9
An update for 2001 is available, but these figures include agri-environment schemes under Regulation 2078/92 and Regulation 1257/99. The data show an overlap in the area covered and hence include double counting. For this reason the 1998 figures were used.

Figure 10/12
The share of high nature value farmland of the utilised agricultural area was calculated as the mean of the estimates on the basis of the land cover (Corine) and farm system (FADN) approaches.

The estimates of UAA are according to Eurostat 2000 figures. For Finland and Sweden only the FADN-based estimate of high nature value farmland coverage was used in the calculations because of unacceptable bias in the land cover data. The official UAA figure for Greece is a gross underestimate of total farmland, since the commons are not included in the statistics. Expenditure figures per hectare could therefore not be used here, and for this reason Greece was excluded from the calculations.

Table B1 **Estimate of coverage of proposed sites of communal interest (pSCIs)**

Utilised agricultural area*	127 000 000 ha	
High nature value farmland	19 000 000 – 31 750 000 ha	(15–25 % of UAA)
pSCIs Natura 2000	39 140 000 ha	
pSCIs extensive agriculture	5 900 000 ha	

* Eurostat 2000 figure.

Table B2 **Estimated share of high nature value farmland and agri-environment and less favoured area expenditure**

Country	Utilised agricultural area (UAA) (million ha)	Estimate of share of high nature value farmland (% UAA)			Agri-environment spending (€/ha UAA)	Less favoured area spending (€/ha UAA)
		Corine based	FADN based	Mean		
Greece*	3.6	53	9	*53	15.9	38.2
Portugal	3.9	38	35	37	32.4	19.7
Spain	26.2	41	27	34	6.8	3.4
United Kingdom	15.8	30	23	27	17.2	14.9
Ireland	4.4	25	23	24	65.7	44.8
Italy	13.1	30	12	21	43.1	7.8
Sweden**	3.1	34	20	**20	83.6	18.5
Austria	3.4	29	9	19	167.3	88.0
France	27.9	27	3	15	11.8	14.6
Finland**	2.2	49	5	**5	108.6	191.6
Germany	17.2	2	5	3	40.6	17.2
Denmark	2.6	5	1	3	18.9	0.8
Netherlands	2.0	3	0	2	15.3	1.5
Luxembourg	0.1	0	2	1	94.1	109.8
Belgium	1.4	2	1	1	17.2	1.4
Total EU-15	**127**	**15–25 %**			**18.5**	**11.7**

Notes:

* High nature value farmland estimate based on land cover approach only, because of inadequate representation of relevant UAA in the FADN-data.

** High nature value farmland estimate based on farm system approach only, because of inadequate land cover data.

Table B3 **Estimated distribution of semi-natural grasslands in central and eastern European countries in 1998**

Country	Total agricultural area (UAA)	Permanent pasture	Semi-natural grassland	Mountain grassland	Semi-natural grassland % of UAA
	(1000 ha)				
Slovenia	500	298	268	30	53.7
Romania	14 781	4 936	2 333	285	15.8
Hungary	6 186	1 147	960	0	15.5
Czech Republic	4 282	950	550	1,8	12.8
Slovakia	2 443	856	295	13	12.1
Poland	18 435	4 034	1 955	414	10.6
Bulgaria	6 203	1 705	444	332	7.2
Estonia	1 434	299	73	0	5.1
Lithuania	3 496	500	168	0	4.8
Latvia	2 486	606	118	0	4.7

Note: Semi-natural grasslands are defined according to their dependence upon continuing agricultural management in order to persist. Alpine pastures above 1 900 m that can be maintained without any human intervention are not included.

Source: EEA, 2003 (original data derived from Veen *et al.*, in Brouwer *et al.*, 2001 and FAOSTAT).

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