GUIDANCE DOCUMENT TO THE MEMBER STATES

ON THE APPLICATION OF THE HIGH NATURE VALUE IMPACT INDICATOR

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ACKNOWLEDGEMENTS

The authors of this Guidance Document are Guy Beaufoy and Tamsin Cooper.

The Guidance Document aims to assist Member States with the application of the CMEF HNV indicators, and specifically Impact Indicator 5 – 'the maintenance of HNV farmland and forestry'. A minimum amount of information necessary to understand the HNV concept and to operationalise the associated indicators is provided. Further material is available from other sources and where relevant, references are provided. Specifically, this document is accompanied by a report on 'HNV Indicators for Evaluation', prepared for DG Agriculture which elaborates all information provided in this document.

IEEP, 2007. HNV Indicators for Evaluation, Final report for DG Agriculture. Contract Notice 2006-G4-04.

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The current document develops the draft Guidance Document prepared in 2007.

IEEP, 2007. Guidance Document to the Member States on the Application of the High Nature Value Indicator. Report for DG Agriculture. Contract Notice 2006-G4-04.

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The final version of the Guidance Document has evolved through discussions with Jan-Erik Petersen (European Environment Agency), Maria Luisa Paracchini (DG-JRC) and experts at a number of international conferences and seminars in 2008[1] at which issues of HNV farmland identification were addressed.

In addition, it aims to reflect approaches to the identification of HNV Farmland that have been developed at European level by the EEA and the JRC (Paracchini *et al*., 2008), as well as work in progress in several Member States, including Finland, Greece, UK (England), Germany, Austria, Estonia, Bulgaria and Romania[2]. The thinking on HNV Features has been

[1] International conference 'Using evaluation to enhance the rural development value of agri-environment measures', Pärnu, Estonia, 17-19 June, 2008; International seminar "High Nature Value farmland - recognising the importance of SE European landscapes", Brussels, 15 May, 2008; International conference "The future of European semi-natural grasslands", Konstanz, Germany, 19-21 October, 2008.

[2] This work has been conducted by the following institutions: The Finnish Environment Institute, The Hellenic Ornithological Society, Natural England, Institute for Agro-Ecology and Biodiversity, Germany, Agricultural

enriched by a study for DG Environment on 'Reflecting Environmental Land Use Needs into EU Policy: Preserving and Enhancing the Environmental Benefits of Unfarmed Features on EU Farming' (Farmer *et al*., 2008).

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1 PREFACE

The Common Monitoring and Evaluation Framework's (CMEF) seven Impact Indicators provide a tool against which to assess the economic, social and environmental impacts of the 2007 – 2013 rural development programmes. Along with the Farmland Birds Indicator, the HNV Impact Indicator is one of two indicators which assess the impact of the current programmes on biodiversity.

Whilst the Farmland Birds indicator has been in existence for some time, and there is a substantial accompanying dataset, the data and monitoring framework for HNV farming and forestry are in their infancy. This document is designed to assist Member States in developing the framework.

There is a range of related terms associated with the High Nature Value concept, including HNV farmland, HNV farming, HNV features, HNV forests and HNV forestry. This document uses the terms HNV *farming* and HNV *forestry* consistently throughout the text as a means of referring both to the respective land uses (farmland and forests) and the associated management activities. This is important in the context of the evaluation of rural development programmes, where measures impact both on the activities of farming and forestry, and via these, on the land itself. For clarity, HNV features are treated as a sub-set of HNV farming.

This document presents an approach to the identification and monitoring of HNV farming and forestry which is based on a common definition and some unifying principles. It allows sufficient flexibility to accommodate work that has already been carried out in the Member States and can be applied with EU and national data. Its aim therefore is both to inform and to reflect work currently ongoing in the Member States on the identification of HNV farming and forestry.

The first step in establishing an appropriate system of indicators is to clarify what types of HNV farming and forestry exist in each Member State and region, and to describe their key characteristics in terms of land cover, management practices and biodiversity values. From this assessment, appropriate indicators can be devised for estimating the baseline extent of HNV farming and forestry.

The HNV Impact Indicator aims to assess changes in the extent and condition of HNV farming and forestry in relation to a baseline established at the start of the programming period. There is no single indicator or data source appropriate for this purpose. In the approach proposed, the Impact Indicator therefore consists of a basket of indicators put in place at the national and/or regional level. These should provide a number of different perspectives on the extent of HNV farming and forestry that can be monitored over time in order to evaluate the direction of change.

At the present time, the available data do not permit a precise assessment of the extent of HNV farming and forestry. However, provisional baseline estimates can be made, while data sources are improved. This Guidance Document aims to present a methodology which can

be made operational at the present time, but whose full implementation over the longer term depends on the further development of the relevant data bases, including harmonisation across databases, and investment in the incorporation of new types of data. For indicators to be effective, they must be selected carefully and founded on appropriate and reliable data.

There are four key steps involved in developing a system for applying the CMEF HNV Impact Indicator and this document sets out how each step may be approached. The four steps may be summarised as:

1. Describing and characterising the main types of HNV farming and forestry;

2. Developing indicators to identify HNV farming and forestry and thus to provide quantitative assessments of their extent - a limited number of representative local case studies should be used to ground-truth the accuracy and sensitivity of the indicators;

3. Developing indicators for monitoring changes in the extent and condition of HNV farming and forestry, through a combination of the monitoring of baseline data established under point 2 (extent), and sample surveys of farming practices and biodiversity (condition);

4. Applying Impact Indicator 5 to assess quantitative (extent) and qualitative (condition) changes in HNV farming and forestry in the context of the rural development programmes.

2 THE POLICY FRAMEWORK

In the EU's 2006 Sustainable Development Strategy (EU SDS) (DOC 10917/06), a commitment is made to halt the loss of biodiversity in the EU by 2010. The conservation of biodiversity on agricultural land is regarded as being critical to achieving this and as such, is an explicit objective of the Pan-European Biodiversity and Landscape Strategy (PEBLDS), the Bern Convention, the European Landscape Convention, the Birds and Habitats Directives, and Rural Development policy (Community Strategic Guidelines for Rural Development) (Paracchini *et al*., 2008).

Given the size of the challenge, a multi-pronged approach to the conservation of farmland biodiversity is needed, combining a programme of site designation as required by legislative measures such as the EU Birds and Habitats Directives, with the maintenance of those farming systems that favour biodiversity across the 'wider countryside'.

The urgency of the need for policy intervention to support HNV farming systems is widely acknowledged (see, for example, EEA/UNEP, 2004). Indeed, in the Kiev Resolution on Biodiversity published in 2003, European Environment Ministers declared that by 2008, a substantial proportion of HNV farmland would be under biodiversity sensitive management

with rural development measures in place to support the ecological and economic viability of the associated farming systems.

In response to this, the Community's Strategic Guidelines for rural development, 2007 – 2013, encourage Member States to put in place measures to preserve and develop HNV farming and forestry systems and traditional agricultural landscapes:

> "To protect and enhance the EU's natural resources and landscapes in rural areas, the resources devoted to axis 2 should contribute to three EU-level priority areas: biodiversity and the preservation and development of high nature value farming and forestry systems and traditional agricultural landscapes; water; and climate change." (OJ L55/20, 2006, Emphasis added).

Clearly the objective established within EAFRD is not to delineate or designate particular *areas* as HNV, but rather to use rural development measures to preserve and develop HNV farming and forestry *systems*. As explained below, these are the types of farming and forestry that are known to be inherently rich in species and habitats of conservation concern. These farming and forestry systems are often found in designated sites, such as under Natura 2000, but are also widespread in other areas of countryside, especially on poorer land where agricultural intensification has not been possible.

There are a number of rural development measures - notably under Axis 2 - which have been identified in the indicator fiches of the Common Monitoring and Evaluation Framework as having the potential to support the maintenance of HNV farming and forestry (see Annex 2 for a comprehensive list). Although not identified as having a direct impact in the indicator fiches, certain measures under Axis 1 (such as the training and advice measures) may have a positive effect if targeted at environmental land management. In assessing the impact of the whole programme, programme evaluators should also take account of any measures which may exert a negative effect.

3 THE HIGH NATURE VALUE FARMING CONCEPT

The High Nature Value farming concept was established in the early 1990s and describes those types of farming activity and farmland that, because of their characteristics, can be expected to support high levels of biodiversity or species and habitats of conservation concern (Baldock *et al*., 1993; Beaufoy *et al*., 1994; Bignal and McCracken, 2000). This positive relationship is described in further detail in Annex 3.

The farming of most value for biodiversity conservation across Europe is the low-intensity raising of livestock on unimproved vegetation that is grazed, browsed, or cut for hay, a fact that is widely supported by the scientific literature (see, for example, Bignal *et al*., 1994; Bignal and McCracken, 1996). The IRENA HNV indicator developed by the EEA confirms this and shows that semi-natural land cover is most widespread in the more marginal regions of the EU (EEA, 2006; Paracchini *et al*., 2008).

This semi-natural farmland is unique in harbouring numerous habitat types from Annex 1 of the Habitats Directive, ranging from hay meadows to wood pastures and heaths. These habitats support communities of flora and fauna that depend on the continuation of low-intensity grazing and/or late mowing for their survival.

In many areas of Europe, semi-natural land cover survives only as smaller patches in a more intensively farmed landscape. These patches may still be of sufficient local value for biodiversity conservation to be considered as HNV farmland. This value normally will be greater where the semi-natural patches exist in a mosaic with low-intensity cultivated land. The biodiversity value of semi-natural elements and a diversity of land cover types is confirmed in many studies (see, for example, Billeter *et al*., 2008).

In most of Europe, arable farming has been intensified to the point where it can no longer be described as HNV, but there are some areas where this is not the case, especially in southern and eastern Europe. These are usually low-yielding, low-input dryland systems retaining a sizeable proportion of fallow and the presence of semi-natural vegetation, including elements such as permanent pasture and features such as field margins, headlands, patches of scrub and/or woodland. Often extensive grazing is part of the HNV land use, exploiting arable stubbles and semi-natural patches (see, for example, Robinson *et al*., 2001).

Permanent crops, particularly the most traditional fruit and nut orchards and olive groves, can be of high nature value. The key characteristics are large old trees and a semi-natural understorey, which is often grazed by livestock. The semi-natural understorey is an essential element in the biodiversity of HNV permanent crop systems, and should be present for all or most of the year. HNV permanent crops are not irrigated and nitrogen fertilisers, biocides or broad spectrum insecticides are not used, or only at very low levels. Significant semi-natural features associated with these systems can include field margins, headlands, patches of scrub and woodland, and dry stone walls (Baldock, 1999; Kabourakis, 1999).

Linear and point features on farmland, such as hedges and ponds, are also significant for other types of HNV farmland, such as in low-intensity bocage landscapes. Where linear and point features survive on intensively managed farmland they are important for conserving vestiges of biodiversity in landscapes that otherwise are of limited nature value.

A systematic presentation of the core characteristics of HNV farming has been developed through projects undertaken for the EEA (Andersen *et al*., 2003) and for the European Commission (IEEP, 2007a and 2007b). These characteristics are represented in Figure 1 and discussed below.

1. **Low intensity farming characteristics** - biodiversity is usually higher on farmland that is managed at a low intensity. The more intensive use of machinery, fertilisers and pesticides and/or the presence of high densities of grazing livestock, greatly reduces the number and abundance of species on cropped and grazed land.

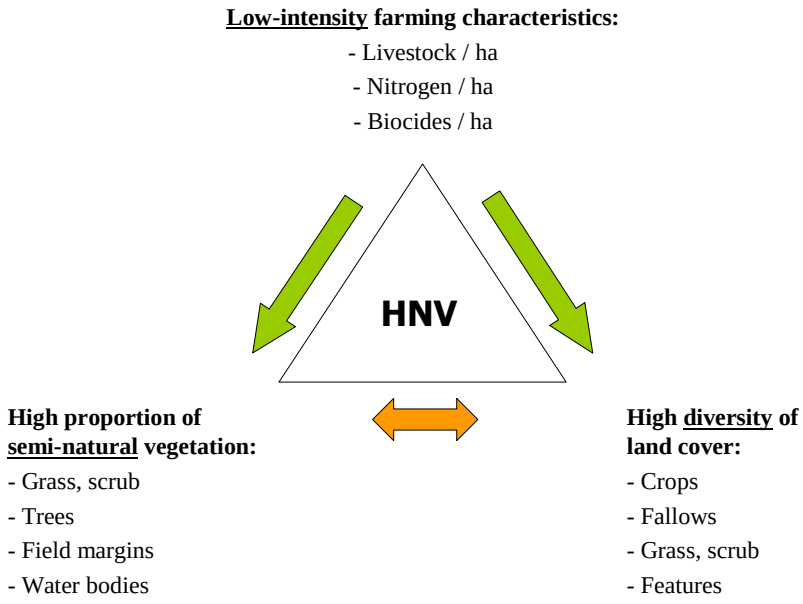
2. **Presence of semi-natural vegetation** - the biodiversity value of semi-natural vegetation, such as unimproved grazing land and traditional hay meadows, is significantly higher than intensively managed agricultural land. In addition, the presence of natural and semi-natural farmland features such as mature trees, shrubs, uncultivated patches, ponds and rocky outcrops, or linear habitats such as streams, banks, field margins and hedges, greatly increases the number of ecological niches in which wildlife can co-exist alongside farming activities.

3. **Diversity of land cover** - biodiversity is significantly higher when there is a "mosaic" of land cover and land use, including low intensity cropland, fallow land, semi-natural vegetation and farmland features. Mosaic agricultural habitats are made up of different land uses, including parcels of farmland with different crops, patches of grassland, orchards, areas of woodland and scrub. This creates a wider variety of habitats and food sources for wildlife and therefore supports a much more complex ecology than the simplified landscapes associated with intensive agriculture.

The dominant characteristic of HNV farming is its **low-intensity**. A significant **presence of semi-natural vegetation** is also essential. In situations where the proportion of land under semi-natural vegetation is reduced, a high **diversity of land cover** (mosaic) under low-intensity farming may enable significant levels of biodiversity to survive, especially if there is a high density of features providing ecological niches. A high diversity of land cover alone does not indicate HNV farming.

In certain situations, it is possible for more intensive farmland, whose characteristics of farming intensity and land cover do not suggest HNV farming, nevertheless to continue to support important populations of species of conservation concern. Generally these are bird populations. Examples include the more intensively farmed cereal steppes in Spain and Portugal which maintain populations of species such as Great Bustard (*Otis tarda*). For these exceptional types of HNV farmland, the presence of one or more species populations may be a sufficient indicator.

Figure 1 The Three Key Characteristics of HNV Farming



4 INTRODUCTION TO THE CMEF HNV INDICATORS

As discussed in Section 2, the preservation and development of HNV farming and forestry systems is an objective of rural development policy and under their rural development programmes, Member States have put measures in place to achieve this.

In accordance with the strategic, programming approach of Pillar 2 of the CAP, rural development programmes and individual measures are monitored and evaluated to assess the extent to which programme objectives are being achieved. In part, this is assisted by the Common Monitoring and Evaluation Framework (CMEF), an EU-wide suite of indicators.

There are three HNV indicators in the CMEF (see also Commission Regulation 1974/2006). They include a Baseline Indicator, a Result Indicator and an Impact Indicator and are designed to assess whether the HNV resource of a Member State is being maintained over the seven year period of the 2007 – 2013 rural development programmes.

The indicators are set out in Table 1 below and should be applied at the national and/or regional scale, corresponding to the scale at which the programme operates.

Table 1 The CMEF HNV Indicators

Indicator Number	Indicator Title	Measurement
Baseline Indicator 18	Biodiversity: High nature value farmland and forestry	UAA of HNV Farmland, hectares
Result Indicator 6	Area under successful land management contributing to biodiversity and HNV farming / forestry	Total area of HNV farming and forestry under successful land management, hectares
Impact Indicator 5	Maintenance of HNV farmland and forestry	Changes in HNV farmland and forestry defined in terms of quantitative and qualitative changes.

There are a number of different terms in circulation, and for clarity, the following variations are being used throughout the Document:

The CMEF Impact Indicator for HNV directly reflects the policy priority of "preserving and developing high nature value farming and forestry systems" as set out in the Community's Strategic Guidelines for rural development. The indicator refers to the "maintenance of HNV farming and forestry". To ensure consistency with the terminology of the Impact Indicator, the document refers to the maintenance of HNV farming and forestry from this point.

The terms HNV farmland and farming and HNV forests and forestry are sometimes used interchangeably. This document uses the terms HNV *farming* and HNV *forestry* consistently throughout the text as a means of referring both to the respective land uses (farmland and forests) and the associated management activities. This is important in the context of the evaluation of rural development programmes, where measures impact both on the activities of farming and forestry, and via these, on the land itself.

The HNV Impact Indicator is complex given that its function is to detect both quantitative and qualitative changes in the HNV farming and forestry of a given Member State or region. Furthermore, it has to be supported by a system of data collection that is sufficiently frequent to capture changes over the relatively short, seven year period of the rural development programme. It therefore comprises:

- Quantitative indicators which provide information on changes in the extent of HNV farming and forestry or other quantitative measurements, in relation to a baseline.

An assessment of change in the estimated total number of hectares under HNV farming and forestry will provide only a limited insight into the extent to which this resource is being maintained. Such a figure will not reveal changes in condition, such as alterations to

vegetation communities arising from the encroachment of scrub or the removal of features, or a decline in the associated biodiversity. Nor will it throw light on changes in farming practices that are significant for biodiversity, such as changes to the cutting date of hay meadows, or the cessation of shepherded grazing.

For these reasons, quantitative indicators will be complemented by:

- Qualitative indicators which provide information on changes in condition, such as trends in specific farming and forestry practices that are known to be important for nature values, or trends in the biodiversity associated with HNV farming and forestry over the period of the rural development programme.

Assessing changes in the condition of HNV farming or forestry is an important aspect of the monitoring and evaluation of the impact of rural development programmes if potentially irreversible changes in farming practices and declines in the associated biodiversity are to be detected.

There are four key steps involved in developing a system for applying the CMEF HNV Impact Indicator and the remainder of this document sets out how each step may be approached. The four steps may be summarised as:

1. Describing and characterising the main types of HNV farming and forestry;

2. Developing indicators to identify HNV farming and forestry and thus to provide quantitative assessments of their extent - a limited number of representative local case studies should be used to ground-truth the accuracy and sensitivity of the indicators;

3. Developing indicators for monitoring changes in the extent and condition of HNV farming and forestry, through a combination of the monitoring of baseline data established under point 2 (extent), and sample surveys of farming practices and biodiversity (condition);

4. Applying Impact Indicator 5 to assess quantitative (extent) and qualitative (condition) changes in HNV farming and forestry in the context of the rural development programmes.

These four steps set out what may be regarded as a best practice approach. Each step is set out in detail in Annex 4 and described in Sections 5 and 6, in which the four steps are discussed in relation to HNV farming and HNV forestry, respectively.

5 DEVELOPING THE HNV FARMING INDICATORS

5.1 Describing and Characterising the Main Types of HNV Farming

Describing and characterising the main types of HNV farming may be regarded as Step 1. In order to design appropriate indicators and support measures for HNV farming, it is first necessary to describe and characterise the main types of farming of High Nature Value in a given Member State or region. An overview based on expert knowledge can provide a summary of the relevant farming types, their main agronomic characteristics, and the key species and habitats associated with them.

These descriptions should aim to identify the basic components that make up the broad HNV farming systems in a Member State or region, including:

- The predominant **land cover** that is associated with the farming system, especially the types of semi-natural vegetation, types of cropped land, and their typical spatial coverage and distribution at the farm level (for example, approximate proportion of farmed area, mosaic patterns). Farmland features that make a significant contribution to biodiversity values should be included, although they may be peripheral to the contemporary farming system, such as field margins, semi-natural patches, water bodies and dry-stone walls.
- The way in which the land cover is managed by the predominant **farming system and its characteristics and practices,** such as grazing regimes, cropping patterns and intensity of use (for example, livestock densities per hectare of forage, nitrogen inputs, fallow).
- The nature values (**species and habitats** of conservation concern) associated with these forms of land cover and farming practices.

Annex 5 shows a general typology of HNV farming types which provides a framework for the categorisation of HNV farming types.

5.2 Developing Indicators to Identify HNV Farming

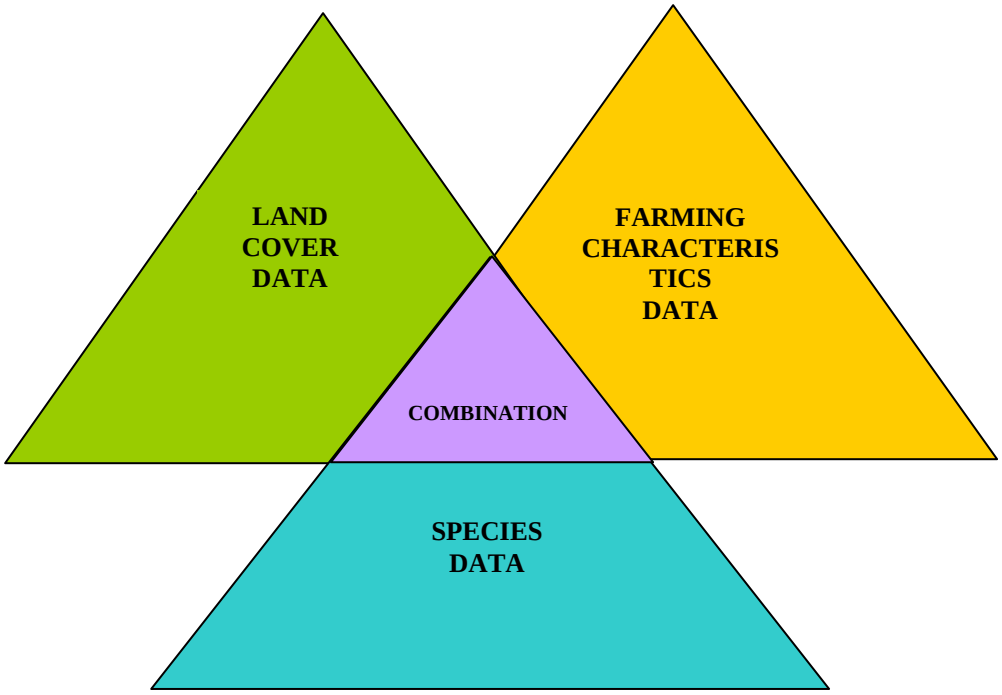
Drawing on the above descriptions, Step 2 involves developing a suite of indicators for the identification HNV farming, under the same three categories:

- Land Cover
- Farming Characteristics and Practices
- Species

A combination of indicators relating to these three categories can be used to provide an estimate of the extent of HNV farming (in hectares). This common approach to the

identification of HNV farming**,** drawing on EU and national data where available, is represented in Figure 2, and reflects the work developed under the IRENA operation (EEA, 2005; Paracchini *et al*., 2008). As the diagram illustrates, it may be useful to combine data from more than one category to create an indicator, but in many cases the data are better kept apart, as separate indicators. This is explained below.

Figure 2 A Common Approach to the Identification of HNV Farming



5.2.1 Identification of HNV Farming under Low-Intensity Livestock

The most widespread type of HNV farming consists of semi-natural vegetation under low-intensity livestock raising. In agronomic terms, this is semi-natural forage. Semi-natural forage is not always grassland; it may also include scrub, woodland, or a combination of different types.

Semi-natural forage types coincide with many of Europe's most valued habitats. The decline in their use for livestock raising, and their subsequent abandonment or conversion to other

uses (for example, afforestation or agricultural intensification), is a major reason for biodiversity decline.

Distinguishing semi-natural forage from other forage types is an important part of identifying HNV farming. Semi-natural forage types are those that have not been sown or artificially fertilised. They consist of spontaneous vegetation that is used for grazing or browsing, or as traditional hay meadows. Excessive stocking and/or manuring may reduce the biodiversity value of semi-natural forage. See Annex 6 for a summary of the range of forage types.

In some circumstances, grassland that has been resown and fertilised may revert after many years to a semi-natural state. The time this takes varies with the substrate and the surrounding vegetation and seed sources. The resulting sward may be qualitatively different from the original vegetation. Occasional manuring at very low levels may be considered compatible with a semi-natural state, for certain specific types of grassland.

A central aim of policy interventions to support HNV farming is to ensure the continuation of livestock-raising, at appropriate levels of intensity, on remaining areas of semi-natural vegetation. The two types of data most relevant for indicating the extent of land under HNV livestock raising are discussed below.

Land Cover Data for HNV Livestock Farming

The EEA has used CORINE land cover data to estimate the extent of HNV farming under semi-natural forage. Some Member States have followed a similar approach, using additional data to compensate for aspects of CORINE that make it imperfect for the identification of HNV farming. For example, the 'Pastures' category in CORINE does not distinguish more intensively managed pastures from those under less intensive management, such as traditional hay meadows. National inventories of semi-natural grasslands are available in several countries and can be used to provide a more accurate picture.

Even where national inventories of semi-natural vegetation exist, some regions have extensive areas of semi-natural vegetation that may be no longer under grazing use. Natural succession can take many years or even decades to produce detectable changes in vegetation on marginal land. In such situations, abandonment will only be revealed by land cover data long after the event. With current data sources, the total surface area of semi-natural vegetation under active farming use (grazing and mowing) is not recorded in most countries.

The Farm Structure Survey (FSS), the national farm census that informs this EU data base and the Land Parcel Identification System (LPIS), may provide relevant data on the area of land under different types of forage that are in current farming use. However, in many countries the categories of forage land do not distinguish semi-natural grassland from agronomically improved types[3].

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[3] For example, the category of Permanent Pasture as defined at EU level may include pasture that has been reseeded after five years, and that has been heavily fertilised (see Annex 6). Permanent Pasture, therefore, can extend to forage types that are of far less biodiversity value. Rough Grazing recorded under FSS is on poorer

Another important consideration is that semi-natural forage is often found off the farm holding, such as on common land, and so may not be recorded in agricultural statistics, for example, under FSS.

However, such land is declared on LPIS in many countries. Furthermore, some Member States (for example, Bulgaria) have combined semi-natural grassland inventories with LPIS in order to be able to distinguish semi-natural forage at the parcel level. This is a thorough approach which should permit a reasonably accurate calculation of the total area of semi-natural vegetation that is recorded as being under current farming use.

Data on HNV Livestock Farming Characteristics

In the absence of reliable statistics on the extent of semi-natural forage, average livestock density per hectare gives a strong indication of the productivity of a given area of vegetation, and thus of whether the vegetation has been reseeded and fertilised. Thus a very low LU/ha of forage at the farm level indicates that the main forage used by that farm is semi-natural.

To be meaningful, such data must be calculated at the level of the farm holding. Average livestock densities for an administrative area or region are not a reliable indication of HNV livestock farming, as they may hide great variations in the density of livestock across the area.

Data on livestock densities per hectare of forage at the level of the farm holding should be available from the FSS and IACS (Integrated Administration and Control System). For a given region, HNV livestock farms will be found in the lowest bracket of livestock densities. The minimum and maximum LU/ha that defines this bracket will vary according to the region. Where grazing land is mostly of low productivity, HNV farming may be in a range of approximately 0.1 - 0.3LU/ha, (the actual range that is used as an indicator must be determined according to regional and local conditions). Available research suggests that even in more productive regions, livestock farming based mainly on semi-natural vegetation is unlikely to exceed 1 LU/ha (Pointereau and Poux, 2007).

An estimate of the area of HNV livestock farming thus can be derived from the sum of all forage land declared by farms in this "HNV stocking bracket". However, to be applicable for this purpose, stocking density data must take account of all forage land, including off-farm grazing land, such as common grazings. Vast areas of semi-natural grazing land fall into this

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land and is more likely to be mostly semi-natural, but it excludes large areas of more productive semi-natural grassland. At the other extreme, Permanent Pasture may be interpreted as excluding scrubby and woody forage types, which often are of particular biodiversity value, because the definition refers only to *herbaceous* forage. In practice, what is included and what is excluded from the Permanent Pasture category depends on the interpretation of each Member State.

category, and if excluded, highly distorted figures will be produced. The use of this land is recorded in IACS, but not in FSS[4].

5.2.2 Identification of HNV Farming under Arable and Permanent Crops

HNV farming under arable and permanent crops covers more limited areas than HNV livestock systems, and is only found where arable and permanent crops are cultivated under traditional, low-intensity systems. For arable and permanent crops, there is no readily available indicator of HNV farming characteristics.

Land Cover Data for HNV Crop Farming

Whereas HNV livestock systems are characterised by a predominant land cover type (semi-natural vegetation) that can be identified in some instances through land cover data, this is not the case with arable and crop systems. Semi-natural vegetation should be present in these systems in order to be HNV, but this presence generally will be in the form of smaller patches and linear features which are not easily detectable from land cover data.

CORINE does not distinguish low-intensity arable and permanent crops from more intensive cropping systems, and so is not useful in this case. Other sources need to be explored, including national inventories and maps of specific types of land cover, for example, of traditional orchards.

Land cover data at a sufficient resolution, such as aerial photographs or satellite images, may allow the identification of mosaic farming patterns, of fallow land within the arable rotation, and of semi-natural farmland features. Suitable information systems could therefore be established in future.

[4] In order to interpret data on livestock densities in a given region, it is important to bear in mind other relevant information. For example, the quantity of purchased livestock feed consumed per LU in a region is highly relevant. An apparent increase in livestock densities on farms might be explained by an increased use of purchased feeds, rather than an increased level of stocking on the local forage resource. Also relevant is the number of days of off-farm grazing by livestock in a region, data that are recorded in some agricultural statistics. A decline in this figure would indicate a decline in the use of one important category of semi-natural forage.

Data on HNV Crop Farming Characteristics

Arable Crops

The relevant characteristics for arable cropping are low input use (especially N and biocides), low yields and a high proportion of fallow, as commonly found in drier parts of southern Europe. Fallow land is recorded on FSS, and probably is the most widely available indicator of HNV characteristics. Unfortunately, however, data on input use and actual yields generally are not available. Yield classes for districts were defined under the previous CAP arable regime for payment calculations. Possible approaches to identifying HNV arable baselines using fallow and yield indicators are discussed below.

A high proportion of fallow land in the arable rotation is an *a priori* indication of potential nature value. It suggests a low-intensity cropping system, while the fallow area itself is potentially a valuable habitat for a range of flora and fauna, especially if a spontaneous cover is allowed to develop for several months. In Iberia, certain species, such as Sandgrouse (*Pterocles alchata*), are found mostly in districts with an average fallow percentage of 20 - 60 per cent. However, the Great Bustard (*Otis tarda*) is found frequently in areas with only a small average percentage, <12 per cent (Andersen *et al*., 2003).

Therefore it is not appropriate to define a single threshold value to determine when arable farming is or is not HNV, on the basis of the proportion of fallow. Depending on where the line is drawn, it will either exclude significant areas of more intensive land that continues to harbour species of conservation concern, or it will include intensive areas of little nature value. A better approach is to group arable systems into two or three categories, according to the proportion of fallow recorded on FSS. Appropriate values for a region should be determined on the basis of the Step 1 analysis.

District yield classes may be used to provide a broad estimate of the area of arable land that is potentially HNV. For example, a threshold value of < 2,500 kg/ha would indicate low intensity dryland systems in Iberia (Andersen *et al*., 2003). As explained above - where fallow is discussed as an indicator - a single threshold probably is not appropriate. For example, a threshold of 2,500 kg/ha would exclude some important bird areas, whereas a higher threshold would include large areas land with low nature value. Therefore, a range of classes could be established with appropriate values determined on the basis of the Step 1 analysis.

These data can form part of the basket of baseline indicators for HNV arable farming, whose monitoring over time will reveal trends in HNV arable characteristics.

Permanent Crops

The relevant HNV permanent crop characteristics are: large old trees in production, presence of a semi-natural understorey (which should be present for all or most of the year, although it

may be absent from late spring to autumn in drier regions of southern European), low input of N and biocides, and low yields. Irrigation is absent.

Unfortunately, data on input use and actual yields generally are not available, although non-irrigated plantations can be distinguished through FSS and LPIS. Data on the age of trees and on the characteristics of the understorey are not available. In some Member States, partial information is available, for example, in Bulgaria, farmers participating in an agri-environment scheme for traditional orchards are required to confirm that trees are above a minimum age, and that management practices are appropriate for a semi-natural understorey. This information could be recorded in FSS and LPIS for future monitoring.

5.2.3 HNV farming not captured by data on land cover and farming characteristics

Existing data sources on land cover and farming characteristics will afford only an approximate picture of the extent of HNV farming. Because available data sources are inadequate, significant tracts of farmland of importance for biodiversity may be overlooked. Data on species distribution where this is available can be used to supplement data on land cover and farming characteristics.

Furthermore, in certain situations, it is possible for more intensive farmland to continue to support important populations of species of conservation concern, even if its characteristics of farming intensity and land cover do not suggest HNV farming. For example, the more intensively farmed cereal steppes in Spain and Portugal that continue to maintain populations of species such as Great Bustard (*Otis tarda*) (Andersen *et al*., 2003; Moreira *et al*., 2004).

The presence of important species populations may be a sufficient indicator to identify this type of HNV farmland, however, as with all data sources, species inventories have their weaknesses, as only certain species and areas have been studied in sufficient detail.

Different suites of species should be used to identify different types of HNV farming. The text box below shows possible groups of bird species as indicators for HNV steppelands in north east Spain. Steppes with a greater proportion of semi-natural vegetation and higher degree of mosaic require different species indicators from steppes that are predominantly under cereal cropping.

Characteristics of HNV Steppeland	**Bird Species as Possible Indicators**
High proportion of semi-natural scrub, small proportion of arable, highly diverse mosaic	Dupont's Lark, *Chersophilus duponti* Lesser Short-toed Lark, *Calandrella rufescen* Spectacled Warbler, *Sylvia conspicillata*
Mix of cereal cropping and semi-natural grassland, medium mosaic	Little Bustard, *Tetrax tetrax* Pin-tailed Sandgrouse, *Pterocles alchata* Black-bellied Sandgrouse, *Pterocles orientalis* Greater Short-toed Lark, *Calandrella brachydactyla* Black Wheatear, *Oenanthe leucura*
Predominantly cereals, less semi-natural vegetation, limited mosaic	Common Quail, *Coturnix coturnix* Lesser Kestrel, *Falco naumanni* Great Bustard, *Otis tarda*

5.2.4 Identification of HNV Features

Whilst most HNV farming comprises large tracts of semi-natural grazed vegetation, there are also smaller semi-natural features which contribute biodiversity value in more intensively farmed landscapes. If a feature is of a high enough habitat quality to be a habitat of conservation concern, and is present at sufficient density and with adequate connectivity to support species of conservation concern, it can be regarded as an HNV feature.

The presence of HNV features in intensive landscapes is important, as they provide feeding, nesting and breeding sites for a range of farmland species. However, by themselves, these features do not qualify intensively managed farmland as HNV. Where similar types of feature sit within more extensively managed land, they will normally be of higher nature value because of the complex interrelations of species and habitats.

As with HNV farming, Step 1 involves identifying HNV features by gathering information both on the main farmland features in a region or Member State.

Drawing on available evidence, Step 2 involves identifying the key characteristics of these features - such as their size, density, connectivity, degree of naturalness or management - that make them important for biodiversity (Hinsley and Bellamy, 2000; Cory and Iveson Nassauer, 2002; Benton *et al*., 2003), as well as identifying the species of conservation concern that are associated with them. For example, in Dobrogea, Romania, lines of trees provide roosting sites for the Red Footed Falcon (*Falco vespertinus*), cited in Annex 1 of the Birds Directive (Arblaster, 2008). In France, 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). In the UK, for example, hedgerows are the primary habitat for at least 47 species of conservation concern, including 13 globally threatened or rapidly declining ones. They are

especially important for butterflies and moths, farmland birds, bats and dormice (Eaton, 2008).

With data on the density, distribution and condition of features limited in many Member States, a quantitative measure will be difficult to generate in practice, although monitoring data are available. Some Member States have national inventories of features but these are based on sample surveys and so do not provide a complete picture of the total stock of features. In addition, they say little about the condition of the features or about the species they support.

Data sources would need to be developed further to allow an identification of the entire stock of HNV features in a given Member State or region. Aerial imagery provides a potentially important tool to assess the extent of farmland features, and features could also be specified on LPIS. Systematic sample surveys would be necessary to assess the condition and biodiversity value of a given feature.

5.3 Assessing Quantitative Changes in HNV Farming

To summarise the above review, Table 2 shows the range of characteristics that indicate HNV farming in the case of land under livestock, arable and permanent cropping, respectively. From these characteristics, indicators should be devised for assessing a baseline situation of HNV farming in a region or Member State, and subsequently for monitoring trends in the extent and condition of HNV farming.

This is not a straightforward process. Most data sources that are currently available still have considerable drawbacks, since they were not designed for the purpose of identifying HNV farming. Nevertheless, Member States and/or regions have been required to produce a baseline estimate of the extent (in hectares) of HNV farming for submission in their rural development programmes.

The HNV Baseline Indicator is intended to provide an estimate of the extent of land under HNV farming in a Member State or region at the start of the 2007 – 2013 rural development programmes. This is an important starting point for the formulation of support measures, as it gives an indication of the scale of the resource that needs to be addressed, as well as to be maintained and developed. The IRENA operation has provided first estimates for the EU-15 Member States (EEA, 2005). Based on EU and national land cover and biodiversity data these estimates should be regarded as provisional and efforts are ongoing to develop data on farming systems as a complement to land cover and species data. Further improvements in HNV farmland estimates can be achieved only through investments in the requisite data at national and EU level.

In order to produce a more precise reference level, the ideal approach would be to develop indicators that combine the different aspects of HNV farming covered in the first three columns of Table 2 – low intensity characteristics, semi-natural vegetation and features, and

diversity of land cover. These reflect the three key characteristics of HNV farming described in section 3.

This is especially desirable in the case of crop farming, since one characteristic (such as low input use, or the proportion of land under fallow or under and semi-natural cover), is not a sufficiently reliable indicator for HNV. Under a robust assessment, arable land should have a combination of characteristics in order to be considered HNV. An ideal HNV arable indicator therefore would combine different sources of data, to check that a given area of land has all of the required characteristics.

Table 2 Characteristics that Indicate HNV Farming and Associated Indicators

	POTENTIAL QUANTITATIVE AND QUALITATIVE HNV INDICATORS			POTENTIAL QUALITATIVE HNV INDICATORS
	Low-intensity characteristics	**Semi-natural vegetation and features**	**Diversity of land cover**	**HNV practices**
HNV livestock	Extent of farmland with low LU/ha of forage, measured at holding level, including off-farm grazing.	Extent of semi-natural grazing including grass, scrub and wooded pasture. This is often partly or entirely off the holding. Traditional hay-meadows. Features can include hedges, stone walls, trees, watering points.	Diversity of forage types at holding level. Small modal parcel or plot size. Length of edges between parcels or plots. Features can add an element of diversity to land cover.	Late cutting of hay-meadows. Use of grazing land off the holding. Shepherding (especially in southern and eastern EU). Condition of relevant species populations.
HNV arable	Low N and biocide input per arable ha, measured at holding level. Low average yield / ha. High proportion of fallow land in arable rotation.	Semi-natural pasture and/or meadows adjacent to arable parcels. Features can include semi-natural patches, field margins, hedges, stone walls, trees, water bodies.	Diversity of crop types at holding level, including grazing land. Small modal parcel or plot size. Length of edges between parcels or plots. Features can add an element of diversity to land cover.	Fallows of > 1 year with minimal intervention. Use of traditional local cultivars. Grazing on stubbles and fallows. Condition of relevant species populations.

HNV permanent cropping	Low N and biocide input per crop ha at holding level. Low average yield / ha.	Large, old trees/vines in production. Semi-natural understorey for all or most of the year. Features can include semi-natural patches, field margins, hedges, stone walls, trees, water bodies.	Diversity of crop types at holding level, including grazing land. Small modal parcel or plot size. Length of edges between parcels or plots. Features can add an element of diversity to land cover.	Grazing of understorey. Late tillage (southern EU) or late mowing of understorey. Understorey is spontaneous, not sown. Condition of relevant species populations.
HNV not captured by the above characteristics	Distribution on farmland of wildlife species of conservation concern. Mostly bird and butterfly species using farmland that does not meet the usual HNV characteristics of low intensity, semi-natural vegetation or mosaic.			Relevant practices should be defined for the species present.

However, the current reality is that available data sources may not allow the combination of data into complex indicators, because the required information is not recorded, and/or because the different data bases are not compatible. Therefore it may not be possible to generate a single indicator of the extent (in hectares) of HNV farming in a Member State or region. A more pragmatic approach is to use a basket of separate quantitative indicators, as explained below.

For example, there are two possible indicators of the extent of HNV livestock farming (see previous section):

- Extent of semi-natural land used for grazing and/or mowing from land cover data.
- Extent of forage declared by holdings in the appropriate range of livestock densities per hectare of forage, from farm statistics.

Because of the weaknesses of the data sources, neither of these indicators can be applied in order to determine the precise extent of HNV livestock farming. In addition, because data sources are not compatible, they cannot be combined to indicate and monitor the livestock density specifically on semi-natural vegetation. Rather they provide two distinct tools which indicate an approximate baseline of HNV low-intensity livestock farming. These two baseline figures can be monitored in parallel to provide a quantified assessment of how this type of farming is evolving.

Similarly, data on the extent of arable land with a proportion of fallow within defined thresholds can provide one indication of the extent of arable land that is likely to be HNV. Species distribution data can provide an indication of the extent of farming that harbours populations of certain taxa, such as butterflies or birds. Member States may consider, for example, drawing on these two data sources to provide two distinct HNV baseline figures, which can be monitored over time.

In the case of farmland features, the baseline may need to be distinct from the HNV farming baseline. There may even be more than one baseline figure for features. For example, one quantitative measure of HNV features may be the total length of HNV field margins (in kilometres), while another could be the number or surface area of HNV water bodies or ponds. It is not appropriate to add such indicators together to create a single figure.

These may be viewed as a basket of indicators - providing a number of discrete, quantitative estimates (see Table 3 below). The aim in Table 3 is to illustrate a possible suite of different quantitative indicators, depending on the availability of data, which in combination afford a more detailed picture of quantitative trends in HNV farming.

Table 3 A Schematic Example of the Use of Different Quantitative Measures of HNV Farming

Indicator	**Measurement**
Indicators for the identification of HNV farming may be based on 3 core characteristics (low intensity, semi-natural vegetation and diversity of land cover) for: - HNV semi-natural forage - HNV arable - HNV permanent cropping Use of species indicators where appropriate.	Possible quantitative measures of HNV farming: - Number of hectares of semi-natural land used for grazing and/or mowing - Number of hectares of forage declared by holdings in the appropriate range of livestock densities per hectare of forage - Number of hectares of arable land with a proportion of fallow and semi-natural vegetation within defined thresholds - Number of hectares of HNV permanent cropland with trees in production over a defined age threshold and with a semi-natural understorey - Number of hectares of farmland with a density of semi-natural features within defined thresholds - Number of hectares of HNV farmland which harbour populations of certain taxa of conservation concern, or European or global populations.
Indicators for the identification of HNV features.	Quantitative estimates of extent of HNV features, (for example): - Length of HNV hedgerows or other semi-natural field margins (quality must be defined) - Area of HNV water-bodies (quality must be defined).

5.3.1 An Evolving Reference Level

Given the provisional nature of existing baseline estimates, the reference level against which quantitative and qualitative changes in HNV farming are measured is likely to evolve over time through improvements and investments in additional sources of data. This will allow a more in-depth picture of both quantitative and qualitative trends in the HNV resource to be generated.

In order to produce a more precise reference level, ideally, it is recommended that indicators should be developed that combine the different aspects of HNV farming – low intensity characteristics, semi-natural vegetation and features, and diversity of land cover. These reflect the three key characteristics of HNV farming described in section 3.

However, as previously stated, the current reality is that available data sources may not allow the combination of data into complex indicators, because the required information is not recorded, and/or because the different databases are not compatible. The adaptation of existing data bases needs to be considered for more accurate and meaningful estimates of the extent of HNV farming in the future. In particular, agricultural data bases could be adapted to:

- Distinguish between more intensively used grassland and semi-natural types, by adapting the forage categories used. Some countries already make these distinctions and have incorporated them into the LPIS.
- Record the extent of forage land off the holding, including common grazing land.
- Record relevant farming characteristics in arable cropping, such as use of nitrogen and biocides, proportion and length of fallows.
- Record relevant farming characteristics in permanent cropping, such as approximate age of trees, use of nitrogen and biocides, and presence of semi-natural understorey.
- Record the presence of farming features of particular biodiversity value, including semi-natural patches and field margins.

5.3.2 Ground-Truthing the Applicability of the Indicators

When developing national or regional indicators for HNV farming (as well as for forestry), it is important to ground-truth them at the local level in order to test the accuracy and sensitivity of the indicators. This can be achieved by conducting a number of case studies at sites which have been selected because they are regarded as typical of HNV farming across a wider area. A precise assessment can be undertaken in a given locality of how much HNV farming there is and of what type, which may then be compared against figures generated through national indicators for the same locality.

Given that case studies are qualitative and context specific, it is not appropriate to conduct one case study in a single region, rather a selection of varying case studies should be conducted to generate a more informative picture.

5.4 Assessing Qualitative Changes in HNV Farming

An estimate of the number of hectares under HNV farming and of any changes over time will provide a limited insight into the extent to which this resource is being maintained and developed. Even a basket of indicators detecting changes in the extent of HNV farming will give only a partial indication of how HNV farming is evolving, given that data sources are far from perfect. Indicators of qualitative change are needed in order to provide a more complete picture of trends in HNV farming. These should draw on data that relate to the farming characteristics or practices that have been identified as most significant for the Member State or region.

Assessing changes in the condition of HNV farming - described as Step 3 in the schematic approach - therefore, is an important aspect of the monitoring and evaluation of the impact of rural development programmes if potentially irreversible changes in farming practices and declines in the associated biodiversity are to be detected.

In order to monitor qualitative changes in HNV farming, two aspects need to be addressed:

- Changes in HNV farming practices
- Changes in the ecological condition (species populations and habitats) of HNV farmland.

In an ideal situation, these aspects would be monitored using comprehensive data on farming practices and nature values across a region or country. However, the data sources available generally do not permit such an approach and establishing comprehensive biodiversity monitoring systems is resource intensive. Instead, a case study or stratified sampling approach can be used for the assessment of changes in species and/or habitats and in farming practices, respectively.

A survey, drawing on a stratified random sample, may be designed to provide representative statistics on agricultural holdings at regional and national levels (see, for example, Regulation (EC) No 1166/2008 of the European Parliament and of the Council on farm structure surveys and the survey on agricultural production methods). Surveys of this nature should aim to monitor trends in farming practices which are typical of different types of HNV farming. Relevant practices (depending on the region and farming system) could include shepherding and transhumance, the use of remote pastures, traditional late hay cutting, the use of long fallows in dryland arable rotations, allowing the development of a semi-natural understorey in permanent crops, or the sympathetic management of HNV features such as hedges. A sample survey of these and other relevant practices will give an indicative picture of how HNV farming is evolving over time.

Changes in the ecological condition of HNV farming may be assessed using a number of species indicators to provide broad contextual trends. Indeed, trends in the population sizes of these species, measured as the abundance of individuals, provides an indication of the changes in the ecological condition of different types of HNV farming over time.

To carry out species monitoring of this nature, it is important to identify species of European, national and regional conservation concern associated with HNV farming which may be plant species; vertebrates, including birds; invertebrates, including butterflies; and fungi, depending on data availability. The selection of species should not be limited to the most threatened or emblematic species, rather, it is important to select suites of plant and animal species that are considered to be indicators of habitat quality on the basis of expert judgement. See Annex 8 for a list of farmland bird and butterfly species of European conservation concern which may help to inform the selection of relevant species.

The more precise, frequent and widespread the monitoring of the abundance of the selected taxa, the more useful it is in establishing the condition of HNV farming, although a less rigorous but potentially more immediately operational approach can be developed. If no other options are available, a first step could build on the use of expert judgement and a sampling approach, including case studies, where monitoring schemes are conducted at individual sites which have been selected because they are in some way typical of broader HNV farming systems. However, a proper evaluation should ideally be based on representative and comparable monitoring data.

6 DEVELOPING THE HNV FORESTRY INDICATORS

The High Nature Value concept was first applied to forestry in the context of the EAFRD Strategic Guidelines. As such, there has been no systematic identification of HNV forestry across Europe, and an approach for doing so does not yet exist. Given the immaturity of the concept, therefore, the process of identifying HNV forestry is likely to lag behind that of HNV farming.

A similar concept, however, has been developed over the last decade - High Conservation Value Forests (HCVF) - which means that there is some precedent. This term originated in the certification criteria of the Forest Stewardship Council (FSC) and is defined as 'forests of outstanding and critical importance due to their high environmental, socio-economic, biodiversity or landscape values'. Data on forests have been collected under the auspices of The Ministerial Conference on the Protection of Forests in Europe (MCPFE) which has developed a number of forest indicators, including Indicator 4.3, which assesses the degree of forest naturalness.

Reflecting the definition of HNV farming and HNV features, HNV forestry can be defined as all natural forests and those semi-natural forests in Europe where the management (historical or present) supports a high diversity of native species and habitats and/or which support the presence of species of European, and/or national, and/or regional conservation concern.

As set out in Table 4, forests can be classified according to the following categories which have been used to assess the degree of forest naturalness under the MCPFE Indicator 4.3: Plantation, Semi-Natural Forest and Naturally Dynamic (EEA, 2006).

Table 4 Three Categories of Forest Type and their Relationship with HNV

Forest Types	Definition	HNV Status
Plantation Forests	Forest stands are established by planting and/or seeding in the process of afforestation or reforestation. They are either composed of introduced species (all planted stands), or intensively managed stands of indigenous species which meet all of the following criteria: one or two species in the plantation, even age class, regular spacing. This excludes stands which were established as plantations but which have been without intensive management for a significant period of time. These should be considered as semi natural.	Not HNV
Semi-Natural Forests	These are non-plantation forests whose natural structure, composition and function are, or have been, modified through anthropogenic activities. Most European forests with a long management history belong to this category.	HNV Forestry
Naturally Dynamic	These are forests whose composition and function have been shaped by the dynamics of natural disturbance regimes without substantial anthropogenic influence over a long time period.	

As with the development of HNV farming indicators, Step 1 involves identifying the main types of forests of high nature value in a given Member State or region. An overview based on expert knowledge can provide a summary of the relevant forest types, their main ecological and management characteristics, and the key species and habitats associated with them. Drawing on this description and characterisation, a range of possible indicators for the identification and monitoring of HNV forestry can be considered.

In broad terms, all naturally dynamic forests are HNV. Plantation forests are not HNV in their current state. These types should be identifiable using inventories of forest types.

Semi natural forests are a less straightforward category. The HNV status of a semi-natural forest is a function of its state and the present day and/or historical management regime. Management may mimic natural processes, or comprise cultural practices that are known to favour biodiversity and species or habitats of conservation concern.

6.1 Assessing Quantitative Changes in HNV Forestry

Whilst Member States and/or regions have been required to produce a baseline estimate of the extent of HNV farming for submission in their rural development programmes, a baseline estimate of the extent of HNV forestry does not yet exist in many Member States as it is not included in the CMEF Baseline Indicator 18. Member States are encouraged to develop a quantitative baseline measure of HNV Forestry as soon as possible to provide a reference point against which to assess any changes that may occur over the course of the current programmes.

Given the absence of a baseline figure for forestry, the reference level against which quantitative and qualitative changes in HNV forestry are measured is likely to evolve over time through continuous improvements and investments in additional sources of data.

To determine whether a forest is HNV, a single indicator may not always be sufficient and instead, a range of indicators may be used separately, each affording a distinct insight into the approximate extent of HNV forestry at a given point in time. Such indicators do not always lend themselves to being combined in a single formula. As with HNV farming, these may be viewed as a basket of indicators - providing a number of discrete, quantitative estimates (see Table 5 below). It is not suggested that all of these measures are used, rather the aim in Table 5 is to illustrate a possible range of different quantitative measures, depending on the availability of data, which in combination afford a more detailed picture of quantitative trends in HNV forestry.

Forest inventories may provide an indication of the extent of certain types of natural and semi-natural forestry, and thus to produce estimates of the number of hectares of HNV forestry at a given point in time.

In addition, data on the distribution of species may provide an indication of the number of hectares of forest that are of particular value for certain taxa, such as butterflies or birds. Again, this can provide an indication of the extent of a certain type of HNV forest that can be monitored over time.

Exhaustive data may not be available for the whole territory, although relevant data will be available through indicators developed under the auspices of The Ministerial Conference on the Protection of Forests in Europe (MCPFE) and the SEBI 2010 process, as well as through the reporting requirements on the Member States as set out under Article 17 of the Habitats Directive. Systematic sampling can also be used to gather data from a range of situations across a region or country, although the interpolation of broader trends should be conducted with caution.

Table 5 A Schematic Example of the Use of Different Quantitative Measures of HNV Forestry

Indicator	Measurement
Indicators for the identification of HNV forestry for: - Natural forestry - Certain types of semi-natural forestry Use of structural and species indicators as appropriate, e.g. deadwood, old trees, vertical diversity.	Possible quantitative measures of HNV forestry: - Number of hectares of natural and semi-natural HNV forestry - Number of hectares of HNV forest valuable for certain taxa.

6.2 Assessing Qualitative Changes in HNV Forestry

As with HNV farming, a single or a basket of numerical indicators will afford only a partial indication of how HNV forestry is evolving, given that data sources are far from perfect. They are likely to mask fundamental changes in management that could be critical for the maintenance of biodiversity.

In order to detect any significant changes in the management of forestry, a sample survey approach could be used to monitor trends in management practices which are associated with different types of HNV forestry. This is a qualitative approach designed to monitor qualitative changes in HNV forestry.

The sample survey approach is appropriate for monitoring changes in key characteristics, such as:

- The volume of standing or lying deadwood, measured in metres^3/hectare[5]
- The density of large trees, in the proportion of trees that are older than the age of economic maturity
- The degree of forest fragmentation over time, measured in terms of the mean forest patch size
- The condition and species composition of the understorey.

5 A measure of the volume of standing and lying deadwood in the forest should be used with care in southern Member States, where an accumulation of lying deadwood may also increase the threat of forest fires.

All or a selection of these characteristics may be monitored to give an indicative picture of changes in management over time.

It should be noted that these characteristics are not appropriate for capturing changes in the condition of traditional forest coppicing systems and a species approach - described below - may be more relevant.

In the absence of data on current management, changes in the ecological condition of HNV forestry may be assessed using a number of species indicators to provide broad contextual trends. This approach is particularly relevant for traditional forest coppicing systems. A significant number of species of European conservation concern inhabit or utilise coppiced forests throughout Europe, for example, many species of bats, the Common dormouse (*Muscardinus avellanarius)* or the Hazel grouse (*Bonasa bonasia*). Data on the distribution and habitat needs of such species would help to identify HNV coppice systems as well as suitable indicators for monitoring the appropriateness of management regimes in such forests.

To carry out species monitoring of this nature, it is important to identify species of European, national and regional conservation concern associated with HNV forestry which may be plant species; vertebrates, including birds; invertebrates, including butterflies; and fungi, depending on data availability. The selection of species should not be limited to the most threatened or emblematic species. Rather it is important to select suites of plant and animal species that are considered to be indicators of habitat quality on the basis of expert judgement.

Trends in the population sizes of these species, measured as the abundance of individuals, provides an indication of the changes in the ecological condition of different types of HNV forestry over time.

The more precise, frequent and widespread the monitoring of the abundance of the selected taxa, the more useful it is in establishing the condition of HNV forestry, although a less rigorous but potentially more immediately operational approach can be developed. As a first step, expert judgement and a sampling approach, including case studies (as described in Section 5.3.2), can be employed where monitoring schemes are conducted at individual sites which have been selected because they are in some way typical of broader HNV forestry systems.

7 IMPACT OF RURAL DEVELOPMENT PROGRAMMES ON THE HNV RESOURCE

There are a number of challenges to assessing the impact of rural development programmes (RDPs) on the HNV farming and forestry resource of a given Member State or region. First, within a given programme, there are likely to be differences in the way in which quantitative estimates of HNV farming and forestry are generated at the start and at the end of the programme. Second, the capacity to assess changes in the condition of HNV farming and forestry is constrained by the lack of available data at the present time and so any assessments

of such changes are likely to be qualitative and thus should be interpreted by specialists. And third, there are inherent difficulties in evaluating what proportion of the changes observed may be attributed to the interventions under the programmes and what proportion result from other factors.

In some rural development programmes, a precise baseline figure of the extent of HNV Farming (hectares) does not yet exist. Certain Member States have used figures based on CORINE land cover data. This provides an approximate estimate of HNV farming, but the drawbacks inherent in the European datasets mean that it does not provide an accurate baseline figure in individual Member States and regions for the purpose of monitoring quantitative change. Other Member States have used the area of agricultural land within Natura 2000 sites or within the LFA as an estimate of the extent of HNV Farming. Neither approach fits well with the HNV farming concept.

It is recommended that programme evaluators should treat the original figures in the RDPs as a provisional baseline. Indeed, because data sources do not permit a precise estimate of the HNV Baseline surface area at present, any indication of quantitative changes must be interpreted with care as some may be an artefact of differences in approach. Caveats setting out some of the potential limitations of the approach used for these early estimates, along with a clear documentation of data sources, should be noted.

This document has served to highlight that simple numerical indicators cannot be devised that will indicate how rural development programmes are impacting on HNV farming and forestry. Rather, it is a question of using baskets of indicators to gather an understanding of how HNV is evolving, and then of using expert judgement to assess the role rural development measures may be playing in this evolution. Multiple indicators may reveal conflicting trends, however, with some indicators pointing to a maintenance of the extent and condition of certain aspects of HNV farming and forestry, whereas others indicating a decline, or improvement in the resource. Programme evaluators will need to use their expert judgement and draw on all of the available information to make an informed assessment of the impact of the programme.

The estimate of impact should reflect only that proportion of the change over time which may be attributed to the programme once the baseline trend and other factors have been taken into account. This requires an understanding of the causality between rural development interventions and any changes in the HNV resource, derived in part from a consideration of the counterfactual. Because indicators are fairly blunt tools, the impact indicators alone will not be sufficient to capture these complex relationships. The indicators are also likely to reflect changes in the environment arising from a variety of driving forces and decisions by different actors. The extent to which the changes observed can be attributable to rural development programmes will need to be inferred by programme evaluators on the basis of evidence available to them.

Effective monitoring of changes in HNV farming will require the adaptation and development of existing data bases, particularly for assessing quantitative change. Furthermore, the establishment of new sample surveys is likely to be necessary to capture

changes in HNV farming practices and in associated nature values. Only an investment in appropriate data collection and monitoring schemes will ultimately allow a full evaluation of the benefits or negative impacts of rural development programmes on HNV farming and forestry.

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ANNEXES

Annex 1 Glossary of Key Terms and Acronyms

CMEF	Common Monitoring and Evaluation Framework.
CORINE	Coordinate Information on the Environment (CORINE Land Cover Project)
EAFRD	The European Agricultural Fund for Rural Development.
EEA	European Environment Agency
EU SDS	EU Sustainable Development Strategy
FSC	Forest Stewardship Council
FSS	Farm Structure Survey
HNV Farmland	High Nature Value farmland comprises those areas in Europe where agriculture is a major (usually the dominant) land use and where that agriculture supports or is associated with either a high species and habitat diversity, or the presence of species of European conservation concern, or both. In the context of the evaluation of rural development programmes, this EU-wide definition may be modified to include those areas in Europe where agriculture is a major (usually the dominant) land use and where that agriculture supports or is associated with either a high species and habitat diversity, or the presence of species of European and/or national, and/or regional conservation concern, or both. This document uses the term HNV *farming* consistently throughout the text as a means of referring both to the land use (farmland) and the associated management practices. This is important in the context of the evaluation of rural development programmes, where measures impact both on farming practices, and via these, on the land itself.
HNV Feature	An HNV feature supports the presence of habitats and species of European, and/or national, and/or regional conservation concern whose survival depends on the maintenance or continued existence of the feature.
HNV Forests	All natural forests and those semi-natural forests in Europe where the management (historical or present) supports a high diversity of native species and habitats, and/or those forestry which support the presence of species of European, and/or national, and/or regional conservation concern. This document uses the term HNV *forestry* consistently throughout the text as a means of referring both to the land use (forest) and the associated management practices. This is important in the context of the evaluation of rural development programmes, where measures impact both on forestry practices and via these, on the land itself.
HCVF	High Conservation Value Forests are forests of outstanding and critical importance due to their high environmental, socio-economic, biodiversity or landscape values.

IACS	Integrated Administration and Control System
IRENA	Indicator Reporting on the Integration of Environmental Concerns into Agriculture Policy (a joint activity between DG Agriculture, DG Environment, Eurostat, the EU Joint Research Centre and the European Environment Agency for developing a common set of EU agri-environment indicators).
LFA	Less Favourable Area
LPIS	Land Parcel Identification System
LU	Livestock Unit
MCPFE	Ministerial Conference on the Protection of Forestry in Europe.
PEBLDS	Pan-European Biodiversity and Landscape Strategy
RDP	Rural Development Programme
Traditional Agricultural Landscapes	Traditional Agricultural Landscapes in Europe are typically derived from historic - frequently family and/or subsistence-style - farming methods where the dominant cultural landscape characteristics are the result of a traditional or locally adapted approach to management. In general, these farming systems are characterised by the presence of farming features, whose distribution will be regionally and/or locally specific, which contribute to the landscape's aesthetic qualities as well as to supporting its ecological integrity.
UAA	Utilised Agricultural Area
UNEP	United Nations Environment Programme

Annex 2 Rural Development Measures with A Potential Impact HNV Farming and Forestry

All rural development measures which have been identified in the indicator fiches of the Common Monitoring and Evaluation Framework as having the potential to support the maintenance of HNV farming and forestry are listed in the table below. They are all Axis 2 measures. Although not identified as having a direct impact in the indicator fiches, certain measures under Axis 1 (such as the training and advice measures) may have a positive effect if targeted at environmental land management. In assessing the impact of the whole programme, programme evaluators should also take account of any measures which may exert a negative effect.

In considering the impact of the rural development programme on the maintenance of HNV farming and forestry in a given Member State or region, programme evaluators should take account of the whole suite of measures which potentially impact on the extent and condition of HNV farming and forestry.

Measure
211 Natural handicap payments to farmers in mountain areas
212 Payments to farmers in areas with handicaps, other than mountain areas
213 Natura 2000 payments and payments linked to Water Framework Directive
214 Agri-environment payments
216 Support for non productive investments
221 First afforestation of agricultural land
222 First establishment of agro-forestry systems on agricultural land
223 First afforestation of non-agricultural land
224 Natura 2000 payment
225 Forest environment payments
226 Restoring forestry potential and introducing prevention actions
227 Support for non-productive investments

Annex 3 The Relationship Between Farming and Biodiversity

Since the end of the last ice age, Europe's natural environment has been shaped by human activities, and particularly by farming. The loss of "naturalness" caused by the rise of agriculture was compensated for, in biodiversity terms, by the emergence of open, semi-natural habitats, and the increases in habitat diversity per area resulting from mixed farming landscapes. The mosaic of habitats resulting from traditional farm management favoured the diversity of plant and animal species across Europe (Tubbs 1977; Plachter 1996; 1998). It is estimated that 50 per cent of all species in Europe depend on agricultural habitats, including a number of endemic and threatened species (Kristensen 2003).

At the present time, farming in Europe ranges from the most intensive production systems, typically on more fertile land, to very low-intensity, more traditional land uses, usually found on poorer land. The differences in intensity are enormous. Nitrogen inputs range from zero to several hundred kg/ha/year; arable yields from less than 1 t/ha to over 10 t/ha; olive yields from less than 0.5 t/ha to over 8t/ha; and livestock densities from as low as 0.1 Livestock Units (LU) per hectare to 5 LU or more.

Typically, the highest levels of species richness are associated with semi-natural habitats, under low intensity management. This is explained in Grime's classic hump-backed model which depicts the relationship between species richness and levels of disturbance (Grime 1973; 1979; Oba *et al*., 2001). Low-medium levels of disturbance, such as those generated through low intensity agricultural management, introduce a greater variety of niches and provide greater colonisation opportunities for a wider range of species.

Only a limited number of species are adapted to high levels of disturbance, associated with intensive forms of land use, and hence the overall species richness is relatively low. At the other end of the scale, where there are very low levels of disturbance - associated with conditions of land abandonment - a relatively limited number of plant species, with the capacity to outcompete others, tend to dominate. Both extremes result in relatively homogeneous vegetation types which limit the possibility of colonisation and growth by other species.

Whilst most farming biodiversity is associated with semi-natural vegetation under low intensity grazing or mowing, some more intensive agricultural landscapes are punctuated with farmland features, certain of which are beneficial for biodiversity, providing nesting and breeding sites, food sources and migratory corridors.

Furthermore, certain more intensively managed farmland areas can support large populations of species important for nature conservation. Examples include the intensively managed wet pasture in Denmark and the western Netherlands, which support important populations of breeding waders and wintering wildfowl, such as the black-tailed godwit (*Limosa limosa*) (Andersen *et al*., 2003). There are a number of reasons for this. Under these specific circumstances, the farmed land provides a specific habitat and especially feeding (and breeding) opportunities that are exploited by a limited number of species - almost exclusively birds - as a substitute for a natural habitat. Certain bird species will tolerate, or even benefit

from, habitats found on productive, relatively intensively managed farmland where there is little botanical diversity coupled with high-yielding crops which are compatible with feeding or breeding conditions.

In recent decades, there has been a marked decline in biodiversity across European farmland. This has arisen primarily through the industrialisation of agriculture, resulting in farm specialisation, increased farm size, and mechanisation. Simplification of the landscape has occurred, replacing the systems of multiple use that predominated in the past. These changes happened first and most intensely in the lowlands of northwest Europe on the best land, such as in southern England, northern France, Belgium, Netherlands and Germany. However, the wider availability of technologies, and more recently the influence of market forces and public policy, have meant that the trend has spread to all but the least accessible areas and the poorest land.

Another cause of the decline in agricultural biodiversity in recent years has been the progressive marginalisation and abandonment of agricultural land caused by physical or climatic handicaps and wider socio-economic changes. Agricultural land abandonment can have a detrimental affect on biodiversity as many of the farmland habitats of high nature value need to be actively managed to maintain them, especially semi-natural grasslands (van Dijk *et al.*, 2005; Keenleyside and Baldock, 2007). The main reason for abandonment arises from the considerable challenges of socio-economic viability faced by HNV farming systems. As intensive farming expands and as incomes rise in the wider economy, it becomes harder to earn a living from low-intensity farming.

As such, HNV farming is under threat. Those farmers who deliver the greatest biodiversity benefit are typically farming under the most difficult circumstances and vulnerable to technical, social and economic change, they are subject to the greatest pressures to abandon their traditional way of life. Identifying these systems is an important precursor to being able to target measures to ensure their ongoing maintenance. There is an urgency to this task given that many of the farming systems so integral to the maintenance of Europe's cultural landscapes and semi-natural habitats face an uncertain future.

Annex 4 A Schematic Representation of the Four Step Process in the application of the CMEF HNV Indicators

Step	Process	Output	Comments
1a	Describing the main types of HNV farming in MS or region, through expert consultation and existing literature.	Broad typology of main HNV farming systems, including descriptions of relationships between farming practices and biodiversity.	See Annex 5 for a schematic typology of HNV farming systems in Europe.
1b	Describing the main types of HNV features in MS or region, through expert consultation and existing literature.	Descriptions of typical features and of the characteristics of those features that contribute to their biodiversity value.	Focus on those features for which there are data – e.g. monitoring data. Information on the abundance and condition of additional or all features may be collected over time.
1c	Describing the main types of HNV forestry in MS or region, through expert consultation and existing literature.	Broad typology of main HNV forestry systems, including descriptions of relationships between management practices and biodiversity.	May be informed by existing typologies of broad forest types (e.g. EEA, 2006).
2a	Develop indicators to identify HNV farming based on 3 core characteristics (low intensity, semi-natural vegetation and diversity of land cover) for: - HNV semi-natural forage - HNV arable - HNV permanent cropping Use of species indicators where appropriate.	Possible quantitative indicators of HNV farming: - Number of hectares of semi-natural land used for grazing and/or mowing - Number of hectares of forage declared by holdings in the lowest range of livestock densities per hectare of forage - Number of hectares of arable land with a proportion of fallow and semi-natural vegetation within defined thresholds	The IRENA indicator has produced estimates based on EU data. National data may produce a more precise approximation, with investment in relevant data encouraged over time. The figures in hectares produced could be combined to produce a single figure of the extent of HNV farming, or they could remain as separate figures.

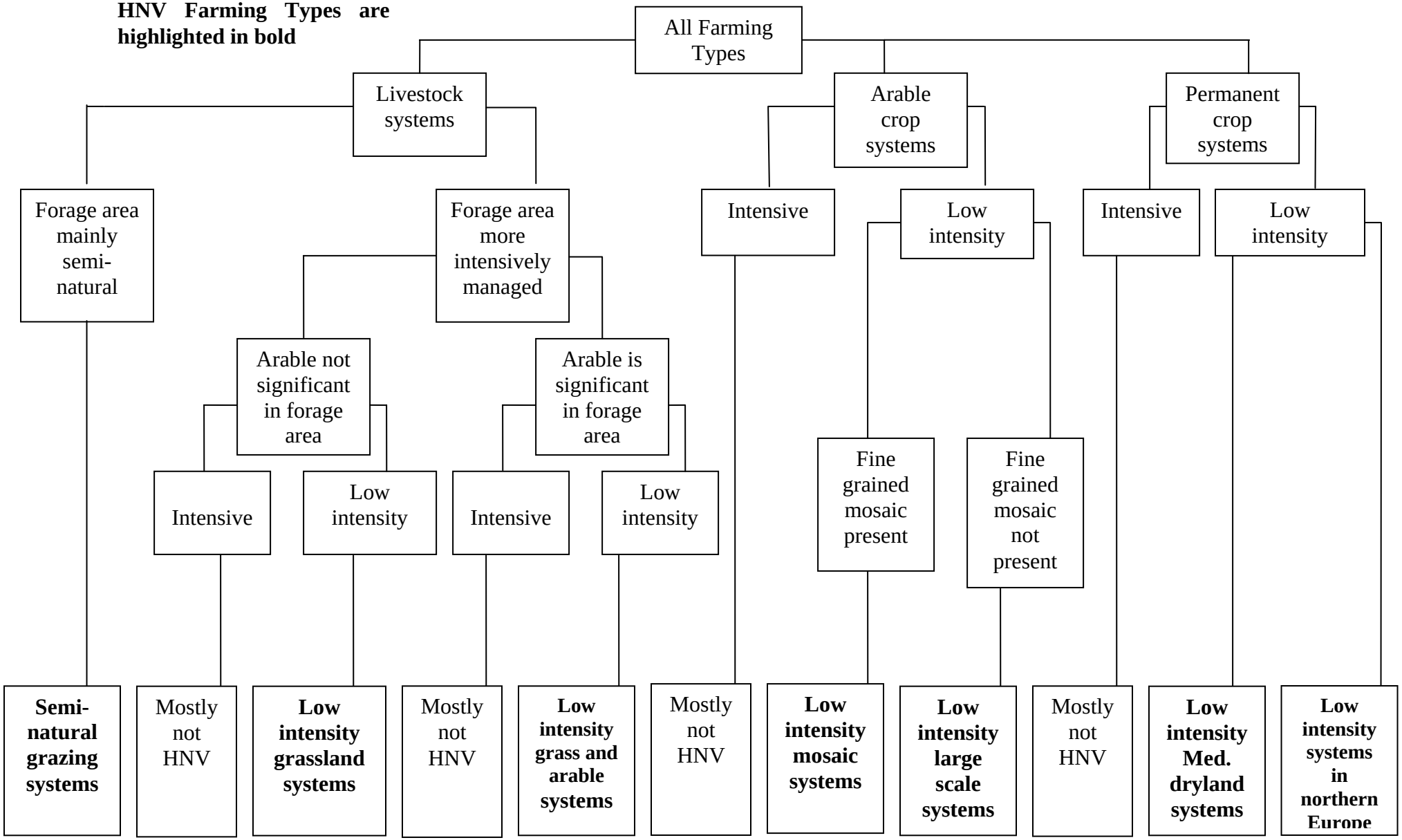
		- Number of hectares of HNV permanent cropland with trees in production over a defined age threshold and with a semi-natural understorey - Number of hectares of farmland with a density of semi-natural features within defined thresholds - Number of hectares of HNV farmland which harbour populations of certain taxa of conservation concern, or European or global populations.	
2b	Develop indicators to identify HNV forestry for: - Natural forestry - Semi-natural forestry Develop species indicators where appropriate.	Possible quantitative indicators of HNV forestry (in hectares): - Area of natural and semi-natural HNV forestry (hectares) - Number of hectares of forest valuable for certain taxa.	These estimates do not lend themselves to being combined, and included in a total figure of the extent of HNV forestry. Keeping these as separate figures provides programme evaluators with valuable information.
2c	Develop other quantitative indicators, relating to the extent or length of HNV features.	Quantitative estimates of extent of HNV features, (for example): - Length of HNV hedgerows, or other semi-natural field margins (qualities must be defined) - Area of HNV water bodies (qualities must be defined)	Initially, these will be derived from existing data, but additional data may be collected over time.
2d	Establish baseline which may be added to over time as more data become available. This baseline	Number of hectares of HNV farming (or other quantitative measures).	May be combined or separate figures. May be combined or

	may comprise a number of discrete quantitative estimates.	Number of hectares of HNV forestry (or other quantitative measures). Quantitative measure relating to HNV features.	separate figures.
2e	Identify case studies to test whether regional/national indicators are appropriate on the ground	Selection of a limited number of representative case studies for ground-truthing of indicators.	The accuracy and sensitivity of the indicators may be ground-truthed through local case studies.
3a	Develop indicators to capture the condition of HNV farming.	Indicators relating to: - Relevant farming practices - Abundance of selected species.	Data are generally not available for an entire Member State and/or region and so may be collected through stratified random samples or through the case studies selected under step 2e, to provide a picture of how the condition is changing over time.
3b	Develop indicators to capture the condition of HNV features.	Indicators relating to: - Relevant management practices - Abundance of selected species.	Data are generally not available for an entire Member State and/or region and so may be collected through stratified sample surveys or through the case studies selected under step 2e, to provide a picture of how the condition is changing over time.
3c	Develop indicators to capture the condition of HNV forestry.	Indicators relating to: - Relevant forestry practices - Abundance of selected species.	Data are generally not available for an entire Member State and/or region and so may be collected through stratified sample surveys or through the case studies selected under step 2e, to provide a picture of how the condition is changing over time.
4a	Application of Impact Indicator 5:	Estimate of any changes in the different quantitative measures of HNV farming,	

	- Assess quantitative changes in HNV resource.	features and forestry.	
4b	Application of Impact Indicator 5: - Assess qualitative changes in HNV resource.	Estimate of any changes in management practices and population sizes of selected species based on observable trends in sample surveys.	Evaluators to use judgement to assess whether it is appropriate to extrapolate any changes in condition to the entire HNV resource.
4c	Programme evaluators to assess results from all available information.		Evaluators to interpret what proportion of the observed changes can be attributable to the combined impact of all relevant measures.

Annex 5 Typology of Potential HNV Farming Types in the EU-27

HNV Farming Types are highlighted in bold



Annex 6 Overview of the Range of Forage Types

Forage types range from intensively cultivated crops (for example, irrigated forage maize), to scrubby and woody vegetation that may be grazed or browsed only occasionally. The forage types found between these extremes are summarised in the figure below.

Semi-natural forage					
Rough grazing					
	Permanent Pasture (CAP definition R796/2004)				
Scrubby and/or wooded pasture of native species, grazed and/or browsed.	Permanent grassland that has not been reseeded or fertilised.	Traditional hay meadows, not reseeded. May receive low levels of manure.	Permanent grassland that may be reseeded after 5 years and/or fertilised.	Multi-annual sown forage, such as grass, lucerne, reseeded after < 5 years.	Annual sown forage, such as grass leys, forage maize, other forage crops.
<0.1 LU/ha ---------- >5 LU/ha					

Semi-natural forage types are those that have not been sown or artificially fertilised. They consist of spontaneous vegetation that is used for grazing or browsing, or as traditional hay meadows. Semi-natural forage is not always grassland; it may also include scrub, woodland, or a combination of these types.

Distinguishing semi-natural forage from other forage types is important in order to understand the HNV farming concept and to identify HNV farming. However, existing agronomic definitions of forage types often do not lend themselves to making this distinction.

Permanent Pasture is defined under the CAP as, “Land used to grow grasses or other herbaceous forage naturally (self-seeded) or through cultivation (sown) and that has not been included in the crop rotation of the holding for five years or longer” (Commission Regulation 796/2004). Thus at the more productive extreme, Permanent Pasture includes pasture that may be reseeded after five years, and may be heavily fertilised. Such pasture is not semi-natural or of significant biodiversity value.

At the least productive end of the forage spectrum, the CAP Permanent Pasture definition may be interpreted as excluding the scrubby and woody forage types which often are of particular biodiversity value. This is because it focuses explicitly on *herbaceous* forage.

Under the FSS, Permanent Grassland is broken down into more intensively used Permanent Pasture and Meadows, and Rough Grazings. In Regulation (EC) No 1166/2008 of the European Parliament and of the Council on farm structure surveys and the survey on agricultural production methods and repealing Council Regulation

(EEC) No 571/88, Rough Grazings are defined as “low yielding permanent grassland, usually on low quality soil, for example on hilly land and at high altitudes, usually unimproved by fertiliser, cultivation, reseeding or drainage. These areas can normally be used only for extensive grazing and are not normally mown, or are mown in an extensive manner; they cannot support a large density of animals” (Handbook on implementing the FSS and SAPM definitions, Eurostat, September 2008).

From the above definition, Rough Grazings appear to be well within the category of semi-natural forage. However, this category does not cover the full range of semi-natural forage. More productive types, such as hay meadows, are excluded. Also, Permanent Grassland (including Rough Grazings) under FSS is defined with the same focus on herbaceous forage, as in Commission Regulation 796/2004. In practice, what is included and what is excluded from these categories depends on the interpretation of each Member State. In practice, Rough Grazings often include some types of non-herbaceous pasture (for example, heathland), but it does not necessarily cover the scrubby and wooded types of forage.

Determining which pastures are semi-natural, and which are not, is to some extent a value judgement. One approach is based on the presence of certain indicator species, another is to decide that a pasture that has not been resown or fertilised for a certain number of years can be considered semi-natural.

In some circumstances, grassland that has been resown and fertilised may revert to a semi-natural state after reseeding. The time this takes varies with the substrate and the surrounding vegetation and seed sources. The resulting sward may be qualitatively different from the original vegetation.

Occasional manuring at very low levels may be considered compatible with a semi-natural state, for certain specific types of grassland.

Occasional tillage also may be compatible with semi-natural status. This is especially relevant in Mediterranean regions, where grasslands may be tilled occasionally for scrub control, without significantly reducing their natural value. Under these climatic conditions a large proportion of the ‘sward’ consists of annual species which are less affected by tillage. Spontaneous vegetation in olive groves and on low-intensity fallow land may be counted in the same category if it is not affected significantly by fertilisers or biocides (Beaufoy, 2008).

Annex 7 Potential Data Sources for HNV Farming Indicators

The following tables detail the data available at the farm level in a sample of Member States.

Table 6 Relevant data from national Farm Structure Survey (FSS) data for selected Member States

Member State	Livestock Categories Recorded	Semi-Natural Vegetation (SNV) or Permanent Grassland (PG) Categories Recorded	FSS information
Denmark	All: pigs, poultry, dairy cattle, beef, sheep, goats and horses	Permanent grassland not in rotation	Census every 10 years and an annual sample
Finland	-	-	-
France	All: pigs, poultry, dairy cattle, beef, sheep, goats and horses		Census, every 10 years and no integration with IACS or LPIS
The Netherlands	All: pigs, poultry, dairy cattle, beef, sheep, goats and horses	3 categories of natural grassland (per parcel) are recorded: natural grassland (max 5 ton dry matter production) with 1) >75% grassland coverage; 2) 75-50% grassland coverage; 3) <50% grassland coverage.	Yearly recording because FSS is matched with IACS

Table 7 Relevant data from IACS declarations for selected Member States

Member State	Livestock Categories Recorded	Semi-Natural Vegetation/Permanent Grassland Categories	Other Landscape Elements Recorded
Denmark	Not registered in IACS but in separate animal registry	Since 2005 the following categories: Permanent grassland, very low yield Permanent grassland, low yield Permanent grassland, normal yield Permanent grassland <50% clover, re-sown <5 years Permanent grassland >50% clover, re-sown <5 years Permanent grassland without clover, re-sown <5 years Permanent grassland and clover-grass, re-sown <5 years Permanent grassland for drying industry min. yield 6 t/ha Permanent grassland for grass layers Permanent grassland under AEP scheme pre-2003, max. 80 kg N/ha Permanent grassland under AEP scheme pre-2003, 0 kg N/ha	

Member State	Livestock Categories Recorded	Semi-Natural Vegetation/Permanent Grassland Categories	Other Landscape Elements Recorded
France	Animal categories are only registered if subject to decoupled payments or second pillar payments (e.g. LFA and/or special AE grassland payment (PHAE) and/or the "extensification premium"). This implies that a proportion of cows and pigs are not registered. However, these are usually the share of the animals which are not generally part of HNV system.	At farm level following the categories are collected: Permanent grassland: >5 years, Temporary grassland: 1-5 years old, Estive (summer pasture) (on farm only, no mention of collective estive), Moorland and individual grazing land (on farm).	Non-productive surfaces ("non agricultural surfaces" such as ponds, woods, and other features) are registered if subject to cross compliance and/or AE payments.
The Netherlands	All: pigs, poultry, dairy cattle, beef, sheep, goats and horses	3 categories of natural grassland (per parcel) are recorded: natural grassland (max 5 ton dry matter production) with: 1) >75% grassland coverage; 2) 75-50% grassland coverage; 3) <50% grassland coverage.	

Table 8 Relevant data from the Land Parcel Information System (LPIS) for selected Member States

Member State	Title of LPIS System, Status, Scale, Methodology	Semi-Natural Vegetation or Permanent Grassland Categories Recorded	Other Landscape Elements Recorded	Link to IACS
Denmark		Same land use categories are registered as in IACS, but at the level of a block of fields (this is an amalgamation of parcels/fields (max 10 fields)		Yes, link at the level of block of fields, but not individual fields
France	Registre Parcellaire Graphique	At parcel level all productive land uses receiving payments are registered. A link is established with IACS, so all IACS land uses are registered per parcel: Permanent grassland: >5 years: Temporary grassland: 1-5 years old, Estive (summer pasture) (on farm only, no mention of collective estive), Moorland and individual grazing land (on farm).	Mon-productive surfaces ("non agricultural surfaces" such as ponds, woods, and other features) are registered if subject to cross compliance and/or AE payments.	
The Netherlands	Dutch LPIS system called GIAP collects information through BRP (Parcel registration information) and FSS survey (Landbouw meitelling). In the GIAP system all collected information is integrated at farm level (both BRP and Landbouw meiteling). In addition a link at farm level is also established with the animal health registry in which all livestock is registered.	3 categories of natural grassland (per parcel) are recorded: - natural grassland (max 5 ton dry matter production) with: 1) >75% grassland coverage; 2) 75-50% grassland coverage; 3) <50% grassland coverage.		Yes, complete integration at farm level.

Member State	Title of LPIS System, Status, Scale, Methodology	Semi-Natural Vegetation or Permanent Grassland Categories Recorded	Other Landscape Elements Recorded	Link to IACS
Romania				The Romanian government is implementing a Land Parcel Information System/Integrated Administration and Control System (LPIS/IACS). Farmers often own or work a number of small, noncontiguous parcels of land. There are approximately 2.5 million agricultural plots farmed by more than 1.5 million people in the country. It is estimated that the LPIS system will handle about 1.5 million subsidy claims per year and will manage about 755,000 claimants. An agricultural information and decision support system will be installed in the country's agency of payments and interventions in agriculture (APIA). In the first phase, only authorised employees from the 210 local offices will have access to the LPIS system. A dedicated geoportal for use by the general public will be integrated into the system at a later date, providing access for farmers to register online for subsidies.

Table 9 Relevant data from the Animal Health Registry for selected Member States

Member State	Livestock Categories Recorded	Link to IACS	Other Relevant Data Sources (Scale, Quality, Methodology)	Semi-Natural Vegetation or Permanent Grassland Categories Recorded	Other Landscape Elements Recorded
Denmark	All: pigs, poultry, dairy cattle, beef, sheep, goats (except horses)	Not clear			
The Netherlands	All: pigs, poultry, dairy cattle, beef, sheep, goats and horses	Yes, at farm level	Topographic information (Top-10 vector) at 1:10000 m resolution; SynBioSys (Syntaxonomic Biological System). This is an information system for the evaluation and management of biodiversity among plant species, vegetation types and landscapes. It incorporates a GIS platform for the visualisation of layers of plant species, vegetation and landscape data. The section 'Vegetation' holds a distribution database of relevé data (plot data). Because each relevé in the database is – through an automated process using the program ASSOCIA - assigned to a plant community we have a database with distribution of plant communities. SynBioSys can be used to predict the distribution of HNV Farming. The different HNV farming areas have first been described in terms of plant communities as described in Symbioses. Subsequently these plant communities have been mapped using Synbioses. For example the type 'Saltmarsh' belonging to HNV type 1 can be associated with 8 plant communities.	Semi-natural types that can be mapped are: Dry calcareous and non-calcareous dune grasslands; Salt meadows in or behind dunes; Dry heather and moorland (including on dunes); Peatlands; Dry and wet infertile grasslands; Calcareous grasslands; Wet (semi) - infertile grasslands; Marsh Marigold grasslands in peat, clay and brook valleys.	Top-10 vector provides coordinates of wet (ditches of less and more than 3 metres wide) and green (hedges, tree lines and field boundaries) landscape elements.

Table 10 Relevant data from national grassland surveys for selected Member States

Czech Republic			Grassland inventory Czech Republic		
Estonia			Grassland inventory project; Estonian Fund for Nature and Estonian Seminatural Community Conservation Association: period 1998-2001: http://www.veenecology.nl/data/Estonia.PDF	Wooded, floodplain, coastal and alvar meadows	
Hungary			Grassland inventory project: http://www.veenecology.nl/data/Hungary.PDF	Grassland type total area in Hungary (x1.000 ha) Alkali grasslands 250-270 Sand grasslands 35-40 Steppes 100-230 Rock grasslands 1.7-3 Flood-plain and hay meadows 200-250 Fen meadows and sedge-beds 20-60 Mountain grasslands 1.4-2	

Latvia			Grassland inventory project: http://www.veenecology.nl	Area of grassland habitat type (ha) and % (of all grasslands) 1. Dry grasslands 1851 ha (11%) 1.1. Dune grasslands Corynephorion 124 ha (0.72%) 1.2. Dry siliceous grasslands Plantagini-Festucion 473 ha (2.73%) 1.3. Dry grasslands on cliffs Alysso-Sedion albi 4 ha (0.02%) 1.4. Dry calcareous grasslands Bromion erecti 1116 ha (6.44%) 1.5. Xero-thermophile fringes Geranion sanguinei 12 ha (0.07%) 1.6. Mesophile fringes Trifolion medii 121ha (0.7%) 2. Fresh grasslands 6386 ha (36.86%) 2.1. Nardus grasslands Violion caninae 221 ha (1.28%) 2.2. Mesophile pastures Cynosurion 4236 ha (24.45%) 2.3. Hay meadows Arrhenatherion 1908 ha (11.01%) 2.4. Potentillion anserinae 10 ha (0.06%) 3. Moist grasslands 5876 ha (33.92%) 3.1. Humid riverine grasslands Alopecurion 1088 ha (6.28%) 3.2. Humid eutrophic grasslands Calthion 3889 ha (22.45%) 3.3. Humid oligotrophic grasslands Molinion 46 ha (4.88%) 3.4. Coastal brackish grasslands Armerion maritima 47 ha (0.27%) 4. Wet grasslands 2937 ha (16.96%) 4.1. Acidic dwarf sedge communities Caricion fuscae 258 ha (1.49%) 4.2. Calcareous dwarf sedge communities Caricion davallianae 47 ha (0.27%) 4.3. Tall sedge communities Magnocaricion 2632 ha (15.19%) 5. Semi-ruderal grasslands 273 ha (1.57%)	
Lithuania			Grassland inventory project: http://www.veenecology.nl (See below)		

Slovenia			Grassland inventory project: http://www.veenecology.nl	Area of grassland habitat type (ha) and % (of all grasslands) 1. Submediterranean-Illyrian- meadows (Scorzonerion villosae) 9534 ha (3%) 2. Submediterranean-Illyrian karst pastures (Satureion subspicatae) 10095 ha (4%) 3. Suboceanic/submediterranean dry grasslands predominately on basic (calcareous) substrate (Mesobromion) 8875 ha (3%) 4. Matgrass (Nardus stricta dominated grasslands on acid substrate (Nardo-Callunetea) 221 ha (1%) 5. Oligotrophic moist meadows with Molinia caerulea (Molinion) 2875 ha (1%) 6. Mesotrophic wet meadows (Calthion) 354 ha (0.1%) 7. Meadowsweet dominated wet meadows and lowland tall herb communities (Filipendulion) 120ha (0.04%) 8. Manured mesotrophic and eutrophic slightly moist (Arrhenatheretalia) 84809 ha (27%). 8.1. Oatgrass dominated manured meadows (Arrhenatherion) 3884ha (1.4%) 8.2. Ryegrass-Crested Dogstail grasslands (Cynosurion) 2719ha (0.01%). 9. Small Sedge intermediate mire and swamp swards (Scheuchzerio-Caricetea fuscae) 32ha (0.01%). 10. Water fringe vegetation and swamps (Phragmition communis) 1137ha (0.4%). 11. Vegetation dominated by bulky sedges (Magnocaricion elatae) 1090ha (0.4%). 12. Vegetation dominated by grasses and herbs along the water banks (Glycerio-Sparganion) 8ha 13. Pioneer annual flooded mudflats grasslands (Thero-Salicornietea) 271 ha (0.1%) 14. Perennial halophytic grasslands of muddy semi-dry soils (Arthrocnemetea fruticosi) 16 ha (0.01%). 15. Marine swamps (Juncetea maritimi) (not mapped). 16. Submarine grasslands (Posidonia, Cymodocea, Zostera in Ruppia beds) (not mapped)/ 17. Village mosaic 7935 ha (2.8%). 18. Extensive grasslands (based on Land use map 2002) 100905 ha (35.2%). 19. Unclassified (mosaic of types) 58303 ha (20.3%). Total Area 286581ha	

Slovak Republic			Grassland inventory project: http://www.veenecology.nl		
Bulgaria			Grassland inventory project: http://www.veenecology.nl		
Romania			Grassland inventory project: http://www.veenecology.nl/data/Hungary.PDF		

Annex 8 Farming Species of European Conservation Concern

European Farmland Bird Species

Species indicators of the condition of HNV farmland can be drawn from the following list of 119 farmland bird species. They are either species of European conservation concern, or species for which a high proportion of European or World populations are associated with European farmland[6].

Scientific Name	Common Name
Accipiter brevipes	Levant Sparrowhawk
Acrocephalus paludicola	Aquatic Warbler
Aegypius monachus	Cinereous Vulture
Alauda arvensis	Eurasian Skylark
Alectoris chukar	Chukar
Alectoris rufa	Red-legged Partridge
Anas querquedula	Garganey
Anser albifrons	Greater White-fronted Goose
Anser anser	Greylag Goose
Anser brachyrhynchus	Pink-footed Goose
Anser erythropus	Lesser White-fronted Goose
Anser fabalis	Bean Goose
Anthus campestris	Tawny Pipit
Aquila adalberti	Spanish Imperial Eagle
Aquila clanga	Greater Spotted Eagle
Aquila heliaca	Imperial Eagle
Aquila pomarina	Lesser Spotted Eagle
Asio flammeus	Short-eared Owl
Athene noctua	Little Owl
Branta bernicla	Brent Goose
Branta leucopsis	Barnacle Goose
Branta ruficollis	Red-breasted Goose
Bucanetes githagineus	Trumpeter Finch
Burhinus oedicnemus	Eurasian Thick-knee
Buteo rufinus	Long-legged Buzzard
Calandrella brachydactyla	Greater Short-toed Lark
Calandrella rufescens	Lesser Short-toed Lark
Carduelis cannabina	Eurasian Linnet
Carduelis flavirostris	Twite
Chersophilus duponti	Dupont's Lark

[6] This list was drawn up by the JRC/EEA for use in their mapping approach of HNV Farming areas (Paracchini *et al*., 2008). The contributions of Birdlife International are acknowledged. An initial list of 75 farming bird species was derived from 'Birds in Europe' (Birdlife International, 2004). Following a consultation exercise with the Member States carried out by the EEA in the second half of 2006, this list was revised. The final list was produced in April 2007.

Chlamydotis undulata	Houbara Bustard
Ciconia ciconia	White Stork
Circaetus gallicus	Short-toed Snake-eagle
Circus cyaneus	Northern Harrier
Circus pygargus	Montagu's Harrier
Columba oenas	Stock Pigeon
Coracias garrulus	European Roller
Corvus frugilegus	Rook
Corvus monedula	Eurasian Jackdaw
Coturnix coturnix	Common Quail
Crex crex	Corncrake
Cursorius cursor	Cream-coloured Courser
Cygnus columbianus	Tundra Swan
Cygnus cygnus	Whooper Swan
Cygnus olor	Mute Swan
Dendrocopos syriacus	Syrian Woodpecker
Elanus caeruleus	Black-winged Kite
Emberiza cirlus	Cirl Bunting
Emberiza citrinella	Yellowhammer
Emberiza hortulana	Ortolan Bunting
Emberiza melanocephala	Black-headed Bunting
Emberiza schoeniclus	Reed Bunting
Erythropygia galactotes	Rufous-tailed Scrub-robin
Falco biarmicus	Lanner Falcon
Falco cherrug	Saker Falcon
Falco naumanni	Lesser Kestrel
Falco tinnunculus	Common Kestrel
Falco vespertinus	Red-footed Falcon
Francolinus francolinus	Black Francolin
Galerida cristata	Crested Lark
Galerida theklae	Thekla Lark
Gallinago gallinago	Common Snipe
Gallinago media	Great Snipe
Glareola pratincola	Collared Pratincole
Grus grus	Common Crane
Gyps fulvus	Eurasian Griffon
Haematopus ostralegus	Eurasian Oystercatcher
Hieraaetus fasciatus	Bonelli's Eagle
Hieraaetus pennatus	Booted Eagle
Hippolais olivetorum	Olive-tree Warbler
Hippolais pallida	Olivaceous Warbler
Hirundo rustica	Barn Swallow
Jynx torquilla	Eurasian Wryneck
Lanius collurio	Red-backed Shrike
Lanius excubitor	Great Grey Shrike
Lanius minor	Lesser Grey Shrike
Lanius nubicus	Masked Shrike
Lanius senator	Woodchat Shrike
Limosa limosa	Black-tailed Godwit

Locustella fluviatilis	Eurasian River Warbler
Locustella naevia	Common Grasshopper-warbler
Lullula arborea	Wood Lark
Melanocorypha calandra	Calandra Lark
Merops apiaster	European Bee-eater
Miliaria calandra	Corn Bunting
Milvus migrans	Black Kite
Milvus milvus	Red Kite
Motacilla flava	Yellow Wagtail
Neophron percnopterus	Egyptian Vulture
Numenius arquata	Eurasian Curlew
Nycticorax nycticorax	Black-crowned Night-heron
Oenanthe hispanica	Black-eared Wheatear
Oenanthe oenanthe	Northern Wheatear
Otis tarda	Great Bustard
Otus scops	Common Scops-owl
Passer montanus	Eurasian Tree Sparrow
Perdix perdix	Grey Partridge
Philomachus pugnax	Ruff
Picus viridis	Eurasian Green Woodpecker
Pluvialis apricaria	Eurasian Golden-plover
Porzana porzana	Spotted Crake
Pterocles alchata	Pin-tailed Sandgrouse
Pterocles orientalis	Black-bellied Sandgrouse
Pyrrhocorax pyrrhocorax	Red-billed Chough
Saxicola rubetra	Whinchat
Saxicola torquata	Common Stonechat
Serinus canaria	Island Canary
Streptopelia turtur	European Turtle-dove
Sylvia communis	Common Whitethroat
Sylvia hortensis	Orphean Warbler
Sylvia nisoria	Barred Warbler
Tetrao tetrix	Black Grouse
Tetrax tetrax	Little Bustard
Tringa totanus	Common Redshank
Turdus iliacus	Redwing
Turdus pilaris	Fieldfare
Tyto alba	Barn Owl
Upupa epops	Eurasian Hoopoe
Vanellus vanellus	Northern Lapwing

European Farmland Butterfly Species

The following butterfly species are considered indicators of HNV farmland.

Species indicators of the condition of HNV farmland can therefore be drawn from the following list which includes either species of European conservation concern, or species for which a high proportion of European or World populations are associated with European farmland[7].

Alpine Grassland
Erebia calcaria
Erebia Christi
Erebia sudetica
Parnassius apollo
Polyommatus golgus

Dry Grassland
Argynnis elisa
Erebia epistygne
Hipparchia azorina
Hipparchia miguelensis
Hipparchia occidentalis
Lycaena ottomanus
Maculinea arion
Maculinea rebeli
Melanargia arge
Papilio hospiton
Plebeius hespericus
Plebeius trappi
Polyommatus dama
Polyommatus galloi
Polyommatus humedasae
Pseudochazara euxina
Pyrgus cirsii

Humid Grassland
Coenonympha hero
Coenonympha oedippus
Euphydryas aurinia
Maculinea nausithous
Maculinea teleius

Note: Woodland species were not included in the list.

[7] This list was drawn up the EEA/JRC in their mapping approach of HNV Farming areas (Paracchini *et al.*, 2008) using Van Swaay, C. and Warren, M. (2003). The contributions of De Vlinderstichting (Wageningen) are acknowledged. The final list has been revised following consultation with the Member States.