Institute for European Environmental Policy

METHODOLOGY FOR THE CALCULATION OF OPPORTUNITY COSTS AND ANALYSING COSTS AND BENEFITS OF POTENTIAL INCENTIVE SCHEMES FOR BIODIVERSITY CONSERVATION ON AGRICULTURAL LANDS

Guidance document for data collection and analysis

PROJECT: 'Complementary Financing for Environment in the Context of Accession – Innovative Sources'

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1 INTRODUCTION

Agricultural landscapes in Europe are a recognised reservoir of biodiversity, and this is especially true in the countries to be considered in this project. However, the value of agricultural land for biodiversity preservation can vary significantly depending on the agricultural systems in place. For example, traditional extensive agricultural systems that encourage diverse landscapes with features such as hedgerows, fallow, and stone walls are recognised as being preferable to large-scale intensive and mechanised systems with few permanent landscape features.

Efforts to enhance and maintain biodiversity in agricultural landscapes need to consider the incentives faced by individual land users, who decide what practices to use on their land, generally without considering biodiversity impacts. Where biodiversity-friendly agricultural practices are the most profitable, there may be convergence of private and social interests. However, this is seldom the case, as high-intensity practices which are generally harmful to biodiversity tend to carry more profit than low-intensity practices which are generally biodiversity-friendly.

Given the above challenges, finding innovative solutions is a key element within the EU's biodiversity policy. Promising in this respect are systems in which landowners of protected sites are paid for the environmental services that they generate, thus aligning their incentives with those of society as a whole. Worldwide, increasing attention has focused on so-called Payments for Environmental Services (PES) as one example of this approach.

1.1 The role and aim of the guidance document

This guidance document and related methodology templates form a part of the project aiming to outline the necessary implementing arrangements in pilot contracts for biodiversity conservation in EU Accession and Candidate States (five countries), with a particular focus on agricultural land use. One of the objectives of this project is to a) show the opportunity cost of land in order to provide a basis for payment levels under direct contract for biodiversity, and b) provide an outline of the magnitude of the benefits of such contracts.

The aim of this **guidance document** is to provide the country experts working in the project information and advice in calculating opportunity costs and analysing the costs and benefits of potential incentive schemes for biodiversity conservation at national level. The guidance will support and complement the application of the **methodology templates** (ie excel templates for calculating opportunity costs (eg the gross margin, GM) and analysing costs and benefits) that are to be used to collect and analyse country specific information.

The collected and analysed information forms the basis of the **country case study reports** that discuss and analyse the possibilities for payments for biodiversity related services at the national level (separate document).

2 STRUCTURE AND APPLICATION OF THE GUIDANCE DOCUMENT, METHODOLOGY TEMPLATES AND THE COUNTRY CASE TEMPLATE

2.1 Guidance document

The structure of the guidance document is as follows:

1. **Chapter 3** provides general introduction to payments for environmental services (PES)
2. **Chapter 4** introduces the conceptual framework for methodology used;
3. **Chapter 5** presents a step by step method to follow to a) collect the relevant information, b) calculate the opportunity costs and b) analyse costs and benefits of possible payment schemes (see Chapter 1.3 below);
4. **Chapter 6** provides the tables to be used in collecting the information (as part of Chapter 4);
5. Relevant examples of data/measures from other countries are provided in Annex I.

It is to be noted that the examples provided by Annex 1 are **not** directly applicable in the context of this project. The purpose of Annex 1 is to provide examples and ideas on how the payments for environmental services are calculated in other countries (eg as a part of the EU agri-environment programmes).

2.2 Methodology templates

The methodology templates (three Excel sheets) have been developed to assist in a) calculating the opportunity costs and b) analysing the cost and benefits of possible payment schemes. These methodology templates form an integral part of the national level analysis of the study and the information collected/analysed via the methodology templates will feed into the country analysis (together with the information collected in the Chapter 6 tables).

The **template for the calculation of opportunity costs** assists in calculating the opportunity costs resulting from changes in land use. The **template for the calculation of gross margin** will feed directly into the opportunity costs template.

The **template for analysing the cost and benefits of possible payment schemes** is a tool to assist in analysing the possible costs and benefits of payment schemes at national level. This template will built on the opportunity costs template and on the information collected via tables provided in Chapter 6.

2.3 Country case study template

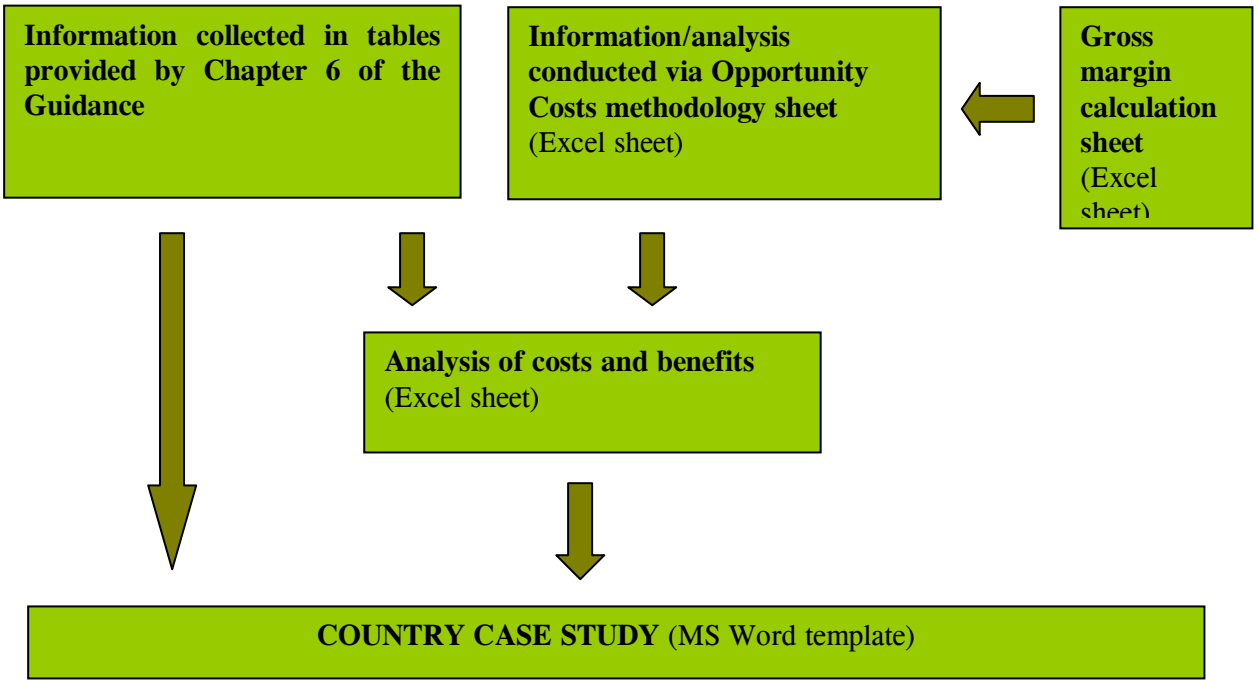
The collected and analysed information (via guidance document and methodology templates) forms the basis of the **country case study reports** that analyse and discuss the possibilities for payments for biodiversity related services at the national level.

A country case study template has been developed to provide the structure for the reports of the national level analysis and discussion. It comprises nine main chapters following the developed methodology and provides reference to where each step of the methodology fits in.

It is to be noted that the country case studies only build on the information collected/analysis conducted with the assistance of the guidance document and methodology templates. Therefore, further analysis and discussion (eg country experts' opinions) is needed to complete the country case study templates.

A template for country case reports is provided as a separate document. The country experts will use this template to submit their inputs at each step of the analysis and will, thus, complete it during the project implementation.

2.4 Summarising the application of the different components



3 PAYMENTS FOR ENVIRONMENTAL SERVICES - GENERAL CONTEXT

One approach to support maintenance of biodiversity on agricultural land is to provide direct payments for the provision of biodiversity services (in general, **payments for environmental services - PES**). This approach internalises - to the farmers' decision making/vision of their welfare - what had been an externality (a positive biodiversity related externality – a 'common good' for society), ensuring that it is taken into consideration in decision-making by farmers.

When calculating the amount to pay for maintenance of biodiversity, estimation of the **opportunity costs** involved is required, as farmers will need to receive for biodiversity conservation at least enough to compensate what they have either a) lost from their 'changed' choice of farming practice – where the payment makes them change habits; or b) not gained from a potential change in practice. In some cases the benefits of maintaining the biodiversity will be higher than the opportunity costs (biodiversity rich agricultural areas), and in some cases the benefits will not be worth it on reflection (biodiversity-poor agricultural areas).

In general, when calculating PES following aspects are important to know:

- types of land use for a range of different land types – and importance nationally if possible (eg share of land type and use nationally);
- possible changes in land use practice and possible forgone value; and
- what measures could lead to what costs if any (and what level of protection of benefits).

It is also important to note that PES, in this case related to the maintenance of biodiversity on agricultural land, will not always be an appropriate or effective tool to prevent changes in land use. For example, if development pressure from suburbanisation is very high in certain areas, land owners may have a very high financial incentive to sell land for development. It may be appropriate in such cases to establish legal protection for vulnerable areas, rather than to attempt a PES approach.

It is also worth noting that different levels of PES will lead to different land areas and types being 'saved' from biodiversity loss. A low PES will save areas with only a low opportunity costs, and higher PES will be required to save higher opportunity cost areas. Obviously paying a high PES will only be warranted for areas of high biodiversity value – it will therefore be important to characterise areas for their biodiversity value. It will also make sense to have a multi-tier PES in order to reflect different levels of biodiversity, so that appropriate support is given to the right areas. Budget considerations will also play a role, so an understanding of payment levels will be important.

It will also be necessary to check the correspondence between land use types with opportunity costs and land use types with biodiversity value. It may turn out that 'biodiversity protection issues' are only for a subset of cases.

4 METHODOLOGY – THE CONCEPTUAL FRAMEWORK

The methodology for the calculation of opportunity costs and the analysis of the costs and benefits of potential incentive schemes for biodiversity conservation is set out below. The methodology consists of two main tasks, namely 1) calculating and presenting the opportunity costs and 2) assessing costs and benefits of potential PES.

4.1 General considerations and restrictions

4.1.1 Specific regional characteristics

The methodology aims to make it possible to consider and reflect the specific characteristics of the agriculture sector in the accession/candidate countries. For example, due to the land restitution processes the agriculture and forest practices in the majority of the project countries (Bulgaria, Romania, Macedonia and Croatia) are based on dispersed plots of land owned/managed by one entity. Therefore, the concept of a 'farm' differs from the European one, where all the land is situated in one location. Additionally, due to changes made to the land and infrastructures during collectivization, precise boundaries of/access rights to land are often unclear. Land is also generally managed under informal agreements between the land owners and land users. Therefore, the users (very often large in scale) are not eligible for support. Furthermore, conventional farming practices in the accession countries still tend to have low external inputs, but at the same time is not sustainable due to improper practices. In several cases the main threat to agricultural biodiversity is not the intensification of agricultural practices but land abandonment.

Given the specific characteristics of the agriculture sector in the accession/candidate countries, it should not be assumed that the measures that will be most effective for biodiversity conservation in the five countries that are the focus of this project will be the same as those being supported in the current EU Member States.

4.1.2 Relationship between the EU agri-environment programmes

It is also to be noted that the PES being considered in this project will actually be payments for maintenance or establishment of biodiversity-friendly farming practices. There is already a precedent for such payments in Europe, in the EU's agri-environment programme funded through the EAGGF (EAFRD in the 2007-2013 funding period). Therefore, information from the EU agri-environment programmes, eg the recent DG-Agriculture review of agri-environment schemes, will be used to feed into the analysis where relevant, together with information available in relevant literature (country case study reports).

In this context, PES estimates will be assessed against the maximum payments indicated in the EAFRD Regulation in the EU25[1]. In addition, estimates of potential uptake of PES will

[1] Regulation (EC) No 1698/2005

be made based on information on uptake of agri-environment schemes in the 2004 Accession Countries. It has been noted that land with high value (eg intensive arable farms with high soil fertility) has been found to have a lower than average uptake of agri-environment schemes[2], and this is likely to be also the case in the countries included in this study.

4.1.3 Scope of the analysis

The country specific analysis will concentrate on estimating the opportunity costs of agricultural land (as requested by the tender). Calculating specific opportunity costs related to biodiversity-friendly management of forest land will, in general, fall outside the main scope of the developed methodology. This is because the amount of work required to include calculations of both land types is not considered feasible within project's budget and time span. However, if feasible in terms of data availability, this methodology could be used to calculate opportunity costs for forest areas. Furthermore, issues related to both agricultural and forest land use will be considered when evaluating the overall costs and benefits of establishing direct payment schemes, and in discussion of general conditions, trends and prospects for payments schemes in the countries.

Additionally, it will not be possible to do national assessment of full PES for the whole area. Therefore, there is a need to a) identify the range of main different land types; b) identify the range of biodiversity value types for each land types and clarify which are general and which are case specific; c) identify a series of high value biodiversity areas; d) characterise/estimate the biodiversity value in these areas and what could be lost if a change of agricultural practice were to take place; e) identify correspondence of land use types with potential high opportunity costs and high environmental benefits.

4.2 The main elements of the methodology

4.2.1 Task 1: Calculating the opportunity cost

In order to calculate the opportunity cost relating to biodiversity-friendly farming practices in the regions concerned, the information listed in this chapter and values about current and possible future practices, including changes in land value, will be collected and considered.

The process of calculation will be as unified as possible for all countries in order to ensure consistency of results. However, the calculation/presentation of opportunity costs will depend on the availability and quality of data. Therefore, the developed methodology is also flexible to allow for adaptation of the methodology to the national specifics.

Please note: when quantitative information is not available, it will be important to have a broad brush estimate and/or qualitative description of trends and magnitude of data.

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[2] See Oréade-Brèche (2005) Evaluation of Agri-Environmental Measures. Report to DG-Agriculture. Available at: http://ec.europa.eu/agriculture/eval/reports/measures/index_fr.htm (in French).

In the context of this project, the calculation of opportunity costs will be carried out with the assistance of methodology templates (see Chapter 2)

Information on current farming/forestry practices

In-country partners will be asked to carry out an analysis of current agricultural (or forestry, when feasible) practices in relation to their support for biodiversity in the study regions. In this context, partners will be required to collect information on practices playing a relevant role in biodiversity preservation, and on those that are not considered biodiversity friendly. Threats to biodiversity friendly practices will be taken into consideration, as well as the potential for non-friendly practices to be improved.

Partners should therefore collect information on the current income of land owners, on the basis of what is referred to as 'gross margin'. Economic data are likely to be available from farmers' organisations and agriculture ministries or specific country studies. Guidance on the calculation of gross margin has been provided in the methodology template, in a separate spreadsheet.

In addition, the partners are requested to provide their perspective on the value of biodiversity currently existing in the sites analysed, and on the negative impacts that farming practices can have on biodiversity. Annex II on ecosystem services can help to identify those values.

In general, information and data should be provided *per hectare*. This will allow comparability across sites and across study regions.

Information on possible future farming/forestry practices

In country partners are requested to assess which possible transformations, in terms of land uses, the analysed current farming/forestry practices could undergo. In case that current practices are considered biodiversity friendly, partners should look at examples of possible future practices which could hamper this quality – eg cases in which land owners could be tempted to shift their cultures into more intensive (and profitable) practices, or to abandon their land. Comparison between current and (potential) future incomes should help to establish the compensation needed to keep the existing biodiversity friendly practices, and therefore avoid negative future changes. When, instead, current practices are not seen as biodiversity friendly, in-country partners should look at examples of friendly practices into which the sites could be realistically 'converted'.

The assumption behind the choice of these possible future land use options should be stated clearly in the country case study reports. Assumptions on likely changes to land uses could be made on the basis of evident trends observed in the case study regions. Furthermore, useful information could be taken from studies undertaken by DG-Agriculture on the

possible impacts of EU Accession on Agriculture, as well as from forecasts of international organisations such as OECD and FAO. Information relating to changes in agricultural practice that have already been observed in neighbouring countries that have joined the EU (eg the 2004 Accession Countries) will also be considered.

Once possible future land uses have been identified, each option should be analysed in detail, providing estimates of potential future gross margin. The costs of additional measures that could be required to support biodiversity (eg cost of land removed from cultivation; costs of additional infrastructures and labour), or the savings from reducing those measures (in case future non biodiversity-friendly practices are expected) should also be portrayed.

Country partners should also provide their insights regarding how these future practices could affect biodiversity, indicating how the value of biodiversity could change once new practices are in place, and which negative impacts (if any) these can have.

The comparison between current and (possible) future farming practices should give an indication of the opportunity costs of changing/keeping these practices.

Monetary land value (current and future practices)

Monetary land value is the amount of money received if land is sold for alternative use. For each region to be considered, the in-country partners will collect information on current prices of agricultural land, and price trends in relation to potential changes in land use. In the country case study reports this information will be compared with information on the values (and changes in value) of agricultural land in the EU25 countries (especially in the 2004 Accession countries) to establish what changes are likely in the upcoming period (focussing on 2007-2013). Where relevant, prices will be considered in relation to different types of agricultural land, eg high altitude mountain farms, plains/semi-natural grassland systems, plains/semi-natural grassland systems, etc. Information will be sought from local authorities, real estate organisations, and Eurostat.

The assessment of land value should provide some immediate information on areas where PES are likely to succeed, and other areas where PES may not be sufficient to arrest changes in land-use. For example, at present certain areas of Bulgarian land are under substantial development pressure in relation to ski resorts. For these areas, legal protection rather than PES may be more appropriate (if the level of biodiversity warrants it), given that the high value of land may otherwise easily induce land owners to sell their properties rather than accept compensations for changing/keeping farming practice.

4.2.2 Task 2: Analysis of costs and benefits of PES

Based on the information received in each region on possible measures to improve/maintain biodiversity in agricultural land, and the estimated opportunity costs, a suggested level of payment will be made in relation to each. In addition, total estimated costs of the proposed PES scheme will be made for each region.

When estimating the regional costs and general feasibility of PES schemes, the national/regional implementation conditions (both short and long term) for possible payment schemes will be taken into account (to be elaborated in the country case study reports, on the basis of the information collected/analyse in the provided methodology). In addition to the estimated direct payments other possible costs, such as foreseeable transaction costs, costs related to advisory/support services and possible changes in national legal and administrative frameworks, and needs for monitoring biodiversity benefits (eg defining baseline information), should be considered.

With regard to benefits estimates, many of the outcomes of the schemes will be difficult to measure in economic terms. When not quantifiable, they will therefore be described in non-economic terms. In addition to the local biodiversity benefits of the PES, other synergistic benefits (eg water retention, carbon sequestration etc) will also be described and considered.

The overall synthesis of country case reports (conducted by IEEP and WWF) will give details of features of PES that have been linked to the success or failure of such schemes elsewhere in the world. This will draw, for example, on the findings of DG-Agriculture's recent review of Agri-environment schemes in the EU-25.

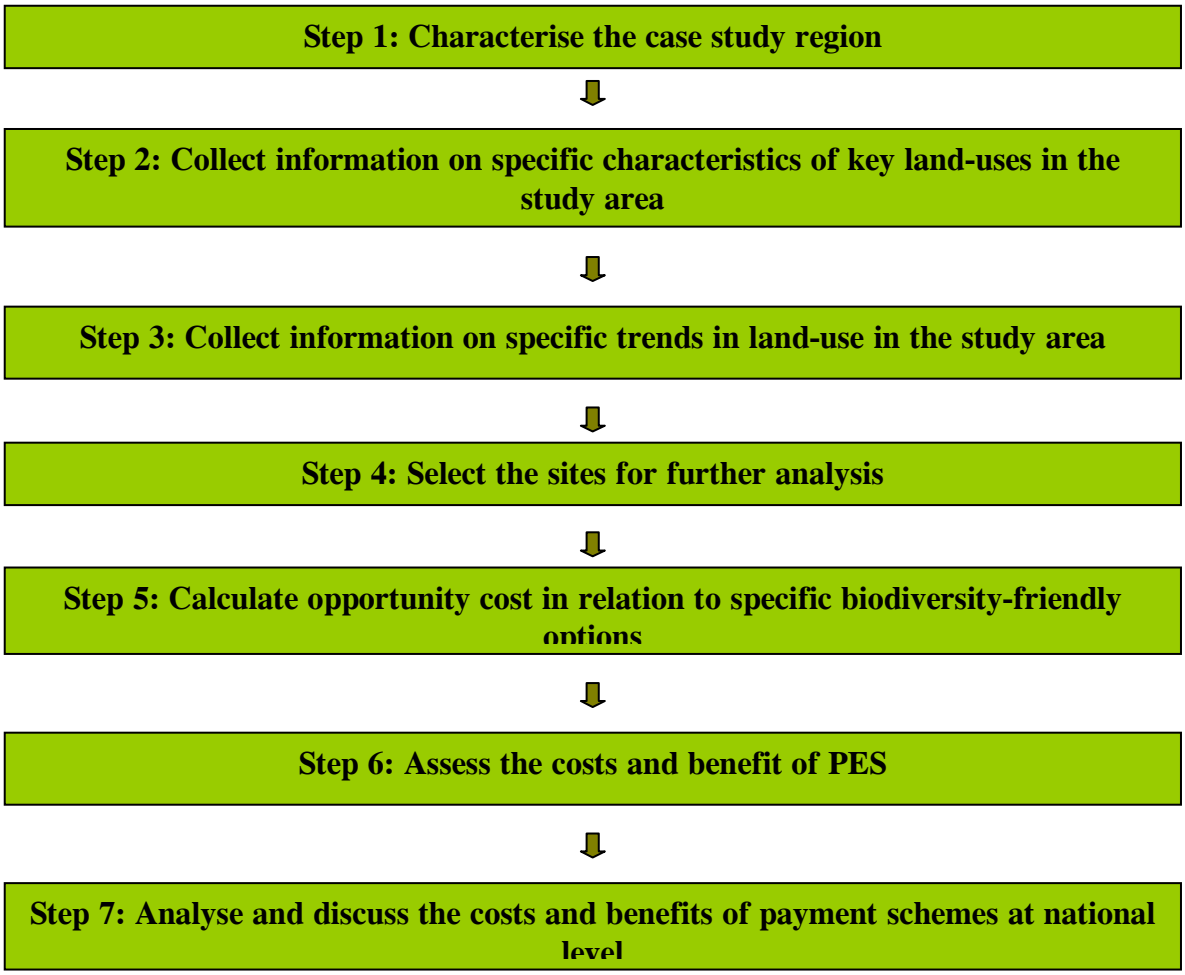
When appropriate, the issues related to both agricultural and forest land use will be considered as a part of the overall analysis.

In the context of this project, the analysis of costs and benefits of will be carried out on the basis of a) information collected in Chapter 6 tables; b) information and analysis conducted via the methodology template for analysing the costs and benefits.

Final analysis and discussion of costs and benefits of PES will be carried out in country case study reports.

5 GUIDELINES AND TABLES FOR DATA COLLECTION

The general instructions on how and within which context to use the guidelines (eg the tables) is given in Chapter 2. The step-by-step approach for information collection and application of the guidance tables and methodology templates is provided below following the overview figure.



5.1 Step 1: Characterise the case study region

The selection of case study regions has been completed in the kick off meeting in Vienna (October 2006) (see the project interim report).

Conduct an elementary SWOT (analysis of strengths, weaknesses, opportunities, threats) for each study region (see Box 1, using Table 2). Include particular reference to SWOTS for biodiversity. Present also examples and some of these might be related to specific site eg important bird areas (IBAs) (especially include biodiversity characteristics of the area, including presence of threatened species, specific species and habitat types of habitats Directive, etc.).

If possible, and as part of SWOT, obtain or create a **map illustrating predominant land uses in the study area**.

Carry out **analysis of the national (or regional if relevant) legal and institutional frameworks in place**, and of any specific **administrative frameworks** in the region. This will involve assessment of: relevant authorities/stakeholders**,** existing administrative procedures and practices**,** delivery structures in place.

Collect information about sites of highest biodiversity value in the area (up to about 10), providing a short description of their location, characteristics, existing (most important) species and their values, potential risk of biodiversity loss, level of protection, etc. (using Table 2 below). This information should correspond (as much as possible) to the priorities laid out in the habitats and birds Directives (Directives' Annexes).

The aim is to understand the key biodiversity strengths of the region and key interactions with farming practice ad hence key influencing factors.

Box 1. SWOT and its questions

A SWOT analysis is a useful mechanism to get an overview of some of the key issues for the area. It helps clarify what the strengths of a region are and hence what could be built on or should be protected. It notes the weaknesses (general and particular) and hence what one should be careful with. It can encourage one to think through the opportunities - in this context this includes both those for agriculture and for biodiversity and associated activities (one should not forget the potential benefits from developing these). It is also a mechanism to identify threats – this is especially important for biodiversity as changes in agricultural practice, if unsuitable, can lead to significant biodiversity loss.

Strengths	**Weaknesses**
(a) What are the agricultural/forestry strengths – actual and the underlying resources (b) What are the biodiversity strengths - for biodiversity and for the wider benefits for the region (c) To what extent does the areas development build on these strengths?	(a) Has the choice of agricultural / forestry practice led to a weakening in biodiversity and associated eco-system services//benefits? (b) Are there any fragile eco-systems that could come under threat by change? Are there any critical trends or thresholds (eg where an eco-system changes irrevocably) close to being breached?
Opportunities	**Threats**
(a) Are there any opportunities for agricultural change to make more money for the farmers? (b) Are there any opportunities for protecting the biodiversity?	(a) What threats are there to biodiversity and eco-system services? (b) How the developments in agriculture threaten low impact farming practices?

5.2 Step 2: Collect information on specific characteristics of key land-uses in the study area

Collect information on the largest/most important land-uses by area (up to 10, or more if information are easily available) **- including non-agricultural uses such as residential, industrial, etc where appropriate** - using Table 3. This will help understand the context for opportunity costs – if residential is big trend, land values will be changing in response to this, therefore opportunity costs will vary.

Among the main land uses, Table 3 will include also **the top biodiversity-friendly farming practices in the area**.

Ideally the top 10 would give a significant share of the total area (eg over 1/3) to be reasonably representative. The aim is to collect information to understand what is done in the area and what is important. This is part of the process of (a) understanding the region, and (b) developing a long list of potential case sites.

Please also note that some of the land-use/farming practices identified in step 2 will be the object of further analysis in steps 3, 4 and 5.

5.3 Step 3: Collect information on specific trends in land-use in the study area

Collect information on any significant trend in land-use in the study area (Table 4). This will be a general discussion for the region complemented by some case insights where available. Key trends should be highlighted in the SWOT analysis carried out in Step 1 (above).

Information on trends should include details of existing changes over the past 15 years, with special focus on the past 5 years, but also any intelligence about expected future trends from real-estate models, agricultural data, or other studies related to the area concerned. Qualitative and quantitative information may be useful in relation to assessment of trends. When describing future trends, it will be useful to note, whenever possible, if it is envisaged that a farming practice will be substituted by a different one, what this will be and if this will be environmental friendly or not.

Note that table 4 will provide information for top land uses, biodiversity friendly practices and land-uses affecting high value biodiversity areas.

5.4 Step 4: Select the sites for further analysis

As noted in the tender, we are looking to a) understand the area and the interplay between agricultural practices and biodiversity and also to b) explore the potential use of PES and other mechanisms to address biodiversity concerns, through more in-depth case studies.

For the latter, it will be useful to look at 2 to 3 case sites in each country, which gives us 10 to 15 for the study as a whole. Note that, in some cases, the whole study region could be considered as a single case site, when the farming practices are homogeneous and data are available.

Choosing the sites: Each country expert should identify the 2-3 (or more if relevant and data are easily available) 'most interesting' sites. These should be rather homogeneous areas in terms of farming practices. They could consist of one or more farms, located in nearby areas and insisting on the same biodiversity site (ie an area with similar biodiversity characteristics).

It would be useful if the country expert could provide a bit of information as to why they were chosen, and could make use of the following criteria:

- Is it a **high value biodiversity area**?
- Are there **interesting insights on the farming practices** (eg measures adopted)?
- Is it a potentially interesting case where there is a threat from changed practice (eg given trends) that need to be withstood to **protect biodiversity**?
- Is it a potentially interesting case where there is **a potential to improve the biodiversity** by changing practice/ new measures?
- Is this a **major area/typical practice** and hence of applicable widely?
- Is this a **unique area of unique importance**?

The aim will also to picture a mix of agricultural practices across the countries object of this analysis. Therefore it will be important that the countries reports provide the widest set of cases of land types, and present a range of biodiversity and ecosystem services types, a range of measures, and a mix of areas to protect and areas to improve.

5.5 Step 5: Calculate opportunity cost in relation to specific biodiversity-friendly options

This step assesses what the opportunity cost to the farmer would be of either maintaining or moving to biodiversity friendly farming practices. This will therefore include a consideration of the specific (net) costs of any measures, and also possible foregone profit from not adopting a more 'profit maximising' approach.

While some data will be available (eg land prices, crop prices), in other areas data will be poorer (eg specific costs of measures that could be applied). This methodology therefore tries to respond to this by presenting a broad picture of the main land uses and assessing an opportunity cost estimate for the 2 or 3 specific sites; and on these basis, building a picture for the region.

Developing a list of the potential range of options and measures for each specific site (eg 'maximum biodiversity protection', 'profit maximisation' and 'land abandonment' etc). This will lead to a full range of potential opportunity costs and biodiversity protection benefits. When developing the list:

- Build on literature of costs - land prices; crop prices; profits; costs of measures
- Interview experts and farmers when possible/relevant
- The list should in principle cover the range of feasible options (ie exclude those that are completely unrealistic)

Calculate the opportunity costs: Use the methodology template input figures and text you have collected (Opportunity cost and gross margin excel sheets). In general, the opportunity cost results from the foregone profit from not moving to (or not keeping) an intensive profitable practice, and includes the cost of the measures required to set up/maintain biodiversity-friendly practices (eg additional labour costs, change in technology, etc). The opportunity cost, in particular the foregone profit associated to it, may be calculated differently, depending on the current situation and future options taken into consideration. The most typical cases are the following:

- When the current practice is intensive/most profitable:

In case the current practice is intensive, and the intention is to move towards a more biodiversity friendly practice, the opportunity cost will result in the forgone profit from moving to the current to the future practice. The opportunity cost will be calculated as follow:

OC = GM (current) – GM (option) + costs of measures

- When there is risk of intensification

When the current practice is extensive/biodiversity friendly (and supposedly not very profitable), there is the risk that farmers may switch to more intensive and profitable practices. If the current practice is maintained though, the opportunity costs to the farmer will be related to the foregone profit from not adopting a more profitable practice – ie, the difference between the profit the farmer would have had if he could move to a more intensive practice, and its current profit from the extensive/biodiversity friendly practice.

OC = [GM (most profitable option) – cost of related measures] – GM (option) + costs of measures

- In case of land abandonment

In order to calculate the opportunity cost for abandoned land a benchmark may need to be identified. This could be, for instance, the average regional/national GM or the GM from a profitable practice in the area. It has to be borne in mind to that this will be just an approximation, or even a theoretical exercise in some cases, as the reasons for land abandonment are often more social then economical – therefore the concept itself of a 'foregone profit' may not be an issue in the farmer decision to opt for abandonment.

OC = [GM (benchmark) – cost of related measures] – GM (option) + costs of measures

Some instructions are also provided in the template excel sheets (opportunity cost sheet). The calculation will result in figures or estimates, which may be qualified in many cases. The table should be broadly filled in for the 2-3 selected sites. If needed, support will be provided by IEEP.

When analysing the positive and negative values of systems in the excel spreadsheet, include consideration of ecosystem services impacted positively or negatively, and other impacts such as waste production, pollution (including nitrates, diffuse pollution etc), and impacts on local economies where information is available (flow-on effects such as support for eco-tourism).

The PES being considered in this project will be payments for the maintenance or establishment of biodiversity-friendly farming practices. The calculation of opportunity cost thus will consider two main assumptions:

- that incentives should be needed for moving from an existing 'profit driven' farming practice to a sustainable one.; and that
- incentives should be needed to avoid moving from an existing environmental-friendly practice to a practice that has negative effects on biodiversity (eg 'profit driven' or land abandonment).

5.6 Step 6: Assess the costs and benefit of PES

Use the methodology template and its instructions (Cost and benefits excel sheet) to analyse the costs and benefits of possible payment schemes and estimate the level of PES.

PES consist on a payment on top of the farmer's revenue. The payment should at least cover the opportunity costs (as calculated in step 5), ie it should compensate for the foregone profit for adopting/keeping a biodiversity friendly practice and for the (possible) cost of additional measures required to maintain biodiversity.

A PES equal to the opportunity cost though will make biodiversity-friendly and intensive practices worth the same (from an economic point of view), and a farmer can be indifferent between choosing one or the other. Therefore, as a rule of thumb, the overall profit from biodiversity-friendly farming practices should be slightly higher than the profit from more intensive alternatives.

This will result in a sort of 'mark-up' on top of the PES, which should make biodiversity-friendly practices economically more 'appealing'. A graphic explanation is provided in Figure 1 below.

In this study the overall PES is therefore to be calculated as:

*PES = Opportunity costs * mark-up*

In order to promote the highest level of biodiversity protection, different mark-ups have been used, according to the degree of environmental friendliness of the practices. Starting from a basis of 10%, higher mark-ups (13 or 15% for instance) can be used to promote the practices that are considered to be the best for biodiversity. In this way, the payment for more 'virtuous practices', among the biodiversity friendly options, will be slightly higher, hence signalling what options should be preferred.

What is the practice to be preferred though may change according to the land type of farming practice in use.

For instance, in the case of grassland, the best biodiversity practices are considered to be those requiring to meet some environmental standard (eg IPARD), followed by extensive practices, while organic farming is considered less ideal (although still a practice worth being incentivated), because may lead to some slight intensification of the agricultural activity. For this reason, the following mark-ups has been used for grassland:

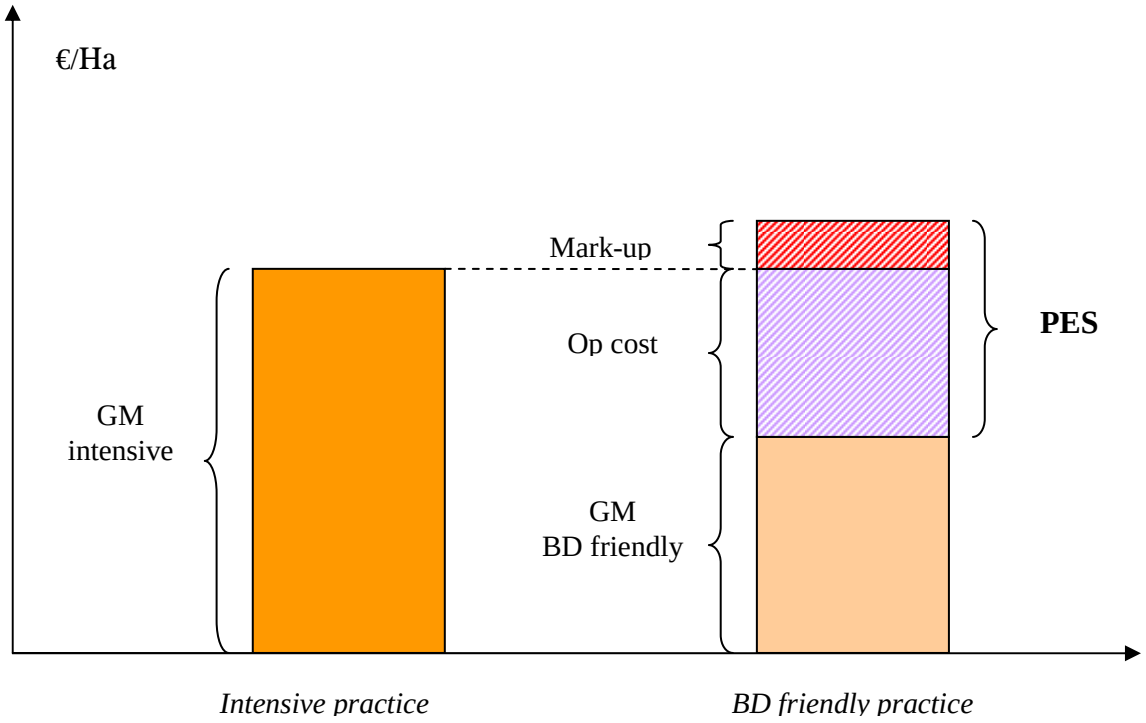
Mark-up = 10% for organic farming
Mark-up = 13% for extensive practoces
Mark-up = 15% targets met (eg IPARD)

For other type of land type or farming practices, organic is instead supposed to be best for biodiversity, followed by programmes requiring standards to be met, and finally extensive practices. In cases different than grassland then, the following mark-ups have been used:

Mark-up = 10% for extensive practice
Mark-up = 13% targets met (eg IPARD)
Mark-up = 15% for organic farming

The way these percentages have been used is though arbitrary, and different percentages can be used (eg 5 – 8 – 10%) according to financial resource availability, degree of environmental danger, urgency of the measures etc. Also, whether to differentiate among biodiversity friendly practices with different mark-ups, and what practice to prefer, can be decided on a case by case basis.

Figure 1: PES for biodiversity friendly practices compared to intensive practices



5.7 Step 7: Analyse and discuss the costs and benefits of payment schemes at national level

Draft a country report by using the country case study template provided (separate MS Word template). The country case studies build on the information collected/analysis conducted with the assistance of the guidance document (Chapter 6 tables) and methodology templates. Therefore, further analysis and discussion (eg country experts' opinions) is needed to complete the country case study templates.

6 TABLES TO BE USED TO COLLECT THE INFORMATION

Table 1. SWOT analysis of the region (based on example given in Box 1)

A SWOT analysis is a useful mechanism to get an overview of some of the key issues for the area. It helps clarify what the strengths of a region are and hence what could be built on or should be protected. It notes the weaknesses (general and particular) and hence what one should be careful with. It can encourage one to think through the opportunities - in this context this includes both those for agriculture and for biodiversity and associated activities (one should not forget the potential benefits from developing these). It is also a mechanism to identify threats – this is especially important for biodiversity as changes in agricultural practice, if unsuitable, can lead to significant biodiversity loss.	
Strengths	**Weaknesses**
Opportunities	**Threats**

Table 2. Information about (agricultural/forestry) sites of highest biodiversity value in the area

TOP 10 HIGH BIODIVERSITY VALUE AREAS				
Name(1)	**Biodiversity Description (2)**	**Approximate land cover in study area (ha. and percentage)**	**Where is it**	**Interaction between biodiversity and farming practices and/or other land use interactions**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

(1) Preferable as according to the habitats and birds Directives,

(2) Including type(s) of biodiversity that makes the site special (eg most important and/or endangered species) – if possible refer to Habitat/Birds Directive. Also mention if it is unique or typical, and whether fragile (is it near a critical threshold) or reasonably robust.

Table 3. Information on 10 largest/most important land-uses (agricultural/forestry) by area (including the identified biodiversity friendly farming practices)

TOP 10 LANDUSES IN STUDY AREA					
Name	**Description (1)**	**Approximate land cover in study area (ha. and percentage)**	**Biodiversity existing/affected by the land-use**	**Interaction between farming practice and biodiversity**	**Indicator of interaction (2)**
1. **Agriculture – pastoral farming**					
2**Agriculture – pastoral arable**					
3 Urban/road					
4 Forestry					
5					
6					
7					
8					
9					
10					

(1) including ownership type (public/private), management systems (extensive, intensive), etc. Also mention if it is typical land-use, or small local issue

(2) key:

☹ Negative effect on biodiversity (and make note if a critical threshold is breached (red dot) ● or heading towards being / close to being breached (red arrow); ⬇

😐 Negligible effect on biodiversity;

☺ Positive effect on biodiversity.

Table 4. Information on significant trends in land-use in the study area

SIGNIFICANT TRENDS IN LAND-USE IN THE STUDY AREA						
	Past Trends			Future Trends		
Name	**Description of the trend – crop type, farming practice and measures**	**Insights on costs, profits, land value**	**Socio-economic drivers behind the trend**	**Description of the trend – crop type, farming practice and measures**	**Insights on costs, profits, land value**	**Socio-economic drivers behind the trend**
1. **EXAMPLE TO COMPLETE**						
2						
3						
4						
5						
6						
7						
8						
9						
10						

ANNEX I – Examples of data

The information and figures provided in this annex are all taken from: AVALON and IEEP (2002): 'Developing Agri-Environment Programmes in Central and Eastern Europe – A Manual'.

The headings and comments in *italics* are part of this guidance.

It is to be noted that the examples provided by Annex 1 are not **directly applicable** in the context of this project. The purpose of Annex 1 is to provide examples and ideas on how the payments for environmental services are calculated in other countries (eg as a part of the EU agri-environment programmes).

Environment and policy issues

Figure 1 Agricultural intensification factors that threaten farmland bird species in Europe
Source: Tucker and Heath, 1994

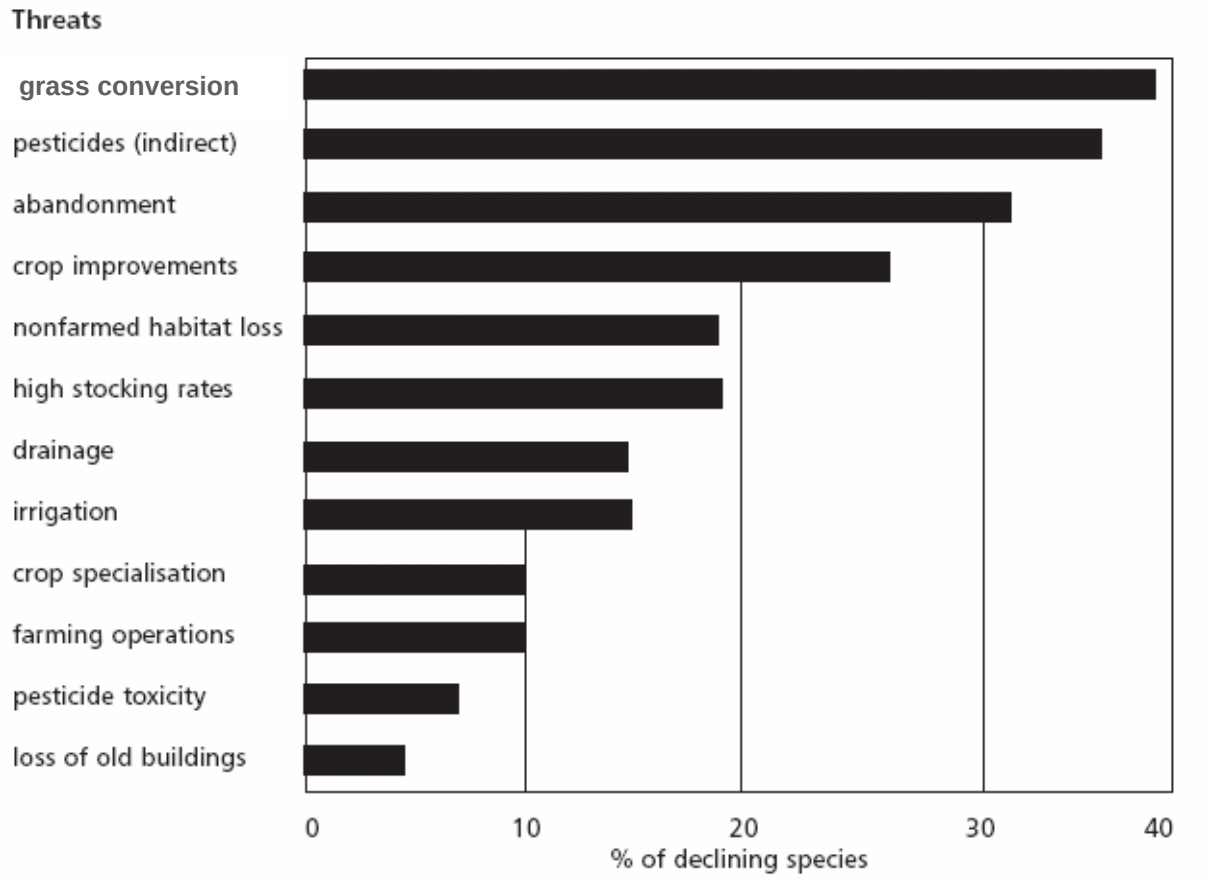


Figure 2 Hierarchy of measures for conserving habitats and landscape

Description of the areas/sites

The following information could give some ideas with reference to step 2 of the guidance.

In the context of an agri-environment scheme the term 'farm structure' refers to the types of farm businesses in an area. There are many ways of categorising farm businesses of which the following are just some examples.

- Type of farm production, eg dairy farm, arable cropping farm, mixed farm.
- Farm size (often this is defined by area, but other measures of business size can be used).
- Socio-indicators such as age, average household size, average yearly income, full- or part-time farmers.
- Business-indicators such as average output, yields, average input of fertilisers and pesticides per ha, average investment rate, forage method.
- Land tenure (eg owner, occupier or tenant).

A method of categorising farms is often called a 'typology'. As an example, a typology used by a university to categorise lowland farms in south-west England is outlined below:

Farm Classification	
Specialist Dairy Farms	0 – 40 hectares
Specialist Dairy Farms	40.1 – 80 hectares
Specialist Dairy Farms	over 80 hectares
Mainly Dairy Farms	100 hectares and under
Mainly Dairy Farms	100.1 hectares and over
Lowland Cattle & Sheep Farms	80 hectares and under
Lowland Cattle & Sheep Farms	80.1 hectares and over
Mixed Mainly Crops	100 hectares and under
Mixed Mainly Crops	100.1 hectares and over

Identification of potential measures/option

The information provided below could be useful when identifying possible measures/options, to be analysed in table 5 of the guidance as required in step 5.

Figure 3 Identification of potential management packages targeting biodiversity protection

Biodiversity protection	Examples of management conditions
Basic protection for ecosystems	–reduction of fertilisers/pesticides
Special protection for arable land ecosystems	–reduction of fertilisers/pesticides
Protection of semi-natural grassland types	–extensive grazing regime –continuity in mowing (mowing date also) –maintaining groundwater level
Restoration of grassland types	–restoration of groundwater regime –applied mowing regime - applied grazing regime –reduction of fertilisers
Achieving right grazing regime	–reduction of overgrazing –increased grazing in undergrazed areas
Landscape protection, including geomorphology and cultural heritage	–protection of landscape features such as hedgerows –protection of cultural remnants such as stonewalls and old roads
Restoration of landscape features	–restoration features such as hedgerows, stone walls, old roads, historical settlements, old orchards, etc

Examples of costs

The following data could be used as benchmark to assess opportunity costs, as required by step 5 of the guidance and in table 5

Figure 4 Management packages for landscape features in the Netherlands

Management Prescription	Payment*
Planting or restoring landscape features	Up to 9,075 per ha
Basic requirements and management	—
No changes in the composition of landscape features other than management of the features	—
No application of chemical pesticides and fertilisers and no burning near the features	—
Requirements relating to the timing of activities (eg all timber management should take place during the winter)	—
If necessary: establishment and maintenance of a fence at a distance of at least 1 metre from the landscape feature	0.42 per m
Yearly or periodic management of the following landscape features	
1. Wooded banks	238 – 474 per ha
2. Wooded dykes and land boundaries	238 – 474 per ha
3. Shelter belt / windbreak	215 – 431 per ha
4. Alder coppice	11 – 22 per 100 m
5. Coppice woods	431 per ha
6. Hedges	0.80 per m
7. Shrubs / brushwood hedge	0.19 per m
8. Pollarded trees	2.72 per tree
9. Wooded hollow roads	1,060 per ha
10. Standard fruit trees	9 per tree
11. Duck ponds	1,493 per ha
12. Ponds	41 – 77 per pond
13. Reed borders and small reedbeds	499 – 694 per ha

* Payments may vary according to the coverage (eg density of trees) or the size of the feature (eg for ponds). Except for planting or restoration payments, the payments mentioned are annual.

Figure 5 Calculation of Gross Margin for UK circumstances (1998 prices)

All figures are per hectare	Winter	Winter Barley Malting	Winter Oilseed Rape	Spring Barley Feed
Gross Output				
Yield (tonnes)	7.0	5.5	2.5	5.7
Price (EUR/tonne)	150	200	265	150
Crop Value (EUR)	1000	1100	660	840
Area Payment (EUR)*	415	415	700	415
Total (EUR)	1500	1500	1400	1300
Variable Costs				
Seed	65	72	60	70
Fertiliser	160	110	144	125
Sprays	260	240	130	120
Miscellaneous		6	60	6
Total (EUR)	490	430	400	320
Gross Margin (£)	960	1070	960	930

* This is based on an EU subsidy for cereal producers.

Figure 6 The financial impact of stopping arable crop production

Prescription	Arable Reversion	Losses EUR/ha	Gains EUR/ha
Costs Saved			
Interest on work + capital on arable crops			23
Fixed costs savings			200
Income Lost			
Loss of arable gross margin		930	

Figure 7 The financial impact of starting low intensity grassland management

Prescription	Losses EUR/ha	Gains EUR/ha
Extra Income		
Hay production		200
Grazing (0.2 LU at €460/LU)		92
Extra Costs		
Interest on work + capital (ie livestock)	20	
Livestock quota leasing	6	
Grass establishment (amortised)	52	
Fencing (amortised)	25	

ANNEX II – Types of Ecosystem services

The table (left hand column) is there to help the experts identify the range of benefits from the land; the right hand columns are there only for the select case studies.

TYPE OF ECOSYSTEM SERVICE*	ARE THEY RELEVANT IN THE AREA? (YES/NO)	IMPORTANCE 0, *,**, ***	UNDER THREAT BY CHANGES? Y/N
Provisioning Services			
Food and fibre			
Fuel			
Biochemicals, natural medicines, and pharmaceuticals			
Ornamental resources			
Fresh water			
Other			
Regulating services			
Air quality maintenance			
Climate regulation (eg temperature and precipitation, carbon storage)			
Water regulation (eg flood prevention, timing and magnitude of runoff, aquifer recharge)			
Erosion control			
Water purification and waste management			
Regulation of human diseases			
Biological control (eg loss of natural predator of pests)			
Pollination			
Storm protection (damage by hurricanes or large waves)			
Fire resistance (change of vegetation cover lead increased fire susceptibility)			
Avalanche protection			
Other			
Cultural services			
Cultural diversity, spiritual and religious values, educational values, inspiration, aesthetic values, social relations, sense of place and identity			
Cultural heritage values			
Recreation and ecotourism			
Other			
Supporting services			
Primary production			
Nutrient cycling			
Soil formation			
Other			

as according to MEA