Jordbruks verket

How can the Rural Development Programme's agri-environmental payments be improved?

Experiences from other countries

Photo: Jörgen Wissman

- Pedagogically presented payments can solve many of the problems with the Swedish system.
- The regionalisation of payments may lead to a greater degree of clarity and precision, but this must be balanced against equality both of treatment and administration costs.
- Flexible solutions, such as feedback systems, value-based payments, and the option to prematurely relinquish one's commitments, may bring about wider acceptance of the payments.

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Abstract

Swedish agri-environmental schemes are viewed and compared to the programmes of other European countries. With evaluations, reports and the available scientific literature as a background, we suggest several possible alterations and additions to the current Swedish programme. They include seeded fallow, regionalisation of measures, and added system flexibility. The agri-environmental schemes of six countries are examined and over 200 scientific publications have been synthesised.

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Summary

This study has shown that there is much to learn, and inspiration to be drawn, from the solutions that other countries have found with regard to rural development programmes. The most obvious difference between the agri-environmental payments made by Sweden and those of several other countries is that it is common that a set of basic measures need to be satisfied before it is possible to apply for other payments, where the requirements are more exacting. In many countries, the payments are also clearly regionalised, which makes it possible to make adjustments based on various natural. Several countries have a more comprehensive agri-environmental payment system than Sweden, but, since they are presented in a simple manner, they are easier to understand. It would probably be possible to retain, and maybe even increase, the number of different payments available through the agri-environmental payments system, if they were presented in a simple manner and if regionally-specific information could be provided to those concerned. There are many payments that have effects on specific species or on plant nutrient leaching in certain circumstances. That which has most clearly been demonstrated as having the greatest effect is the use of fallow land. However, this is not currently widespread in the Swedish plain districts.

For the majority of payments, there has not been sufficient monitoring of their environmental impact. This applies both to Sweden and the six other countries we have studied. Integration of the monitoring of the effects of the payments should be a matter of course when an agri-environmental payment system is created, since it is not otherwise possible to assess the benefit of the funds expended on each respective measure.

Agri-environmental payments to farming are an important part of the measures being taken to achieve environmental objectives, which comprise targets for the preservation of both cultural heritage and the distinctive nature of the agricultural land of individual regions. In this report, the agri-environmental payments of five EU countries and Switzerland are described and evaluated, subject to the information available. Proposals for additions or amendments to the Swedish Rural Development Programme are also presented. They are based, inter alia, on a synthesis of around 200 scientific studies that address different aspects, from the design and effects of individual payments to the perceptions and attitudes of the farmers. These proposals have several levels, from the addition of special measures to apply to specific species, and how commitment periods can be handled, to proposals regarding a transition towards a value-based payment system incorporating obligatory basic management measures.

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Preface from the authorities

The Swedish Board of Agriculture, the Swedish Environmental Protection Agency and the Swedish National Heritage Board have been jointly commissioned by the Government to continually monitor and evaluate the environmental impact of the EU's Common Agricultural Policy, CAP. The work is conducted within the project *Environmental Impact of the CAP*. This report has been produced with the aim of assessing the efficiency of the agri-environmental payments and acquiring experience or learning lessons from other countries design and analysis of their agri-environmental payments. The results have been used as an information base for the work involved in the development of the forthcoming Swedish Rural Development Programme within the CAP.

The main emphasis of the report lies in agri-environmental payments and measures concerning the use or management of biodiversity in the cultural landscape, however, there are also descriptions and assessments that address the other public goods of the agricultural landscape, as well as agricultural plant nutrient leaching and problems connected with the agricultural use of pesticides.

This study has been financed by the *Environmental Impact of the CAP* project and Baltic Compass. The work has been conducted as a consultancy assignment by CBM (Swedish Biodiversity Centre) at SLU (Swedish University of Agricultural Sciences), in collaboration with staff from the Swedish Board of Agriculture. The authors themselves are responsible for the content of the report. Therefore, the statements and proposals therein are not necessarily consistent with those of the Swedish University of Agricultural Sciences, the Swedish Board of Agriculture, or other public authorities.

The report has been translated into English by an external firm, which means that not all professional expressions may be correct. It has also been revised a little from the Swedish version.

Preface from the Project Leader

The agri-environmental payments within the EU's agricultural policy have become all the more important. This applies both to the incomes of many farmers and in the work which is directed at: A Varied Agricultural Landscape, A Rich Diversity of Plant and Animal Life, Zero Eutrophication, and other offical Swedish environmental goals. There is much to suggest that this trend will intensify in the future. My impression is that the agri-environmental payments that we have had up until now, as well as other measures within the Rural Development Programme, have two origins. One of these is that the direction and design of the measures has been governed by the EU's regulatory framework. The other would be that they have been formed on the basis of previous Swedish environmental policy and Swedish experiences. Agrarian, ecological and other knowledge connected with the natural sciences has thus provided important information. On the other hand, it does not appear that many lessons have been learned or effective solutions adopted directly from the programmes of other countries. At the same time, despite positive effects, the Swedish agri-environmental payments have been criticised by many and in many different respects. With this study, we want to investigate measures employed in other countries that may be of interest to us and see which forms of payment have proved to be effective or which work well in collaboration with the farmers. Our main hope is that we can contribute towards improving future rural development programmes, so that everyone working in or otherwise involved with the agricultural landscape may enjoy its bounties.

The study has been conducted by a research group from the Swedish University of Agricultural Sciences, SLU, on behalf of the Swedish Board of Agriculture. Jörgen Wissman has been the coordinator of the research group at SLU, and is the main author of chapters 2, 3.1 and 4.2. Åke Berg has primarily been involved with the scrutinising of the scientific literature and has written chapter 3.2. Chapter 3.3 on the agri-environmental payments and the farmers has been written by Johan Ahnström. Johan Wikström has been responsible for the collection of the majority of the data used in chapter 3.1 and its texts. Chapter 4 was written by these authors together. Knut Per Hasund at the Swedish Board of Agriculture is in charge of the project and has been involved with chapter 1.2, in addition to editing and contributing various viewpoints and smaller text items.

Jönköping, 8th November 2011

Knut Per Hasund

Figure 1. The agri-environmental payments within the EU's agricultural policy have become all the more important, both for the incomes of many farmers and for the environmental impact of agriculture. Albi, France

Photo: Knut Per Hasund

Acknowledgements from the authors

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1. Background

1.1 The aim of the project

Sweden's agriculture affects the environment in many ways, and to a significant extent. One of the most important of these is the negative effect on ground and surface water that occurs as a result of the leaching of plant nutrients and pesticides. However, there are also positive impacts on the biodiversity of the agricultural landscape, cultural heritage environments or other valuable social landscapes. These are expressed through ”A Varied Agricultural Landscape”, ”Zero Eutrophication” and also in some of the other Swedish environmental goals. Common to several of these environmental impacts is that they affect public goods, so they must, therefore, be regulated politically, in order to increase these benefits toward socio-economic optimum, since there is no market for this kind of production.

Major work is currently ongoing in a number of parallel projects which are aimed at simplifying for farmers the Swedish rural development programme's regulatory system. The system shall be simultaneously both flexible for farmers, but firm with regard to the EU's regulatory framework; it shall bring about specific and major positive effects on the environment, culture, nature and landscape, and be economically efficient.

The aim of this project is to learn lessons from several other European countries regarding their design of rural development programme measures, and how well these have worked. The project report shall be able to be used as a basis for the design of Sweden's new Rural Development Programme, which will come into effect in 2014.

1.2 Agri-environmental payments in a socio-economic perspective

1.2.1 Market, policy and efficiency

One fundamental question concerns what the market can be left to manage and which problems are better handled with the help of political intervention. For what can agri-environmental payments be justified, and what should consumers, farmers and others concerned be able to take care of themselves? There is of course no objective scientific criterion that can decide this question. The choice is normative and can be seen as a political issue. However, if the aim is socio-economic efficiency, then this criterion can be used to decide those measures to which agri-environmental payments are justified.

Socio-economic efficiency implies that all resources (land, labour, etc.) are used in such a way as to maximise their benefit to society over time. Benefit to society comprises everything on which its members place a value. The higher the members of society value the goods and services in question in terms of what you really are willing to forsake, the higher is their social value. All current and future generations are included, although the society can be defined so that it only encompasses its own country or region. Biodiversity, the quality of ground water,

and healthcare have social value, in the same way as cars, hairdressing services and milk do, as long as people value them. At the same time, the costs of both resource consumption and other negative effects, such as nitrate pollution, must be considered in order to calculate the total net benefit to society.

A perfect market economy works constantly to maximise welfare[1] to society over time, assuming that certain prerequisites are fulfilled. The most advanced technology of the time will be used in every production decision, so that the optimum amount and combination of resources will be used to produce an adequate amount of all goods and services.

The problem is that, in reality, there is no market that functions this perfectly. There are certain ”market failures” that mean that the prerequisites for effective production and consumption are not met. For many environmental qualities, such as pure water or open landscapes, there is such a high demand that, from the point of view of efficiency, it would be justified to have considerably more of them than would be found in a free market, i.e. the amount that would be produced if specific policies were not implemented. Agri-environmental payments, technological restrictions or other interventions are, therefore, normally required, whether the society wishes to have effective ”production” of environmental services, or whether the negative effects are to be limited to the optimal socio-economic level.

1.2.2 Market failures

Market failures[2] give rise to environmental problems. The most important, in terms of the environmental impact of agriculture, are:

- externalities, especially when they involve:
- non-excludable goods and services, or
- non-rival goods and services, and
- information shortcomings, that lead to high transaction costs.

Externalies are those that affect the benefit to uninvolved parties (or a company’s profits) without there being any compensation for this. The external effects can be either negative or positive. Nitrate leaching, that raises the nitrate levels in ground water and, therefore, in drinking water, is an example of a negative external effect, whilst the cultivation of fields that provide an appreciated open landscape is a positive external effect. The external effects contradict the principle of voluntary agreement that must apply in order for both buyers and sellers to always be winners, and for the market to bring about an increased level of welfare. A dairy farmer who wants to maximise his company’s profits compares, for example, the costs of labour, tractor fuel, barbed wire, etc., against the contribution they make to production, and the profitability of any alternative. However, the environmental costs, in the form of polluted ground water or destroyed lake and marine ecosystems, is not included in the company’s economic calculations. These primarily affect other parties. Neither is the environmental benefit in the form of, for example, the biodiversity of semi-natural pasture, included in the calculations when this farmer decides about the amount of land that is to be devoted to semi-

1 The social welfare is defined as the sum of – or other aggregate of – the individual benefits in the society plus the sum of firm profits.

2 Another term often used to describe this is: “market imperfections”.

Figure 2. Without active agriculture, much of the cultural heritage of the agricultural landscape disappears, since this is a positive external effect of agriculture that is not financed by private markets. Stone-bordered cattle path, The Cévennes, France

Photo: Knut Per Hasund

natural pasture, or to grazing pastures, or feed concentrate. The data on which the decision is based may even show that it would be more profitable to switch to only cultivating cereal crops.

External effects arise if ownership rights are not well-established, or if they are well-established, but the transaction costs are so high that an agreement is not entered into (see below). They lead to sub-optimal production and consumption since the value of the external effect is not taken into consideration in the behaviour of the parties concerned. More pollution is released than is optimal with regard to the demands of the society for food and a clean environment. Biodiversity in agricultural landscapes will be below the optimal level, bearing in mind its demand relative to other goods and services. The difficulties involved in obtaining the optimal level of both production and consumption (including of environmental resources) without political intervention, are particularly clear, as far as public goods are concerned. These are characterised by two qualities: non-excludability, and non-rivalry. An environmental quality can have more or less of one or both of these qualities.

Non-excludability means that it is not possible to prevent someone from consuming or benefiting from a resource, product or service that has this quality. This applies even if the person has no (ownership) right to it, or has not contributed to its creation. For example, in Sweden there are many who value semi-natural pastures and their biological or cultural qualities (Drake 1992, Hasund et al. 2011), but who believe that, even if they were to contribute majority large part of their income, this investment would scarcely be noticeable in terms of increasing to the supply of such landscapes. It is not rational for the individual to have to pay, so everyone hopes to benefit from the landscape that others place at their disposal. Non-excludability gives an incentive to ”free-riders”. This in turn

leads to sub-optimal production, i.e., less public goods than would have been expected with respect to our valuations. (Randall 1972)

Non-rivalry in consumption means that if someone benefits from the beauty of flowering meadows, for example, then this does not reduce the opportunity for others to benefit from the same meadows. on the contrary, the market registers the value of milk and other rival goods when the benefiting consumer pays for them. The valuation is expressed in their price and, in a cash flow, which gives producers the incentive and financing to supply such products. On the other hand, the market can seriously undervalue the socio-economic worth of resources with non-rivalry. Only the evaluation of the person who buys the meadow land is reflected in its price, even if there are many who value the same pasture and its qualities. Perhaps not everyone values this exact meadow so highly, but the total benefit to all may mean that it has a very high socio-economic value. Therefore, the market understates the value of non-rivalry goods. This case also gives rise to a sub-optimal situation: ”too few” positive resources will be produced and there will be ”too many” negative environmental impacts. (Samuelson 1954, Randall 1988)

Information shortcomings and subsequent **high transaction costs** are another major cause of market inefficiency. In reality, of course, a society's individuals and companies should be able to contact each other and negotiate a (market) solution on a voluntary basis (Coase 1960). All of those concerned should, in principle, be able to contribute funds so that the lake is not polluted too much, or so that the valuable pasture is grazed and preserved. (. In cases where the legal circumstances are reversed, the polluters have to contact those affected and agree an amount to compensate for their emissions, etc. The polluters then have the right to pollute, or the landowners have the right to decide on the land usage, so, in this example, it is the ” environmental consumers” who have to pay, i.e., compensate the polluter for reducing their emissions or the farmer for continuing costly grazing of the pasture.) Voluntary agreements mean that no one contributes more to the preservation of an object than what it is actually worth[3] to her or him. Correspondingly, no landowner or farmer will accept a lower compensation for the respective object than the sacrifice, the cost that is, that preservation of the object[4] implies. An optimal balance between how people value environmental qualities (the environmental consumers' willingness to pay, WTP) and what it costs to achieve them (the producers' willingness to accept, WTA) leads to socio-economic efficiency.

The problem is, of course, that, only rarely is it possible to come to any kind of effective negotiated settlement. The information, lawyers and such like, that are required to arrive at just such a settlement and ensure that it is adhered to, always entail a cost that is required in order for the transaction to come about (Dahlman 1979). Since each object can have many stakeholders, who have varying incomes, interests and ways of enjoying the object, and, since all of the objects are different, the transaction costs are, in practise, in almost all cases too high. The payment for the object plus the transaction cost is then, per person, larger than the value that the person assigns to the increase of the environmental service. Political interventions can, in many cases, lead to lower transaction costs than might be possible in the market via voluntary agreements. Such interventions can, therefore, be a more

3 The price for the respective individual *i* is never higher than their valuation, the willingness to pay (WTP), for this particular object *k*, i.e., $Pik \leq WTP_{ik}$, *i, k.*

4 The price for the respective farm g is never lower than the valuation of the landowner of farmer, the willingness to accept (WTA) the management of this particular object k, i.e., $P_{gk} \leq WTP_{gk}$, g, k.

effective way of balancing the social costs and benefits of good environmental conditions.

In conclusion, we can note that if market failures occur, then the market is, as a rule, socio-economically inefficient. If socio-economic efficiency is the aim, then it is justified to introduce a political intervention that limits harmful environmental impact or compensates for the production of environmental goods and services whose value is greater than the costs involved[5].

1.2.3 Fairness and distributional motives for agri-environmental payments

There may be reasons for agri-environmental payments other than just socio-economic efficiency. Distribution and fairness issues may be the strongest of these reasons.

Based on a normative or political valuation, one can choose a distribution other than that which the market would provide. There may be a desire, for example, to favour families with children, small farmers, future generations, Sweden vis-à-vis other EU countries, or farmers vis-à-vis taxpayers. Such redistribution policies will involve alternative use of resources, and changes in production and consumption, which may be stimulated with the aid of agri-environmental payments. This includes the production of the agricultural landscape's public goods, the reduced "production of greenhouse gases", the consumption of pure water, etc.

It can also be argued, for reasons of fairness, that agri-environmental payments should be applicable to certain types of services or effects. The fairness criterion, "Producer Compensation Principle" (PCP), implies that whoever produces positive environmental impacts shall be compensated for this. Farmers who manage pastures so that biodiversity increases and the landscape is seen as being even more beautiful should, for reasons of fairness, by compensated for this. The principle is the inverse of the more well-known "Polluter Pays Principle" (PPP). This maintains that it is the polluters who shall pay the costs associated with reducing the amount of pollution and other negative environmental impacts. (Note that effective production with an optimal level of emissions can be realised, even if those who are affected pay the polluters in order to reduce the emissions (Coase 1960)).

To force someone to use commercially unprofitable land or employ unprofitable methods in order to create positive environmental impacts also contravenes another fundamental fairness principle and fuels the general sense of justice. This differs from forcing someone to reduce their negative environmental impacts.

5 The theory for this is well-developed in, inter alia, Arrow & Debreu 1954; Freeman 1993, and Randall 1988.

Figure 3. To compensate agriculture because it "produces" biodiversity is in accordance with the fairness criterion "Producer Compensation Principle" (PCP), unlike agri-environmental payments that are made in order to reduce plant nutrient leaching, which contravene the "Polluter Pays Principle" (PPP). Species-rich pasture, Ingadal, Skåne, Sweden.

Photo: Knut Per Hasund

1.2.4 Agri-environmental payments or other interventions?

It is justified to apply policy measures to influence what is produced or consumed - including environmental goods - if:

1. the aim is socio-economic efficiency,
2. there are ”market failures”, and
3. interventions exist that are capable of correcting these market failures so that there is a net benefit to the society.

As was noted above, political intervention can also be justified for redistributive reasons. The question, when considering which interventions are to be applied, is whether agri-environmental payments or the like are most suitable, or whether another incentive is preferable. The other, alternative interventions that are primarily relevant in these contexts include both ”negative incentive measures” (taxes, charges, transferable quotas, etc.), normative regulations (technological restrictions, quantitative restrictions (quotas, maximum values, bans. etc.), physical planning, etc.), and promotional measures (training, counselling, research, etc.).

The fairness criteria PPP and PCP, as well as socio-economic efficiency requirements mean that agri-environmental payments should, as a rule, only go to:

- positive external effects in the form of:
- non-excludable resources or
- non-rivalry resources, or where for other reasons there are
- information shortcomings[6].

The reference point for positive external effects is that which would exist if the measure was not implemented, i.e., non-activity. For example, grazing a pasture increases its biodiversity, compared with the situation if grazing ceased and the land was abandoned, to become overgrown. This is, therefore, a positive external effect that, furthermore, is characterised by non-excludability and non-rivalry. On the other hand, there is no positive external effect in the reduction of the use of nitrogenous fertiliser in crop production, since plant nutrient leaching is still greater, when compared with the non-activity of abandoning the land in question. It should be pointed out here that producing positive environmental impacts is not the same thing as reducing one’s negative environmental impacts, despite the latter also implying environmental improvement, of course. Agri-environmental payments are only justified in the first instance, according to these criteria.

This point of departure means that agri-environmental payments would be justified for, inter alia, biodiversity, and the preservation of recreational opportunities and cultural heritage in the agricultural landscape, which would disappear if

6 The market’s transaction costs for bringing about production of what are initially seen as positive external effects may be too high. If the total cost, including the transaction cost, is higher than the benefit for the (environmental) consumer or the company’s revenues, one refrains from signing an agreement and producing.

The transaction costs tend to increase, the more parties, the more heterogeneous parties, and the more heterogeneous products are involved, or the more difficult it is to verify the production (see, inter alia, Vatn et al. 2002)

agriculture was to cease. The net sequestration of greenhouse gases would also, possibly, qualify for agri-environmental payments, if it is the case that farming could sequester more than the other alternatives. On the other hand, agri-environmental payments should not go to measures that lead to reduced leaching of biocides or plant nutrients, reduced erosion or soil conservation. Accordingly, neither should organic farming receive agri-environmental payments (Hasund 2007).

That even socio-economic efficiency gives this answer, for what agri-environmental payments should or should not be used for, depends, in short, on the fact that the payments affect the general profitability of production and, therefore, that which is commercially optimal. Funding for the reduction of pollution or other harmful effects means, according to the ”subsidy paradox”, that the product range of the companies increases, since the average cost of producing marketable goods is reduced, thanks to the subsidy. Despite the funding to reduce emissions, they will be higher than that which would be socio-economically optimal, since the companies simultaneously increase their production. So, for example, funding to reduce insecticide leaching from rapeseed cultivation can lower the average costs of cultivation, which in turn leads to an increased level of rapeseed cultivation and insecticide usage.

2. Method

Work on the report has consisted of literature review (both scientific literature and reports from governmental agencies), analysing the usefulness of different types of information and making a summary of these sources. It has been an extensive process to become immersed in the rural development programmes of the various countries examined, and to review the literature regarding relevant measures. The ambition from the start was to include more countries in the overview, but the literature review was more extensive and complicated than expected. This is due, inter alia, to the information regarding the evaluation and incentive systems of the different countries being spread over several locations. It would have been easier to search for information from scientific articles, since there are web-based systems for this kind of literature review.

Since the two different types of literature – scientific articles and governmental reports or evaluations – often differ in their generalisations, this report is divided up into two sections. Firstly, an overview of the incentive systems of the selected countries is given. After this, there is an overview of relevant scientific literature regarding the effect of various incentives and other measures. The scientific review has been further divided up into two parts. One examines the effect of the various measures, whilst the other deals with the relationship between farmers and those measures. The scientific sections have not necessarily been limited to the effects of one measure in a specific country; they address the effect of various measures generally within the EU. This is essential as the scientific literature is seldom limited to one country, and it is also necessary in order to get access to investigations conducted in individual countries.

The scope of this investigation is limited to payments within the agri-environmental payments system, and is directed at the reduction of pesticides and plant nutrient leaching, the promotion of biodiversity, cultural heritage, and other public goods in the agricultural landscape. The assignment did not stipulate that attention should be paid to organic farming, but since this is naturally associated with discussions concerning, for example, biodiversity or plant nutrient leaching in arable landscapes, it has been addressed here to a large extent. However, we do not claim to have touched upon all aspects of organic farming, as this would require a considerably more extensive report than this. In the analysis of the payments which emerged from the literature, it quickly became clear that conclusions must also be drawn with regard to the system as a whole, its design, and the dissemination of information. This is especially evident in the section regarding the relationships between farmers and the agri-environmental payments. Our conclusions are summarised in the discussion and synthesis of the report (chapter 4).

2.1 The selection of countries

The countries have been selected based on the similarity of their natural conditions to those of Sweden, whether documents regarding their rural development programme are available in a language with which we are familiar (i.e., Swedish, German, English and French), and also based on the way in which they have designed their rural development programmes. The countries that have been primarily chosen due to the design of their rural development programmes are

England and Switzerland. These countries are known for their use of alternative solutions within the programme and they have also described the structure and function of their programmes in a relatively detailed way.

Unfortunately, there are no detailed evaluations of the effects of the measures within the programme for any of the countries involved. This is surprising, not only since this is an EU requirement, but also since there is a large amount of money invested within the Rural Development Programmes in order to reduce the negative or enhance the positive effects of agriculture.

2.2 Data collection

Information regarding the rural development programmes of many countries is surprisingly hard to get hold of, even on the respective language in question. There is no complete, compiled information that can be accessed via the European Commission's web page, and it is often difficult or impossible to find information on the respective government's web pages. For several countries, an indirect approach was required in order to understand the construction of the programmes, i.e., through instructions issued to farmers, through OECD reports, through researchers, or through the presentations of officials that are available online. Furthermore, there is a great variation between countries with regard to the amount of available information that concerns the design of the various interventions and their effects.

That which exists is, in many cases, a summary of the countries' final and mid-term evaluations of their respective rural development programmes. However, with a very few exceptions, these have not investigated whether the outcome of individual political interventions has been good or otherwise. The reason why this is the case can vary between countries. One clear pattern is that very little effort has been made to monitor the effects of the payments through follow-up investigations and the collection of data. Sweden is at the cutting edge, as far as this is concerned, with our investments in the National Inventory of Landscapes in Sweden (NILS), the Swedish National Forestry Inventory, the Meadow and pasture inventory (using the TUVA database), the Environmental monitoring of plant nutrient leaching, and FOMA (continuous environmental analysis).

In this study, the collection of references and information for specific countries has, primarily, been conducted through searching for the rural development programmes of the relevant countries, and evaluations and reports that deal with the respective political interventions. Furthermore, personal contacts in several of the countries have provided references, such as unpublished presentations or investigations that would have been difficult to locate using normal search methods.

The scientific summary focuses on recently published scientific articles (2008–2011) which were searched for systematically in Web of Science, but several older central references (primarily from the 2000s) have also been included.

Central search words have been: agri-environment schemes (AES), subsidies, and stewardship. These search words have been combined with several others in various combinations. These search words have included: biodiversity, species-

richness, ecological services, conservation, soil fauna, weeds, farmland birds, pollinating insects, Carabids, butterflies, bumblebees, bees, nutrients, leaching, nitrogen, phosphorus, pesticides, organic farming, farmyard, hedges, autumn-sown cereals, spring-sown cereals, intensification, yield, vegetation density, conservation tillage, management, set-aside, field margins, semi-natural grasslands, landscape scale and agri-environmental footprint index.

The summary also includes a number of scientific articles and other publications that address factors central to biodiversity, ecosystem services, and natural resources in the agricultural landscape, even if the studies have not directly evaluated the effects of agri-environmental payments. These studies have been included in order to give as complete a picture as possible of the various factors that affect biodiversity, ecosystem services, and natural resources, the extent to which these are included in agri-environmental payment schemes, and, in the cases where evaluation of them was possible, whether the payments have had the intended effect. The summary also includes literature that has analysed the problems involved with evaluating the effects of the agri-environmental payments due to factors such as time-lag, the effects of various spatial scales, and differences between the various species groups in respect of the effects of the different agri-environmental payments.

A total of approximately 200 articles have been read and evaluated as a basis for chapter 3.2., and many of these are included as references in this report. One problem has been that several agri-environmental payments have been merged together in many of the studies and only their joint effects have been evaluated; the efficiency of each individual payment cannot, therefore, be assessed. Neither has it been possible to find studies that evaluate the effects of payments made for the management of certain small-scale habitats (i.e., stone walls, field islets), special pastures, or for unusual management methods. The summary focuses on the effect of the larger (both economically and in terms of area) agri-environmental payments: organic farming, riparian strips and border zones, reduced nitrate leaching, payments for the management of semi-natural pastures, and the establishment and management of fallow land. The objective has been to address:

1) General possibilities for evaluating current agri-environmental payment schemes (available data, the objectives of the schemes, and other limitations).

2) How different agri-environmental payments can work to promote biodiversity and reduce nitrate and pesticide leaching.

3) Analyse factors that influence the effect of the support, i.e., the effects on the surrounding landscape, the occurrence of time-lags in the effects of various measures, and differences between how different species groups are affected.

4) Identify the areas where there are synergies or conflicts between management measures and means of control.

5) Find possible future changes to the agri-environmental payment system, and identify the areas where there are no agri-environmental payments but where they could potentially have a positive effect.

For the section on the relationships and attitudes of farmers to agri-environmental payments and other measures (chapter 3.3), the collection of data started with a search in Google Scholar, using the search words: agri-environmental schemes

and attitudes. The material collected was then expanded, based on the reference lists of these first articles. The texts are largely based on 30 central scientific articles. These 30 articles have been read and their main messages have been summarised in a separate document. The first ten paragraphs of all of the summaries are used to create categories which concern various different areas of interest. One of these is ”Get involved”, i.e., what was it that encouraged the farmers to get involved/not get involved with agri-environmental payments. Another category is ”Levels of support”, i.e., the amount of money that is required for them to be interested in getting involved. A total of 22 categories were developed.

To broaden our discussion and to get viewpoints from complementary skill areas, a workshop was organised with representatives from: the County Administrative Board, HS Konsult, farmers, and researchers involved in agri-environmental management or economic issues. The discussion primarily addressed aspects concerned with the design of a future rural development programme. This discussion was valuable and has been incorporated into the synthesis, i.e., it will be reported separately.

2.3 Data quality

The quality of the supporting data is generally low, as far as the monitoring of measures within the rural development programmes is concerned. For biodiversity, the quality is often very low. However, the quality of the monitoring of the effects of plant nutrient leaching is better, at least in certain countries. Despite serious shortcomings, Sweden has comparatively good collection of environmental analysis data, and is seen by many countries as a forerunner in this area.

The scientific literature deals with many of the major forms of support, but is more restricted when it comes to more specific political interventions. In certain cases it may not be possible to investigate these special payments since they are not widespread, or because there are no representative control areas where the measures have not been implemented. Another problem is that the effects are not monitored until after a measure has been introduced.

3. Results

3.1 The rural development programmes in six countries

3.1.1 Denmark

Overview

Agricultural land in Denmark amounts to approximately 2.6 million hectares, which is about 60 % of the country's total area. Approximately 5 % of the population are active within agriculture but this percentage is diminishing rapidly (a reduction of approximately 19 % over 10 years). Agricultural products are an important export category for Denmark and represent approximately 17% of the country's total exports.

Of the EUR 1,667 million allocated to the Danish Rural Development Programme for the years 2007-2013, EUR 627 million (37.7 %) goes to axis 2. What is more, 78.8% of the public funds that finance axis 2 are directed to payments that are aimed at improving nature and biodiversity (MFAF 2008, European Commission 2008b).

Many of the Danish agri-environmental payments are aimed at improving water quality and reducing plant nutrient leaching. The whole of Denmark is classed as a nitrate sensitive area, according to the EU's Nitrates Directive, which Denmark implemented[7] (MFAF 2008).

Green Growth is a programme that the Danish Parliament (Folketinget) started in 2009 and which will continue until 2020. Within the framework for this programme there are several intermediate goals that coincide with the goals of the rural development programme. One of these goals is to reduce nitrate leaching by 1,130 tonnes during the period 2010-2015, and by 678 tonnes by 2013. Another goal is that 16,000 hectares of agricultural land shall be converted back to natural water habitats (MFAF 2011).

Similarities and differences with Sweden's programme

The support system within axis 2 is designed similarly to the Swedish programme, but it places greater importance on the reduction of both plant nutrient leaching and pesticides. It is not surprising that this difference exists as the natural preconditions of the two countries differ greatly. The conditions are, of course, similar in southern Sweden, but, on the whole, there is greater variation in terms of environments, regional differences, and types of landscapes to which attention must be paid within the Swedish system.

Types of support

The Danish agri-environmental payments place great emphasis on improving the water quality and counteracting plant nutrient leaching.

Denmark's rural development programme is, like that of Sweden, divided up into

7 Out of the total area of the EU, 40.9 % is classed as nitrate sensitive (European Commission 2008a).

groups of measures that are, in some cases, further divided up into sub-groups. These groups or sub-groups consist, in their turn, of one or more cropping or management measures that attract agri-environmental payments. The Danish programme has been created with fewer measures, which is partly due to that fact that Sweden has a greater number of measures that are specific within the regionalized Swedish Scheme ”Selected environments”.

The preservation of grassland through grazing and mowing

This measure aims to protect and improve the landscape and habitats as a result of grassland and semi-natural pastures being grazed or annually mown, thereby creating open countryside. Payments are made annually based on the area to which the five-year commitment applies. Only land in certain geographic areas and of the correct natural type can be included in this scheme. In short, it means that the area shall be mown or grazed each summer, that the waste material shall be removed and that neither pesticides nor fertiliser shall be applied (MFAF 2011).

Conversion to organic farming

One important way to reduce the effects that agriculture has on water quality is to reduce plant nutrient leaching through organic farming. This measure also aims to reduce the usage of pesticides and to protect important habitats and ecosystems. Payments can be made for a commitment that spans five years, where the farmer converts a certain area for organic production, in accordance with European and Danish standards. The payment is EUR 141 per hectare per year for the first two years and EUR 13 per hectare per year for the remaining three years (MFAF 2011).

Extensive production on agricultural land

The main purpose of this payment is to reduce the use of pesticides, with the primary aim of improving water habitats. The reduction of plant nutrient leaching and the improvement of habitats are also included in the goals. The measure is open to applications from both conventional and organic farmers. It spans a five year period. It can even be combined with the *Conversion to organic farming* measure but, unlike that measure, it can be renewed after the completion of a five year period. The requirements for *Extensive production on agricultural land* are, in short, that only pesticides that are approved for organic farming may be used, and that fertilisation with nitrogen is restricted to 140 kg/ha or 75 % of the nitrogen quota for fields, as decided by the Danish Agriculture and Food Council. Furthermore, the farmer is also required to establish a plan and keep a record of the farm’s use of fertiliser and pesticides. The aim of the latter is to facilitate control and to stimulate alternative farming practises (MFAF 2011).

Figure 4. Agri-environmental payments are made for extensive production, which means, inter alia, that fertilisation with nitrogen is restricted to 140 kg/ha/year, and that records must be kept of the farm's use of fertiliser. Jutland, Denmark

Photo: Urban Emanuelsson

Establishment and management of unfarmed buffer strips

In order to reduce leaching of phosphorus and pesticides out into the surface water, payments can be received for riparian strips alongside lakes and water courses. To be entitled to receive payments, the farmer shall establish and maintain a 10-20 metre broad strip alongside the stream or lake. The strip shall lie fallow, be kept free of pesticides and fertilisers, and be mown annually with light machinery that does not cause erosion (MFAF 2011). This measure is proposed to become a legal requirement in Denmark, which means that it would, then, no longer be a part of the agri-environmental payment system.

Management of wetlands and the restoration of natural water conditions

This measure aims to create and manage wetlands that are important habitats for, inter alia, birds, and to prevent the leaching of nutrients and pesticides. Payments can be received annually for a 20 year commitment to restore water habitats in an area that floods and where no fertilisers or pesticides are used. Payments are also made for five year commitments. These are made for environmentally sound management that preserves the water conditions of sensitive areas, or for alterations to the drainage of such areas (MFAF 2011).

Plant genetic resources for food and agriculture

The purpose of this measure is, primarily, to preserve domestic Danish plant species that are currently rare. To be entitled to receive payments, cultivation shall be carried out without artificial fertilisers and pesticides, other than those approved for organic farming. The plants to be grown shall be older, local variants. Furthermore, the plants and their use shall be displayed (MFAF 2011).

Non-productive investments for the protection of the environment, nature, and the well-being of animals

This payment has many goals, including, primarily, to contribute to biodiversity through the creation of important habitats, to generally promote various natural, cultural and recreational assets, to connect natural habitats, and to prevent the damage caused by wind. Payments can be received for, inter alia, efforts to recreate old landscape features, such as various kinds of walls or habitat-improving vegetation, such as hedges and bushes (MFAF 2011).

Non-productive investments – establishment of wetlands, etc.

The agri-environmental payment, "Establishment of wetlands, temporary flooding of agricultural land, nature preservation projects and the recreation of natural water habitats", aims to reduce nutrient leaching into open water and to create and preserve threatened habitats. The authority that administers the payments only disburses to measures that are cost-effective according to calculations based on modelling (MFAF 2011).

State acquisition of land, in order to guarantee permanent alterations to the management of agricultural land

This measure is based on the State being able to purchase from a farmer land that is needed for the implementation of an environmental project, should the farmer himself not want to own the land as it can no longer be farmed. This primarily applies to projects that aim to improve water habitats or protect important biotopes. After, for example, a wetland is established, the State can sell it, but it can also remain in State ownership and be managed by the same, should no purchaser be found to manage the land.

Figure 5. In Denmark, the State can purchase land with funds from the rural development programme in order to implement environmental projects, if the farmer no longer has an interest in the land.

Photo: Urban Emanuelsson

The planning of cultural, biodiversity and reduced leaching projects

Payments can be received for the planning of cultural, biodiversity and reduced pesticide and nutrient leaching projects. The aim of the projects shall be biodiversity, the promotion of unique cultural and landscape features, the promotion of environmentally-friendly or extensive agriculture, extensive grazing, or the development of recreational assets in rural areas with a high natural value. Payments can be made for costs arising in connection with the planning of future initiatives. The payment can be combined with other agri-environmental payments (MFAF 2011).

Evaluations of the environmental impact of the payments

A mid-term evaluation came to the conclusion that the programme had only had a minor effect on the goals of the Aquatic National Plan II - to reduce nitrogen emissions. This is believed to be partly due to the administration of the support not being particularly effective. The measures aimed at creating wetlands had the greatest effect, but this measure did not meet its objectives either. (MFAF 2011).

As with many other countries, there is no report or investigation that can show the actual effects of the various payments accounted for in the mid-term evaluation. The mid-term evaluation only mentions briefly that there has been a certain shift in focus from axis 2 to axes 1 and 3 in the Danish rural development programme. However, it does mention that the programme's aims are unchanged and that it contributes to sustainable development, even if it does not essentially change the direction of development or the conditions for the development of the agricultural sector. (Orbicon & Epinion (consultants)/MFLFF 2010).

Of the payments within axis 2, the payment for the establishment of riparian strips alongside water courses to prevent phosphorus leaching into the surface water is the one that has least fulfilled its objectives. Only 5 % of the goal was achieved, in terms of the number of farmers who became involved with the scheme (Orbicon & Epinion/MFLFF 2010).

Only 33% of the goal to reduce the nitrogen surplus in agriculture by 3,600 tonnes was achieved, as the reduction amounted to only 512 tonnes of nitrogen. (Orbicon & Epinion /MFLFF 2010).

Figure 6. The Farmland Bird Index has fallen in Denmark, but, despite this, biodiversity is still considered to have developed positively in the agricultural landscape.
Photo: Urban Emanuelsson

According to the evaluation, the development of biodiversity seems to have been positive. Despite this, the Farmland Bird Index[8] has fallen during the period studied, up until 2009. At this point a slight upturn occurred. However, how this result can be interpreted as positive is not accounted for (Orbicon & Epinion/ MFLFF 2010).

The number of new establishments for the separation of sludge and the production of biogas is low. It is unclear whether the rural development programme's payments have influenced the investments that have been made. Consequently, the payments for investments of this kind, probably, did not have a particularly great effect (Orbicon & Epinion/MFLFF 2010).

The Danish rural development programme's objective for reduced use of pesticides was that 290,000 ha would be included in various measures for environmentally-friendly production. As 191,000 ha were included in such measures, 66 % of this objective was met (Orbicon & Epinion/MFLFF 2010).

Figure 7. Coastal heathland. Denmark
Photo: Urban Emanuelsson

The programme for 2000-2006 was estimated as having "deadweight costs" of 24 %, i.e., that 24 % of the money went to measures that would have been implemented even if support payments had not been made. The programme for 2007-2013 should, therefore, have been designed so that these deadweight costs were minimised. However, they had increased to 30% for 2007-2009, as DKK 724 million of DKK 2,413 million was estimated to have gone to payments for measures that had already been implemented. Among the agri-environmental payments, the problem is worst for the conversion to organic farming measure,

8 The Farmland Bird Index, FBI, is a measure of the combined population development of selected species of birds in the agricultural landscape.

where many of those involved would have implemented the measures even without the payments (Orbicon & Epinion /MFLFF 2010).

Assessment of Denmark's payment systems when applied to Swedish conditions

For many of the payments there is a direct equivalent in Sweden, albeit with minor differences. (The differences in the amount of the payments can however be substantial.) For example, there is a payment made through the rural development programme where the State takes over land for significant environmental landscape projects. This, as far as the authors are aware, has no equivalent in the programmes of other countries. If this is something that Sweden could also or should also employ has not been analysed sufficiently here. If it is possible within the EU's regulatory frameworks, this would facilitate projects where, for example, forest areas are to be preserved or wetland areas are to be restored, and many landowners are involved.

Other differences are that there are payments for planted wind-breaks or other structures that reduce erosion and/or have a positive impact on biodiversity. In a way, this is the opposite of the situation in Sweden, where payments for the management of landscape elements facilitate the clearance of bushes and brushwood in field ditches.

Another difference that might be of interest for the Swedish situation is the payment relating to plant genetic resources. It is considerably more developed here than it is in the Swedish programme, which only encompasses brown beans grown on the island of Öland. Older species and their usage can be seen as biocultural heritage, so payments could, therefore, be made to encompass more types and plant species than those currently included. What the most effective preservation measures are is, however, an open question.

3.1.2 England

Overview

Over 70 % of England's area (i.e., approximately 9.3 million hectares) is used for agriculture. Of this, 4.6 million ha are used for grazing or perennial grassland. The remaining area consists of other land types such as groves, wetlands, etc. Depopulation of rural areas is not a common phenomenon in England, which may be a result of the high population density and the short distance between towns. The least densely populated area in England houses approximately 87 persons/km^2, whilst the corresponding figure for Norrland in Sweden is 4.5 persons/km^2. Despite the decreasing profitability of food production in England, profitability on a farm level has generally been maintained, which is thought to be due to the effects of the rural development programme.

Of the funds that are used within the rural development programme, 69 % lie under axis 2, where approximately 80 % of the funds go the equivalent of our agri-environmental payments (The compensatory allowance is very small in England, compared with Sweden.). However, there are elements within the *Uplands Entry Level Stewardship* (UELS, for an explanation, see the section below) scheme that are similar to our compensatory allowance. It is useful to translate the English payments since they have an interesting system. In some

cases, however, the problems and, therefore, the interventions are different to those in Sweden. This can be seen, inter alia, in the payments for the establishment of forests on agricultural land, but also on other types of land.

Agri-environmental payments for agriculture in England are organised within the *Environmental Stewardship* programme, the objectives of which are to:

- preserve biodiversity
- preserve and develop the qualities and character of the landscape
- protect historical environments and resources
- promote public access to and understanding of rural areas
- protect natural resources

The programme has four parts:

1. *Entry Level Stewardship (ELS)*, which is open to all farmers and landowners. ELS includes simple measures over and above those required for the receipt of farm support payments.
2. *Organic Entry Level Stewardship (OELS)* is the equivalent of ELS for those involved in organic production. It is open to all involved in this area who do not already receive support from a specific organic farming programme.
3. *Higher Level Stewardship (HLS*) encompasses more complex types of management. This is tested on a case-by-case basis against local objectives, and agreements are only offered where the farmers can cost-efficiently contribute to the achievement of these objectives.
4. *Uplands ELS* has been open to all farmers and landowners in England's severely disadvantages areas (SDAs) since 2010. It differs from its predecessor (Hill Farm Allowance) in as much as it also encompasses dairy farms and small-scale farming.

For each parcel of land or landscape element, the farmer can freely choose between environmental management options, each of which provide a predetermined number of points. Many, but not all of the alternatives can be combined within the same parcel. It is also possible to participate in the various parts of the programme and to combine management options from them, as long as the land satisfies certain qualification requirements (these depends on the type of land, and for this reason they are not addressed here). The number of points is multiplied by the parcel's area (or the length of the element) and a total for the whole farm is then calculated. Since arable land and pastures are counted together, the management requirements of a single field can vary from parcel to parcel (Hasund 2009). However, at farm level, the individual farmer must achieve enough points in order to receive agri-environmental payments.

Entry Level Stewardship, ELS

Entry Level Stewardship (ELS) is a payment that encompasses all agricultural land. All of the farm's agricultural area must be included in the agreement, but it is up to the applicant to decide which landscape elements are included. One requirement is that the land must be registered in the Rural Land Register (RLR). All

farms that fulfil the basic requirements are entitled to this support and are automatically guaranteed an agreement.

ELS is open to all farmers, tenants, and landowners. However, publicly owned land and land belonging to the State is not eligible to receive this support. The payment level is £30 per hectare per year for all land included in ELS, i.e., approximately SEK 317 per hectare per year (at the time of writing). The exception is parcels larger than 15 hectares within the Moorland Line; these receive £8 per hectare.

To off-set receipt of the payment, an average of at least 30 points per hectare for the contracted land area must be achieved (8 points within the Moorland Line for parcels larger than 15 hectares) (Natural England 2010a).

Organic Entry Level Stewardship, OELS

The aim of this report is not to study organic farming in detail, however, in order to get a reasonable grasp of the payments involved, an overview is given here. The agri-environmental payment known as Organic Entry Level Stewardship, OELS, is equivalent to ELS, but is for land used for organic farming. In order to receive this support, all agricultural land used or owned by the applicant is required to be in organic production (see below), and, within the Moorland Line, none of the land may consist of parcels larger than 15 hectares. The land must also meet the criteria for organic agriculture laid down by the EU (Council Regulation No.2834/2007).

The OELS support is largely identical to ELS as far as its design, regulations, procedural issues, management requirements, and sanctions are concerned. However, in addition to the requirement that the agriculture must be organic, there are a couple of major differences. The payment level is £60 per hectare per year, even for pastures and permanent cultivated grassland. This is double the payment for non-organic land and equates to SEK 635 per hectare per year (at the time of writing). In order to receive this, an average of 60 points per hectare for the farm must be achieved (instead of 30 points for the ELS support). However, the difference between this and the ELS requirement is received automatically as a result of the obligatory "management option", which provides 30 points for all land with organic production. The requirements of the measures connected to this management option include, inter alia, a ban on the use of commercial fertilisers and pesticides, but nothing over and above the relevant requirements for organic agriculture established by the EU. For some of the measures, the number of points awarded within OELS is greater than the points awarded for the equivalent measures within ELS. The management requirements can even differ between the equivalent measures within ELS and OELS, as a result of the OELS land satisfying the requirements for organic farming (Hasund 2009, Natural England 2010b).

Higher Level Stewardship, HLS

The agri-environmental payments known as Higher Level Stewardship, HLS, are only made for agricultural land of particularly high environmental or natural interest. The support must be clearly linked to at least one of the five objectives of the programme that were mentioned at the start of this chapter. These objectives

are broken down to regionally established levels. HLS agreements are only offered for land which, after an obligatory inventory-taking, can contribute to the regionally established objectives in a cost-efficient manner. An agreement can contain a mix of management measures in accordance with ELS or OELS and HLS.

Some types of land can receive HLS support but not the general forms of support. This primarily applies to tidewater zones along the coast and lowland moors. HLS support differs from the general forms of support (ELS, OELS) in as much as it can be given for land that belongs to or is managed by public agencies such as municipalities, national park authorities or various other organisations.

As with the general forms of support, the HLS support is provided if the management measures cited in the agreement are fulfilled. There are many different management options that can be chosen within HLS, but the farmer or landowner does not have complete freedom in their selection, as their decision is made in consultation with advisers from Natural England (the authority responsible for information and advising within the rural development programme, and for administration of the protected areas). In order to apply for an HLS agreement, a land inventory must first be carried out, a "Farm Environment Plan". This forms the basis for deciding which land and which management options can be included in the agreement. This may contain detailed and location-specific management instructions (Hasund 2009, Natural England 2010c).

Uplands Entry Level Stewardship, UELS

For England's upland areas, a new agri-environmental payment programme replaced the previous Hill Farm Allowance in 2010. This is open to all farmers and landowners in England within areas that are classified as seriously disadvantaged. The support also covers leased and common land.

UELS works in the same way as the general ELS programme, but allows higher payments as compensation for the greater and more comprehensive requirements of the measures. In the same way that applies to ELS, farmers must achieve a number of points for their farm, based both on its size and type of land. They receive points through meeting a number of alternative management requirements, one of which they can select for each parcel. Each point equates to £1 (≈ SEK 12) in support.

The payments amounts are:

- Heathland, parcels ≥ 15 hectares: £23/ha (ELS: £8/ha)
- Heathland, parcels < 15 hectares: £62/ha (ELS: £30/ha)
- Seriously Disadvantaged Areas outside the Moorland Line: £62/ha (ELS: £30/ha)

For common land, an additional £5/ha is paid to cover the transaction costs incurred by the landowner and farmer in the formation of collaboration groups and the negotiating of agreements (Hasund 2009).

Similarities and differences with Sweden's programme

The similarities between the two programmes are relatively few, even if individual measures within the payments have major similarities and address the same basic problem, i.e., the need for increased variation in the landscape or reduced plant

nutrient leaching. The differences that exist are probably due to the fact that the problems of the two countries, both at landscape level and for individual objects, differ greatly. For example, the instructions for agri-environmental payments expressly state that cattle are to be kept out of forest areas: ”Ungrazed woods are able to regenerate naturally and provide a better wildlife habitat”. This demonstrates not only that the problems are seen in a different light, but also that the use of grazing animals is completely different. The different programme components, of which England’s agri-environmental payments are constructed, are extremely detailed, and there are a great alternative measures. On the other hand, they are presented pedagogically, which means that the system is not so difficult to understand.

Types of support

The English agri-environmental payments system is very comprehensive, and it is not possible to address all of the measures in detail in this overview. For a more detailed look, Natural England (2010) is recommended; this addresses the various requirements and the specific details of each measure. The agri-environmental payment system and its integral parts are addressed below, with various measures grouped under selected headings.

Entry Level Stewardship, ELS

Obligatory measures

One obligatory measure for eligibility for ELS payments is the mapping and reporting of all environmental features and cultural relics to be found on the farm’s land (Natural England 2010a).

Non-obligatory measures

Hedges and ditches

Bordering hedges, ditches and the like fulfil several purposes, such as enclosing cattle, creating habitats for animals and plants, and counteracting erosion and flooding, they often, also, have a high cultural value. In order to promote these features of the agricultural landscape, there are measures which, in short, are aimed at protecting and preserving hedgerows, stone walls, ditches, and other kinds of walls. Management and maintenance is to be carried out using traditional methods (Natural England 2010a).

Figure 8. Hedges are important for biodiversity, cultural heritage and the appearance of the English landscape. Farmers receive agri-environmental payments for the preservation, management, and maintenance of them.
Photo: Urban Emanuelsson

Trees and tree-covered land

Measures to preserve individual trees on arable or grassland or measures to protect woodland are undertaken partly for their historical and landscape value, but also in order to create habitats for, primarily, birds, smaller mammals, and insects. Points can be achieved if woodland owned by the farmer is protected from cattle through well maintained fencing. There are also measures involving the establishment of buffer zones, using trees and hedges, on pasture or arable land and where fields border woodland, with the aim of creating habitats for plants and animals. In these buffer strips, the mowing of grass and the control of weeds is regulated, and the area may not be fertilised or used for the storage of equipment or vehicles (Natural England 2010a).

Landscape elements and cultural heritage remains

Payments can be made for the management of weather-proofed traditional buildings, landscape elements that arose as a result of agricultural practises (i.e., stone cairns), the reduced usage of land in areas of archaeological interest, the clearance of bushes from around ancient monuments, and the exposure of ancient monuments in grasslands.

Buffer strips

Buffer strips are most often established around fields, but they can also be established in fields, for example, to protect a group of trees or an embankment. Commitments regarding buffer strips can only be approved if the land occupied by them could be farmed. If this involves grassland, then this must refer to land that is currently farmed intensively, i.e., fertilised with a certain amount of nitrogen per hectare per year. Buffer strips may not be fertilised, but harmful weeds may be controlled chemically. How often and when the areas may be mowed, and when the grassland buffer strips may be grazed, may be limited by the terms of the commitment (Natural England 2010a).

Measures on arable land

There are a number of alternative measures that apply to the management of arable land, and that aim to create habitats for, primarily, birds, insects and small mammals. Points are earned if, on parts of the arable land, grassland is established or plants are sown that can provide food for birds and insects. Even unsown sections where birds can breed, or areas that are tilled but not cultivated, areas that are not harvested, or areas where stubble is left over the winter after harvest can also earn points. Furthermore, the limited use of, inter alia, fertilisers and pesticides is generally specified in all of the various alternatives. (Natural England 2010a).

Increased heterogeneity in the crops

These measures exist in order to increase the availability of food for birds by increasing the botanical diversity in the agricultural landscape. This can be done by sowing grass and plant species as undergrowth in cereal crops, or by allowing stubble to remain lying in the field after the grain has been harvested. (Natural England 2010a).

Land and water protection

In order to counteract soil erosion, and leaching of nutrients and pesticides, several measures are designed to bind nutrients over the winter and to prevent erosion and surface runoff into water courses. In short, this involves maize being harvested early and the maize fields then being tilled or sown with a winter crop. Alternatively, insown grass or clover can be used. Alternative measures are: to establish buffer strips alongside water courses, maintain fencing to keep cattle away from water courses, or the establishment of permanent grassy areas in fields where there is a risk of erosion and surface runoff. For some of these measures, the farmer will counteract surface runoff and erosion by loosening up earth that has become compacted (Natural England 2010a).

Figure 9. In England, agri-environmental payments are made for integrated grazing, if several species of animal graze the same area, either together or in the following year.
Photo: Urban Emanuelsson

Integrated grazing on pastureland

This measure aims to increase the biodiversity of pastures. To be entitled to points, the pastureland must be grassland that is not ploughed, tilled or resown. Furthermore, there are requirements for the minimum percentage of grazing sheep and cattle. However, there is no requirement for different types of livestock to graze the land during the same year; the division can be made over a two-year period (Natural England 2010a).

Measures outside of the seriously disadvantages areas (SDAs)

These measures can only be applied for with respect to land that lies within defined areas with poorer production preconditions (similar to areas where the compensatory allowance can be applied for in Sweden). The measures are primarily aimed at increasing biodiversity but also at reducing surface runoff and erosion. In short, the measures are aimed at taking corners or part of fields out of farming usage, at limiting the spreading of fertiliser and pesticides on pasture, or at managing damp pasture with a limited supply of fertiliser and pesticides (Natural England 2010a).

Measures in the Seriously Disadvantaged Areas (SDAs)

Measures for grasslands within SDAs and on moors aim to promote the biodiversity and protect natural assets as well as traditional cultural landscapes and archaeological features. Some of the measures apply to land within SDAs which is not moorland, whilst other measures apply to moors within SDAs. The grasslands shall be managed so that soil compaction and, therefore, surface runoff and erosion are prevented.

(For all measures, see appendix 1.)

Uplands Entry Level Stewardship, UELS

Obligatory requirements for payments to upland areas

For all land that is classed as being part of a seriously disadvantaged area (SDA) and which is included in the Uplands ELS, there are two measures that are obligatory, these vary depending on the type of land (see the first two measures below). Furthermore, there is another measure that is obligatory if it is applicable (see the third point below, Natural England 2010).

Measures on arable land

Supplementary feeding within six metres of water courses is not permitted. Commercial fertiliser is not permitted; pesticides and manures may not be spread within 6 and 10 metres of water courses, respectively. This is also governed by other regulations. Stone walls, stiles, hedgerows, ruins, and other traditional landscape features shall be preserved and maintained in a traditional manner. In natural bush and wooded areas, animals may not be given supplementary feeding. All plastic waste shall be removed from water courses, and stone boulders and flat pieces of rock shall be preserved (Natural England 2010a).

Measures on moorland

It is obligatory that moorland is grazed to a sufficient degree, which means that a minimum number of animals shall graze there during the summer months.

Furthermore, the management of wetlands, mires and bogs, and the control of ferns are also obligatory. It is not permitted to fertilise, plough, till, harrow or sow the earth. Feeding places shall be moved regularly so that the ground is not damaged. Burning may be carried out according to the relevant regulations (Natural England 2010a).

Common land and shared pastureland

In order to receive support for moorland areas situated within SDAs, where several farmers have animals grazing, it is an obligatory requirement to sign an agreement regarding measures for common land and shared pastures. The farmers shall accordingly form a mutual association and draw up a register of the livestock farmers who use the area and the livestock they graze there. Sheep shall have been bred there or be suited to this type of environment, and they must not have sheep lice (Natural England 2010a).

Non-obligatory measures

Trees and tree-covered land

This agri-environmental payment is given for the setting up of fencing around small wooded areas. The wooded areas may be up to three hectares. At least 50 % of the bushes and trees shall be domestic species (Natural England 2010a).

Linear landscape features

These measures aim primarily to maintain traditional features such as hedges, earthen walls, and stone walls in the agricultural landscape, but also to preserve habitats for certain plants and animals. The measures are largely similar to the alternatives within the regular ELS for land outside of SDAs. One important component is that management and maintenance shall be carried out in a traditional manner (Natural England 2010a).

Landscape elements and cultural heritage remains

This measure aims to preserve and care for archaeological features and traditional agricultural buildings. The archaeological features shall be situated on moorland and, in short, they are to be protected from damage caused by grazing animals and agricultural machinery (Natural England 2010a).

Land and water protection

This measure is directed at protecting water and soils in SDAs that are not classified as moorland. The measure aims primarily to prevent sediment, animal waste, and nutrients from running off into water courses. In order to keep cattle away from water courses and shorelines, points are awarded for the construction of new fencing. Not storing fertiliser in areas where there is a risk that it might run into water courses, and not fertilising or keeping cattle there during the winter also entitles the farmer to points (Natural England 2010a).

Measures on upland grasslands or moorlands

These measures are designed, above all, to create habitats for birds and other animals. There are, for example, measures for leaving parts of cultivated grassland areas unmown, for refraining from supplementary feeding of livestock on moorland, or for managing grasslands so that bird life is encouraged. A couple of the measures apply to moors, whilst others do not. For many of the measures, ferti-

liser, lime, or pesticides may not be used at all, or only to a limited degree, and the soil may not be ploughed or tilled (Natural England 2010a).

Organic farming (OELS)

It is largely the same alternatives within OELS as are within ELS, since OELS in the organic equivalent of ELS. In many cases however, more points are awarded for the organic version of a measure.

Over and above the obligatory measure within ELS to map the land in question, another obligatory measure applies to land included in OELS: each area that is included in OELS must satisfy the obligatory ”Organic management” measure, according to which, no pesticides or artificial fertilisers may be used. Furthermore, crop rotation shall be undertaken, and no more than an average of 170 kg nitrogen from manure may be spread per hectare. In addition to this, the fields shall be registered with an organic inspection organisation. The standards set out in both EU regulations and those set by England’s Department for Environment, Food and Rural Affairs shall be adhered to (Natural England 2010b).

Payments for conversion to organic production

Within OELS it is also possible to apply for payments that are made during the first year following conversion from conventional to organic production. These measures give no points, but instead attract payments over and above those which are received if sufficient points have been accumulated. Payments of £600 per hectare can be received for conversion of orchards with tree-growing fruit to organic production. The corresponding payment for other land that has been ploughed or artificially fertilised over the past 20 years is £175 per hectare (Natural England 2010b).

The remaining management options within OELS are largely the same as for ELS and are, therefore, not further described here.

HLS

With High Level Stewardship, the farmer enters into a 10 year commitment to manage the whole farm in accordance with the agreed terms (this differs from the other commitments which are for 5 year periods). Here there is a long list of measures from which the farmer can choose. All measures within HLS are considered to be more demanding for the farmer and are to have more specific impact on the environment than those included in ELS. ELS forms the foundation of HLS, so all the undertakings of ELS also apply to the farms that are involved with the more demanding HLS.

The measures are divided up into approximately 20 different groups, with each group containing up to 13 measures (see appendix 1). In addition to these basic measures, in HLS there are extra measures that can be undertaken and which are place on top of those measures already undertaken within HLS (see appendix 1). It is, unfortunately, impossible to describe all these measures within the scope of this project. For detailed information on all of these measures, you are referred to the publication Natural England (2010c).

The environmental impact of the payments

Exactly as in Sweden, the initial decision made in England was concerned with what was actually needed. After this, they have tried to assess the types of measures that might have a positive effect on the areas which the agri-environmental payments affect, i.e., biodiversity, water quality or soil quality. They analysed and drew up different objectives for the initiatives that would be undertaken, i.e., how many hectares were to be included in the respective measures. In their evaluations, they primarily reported whether or not the acreage targets for the various different measures had been achieved. However, there is no information regarding whether the measures have actually had the desired environmental impact. When reports are made regarding whether or not the acreage targets for the measures have been achieved, reservations are often made, stating that the measures are considered as having had the desired effect if they are carried out correctly, and that the desired effect varies dependent on regional circumstances. As far as the measures that have been assessed as being positive for biodiversity are concerned, even Natural England, the authority that manages the administration of the agri-environmental payments, has expressed doubt over whether some of the measures actually have such an effect.

In the English mid-term evaluation, there is, essentially, no data on the actual impact of the rural development programme's agri-environmental payments. Instead, it reports to what degree the measures have been implemented and it explains the measures that ought to have an impact on various different environmental aspects.

Concrete effects of the agri-environmental payments (a selection)

The evaluation refers to various studies that have indicated that larger reductions (>20 %) in nutrient leaching are not possible without comprehensive measures being taken to completely change the way in which agriculture is currently conducted. However, certain measures can substantially reduce the leaching from individual parcels of land. Measures that involve substantial reductions in the amount of fertiliser used are believed to have a positive effect on water quality. It is uncertain, however, how much impact these measures have had, since the impact depends on the location of the field in relation to the water courses and there is no information regarding this. (Hyder Consulting 2010).

In the mid-term evaluation, it was assessed, based on external studies, that organic farming probably has a positive impact both on the environment and, above all, on biodiversity. How great this impact is cannot, however, be quantified (Hyder Consulting 2010).

A common problem within the English rural development programme is that payments are made for measures that would have been carried out even if payments had not been available.[9] According to the evaluation, this problem is particularly rife where the measures that promote boundary features (hedges, ditches and the like) and extensively managed grasslands are concerned (Hyder Consulting 2010). The mid-term evaluation also states that it is doubtful whether

9 The economic term for this is, "deadweight loss". Please note that these payments do not necessarily need to imply ant socio-economic cost, but are primarily a distribution issue (in so much as money is transferred from taxpayers to farmers).

certain boundary features (such as walls and fences) actually have the positive effects on biodiversity claimed in the descriptions of the measures (Hyder Consulting 2010).

One conclusion of the mid-term evaluation is that it is not possible to demonstrate whether the measures have had a generally positive or negative effect on habitats and biodiversity. Positive effects have, however, been observed in certain habitats and biodiversity (in limited groups of species) in regional initiatives, i.e., in measures that promote increased access to food for birds during the winter. However, no more general effects of the measures have been noted in larger areas or populations. That larger positive effects cannot be demonstrated is due, to a certain degree, to the fact that ELS is not adapted to local conditions and that the focus has been on measures to promote boundary features around fields, rather than measures in fields. (Hyder Consulting (2010).

Assessment of England's payment systems when applied to Swedish conditions

The English rural development programme is characterised by management in detail. This means that there is a very interesting list of available payment types. But it also means that it is difficult to draw conclusions regarding which measures have a significant effect, since the mutual relationship between the various payments, and the reciprocal effect between measures can be assumed to be substantial (both positive and negative synergies or conflicts can be expected).

One aspect that could possibly be transferred to Sweden from the English rural development programme is the integration with outdoor life and accessibility. That this is clearly included in the rural development programmes of other countries can be explained by the fact that these countries lack a common right of access to private land. The fact remains, however, that the majority of land in Sweden that receives support for the preservation of its landscape or biodiversity is, in practice, inaccessible to the general public. This may be partly due to the fact that information on the location of this land is hard to find for many people, but the lack of paths, parking facilities, access through enclosed pastures, etc. may also be contributory factors.

Something that might aid clarity in this programme, despite its scope, could be the implementation of one basic package to which all must subscribe, but to which specific additional options could be added. This would, to a certain extent, limit the confusion over the abundance of options available. It could also mean that the measures which considered to be the most important for certain types of land or farms are implemented. With this system, information can be directed to those who need it. The pedagogical manner in which the information on the payments is presented could also be used within the Swedish system.

Despite specific payments for many different measures which appear fine and logical in themselves, there is very little, in terms of evaluations, that suggest that extensive positive effects have resulted from the English model and its many different payments. This may be largely due to the fact that the environmental surveillance system that is used for this purpose has only been in operation for a few years. Furthermore, certain payments are so closely interconnected that the interplay between them means that it can be difficult to establish what actually has

an effect on what. However, for certain payments there are scientific studies that have shown they have an effect (see the summary of scientific literature in chapter 3.2). The English system demonstrates that it is possible to handle a large number of specific measures without making them difficult to understand. This is something that Sweden can bear in mind when the new rural development programme is launched.

Figure 10. The English agri-environmental payments system is constructed around a basic package plus a multitude of additional measures, from which the farmer can choose.
Photo: Urban Emanuelsson

3.1.3 Finland

Overview

Agricultural land makes up 8.9 % of Finland's total area of approximately 391,000 km^2. All of this area is considered to be seriously disadvantaged and can therefore receive compensatory allowance. Approximately 4 % of the population are employed within agriculture, while forestry (89 % of the country's area) only employs approximately 1 % of the population.

The aim of the agri-environmental payments is that agricultural and horticultural production shall be conducted in a sustainable manner, so that the production places less of a load on the environment than it does at present, that the natural diversity found in the agriculture landscape shall be safeguarded, along with the cultural landscape, and that good conditions for long-term agricultural production shall be maintained. In addition to the agri-environmental payments aimed at reducing the negative impact on the environment, they shall also control the use of production methods so that the overriding objectives of reduced nutrient leaching, increased biodiversity and maintaining the appearance of the agricultural landscape are met, at the same time as the conditions are there for the production of good quality produce. Burdens on the environment, especially surface and ground water, and the air, shall be reduced through increasing the utilisation of plant nutrients and reducing the risks associated with the use of pesticides. The objective is also to reduce the erosion of fields, increase the amount of humus in the soil, and to preserve or improve the productivity of the land. The goal is that 93 % of farmers (98 % of the cultivated acreage) shall be encompassed by the agri-environmental payment system (Ministry of Agriculture and Forestry 2009).

The rural development programme for the Finnish mainland for 2007-2013 receives

EUR 6,626 million in public funding, of which EUR 2,062 million (31 %) comes from the EU. Of these funds, 74 % is invested in axis 2, which incorporates the agri-environmental payments[10], but not the compensatory allowances. Since the compensatory allowance can be received throughout the whole of Finland, whilst the principal agriculture areas in Sweden cannot receive this payment, the investments of funds within the axes cannot be directly compared in respect of investments in environmental improvement measures. Of the funds that are invested in axis 2, 43 % go to agri-environmental payments (the equivalent figure for Sweden in approximately 80 %).

Similarities and differences with Sweden's programme

The construction of Finland's rural development programme is like a combination of those of Sweden and England, where certain parts are obligatory if agri-environmental payments are to be applied for at all. There is a basic level where approximately 90 % of all farmers are involved (cf., "Entry Level Stewardship" in England), then there are special payments that approximately

15 % of the farmers receive (cf., "Higher Level Stewardship"). The investment in agri-environmental payments is lower in relation to other parts of the programme, compared with Sweden. Furthermore, within the agri-environmental payment system, the main focus of the measures is aimed at pollution, primarily plant nutrient leaching. The various special agri-environmental payments detailed below are of a similar type to those in Sweden, but with a slightly different goal as they aim to preserve landscape characteristics rather than focusing on individual cultural heritage elements.

Types of support

Finland's axis 2 is known as "Compensatory allowances with additions, environmental support and support for non-productive investments". During the programme period, 2007-2013, 28 % of the measures within axis 2 were financed by compensatory allowances and agri-environmental payments and 45 % by special environmental support from the EU. If an application is made for agri-environmental payments, applications can also be made for special support and support for non-productive investments. In order to apply for support, cross compliance requirements and good agricultural practices must, of course, be satisfied (Ministry of Agriculture and Forestry 2009).

The agri-environmental payments consist of three different components: basic sub-measures, additional measures and special sub-measures covered by special agreements. When the farmer enters into a five-year commitment to agri-environmental payments, he or she commits to the basic sub-measures for the whole area of the farm. The farmer can choose between several alternative additional measures. The special support is a five or ten year agreement entered into between the farmer and the State, but registered associations can also benefit from certain parts of the support. The agri-environmental payment system is complemented by support for non-productive investments, which is intended for farmers as well as associations.

10 A national allowance to agriculture in the far north, that Sweden (support area 1 – 5c) and Finland are entitled to provide, in accordance with the CAP.

It is possible, if necessary, to request advice in connection with compensatory allowances, agri-environmental payments and special environmental support. To help with this, the farmer or association has access to the municipal agency for rural affairs, counselling organisations, EU assistants and ELY Centres (Centres for Economic Development, Transport and the Environment), which have similar tasks to the county administrative boards in Sweden.

General requirements for the receipt of agri-environmental payments:

To be entitled to receive one or more of the agri-environmental payments, certain minimum requirements must be met for the whole of the farm's area. This is a system that is fairly similar to the English stewardship system. However, the Finnish system is not as strict, and only incorporates minimum requirements for fertilising and use of pesticides. Here, minimum levels for fertilising with nitrogen and phosphorus apply, in accordance with the Government's Nitrate Ordinance: spraying shall be approved in accordance with the European standard SFS-EN 12762, and the spraying shall be tested and approved every fifth year. Persons who spread pesticides shall undergo training concerned with current plant protection issues every fifth year.

The basic sub-measures of the agri-environmental payments

The least demanding form of the environmental commitments requires that environmental planning should be conducted, and that environmental protection measures carried out in connection with cultivation should be monitored; there are also requirements to be met with regard to the fertilising of field or garden plants, the establishment of conservation fields, the management and clearance of banks and riparian strips, and the implementation of measures for the preservation of the landscape and natural diversity. The support for basic sub-measures is differentiated between arable farms and those with livestock. There are specific requirements for animal density, in order for a farm to be classified as a livestock farm.

In order to meet the basis requirements, the farmer must draw up a crop production plan before the growing period commences. The written crop production plan shall state the plant species that are intended to be grown on each agricultural parcel and the planned fertilisation. The crop production plan is preliminary and its content is finalised at the time of sowing.

The cultivated fields shall be marked on a soil map, in respect of the crop production plan and monitoring. Samples will be taken during the growing period when the fields are being cultivated and from fallow fields. A new soil map shall be constructed when five years have passed since the latest samples were taken.

Conservation fields, refers to permanent grassland on fields and diversity fields that can be established within fields that are not cultivated but which are managed in accordance with the farm support payment system. The objective is the long-term protection of the field against the eroding effects that rain, melting snow, and water run-off can have, the improvement of the structure and composition of the arable land, the reduction of the requirement for pesticides, and the increase of the amount of organic substances in the soil.

Diversity fields, which are a type of conservation field, can be sown with a mixture of meadow seeds or with the seeds of landscape or wild plants. The aim of diversity fields is to increase biodiversity through supporting the habitats of the wild species, and to provide wild animals with food and protection within the arable landscape. The measure also contributes to the versatility of the landscape. At least 5% of the farm's areas must be conservation fields.

The requirements for the approved fertilising of arable and horticultural plants depends on the crop, the harvest level and the qualities of the parcel. The fertiliser rations are to be stated for all crops on all fields and shall include the rations of both nitrogen and phosphorus. These measures are designed to improve precision in fertilising and reduce leaching (for detailed tables, see: the Ministry of Agriculture and Forestry 2009).

Headlands and riparian strips are established adjacent to water courses, lakes and ditches. These are to reduce the leaching of nutrients or other harmful agents from fields into ditches, brooks, water courses or springs; they shall also reduce erosion, improve the biodiversity in the agricultural environment and support the management of game and fish stocks.

Preservation of biodiversity and the landscape encompasses many different measures. What is fundamental is that the farm's values are mapped out and that a plan is drawn up for how they are to be managed. One requirement is that the farmer maps out the "natural diversity" of the farm before the end of his second year of involvement with the agri-environmental payments scheme. This involves accounting for objects that are important for biodiversity that are located near to the farm's production buildings or on the farm's land. This is done both as a table, on a pre-printed form, and as a map which illustrates the location of the objects. Examples of such important objects are: species-rich fields, field boundaries and headlands, verges, boundaries between fields and woodland areas, brooks, water sources, wetlands within arable areas, old stone fences, barns, avenues, conservation fields, species-rich permanent pastures, non-cultivated fields (that are managed) and fields that have been taken out of production. If special support is received for some of these objects, this is to be accounted for in the map summary. This mapping is not to be digitalised, but shall be available should persons in authority request it. The measure aims to improve the knowledge of the farmers with regard to the objects found on their own farm that are significant for biodiversity and how these are to be managed. This includes the preservation of habitats in arable environments that are important for biodiversity and the maintenance of habitats for various wild species. Furthermore, the measure also aims to encourage the farmers to manage "biodiversity objects" on their farms, i.e. to establish wild fields or apply for agreements on special support for the promotion of natural diversity or the management of care habitats (see below) (Ministry of Agriculture and Forestry 2009).

Figure 11. A minimum requirement for receipt of the basic level of Finnish agri-environmental payments is the taking of an inventory and the establishment of a plan of management of the farm's environmental qualities. Kokkola, Finland

Photo: Urban Emanuelsson

Additional measures

The Ministry of Agriculture and Forestry (2009) has provided the following summary description of the allowances. Applications can be made for allowances and support in respect of:

Reduced fertilising

The goal is to reduce fertilising from the level specified in the basic sub-measure for the fertilising of arable plants. A maximum of 80-90 % of the nitrate ration stated in the basic sub-measure may be used. The phosphorus rations permitted within the additional measure are 20-50 % less than those permitted within the basic sub-measure. The goal of the reduced phosphorus fertilising is that the content of easily-soluble phosphorus in the soil shall not rise, in the low phosphorus classes, and that the content in the high classes shall fall more effectively that it would if fertilising was carried out as per the basic sub-measure. The measure may not be applied for by farms that have entered into agreements for special support with regards to organic production, or by farms that have other commitments connected with special environmental support for arable cultivation in ground water areas.

Precision nitrate fertilising of arable plants

The measure aims to reduce the risk of nitrate leaching from fields to water courses and ground water in addition to the emission of nitrogen oxides into the air. The goal shall be achieved through the reduction of over-dimensioned nitrogen fertilising. Measurements are carried out to decide how much soluble nitrogen has remained in the soil from the previous growing period and whether the nitrogen ration needs to be reduced in the spring or the next time that spreading is conducted. When the farmer becomes aware of the amount of nitrogen in his parcels, he or she can fertilise more precisely so that it is not over-dimensioned.

Winter cover crops and reduced tilling

The goal is to protect the surface layer of the field from the eroding effect that rain, melting snow and run-off water have during mild winters. This measure increases the amount of organic substances in the field's topsoil layer, which reduces the inclination for slurries in the soil surface. This measure shall reduce the soil erosion, nutrient leaching and emission of carbon dioxide brought about by agriculture. Furthermore, the soil structure is improved as organic substances accumulate and microbe activity becomes livelier. This measure is also found in *Winter cover crops* and *Streamlined winter cover crops* as well, but can only be applied for in the south of the country.

Versatile cultivation

The aim of this measure is, with the help of crop rotation, to reduce the environmental load brought about by, for example, the unilateral cultivation of cereal crops. A crop rotation involving more cultivated grassland or other permanent crops leads to versatile cultivation, better soil structure, a greater number of organic substances in the soil, less erosion, less need to control weeds, a reduction in plant diseases and harmful insects and an improvement in crop safety. Furthermore, a versatile crop rotation has a beneficial effect on biodiversity since more habitats are created and the landscape becomes visually more varied. The measure can be selected by farmers in the south of the country whose farms have at least 10 % grassland or grassy areas.

Extensive grassland cultivation

This measure shall contribute to improved water quality through protecting against erosion, improving the structure of arable land, reducing the need for pesticides, improving the organic content of the soil and having a beneficial effect on biodiversity. The farmer may only use 75 % of the maximum rations in their crop production calculations. The measure can only be applied for by farmers in the south of the country.

The spreading of manure during the growing period

This measure shall reduce the risk of nutrients in manure leaching out into water courses and the ground water. It can only be applied for by livestock farmers in Finland's southern regions.

Nutritional balance

The aim with the drawing up of nutritional balances is to create an aid to the monitoring of cultivation measures and the use of fertilisers that can lead to the farms' more efficient use of nutrients. The calculation of various nutritional balances shall encourage a more careful usage of plant nutrients than before, within the various parcels and throughout the whole farm.

Cultivation of catch crops

Through the cultivation of catch crops, the goal is to bind together in the soil those nutrients that the harvested crops have not utilised and "catch" them in the soil so that they can be utilised by subsequent crops. The catch crops reduce the leaching of plant nutrients, protect the soil against erosion, may improve the soil structure, increase the amount of organic substances in the soil and prevent weed growth (Ministry of Agriculture and Forestry 2009).

Figure 12. The Finnish agri-environmental payments are primarily aimed at reducing agricultural plant nutrient leaching. Agricultural landscape, south of Uleåborg, Finland
Photo: Urban Emanuelsson

Special environmental support

Applications for these forms of support are made for a period of five or ten years. They generally have no fixed payment level but are decided based on the cost of the measure and a possible allowance for loss of income. Several of these forms of support are new for 2011. They have therefore not been evaluated and are probably not completely defined either. The measures addressed in 2011 are: the establishment and management of riparian strips, the establishment and management of multi-functional wetlands, arable cultivation in ground water areas, organic production, organic livestock production, natural and landscape diversity; care habitats (support for non-productive investments, see below), the breeding of native breeds, the cultivation of native plants, the more efficient reduction of the burden from nutrients, the placement of liquid manure in arable land (the use of machines that either place the manure or push it down into the ground), long-term grassland cultivation in peat land, regular underground irrigation or reuse of drainage water (water management and the reuse of drainage water from fields, i.e. nutrients).

Within the special support scheme "support for non-productive investments, 5 or 10 year agreement", great importance is attached to the border zones between, inter alia, fields and wooded areas, or water and non-arable outcrops. This does not affect the actual agricultural land, but border zones up to 20 m in width in its immediate vicinity. This means that a wooded outcrop on a field can be covered in its entirety by such an agreement, if its area does not exceed one hectare. Furthermore, the areas that are no longer used for cultivation or grazing purposes can, in certain cases, also be covered by the agreement. The support scheme also comprises measures for small wetlands areas in cultivated environments, existing

flood-meadows, bird fields in prioritised areas (this also includes opportunities to build bird observation towers and to establish paths for easier access to the countryside), diversity strips (special management of parts of fields or the establishment of flower-rich, southern-facing forest edges). Also included is:

- special management for threatened species (Where red-listed species are to be found, management plans are to be drawn up so that the management employed encourages the threatened species. Here, the general management requirements differ from those of the special environmental support),
- making the landscape more versatile (This has similarities with the Swedish payments to small-scale habitats, but differs in that the payments in Finland are directed more at accentuating the landscape than they are in Sweden),
- the establishment and rejuvenation of avenues (this payments is also for the improvement of the landscape's appearance and to create heterogeneity in homogeneous landscapes),
- small-scale plantations (to improve the appearance of the landscape and to protect it from view), and
- restoration of traditional agricultural constructions (i.e., barns, seasonal mountain holdings, watermills and windmills, stone bridges, stone or wooden fences, stacks and piles on hay racks).

Evaluations of Finland's agri-environmental payments

The mid-term evaluation of Finland's rural development programme for 2007-2013 (Kuhmonen et al. 2010) is largely based on summaries of 20 discussion fora that were established in order to illustrate the effect of the programme. The majority of the discussions were regionalised, in order to capture the variations and differences throughout the country. In other words, the evaluation is a summary of the discussions on these groups, in which a total of 189 people were involved. In addition to this, separate investigations were conducted with the help of electronic questionnaires, where some of the conclusions from the discussion could either be substantiated or discarded. It was pointed out in the introduction to the evaluation that the information basis was unreliable. Only the basal indicators for the evaluation were covered, and the evaluation could not go into details concerning individual payments or support schemes.

In general, the Finnish rural development programme was considered to be far too bureaucratic to function effectively as a tool with which to achieve the objectives. Despite this, agri-environmental payments were considered the best possible means of achieving environmental improvements and increased natural values, compared with other possible means of control. The majority of the money that is allocated via the rural development programme goes to large, general payments. The farmers through this was good, whilst the evaluation largely suggested that there were major problems as attention could not be paid to regional conditions and variations in farming practises.

The evaluation proposed that the payments could be divided up into two levels instead of the current three. The first would correspond to the "entry level" in England or to broad basic measures that would need to be fulfilled if any payments where to be received whatsoever. The second level includes payments that are region or farm-specific.

In connection with the OECD's "Evaluation of Agri-environmental Policies" workshop in June 2011, a more comprehensive evaluation of the impact of the rural development programme's effects was conducted.

Plant nutrients

The leaching of phosphorus plant nutrients has reduced on a national basis thanks to agri-environmental payments, but many external effects have also had a major influence. In certain cases, increased environmental loads have even been recorded for the period 1995-2008. On example of negatives effects is when the area of fallow land reduced over several years and then an increased leaching of phosphorus could also be observed. On the whole, the effect of the fallow land overshadowed all the other measures in the short term, whilst the trend of reduced usage of plant nutrients has a positive effect, when viewed in terms of all measures.

The leaching of nitrogen has, unlike phosphorus, increased over time. Data from 1985 to 2006 shows an increase of approximately 27 %. This is not due to the nitrogen ration per hectare having increased; these have actually decreased as an effect of the measures with the rural development programme. This is instead due to increased cereal crop cultivation and intensified livestock production.

Biodiversity

Monitoring of biodiversity in Finland has focused on five areas: arable weeds, vascular plants, butterflies in open habitats, farmland birds and landscape structure. These have been examined on four occasions during the period 1961-2009 (for the method employed, see Salonen and Hyvönen 2010). As is the case in the majority of countries, this is however no control over the land receives payments, i.e., it is not possible to compare land that receives payments or support with land that does not. The results are therefore only indirect evidence of the effects of the rural development programme (figure 1). Positive effects have been demonstrated where wetlands have been established on arable land, as far as the number of dragonflies in the wetlands and small or medium-sized ditches is concerned (Aakkula et al. 2011). A study of riparian strips and biodiversity shows that variety of species of both vascular plants and butterflies was greater in these strips than in other types of border zones within the same landscape (Aakkula et al. 2011). It could also be observed that the age and depth of the strip (the distance measured at an angle of 90° from the ditch) was significant for the number of species that were to be found there, i.e., the older and deeper the strip, the higher the value that could be found there (Aakkula et al. 2011). However, it has not been established whether payments for riparian strips in general have had any effect on the preservation status or the threatened biodiversity.

Agri-environmental payments for fallow land are thought to have had a major effect on plant nutrient leaching, and also on biodiversity. Fallow land has been shown to have different effects on groups of organisms, depending on how they are arranged and managed (Aakkula et al. 2011). Generally, the best results for the organisms groups were recorded when the fallow land was covered with flower-rich mixtures of meadow seeds. Pollinating insects reacted at different speeds to the creation of the fallow land. Bees increased in number as early as the first year and more individuals could be found in the fallow land than in the surrounding

permanent structures (filed boundaries or ditches). On the other hand, butterflies took three years before their number increased in the fallow land, and their number never reached the same level as is the surrounding areas. The conclusion drawn by Aakkula et al. (2011) is that the perennial flower-rich fallow land is important for increasing the number of insects that function as pollinators in the landscape, but the land must be left for several years in order for butterflies to benefit from its, whilst bees benefit from it as early as in the first year. Other studies show that the total number of insects using the fallow land diminishes over time, due to grass driving out flowering plants, which is why elder fallows also become less significant for birds that otherwise utilise the insects as a source of food (Hyvönen and Huusela- Veistola 2011).

Herzon (2010) listed what she saw as the respective winners and losers from the rural development programme: winner 1 – arable weeds, winner 2 – Birds, where fallows are seen as an important element, loser 1 – vegetation and biodiversity in field boundaries, where only small areas are managed and there is widespread overgrowth, loser 2 – butterflies, the homogenisation of their communities has been detected, specialists are disappearing and generalists are remaining, loser 3 – traditional environments, i.e., meadows and pastures, where payments have not contributed sufficiently to preservation. Approximately 20,000 ha remain in the country, of which it is believed that 50 % is not maintained as well as it should be.

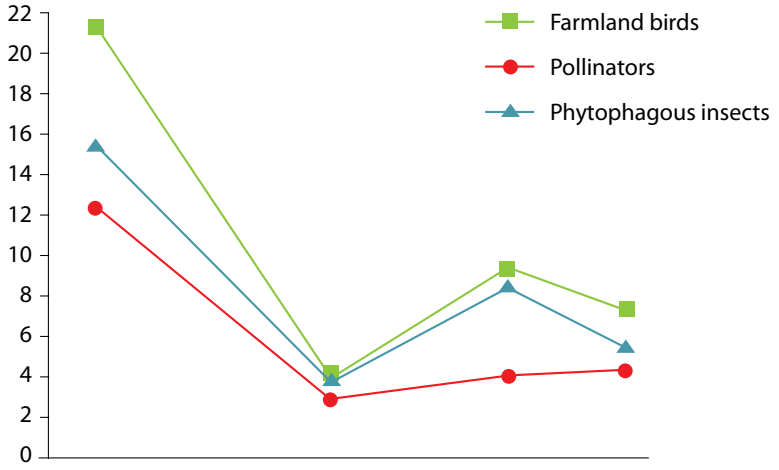


Figure 13. Index for farmland birds, pollinators and phytophagous insects in Finland during the period 1961 – 2000.
Source: Hyvönen & Huusela, 2008

Despite many species of birds showing positive population trends, there are problems for those species that are dependent on maintained grasslands. From 1990-2005, the proportion of unmaintained land increased by approximately 20 %. The amount of permanent grassland reduced to half of its 1990 level (Herzon 2010). Conclusions with regards to the Finnish rural development programme and biodiversity suggest that there is a lack of well-directed and accurate measures. The programme is aimed at all farmers but its requirements are too small to have any major effect. The payments appear not to be created to improve the biodiversity situation, rather to maintain the diversity that currently exists (Herzon 2010). Furthermore, Aakkula et al. (2011) believe that the EU should, to a greater extent, allow its member states to set their payments levels so that more is paid for the

most important and most effective measures than for measures whose effects are doubtful, instead of calculating the support based on its cost to the farmer.

Assessment of Finland's payment systems when applied to Swedish conditions

Finland's system means that the farmer can be forced to undertake measures for their farm, if they are to be involved with the payment system at all. Such a system can probably be implemented more pedagogically than the Swedish system, where everything can be applied for. However, there is a risk that farmers who do not satisfy the obligatory basic requirements (those who possibly would have contributed most if they had complied with the payment regulations) are excluded from other agri-environmental payments and therefore do not undertake certain measures that would be important for the environment. The degree of involvement is, however, high in Finland, so this risk is not currently applicable, with the requirements being relatively fundamental and easy to satisfy.

Finland has invested a great deal in agri-environmental payments associated with leaching and water. These have been shown to reduce the leaching of phosphorus but not of nitrogen. Since this report is not aware of any evaluations of pesticides having been conducted, no conclusions can be drawn on this subject. The single most important measure in the arable landscape is overgrown, flower-rich and preferably perennial (>2 years) fallow, which has been shown to have positive effects for both biodiversity and plant nutrient leaching.

Figure 14. France has extensive plain areas with high-producing cereal crops in large monocultures. Arable landscape in the Paris Basin, France

Photo: Knut Per Hasund

3.1.4 France

Overview

France has six rural development programmes: one for the French mainland in Europe, one for Corsica and four for the French territories outside of Europe. The agri-environmental payments described here are those of the French rural development programme for the French mainland in Europe.

Of the EUR 12,566 million in public funds that goes to the French mainland rural development programme, EUR 7,109 million goes to axis 2. When private funding is included, the total budget for the rural development programme amounts to

EUS 16,339 million, of which EUR 7,249 million goes to axis 2. Within axis 2,42 % of the funds go to agri-environmental payments within agriculture, which equates to only 19.5 % of the total budget for the programme (European Network for Rural Development 2011).

175,000 farming companies participate in the rural development programme, which corresponds to 54 % of the active land users in the country. Of these, 37 % have commitments to measures within the agri-environmental payments of axis 2 (MAAPR 2011c).

The French mainland in Europe has an area of approximately 543,000 km2 and 54 % of this consists of agricultural land. 3.3 % of the French labour force is employed within the agricultural sector. In 2002, the country was responsible for a fifth of the total agricultural production of the EU-25 (MAAPR 2011c).

Similarities and differences with Sweden's programme

France's agri-environmental payment system is, basically, easy to understand. It has two parts with an increasing degree of commitment (an increasing number of regulations). Within level 2, there is an extensive variety of measures similar to the Swedish equivalent, the regionalized scheme "Selected environments". The design of the French programme has certain similarities with the programmes of other countries. What sets it apart from many others is the mix between national level and a strongly regionalised structure.

Types of support

The main purpose of the French agri-environmental payments made under axis 2 is, through the promotion of sustainable agriculture, to protect and improve water quality and biodiversity. But the landscape, agricultural land and genetic diversity shall also be encouraged.

One ground rule is that several sub-measures can be applied on a farmer's land, but not on the same agricultural parcel. Furthermore, the environmental measures that are applied to an agricultural area are divided up into two level groups, depending on how demanding the commitments are (Table 1).

Table 1. Two levels for measures within the French Rural Development Programme, axis 2.

Level 2	Conversion to organic farming Organic farming Improvement of the potential of honey bees to preserve biodiversity through pollination Local measures for environmentally-friendly farming
Level 1	Environmentally-friendly pastureland Measure for environmentally-friendly farming through crop rotation Feed systems with extensive cultivation of several crops

As in other EU countries, it is not permitted to interrupt a measure during the commitment period, in order to commence a new measure if the new commitment is less demanding, i.e., change from a level 2 measure to a level 1 measure. On the

other hand, it is permitted for a specific parcel to switch from a level 1 measure to a level 2 measure (MAAPR 2011d).

A) National measures

The two national measure payments can be applied for in respect of agriculture within the whole of the French mainland.

Environmentally-friendly pastureland

This measure makes payments possible for that which is described as extensive farming of pastureland. The primary purpose of this payment is to promote biodiversity in accordance with the rural development programme.

Participation in the measure means a commitment to the management of pastureland for a five year period. It differs for temporary and permanent grassland – measures for temporary grasslands may be moved once during the five year period. A certain percentage (decided locally in each region) of the farm's land is to be grassland. Only a limited amount of tilling is permitted, as is the amount of fertiliser that may be used. Other requirements are that there an upper limit is set for grazing pressure and that chemical pesticides may not be used (MAAPR 2011d).

This measure is one of the most widespread in France. It has 52,800 participants, which is 77 % of all those who receive some form of agri-environmental payment (MAAPR 2011a).

Measure for environmentally-friendly farming through crop rotation

This measure shall promote crop rotation as a technique for reducing the use of chemical supplements used in agriculture. This will benefit both the water quality and biodiversity. To be entitled to receive payments, the farmer is required, during a five year period, to rotate at least three crops on the fields included in the measure, and that the same crop may not be grown in the same area for two years in a row (MAAPR 2011d).

B) Regional measures within the rural development programme

The regional measures are specified at national level. However, decisions regarding the payment measures to be applied to whole or part regions, or whether they shall even be available at all within a particular region, are made at regional level.

Feed systems with extensive cultivation of several crops

Payments are available for the extensive cultivation of animal feed in connection with animal breeding. Management of grasslands with restricted use of pesticides aims to improve water quality and the landscape. The payment is made to businesses whose cultivation area is largely involved with the growing of animals feed, where the majority of land is grassland, and where the use of seeds is also restricted. Furthermore, the amount of animal feed (i.e., in the form of pellets or similar) which a business can purchase is also regulated. The use of nitrogenous fertiliser and pesticides is also restricted (MAAPR 2011d).

Figure 15. In order to receive the French agri-environmental payments for extensive pastureland, a limit must be set on the amount of fertiliser used. The Cévennes, France
Photo: Knut Per Hasund

Conversion to organic farming

Payments are available for conversion to organic farming which, through the exclusion of chemical pesticides and artificial fertilisers, enhances water quality and biodiversity. To receive the support, the farmer must adhere to both EU and

national regulations for organic production. The size of the payment per hectare depends on the type of farming being carried out. Applications for support can be made for either the whole cultivation area or parts thereof, but support for conversion organic farming shall not have been received for the areas in question during the previous five years. Applications for payments can be made up to one year after commencement of the conversion (MAAPR 2011d).

Organic farming

This measure aims to protect water and biodiversity through organic farming where the use of chemical pesticides and artificial fertilisers is not permitted.

The size of the payment per hectare depends on that which is being grown. Applications can be made for either the whole cultivation area or parts thereof. The commitment spans a five year period. Another requirement is that the farmer shall report their activities each year to Agence Bio (an organisation that, inter alia, supervises organic farming in France, MAAPR 2011d).

Honey bees

Payments are available for improving the potential of honey bees to preserve biodiversity through pollination. The measure aims to preserve and enhance biodiversity. The payment can be received if bee hives are places in areas that are interesting in terms of biodiversity. National parks and Natura 2000 areas are examples of such areas. To be entitled to payments, the farmer must have at least 75 bee colonies. The commitment entails, inter alia, that a certain percentage of the hives are place in zones that are interesting from a biodiversity point of view and that they are left there for at least three weeks (MAAPR 2011d).

C) Local measures for environmentally-friendly farming

The aims of the sub-measures to this measure are divided up into three different focus areas. The measures can be directed at improving the situation within Natura 2000, the Water Framework Directive, or other environmental initiatives (including the Birds Directive or habitats outside Natura 2000 areas; see Table 2).

The sub-measures are aimed primarily at the preservation or restoration of water quality and at restricting the deterioration of biodiversity. The measures can be placed in Natura 2000 area, catchment areacatchment areas and other locations with specific needs, i.e., biodiversity outside Natura 2000 areas, erosion, the landscape and protection against fires (MAAPR 2011d).

Table 2. Different measures and the focus areas that they primarily aim to improve. Other environmental initiatives may be biodiversity in the agricultural landscape, reduced erosion, aspects of historical interest, etc.

Measure	Focus areas		
	Natura 2000	Water Framework Directive	Other environ-mental initiatives
Conversion to organic farming in areas that are sensitive to chemical pesticides	X	X	X
Organic farming in areas that are sensitive to chemical pesticides	X	X	X
Planting of cover crops during periods of erosion risk outside of areas where the planting of cover crops is obligatory	X	X	X
Management of cover crops as perennial crops that are grown in rows (arboriculture, viticulture, nurseries)	X	X	X
Protective bark cover between rows of vines		X	
Creation and management of networks of organically regulated zones	X	X	X
Creation and management of protective layers of soil-covering plants (parcels or covered strips)	X	X	X
Creation and management of mulch that is of interest for flora or fauna	X		X
Improvement of soil-covering vegetation in fallow	X	X	X
Crop rotation based on Lucerne, to benefit European hamsters	X		X
Crop rotation based on autumn-sown seeds, to benefit European hamsters	X		X
Earth-covering vegetation between the rows in viticulture	X	X	X
Limit for nitrogenous fertilising, total, and through artificial fertilising	X	X	X
Platform applicable to the management of grasslands	X	X	X
Platform applicable to the management of moderately productive grasslands	X	X	X
Platform applicable to the management of moderately productive grasslands that are operated collectively	X	X	X
Registration of mechanical measures and/or grazing	X	X	X
Limit for nitrogenous fertilising, total, and through artificial fertilising, on grassland and special habitats	X	X	X
Refrain completely from fertilising (organic or artificial fertiliser) on grasslands and special habitats	X	X	X
Adjustment of grazing pressure during specific periods	X		X
Postponement of grazing on grasslands and special habitats	X		X
Postponement of mowing of grasslands and special habitats	X		X
Management of the natural grassland's abundance of flowers	X		X
Management of special grassland with non-mechanical mowing	X		X
Using shepherds	X		X
Management of grass and heath as undergrowth	X		X

Measure (continued from previous page	Focus areas		
	Natura 2000	Water Framework Directive	Other environ-mental initiatives
Refrain from the grazing and cutting of grasslands and special habitats during the winter	X		X
Management of wet grassland zones	X	X	X
Safeguarding of constant water flow through the surface treatment of shrub cultivations	X		X
Restriction of artificial irrigation		X	
Management of traditional surface watering	X		X
Importing of leguminous fodder crops on artificially-irrigated land		X	
Importing of leguminous fodder crops on artificially-irrigated land		X	
Management and suitable placement of hedges	X	X	X
Management of individual and isolated trees or trees growing in a row	X		X
Management of wooded shore areas	X	X	X
Management of shrubbery	X	X	X
Mechanical management of overgrown slopes	X	X	X
Management of drainage and irrigation ditches, ditches and canals in marshes	X	X	X
Management of embankments	X	X	X
Temporary protective measures for special habitats (primarily for birds and butterflies)	X		X
Restoration of grassy areas after flooding of shorelines	X	X	X
Management of fruit cultivation on pastureland	X		X
Exploitation of reed fields to encourage biodiversity	X		X
Postponing the harvesting of lavender	X		X
Management of salt marshes (similar to those in Guérande) to encourage biodiversity	X		X
Management of salt marshes (similar to those in Ile de Ré) to encourage biodiversity	X		X
Restoration of overgrown agricultural environments	X		X
Preservation of opened agricultural areas through the mechanical or manual weeding of undesirable vegetation	X		X
Controlled fires for the clearance of inaccessible fields	X		X
Annual report of the plant protection strategy for the crops grown	X	X	X
Refrain from the use of herbicides	X	X	X
Refrain from the use of synthetic pesticides	X	X	X

Measure (continued from previous page	Focus areas		
	Natura 2000	Water Framework Directive	Other environ-mental initiatives
Gradual reduction of the permitted use of herbicides	X	X	X
Gradual reduction of the permitted use of pesticides, apart from herbicides	X	X	X
Gradual reduction of the permitted use of pesticides, apart from herbicides, on fields where corn, sunflowers and temporary grassland constitute a significant part of the crops	X	X	X
Introduction of biological pesticides	X	X	X
Introduction of mulch consisting of plants or biodegradable material on vegetable crops	X	X	X
Varied crop rotation on fields with otherwise specialised cultivation	X	X	X
Refrain from using herbicides between rows of perennial plants	X	X	X
Gradual reduction of the permitted use of herbicides	X	X	X
Gradual reduction of the permitted use of pesticides, apart from herbicides	X	X	X
Gradual reduction of the permitted use of pesticides, apart from herbicides, on fields where corn, sunflowers and temporary grassland constitute a significant part of the crops	X	X	X

Evaluations of the environmental impact of the payments

France's evaluations have a relatively limited scope. Overall, the actual effects of the payments on the environment are not discussed, rather it is the extent to which the French farmers participate in the measures that is examined.

According to the mid-term evaluation, France has not produced any result indicators of its own to see how the various implemented measures have succeeded. Only those indicators that are already in existence for the whole of the EU are used, despite the fact that the EU has specified that each country should identify its own indicators, based on its specific preconditions and measures, and despite the fact that the French pre-investigation recommended the production of such indicators. It is claimed in the mid-term evaluation that the existing result indicators are not particularly relevant and no political efforts have been made to develop them (MAAPR 2011a).

As far as biodiversity and water quality are concerned, progress has been made, compared with the previous programme period. Relative to the objectives that were set up, the progress has however been quite modest and, if progress continues at the same rate, the objectives for the present programme will not be achieved. As mentioned, one reason for this is that the funding is insufficient. Neither the financial funds nor the agri-environmental payments that have been introduced are considered sufficient. The latter applies above all to the measures for improved water quality, where the demands made of the farmers' production methods are not high enough to reach the environmental objectives that were established (MAAPR 2011a).

Figure 16. Can agri-environmental payments for the restoration of overgrown agricultural environments also be of interest to Sweden? The Cévennes, France
Photo: Knut Per Hasund

According to the mid-term evaluation, the *Environmentally- friendly pastureland* measure has only very slightly affected the way in which those farmers involved with the measure conduct their business. The conclusion therefore is that the measure has not had any significant effect on biodiversity. Farmers tend to adapt their participation in the measure to the way they conduct their business, rather than the other way around. Furthermore, according to the evaluation, there are shortcomings in the design of the measure (MAAPR 2011a).

The evaluation also maintains that the *Conversion to organic farming* measure is useful for the promotion of organic production, but that it does not currently have any noticeable effect on the dissemination of organic farming. Instead, the decision to convert to organic production is influenced by other factors, other regulations and market conditions (MAAPR 2011b).

Assessment of France's payment systems when applied to Swedish conditions

The regionalisation of payments and a major adaptation to local conditions could be a good way of improving the efficiency of the payment system. However, regionalisation also increases the requirement for regionally adapted administration and IT systems. There is also a risk that this could reduce the scope for a coherent overview of the payments and their effects.

The majority of the six regional payments have their equivalents in Sweden, so there are, in effect, no measures that could be seen as innovations for the new rural development programme. There are probably a number of specialised payments (Table 2) that could be employed within the regionalized scheme "Selected environments" in various parts of Sweden, but since there is no information regarding the effect of the payments, it is difficult to recommend any of them

without conducting a more thorough examination of the individual measures. Like England's HLS, many of the payments are very specific in their aims, and for this reason, the number of actual measures is therefore substantial. This is probably not completely in line with an easy to understand and efficient payments system. It is possible that a pedagogically presented payment system with information directed at the farmers in the relevant regions, instead of a general information system for the whole country, would at least partly compensate for the great variety of payments that are offered. This could also be something that Sweden could make use of, in order to disseminate information more effectively to the farmers concerned.

Figure 17. The French bocage landscape can be promoted through agri-environmental payments made for the management of free-standing trees or trees that grow in a row. Normandy, France

Photo: Knut Per Hasund

3.1.5 Switzerland

Overview

The percentage of agricultural land in Switzerland is large, relative to the country's area - approximately 1.6 million hectares, i.e. approximately 40 % of the country's area (approximately 8.5 % in Sweden). There are 60,000 farmers and for 60 % of these, farming is their full-time occupation (SFOA 2010). The number of active farmers is decreasing the whole time, even if the rate of the decline has slowed down a little in the last 10 years (-1,8 % per year during 2000-2009, -2,7 % per year during 1990-2000). The major problem with the winding up of farming is in the mountain areas, but the decline has also slowed up there under recent years (ibid.). 3 % of the population are employed within farming and this sector represents approximately 1 % of the country's gross national income. Switzerland's rural development programme (which corresponds to the programmes within the EU) has the objectives of preserving the landscape and biological values at the same time as another important part states that farming shall be competitive and shall be able to freely compete in global markets (SFOA 2004). How this is to be achieved is unclear since the payments levels in the country are very high, compared with those of neighbouring countries (in our opinion). One step in this direction is that the percentage of the support that goes to market measures (i.e., subsidies) has been reduced. Instead, Switzerland invests approximately 90 % of the resources into what is known as direct payments, i.e., measures that are similar

to those to be found in axis 2 for the EU countries (Hofer 2007). Despite this, approximately 40 % of agricultural products are imported and the SFOA sees expensive production costs and global competition as the major threats to the preservation of the agricultural industry and, therefore, to the fulfilment of the objectives set up for the rural development programme. The focus on the landscape can be clearly evidenced through the statements of, inter alia, Mandred Bötsch, Director-General of the SFOA, who places the landscape and its appearance high on the agenda (SFOA 2004).

The Swiss rural development programme is composed of two parts: a basic part which incorporates general payments with some cross compliance. This shall form the basis of an open and more environmentally-friendly agricultural landscape. This second part is described as organic payments and includes more specific measures for extensive production, stricter requirements for animal welfare, and payments described as organic compensatory measures (low-intensity cultivated grassland, hedges, flowering fallow areas, etc.)

Figure 18. The Swiss rural development programme also has two parts, where basic payments are linked to cross compliance-type minimum requirements for the whole farm and where there are specific agri-environmental payments above this for extensive production, animal welfare, flowering fallow areas, etc.
Photo: Urban Emanuelsson

Similarities and differences with Sweden's programme

Switzerland's rural development programme is largely similar to that of Finland ad, to a lesser extent, England's in that it has a minimum level with measures that the farmer must satisfy in order to be eligible to apply for compensation. The agri-environmental payments in Sweden are aimed at several types of environments and, as such, are more difficult to survey, but Sweden is also a much bigger country. Switzerland has left pasturelands completely out of the payments system and only compensates land that is mown. It has not been possible to investigate why this is so, but since many restrictions state that land may not be grazed intensively, one can guess that this is a bigger problem than the disappearance of pastureland. One major difference between the payment systems in Sweden and Switzerland is that the size of the payments is considerably higher in Switzerland, sometimes up to 6 times as much.

Types of support

To participate in the payment system, the whole farm must satisfy a number of minimum requirements - “ecological performance” (freely translated). These general requirements include aspects such as: animal protection, a balanced nutrient budget, variable crop rotation, soil protection requirements, i.e., against erosion, targeted pesticide measures (not preventative). This means that:

- Land mapping must be conducted and that plant nutrient balances must be established for individual fields and crops.
- 3.5 % of the farm’s fields must have special crops, in accordance with an established list (i.e., berries, fruit trees, vegetables, grapevines, etc.).
- At least 7 % of the farm’s area must consist of ecological compensations areas (such as extensively or low-intensity farmed pasturelands or mown land (which means everything from unfertilised meadows to flower-rich cultivated grasslands, or measures within fields, i.e., flower-rich vegetation strips)). pastureland is included in the calculation of the compensation area but no payments are made for this land.
- Unsprayed riparian strips must be established alongside all water courses and wooded borders established for water courses, hedges and embankments.
- The crop rotation must include at least four crops every year and the percentages of these must lie within the following pre-decided maximum values: 66 % for cereal crops, 40 % for corn, 25 % for potatoes.
- Pesticides must be tested at least every fourth year.

The payments that are included in the ”basic package” (that one is approved for if one satisfies ”the ecological performance requirements”) are generally described as direct payments and consist of two parts:

1) payments for active agricultural land (similar to the EU’s farm support payments, but with significantly stricter requirements) and for grazing or roughage-eating farm animals.

2) payments per area of active agricultural land within, for example, mountainous areas with disadvantaged production conditions, and for livestock farming in these areas.

In addition to this, it is possible to apply for more specialised “organic payments” (cf. Sweden’s agri-environmental payments). Amongst these are a number of measures divide up into payments per unit area and per animal unit. The payments per unit area includes: additional payments for ecological compensation area, organic farming and extensive farming. Within the organic payments for livestock farming there are:

payments for keeping animals outdoors and payments for stricter requirements for animal-friendly stables.

Figure 19. There is a specific basic support with higher levels of agri-environmental payments for cultivation and the farming of livestock in, for example, mountainous areas with disadvantaged production conditions

Photo: Urban Emanuelsson

Permanent grasslands

There are only payments for mown land in Switzerland, which means that pastureland is not included in the system. The requirements made of mown land are:

Extensively farmed mown land:

- The land shall be farmed for at least 6 years.
- The harvest must be used for fodder.
- Neither fertiliser nor pesticides may be used, with the exception of the treatment of individual plants.
- The land shall be mown at least once a year.
- The first harvest shall be carried out no earlier than 15 June – 15 July, depending on the growing zone. The various different cantons may have other rules regarding the time of harvest.
- The land may be gently grazed during the autumn, as long as this causes it no harm. Grazing may not happen before 1 September or after 30 November.
- There is a requirement for a maximum of 2 animal units per hectare in the most productive parts and fewer in the less productive areas of land. The idea is to keep the land maintained but to reduce the intensity in the farmed areas.

The payments correspond to approximately SEK 3,330 - 11,000 per hectare per year, depending on the growing zone.

Low-intensity farmed meadows:

- Nitrogenous fertilising may be conducted with manure or compost. A maximum of 15 kg N/hectare may be spread at any one time and a maximum of 30 kg per year.
- Otherwise, the regulations are the same as they are for extensively utilised grasslands. Payments amount to approximately SEK 2,220 per hectare per year.

Production of straw

In addition to allowances for grassland that is used for fodder, allowances are also made for grassland that is used for the production of straw. The regulations and payments are the same as they are for grassland used for fodder, although the first harvest may not be made before 1 September, unless a nature conservation agreement provides another date.

Hedges, groves and sand dunes

Payments for the preservation of landscape elements

The rules for these are:

- An overgrown zone around the element of three to six metres in width.
- The overgrown zone shall be mown at least once every three years.
- Arable land shall be mown at least once a year. The first harvest shall be conducted no earlier than 15 June – 15 July, depending on the growing zone. The various different cantons may decide on specially adapted regulations for the time of harvest, over and above the basic regulations.
- Neither fertiliser nor pesticides may be used, with the exception of the treatment of individual plants.
- The land may be gently grazed during the autumn, as long as this causes it no harm. Grazing may not happen before 1 September or after 30 November.

The payment corresponds to approximately SEK 14,000 – 18 500 per hectare per year, depending on the growing zone.

Payments for the preservation of meadows with trees

The payments apply to meadows with fruit trees, edible chestnuts or trees nearing nuts (these meadows are called “Selven” in Switzerland). The rules for these are:

- The meadows shall be managed.
- The trunk height shall be at least 1.2 metres for fruit trees and 1.6 metres for other trees.
- Herbicides may not be used to keep grass away from the trunk, with the exception of trees less than five years old.
- At least 20 trees per business. The payment is approximately SEK 110 per tree per year.

Border zones on arable land

In the Swiss rural development programme there are two types of border zones around arable land.

Extensive border zones around field crops.

For this border zone, the following applies:

- The border zone shall be between 3 and 12 metres wide.
- It shall be located in the same place for at least two consecutive main crops.
- Insecticides and nitrogenous fertilisers may not be used.
- The border zone shall be sown with cereal, rape, sunflowers or leguminous plants.
- Cereal in the border zone shall be threshed when ripe.
- Authorities at canton level can decide whether mechanical weed control can be undertaken. However, no payment is made for the year in question.

The payment is approximately SEK 9,600 per hectare per year.

Borders by fields

For this border zone, the following applies:

- The sown area shall be between 3 and 12 metres wide.
- It shall be located in the same place for two consecutive growing periods.
- Fertilisers and pesticides may not be used.
- Individual treatment of problem plants may only be carried out if they cannot be treated suitably mechanically.
- Half of the area must be mown each year, on an alternating basis. The waste material shall be removed.
- Sowing shall be with a seed mixture approved for this purpose. The payment is approximately SEK 17,000 per hectare per year.

Fallow land

There are two types of payments for fallow land in Switzerland. Both are both green fallow and are only intended to be used in long valleys where arable farming is at its most intensive.

Perennial fallow

- The fallow shall be at least three metres wide and must remain for no less than two and no more than six years.
- No fertilisers or pesticides may be used. However, the chemical treatment of problem plants is allowed.
- The fallow may not be mown until the second year. This may only be done during the period 1st October to 15th March. A maximum of half of the area may be mown. With a large amount of weeds, the fallow may also be mown in the first year.
- In normal cases, fallow may be replaced within the same parcel no earlier than after four years.

The payment is approximately SEK 21,000 per hectare per year.

Green fallow, rotating

- The fallow shall be at least six metres wide and the area shall be at least 0.20 hectares.

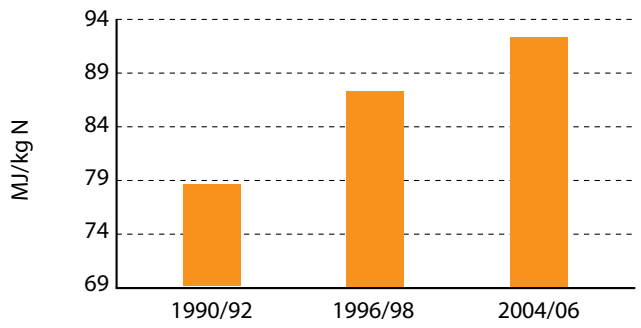
- No fertilisers or pesticides may be used. However, the chemical treatment of problem plants is allowed.
- The area shall be sown with a recommended seed mixture. Exemption can be granted if the fallow is self-sown.
- Sowing shall be carried out between 1 September and 30 April.
- The fallow may be broken up no early than 15 February the following year for one year-old fallow, or no earlier than 15 September for two year-old fallow.
- The fallow may be replaced within the same parcel no earlier than after four years. The payment is approximately SEK 17,000 per hectare per year.

Evaluations of the environmental impact of the payments

The productivity of Swiss farming has increased over the past 20 years. The use of nitrogen has improved so that more products have been produced per inserted resources, measured in MJ per kg of nitrogen used (Figure 2). The SFOA believes that this is due to the basic requirements made of the farmers within their farming support system. They point out several issues which have been significant:

- farmers shall be able to present a plan for how they will reach well-adjusted fertiliser rations for respective crops per field,
- increased variation in crop rotation, and
- reduced erosion and plant nutrient leaching due to strict requirements for reducing the percentage of bare fields (SFOA 2009).

Changes can also be seen in the total usage of phosphorus, which has reduced from 20,000 tonnes in 1990 to 5,000 tonnes in 2009, without production having decreased (it has actually increased). The reduction is due partly to previous recommendations being higher, so that improved advice had a noticeable effect.



MJ/kg N: Megajoules/kg nitrogen
Sources: Swiss Farmer´s Union,
Swiss Federal Statistic Office

Figure 20. The number of megajoules produced in livestock production as a function of the kgs of nitrogen inserted (SFOA 2009).

Although improvements have occurred, the trends now appear to have stagnated. Several problems still remain, especially within the area of water quality: polluted water in agricultural buildings, nitrogen leaching is still not down to target levels, and pesticides leach out into water courses.

Emissions of greenhouse gases from farming have reduced since 1990. Nitrous oxide and methane emissions have reduced by approximately 10 %. Furthermore, emissions of ammonia have reduced by 15 % (SFOA 2009). Whether this change in production has been brought about as a result of the agri-environmental payments, or whether it is connected with the winding up of inefficient farming is not known in detail.

In Switzerland there are conditions whereby pesticides may only be used for preventative purposes. The use of pesticides has steadily decreased since the 1990s but has risen sharply again since 2005. In 2008 it was back to the level it was at in 1990. However, the cause of this increase has not been established (Decrausaz 2010).

In order to counteract intensification, the effects of an expanding infrastructure, changes in the structure of the landscape and the depletion of specific habitats, it has been decided that at least 7 % of all agricultural land shall be set aside for extensive use; these areas are known as ecological compensation areas. In 2009, compensation areas accounted for 120,000 hectares (approximately 11 % of the total agricultural area). These are not evenly spread out throughout the country and therefore several thousand hectares are still (2009) required before the target for the most intensively farmed areas is achieved (SFOA 2009). The SFOA credits these areas in particular (plus other measures within the support system) as having had a major effect on the recovery of the farm bird population. From having a trend with a decreasing level of breeding in the landscape, the trend is now stable or maybe even positive (SFOA 2009). However, this conclusion was based on somewhat limited data (Birrer et al. 2007). Switzerland, unlike the majority of EU countries, has not just set requirements and objectives for how the lands shall be farmed but also the quality, in a biological sense, that the managed land shall achieve (Henle et al. 2007). This applies, inter alia, to the number of species from a chosen indicator list that should be expected to be found (Jeanneret et al.2010). With the help of this type of indicator, compensation areas have been examined and positive effects found, even if these are not exactly over-clear. Despite that a large proportion of the threatened plants in Switzerland is associated with the agricultural landscape, only 18 % of these could be found in mown land. Jeanneret et al. (2010) draws the conclusion that the payments have not helped in the preservation of these. On the other hand, Knop et al. (2006) demonstrated that there were differences in the number of species to be found in land within the system and land outside of it. Both wild bees and grasshoppers appear to have benefited from the payments (Knop et al. 2006). On the other hand, it has not been possible to see any differences regarding the variety of spiders to be found in conventionally farmed mown land (grassland) or in those mown fields that received payments (Jeanneret et al. 2010, Knop et al. 2006).

Butterflies generally benefited from border zones, but, other than this, none of the effects on this species group could be attributed to the payments. 2010). Haaland (2011) demonstrated that both the number of species and the individual density of butterflies is higher in border zones sown with flower-rich seed mixtures than in habitats outside of the payment system or mown land. However, it is various species that reside in the various environments, so a direct comparison is therefore not so easy to carry out. In the examination, few threatened species have been found in the border zones (Haaland 2011).

Border zones have also had positive effect on the farm birds in Switzerland (50 % of the farm birds are red-listed), but, despite major efforts for about 20 years, the effect has not been as great as had been expected. This is attributed to the quality of the border zones not being sufficiently high within the payments system (Birrer et al. 2007).

Switzerland has started a comprehensive investment programme in environmental analysis. So far, however, the data for water courses (water quality, plant nutrient leaching, and pesticides) has been considered poor, and for soil conditions, acidification, the ecosystem and species of the agricultural landscape, data is non-existent.

Assessment of Switzerland's payment systems when applied to Swedish conditions

As far as plant nutrient and pesticides are concerned, it is not thought that Switzerland's payments contribute any new ideas to the Swedish payments system, apart from the requirements for a minimum level of measures that must be satisfied. This would be a good way in which to increase the environmental impact of the programme. It would probably not be as positively received by many farmers, as in certain cases this would imply increased costs. The payments that have been demonstrated to give the greatest positive effects are border zones where no pesticides or fertiliser may be used, and which are sown with flower-rich seed mixtures. Such zones have been established over a very wide area since this is a basic requirement for participation in the payment system. These types of unsprayed zones have been shown to be capable of great species variety and they have also been sought after in Sweden (i.e., in Pedersen 2009). These border zones naturally also have an effect on plant nutrient leaching and pesticide usage, as fallow areas do. Requirements for border zones (with payments) around water courses, and certain permanent habitats such as, forest borders and certain types of ditches, can be something that the Swiss payment system contributes to the production of the new Swedish rural development programme.

Figure 21. The use of nitrogen has been considerably improved within Swiss agriculture, thanks to farmers establishing fertilisation plans

Photo: Urban Emanuelsson

3.1.6 Austria

Overview

Approximately 70 % of Austria's area is used for farming. Roughly 60 % of the country's area consists of areas classified as alpine, at the same time as 80 % of the areas are categorised as disadvantaged. Farming represents 1.9 % of the country's GNP and employs 3.9 % of the country's population (including forestry). Austria has, in European terms, a small-scale structure at farm level. This is seen as something relatively positive in Austria, in terms of the possibilities it presents for strategic investments in the landscape and biodiversity. It is also seen as positive in terms of the landscape's power to attract tourists and investors.

ÖPUL (part of axis 2 of the Austrian rural development programme) is the name of the Austrian programme that promotes farming as environmentally sound and extensive, and that protects the natural environment for plants and animals. 73 % of the funding for the Austrian rural development programme goes to axis 2. In addition to measures that promote environmentally sound farming, this includes compensation payments for agriculture in disadvantaged areas. In 2009, EUR 273 million was paid out in compensation allowances. The budget for axis 2 for the entire programme period was

EUR 5,824 million. Accordingly, one third of the budget for axis 2 goes to compensation allowances (Lebensministerium 2010).

Within ÖPUL there are 20 types of agri-environmental payments that aim to improve natural resources such as water quality, soil quality and biodiversity, but also to preserve traditional landscapers and plant species due to their cultural value, and to support animal welfare (European Commission 2007).

Overall, Austria's water environments are in a good condition, but there are problems with excessive nitrogen levels. For this reason, many measures are directed at reducing plant nutrient leaching into surface and ground water. The payments are made per hectare of the cultivation area that is included in the programme measure and the commitments span over five to seven years.

Similarities and differences with Sweden's programme

Austria's rural development programme is largely similar to Sweden's, even if there are differences between certain payments. As is the case with many European countries, Austria also has more measures for the reduction of plant nutrient leaching than it has for the preservation of biodiversity. Even if Sweden and Austria do have similar environments and, to a certain extent, similar problems within nature and the environment, there are differences in the appearance of traditional agriculture in the two countries. Austria's measures for the landscape and traditional agriculture are directed at the preservation of mown meadows and fruit cultivation (or integrated production of these), whilst in Sweden, the primary focus is on pastureland and landscape elements. They also have a clearer direction as far as the preservation of traditionally grown plant types, etc. is concerned, compared with Sweden.

Figure 22. Austria's agri-environmental payments to the agricultural landscape go primarily to mown meadows and fruit cultivation. Much less goes to pastureland and the landscape elements of arable land.
Photo: Urban Emanuelsson

Types of support

Below, can be found brief descriptions of the measures within Austria's programme for environmentally sound farming that concern the three problem areas of biodiversity, the handling of plant nutrient leaching and pesticides.

Organic farming

This measure aims to increase the amount of organic farming, in accordance with the EU's regulations for organic production. The objective is to improve biodiversity and the condition of the country's land, soil and surface water through reducing the usage of fertiliser and artificial pesticides (European Commission 2007).

Environmentally-friendly farming of fields and grasslands

This measure can be combines with the majority of other measures concerned with fields and grasslands. The aim is to bring about a level of fertilisation which lies below that of the general recommendations, to preserve the cultural landscape and various landscape elements, and that the measure shall take up as large a part of the agricultural area as possible, as a base for other measures. Restrictions are set on the amount of nitrogen that may be spread and the number of grazing animals per hectare. There are also requirements that the farm's agricultural area be divided between various crops and that a certain percentage of the area shall be fallow, that grassland is preserved and that biodiversity areas and strips for flowers and beneficial insects are established (Swedish Board of Agriculture 2011, European Commission 2007). A separate payment is also available for the preservation of fruit trees in grasslands. These are still an important part of the traditional meadow and pasturelands in central and eastern Europe.

Refrain from measures that increase production on arable land

This measure aims to improve biodiversity and soil and water quality through a reduced usage of pesticides and fertilisers. The measure must encompass all of the farm's agricultural land except that used for fodder production. Furthermore, participants in this measure must also be involved in the general "Environmentally-friendly farming of fields and grasslands" measure.

It is primarily the following prerequisites that apply:

- Refrain from the use, purchase and storage of pesticides and fertilisers, with the exception of products approved for organic farming. However, seed may be treated with pesticides.
- Refrain from sludge and composted sludge.
- Payments for green fallow are limited to a maximum of 25 % of the farm's agricultural area. (Swedish Board of Agriculture 2011, European Commission 2007)

Figure 23. The Austrian farmers receive payments if they refrain from using pesticides, fertilisers and sludge on all of their farm's arable land.
Photo: Urban Emanuelsson

Refrain from measures that increase production on cultivated or natural grassland

The aims and conditions of this measure are similar to those of the previous measure. It is however permitted to use commercial fertiliser (up to a maximum of 30 kg P205/ha) on grassland with pH >6 and which has a major need for it (Swedish Board of Agriculture 2011, European Commission 2007).

Refrain from the use of fungicides in the production of cereal crops

This measure aims to increase biodiversity through preventing the use of synthetic fungicides. The measure must incorporate all cereal crop production on the farm and also requires the farmer to participate in the "Environmentally-friendly farming of fields and grasslands" measure. In principal, the same commitments apply for this measure as for the "Refrain from measures that increase production

on arable land" measure, with the addition that fungicides may not be used. However, seed may be treated with pesticides. Nor is the purchase or storage of chemical supplements permitted by this measure. (Swedish Board of Agriculture 2011, European Commission 2007).

Environmentally-friendly farming of medicinal plants and herbs and seed cultivation

This measure aims to reduce the usage of fertiliser and pesticides in certain crops where the intensive use of such supplements is common. As with both the preceding measures, it requires the farmer to also participate in the "Environmentally-friendly farming of fields and grasslands" measure. Otherwise, it is not permitted to use pesticides that are not approved for organic production. Nor is the spreading of sludge permitted. Furthermore, the amount of fertiliser and the time at which it is spread is regulated, based on the crop being grown (Swedish Board of Agriculture 2011, European Commission 2007).

Integrated production (IP)

IP is a form of environmentally-friendly cultivation which employs a holistic view with regards to how agriculture can operate in a sustainable manner. The concept is described in more detail in, for example, Växtskyddsnotiser (61:2,

1997). The Austrian programme for environmentally-friendly cultivation supports IP cultivation of potatoes, strawberries, vegetables, beets, fruit, hops and wine, as well as cultivation in greenhouses. Documentation, education, soil analyses, the minimisation of fertilising with nitrogen and phosphorus and crop rotation are important parts of the Austrian programme (Swedish Board of Agriculture 2011, European Commission 2007).

Erosion protection in the growing of fruit, hops and wine

Payments are available for erosion protection in the growing of fruit, hops and wine. The measures aim to protect soil from wind and water erosion and to reduce nutrient leaching into the surface water. In order for the farmer to be entitled to support, the ground where the crops are grown is to be covered by grassy vegetation or is covered with straw or bark. The size of the payments varies depending on the slope of the land (European Commission 2007).

Refrain from the use of silage

To promote biodiversity on grassland, this payment can be applied for where neither grass nor cultivated fodder may be converted into silage. There are also requirements that, inter alia, sludge is not spread on the area in question (European Commission 2007). The objective of this payment is to reduce the damage to the nests of ground-breeding birds, increase the access of birds to food and to allow a greater diversity of flowers in the landscape. Another sub-objective is to counteract, intensification, increased fertiliser rations and plant nutrient leaching. High rations are possible when silage is made, since is it is possible to harvest this up to five times in Austria. With hay-making, intensification of the cropping system is more limited (Lebensministerium 2011).

Farming of mountain meadows

There are several payments available for the farming and traditional use of mountain meadows. These payments aim to preserve traditional landscape because of its cultural value but also in order to promote biodiversity. Which payment is applicable depends, inter alia, on the methods used for farming the grassland (European Commission 2007).

Animal welfare

Payments for animal welfare are based on measures that go further than those required by legislation. This can mean measures that allow the animals to graze or measures that reduce leaching of plant nutrients from livestock farms (Lebensministerium 2011).

Catch crops

The objective of catch crop measures is to reduce plant nutrient leaching and erosion by sowing cover crops on land where other crops are grown. A certain part of the area must be sown with the crop, and the regulations for the use of pesticides vary between the various crops (European Commission 2007). There is also a separate payment of the sowing of corn to reduce the risk of erosion in sensitive areas (Lebensministerium 2011).

The use of green manure and direct sowing

The measures "The use of green manure on arable land" and "Direct sowing" are both aimed at the reduction of plant nutrient leaching and erosion. Payments for direct sowing are only made to those who have fertilised with green manure (and who received agri-environmental payments) and, reciprocally, to be eligible for green manure payments, the farmer must have subsequently mull or direct sowed, in accordance with the requirements of the agri-environmental payments (European Commission 2007).

Preventative water conservation

This payment aims to reduce plant nutrient leaching to ground and surface water in certain regions. In short, it requires that the farm's entire cultivation area shall be included in the green manure measure and either the measure for organic farming or the measure for environmentally-friendly farming. Furthermore, nitrogenous fertiliser may not be spread during the winter. One requirement is that the recipient of the support must take part in training regarding preventative water protection (European Commission 2007).

Farming of arable land that is especially sensitive to leaching

Payments are available for those who refrain from the fertilising of arable land that is especially sensitive to leaching. The aim is to prevent nutrient leaching. In order to be entitled to the payment, participation in the preventative water conservation measure is required, in addition to at least half of the land in question having disadvantageous soil, according to Austrian classification standards. Furthermore, neither treatment with pesticides nor ploughing is permitted. The area must be mown annually (European Commission 2007).

Reducing losses caused by the spreading of fertiliser

Payment is available for the usage of certain techniques for the spreading of manure. The aim is to reduce the leaching of nutrients to surface and groundwater and to reduce odour problems.

In order to be entitled to payments, it is required that at least 50 % of liquid manure is spread directly onto the soil surface or into the soil. A further requirement is the reporting of the manure that the farm produces and the use of machines for the spreading of the manure (European Commission 2007).

Especially sensitive nature conservation and water conservation areas

Payment is available for a number of different measures that aim to protect and develop high-value agricultural land in the area, to build up habitats, and to apply fallowing or water-conserving cultivation in areas prone to leaching. Support can even contribute to the achievement of the Natura 2000 objectives. Projects approved by the nature conservation authority are entitled to support. The measures can be applied to grassland (not mountain meadows), arable land and certain embankments. The requirements and payment levels vary between the different projects (European Commission 2007).

Preservation of rare cultivated plants.

The objective of this payment is that it shall lead to increased usage and propagation of unusual and threatened agricultural crops. The implementation of the measure shall be coordinated with scientific examinations for the identification and genetic testing of all varieties. The list of varieties is to be constantly updated and the varieties included are to be stated along with their origin. This system means that one recommend the cultivation of varieties that are at risk of disappearing, before this happens (Lebensministerium 2011).

Figure 24. Agri-environmental payments have improved the biodiversity in Austria's agricultural landscape.

Photo: Urban Emanuelsson

Evaluations of the environmental impact of the payments

As far as the problems with plant nutrient leaching are concerned, ÖPUL's measures contribute considerably to improvements in the quality of surface and ground water, according to the mid-term evaluation. Furthermore, it appears that commitment levels are insufficient for certain measures, but the mid-term evaluation does point out which measures these are (Lebensministerium 2010).

As far as soil quality is concerned, a comprehensive study has shown that the rural development programme and previous programmes have had positive effects on the acidity (pH) of the soil, and on humus and nutrient values. The nutrient levels in the soil range from "surplus" to "sufficient content", according to the mid-term evaluation. It also states that "for example, the spreading of green manure on arable land, direct sowing and organic farming" are very important for the positive development of the humus content in the soil (Lebensministerium 2010).

According to the mid-term evaluation, many measures have had a positive effect on biodiversity and the most important measure from this point of view is "Preservation and development of especially sensitive nature conservation and water conservation areas". The evaluation believes that the importance of this measure is also confirmed by other studies. Between 2007 and 2009, the area receiving payments for conservation measures increased by 19%. Furthermore, the mid-term evaluation shows that organic farming improves the biodiversity in cereal crops, but that the same effects have not been established with regards to grass cultivation. The effects of measures for environmentally-friendly farming on biodiversity can, according to several evaluations, be improved through the conditions for payments becoming more flexible (Lebensministerium 2010).

Assessment of Austria's payment systems when applied to Swedish conditions

The Austrian rural development programme incorporates several payments that might be of interest, when applied to Swedish conditions. On example of this is the refraining from the use of silage, since this would lead to increased flowering which is a resource for pollinators (with the reservation that it is covered with flower-rich cultivated grass mixtures). This measure could potentially even benefit ground-nesting birds, should the harvesting be postponed. The payments for the preservation of threatened, traditional agricultural crops are more ambitious than the Swedish ones which, in their current form, only apply to one variety. This could be developed now that the Programme for Diversity of Cultivated Plants (POM) has provided information regarding the cultivation of a number of traditional and unusual varieties.

As is the case with many other European countries, Austria has not been able to demonstrate any extensive impact resulting from its initiatives. However, this is does not mean that there has not been any impact. One general problem with the evaluation work is that there is neither basic data nor the possibility to compare the development of farms that receive agri-environmental payments with those that do not.

3.2 What does research tell us about the efficiency of the various measures?

3.2.1 Introduction

Modern agricultural practises have had an extensive negative impact on the environment, but even its positive effects have reduced, compared with traditional agricultural. This concerns natural resources such as ground water, lakes and seas, soil conditions, biodiversity, the appearance of the landscape, cultural heritage qualities, etc. Large, intensively managed fields, small areas of uncultivated land, abandoned or intensively managed grasslands, the use of pesticides and artificial fertilisers, drainage and other factors connected with modern agriculture have all contributed to its negative effects. Intensified farming correlates negatively to biodiversity (Green et al. 2005), and this is especially clear in plants and animals that are suited to traditional management techniques (Stoate et al. 2001). It is believed that a more enduring agriculture could be brought about through increased usage of natural enemies (and less use of pesticides), a balanced use of nutrients, conservation tillage (ploughing and harrowing), an increased integration of forestry and agriculture, better water management and integration of livestock production (including fish farming) within agriculture (Pretty 2011). Various means of control have been used to reduce the negative impact of agriculture. Major sums are paid out annually to farmers in order to stimulate measures that are positive for the environment, natural resources and biodiversity. However, the agri-environmental payments in Europe are questioned, since their effects have been limited or difficult to illustrate (Whittingham 2011).

Below can be found a summary of the scientific literature regarding the effects of the agri-environmental payments on biodiversity and the environment (i.e., leaching of nitrogen and the use of pesticides. Some of the results cannot be directly related to Swedish conditions, since ecological and other preconditions pay be different to those we have here. We therefore urge caution in the interpretation of these, in respect of the Swedish agri-environmental payments. Other results are based on Swedish studies or ought to also be largely relevant in Sweden. Studies of the attitudes of farmers to agri-environmental payments and to the preservation of biodiversity and the environment can be found in the second section (see 3.3).

The effects of the intensification of agriculture

Several recently conducted studies confirm that there are major negative effects associated with the intensification of agriculture. Studies in seven European countries (Flohre et al. 2011) showed that the intensity of agriculture affected the variety of species of birds and vascular plants negatively, and that it could be demonstrated that the higher the proportion of arable land there was in a landscape, the greater the negative impact was on the diversity of birds and vascular plants. Kleijn et al. (2011) also showed a negative connection between an abundance of varieties of vascular plants in arable land or in grassland and the intensity of agriculture. This was measured through the amount of nitrogenous fertiliser in an intensity gradient in seven European countries. The occurrence of less common and rare plants also followed this pattern.

In line with these studies, Geiger et al. (2010) showed that the agricultural intensity (measured as the yield from cereal crops) had overriding negative effects on the abundance of species of vascular plants, carabides and birds, but that this effect did not occur in all countries. Furthermore, the predation of aphids through natural enemies negatively correlated to the yield. Several factors are involved in the intensification of agriculture (land usage, the amount of unfarmed land and border zones, the amount of fertiliser and pesticides). It should be noted that intensification is not in itself harmful, but what is important is the end result in terms of biodiversity, nitrate leaching, etc. and not the actual production method or the amount of supplements used. Geiger et al. (2010) found that the amount of pesticides (primarily insecticides and fungicides) was the factor that had the greatest negative effect, and that this had a negative effect on all species groups and the predation of aphids.

Similar patterns have found on farms with livestock production. McMahon et al. (2010) studied fauna and flora on intensively farmed dairy farms and on more extensively farmed meat-producing farms (which, to a large degree, received agri-environmental payments) and found that the intensity had a negative effect on vascular plans and the diversity of invertebrates. In contrast to the studies above, they found that the abundance of invertebrates and species of birds was higher in the more intensively farmed dairy farms. One possible explanation is that the areas with unfarmed land (i.e. border zones and hedges) is managed better by milk farmers (full-time farmers) than it is on other livestock farms (which are often run by part-time farmers). One conclusion of this study is that the effect of agri-environmental payments depends on supplements or cropping systems that are connected to the intensity of the cultivation, but that the existence of non-cultivated land can be of equal or greater significance for certain species groups.

The suspension of agriculture in less productive regions (i.e., mountainous or wooded areas) also constitutes a threat to many of the values that are found in the agricultural landscape. In these regions, means of control are required, if agriculture is to be maintained. Sometimes means of control may even be required for the benefit of measures that might be considered more intensive, i.e., active arable farming in landscapes dominated by fallows and cultivated grasslands (see Wretenberg, et al., for example) 2010).

Information for the monitoring of the effects of the agri-environmental payments

The agri-environmental payments have been introduced to farmers in order to counteract the negative and promote the positive effects of agriculture on the landscape, cultural values, biodiversity, soil and water quality, etc. Several summaries have indicated that, by and large, there is no information with which to evaluate the effects of various forms of payments on biodiversity (Kleijn and Sutherland 2003, Herzog 2005). Furthermore, when data for the analyses does exist, it often shows that the effects are limited (Kleijn et al. 2006, Birrer et al. 2007, Davey et al. 2010). Several new studies have demonstrated generally positive effects resulting from the agri-environmental payments. Geiger et al. (2010) demonstrated in a study of eight European countries that the percentage of land (within 500 m) that received agri-environmental payments positively affected the number of species of vascular plants and carabides, but that it did not have any

Figure 25. Only a few agri-environmental payments have been evaluated qualitatively, and even fewer quantitatively. As a general rule, there is no monitoring of the effects of the agri-environmental payments or data with which to evaluate them. Österlen, Sweden
Photo: Knut Per Hasund

effect on the variety of species of birds. The same study also showed that agricultural intensity still has major negative effects on the variety of species within these groups, i.e., the use of pesticides and the yield from arable crops. This suggest that the effect of the payments is still limited, on a larger scale.

One recent summary of evaluation models for agri-environmental payments in seven countries (Denmark, Finland, Germany, Greece, Hungary, the Republic of Ireland and the United Kingdom) was conducted by Primdahl et al. 2010). This showed that over half of all support was evaluated without qualitative or quantitative variables that measured effects. Over a third of the payments were evaluated with qualitative models and less than a sixth of the payments were evaluated with quantitative models. The payments were divided up into three groups: preservation of natural resources, biodiversity and "landscape". The payments made for preserving the quality of natural resources (i.e., water) were more often (30 %) based on quantitative models than the evaluations of payments made for preserving biodiversity and the appearance of the landscape (6-8 %). Furthermore, the evaluation models for payments that went to parts of farms were more often (43 %) based on quantitative variables than the evaluation of more general payments at farm level (21 %). Most evaluation models (approximately 50 %) were only based on the degree of involvement (number of farmers or area) which says nothing definite about the end effect of the various measures. Another criticism of the agri-environmental payments has been that they are ineffective, i.e., give too little effect in relation to their costs (Hodge 2001).

All-embracing integrated scientific evaluations of other factors such as the preservation of soil and water resources and climatic effect are rare (Purvis et al.

2009), but some reports at EU level are available (GFA 2006, Hudec and Kaufmann 2007) as are several more detailed investigations of nutrient leaching (see below).

One important conclusion is that the collection of "basic data" and reference data (i.e., farms not receiving payments) is required to a far greater degree, in order to be able to use quantitative evaluation models that analyse the effects of the agri-environmental payments. Such a system could also identify problems in the evaluation system, identify research requirements and contribute to improving the systems.

3.2.2 Development of an agricultural effects index

The effects of measures within agriculture are often complex. One measure can have different effects on natural resources, the environments, cultural values and biodiversity. What is more, different species groups can react differently to the same measure. To facilitate all-embracing evaluations of payments and farming or management measures, indices of a more comprehensive nature are often sought after, as are more detailed indices.

The Agri-environmental Footprint Index (AFI) is an all-embracing method based at farm level. It has been developed to evaluate the effect of agriculture on more factors than just biodiversity, and can also be used to evaluate the effects of agri-environmental payments (Mortimer et al. 2009, 2010, Purvis et al. 2009). The method has been shown to work for the evaluation of the environmental effect of participation in various agri-environmental payment programmes (Knickel and Kasperczyk 2009) through using data collected for this specific objective. The method is based on a 3x3 matrix with measures within three groups (crop-animal management, farm structure, nature and cultural environments) and their effect on the values within the three groups: natural resources, biodiversity and landscape. One such 3x3 matrix includes several indicators, all of which are weighted. Finally, everything is entered into one AFI for the whole farm. These indices should be monitored for a number of farms over a long period in order to track comprehensive changes within agriculture and the effects that these have over time.

Investigations into the possibilities of using AFI to evaluate the effects of various types of agriculture with already available data (Westbury et al. 2011) showed that this worked, to a certain extent, in comparisons between arable farms and livestock farms (lowland and upland) in the United Kingdom. Despite this, access to more detailed data would be desirable (in this case, the management of grasslands, use of pesticides and fertiliser). Furthermore, it is thought that the AFI is driven by several sub-indicators. The inclusion of more sub-indicators would make more detailed indices possible as well as sharper analyses of the effects of various measured. An investigation is in progress into the possibilities of using AFI for Swedish conditions (Wissman and Colentine 2010).

Another alternative is to develop indices for habitat structure and diversity. Kadoya and Washitani (2011) developed an index (Satoyama) for landscape diversity that was correlated to the variety of species of batrachians, damselflies

and the occurrence of a bird of prey in Japan. The index also agreed with areas of habitat with high natural value when it was tested in other countries (i.e., Dehesa in Spain) and regions of various agricultural intensity. The index can also be used in different scale levels. Many investigations of biodiversity in the agricultural landscape have shown that the proportion of land that is not arable (i.e., border zones, grasslands, etc.) is of major significance. An index that describes this should be usable in, for example, environmental surveillance. This would be able to describe long-term changes in the agricultural landscape connected to the effects of agri-environmental payments on, for example, biodiversity.

A third possibility is to use the index for the occurrence (abundance) of several species and population development. One example of such an index is the ”Farmland Bird Index” (FBI), that shows the population development of selected farm birds (Gregory et al. 2005). This index is thought to be usable for showing the effects of changing agricultural production methods. This seems to be connected to similar patterns in other organism groups such as, for example, butterflies, even if different organism groups often show differing patterns as far the effects of different measures and agri-environmental payments are concerned (see below). Development of a butterfly index ought to work in Sweden since the monitoring of butterflies is part of a newly started national surveillance programme. This is being conducted by volunteers and also within the NILS programme (see, for example, Pihlgren et al. 2010). The voluntary reporting of observations of several species groups to Species Gateway is also increasing. The quality of this data and the opportunities to use it in environmental surveillance should be investigated in more detail.

A fourth type of index is based on the ecological qualities of various species. They could be used to predict the effect of future changes and measures. Butler et al. (2007) constructed a model that was based on the diet of different species of birds, habitats in which they could search for food and habitats in which they could nest. The model calculated how different measures would affect a particular species. An evaluation of the model was conducted going back in time for the effects of transition from autumn sowing to spring sowing, the increased use of chemicals, the loss of unfarmed land, the drainage of agricultural land, previous mowing due to silage, and the intensified management of grasslands. This showed that the calculated risk factor for the species was connected to their current threat status and to the annual population growth of the species. Negative effects of the use of genetically modified crops (due to reduced insect and weed populations) were predicted to have negative effects on 23 bird species in the future, should thee measures be introduced. The authors suggest that similar models could be used in different contexts, where the effect of the means of control should be evaluated. Another conclusion from this study is that current payments systems in England focus too much on non-cultivated land. The bird populations will therefore continue to decrease in the future, despite the extensive payments systems (Entry Level Stewardship, see below also).

Butler et al. (2009) identified the basic needs of several organism groups (over 300 species were included). For example, habitats where bees search for food were identified, as were the plants where they find food and their living requirements; preferences in terms of humidity, nitrogen content, flowering and germination periods were also identified, along with the sensitivity of vascular

plants to herbicides in arable land in the United Kingdom. These were connected to various environments in the agricultural landscape. Similar assessments were made for butterflies, mammals and birds. Finally, everything was appraised into a biodiversity index that can be used for the evaluation of biodiversity in various agricultural landscapes, for establishing objective goals for biodiversity in the agricultural landscape, and for evaluating the effect of various future measures that are included in the agri-environmental system.

As far as the risk of nutrient leaching (i.e., phosphorus) is concerned, several models and indices have been developed and applied in, for example, USA and in Scandinavia (Djodjic and Bergström 2005, Heckrath et al. 2008). Initial evaluations of Scandinavian systems suggest that the phosphorus index explains a great deal of the losses in individual fields and in catchment areas, but more detailed evaluations and further development of such indices is required (Ulén et al. 2011).

The development of comprehensive agricultural development indices would be desirable, i.e., in order to evaluate whether environmental objectives are fulfilled. A combination of all-encompassing indices (of the AFI type), indices based on landscape composition and indices concerned with the changes to certain selected species groups (or their qualities) ought to be able to work in several contexts.

3.2.3 Factors that complicate the evaluation of the effect of the measures

Effects of scale and landscape type - where should the money be invested?
A number of current studies have shown that the significance of various agri-environmental payments is affected by the composition of the surrounding landscape. There seems to be different scales of effects. At farm level, there is often a strong connection between the proportion of non-cultivated land and biodiversity (Whittingham et al. 2007, Fuentes-Montemayor et al. 2011, Hanspach et al. 2011). On a larger landscape scale, several studies have shown that the local effect of agri-environmental payments depends on how large the proportion of the land in the surrounding landscape is that receives such payments (Gabriel et al. 2010). Dallimer et al. (2011) showed that the variety of species of birds that were classified as being of interest for conservation purposes (and the variety of highland species) in pastureland in England was higher in areas where a large proportion of the surrounding fields also received agri-environmental payments for the reduction of both grazing pressure and the use of fertiliser.

The conclusion of these studies is that agri-environmental payments to land that lies in heterogeneous landscapes with high biodiversity often have better conditions for the provision of positive effects. Similar effects can be expected in Sweden. This is also supported by Kleijn et al. (2011) who demonstrated that the connection between the variety of species of vascular plants and agricultural intensity (amount of nitrogen used) was negative, but that the connection was not lineal (negatively exponential). Their conclusions were that 1) high biodiversity is linked to areas with less intensive farming, 2) rare species that are of interest from a conservation point of view are mostly found in areas with low intensity, 3) environmental measures based on agri-environmental payments are cheaper and more effective to implement in extensively farmed areas than in intensively farmed

areas, and that 4) there are certain exceptions when the measures are specifically targeted at threatened species that survive in intensively farmed areas. In certain landscapes (i.e., mosaic landscapes with forests and arable land) environments other than the agricultural landscape can also be important for biodiversity that is traditionally thought to be linked to open agricultural areas. Berg et al. (in press) showed that the butterfly fauna in power lanes were richer in terms of species and the number of individuals than in pastureland. Clearance areas and forest roads were also valuable for butterfly fauna (all four habitats were required for preservation of the entire butterfly fauna). The existence of habitats other than traditional agricultural land can therefore also affect the efficiency of various agri-environmental payments and measures.

A study in Holland (Leng et al. 2010) showed that the variety of plant species in ditch borders with agri-environmental payments reduced, the further they were from the nature reserve. Ditches receiving agri-environmental payments showed a greater variety of species than those without. Other factors that affected the variety of species were the direction in which the ditches ran, the water level, where they were located in relation to the nature reserve, the dominant wind direction and the size of the fertiliser ration used in the neighbouring fields. An important conclusion was, again, that the effect of agri-environmental payments depends on whereabouts in the landscape they are to be found and that the planning of their location can have major, positive effects.

Figure 26. The effect that the agri-environmental payments have on biodiversity is affected by the surrounding landscape. Trulshärad, Skåne, Sweden
Photo: Knut Per Hasund

In other studies (i.e., a compilation of literature by Tscharntke et al. 2005) it emerges instead that many of the measures have a good possibility of increasing the variety of species in homogeneous landscapes where there are few species. In a meta-analysis (summary of several studies) of the effects of agri-environmental payments in relation to the complexity of the surrounding landscape and the type of production - crop or livestock- based, it was shown in a similar way that arable land that is managed for the promotion of biodiversity and the environment had the greatest positive effect in homogeneous, intensively farmed landscapes (Batary et al. 2011). In areas with grazing-based production, there was a positive effect from environmentally-oriented management, regardless of whether the land

was located in homogeneous or heterogeneous landscape. The effects were equally great in the grazing-based farms as they were in the farms with crop production. In a French study (Filippi-Codaccio et al. 2010) a comparison was made of the effects of the intensification of agricultural on specialists (species inked to just a few habitats) and generalists, and it was shown that species that specialised in areas with open arable land were affected more by the intensification of agricultural than species that were generalists. It was even the case that the generalists actually benefited from an increased proportion of arable land. Measures that reduce the intensity of agriculture in open landscapes can be important for the species that are specialised in these open habitats (field species). On the other hand, the measures to promote these species probably do not have the same effect on other species that occur in, for example, more heterogeneous habitats, where there is a large proportion of unfarmed land. One conclusion of these studies is that agri-environmental payments should be adjusted to the landscapes and organisms which they are aiming to promote. In homogeneous landscapes where there are few species, many types of measures have a major chance of increasing the variety of species, but it is probably only widespread and common species that benefit from these measures. However, these species are not unimportant; they can have major significance through their performance of ecosystem services, such as the predation of pests, pollination, decomposition or other central functions within the landscape.

How quickly can effects be expected – the significance of time-lags Another problem with the evaluation of the environmental impact of the measures is that "time-lags" are often involved. This can apply to the whole chain of events, from structural effects on to the response of various organisms. A Swedish investigation by Jonason et al. (2011) showed that the number of individual butterflies was greater on organic farms than on conventional farms. The difference was correlated to the number of years since the transition (1-25 years) from conventional to organic farming. The speed at which the changes occurred was not dependent on the structure of the surrounding landscape, i.e., the number of individuals did not increase more rapidly in heterogeneous landscapes with a large proportion of non-cultivated land. The number of species of vascular plants was also greater on organic farms than on conventional farms. The variety of species was not, however, correlated to the number of years since the transition to organic farming. Studies of farm birds in the United Kingdom have shown that time-lags of 3-5 years commonly occur (Chamberlain et al. 2000). Further studies of other species groups and other agri-environmental payments are needed to be able to illustrate how common it is for time delays to occur between the implementation of the agri-environmental payment measures and changes to the variety of species or individuals. If this is a common phenomenon, long-term studies will be needed to evaluate the effects of the various agri-environmental payments. Short-term studies risk underestimating the effects of the agri-environmental payments on biodiversity. The results also raise the question of continuity in the payment systems, i.e., that payments and subsequent measures will become permanent.

Differences between organism groups

There are major differences between organism groups and how they are affected by the various agri-environmental payments. The effects depend of course on how the payments are designed, but it seems that the effects are generally greatest on

plants and invertebrates in the cases studied. The effects on birds and mammals are often more limited (Klein et al. 2006, Gabriel et al. 2010, Fuentes-Montemayor et al. 2011).

Gabriel et al. (2010) investigated both the local effect and the landscape effect of organic farming and found that biodiversity was connected to the farm's operational direction (organic and conventional farming). The majority of organism groups were also affected by the composition of the surrounding landscape. The majority of organism groups (apart from birds and bees) were generally more common on organic than conventional farms, but a conventional farm in a landscape with a large proportion of organic farming could have an equally large biodiversity as an organic farm. It was also found that different organism groups reacted to the composition of the landscape on differing scales. Furthermore, the biodiversity of the landscape was often affected by several other scales. An important conclusion of this and many other studies (Knop et al. 2006, Frampton and Dove 2007, Berg and Gustafson 2008, Guerrero et al. 2010, Moreno et al. 2010, Wretenberg et al. 2010, Winqvist et al. 2011, Whittingham 2011) is that there is not one single measure that it beneficial for all organism groups. Different measures have different effects in different landscapes. Thirdly, there is no optimal landscape level for agri-environmental payments that benefits all organism groups.

A study of the effects of environmentally-oriented measures on four species of steppe birds (the great bustard, little bustard, lesser kestrel and the montagu's harrier) in extensively farmed areas in Spain showed that the measures had different effects on the four species (Moren et al. 2010). A rotating system with fallows, limited usage of pesticides and fallow trimming bans during the breeding season were considered to be the most decisive measures. An important conclusion was that several measures could have the same effect and, that in a system of extensive farming, this could mean an "excessive establishment" of environmental measures, i.e., that the money invested was not being optimally utilised. Species-specific measures in selected areas were considered more successful that general measures aimed at the promotion of biodiversity in general. Synergies and conflicts between different measures (and agri-environmental payments) at farm and landscape level are, in most cases, not analysed in the studies included in this summary.

3.2.4 Effects of agri-environmental payments – important factors for biodiversity and natural resources

Presented below are scientific investigations of certain selected agri-environmental payments and their effects of biodiversity and natural resources. The presentation also includes investigations that analyse the effects of various farming and management measures in the agricultural landscape - effects that are not currently directly connected to agri-environmental payments, but which are deemed as having the potential for inclusion in such systems. The presentation focuses on the following three main areas: 1) management of arable land (organic farming, crop density, crop heterogeneity, fallows, etc.), 2) border zones (establishment and management of) and 3) the management of semi-natural pastures, since it is within these areas that nearly all scientific studies are conducted. The effect of many other agri-environmental payments and management measures (such as, for example, the significance of specific types of small-scale habitats)

has not been analysed separately in the majority of studies, so overall conclusions cannot therefore be presented.

3.2.5 Arable land

Vegetation, height and density

Several studies (Morris et al. 2004, Wilson et al. 2005, Berg 2008) have shown that high and dense vegetation on arable land, and the absence of areas with low or no vegetation, can be an important cause of the decreasing population of many farm birds. Measures on arable land may therefore need to be prioritised (Butler et al. 2007). The height and density of the vegetation affects the accessibility of both food and suitable nesting places (Butler and Gillings 2004). Agri-environmental payments that include areas without or with short vegetation are therefore something that could benefit many threatened bird species. Unsown areas in cereal fields ("skylark plots") should be able to receive support (i.e. Morris et al. 2004). However, such measures to not always seem to have the desired effect, i.e., in organic fields with less dense crops (Berg and Kvarnbäck 2011) Even on grasslands, many species prefer to search for food in areas with short vegetation, where their success in finding food is greater (Deveruex et al. 2004, Wilson et al. 2005, Douglas et al. 2010) During certain parts of the season and in many landscapes, grassland with short vegetation (i.e.. cultivated grassland) is in short supply.

Studies of four species of birds equipped with radio transmitters (the hoopoe, the woodlark, the Eurasian wryneck and the redstart) in orchards, gardens and tree plantations in Switzerland (Schaub et al. 2010) showed that all the species preferred to search for food in areas of bare ground without vegetation. An optimal covering of bare ground was 30-70 % in the spots where these species most commonly searched for food. Guerrero et al. (2010) showed that the variety of species of birds and weeds on extensively farmed arable land in Spain was negatively correlated to crop density. For birds, this was due to the fact that they preferred to search for food and build their nests in areas with sparse vegetation.

The overall effects of the various agri-environmental payments on the partridge populations in England (Ewald et al. 2010) were limited, as far as density, reproductive success and survival over the winter were concerned. There were however three groups of measures on arable land that had positive effects on partridges: ”beetle banks”, ”conservation headlands”, and ”wild bird cover”. These measures were not widespread, however. If more farmers had adopted these measures, they would have had greater positive effects on the number of habitats with suitably protected nesting places, habitats suitable for the raising of young and good overwintering environments (three factors that are key to the well-being of the partridge species).

Autumn-sown and spring-sown crops

The growing of autumn-sown crops is generally considered to be negative for biodiversity. They lead to high and dense vegetation and mean that the stubble fields disappear (see above). This is thought to be a strong contributory factor to the reduction in the population of many European bird species. The conclusions regarding the negative effects of autumn sowing (compared with spring sowing) are largely based on a few British studies (Donald et al. 2001, Wilson et al. 2005). Studies in Finland (Piha et al. 2003) and Sweden (Eggers et al. 2011, Hiron et al.,

manuscript), where vegetation develops later in the season, suggest that autumn sowing can provide a good or better habitat for, inter alia, the Eurasian skylark than spring-sown fields, at least for the majority of the breeding season. For other species, i.e., the Northern lapwing, the vegetation in autumn-sown fields is too high. Plovers in principal never make their nest in autumn-sown fields, but often on un-sown fields that are sown during the spring (Berg et al. 1992). There is no evidence to suggest that agri-environmental payments to promote spring-sown crops would have the general potential to promote biodiversity in fields in Sweden, apart from in regions dominated by cultivated grasslands or autumn-sown crops. There it can be difficult for species that are tied to areas with low vegetation to find suitable habitats. The spring sowing of crops or measures to reduce the crop's density in autumn-sown fields can therefore be important in regions such as these (see also under the section on heterogeneity, below).

Fallows – establishment and management

Many studies have shown that fallows are positive for biodiversity in the agricultural landscape (Berg and Pärt 1994, Berg 2002, Henderson et al. 2002, van Buskirk and Willi 2004, Vepsäläinen et al. 2010), inter alia for birds, vascular plants and several groups of insects. Permanent fallows that are established without sowing are often richest in species at an early stage, with mosaic-type herb-rich vegetation and patches with low vegetation (Tscharntke et al. 2011). Perennial fallows and abandoned agricultural land become overgrown with long grass, which reduces their value, in terms of terrestrial biodiversity (Hansson and Fogelfors 1998, Hyvönen and Huusela Veistola 2011). Bees increased in number in the first year that fallows were established (Alanen et al. 2011). Butterflies gradually increased in number over a six year period, which can be linked to the ability of these species to spread. Furthermore, there is also an effect which is dependent on how the fallow is established. Fallows sown with meadow mixtures or other herb-rich mixtures generally seem to have a greater positive effect on biodiversity than fallows sown with just grass or grass-clover mixtures (Alanen et al. 2011). Mowing may also have a certain positive on the ecological values of the fallow. Furthermore, it seems that sowing with wild varieties has a greater positive effect than sowing with similar commercial varieties. This applies, for example, to the occurrence of parasites and predators for the biological control of pests. Many plants that benefit from biodiversity are annual or biennial and have a poor capacity for competition, which means that it can be advantageous to sow them in patches (without competition from other species), even if this means more work in the establishment of the fallow (Tscharntke et al. 2011).

During the period when fallows were obligatory, they were an important feature of the landscape since they cover larger areas than many of the other measures and have a clearly positive effect on biodiversity. It is therefore important that the payment levels for different types of fallows are high enough so that the degree of involvement brings about an increased level of fallow diversity, etc. It is also important that there are different types of fallows (different species have different vegetation structure requirements), that the sowing of, for example, meadow mixtures is stimulated and that certain management and disturbance practises (i.e., the harrowing of parts of fields and mowing late in the season) are included in such payment systems. Fallows are probably one of the few measures that can be expected to have major positive effects in plain districts dominated by arable

fields. For example, fallows have been shown to have greater positive effects in plain districts than in heterogeneous landscapes such as forest and central districts (Wretenberg et al. 2010, Tscharntke et al. 2011).

Payment systems (maybe with an obligatory fallow element) that promote the establishment and management of fallows should, therefore, from the point of view of biodiversity, be a central part of future agri-environmental payments systems. It seems that there are positive effects with fallows and other "non-farming" environments, at levels up to 20 % of the landscape (Tscharntke et al. 2011).

Heterogeneity - unfarmed land and crops

Generally, the heterogeneity of a habitat is something that promotes a variety of species (Benton et al. 2003), and many species in the agricultural landscape are dependent on a combination on unfarmed land (i.e., non-arable outcrops, ditches, forest edges, farmyard environments, border zones, etc.) and fields with vegetation of a certain type, see, for example, Pärt and Söderström (1999), Berg (2008). There may be a lack of less intensively farmed crops (i.e. fallows, cultivated grasslands) in intensively cultivated plain districts, but also, a lack of cereal fields in landscapes dominated by cultivated grassland and fallows (Wrenberg et al. 2010). Studies of vascular plants, carabides and birds in low-intensity arable land in Spain (Guerrero et al. 2010) showed that these three organism groups were affected by different factors, but that the intensity (the density of the crops and the amount of nutrients) and the diversity of the crops were important factors. The variety of species of weeds was negatively affected by the crop's density and the size of the field. The variety of species of carabides was affected positively by, inter alia, the crop diversity in the surrounding area. For birds, the variety of species was positively correlated to the size of the field but negatively correlated to the crop's density.

Agri-environmental payments for certain measures therefore have greater possibilities of having effect in "the right type of landscape". Furthermore, payments to promote crop diversity (see also Vepsäläinen et al. 2010) and the occurrence of areas with low and high vegetation during different parts of the year have the potential to benefit many species found on arable land.

Connections between biodiversity and ecosystem services?

The majority of agri-environmental payments are not designed to provide ecosystem services. Furthermore, there are only a few studies that clarify the extent to which ecosystem services are affected by agri-environmental payments created for the improvement of biodiversity (Whittingham 2011). Power and Stout (2011) showed that higher diversity and density of plant species affected the occurrence of pollinators. Other studies have shown that an increased diversity can lead to improved biological control of pests (with the help of beetles and birds) in organic farming (Winqvist et al. 2011), even if this effect is only found in heterogeneous landscapes. The same study showed, in contrast to this, that the diversity of birds and vascular plants benefits from organic farming, regardless of whether the landscape was homogeneous or heterogeneous. The variety of species of beetles was however not affected by whether the farming was conventional or organic, but there was a higher density of beetles in homogeneous landscapes (fewer common species dominated).

Geiger et al. (2010), in a study of the effects of agricultural intensity in eight European countries, showed that the proportion of land that received agri-environmental payments (it is not specified which) had a positive effect on the predation of aphids through natural enemies. The amount of insecticides had the opposite effect however, i.e. it was negatively correlated to the natural predation of aphids.

Effects of conservation tillage

Intensive tillage of the soil (ploughing, harrowing, sowing, rolling) is thought to reduce the diversity of the soil's fauna, increase the risk of nutrient leaching and reduce the areas of stubble fields. The latter can improve food access for, inter alia, birds outside of the growing season (Stoate et al. 2001, Butler et al. 2007). Conservation tillage (CT; surface cultivation, direct sowing, etc.) is widespread in USA, South America and South Africa, but, with certain exceptions, less common in Europe. A compilation of literature regarding the environmental impacts of CT (Holland 2004) highlighted its positive effects on soil structure, drainage and water retention capacity, a rich soil fauna and increased access to weeds and food for insects, birds and mammals. It stated however that few studies have been conducted in Europe. The effects were not clear, as far as nutrient leaching, its significance for biodiversity and other factors are concerned. Factors that seem to increase the area with CT are expensive machines, an increased amount of weeds and uncertainty with regard to yield (major variation). Further evaluations of effects in other areas are required before "Conservation tillage" can be adopted for agri-environmental systems, at least on a comprehensive basis.

Factors that influence plant nutrient leaching

The reduced number of wetlands and the drainage of the agricultural landscape has had a negative effect on biodiversity, at the same time as the increased usage of chemicals in farming has increased the risk for the transportation of nutrients and pesticides (pesticides) into the major water courses (Dalton and Bran-Hardy 2003). Extensification and the increased planning of the time points for soil tilling, the establishment of border zones alongside water courses and small wetland, and the use of catch crops can help to reduce the leaching of nutrients and pesticides into water courses and seas. At the same time, these things can have a positive effect on biodiversity (Bradbury and Kirby 2006). Pools of water and embankments are beneficial to many insects. They are also important places for many birds to search for food. The same applies to adjacent land with damp soil and short vegetation (i.e. flooded land) and to open ditches. Agri-environmental payments that reduce the leaching of nutrients and pesticides in the vast majority of cases also benefit the biodiversity that is linked to wetlands and damp areas.

An investigation of the leaching of nitrogen and phosphorus in Switzerland (Herzog 2008) showed that implemented measures could reduce leaching, but that the goals set were not really achieved (phosphorus leaching reduced by 10-30 % instead of by the goal of 50 %, whilst nitrogen leaching reduced by 18 % instead of the goal of 33 %). The study concerned obligatory measures, "cross compliance", including the reduced usage of fertiliser and the increased usage of fodder which was less rich in nutrients. The limited effect was due, inter alia, to the differences between the different types of agriculture, where livestock-based farms had greater problems in achieving the targets than the arable-based farms did.

Simulations based on the flow of nutrients from test farms in Germany and Holland (Rotz et al. 2005) suggest that catch crops, improved storage options for fertiliser, and injections of fertiliser into the soil instead of spreading it on the surface, are measures that would reduce nitrogen leaching substantially. However, the measures are considered to be costly, so political means of control would be required, i.e. special payments to farmers who implemented them.

Ulén et al. (2010) found that spring ploughing and surface cultivation of sloping land can reduce the transportation of particles by 90 % in erosion-sensitive soils (Sweden?). In a similar way, direct sowing without cultivation can reduce the transportation of particles by 80 % in clayey soils. Such methods commonly reduce the transportation of phosphorus by 10 - 80 %. These methods are used extensively in Norway, where less than half on the arable area is ploughed in the autumn. The disadvantage with these methods is that the transportation of soluble phosphorus can increase, that the yield can reduce, that the amount of weeds can increase, as can the risk of the spread of diseases. One conclusion from the study is that the choice of method must be adapted to the soil, precipitation, topography, etc. and that both positive and negative aspects must be considered. Silgram et al. (2010) showed that a great deal of surface leaching of sediment, phosphorus and nitrogen on arable land occurred via wheel tracks used when driving to spray crops, etc. Measures to stop the flow into wheel tracks, i.e., ground harrowing, reduced the leaching substantially. Such measures are proposed to be included in targeted payments to areas that are particularly sensitive to leaching from arable land into water courses.

On livestock farms (cattle, hens or pigs) with intensive and large-scale production, a surplus of manure is produced, as a rule. This often has a major influence of the surrounding agricultural land, since in it generally spared in the local vicinity of the farm (Sims et al. 2005). A balance between the area of land and the number of animals is desirable, but an accumulated storage of plant nutrients often occurs in the soil, or there is leaching into the surrounding atmosphere and into water courses. Manure is difficult to spread evenly and expensive to store and transport. Payments from authorities for the transportation of manure would help to reduce this problem on the largest farms (Sims et al. 2005). Development and support of alternative uses for manure need to be developed.

Improved management of nutrients, with better plant nutrient planning is stated in several studies as being an important factor in the reduction of nitrogen leaching in the agricultural landscape. Such measures are also positive for biodiversity in the agricultural landscape. Water-dwelling plants and animals benefit from these measures, as do soil-dwelling organisms and species that are dependent on such. Reduced usage of fertiliser can also affect the vegetation structure and other things (which would be positive for species that are dependent on low or sparse vegetation), but these effects are probably marginal as high yields are generally sought after.

Catch crops and evergreen land is often considered to be the most efficient way of limiting nitrogen leaching. However, the effect of these measures on biodiversity has been poorly studied, and there may be a conflict here since dense crops are negative for a number of species in arable land.

Organic farming – biodiversity and nutrient leaching

Summaries of scientific investigations into the effects of organic farming generally show positive effects on biodiversity (Bengtsson et al. 2005, Hole et al. 2005). European studies show that the variety of species is, on average, 30 % higher in organic fields than in conventionally cultivated fields. Not spraying the fields with pesticides is thought to have the greatest positive effect. Other factors associated with organic farming that are positive for biodiversity are: good crop variation at farm level, less dense crops, compared with conventional cultivation (which is of benefit to, inter alia, birds), the use of manure (which is thought to be positive for soil organisms), and the management of small-scale habitats outside of the farmed area. Many organic farms also have relatively small fields with many border zones, which promote biodiversity since many species spread themselves out in the field, starting from the border zones. One important point is that few studies of the effects of organic farming have studied differences in species compilation. It is primarily quite common and widespread species that benefit from the organic farming of arable land. Many rare and red-listed species are linked to other habitats such as semi-natural pastures, wetlands and deciduous forests or older trees. It is still largely unknown whether organic farming has any effect on the biodiversity in these environments.

Several studies have shown that these effects differ between organism groups, depending on the structure of the surrounding landscape (Smith et al. 2006, Gabriel et al. 2010), and that there can be time-lags between effects and the number of years ago that the farm made the transition to organic farming (Jonason et al. 2011), see also the discussions above. A comprehensive European study (Geiger et al. 2010) showed that the negative effects of pesticides on biodiversity were greater than the effects of the field size, the amount of fertiliser and the occurrence of various other landscape elements.

In a similar manner, a study of the breeding success of yellowhammers on arable land in the United Kingdom (Hart et al. 2006) showed that spraying with insecticides had a negative effect on the availability of food for the young (invertebrates). This had negative effects on their growth which resulted in a higher mortality rate. Similar models that predict the scope of the effects at population level could be used for predicting the effects of different measures and agri-environmental payments for various model species.

A comparison (Power and Stout 2011) of interactions between plants and insects on organic and conventional farms showed that the network of vascular plants and pollinators (bees and hoverflies) was larger and more complex on organic farms. The pollination of a selected plant (hawthorn, in hedges) was also better in organic farms than in conventional ones. An important conclusion is that organic farming proffered more flowering plants, which attracted more pollinators and, therefore, improved pollination. The strategic management of flowering plants in border zones and pastures is suggested as being suitable for agri-environmental payments. The sowing of certain flowering plants that are common in organic farming (i.e., clover) is suggested as a measure that would also be of benefit within conventional farming (see also the discussions below). Winqvist et al. (2011) demonstrated, however, that the increased predation of aphids in organic fields only occurred in heterogeneous landscapes and not in homogeneous ones.

This suggests that the opportunities to promote ecosystem services through organic farming are, at least in some cases, dependent on the structure of the surrounding landscape.

The yield is generally 25-65 % lower (depending on the form of production and the region) in organic farms than it is in conventional farms (Kirchmann et al. 2007), which means that larger areas need to be farmed to produce the same production volume. This means that organic farming, as a rule, produces more nutrient leaching per tonne produced than conventional production. This is the case, despite the fact that a compilation of several studies shows that the leaching of nitrates per unit area can be somewhat less in organic farms than in conventional farms (Kirchman and Bergström 2001). In a six year experimental study (Torstensson et al. 2006) of the plant nutrient efficiency of sandy soil, it was found that conventional farming (with cover crops) had less leaching of nitrogen and calcium than organic farming (with or without the addition of manure). The leaching was even less than from conventional farming without cover crops. There was little phosphorus leaching from any of the systems. The use of artificial fertiliser also produced less leaching than green manure. Besides, manure, in combination with cover crops gave higher harvest than the organic farming (on the occasions that the same crops were grown).

In a similar, Swedish study of clayey soils, (Aronsson et al. 2007) no differences were found in the nitrogen leaching between organic fields (with green manure or animal manure) and conventional fields (without cover crops), but the leaching of phosphorus was greatest on the fields where green manure was used. What is more, the harvest was considerably higher in the conventionally cultivated fields, which was thought to show a more effective use of nutrients in conventional farming. Kirchmann et al. (2007) compared conventional and organic farming on previously unfertilised soil in Skåne and found that:

- the yield was higher with conventional farming,
- the occurrence of weeds was higher with organic farming (did not reduce over 18 years),
- the utilisation of nutrients was more effective within conventional farming, and
- there was no difference in nutrient leaching between the two forms of cultivation.

One conclusion it that nutrient leaching is often greater in organic fields than in conventionally cultivated fields.

If nutrient leaching is stated per cultivated area, than the picture is completely different. The organic farms have shown themselves to have significantly lower nitrogen surpluses, which means less risk of eutrophication. The phosphorus surplus per hectare was lower for organic dairy and meat farms, but higher for organic arable farms, compared with conventional farms (Wivstad et al. 2009). One conclusion from this study is that organics farms have fewer negative effects than conventional farms and that organic farms contribute less to eutrophication (at least, as far as nitrogen is concerned). Organic farming should therefore have the greatest positive effect in areas sensitive to eutrophication, whilst conventional farming with greater yields should have the least negative effects in areas that are less sensitive, from the point of view of eutrophication. The results of the compa-

rison between organic and conventional farming therefore depend to a great deal on whether the comparisons are based on yield or area. That which is most relevant depends on the context.

In a compilation of literature, Crews and Peoples (2005) found that nitrogen from artificial fertiliser was absorbed better by crops than nitrogen from green manure, but that green manure leaching was stored in the soil to a greater extent. Admittedly, there was great variation between the various studies. In crops that were watered, the leaching was however greater from artificial fertiliser than from green manure. The authors also believed that, through planning and adjustments to the supply of artificial fertiliser, it would be possible to reduce the negative effects. However, this is carried out to a minor degree since fertiliser is relatively cheap, the risk of crop reductions is considered great when fertilising is reduced, and farmers consider many of the measures to be too awkward. The authors of the compilation propose that the increased usage of perennial crops in the cultivation systems is the factor that is most likely to reduce the negative effects of fertilising in the future, but that more research and development is required.

3.2.6 Riparian strips – effects on biodiversity and nutrient leaching

Riparian strips are established to reduce the leaching of nutrients and pesticides from fields to adjacent water courses. They are considered to reduce the leaching of various substances, but there are no comprehensive scientific studies that illustrate these effects. Extensive systems of riparian strips in certain countries (i.e., Switzerland) have, however, helped to reduce leaching of nitrogen and phosphorus (Herzog 2008).

Investigation of Swedish riparian strips (Halden 2011) suggest that they had little effect on the occurrence of birds on arable land, and that the vegetation structure in the adjacent ditches had greater significance for certain wetland species. One positive effect of the riparian strips was found with butterflies, but it was primarily common species linked with various grasses that benefited. Leaving certain bushes and some reeds when clearing ditches (see also Vepsäläinen et al. 2010), encouraging herb vegetation in the riparian strips and aiming for several different types of vegetation in the riparian strips on landscape level were possible measures suggested for the improvement of biodiversity in riparian strips and adjacent water courses and ditches.

Below, can be found a review of recently published scientific investigations of border zones, in order to illustrate their effect and to identify measures that have the potential to increase their significance for biodiversity.

In a Finnish overview of the effects of agri-environmental payment son birds in the agricultural landscape, (Vepsäläinen et al. 2010) it was shown that field species benefited from grasslands, fallows and open ditches. The border zones benefited instead from small areas of natural vegetation bushes, habitat heterogeneity, and also from ditches. One conclusion regarding the effect of the agri-environmental payments was that the measures that are assessed as having a positive effect were used by too few farmers and only covered small areas. The measure that was assessed as having had the greatest positive effect was the establishment of border zones alongside ditches, but this measure also only covered relatively small areas.

A compilation of literature (23 experimental studies) regarding the effect of unsprayed border zones on invertebrates in border zones and adjacent arable land (Frampton and Dorne 2007) showed that this often, but not always, had a positive effect (i.e., there were variations between species groups where there was a great effect on, for example, heteropterae, but none on carabides). In the majority of the studies that were compiled, it was not possible to differentiate between the effects of pesticides and fertilising, so, since there were no studies that had analysed the effects of insecticides and fungicides, the conclusions only apply to herbicides. What is more, no support was found for the idea that an increase in the invertebrate populations within the border zones also led to an increase in the adjacent fields.

Blake et al. (2011) found that border zones that were dominated by grass (established within the agri-environmental payments system) in the United Kingdom could get increased amounts of flowering plants through sowing, conservation tilling and the limited use of herbicides against grass. A combination of all the measures had the greatest positive effects on the occurrence of both plants and butterflies. The grass border zones that had fewer species limit the leaching of nutrients and pesticides to more sensitive parts of the border zones (i.e., hedges and water courses, Marshall and Moonen 2002), but have a limited value for biodiversity (generalist predators like common spiders and beetles benefit).

One study of methods for increasing the diversity of vascular plants in field bordering intensively managed grasslands (Fritch et al. 2001) showed that the sowing of seed mixtures has a greater positive effect than enclosures and natural succession, i.e., the spontaneous immigration of species. Management of the border zones (grazing or mowing) had less effect, but led to greater grass coverage in fields with insown seed mixtures. A study of the vascular plant flora in border zones established in Finland (Tarmi et al. 2009) showed that the flora's compilation differed a great deal between various regions (connected to the heterogeneity of the landscape and whether the production was dominated by arable cultivation (many weeds), or livestock production (more cultivated grassland plants). The soil's pH and phosphorus content (negative effect on the variety of species) also affected the compilation of the flora, as did its management and the width of the border zone (wider border zones were richer in species).

A study of border zones in USA that were established to promote a species of quail showed that these border zones had no positive effect on harmful insect predators and that they did not restrict the number of pests (Olson and Wäckers 2007). Analyses of the predator insects showed that they had low contents of sugar (important energy source). The sowing of pollen and nectar-rich plants was therefore suggested, in order to promote the predators (that are dependent on this source of energy) and thereby obtain border zones that have several ecological functions. A comparison of beetle fauna in border zones consisting of two different types of grass (tufty and not tufty) and with or without herbs (Woodcock et al. 2008) showed that seed mixtures with tufty grass and herbs had the greater positive effect on the beetle fauna. Predators benefited from the tufty grass and plant-eating beetles benefited from the herbs. The management of the border zones also had an effect on the compilation of the beetle fauna, i.e. it seemed as though harrowing of parts of the border zone benefited the predators. The authors proposed that different seed mixtures should be used, since extensive use of just one seed mixture leads to the homogenisation of the beetle fauna in border zones.

Few studies have been conducted to analyse the effect of the agri-environmental payments on mammals. A study in the United Kingdom regarding the habitat selection of hedgehogs equipped with radio transmitters (Hof and Bright 2010) showed that hedges and managed border zones (receiving agri-environmental payments) were important habitats both within the forest district and on a landscape level. Probable reasons for this may be the protection from predators and good access to food afforded them in these areas.

An important conclusion from these studies is that the sowing of selected seed mixtures (adapted to regional conditions and soil) has the potential to increase the diversity of flowering plants in border zones, which can benefit both pollinators and the predators of pests. Wide border zones are good. In arable cultivation areas, it is important to mow and remove vegetation, in order to reduce the soil's nutrient content and the dominance of tall species. Border zones have different effects on different species groups. Their positive effect (increased number of predators) on adjacent crops is not unequivocal.

Smith et al. (2009) showed that the decomposition of organic debris in border zones that were mown differed from that which was found in zones that had been harrowed. There was an imbalance in the decomposition in the harrowed border zones (faster decomposition in the soil than in the surface) that was not found in the mown border zones.

Smith et al. (2008) showed that soil-dwelling organisms (i.e., worms) were more common in border zones established on arable land than in border zones with natural vegetation succession. Analyses of differences between three seed mixtures and management (mowing, harrowing and spraying) showed that harrowing had negative effects on the soil-dwelling organisms. Furthermore, it was recommended that cultivation be minimised in order to establish a layer of debris that benefits soil-dwelling organisms, but it was also mentioned that this can have negative effects on the diversity of vascular plants and pollinators. One conclusion is that tilling may be needed in order to promote herbs and reduce the dominance of grass, but that may also have negative effects on nutrient leaching, soil-dwelling organisms and decomposition. The type of tilling, its extent and when in the year it is to be carried out are probably highly significant, but this has not been studied in detail.

Davey et al. (2010a) showed, in a comprehensive study, that "Entry Level Stewardship (ELS)"[11] had an extremely limited effect on the bird fauna, after three years. The farmers themselves choose the measures that are to be implemented; management of border zones and hedges are the most common measures (>50% of the payments) whilst measures in crops and fields (unsown patches, stubble fields, bird fields, etc.) were less common. Of the 19 species that are included in a Farmland Bird Index, only the corn bunting and the starling were positively affected by the area of surrounding land (1 km squares) that was included in the ELS and certain species were even negatively affected in analyses at national level. A study of other bird species (Davey et al. 2010b) in the border zones showed that several other species (blue tit, hedge sparrow, greater whitethroat and

11 The dominant agri-environmental payment in England, basic support, for further details see section 3.1.2 page 16. This encompasses approximately 5 million hectares and includes major border zone management elements.

yellowhammer) were found more densely in border zones that were part of the ELS than in other border zones.

More detailed studies in England (Davey et al. 2010c) showed that there were regional variations in how various bird species were affected by the management of hedges, border zones and other measures. For example, certain species were able to benefit from the management of hedges in one region, but were disadvantaged by this in another. The reasons for these regional differences are not known. However, differences in the amount of various habitats in the landscape, differences in the soil, topography and climate can all have contributed to the regional differences. Other factors that can be expected to have influenced the effects of various measures (i.e., the management of hedges) are the quality of the habitat before management commenced or when and how the management is conducted. More detailed studies are needed however in order to clarify the mechanisms behind the regional differences in the effect of various management measures within ELS. One conclusion is that much more extensive measures are needed on arable land (Butler et al. 2007), since many species use this land for searching for food and a combination of measures in border zones and small-scale habitats and in the fields has the largest likelihood of having a positive effect in the population development of many diminishing farmland bird species.

3.2.7 Management of grasslands

In a large-scale investigation that compared flora and butterfly fauna in pasturelands with and without various type of agri-environmental payments (Pihlgren et al. 2009) in Sweden, it was shown that land with particular values had many cultivation-adapted vascular plants (This should not be surprising since this is often something that is assessed for payment eligibility purposes). Surprisingly enough, however, no major positive effects of the agri-environmental payments were found for butterflies. Land not receiving payments was characterised by high tree and bush coverage and by vascular plants typical for wooded land in all geographical areas. Generally, land receiving payments for pastures with specific values in southern Sweden had low and somewhat tufty vegetation with species that benefited from management, but species that benefited from a nutrient rich environment were also not uncommon. The most cultivation-adapted species were found in dry, healthy land with low vegetation. In healthy, damp land with high or tufty vegetation, common and, in this context, less interesting, moisture-adapted species were often growing.

In northern Sweden, test areas that received payments, both grazed and mown areas with general or specific values, had a similar compilation of species. The difference between the payment types was therefore less in northern Sweden than in the south. For butterfly fauna there were only connections between agri-environmental payments and the compilation of the fauna in southern Sweden, but there were no positive effects for land with specific values compared with land with general values (Pihlgren et al. 2009). The three most common types of land (land receiving no payment and pastureland with general or specific values, respectively) showed no clear distinctive features as far as butterfly fauna was concerned, but land receiving payments for specific values seemed to have a lower number of individuals and species. No species displayed high densities in these types of land. One conclusion of this study is that the current management of land

receiving agri-environmental payments is directed at land with high floristic values, but that the management (mostly grazing during the majority of the season, which leads to limited access to flowering plants) does not benefit the variety of species and abundance of butterflies.

Comparisons of the butterfly fauna in meadows and border zones with meadow vegetation in Switzerland (Haaland and Bersier 2011) showed that border zones were richer in both species and individuals than meadows. Both the variety of species and number of individuals were linked to the occurrence to flowering plants. Of the 38 species that occur in the region, 67 & were found in the border zones and 45 % in the meadowls. One probable reason for the lower numbers in the meadows is that the management there is not optimal for butterflies, since the regulations permit several harvests starting in the middle of June and a certain usage of fertiliser. The border zones were probably important habitats for the larvae of several butterfly species and a more considered choice of seed compilation might mean that more species would manage to carry out their whole life cycle within the border zones. It is important to point out that the species compilations in the border zones and the meadows were different and that both habitats are required since they have different species compilations. Negative effects of grazing (the plants do not manage to flower and produce seeds) can bring about changes to the vegetation, but also affect butterflies directly through the larvae and eggs being eaten by the grazing animals (Pöyry et al. 2005).

In a similar manner, several investigations have shown that the variety of species of butterflies can be higher in other habitats than in pasturelands, i.e., in power lanes (Berg et al. in press). Less intensive grazing ought to be beneficial for many insects that are dependent on flowering plants and other plant resources (Söderström et al. 2001, Steffan-Dewnter and Leschke 2003, Sjödin et al. 2008).

Studies of the effect of postponed mowing in meadows in France (Broyer 2011) showed that this resulted in a doubling of the density of passerines during the period 1993 – 2000, as an effect of the postponed mowing (after 15 July) of the 25 % of meadows that received agri-environmental payments. The density of birds was equally high in the areas where mowing was carried out at the normal time. It is possible that the surplus of birds was produced in the areas with postponed mowing, but that meadows mown at the normal time produced very few young and, as such, constituted “ecological traps”. This suggests that postponed mowing can have positive effects.

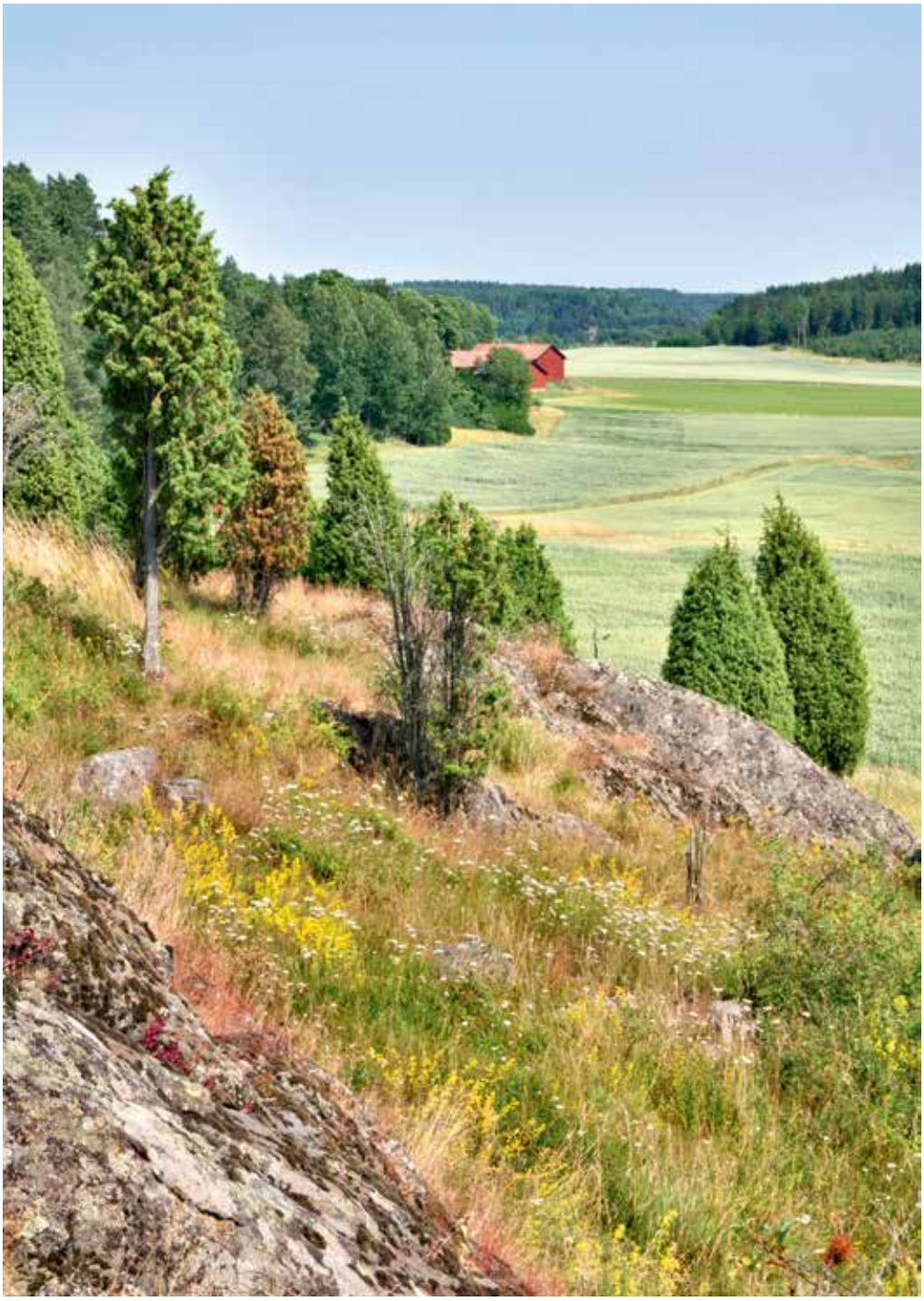


Figure 27. The postponement of mowing or grazing until later in the summer is beneficial for biodiversity. Tystberga, Södermanland, Sweden

Photo: Knut Per Hasund

In contrast to this, a study of mowing in grasslands with agri-environmental payments (Konvincka et al. 2008) showed that modern machine mowing, which is carried out in combination with the removal of bushes, over large areas and during a concentrated period can have major negative consequences for certain species, despite the fact that this management was initially intended to promote biodiversity. In this case it was a butterfly (the clouded yellow) that disappeared from

2,000 hectares of mown grassland in the Carpathian mountains in the Czech Republic during a period of less than 10 years. The reason was that the traditional scythe mowing took place over a drawn out period and that not all of the land was mown annually. Within the agri-environmental system, the regulations state that meadows shall be mown twice a year, and that one of these occasions shall be early in the season, in order to benefit several species of orchids whose distribution has diminished. Furthermore, a higher density cattle was used in the post-mowing grazing of the land than in the traditional mowing. Despite warnings from amateur entomologists, no changes were made to the system and the species has now more or less disappeared from the area.

A study of vascular plants and orthoptera in meadows with different intensity management (mowing frequency and fertilising) in the Italians Alps (Marini et al. 2008) showed that both vascular plants and orthoptera benefited from extensive management (one-off mowing). The orthoptera also benefited from varied vegetation with gaps (that give a good microclimate). The variety of species of orthoptera was disadvantaged by a large proportion of grassland at landscape level, which probably depended on the mortality caused directly by the mowing itself (and probably heightened predation from birds, for example). Border zones that are not mown and sections that are left unharvested were presented as factors that are positive for the variety of species of orthoptera.

Large-scale machine mowing with agri-environmental payments (mowing after 10 July) is also conducted for the benefit of the bird fauna in certain coastal meadow areas in Sweden. Studies (Berg et al. 2002, Berg and Gustafsson 2007) have shown that this leads to a homogeneous vegetation that does not benefit species that want short vegetation (i.e., the lapwing) or species that want very tall vegetation (i.e., the corncrake) and that not all species can benefit from the same management regime. Furthermore, the surrounding landscape and annual variations in water level can have a major effect on the bird fauna (Gustafson and Berg 2006) and there is no one optimal management regime for all coastal meadows.

Studies of the effects of the agri-environmental payments on changes in the populations of farm birds in Switzerland (Birrer et al. 2007) demonstrated only small positive effects on the bird fauna. The most common species increased somewhat whilst the rarer and threatened species continued to decline. The farmers set aside at least 7 % of their area as ecological compensation areas that aimed to promote biodiversity. The most common habitat was extensively managed meadows that were harvested after 15 June, but orchards with hedges, border zones with meadow plants, etc. were also included in the system. The expanse of the compensation areas was considered sufficient to counteract the continuing population decline in the bird fauna, but the low quality of the areas set aside was thought to be the reason why the system did not function as well as it might. The study advocated that work to increase the ecological quality of the areas set aside should be prioritised.

Studies of measures to adapt the management of meadows in Holland to wading birds have shown that these measures (adjustments to the time points for fertilising, mowing and grazing, creation of vegetation mosaics) have had little positive effect (Kleijn et al. 2001, Berendse et al. 2004, Kahlert et al. 2007). One alternative that is proposed by Swagemakers et al. (2009) is that the agri-environmental payments should be used more flexibly by the farmers, i.e., through small-scale

adjustments (without restrictions as to when the measures have to be implemented) to mowing, so that nests and young birds can be saved. Many of the farmers in this study (especially those from farms where operation is more extensive) were skilled in discovering birds whilst mowing and then mowed slowly, to ensure that there was enough time to move the young birds or waited with the mowing until the birds had left the area. An increased collaboration between farmers and the exchange of experiences are also thought to be able to contribute to such methods and can be further developed, often through collaboration with local authorities and experts.

The effects of fertiliser and nutrients also affect biodiversity in pastureland. In a study of nutrient turnover in semi-natural pastures with cattle intended for meat production (Dahlin et al. 2005), it is stated that water and salt blocks should be placed in parts of the pasture that have the lowest biodiversity, and that grazing should happen in large pens during the times of the year when it will have the least negative effect on flora and fauna. In areas where the production of meat is more prioritised, the leaching of nutrients can be reduced by matching high animal density to periods with high pasture growth, and ensuring that the animals do not gather in unsuitable places. The latter implies the planning of where extra feed, access to water, protection and roofing shall be located.

3.2.8 Target-oriented measures and adaptive management - the way forward?

Agri-environmental payments can, on the whole, be of two different types: general measures that are aimed at a large number of farmers who implement limited measures, or more target-oriented measures aimed at fewer farmers who implement more specific and often more comprehensive measures (Uthes et al. 2010). Uthes et al. (2010) compared the effect of target-oriented measures to reduce erosion and nitrogen leaching from grasslands in Germany. Target-oriented measures would have been more cost-effective for erosion-limiting measures and for extensification in grassland management. At programme level, (including, for example, effect on landscape, biodiversity, erosion and nitrogen leaching) the latter had, to the contrary, a negative effect on the cost-efficiency. The conclusion of the study is that target-oriented measures should be implemented if there is only one environmental objective (or a few) or if these environmental objectives are considered as being more important than other environmental objectives.

Several recently conducted studies have proposed routes that may be practicable with regards to the design of future agri-environmental payments for farming (Whittingham 2011). Adaptive management with, for example, surveillance of target organisms and the adaptation of management through iterative processes seems to work. Several studies (Stankey et al. 2005, Bormann 2005, Nicholls et al. 2007, Kenward in press) have shown that surveillance and monitoring of the effects have led to the identification of new management methods and adaptation to regional conditions. One such example is agri-environmental payments to promote the threatened corn bunting in the United Kingdom (Perkins et al. 2001). The populations increased in the areas with adaptive management, whilst they were stable in areas with more general measures and agri-environmental payments. They declined in areas receiving no agri-environmental payments. In areas dominated by the production of cereal crops it was primarily measures that

increased access to food (unharvested fields, management of border zones, postponed spraying of fallows, etc.) that had a positive effect. In regions dominated by farms with livestock and grasslands, the postponed mowing of cultivated grasslands for silage had a positive effect. These measures also had a positive effect on the population on a larger national scale. This demonstrates the positive overall effects of agri-environmental payments to adaptive management for the promotion of the corn bunting in the United Kingdom. Few other studies have been able to demonstrate large-scale effects of one particular agri-environmental payment.

Overall analyses and strategies to promote biodiversity, ecosystem services and sustainable resource usage (Kenward et al. 2011) also showed that adaptive management (with monitoring, feedback and changes in the management) is a strategy that works for the promotion of biodiversity, ecosystem services and sustainable resource usage. In the study, "knowledge leadership" is also identified (a measure of how often higher authorities are consulted) as being important for the promotion of biodiversity and sustainable resource usage. Regulation of systems (with laws and ordinances) was shown to have negative effects on ecosystem services, but positive effects on the preservation of biodiversity. There were no effects dependent on the type of ownership (private or state-owned land) of ecosystem services, resource usage or biodiversity. The prioritising of ecological, social or economic values in the systems studied also influenced how ecosystem services, biodiversity and resource usage were affected. A focus on ecological priorities was positively linked to biodiversity, whilst a focus on economic and social factors was positively linked to resource usage and ecosystem services. If the objective is that the agri-environmental payments shall have positive effects on biodiversity, ecosystem services and sustainable resource usage, then compromise strategies are required that encompass economic, social and ecological factors, since strategies that promote, for example, biodiversity, do not necessarily need to be positive for, for example, ecosystem services.

3.2.9 Discussion and conclusions

The need for data and monitoring

An overall conclusion from the majority of studies is that there is a lack of basic data and monitoring with which to analyse the effects of various measures in the rural development programme; furthermore, there is also no way of monitoring the farming or management measures required to satisfy the conditions for these. It should be obvious in the future that parts of the funding for agri-environmental payments should be used for the monitoring of the effects of the measures in different regions and types of landscapes. This should be an integrated part of every agri-environmental payment. The collection of data should start before the measures are implemented, and this should be done both at locations where measures are and are not being implemented.

Therefore, a well-planned monitoring programme is required with geographically widespread and randomly selected locations from where data can be collected. The best option would be to develop that monitoring that is part of the National Inventory of Landscapes in Sweden (NILS), see, inter alia, Ståhl et al. (2011), so that this includes the effects of biodiversity (selected organism groups), ecosystem services and soil conditions. This should be linked to the respective measures and

agri-environmental payments. This has happened, to a certain extent, in pasture-lands, where inventories of selected species groups are taken (butterflies, bees and vascular plants). Development is ongoing so that it will be possible to connect NILS landscape data to the Swedish Bird Survey. It is also extremely important that investigations of grazing pressure and land maintenance are conducted continuously on the same land, if the reasons for changes in various species groups are to be identified. Environmental surveillance can be considerably developed, especially on arable land and on adjacent unfarmed land (small-scale habitats such as ditches, non-arable outcrops, forest edges, farmyard environments, wetlands, etc.) where data regarding biodiversity is largely missing. The system should also be linked to land usage, soil conditions (including nutrient leaching pesticide usage), and databases of agri-environmental payments or other data of interest with regards to the effect of various measures and payments should be capable of being monitored.

The opportunities for using the comprehensive data that is collected in the form of environmental surveillance data via Artportalen need to be investigated, since large amounts of data regarding less common species and those of specific natural interest are available there. Investigations from other countries suggest that data collected by volunteers can also be useful in long-term environmental surveillance (Silvertown 2009, Sullivan et al. 2009).

Development of usable indices

Since it is impossible, with environmental surveillance, to monitor the development of all factors of interest within the agricultural landscape, the development of several usable indices is therefore clearly important (Purvis et al. 2009). The opportunities to use all-embracing indices such as the AFI (Agricultural Footprint Index), that describe agricultural developments and effects in Sweden, should be further investigated (work is in progress). Such indices are probably most usable for showing general and large-scale changes over time, which can be relevant for the monitoring of environmental objectives and the like. These need to be complemented by more specific indicators. One proposal is to develop and evaluate indicators concerned with land usage, habitat and landscape structure within the NILS programme, and to then investigate how these indicators are connected to the occurrence and development of selected species groups, soil conditions and the quality of natural resources such as water. A combination of an all-embracing index (AFI), a few habitat and landscape structure indicators and indicators concerning several selected species groups and natural resources ought to be able to satisfy many of the demands made of usable environmental surveillance data.

Figure 28. Since the effects of the agri-environmental payments on the agricultural landscape are so complex, usable, comprehensive indices, combined with selected indicators of key factors would be valuable for the evaluation and development of the measures. Mörkö, Södermanland

Photo: Knut Per Hasund

In which landscapes and environments should measures be introduced?

The negative effects of the agricultural leaching of plant nutrients and pesticides, or changes in the cultural landscape are major in intensively farmed plain districts. Measures that reduce these negative or less positive effects are required in these regions. Conversely, there are negative effects associated with the winding up of

agriculture and extensive land utilisation in wooded and central districts. In these areas, measures that stimulate more active agricultural may be required instead. In heterogeneous landscapes with many small-scale habitats and pastureland there are better preconditions for the promotion of biodiversity with agri-environmental payments, since many less common species are dependent of environments other than arable land. In homogeneous, arable-dominated (species-poor) landscapes, many measures can increase the variety of species, but it is probably only widespread and common species that benefit from these measures. However, these measures can be important in the reduction of leaching of nutrients and pesticides, or in the promotion of ecosystem services such as the predation of pests, pollination, decomposition, or other central functions within the landscape.

Semi-natural pastures and wetlands are the environments that have the greatest natural values in the agricultural landscape and many measures and means of control are implemented to preserve and improve the values of these environments (see further discussions below regarding options for change). Forest edges and smaller wooded areas (primarily deciduous) are environments that have high conservation qualities, but for which there are fewer targeted measures and means of control. Means of control to promote complex forest edges (diversity edges) and groves with old trees, bushes and species-rich ground vegetation have major positive potential for biodiversity in heterogeneous landscapes. In homogeneous plain landscapes there are often few environments that are not cultivated. In this kind of landscape, the farmyard is a common environment that can be of major importance to birds (Hiron et al. in prep.), insects and certain types of plants. Support for measures to promote biodiversity and to create "Diversity centres" (with, for example, bird nesting boxes, bee nesting boxes, weed-rich land) would therefore have a major impact in these landscapes.

Measures for arable land are discussed in more detail below, but a general conclusion is that areas with extensive farming are required in plain districts. On the contrary, the more active use of arable land may need to be stimulated in forest and central districts that are dominated by fallows and cultivated grassland.

General or targeted means of control?

The most successful measures based on agri-environmental payments have been specifically targeted at the promotion of individual species with a limited range and well-known ecology. It might also work to implement several such measures target at selected species in, for example, larger pasturelands or landscapes. This should however be carried out together with information, counselling and adjustments to local conditions, through collaboration with farmers. Clear objectives and prioritisation are important for the successful implementation of measures. If there are many values in an area or landscape, or if they are more diffuse, and the planning of different measures cannot be conducted at landscape level, then it is probably more effective to implement broader, general measures that are believed to be positive for biodiversity, natural resources or other values, even if there are sometimes conflicts between the different values (see below).

Effects at landscape level and differences between organism groups

The majority of scientific studies have demonstrated that the structure of the surrounding landscape (i.e., the forest-field relationship, or the occurrence of

valuable environments such as pastureland) at landscape level, has a major effect on biodiversity at local level (i.e., at farm level). Several studies have, inter alia, shown that the effect of agri-environmental payments at farm level is greater if there is a high proportion of land receiving agri-environmental payments in the surrounding landscape.

This presents possibilities to introduce agri-environmental payments that promote collaboration on a landscape level. Farmers could be extra rewarded if, for example, they collaborate with other farmers in the district regarding the management of pastureland (Lindborg et al. 2008). Pastureland in landscapes where there is also similar land has better preconditions for the preservation of viable individual species than isolated pastureland does. The land should also be managed in different ways, depending on local conditions and the status of the landscape. In this way, different stages of succession and disturbance regimes are promoted, which leads to improved heterogeneity at landscape level and better opportunities for the preservation of species with different habitat requirements. It should be clear what the objective of the management of an individual piece of land is, and how this ties in with the management of the surrounding land. In many cases this is made easier if information and counselling increase at the same time as the collaboration of the farmers in a particular district improves.

One practical example is the management of larger coastal meadow areas in Sweden, near lakes where there are occurrences of species of birds that have differing requirements in terms of management and height of vegetation. Large-scale machine mowing can benefit species that want intermediate vegetation height (i.e., curlew). Species that need low vegetation (lapwing) avoid these areas and need areas that have been grazed short and that have short, sparse vegetation. Both species avoid forest edges and close proximity to individual trees. They prefer open landscape, so mowing and grazing can therefore be successfully concentrated on open sections of the coastal meadows. The corncrake and many passerines are attracted by tall vegetation and the presence of bushes (overgrown land). Extensive management can successfully be carried out in border zones along forest edges that are avoided by curlews, lapwings and many other ground-nesting species. This can, for example, be conducted through mowing every couple of years or so and by leaving s certain amount of bush vegetation. The implementation of such planning at landscape level, with specific objectives and measures, has a very good chance of producing positive results. However, it requires collaboration between farmers, planning and counselling, which should be prioritised in the means of control systems. More concrete idea and proposals concerning the collaborations and the landscapes can be found in the report's discussion and synthesis section, chapter 4.

Figure 29. Many farmers prefer agri-environmental payments that give the freedom to choose when, how and which management measures are to be implemented. The Cévennes, France
Photo: Knut Per Hasund

Greater freedom leads to more variation and heterogeneity?

The vast majority of farmers prefer systems and commitments that are flexible as far as the measures that are to be implemented, the location and size of the area involved, and the length of the agreement (see section 3.3).

One advantage with flexible means of control systems is that it is probable that the management will be similar to that historically practised on the land in question, inter alia, because tradition often has a major effect on how farmers manage, for example, semi-natural pastures. This can be positive for the species that have adapted to this. It is also possible that greater flexibility can lead to greater variation at landscape level, which can be positive for the promotion of species with different requirements, but the disadvantage is that the measures are not always implemented in the best possible locations. In the majority of landscapes, the advantages of this somewhat more flexible system outweigh the disadvantages associated with a strict system with detailed requirements and control mechanisms. Agri-environmental payments should not regulate measures, but by being more results-oriented, they have better preconditions for encouraging greater involvement and cost-efficiency, since the farmers can adjust their management to variations of place and time. It is then particularly important that evaluations are carried out, to see what happens when the more flexible system is introduced.

One possibility is to introduce more flexible systems into the "everyday landscape", but systems with planning at landscape level (as were presented above) in prioritised landscapes with specific values, or in areas where the farmers want to collaborate.

Conflicts between biodiversity and the protection of important natural resources?

The need for short and sparse vegetation on arable land

Several investigations have shown that, for example, many birds and insects in the agricultural landscape are dependent on areas with short, sparse vegetation. This is put forward as one of the restrictive factors in areas dominated by dense crops and

uncultivated land (Wilson et al. 2005). Measures on arable land are generally considered to be lacking, in relation to measures on uncultivated land (Butler et al. 2009). Several bird species living in arable land and grassland need areas with short vegetation so they can search for food; this applies to, for example, skylarks, lapwings, wheatears, wagtails, starlings, ortolan buntings, etc. On arable land, unsown or uncultivated patches or land can give good results, but cultivation must then be conducted during periods when the birds do not breed. Such measures also benefit short-lived and short-grown vascular plants and certain insects. Skylark plots are an example of measures introduced to make searching for food on the ground easier. They are created by the farmer leaving certain patches of fields unsown (by turning off the sowing machine for a few metres). However, these measures are conducted in small areas (often < 1 %) of the fields and do not always seem to have a positive effect (i.e., on Swedish organic farms). It is probably due to the area of skylark patches being small and that the crops may have areas of sparse vegetation with gaps anyway. Tilling (or mowing) of border zones is an alternative for the creation of short vegetation, but the increased risk of plant nutrient leaching and the negative effect on any nests of ground-dwelling birds must be taken into account.

Measures that create larger areas where it is possible to search for food, and that have a limited negative effect on nutrient leaching should be prioritised in future agri-environmental payments schemes. Examples of such are the planning of where unsown patches should be located and how they are to be cultivated. Since the obligatory requirement for fallow at farm level disappeared, there are now all the more areas that lack short, sparse vegetation. The establishment of fallows is probably the measure that can be expected to have the greatest positive effect, but this requires high payments levels (or an obligatory proportion of fallow), the use of suitable seed mixtures and a certain amount of management of the fallows (to prevent succession towards tall and dense vegetation).

The need for flowering plants - the creation of "butterfly borders"

A number of investigations have shown that butterflies and other insects (i.e. predators of pests and pollinators) are dependent on flowering plants. There is currently a shortage of flowering plants in arable land, and also in the majority of pastureland that is grazed continually throughout the season. In arable land, "butterfly borders" can be created through the sowing of flowering plants in border zones and riparian strips. One problem can be that herb-rich borders require continual disturbance of the soil, so that grass vegetation does not become completely dominant. The measures should be carried out at suitable points in time and adapted depending on the soil's sensitivity to nutrient leaching. Different seed mixtures ought to be usable, but there are question marks over the extent of the negative effects caused by the sowing of nitrogen-fixing plants (i.e., clover) in border zones. The encouragement of flowering plants in border zones and riparian strips through future agri-environmental payment systems has a great potential to increase the effect of these payments on biodiversity.

Flower-rich border zones can also be created in verges and other border zones that have more varied soil conditions and lower nutrient content, which can help reduce the fragmentation of the landscape. There should also be room for management techniques designed to benefit herb-rich vegetation (late mowing or

trimming) within the agri-environmental payments systems. These should incorporate the whole landscape.

Organic farming

Many investigations have shown that pesticides still have major negative effects on biodiversity in the agricultural landscape (see, for example, Geiger et al. 2010). There are also studies that show that organics farming benefits biodiversity in many cases, at least in arable land (Bengtsson et al. 2005). Furthermore, organic farming also has an influence on the surrounding landscape. The effect seems to often be greatest in intensively farmed landscape. The species that benefit are often quite common in arable land, which can have a positive effect on various ecosystem services. There is a conflict between plant nutrient leaching and biodiversity, since organic farming produces greater leaching of nutrients if the calculations are based on yield. The leaching per unit area is generally less than that produced by conventional farming, so the localisation of organic farming to eutrophication-sensitive landscapes should therefore be prioritised.

From the point of view of agri-environmental payments, it is uncertain how great the effects of transition from conventional to organic farming are, since many farmers who convert to organic farming were operation a less intensive form of agriculture even before they converted. It is also probable that they would continue to operate with methods similar to organic farming even without these subsidies, which would mean that the means of control has major "deadweight losses". Few farmers that operative intensive crop production in plain districts have converted to organic farming. It is in these landscapes that we can expect to see the greatest positive effects of organic farming.

If the term "organic" is to be widened, then environments other than arable land should also be included with the term. Increased efforts to manage and preserve species-rich environments such as, for example, pasturelands, land with large deciduous trees and wetlands, or to manage and promote biodiversity in farmyard environments should be suitable for making organic production even more "organic". Changes in the agri-environmental payments would help to make organic farming more positive, in terms of biodiversity. Purely from a practical point of view, this can be brought about by making support available for individual measures (i.e., refraining from pesticides, managing pasturelands in a certain way, undertaking biodiversity measures in the farmyard environment), even of not all the requirements for an organic farm are satisfied.

How can the management of grassland be improved?

A number of investigations have shown that the current maintenance of semi-natural pastures is not optimal for biodiversity. Less intensive grazing would be beneficial for many insects that are dependent on flowering plants and other resources linked to a well-developed field parcel. Certain birds also prefer pastureland with higher vegetation and bushes. It should therefore be possible to manage pasturelands less intensively in order to benefit the insect fauna and other species groups linked to a well-developed field parcel and bush vegetation. One proposal is to establish "butterfly pastures" in certain pastures (or parts of larger pastures) where grazing starts late in the season, in order to benefit the insect fauna. Payments should be paid for lost grazing resources, work involved with the

planning of grazing operations, the moving of grazing animals during the season and other added costs. It should therefore be available as a supplement to pastureland measures.

In pasturelands and cultivated grasslands there is also a need for areas with short vegetation, in which birds can search for food (i.e., wheatears, skylarks, starlings) and for insects connected with disturbed soil (i.e., certain bees and beetles) that require more intensive grazing and/or mowing. It is important that heterogeneity in management and vegetation is created both within pastureland and at landscape level, if viable populations of species with different requirements are to coexist in in the same landscape. For the greatest possible positive effect to be achieved, this requires planning of the management of the grassland at farm and landscape level.

3.3 The relationship between farmers and agri-environmental payments

This part of the report contains a brief overview of agri-environmental payments and their relationship with farmers, followed by a number of example studies of attitudes to agri-environmental payments reported in a little more detail. After this there is a summarising and discursive section regarding the information that farmers receive about the agri-environmental payments, why they do/do not get involved, what they think about the payment system and what will happen when the payment period is over. The chapter is concluded with a short summary with implications for the development of successful agri-environmental payments in the next programme period.

3.3.1 Preliminary remarks regarding agri-environmental payments and farmers

The opportunities presented by agri-environmental payments for the creation of sustainable, positive changes to attitude, with regards to nature and environment-related issues, is questioned by studies conducted in several European countries; Austria (Schmitzberger et al. 2005), Finland (Herzon and Mikk 2007), the Republic of Ireland (Aughney and Gormally 2002), Switzerland (Schenk et al. 2007), Holland (Kleijn et al. 2004) and the United Kingdom (Macdonald and Johnson 2000). It is not, therefore, certain that the agri-environmental payments have a positive effect on fundamental attitudes to nature and the environment. Those who had a positive attitude to nature and the environment operated their farm in a more nature and environmentally-friendly manner even before they received payments, and the payments were viewed therefore more as a bonus. Those who got involved with the payment scheme in order to make money will probably return to the situation they had before the payments were introduced, should the financing disappear.

It should be pointed out, however, that there are studies that show that agri-environmental payments can alter the focus of farmers, from seeing environmental and nature issues as purely economic issues to seeing them as things that are valuable in their own right and things that should be safeguarded (Bager and Proost, 1997: Fish et al. 2003; Morris 2004). This may be assumed to apply for specific payments and for certain individuals and should not be generalised more than this, according to Burton and Paragahawewa (2011). Burton and Paraga-

hawewa (2011) go as far as to write that ”the evidence from both the northern and southern hemispheres suggests that voluntary agri-environmental payments failed to change the prevalent farming culture’s view of nature and the environment, or to put it less mildly, the payments failed to prevent the negative environmental impact of farming and the loss of species”. Furthermore, Deci et al. (1999) write that, even if agri-environmental payments can control human behaviour, the main negative effect of the payments is that they prevent “self-regulation”. This means that agri-environmental payments, rather than reinforcing positive attitudes to nature and conservation, maybe actually prevent attitude changes (Burton and Paragahawewa 2011).

3.3.2 Example studies

Below are presented a number of studies regarding the relationships of farmers to agri-environmental payments, in a little more detail. These studies contain information regarding how farmers have related to the payments systems in both thoughts, words and deeds. The studies have been obtained from Europe: Denmark, Switzerland, Holland, the United Kingdom and Germany.

Denmark

In Denmark, there have been agri-environmental payments for the establishment of spray-free border zones for more than 10 years. The goal of the Danish State was that there should be 25,000 hectares of these zones, but, in 2006, there was only 9,000 hectares. The effect that was to be achieved, to reduce the leaching of pesticides and plant nutrients was, naturally, not achieved, since so few implemented the measures. What is the view in Denmark regarding why the goal was not achieved? One of the reasons is thought to be that the preconditions for farming had changed, i.e., the price of cereal had increased, supplements had become more expensive, and the negative effects of pests had increased. The combined effect of all this has meant that the losses incurred by not using supplements have not been compensated by the agri-environmental payments. Put another way, the farming situation that was prevalent when the payments were designed had changed substantially, and, therefore, the payments were not appropriate. Over and above this practical argument for why the farmers did not subscribe to the scheme, there is, amongst farmers, a pride in well-managed fields that is more important than any agri-environmental payments that they might receive. Furthermore, the payments prevent the farmer from farming his own land in his own way (Christensen et al. 2011).

Those two examples show that farmers see the cost of involvement as being too high. The cost, therefore, is not necessarily just measured in monetary terms; it could also be that there is a “cost” associated with land within the farm that the farmer is embarrassed about, or that they feel restricted and that they cannot farm the land as they wish. How would it be possible then, to reduce the perceived total cost and get the farmers to subscribe to the system? One alternative, which is not politically and economically sustainable, would be to increase the levels of payments substantially. However, since farmers in several studies have shown themselves to be anything but Homo Economicus, higher payment levels do not automatically lead to higher levels of subscription to agri-environmental payment schemes. Another alternative is to get farmers to see the payments as more attractive through making them more flexible and less restrictive. Ruto and Garrod

(2009) stated in their investigation of ten areas within the EU that farmers demanded higher financial compensation for their participation in the payment schemes, with long contract periods and low flexibility. But they also mentioned that farmers are not a homogeneous group and that there is a group of farmers who only require a relatively low level of compensation for their participation, with both long and inflexible payments. There is also another group that will never get involved, regardless of how high the payments are. If one was to generalise, then the farmers would be more willing to be involved in payments schemes with short contract times and high flexibility (have an option to break the contract, choose where the measures are to be implemented, etc.). However, it should be pointed out that, in certain cases, this would disadvantage biodiversity, which requires that initiatives are carried out over a long period, in order for them to have a positive effect. If the payments measures were to be implemented exactly as the farmer wished, there is also a risk that they would be implemented in unproductive parts of the farm where the effect of the measure would be low.

Christensen et al. (2011) let Danish farmers answer a list of questions regarding the payments. Their answers were connected to an economic model with the focus on the simulation of what the farmers required in order for them to accept and subscribe to the agri-environmental payments. One of the results shows that 75 % of the farmers saw the administration of the payments, i.e., their own paperwork, to apply and account for the payments, as an important or very important factor. Approximately 60 % of the farmers considered that how the payments measures affected their own field planning was important or very important, and 75 % were afraid that the voluntary measures would become a legal requirement. It was also interesting that the majority of the farmers answered that they did not consider the agri-environmental payments to be "an easy income". The study showed that the average farmer was prepared to reduce their payments by:

- EUR 43 per hectare per year, in order to have the flexibility to vary the width of their riparian strips,
- EUR 128 per hectare per year, if the contract was only for one year,
- EUR 137 per hectare per year, if they have the option to break the contract once a year,
- EUR 110 per hectare per year, if allowed to use fertiliser in the riparian strip, i.e. simply refrain from the use of pesticides,
- EUR 52 per hectare per year, if they received free advice/help in completing the application documents.

Christensen et al. (2011) believe that their results are promising since they show that it is possible to get the farmers to subscribe to agri-environmental payments without increasing the level of the payments, but through making them more flexible, for example, through allowing withdrawal from the payment scheme before the end of the contractual period. The possibility to withdraw from the contract gives the farmers a "back door", something which is considered to be important for many farmers, but it has been shown that very few actually use this back door, i.e., break their contract. This shows that the possibility of including an option to break the contract is associated with low costs for authorities but also with nature and the environment, since so few actually make use of this option.

Holland

Lokhorst et al. (2010) discuss the importance of informing the farmer or giving feedback regarding how the prevailing type of production or operation on the farm affects nature and the environment. If the information is to influence the behaviour of the farmers, then is must be farm-specific and not general in nature. The information that agriculture is part of the eutrophication problem is difficult for the farmers to relate to, but farm-specific information on leaching at farm level is clear and provides an incentive for change. This information shall also be followed up by advice and tips on how nutrient leaching can be reduced.

In the study by Lokhorts et al. (2010), three groups of farmers were created; one group received targeted information regarding the farm's effect on nature and the environment, another group received the same information but also had to make a public commitment on what they were going to do to improve the farm's effect on nature and the environment, and the third group received no information whatsoever. The farm's effect on nature and the environment was estimated by a group of experts, based on data that the farmers had submitted regarding areas of natural habitat and the number of environmental and conservation measures (either voluntary measures or those receiving agri-environmental payments) used on the farm. The same experts summarised the results of the effects and wrote a farm-specific report on what the farmer could do to improve the situation. The study shows that the farmers who received farm-specific information regarding the farm's situation and also made a "public commitment", were more interested in becoming involved with conservation as soon as one year after the study, had increased their non-payment-related conservation areas and had devoted more time to non-payment-related conservation. The farmers that did not make a "public commitment" but who received information about the farm's effect on nature and the environment also increased their non-payment-related conservation area. Those who did not receive any information or made a public commitment had not made any changes.

Musters et al.'s (2001) study is one of few that analyses the effects that would have occurred if agri-environmental payments were not paid out for the implementation of a measure, but for the results that the farm achieved; i.e., payment for results rather than for action. The success of conservation measures requires that the measure is implemented and that it is done in a suitable manner, both in terms of time and space. Measures that place constraints on the farm's operations have seldom been popular, if ever. One way of bypassing this is to motivate farmers to increase their production of, for example, biodiversity, by getting paid for the increased offspring produced by wading birds (Musters et al.2001) or the occurrence of vascular plants in pasturelands (Wittig et al. 2006). Musters et al.'s (2001) article is called "Breeding birds as a farm product". A key factor in success is to communicate the concept that the production of public goods are of the same value as other production, i.e., that biodiversity is a product just like wheat and milk.

Musters et al.'s (2001) describe the problems with the then prevailing (1995) agri-environmental payment system (postponed mowing), which aimed to promote wading birds, but which at the same time also obstructed the operational freedom of the farmers. The success of the payment is unclear since there was no

surveillance or monitoring of the birds and the measure also became very expensive, as the farm's lost production had to be compensated. What Musters et al. (2001) are investigating is what a system that pays for results (i.e., successful wader breeding) might look like, and the advantages which that type of system might have. These advantages might be that:

- payments are only paid for that which is produced, or that which can be found on the farm,
- there is no obvious restriction of operations,
- that natural and environmental products become additional products of the farm,
- that the farmers can develop their own strategies for how best to produce these products,
- that conservationists, environmentalists and farmers will work together, and
- that the farmers will focus on the promotion of less common species, since these would give higher payments than common species.

Musters et al.'s (2001) experiment showed that the breeding success was higher on farms that were paid per brood of waders (lapwings, black-tailed godwit and common redshank) than on those that were not paid. The farmers were actively involved in finding nests and reporting them. These reports then led to visits from the authorities (in this case, the research team) who verified whether it was a nest and that the right species had been reported. The study showed more successful breeding that with previous payment systems. Furthermore, this system was cheaper for the authority, at EUR 40 per brood, compared with between EUR 100-400 per brood which the previous system had cost. Another plus with the system was that the farmers were involved both in finding the birds and ensuring that their breeding was successful.

Switzerland

It is important to remember that, in certain cases, we can talk about farmers generally and assume that they have similar attitudes to certain overall issues and developments, whilst in more specific cases, the group should be split up into, for example, livestock farmers and arable farmers. These sub-groups probably have different views and attitudes on many issues and, what is more, see some issues as more important than others. Our daily attitude (practical attitude) is the one that we instinctively have in our daily lives. If there are no changes to the attitude, then the farmer has no reason to alter his actions.

Figure 30. Farmers have different views of the functions of agriculture and varying reasons for subscribing to the agri-environmental payments. Small-scale scythe mowing, Switzerland

Photo: Urban Emanuelsson

In Schneider et al.'s (2010) study, it is mentioned that soil erosion in Swiss farms was, naturally, seen as negative, but that it did not lead to involvement in agri-environmental payment schemes (changed behaviour). Erosion was just one of many problems that the farm has to deal with and, since erosion was considered natural, the attitude amongst the farmers was that there was not so much that could be done about it. If the farmers do not see themselves as a part of the problem, then they have no reason to change their behaviour; the attitude is that the soil runs off, but that its does that irrespective of my actions, or that the soil always runs off if it is farmed, but that is outside of my control.

Farming has for a long time been focused on the production of ever-increasing harvests and has, in so doing, created a farming identity where effective production is central. During the last 30 years, the price of this efficiency, in the form of harm to nature and the environment, has increased, and the harm has become all the more obvious. This leads to the previous farming ideal being questioned and, accordingly, the identity of the farmers. This means that the farmers see themselves all the more (or are seen by others) as scapegoats for environmental problems such as eutrophication and erosion. The farmers are, naturally, involved in the problem but are not solely responsible either for their existence or for finding solutions to them.

Plough-free farming would reduce erosion but this would introduce other problems, such as increased slug damage to crops and slower crop germination. According to those who are positive to plough-free farming, these problems can be solved, whilst those who are negative to such ideas cannot see past the problems. In addition to these agronomic problems, many considered that fields where plough-free farming was employed looked untidy and badly tilled. Further-

more, several of the farmers considered that ploughing was one of the most important and traditional activities that a farmer can conduct, so stopping ploughing would be a very difficult decision to take. To this it should be added that farms have ploughs, but machines for plough-free farming or the service itself must be purchased by the farm. This leads to the farmers losing part of the power they have over their own farm. This means therefore that plough-free farming leads to the farmers having to revalue farming as a concept (i.e., the picture of that which is "real farming"), how practically the farming should be carried out (i.e., crop rotation), and experiences (old knowledge can no longer be applied in this new system) (Schneider et al. 2010).

England

Wilson and Hart (2001) compared an Environmentally Sensitive Area (ESA) with one receiving Countryside Stewardship (CS) payments.

ESA payments focus on preserving structures and this means only limited changes to farming, which makes few demands for changes of attitudes. This leads to this support mostly attracting farmers who subscribe but who do not particularly care a great deal about the measures (passive adopters). ESA applies for the whole farm, i e., the whole farm has to be adjusted to the requirements of the payment.

The CS payments focus instead on protecting "good" habitats and improving the landscape. This often requires major changes to operational practises on the farm and, as such, encourages a rethinking of ideas concerned with the environment and conservation which, in the long-term can change attitudes in these areas. Subscription to this payments requires participation both in the form of operational changes but also a desire to change and to apply these new ideas (active adopters). CS applies only to those areas for which the farmers have applied to be included within the payments scheme.

Where the payments apply to the whole farm, it can be seen that it is more difficult for large farms to subscribe, since it can require a large number of small changes to large areas, whilst on the smaller farms, relatively few changes need to be made.

Table 3. Why did the farmers subscribe? Reasons given by farmers in England for subscribing to the Environmentally Sensitive Area (ESA) and Countryside Stewardship (CS) programmes.

Reason for subscribing	ESA (%)	CS (%)
Economic reasons	87	65
Fitted in with the operation	83	74
No operational changes required	67	41
Provides a guaranteed income	63	46
Wanted to promote nature and the environment	23	66
Encouraged by officials to apply	17	9
Participated in previous payment schemes	11	3
Neighbouring farms were involved	10	9
Reduced activity in farming	3	6

* The farmers were permitted to give several answers, so the total exceeds 100 %.
Source: Wilson and Hart (2001)

Of those not involved with the ESA programme, 21 % said that they had not received sufficient information with which to make an informed decision.

The study divided up the subscribers into two types and the non-subscribers into two further groups, based on the reasons they gave for their involvement/non-involvement in the agri-environmental payments systems (see Table 4).

Table 4. Categories of farmers based on reasons given for their subscription to the Environmentally
Sensitive Area (ESA) and Countryside Stewardship (CS) programmes in England

Subscribed		Non-subscribed	
Active adopters	Passive adopters	Conditional non-adopters	Resistant non-adopters
I have always been interested in the environment I have never relied completely on my income from farming anyway, so the payments fit into my philosophy quite well. (CS)	I subscribed to the payments in order to get some money for a piece of land that did not produce anything anyway. It helped to pay for putting up fences and looking after the hedges. It provided a little extra cash which was really needed... (CS)	I looked at the payments but did not think that it fitted it with the current operation of the farm. I could imagine getting involved in the future, if the conditions are right. (ESA)	I am interested in managing a park; money is far too important. I want two options where there was previously only one, more production. They did not use commercial fertiliser on the farm before we took it over, they were slow on the uptake. I do not want to see my investments go backwards. (ESA)

Source: Wilson and Hart (2001)

In Wilson and Hart's study, the farmers stated how their involvement in the payment scheme affected them and how they reacted when the payment period came to an end (See Table 5).

Table 5. How subscription to the Environmentally Sensitive Area (ESA) and Countryside Stewardship (CS) programmes in England affected the farmers

	ESA farmers who said yes (%)	CS farmers who said yes (%)
The payment changed attitudes to farming	23	31
I learnt new things	10	31
Will subscribe again when the payment period is over	61	77
Will continue with the measures, even after the payments cease	45	57

Source: Wilson and Hart (2001)

The ability of officials to inform and inspire was important for whether or not the farmers subscribed. If key farmers, large areas or important figures within local farming can be persuaded to get involved through the provision of personal information and inspirational meetings, then this can lead to a high level of subscription later in the period (Wilson and Hart 2001).

The farmers in Wilson and Hart's study (2001) expressed their surprise over how little the officials knew about farming and ecology. Furthermore, many thought

that ESA was so easy to get involved with that it should not be called an agri-environmental payment; it was more of a form of production support. This "dishonesty" was not viewed kindly. The farmers also felt, even after they had subscribed to the payments, that there was no feedback or flow of information, either regarding the progress being made, in terms of nature and the environment or with regards to how the farmers could develop their measures. If this feedback had been available and a flow of information established, this would have led to the farmers being proud over their conservation and environmental efforts.

In the area where this specific CS was in operation, a non-profit organisation was involved and an official from this organisation made contact with the farmers who subscribed to the payments scheme. This official took the time to explain why it was important to preserve a certain species or function and also how this could be achieved in conjunction with the operation of the farm. The farmers commented that this direct contact and connection to their own farm was important for increasing their own interests in nature and the environment. Furthermore, the non-profit organisation produced a written document, once a quarter, with information about how certain habitats should be managed and interviews with farmers who were involved in the payments scheme. The farmers saw this document as a very good way of learning more about the measures and maintaining their interest in them. Now that their interested had been aroused, the farmers also wanted to know if their own operations were having any effect. Accordingly, they requested monitoring and evaluation of the natural and environmental effects.

Future agri-environmental payments should include improved monitoring and information. By doing this, the society shows that it cares about whether or not the funds invested have any effect. It also provides a follow-up to the farmer and it is better for nature and the environment, thanks to the changes made in the operation of the farm. Within the framework of the agri-environmental payments, there should be a programme of education through which the farmers can learn more about agricultural practises, including preconditions for and threats to nature and the environment, within the agricultural landscape. In the long-term, this can change the attitudes of farmers to the relationship between farming, nature and the environment. Different agri-environmental programmes have different opportunities to create long-term changes of attitudes to the benefit of nature and the environment, and this knowledge should be included in the future development of payment systems.

Germany

In Baden-Würtenberg in southwest Germany, a payment system has been implemented for grasslands; pasturelands and meadows, that implies that the farmers carry out an inventory of their land and, should they find a certain number of species, then the land is entitled to compensation payments. Before the inventories are taken, the farmer receives training in order to be able to recognise certain species. This type of payment system shows that the land has at least some of the indicator species. This is also appreciated by the farmers and they can manage their land as they wish. It is, accordingly, their decision that counts and they receive payments as long as the indicator species to not decrease in number.

If the farmers are to take an inventory, they have to be trained, but, above all else, the indicator species chosen must be fairly common and easy to recognise. In the

study by Wittig et al. (2006), the farmers received a brochure with information on the indicator species and then groups of farmers were trained in species identification and how they were to conduct their inventory-taking.

In Sweden, pasturelands and mown land are divided up into two categories, with basic payments for land that has general values and higher payments for land that has specific values. The conservation value of the land with general values is not known, but all land with specific values is subject to field visits. A location-specific action plan is drawn up for these, which means that they values that exist are known and the management requirements that will encourage these species in included in the management plans.

The indicator species that have been chosen in Baden-Würtenberg reflect well the variety of species of vascular plants in the land. The study showed that it would actually have worked with fewer indicator species, but many indicator species were used, in order to give the farmers a better chance of finding them. In order to receive payments, the farmers have to find four indicator species per segment. The pastureland was inventories in a total of two transects and each transect was divided up into three segments. The farmers managed well with the inventory of the plants, i.e., the located the correct species and did not attempt to mention species that they had not found.

3.3.3 Key factors for a high level of subscription to agri-environmental payments that are of great benefit to the environment and farmers alike

Information

Different farms have, naturally, different preconditions for the implementation of various measures for promoting natural values and reducing environmental loads. An intensive cereal-producing farm and an intensive dairy farm have, in many way, different problems and opportunities as far as environmental loads are concerned, but also different preconditions for promoting natural values. This should be borne in mind when we design agri-environmental payments. ”I do not apply for agri-environmental payments because I have no pasturelands” (Ahnström 2009) is a frequent comment that illustrates that, in Sweden, there is a prevailing view that agri-environmental payments are the same as payments for the management of semi-natural pastures. This fallacy is unfortunate, since the measures that can be conducted in arable land and in its close vicinity are also very important for conservation of nature and the environment. This shows the importance of good, clear information. One way in which this could work would be to use more targeted information. In Sweden, one could imagine that farmers with single-stomached livestock and arable farms would receive different information to farms with ruminants. Alternatively, information could be varied on a regional basis. Furthermore, the information should be produced from a farming perspective - i.e., the various payments for which the farmer can apply - and not based, as it currently the case, on the money that finances the measure (agri-environmental payments and Selected environment).

Barnes et al. (2011) divided up farmers who were involved in the agri-environmental payment schemes into three categories:

- multi-functionalists (those who think that the farms should produce both wheat and benefit the environment),
- resistors (those who do not wish to or who think that regulations are necessary), and
- the apathetic (those who do not care).

Those who create the regulations and payments, naturally, cannot know specifically which farmers are which, but is important that farmers are not considered to be a homogeneous group, in order for the information to be provided in the right manner. This also shows of course that there are different ways of relating to payments and regulations and, with this knowledge, some of the misunderstandings can be avoided.

Since farmers are keen to listen to other farmers and study their successes and failures, an initial, targeted, information and counselling campaign regarding the agri-environmental payments may be successful with certain farmers, especially those with large farming areas. This would be one way to encourage the subscription of large areas and for informed farmers to become prominent figures whose lead can be followed by other farmers. This would help to attract other farmers to subscribe (van der Horst 2011). The agricultural press is respected by farmers and is believed to provide clear, correct information, so this channel should be used to a greater extent (Defrancesco et al. 2008). The farmers who Barnes et al. described as apathetic will not read special literature or state-produced brochures regarding payments, but they probably read the trade press and is may be possible to appeal to these farmers with interest-arousing reports. It is however important that the information is correct. An example of this is that many farmers in Sweden had read about the "60 tree regulation" in pastureland in the agricultural press, but there was no information there regarding the fact that application of the regulation was to be carried out in 0.1 hectare sections, i.e., that the regulation should really have been called the "6 trees in 0.1 hectares" regulation. This led to certain farmers not being approved at control checks, despite the fact that they had cleared large parts of their pastureland (Ahnström et al. 2010).

Figure 31. To initially target information and counselling at farmers who are seen as prominent local figures can be an effective way of promoting subscription to a new agri-environmental payment. Ingadal, Skåne, Sweden

Photo: Knut Per Hasund

Why do the farmers subscribe/not subscribe?

In much literature and in the development of agri-environmental programmes, farmers have been seen largely as the financially rational "Homo Economicus". This implies that it is only economic measures that can change the behaviour of farmers. When the farmers are asked, in various studies, to explain why they participate in the agri-environmental payment schemes, it is often the economic reasons that they mention first, rather than reasons connected with conservation or the environment (Wilson and Hart 2000). The operation of the farm, of which the agri-environmental payments are a part, is based on economy, but also on a number of other factors such as whether it is an old far, whether there is someone who will take over its operation in the future, the price of cereal crops and the costs of supplements, the interest in nature of the farmer and his family, neighbourliness, etc. (see Ahnström et al. 2008). However, it must be noted that it is natural that the farmers say that they get involved primarily for financial reasons. One reason for this may be associated with farmer identity. They can very well also carry out nature and environmental initiatives that do not fit in within the payments, i.e., they might have a beautiful piece of pastureland without feeling that it is reasonable/important to apply for compensation for the work that they carry out on that land. When a farmer subscribes, they receive money but they are also given a framework to which they must relate and they cannot therefore farm the land exactly as they would like. Siebert et al. (2006) notes that farmers mention economic reasons as being important for their participation in the payment systems, but these reasons are mentioned in conjunction with social and cultural reasons. But agri-environmental payments also provide some form of risk minimisation, both economically and in terms of regulations (if one participates, then the rules of the game are known, at least for the support period).

The possibility of the agri-environmental payments changing the attitudes of the farmers to nature and the environment is extremely limited, since the payments that have the highest degree of subscription are those that have not required any change to be made to the farmer's practical operations or ideas concerned with this (Wilson, 1996). There is also a clear differentiation regarding the habitats that the farmers want to preserve and develop. There is a greater interest in including habitats defined as non-productive in the agri-environmental payments schemes, i.e., environments already in existence that produce no harvest and that are not used for any purpose on the farm (Battershill and Gilg, 1996) than land that requires active management and that also "makes claims" on productive land (Riley 2011). In cases where the agri-environmental payment measures fit in with the production and operation of the farm, i.e., border zones, the payments are appreciated and the level of subscription is high. In Scotland, the farmers said that they liked the border zones since they could remove unproductive land and get paid for it. Payments were made for putting up fences (fences can be put up nice and straight and are therefore appreciated by other farmers), i.e., theses measure were completely in the line with the farmer's own production-oriented interests.

The effect of the agri-environmental payments on the environment depends on how many farmers subscribe to them, or, rather, over how large an area the measured are carried out. In England, the subscription level for ELS in 2008 was more than 50 % of all agricultural land. This means that the majority of farmers had to consider the operation of their farm from an environmental and natural

perspective, when they applied to subscribe to ELS. But, at the same time, it can be said that ELS attracts those who see that can easily conduct certain measures and in so doing use their involvement as an alibi for not carrying out more demanding measures, i.e., I already do what is required so I do not need to do more. It has also been noted that subscription to ELS is highest in the areas with major cereal crop production (high cultivation intensity) and in areas with large farms (>50 hectares). The small farms incur high fixed costs if they are to be involved in the agri-environmental payments schemes. These fixed costs include everything from learning about the system, having the right knowledge to be able to conduct the measures, to having the right machinery. These farms also have a limited investment capacity. Another factor was that the owners of smaller farms were often older and there was a lack of farmers willing to take over operation of the farm. In the United Kingdom, it can also be seen that the smaller farms are cultivated more intensively, i.e., there is no space for unproductive elements such as hedges, or for other measures found within the framework for ELS. This can be contrasted with Spain, where older farmers were willing to get involved with the payments system since the requirements agreed with how they currently farmed the land, or was similar to the traditional methods of operation in the surrounding areas. Therefore, few changes were required but, if they were, they were changes back to something with which they were already familiar (Barreiro-Hurlé et al. 2010). A study from Italy on the same theme considered that, if farming was just one part of the family's income, then the farm was more willing to subscribe to agri-environmental payments, and vice versa: if the family devoted a great deal of time to the farm and this produced monetary rewards, then the probability of subscription to the payments was lower. The agri-environmental payments were seen as an extensification, i.e. the payments were NOT seen as another source of income or as a product. On a very production-oriented farm, where the need for profitability was great, agri-environmental payments were therefore not regarded as an option. The farmers who saw a positive future for their farms were less willing to subscribe to agri-environmental payments that those who considered their farms to be less profitable and who did not have anyone willing to take over the operation of the farm in the future. In France, 16 % of the farms over 100 hectares were involved with the agri-environmental payments whilst just 6 % of those farms of less than 50 hectares were involved. The reason for this was that some of the farms are too small to receive agri-environmental payments, some of the tools/machines required for the implementation of the prescribed measures are too expensive for the smaller farms to invest in, it takes time to learn technical/ecological/practical methods with which to implement the measures, and there are also costs involved with learning how one applies for the payments.

Confidence in the State and its payment system is important for whether or not farmers subscribe. This applies both to confidence in the system itself, i.e., that it is legally secure, fair and stable over time (Peerlings and Polman 2009), but also that the officials that are encountered inspire confidence (van der Meulen et al., 1996). The rapid and, for many farmers, ambiguous changes to the conditions for receipt of payments for mown meadows and pastureland in Sweden has reduced the level of trust in the State, the system and, in many cases, the official themselves (Ahnström et al. 2010) - the latter because the farmers have met various officials from the Swedish Board for Agriculture (block inventory taking) and the

County Administrative Board on various occasions and these officials have made different appraisals of the land. The assessments have been different partly because they were carried out by two different people and partly because they have had different regulations to follow. The latter has been difficult for farmers to understand.

It is important that farmers are involved in the design of hew agri-environmental payments if these are to be accepted and be effective. Farmers often prefer to implement measures that require a little effort or to continue with measures that have already been implemented (Boatman 2007). It seems as though measures on cultivated land are less popular than those on non-cultivated land (Butler et al. 2007), even if certain measures on cultivated fields only affect small areas and have been proven to have positive effects on biodiversity (Morris et al. 2004).

Peerlings and Polman (2009) see three possible ways to increase subscription to the agri-environmental payments: i) increase the levels of payments, ii) change the contract length and subscription requirements for the payments, or iii) try to influence fundamental factors, such as it being socially acceptable to subscribe to the payment system, and confidence in the State and the payment system. They tested these three routes in a model and found as follows: Increasing the levels of payment by 10 % did not increase the probability of subscription, but it did increase the areas within the payments. If the farmers' trust in the system increases, so does the probability of subscription and/or the subscription of more land. If the perceived risk of changes to the payments during the programme period reduces, the probability of subscription increases. However, it should be pointed out that this increase is payment-specific, and in this case, the area related to intensity-reducing measures decreased, in favour of measures that promoted the protection of biodiversity; see Table 6. Table 6 contains a summary of the characteristics that Peerlings and Polman (2009) found for the farmers who subscribed to the various payments. Confidence and social capital are important factors that influence subscription to the payment systems; see Table 6.

Table 6. Characteristics of the farmers who subscribe to various type of payments, according to Peerlings and Polman (2009)

Payment	Characteristics of those who subscribe	Characteristics of those who do not subscribe
Landscape management	High level of education, not a member of a farming organisation, i.e., also involved in areas other than farming, confidence in the system.	Beef producer, member of a farming organisation, i.e., involved in farming and interested in production as well as conservation, organic farmers, i.e., conflict between payment of organic farming and landscape management
Diversity protection	Dairy and beef farms, confidence in the system and that it will not change over time, make use of public counselling	Use private counselling, i.e., machinery firms and chemical businesses. This is a sign of high intensity
Intensity-limiting measures	Organic farms, income from outside the farm, public counselling	Older farmers and dairy farms
No payments	Older farmers, large farms and use private counselling	

Source: Peerlings and Polman (2009)

Dessein and Nevens (2007) state that, if the subscription frequency is to be high, and the implementation of the measures within the payment schemes is to be successful, then the farmer needs to be equally proud of his production of, say, skylarks, as he is of his wheat production. This is not currently the case. Dessein and Nevens (2007) discuss the pride of the farmers from many different perspectives but those mentioned below are just those that concern the pride/lack of pride associated with factors over which the farmers cannot have any direct influence. The farmers in this study felt that the farmers had no confidence in the State, as they themselves thought that they could a good job of producing food with a low negative environmental load. The farmers thought that there was a lack of flexibility in the regulations. The farmers is well-aware that their workplace, fields, pasturelands and meadows are not static but changes dependent on the weather, wind and time of the year, but the State's knowledge of farming was considered to be limited and as a result the regulations are often wrongly or clumsily designed. Successful agri-environmental payments must therefore show that the State has confidence in farmers, that there is a certain amount of flexibility in the regulations, that it is designed so it can be seen that the State understands and respects the contexts in which farmers work, and that the system is transparent so everyone can see that it is fair and legally secure. Furthermore, the State must work together with farmers to dispel the feeling that the high proportion of state financing of farming, via various forms of payments and support, is just wrong. The agri-environmental payments are the State's way of buying a product from the farmer, but the product is not wheat but the management of land that safeguards the survival of different animal and plant populations and other public goods.

Subscription to the agri-environmental payments is a first step, but then the measures prescribed within the conditions of the payment shall also be implemented. Wilson and Hart (2001) divided farmers up into those who subscribed actively and those who subscribed passively. For those who subscribed actively, it was important that it was easy to satisfy the criteria for payment (i.e., carry out the measures) and that the payments are reasonable, but equally important for subscription were conservation and environmental reasons. The passive subscribers got involved just because it was easy to satisfy the criteria that were set for agri-environmental payments and that there was easy money to earn. These farmers will only carry out the measures and pay attention to that which is prescribed in the conditions for payments so long as there is reasonable compensation. Another division of the participants in agri-environmental payments is "administrators" and "followers", and 41 % were "administrators", according to a study by Lobley and Potter (1998). For both of the categories it was important that the requirements of the agri-environmental payments were similar to those of existing operations, but for "the followers", the level of payment was also very important. It was not so important for "the administrators".

When farmers have made their decision to subscribe to the payment, it is important that the subscription process functions, i.e., that the application forms are not difficult to understand or that the description of the objectives of the payments agrees with the farmer's own perception of this.

The farmers' view of the agri-environmental payment system

Farmers are businessmen who receive an income as a result of that which is produced on the farm. This is obvious, but worth pointing out, since we can all

imagine what it is like to be unsure of the contents of our wage packet. Uncertainty regarding income applies to both arable and livestock production and to payments from the public sector. The income of the farmers is not equally divided from year to year. The costs for production of a particular crop are known, but the income that will be receive for it is not, as that depends on the size and quality of the harvest and on price per kilo of cereal. Many farmers have a similar perception with regards to farm support payments and agri-environmental payments: that the extent of these is not known until the end of the year. There is also a constant fear of being checked up on, failing a control and then having a sanction imposed, i.e., not receiving the payments and also having to pay back previous payments or be subject to a standard reduction of farm support payments. The support and the payments that should provide financial security are sometimes actually a cause of insecurity.

Figure 32. If the farmers do not believe that the measures are good for the environment or that the system will last, then their involvement diminishes - as do the positive effects that society hoped to achieve. The Cévennes, France

Photo: Knut Per Hasund

Do the agri-environmental payments make a positive change to the state of nature and the environment, i.e., is subscription to the measures high enough so that the measures are carried out on enough land to actually have a positive effect? If a sufficient number subscribe and create border zones in a catchment area, then the leaching of nitrogen, phosphorus and pesticides in the area can be reduced so that the status of the water quality and ecosystems improves. (Dupraz et al. 2009). Farmers must feel that the measures that they implement within the framework of the agri-environmental payments give the desired results. Otherwise, their actions are meaningless and their confidence in the payment system diminishes. Murdoch and Clark (1994) describe how farmers did not believe that the mowing of cultivated grassland from inside and out had any positive effects on birds. This was based on their own experiences but also on the fact that experts and researchers who talked about the method were indistinct, unclear and, basically, doubtful as to whether this actually had any positive effect on the bird fauna (Deuffic and Candau 2006). In a study by Fish et al. (2003), the farmers questioned the ability

of the agri-environmental payments to deliver long-term, desirable environmental and conservations goals. There is also a hesitation amongst farmers regarding how long society will be able to afford the luxury of agri-environmental payments. This hesitation over whether the payments will only be temporary does not help the farmers lay any foundations for the expansion of their businesses, since this would be based to an excessively high degree on income received from the payment system (Deuffic and Candau 2006).

Payments

Wätzold and Drechsler (2005) believe that those who design and trial the agri-environmental payments have very poor information with regards to what it actually costs to satisfy the management criteria required by the payments. What is more, reasonable compensation levels are difficult to establish since the implementation of one particular measure what cost different farmers different amounts. Those whose costs are the lowest will earn the most and therefore be over-compensated (Gibbons et al. 2011). One way of finding out farmers' costs for operational and management measures is for the agri-environmental payments to be auctioned off (Stoneham et al. 2003). This means that whoever can carry out the measure for the lowest price will receive the relevant agri-environmental payments. Another way is to use "selection contracts", i.e., to negotiate with farmers in selected areas what they need in terms of compensation in order for them to subscribe to a payment system (Moxey et al. 1999).

The definition of the farmers of what are reasonable payments levels depends on the alternative value within of the agricultural land. The alternative value is the net benefit (income) from the usage alternative that is the most profitable. For example, if the land in unproductive for cereal crop production, the loss incurred by not producing cereal crops on that land is relatively small, but in an area with good harvest, the value of the loss harvest would be great. A higher payment level is therefore required in order for the idea of subscription to be of interest to farmers (Hynes and Garvey 2009; Barreiro-Hurlé et al. 2010).

Smits et al. (2008) suggest that "agglomeration bonuses" should be introduced - extra payments for local collaborations benefiting conservation or the environment, or for other measures that increase the collaboration between farmers and with other operators. This applies very clearly in the case of water-related problems. It would be desirable if farmers within a water catchment area were to collaborate and subscribe together to an agri-environmental payment scheme. There are successful but also less successful examples of such collaborative projects (Dobbs and Pretty 2008). One way of succeeding with this type of group subscription is to clearly point out the areas that are prioritised and explain why, and to have a higher payment level within these specific areas. Another way is to attempt to build social capital between farmers, i.e., get farmers to take joint responsibility and to feel pride in being able to improve the situation in the catchment area. The latter requires more work than the first but the effect will probably be more sustained. Furthermore, there is the chance that this will lead to collaborations in other areas (Dobbs and Pretty 2008).

Franks (2011) demonstrated that group subscription to agri-environmental payments increases participation due to the reduction of the scope of some of the main problems and the strengthening of attitudes and social capital within the

group. The injection of financial resources into the groups can facilitate subscription and implementation. By being part of a group, there are also financial opportunities available, such as the hiring of experts or advisers, so that the measures can have an even greater effect. It has also been shown that the most common problems with subscription or non-subscription to agri-environmental payment schemes are reduced with group subscriptions, compared to when individual farms subscribe (Slangen et al. 2008). Slangen et al. (2008) also show that when the farmers have joined the group, they want to defend their place in that group, which means that the farmer implements his agri-environmental payment measures in the best way possible, to show that he is taking the scheme seriously and, maybe even, to show that he is the best in the group. These groups build a very strong social capital.

Pay for actions or results?

For progress to be made with agri-environmental payments, the farmers should be paid for the result of the measures and not just for implementing a measure, the result of which we do not know in detail. This should create farmers who are innovative and interested in becoming more involved so that they can achieve better results and, consequently, receive higher payments (Hasund 2011a, 2011b, 2012). One problem with such payments is that it is difficult to set the correct price for preservation of certain species or certain densities. What is more, the taking of inventories and monitoring can be expensive, according to Burton and Paragahawewa (2011), which, however, contradicts the findings of Hasund (2012) which indicated that these costs were lower than with the present system. To pay for results can help avoid the wastage of agri-environmental payments that occurs when they have no effect. One example could be skylark plots that are intended to favour skylarks in the arable landscape. If farmers are well paid for the promotion of a good number of skylarks and the plots are placed freely by the farmer, based on his knowledge of skylarks and whereabouts on the farm they are usually to be found, then this will probably be of benefit to the skylarks. If, instead, the payment is per skylark plot, then there is a risk that they will be placed in parts of the farms that are unattractive to skylarks and, therefore, the measure will be inefficiently implemented (Gibbons et al. 2011). A modelling study by Gibbons et al. (2011) found that biodiversity increased continuously alongside increasing budget, when payment was made per result. When payment was made per action, the benefits to biodiversity increased until all the farmers had subscribed to the payments. This means that when payments were made per implemented measure, the success (for biodiversity) is dependent on how good the prescribed actions were, whilst if payments are made per results, the farmers use their own ideas and knowledge to maximise the benefits to biodiversity (the income to farms actually increases via higher payments) (Hasund 2011b, 2012). In both cases, monitoring of the success is required for receipt of payments. More monitoring costs more, which, if the budget is fixed, gives less money to measures and, consequently, has a reduced effect on nature and the environment.

In summary, Gibbons et al. (2011) demonstrates that if payment is made per result, higher biodiversity is achieved for a given budget than if payments were made per implemented measure. Other studies of where payment is made for results and not for actions concern the successful breeding of waders in Holland

(Muster et al. 2001) or the number of vascular plant species (selected indicator species) in pastureland in Germany (Wittig et al. 2006). This method leads to payment levels being directly affected by the measures undertaken by the farmer. Feedback is received quickly as to whether the farmer is succeeding or not, and if the farmer is successful, the results can be shown off to authorities and other farmers.

Farmer identity

The image of farming changes over time and this has changed from one where the focus was completely on production to one of multi-functional agriculture. Different parts of society and the agricultural sector have different images of farming. This leads to different views and even to communication difficulties between operators, since objectives and the means of achieving them vary, depending on the image of agriculture than one has. In addition to this dynamic image process, there is also the issue of farmer identity. Identities are very difficult to dislodge or change. This means that there is a farmer identity that is still characterised by a production-orientation with a preference for straight rows of crops and weed-free fields, whilst society has a different image of farming and of the farmer. This creates a conflict between the identity and the image of farming (Dessein and Nevens 2007). A good farmer produces large harvests of cereal crops and has a good quality of livestock. If they succeed in this, their reward comes in the form of respect from their colleagues and they are also well paid. To be a "good farmer" is something that all farmers strive for. In order to become this "good farmer" often requires that the farmer improves their mechanical, motor and operational skills. That which is important, in order for one to be perceived as a "good farmer" in the eyes of other farmers, is that the measures that one undertakes can be carried out well or poorly, or in other words, there must be some differential in the performance of the measure. It must be visible whether one is doing something well or not and it must be visible to others (roadside farming). In several studies it has been noted that there is a perception that a good farmer is a farmer who can produce straight rows, i.e., straight furrows when ploughing, straight rows of seeds, or straight spray tracks; France (Burel and Baudry 1995); New Zealand (Egoz et al. 2001) and the United Kingdom (Burton 2004). In Burton et al.'s study (2008), a Scottish farmer, very interested in conservation, expressed himself as follows: *"It can be a good conservation project, you know, it can be a mix of flowers and wild grass and all possible kinds of wild fauna, but it you drive past it, you don't see it. It can look a bit untidy, actually. But, you know,...so...I don't think...the same comments would be made in the car, "That's a good conservation project", as they would be if they saw a well-ploughed field".* This shows that farmers can lose social capital through these conservation measures. In this case, maybe a sign with text on it stating that "Here I am providing the preconditions for wild flora and fauna" would provide an explanation for why it looks like it does, and also lead to an increased understanding of why the land looks the way it does. Unfortunately, as the farmer above mentions, a perfectly implemented measure within the agri-environmental payments scheme never, or very rarely leads to any praise from colleagues, nor, unfortunately, from the administrative authorities. Neither are payment levels any higher. There is therefore very little reason for doing anything more than just satisfying the minimum requirements for payment (Silvasti 2003). Burton and

Paragahawewa (2011) discuss this further and point out three reasons why the agri-environmental payments do not provide the farmer with higher social capital. The first reason is that it is not possible to subscribe to the agri-environmental payment scheme and carry out the measures badly, well or very well, i.e. there is no way for the farmer to show that he is good at what he does. Since certain agri-environmental payments establish which areas or parts of the farm are encompassed, there is a risk that farmers lose their personal engagement and only deliver exactly that which is stipulated in the instructions. Instead, the farmer gets involved in those areas where he/she can produce something based on his/her own knowledge, experience and interests. Another reason is that, since the payments can only compensate the farmers for actual costs, loss of social capital is never compensated. For payments where many changes to the operation of the farm are required, high payments are required to compensate for possible losses of social capital (These changes should actually promote the farmer as a successful ground-breaker and improve their social status).

Figure 33. For an agri-environmental payment to be successful, it is crucial that it is consistent with the farmers' identity and their fundamental attitudes.
Photo: Urban Wigert

Fish et al. (2003) demonstrated that the farmers in their studies considered that an organised and structured landscape is a beautiful and good landscape. In such a landscape, production and conservation go hand in hand, especially if they are spatially separated and closely resemble each other, i.e. structures and organised. Agri-environmental payment measures that create disorganisation, such as too many weeds, unharvested parts of fields, etc., are of less interest since they go against the farming identity. The quest for order can mean that measures are implemented that have a negative effect on biodiversity, such as the removal of embankments and weed-rich, uncultivated corners of farms. Over the years, farmers have seen themselves as the administrators of the landscape but this has primarily been in terms of developing the landscape in order to increase the production of food, fodder and fibre. The new type of administration deals with the

preservation of structures such as ditches, small-scale habitats and meadows which, on the whole, are seen as obstacles to cultivation or as environments associated with historical farming practises. Society wants to change the major initiatives that farmers have carried out to intensify the landscape, and this is an affront to the pride of the farmers (Mitchell 1998). The implementation of the agri-environmental payments is based on farmers following the management conditions of the payments. This means following a template, but makes no requirement of the farmer to be good, clever or innovative or to use their knowledge of the local land, environment and nature. Wilson and Hart (2001) go as far as to say that the payments take away the farmer's own responsibility for the land that is included in the payments and that the farmers can focus on being a good farmer through high levels of production, "purely" in other parts of the farm. The following sentence is taken directly from Burton and Paragahawewa (2011) and summarises the above discussion well: *"We believe that it is time to think about how we create payments programmes that do more than pay uninterested participants for undertaking measures that are seen as unnecessary and are even morally questioned, and instead ensure that the payments are designed so that they are assimilated (taken up) by farmers, i.e., incorporated as part of being a good farmer, in order to bring about long-term, sustainable change* (Burton and Paragahawewa 2011)."

Engagement and interest in nature

Money, as has been discussed above, is not the only motive behind subscription to the agri-environmental payments; knowledge and an interest in nature are also important factors. The more interested a farmer was in the wild flora and fauna, the more willing he/she was to preserve existing or establish new habitats on the farm (Herzon and Mikk 2007). Ahnström (2009) showed similar results, i.e., that the more interested in nature a farmer was, the higher the biodiversity that was to be found in the arable land. To proceed from the interest of the farmers and, via this, to increase their knowledge of nature, conservation and the environment could have a major positive effect on the cultivation landscape. With knowledge and interest, the probability of wanting to reduce the negative and increase the positive effects of farming, on the environment, flora and fauna increases (see Lokhurst et al.'s example study 2010). One problem that still exists with regards to conservation and the environment is that different parties define problems and solutions in different ways. Definitions and measures to bring about a good level of conservation and care of the environment still differs, after 20 years of agri-environmental payments, between farmers and authorities in, for example, the United Kingdom (Morris and Potter 1995 and Finland (Kaljonen 2006). Disagreement regarding what the problems are and, accordingly, disagreement regarding how they should be solved are NOT the breeding ground for easy and productive collaboration. It is important to establish consensus, or at least, understanding of each other's viewpoints, if the agri-environmental payments are to have an effect on conservation and the environment, and be accepted by the majority of parties. Boonstra et al. (2011), in a study about interest in nature, showed that these misunderstandings also exist between Swedish farmers and biologists.

Figure 34. Without agri-environmental payments, the engagement of farmers in nature and the environment would have decreased and much of the agricultural conservation and environmental work would not have been carried out. Rävlinge, Småland, Sweden
Photo: Knut Per Hasund

When the payments cease...

When the agreement period for the agri-environmental payments is over, no demands whatsoever are made of the farmers and, accordingly, there is no assurance that the natural and environmental benefits that have been created within the framework of the payments will be preserved. If the farmers have been positive to the environment and conservation, the probability that certain benefits will be maintained is increased. Two of five farmers who have been affiliated to the ESA in England indicated that they became more interested in conservation and, specifically, in birds (Dobbs and Pretty 2008). If the farmer's only reason for involvement in the agri-environmental payments scheme was financial, then the measures will not be implemented when the payments stop. The same applies if the cost or loss associated with implementation of the measure is too high. One example of this is the drastic manner in which riparian strips in Sweden diminished when the payment level reduced and the price of cereal increased. On the other hand, measures may continue without agri-environmental payments, if interest has been aroused, if the measure provides a high level of social capital, if the farmers are praised for their actions, if the costs of that alternative are low, or if the measure has a visible effect on nature and the environment.

An English evaluation of CSS agreements showed that 75 % of the farmers felt that the cultivation intensity and livestock density would be the same or somewhat higher without payments. On the other hand. a high percentage of the farmers indicated that their engagement in nature and the environment would decrease if there were no payments for their work in these areas. The reduction would be 53 % for conservation land management, 45 % for the facilitating of public access to the land, 59 % for the management of hedges, stone walls and other boundary elements, 43 % for the management of traditional buildings and 70 % for the management of filed borders (zones in fields). The authors note that there is a risk that the farmers would answer with an extra firm "no" regarding whether they would continue with their nature and environmental efforts if the support was to disappear. This is the answer that lies closest to hand within the identity of the

farmer (Dobbs and Pretty 2008). A similar evaluation by Crabtree et al. (2000) showed that half of the farmers would continue with the same engagement in nature and the environment even if the agri-environmental payments were to be stopped, whilst 25 % would reduce their level of engagement.

Table 7. What the agri-environmental payments brought to farming and what is at risk if the payments disappear, according to Carey et al. 2003. England

The conservation and environmental care brought about by the payments	The percentage of 500 evaluated CSS agreements per category	The comments of the evaluation team
High	36 %	None of the work would have been done without payments Furthermore, the locations were important for nature and the environment and visible and accessible to the public
Medium	38 %	Part of the work that was carried out would have been done anyway but not on the same scale or to the same extent
Low	26 %	The work would have been done anyway

Source: Carey et al. 2003

The measures that have the most effect on nature and the environment would not have been carried out if payments had not been available and there is a clear risk that these measures will not be carried out if the payments disappear (see Table 7). But it can also be argued that these measures may come to be carried out anyway if the farmers have seen that a positive change has taken place which has aroused their interest and engagement; in this way, the measures may survive in the future.

4. Summarising discussion and synthesis

Our assignment has been partly to investigate the agri-environmental payments that are used in other countries and how they are designed, and partly to analyse the experiences of those who have been involved with these payment systems. One aim has been to see what schemes can be of interest as models for future rural development programmes in Sweden. In this report, it is clearly evident that, like the majority of evaluations that have been conducted in connection with rural development programmes, there is too little monitoring and data to be able to prove how effective individual measures have been (with the exception of a few specific cases). This is a recurring theme in the European countries that this report examines. The lack of background material and evaluations is surprising, since this is an EU requirement, while at the same time, a great deal of money has been invested within the rural development programmes in order to increase the positive, or decrease the negative effects of agriculture. This fact has complicated our work considerably. Despite this, we have tried to find out if there are certain payments or solutions in rural development programmes that could be of interest to the Swedish programme. Since direct evidence of the payments having had a beneficial effect in their country of origin is lacking, we have used knowledge of our own rural development programme, knowledge from previous evaluations conducted in Sweden, and scientific literature on the subject to draw our conclusions on plausibility and the possibilities of using them in Swedish conditions.

It is clear that Sweden is at the forefront as far as the collection of environmental analysis data is concerned and. Sweden is often seen as a leader in this respect. Despite this, it is important to constantly evaluate how well the current environmental analysis programmes can be used to evaluate the benefits of various initiatives. Sweden is currently conducting a project in which it is carrying out an overview of existing data and, to determine what is needed to cover the knowledge gaps for certain measures that aim to improve the environment or increase biodiversity.

4.1 General lessons learnt regarding agri-environmental payments

The aim of the agri-environmental payments has been to bring about a process of change that improves the state of nature and the environment. The payments and measures that have had the most obvious effects are those that are very specifically targeted at the promotion of just one species. A good example is the measures conducted to save the bird corn bunting (*Emberiza calandra* / *Miliaria calandra*) in the county Skåne. But it is difficult to find and administer these types of direct connections between species and measures, in the majority of cases. Furthermore, specific measures tend to cover a very small area and they, therefore, offer very little benefit in terms of general diversity. This contrasts with general measures covering larger areas, that have a general and positive effect, such as, for example, the current "*Natural and cultural environments in the cultivated landscape"*-agri-environmental scheme[12] in Sweden.

This also gives rise to a discussion regarding whether agri-environmental payments should apply to whole farms or parts of farms and if they should be general or specific.

If the payment applies to the whole farm - like, for example, ELS[13] does in England – then the farmer is forced to "reconsider", in order to adapt his whole farm to the payment, according to the literature regarding the attitude of the farmers to agri-environmental payments. Payment to organic production is rather similar, even if it possible to apply for payments just for parts of the land. Measures and adaptations have to be made at many levels, everything from choice of crop and crop rotation to transparent bookkeeping that shows the purchasing of seed, etc.

The advantage of the whole farm being included in the scheme is that there is only one entry into the system, but within this, there are still several choices that the farmer can make in order to fit in with the payment scheme. This gives the farmer a certain amount of freedom which is an important factor for their conditions and for how well the agri-environmental payment is received. The ELS in England gives the farmer the freedom to select and carry out a great number of measures (approximately 60), and further encompasses many specific measures. These include, for example, skylark plots or flower-rich corners to encourage pollinators. The disadvantage with the whole farm having to be included in the system is that

12 This scheme involves payments for the management of stone walls, solitary trees, ponds and other landscape elements on arable land.

13 See page 16.

there is a risk that the really big farms are missed out, since they have to carry out a great number of (albeit smaller) measures, and this can deter enrolment. If there are also general measures that are to be implemented, their results are difficult to evaluate, both for the farmer and in terms of administration. Various studies show that, if the farmer doubts whether the measures will have a real effect, then the desire to subscribe diminishes. If instead the farmer is allowed to choose the parts of the farm where the measures are to be carried out, i.e., which pastures shall be included in the payment scheme, then the land on the farm can be divided up into preservation areas and production areas. This means that intensively cultivated parts of the farm can continue to be cultivated intensively, whilst the parts with lower yields are set aside for conservation and environmental purposes. Consequently, the relative effect of the measures is often low since the changes brought about by the agri-environmental payments are relatively minor.

Specific measures can also require specific equipment and/or knowledge, which often means that small farms cannot afford them, or do not have the opportunity to carry them out. Furthermore, there might sometimes be a need to hire consultants or contractors to carry out the measures. This forces the farmer to relinquish part of the control they exercise over the operation of the farm. What is more, the contractor carries out the work when they have time and this is not always the optimal time for the measure.

The most popular agri-environmental payments are those that require the least number of alterations to the farm's daily operation. This means that the taxpayers' money is used to pay the farmers to do what they have "always" done. Consequently, there is a risk that the natural and environmental benefit per pound invested is low or non-existent. However, it should not be forgotten that certain agri-environmental payments can also be effective when they maintain a desirable situation. This may be the case, for example, when someone continues to farm small, irregular fields or to manage pasture that otherwise would have been abandoned. Many of the conservation qualities have, after all, come about through farming of the landscape, even if it is, by current standards of measurement, relatively low-intensity farming that has produced the environmental qualities of greatest value. The relevant comparison is always, of course, to compare the situations with agri-environmental payments with those without the policy measure. To compare the situation before the payments can be misleading since many other factors may also have changed at the same time.

Naturally, this money can also be an important supplement to the farmers' income, which might mean that they can continue to operate their farm, something that is a prerequisite for much of the biodiversity in the agricultural landscape. But it is important that the objectives of the various agri-environmental payments are clearly and honestly defined: what the money is for, and what benefits it will provide. The support for, inter alia, organic farming in Sweden was, during the previous period, seen as a regional support that was an important feature in the economy of farms that, essentially, just cultivated grassland in the northern parts of Sweden. This led to the statistics showing a large area of cultivated grassland, but this was, in principal, organically grown even before the support. The environmental impact was, therefore, low, but it may have kept some of the farms in business. The money was therefore important for rural development, however, its official aim, to bring about environmental improvements, was not achieved.

Regionalisation has progressed further in certain countries, i.e., the United Kingdom and Germany, where their whole programmes have been designed on a regional basis. In France, there is a combination of support at national and regional level. Even in Sweden there is a certain amount of regionalisation as certain payments can only be paid out in certain counties or production areas, such as extensive grassland cultivation and construction of wetland. Furthermore, payments within certain parts of the scheme ”Selected environments” are divided up by county.

4.2 New system

The agri-environmental payments systems of several other countries have been constructed as a two or multi-stage rocket. This means that there is a base of payments with conditions that must be satisfied in order for the farmer to be eligible to participate in the payment system at all. They share certain similarities with the cross compliance of farm support payments, as they make demands that go further than those required by law. These conditions can be seen as generally important measures that can be applied as a template for all farms, or all farms of a certain type. Finland has, for example, different base conditions for livestock and arable farms. Over and above the base section there are specific forms of agri-environmental payments, which might include, for example, measures for pastures or other specific environments.

Measures that might be suitable for the base section, if such a system were to be introduced in Sweden could be, for example, parts of the payments made for environmental protection measures. In order to receive agri-environmental payments at all, there should be an obligatory requirement for things such as plant cultivation plans, function-tested spraying, safe refilling and cleaning of sprays, or spray-free border zones along all water courses. One precondition is, of course, that these aspects are not already included in the cross compliance of the farms' support payments. Agri-environmental payments, therefore, consist of a base package with conditions, plus a number of separate agri-environmental payments that the farmers choose themselves. The base package should vary depending on the farm's type of production (as was mentioned above) or, for example, based on its geographic location.

One advantage with the inclusion of certain obligatory measures in a base package is that these can be seen as being important from an environmental point of view. It is doubtful whether a sufficiently large effect can be achieved if they are not implemented in a great number of farms. This also makes the system simpler to understand. In a way, this can be seen as an endorsement of quality - that the farms that receive agri-environmental payments satisfy at least a certain standard, in respect of conservation and care of the environment. By including several of the agri-environmental payments, or their conditions, in a base package, a number of the payment forms disappear. They do not actually cease to be at all, but the system becomes clearer for the farmer. Furthermore, the choice of flora that has to be made for each block is reduced. The other more specific payments can also be divided up by type of production, type of land and region. This would make it easier for the farmer, who does not then need to get involved with more regulations than just those that concern their own farm.

The difficulties involved with a system such as that proposed are, inter alia, not setting the base payment level too low, or making it too difficult to achieve, as this base level is a prerequisite of all the other payments. It is, naturally, also important that the measures included in this section are effective ones, since these measures will have a major impact. A system where points are allocated, like in England, and where there is a great choice of measures, might be of interest to the Swedish system. The risk for deadweight losses (i.e., that payments are sought for measures that could have been carried out even without payments being made) are, however, generally greater in this kind of system than in a system where the farmers cannot choose the cheapest measures. However, the socio-economic cost-efficiency is greater; see Hasund (2009, 2012).

4.2.1 Extension service

In several countries, farm advisory service is an optional measure within the rural development programme. This would be a good way in which to adopt a more holistic approach to the preconditions and opportunities of each individual farm. In the future, extension could go beyond that offered at farm level, i.e., by addressing measures that are influential at landscape level. In order for this to happen, field visits and counselling should be incorporated to a larger extent into the new rural development programme. This should, in the first instance, happen in areas with high biological and cultural value or areas where the environmental stress is high. The field visits show the farmer that the authorities take the situation seriously.The extension officer can also discuss the qualities of, or problems to be found on the land. The farmers' inclination to take action increase when it can be seen that one is part of the problem or that one can make a real contribution to positive effects. The field visits could also become a link between landowners and livestock farmers, with regard to, for example, maintenance and restoration of abandoned pastures.

4.2.2 Paying for values

In order to create an effective payment system, it is important that farmers see the system as being unambiguous. It is also important that it is flexible enough so that management of the land can be adapted to the production system of the farm and its natural conditions, and that it is able to create the conditions required for, inter alia, outdoor life, conservation, and care of the environment. It is not easy to create a good system along these lines. The complexity of the system can increase with everything that results from, for example, complicated application procedures, increased administrative burdens for farmers, concerns that errors have made in the applications, and a possible lack of confidence in the system. To get around the problem of formal regulations that regiment the landscape, indicators could be developed so that payments are paid for the environmental qualities that are actually created. Such a system has the necessary theoretical prerequisites to be socio-economically efficient (see Hasund 2011a, 2011b, 2012). Our study also shows that variants of value or result-based agri-environmental payments are already being applied, at least in certain member states.

However, the regulations of the WTO and the CAP do not allow rural development programmes to provide compensation for the environmental services that are produced (unlike that which happens in the marketplace), only for the additional

costs that arise. A practicable strategy would, therefore, be perhaps to pay for what it costs to bring about greater biodiversity, increased cultural heritage qualities, increased accessibility, etc. It is more difficult, more time-consuming and it requires more responsibility to farm in a way that creates or preserves biodiversity than to manage land with lower values. This should give farmers the incentive to learn more about how they can produce, not just marketable goods such as food, but also other things that there is a demand of in society. It concerns, not least, the efficient production of public goods, such as biodiversity, recreational landscape access, and carbon sequestration. Another aspect of this is that the value of knowledge of, for example, biodiversity or cultural environments is increased. This can be likened to the value of knowledge regarding the efficient production of food. Under the current system, the farmer has to conform to pre-existing regulations that are not always appropriate for the land on the farm in question. Even if the biodiversity or other public goods decrease, the farmer can still receive the highest payment amount. In the same way, a farmer who manages his land in a manner which is optimal for environmental qualities, such as, for example, biodiversity, receives no extra encouragement from the present rural development programme for this. The farmer can, quite simply, be forced to make repayments. Those who increase the environmental qualities of their land should, in the proposed system, be encouraged and, in the long-term, be rewarded for their ability to, for example, produce biodiversity or cultural heritage qualities. This ought to be able to provide a foundation and create the preconditions for farmers to acquire the relevant knowledge and to use this in environmental work on the farm to a greater extent than they do today. It also provides, at least theoretically, a more efficient system where society can, in a direct manner, pay for the demanded environmental qualities that the farm may produce.

It is important that a system such as the one proposed is regionalised, since it can be assumed that the value-creating environmental qualities and the indicators coupled to them are not identical across the whole country (at least, not all of them). The design of administrative systems falls outside the scope of our assignment, but since the natural question prior to a proposal such as this is how it shall be administered, we make two speculative suggestions below. In both of the systems, assessments are made of the status of the land within a specific assessment interval, i.e., three, four or five stages, in accordance with an indicator system. The first suggestion implies that the farmer has the right to a visit from an official from the county administrative board, let us say, every five years. They make assessments of the status of the farm's land. The second suggestion is that consultants can certify themselves as assessors of the status of the land and conduct a similar assessment. If the status is incorrect and the farmer has followed the consultant's assessment, it is, therefore, not the farmer who is at fault, but the consultant. One can also imagine that farmers would want to update the status of specific pieces of land between the visits of officials or consultants to which the farmer is entitled, but then one can imagine that this should be paid for by the farmers themselves.

4.2.3 The length of the commitment – creating a back door

The length of the commitment to agri-environmental payments has long been debated, primarily by farmers. The problems with five-year commitments have applied, inter alia, to farmers with an uncertain financial situation. Another

hesitant group is older farmers who do not know whether they will manage to stay the course of the whole commitment period, and do not know if anyone else will take over. Similar problems occur with tenancy, where it is common that landowners do not want to sign a contract that is valid for five years. The apprehension of binding contracts that you may not be able to comply with and fear of repayments is a reason why a significant number of farmers have not joined the agri-environmental schemes. Accordingly, the environmental impacts are lower than the potential. However, reducing the period of commitment can have negative effects on the sustainability of the measures. It is hardly worth paying money for riparian strips that are only there for a year, or for pastures that are only grazed for a year. One proposal is therefore to make it easier for the farmer to conclude the commitment ahead of time, subject to a lower payment amount during the payment period and a bonus (or actual receipt of the full payment according to the terms of the previous system) at the end of the period. The proposal follows the ideas of Christensen et al. (2011), that this should increase the interest of the farmers in subscribing, since they do not risk becoming liable to make repayments if they do not complete the whole period. At the same time, the model also clearly shows that completion of the commitment period is preferred by society.

Figure 35. A "back door", where the farmer has the opportunity to conclude their commitments ahead of time would be positively received by the farmers, could considerably raise the level of subscription to certain agri-environmental payments, and lead to positive environmental impacts.

One can imagine that such a scheme could apply to all farmers, or that a few might be given the chance to subscribe to this alternative system of commitment. The advantage with having two systems would be that those farmers who are not worried about a five year commitment would receive more even payments than under the old system. Those who think that a back door is a valuable option may instead subscribe to the new system, and they will then receive payments that vary in size, with larger payments every fifth year. The advantage with having a uniform system is that it is easier to understand, at the same time as it is less of an

administrative burden for local authorities and civil service departments. However, it is unclear whether the proposed system is appropriate for all types of payments. For projects such as restoration support or wetlands it is, naturally, clearly unsuitable, but we believe that this is something to bear in mind for more management-oriented payments.

4.2.4 The landscape perspective

To assume a landscapewide perspective in environmental work implies on one hand the handling of issues on a larger geographic level - i.e., "landscape level" instead of individual fields, stone walls or suchlike, and, on the other hand, the inclusion of all types of land that are found within the area. For example, pastures, fields, wooded areas and wetlands will be handled together, and not just specific objects of these types of land.

The landscape perspective is becoming all the more interesting within conservation and care of the environment, but agri-environmental payments are often made at block level or for even smaller units of land. (Certain payments are however made at farm level.) How can collaboration between farmers be rewarded in the agri-environmental payment systems, and how can planning be carried out at landscapewide level? For water-related issues, the catchment areas are the most appropriate level. For certain insects, measures that apply to a couple or more fields might be sufficient, whilst for migratory birds or the appearance of the landscape as a whole, the tying together of a large area is involved. As far as agri-environmental payments on a larger scale than single farms are concerned, we see two main routes to success: voluntary collaboration or collaboration based on prioritised areas. In order to carry out any measures at all at landscape level, we believe that landscape plans should respond to requirements on several scales. These can consist of the prioritising and establishment of goals for, for example, long valleys that are important flight paths for birds, catchment areas that have an extra-high risk of plant nutrient leaching, landscapes with extra-high natural or cultural qualities, or landscapes that are valuable from an aesthetic point of view.

A voluntary collaboration could be a group of farmers within a specific geographic area, i.e., part of a catchment area, declaring themselves to be an association so that all of their members can apply for payments to reduce nitrogen leaching. The payment made has a base level, but an extra premium is also paid per farmer in the group. This applies until a maximum premium sum has been reached. This would be viewed as a project application with a collaboration and coordination cost that corresponds to the extra premium payment. We do not believe that the application procedure being just as comprehensive for project support is a way forward, but the application could consist of an extra tick on the joint application (the most important thing is of course that more farmers work for the same target, not that it should be in the form of a project).

Another possibility would be for the authorities to prioritise areas where payments will be extra high if a certain percentage of the farmers in this area subscribe to the payment system. The authors believe more in the latter proposal since it provides a more specific geographic prioritisation of the measures. Another advantage is that it does not force the farmers to enter into collaborations. In the case of the former, there is a risk that farmers come under pressure if they do not subscribe, since the premium for the other farmers will be less if fewer farmers

are involved. To this can be added the difficulties involved in handling the problems that can arise if certain people involved in the collaboration do not behave according to the terms of the commitment.

The information regarding the agri-environmental payments must be changed so that it is more inspiring and less off-putting. Several countries have a considerably more comprehensive system than Sweden and manage to present the payments involved in a relatively simple manner. Part of the solution might be to divide the information material up regionally or farm-specifically, i.e., the farmer should initially only receive information regarding those payments that can be actually applied for by their business. If they are interested in the whole programme, then this information should be made more accessible via, for example, the Swedish Board of Agriculture's website.

All payments that can be applied for should be found in the same information material. It is not particularly pedagogic to distinguish between, for example, agri-environmental payments and the scheme "Selected environments". As it is right now, the EU's division of measures is incomprehensible when it lands on the farmer's kitchen table. In order for the agri-environmental payments to be effective, the point of departure must be to make the information and design simple for the farmers. It is, therefore, not practical to keep certain structures just because they originate from different levels of local authorities. The separation of these structures should be a job for the local authorities and civil service departments.

Furthermore, all contact between authorities and farmers should be characterised by respect, understanding and engagement. This requires a certain amount of training for all staff within the county administrative boards' farming and rural development units. They should have basic knowledge of the whole rural development programme and also some knowledge and understanding of the situation of the farmers. This knowledge is already to be found within the county administrative boards, to a large extent, but it is no secret that many of the visits that farmers receive are from seasonally-employed staff for whom the opportunities for introductions and professional development are minimal.

4.3 Individual measures

In the Swedish plain districts dominated by cereal crop production and forest districts dominated by leys, the increased heterogeneity of crops is required for the promotion of biodiversity. For biodiversity, there is a lack, above all, of larger areas with vegetation that are less affected by cultivation, mosaic-type vegetation structures (including sections with short vegetation) and land that is left undisturbed for the majority of the season. **Fallows** are the simplest way of increasing the area of such land in plain districts. If a voluntary system is to work, then the payments must be large enough to ensure a sufficiently high level of subscription. One option would be to adapt the payment levels to the yields of the various regions. Another option is to introduce obligatory fallows within the agri-environmental payments system, i.e., the farm must have a certain percentage of its arable land as fallow (5 %, for instance) for the farmer to be eligible for the payment. The fallows should lie for a number of years so that various species with different demands manage to colonise them. It takes several years for butterfly species, for example, to colonise a fallow. The fallows can be established through natural

succession, which can, however, cause weed problems. Alternatively, they can be established by sowing seed mixtures. Meadow seed mixtures or nectar-rich plants are recommended, in many studies, for the promotion of biodiversity and improving the appearance of the landscape. To this can be coupled certain forms of management that benefit biodiversity, such as mowing or harrowing in strips. If the succession of the vegetation in the fallows continues for too long, the fallows will be dominated by dense grass growth that has only minor positive effects on biodiversity.

Other options for increasing biodiversity in the agricultural landscape are the establishment of, for example, flower-rich vegetation in **border zones** and **riparian strips**. The areas are more limited than if fallows are reintroduced on a larger scale, but both fallows and border zones have positive effects on both biodiversity and the preservation of natural resources, such as pure water. Riparian strips are obligatory in certain countries outside of the EU. The pros and cons of such a system should be investigated. Other options are systems such as **skylark plots**, where smaller sections of the field are left unsown in dense crops for the benefit of species such as the skylark, that are attracted by sections of short vegetation. The system seems to work in England and it seems to be accepted by farmers, since it only affects small areas, however, that is also the disadvantage of the system. In certain regions (Swedish forest districts), there is a shortage of arable land, since the agricultural land is dominated by leys and overgrown agricultural land. In these regions, **payments for active arable farming** can instead be an option for areas where biodiversity can be promoted. Systems that compensate the farmer for having several different crops (**crop diversity**) would be beneficial in these regions, but also in the plain districts (cf., the proposals for greening initiatives in the CAP reform for 2014).

The environmental qualities of pastures should be revealed officially more clearly so that the highest possible compensation can be received for particularly valuable outcomes, despite the land not being managed according to the stipulations. In certain cases this is due to the general management regulations not agreeing with the stipulations for semi-natural pastures. One problem with the system for pasture payments in Sweden is that some of the types of land[14] that are considered to be pasture are not classified as such according to the definitions of the EU. This has caused a great deal of concern in several areas connected with the conservation of the agricultural landscape: possible loss of environmental qualities associated with trees, losses of structures important for biodiversity, farmers having less confidence in county administrative boards/the Swedish Board of Agriculture, and a more complicated system with several definitions of pasture. A major simplification would be if all land that is grazed and that goes under one of the definitions of pasture, is classified as pasture within the application procedure. It is not the definition of the type of land that should be in focus but the management of the land and the results of the management. This should mean that the farmer specifies the management measures for a block and that this is considered to be pasture. The complications with the definition would then be down to the authorities. Another important measure is also the creation of better preconditions for the production of biodiversity and other public goods in pasture. Accordingly, there should be

14 It concerns permanent grassland with dense stands of trees, some kinds of shrubs, open bedrock, etc. with high biological or socio-cultural qualities that depend upon continued grazing, mowing and related management management.

greater freedom with regard to maintenance as long as the environmental services are supplied. Maybe value-oriented management is part of the solution (see under Paying for values, above).

The current payment system includes payments for many different environments such as pasturelands, wetlands, arable land, small-scale habitats, etc. One factor that has a major effect on biodiversity in the agricultural landscape is the occurrence of smaller wooded areas and border zones adjacent to wooded land. Broad, well-developed forest edge with bushes (i.e., blackthorn, juniper and roses), deciduous trees and old trees mixed with open areas are valuable for many insects and birds. Establishment and management (and some clearance) is something that could have a positive effect on biodiversity, not just at forest edges and adjacent areas of arable land but throughout the whole landscape.

The edges also have major, positive significance for the appearance of the landscape, outdoor life and culture heritage as they provide variation in the landscape and show old structures from previous land usage. The "**Diversity edges**" concept from Finland, or the management of hedges, which constitutes an important part of the agri-environmental payment system in the United Kingdom, are examples of similar measures.

Figure 36. It would simplify matters for farmers if all land that is grazed and that is defined as pasture is also referred to as pasture in the application. Trulshärad, Skåne, Sweden
Photo: Knut Per Hasund

In extreme plain districts, arable land dominates completely and wooded land, pasture and other environments with natural vegetation are rare. In these areas, payments for the planting of planted wind-breakes, for the prevention of erosion, or the promotion of biodiversity would be suitable. Farmyard environments are, in certain regions, the dominating environment, alongside arable land. Farmyard environments can be richer in both species and individuals than pastures, as far as birds and plants are concerned. Measures that create "Diversity centres" should be prioritised in plain districts. Measures that promote breeding birds, certain groups of insects (i.e., solitary bees), and rare garden and field plants should be included in this concept, as should the cultivation of winter feed for birds. The establishment of smaller fallow sections adjacent to the centre of the farm is another option.

In order to promote breeding birds and pollinating insects, a payment could be introduced for late hay mowing instead of the making of silage. For the appearance of the landscape and tourism, an abundance of flowers is put forward as a motive for having an agri-environmental payment that is made in respect of postponed mowing in England. Austria is a country where this measure is in operation, but the detailed design of the payment needs to be investigated, since there can be a major risk of deadweight losses, if it is just those who produce hay who apply for the payment. Such a payment could possibly become part of a landscape plan aimed at, for example, increasing the heterogeneity of a landscape.

One overall conclusion from a large number of scientific studies is that species groups and individual species make different demands of their habitat. It is not therefore possible to promote all species with just one type of farming measure, even if heterogeneity and the occurrence of many different habitats benefit a large number of species. It should therefore be possible to, for example, manage pasturelands in different ways within the agri-environmental payments systems. Counselling and discussions with farmers should lead to the establishment of clear objectives for the management of individual pastures. If one wishes to encourage flowering plants and pollinating insects, the land should be relatively open and have a good variety of flowering plants (requires grazing to start late in the season). Many birds in enclosed pastures benefit from bushes, at the same time as others want open land with short vegetation and still other require higher vegetation. Varied grazing pressure in various enclosed pastures should, therefore, be a natural part of the system. If one wishes to encourage tree-dwelling insects and cryptogamae, then the presence of old trees is of course a key factor, so clearance that benefits the development of valuable trees is the most important management measure in certain areas. There should be scope for different types and intensities of management within the agri-environmental payment systems. Clearly defined objectives for the management of individual pieces of land is important so that the effects of the management and the agri-environmental payments can be evaluated. The objective "to promote biodiversity" is far too vague.

4.4 The most important results, point by point

4.4.1 The contact between farmers and the authorities

The findings of the study are, that as a general rule:

- Information should be clear, specific and not too comprehensive, as well as being written from the perspective of the farmer.
- Information that is important should also be disseminated through the farming press. However, the information that goes out via the media should be checked so that it is complete, since these publications are used more than the official brochures.
- The authority officials that meet farmers must be competent. This does not just apply to within their specific area, but with regards to the payments systems in general. Not least, the officials must be skilled in communicating and interacting.
- Farmers prefer payments that do not require major changes to their existing farm management.
- Farmers like payments that create order, and do not like those that create disorder.
- Payments that have a short commitment period or that have a back door, i.e., where it is possible to conclude the agreement mid-way through the commitment period, without the risk of sanctions, are more attractive to farmers.
- The majority of farmers would be willing to give up part of the payment in return for counselling and help with the application documents.

Figure 37. In plain districts with few species, many measures have a great chance of increasing the variety of species, but it is often just the more common species that benefit. However, these species can be important for the performance of ecosystem services. Austria

Photo: Urban Emanuelsson

4.4.2 What is needed to be able to evaluate the agri-environmental payments?

A lack of knowledge of the actual effects of the agri-environmental payments has made it difficult to evaluate them. The study has reached the following conclusions and recommendations:

- Much more basic and reference data are required than has been available to date, so that analysis of the effects of the different agri-environmental payments is possible. A functioning system can identify problems in the evaluation system, research requirements and help to improve the system both in terms of its efficiency and from an environmental point of view.
- Long-term studies are needed in order to evaluate the effects of the different agri-environmental payments. Short-term studies risk, inter alia, underestimating the effects of, for example, biodiversity, due to time-lags.
- In order to follow the development of the effects of agricultural over time, it would be worth aiming to create another all-encompassing index. This could be a combination of all-encompassing indices, indices based on the landscape composition and indices of several selected species groups, greenhouse gas emissions, or pesticide and plant nutrient leaching.

4.4.3 Which measures are missing in Sweden?

The proposals below summarise the experiences from the countries studied regarding the measures that do not yet exist but might be suitable for the Swedish rural development programme:

- In plain districts with few species, many measures have a great potential of increasing the variety of species, but it is often just the more common species that benefit. However, these species can be important for the performance of ecosystem services. There is a shortage of less intensively farmed crops (i.e., fallows, cultivated grassland) in intensively cultivated plain districts, whilst cereal crop production is insufficient for several species in Swedish forest districts dominated by cultivated grassland and fallows. It is obvious that certain agri-environmental payments are dependent on being applied in "the right type of landscape" or region. Other payments, i.e., to promote crop diversity, have the potential to benefit many species on arable and throughout the country (even if it is not possible for technical cultivation reasons to have as much diversity in the north of Sweden as in the south).
- Tall, dense vegetation and the lack of areas with low vegetation seem to be an important reason why the population of many farm birds has diminished on arable land. Agri-environmental payments for measures that create sections without or with short vegetation, i.e., unsown "sky**lark** plots" in cereal crops, would therefore be justified, if these species are to be preserved.
- Perennial fallows that are established without sowing have a positive effect on biodiversity. They are often most species-rich during the first two years of mosaic-type, herb-rich vegetation. Fallows sown with meadow mixtures generally seem to have greater positive effects on biodiversity than those sown with grass-clover mixtures. Sowing with wild varieties has a greater positive effect than sowing with similar commercial varieties, as far as the occurrence of parasites and predators of pests is concerned. Many studies have shown that fallows are positive for biodiversity, so the abolition of the obligatory percentage of fallow land has had negative effects.
- Fallows have considerably reduced plant nutrient leaching. This is due to these areas not being fertilised or ploughed. Fallows should, perhaps, be used more than they currently are, to reduce plant nutrient leaching in sensitive areas.
- Measures to reduce nutrient leaching (riparian strips, catch crops, spring

ploughing) seem to have the intended effect, but the effect of these measures on biodiversity is minor or, in some cases, unclear. They could possibly be adapted for dual objectives, from both biodiversity conservation and an reduced leaching point of view. Examples are: reduced crop density in catch crops, or species and flower-rich plant mixtures in riparian strips.

- Organic farming has generally positive effects on biodiversity, primarily as pesticides are not used. Few studies have investigated the differences in species composition between organic and conventional farming. The studies that have been carried out show that it is primarily the relatively common species that benefit from organic farming. The adoption of measures on arable land is probably not enough to save biodiversity that is under threat in the agricultural landscape. This conclusion applies, naturally, to all types of farming.
- The effect of organic farming on nutrient leaching is much debated. The yields per hectare of organic farms are normally considerably lower than that of conventional farms, and if leaching is calculated per ”produced unit” , then the effect of organic farming is, in certain cases, worse than that of conventional farming. If the calculation of the nutrient leaching is based in cultivated area, the picture is completely different. The organic farms have, on average, a somewhat lower leaching of nitrogen per hectare, but the reverse may apply for phosphorus. One conclusion is that organically cultivated crops often have a smaller negative effect than conventionally cultivated crops, per hectare, and therefore contribute less to eutrophication. Organic farming has, therefore, a less harmful effect in areas sensitive to eutrophication. Conventional farming with larger yields can, therefore, successfully be placed instead in areas that are less sensitive, from the point of view of eutrophication.
- Unsprayed border zones around fields and especially near edge zones and ditches could be an important ingredient in a new rural development programme. Since much of the positive effect for biodiversity within organic farming is due to the absence of pesticides in field borders, this measure could mean that conventional farming comes somewhat closer to organic farming, in terms of the effect that it has on biodiversity.
- The sowing of selected, regionally-suited seed mixture has the potential to increase the diversity of flowering plants in border zones, which can be of benefit to both pollinators and the predators of pests. In arable land, “butterfly borders” can be created through the sowing of flowering plants in border zones and riparian strips. One problem can be that herb-rich borders require continual disturbance of the soil, so that grass vegetation does not become dominant. The measures should be carried out at suitable points in time and adapted depending on the soil’s sensitivity to nutrient leaching.
- A mosaic of the various disturbance regimes employed within a particular landscape is required. Certain bird species and soil-dwelling insects need areas with short vegetation and intensive maintenance, whilst pollinators and certain plant species to not benefit from this. It is important that heterogeneity of management and vegetation is created both within pastureland and at landscape level, if species with different requirements are to coexist in in the same landscape. For the greatest possible positive effect to be achieved, this requires planning (which should be rewarded) of the management of the grassland at farm and landscape level.

- The definitions of pasture are a bureaucratic construction, and the farmers should not need to know all the details of these.
- The definition of pasture should be changed since it creates problems on many fronts, including: the value of trees, mosaic structure in pastures, the ability to see the land from a landscape perspective, and in terms of confidence in the payment system.

4.4.4 Which aspects of the agri-environmental payments practises of other countries can we adopt?

The compilation below lists agri-environmental payments in the rural development programmes of the countries studied that could be suitable for the Swedish programme.

Denmark:

- Payment for the preservation and cultivation of older types of agricultural crops (similar to Sweden's payment for threatened livestock breeds).
- Rows of bushes to prevent wind erosion, snow drifts, and to improve the conditions for biodiversity in plain districts.

England:

- Ambitious payment system for increased accessibility in the countryside.
- Payment for professional help with a management plan for the higher level form of payment - HLS.
- Pedagogic presentation of the payment programme, despite its many details.
- Flexible system with points (major risk for deadweight losses however, i.e., farmers choose payment for that which they already do, or that which is easiest to implement, instead of that which would have the best effect).
- Plant genetic resources – payments based on the number of varieties of domestic apples that are grown.

Finland:

- Fallows have been shown to be by far the most effective measure used to reduce plant nutrient leaching and to increase biodiversity in the landscapes dominated by agriculture. In order for these to have the maximal effect, they should be left to lie for several years, but not for too long, as their positive effect on biodiversity reduces over time.
- In Finland, the market has driven farming towards intensification at a fast rate and the rural development programme has been unable to slow this down. Despite measures to reduce leaching of plant nutrients and preserve biologically important habitats, there have been negative long-term trends in these areas. Possibilities must be created to pay for that which the society demands, rather than motivating farmers with compensation for their costs and the work they carry out.

France:

- Like England, France has a great number of measures, some of which could possibly be candidates for payments within, for example, the Swedish, regionlized scheme "Selected environments" (the French payments have, however, been poorly evaluated).

- Payment for the management of periodically flooded areas.
- Regionalisation of payments. It is possible to simplify matters for farmers by just giving them information regarding the payments that exist and that may be applied for within their region. Furthermore, the agri-environmental payments can then be adapted to regional conditions.

Switzerland:

- Border zones covered with flower-rich mixtures, free of spraying and fertilisers. They should be established around pre-determined structures.
- Use of meadows for bedding straw production.

Austria:

- Payment for refraining from making silage, i.e., payment for hay-making instead of silage. This is to benefit pollinators and ground-nesting birds.
- Payment for the preservation of traditional plant varieties through an integrated preservation programme (cf., POM[15] in Sweden)

Figure 38. With more regionalised payments, information provided to farmers can be simplified and the measures can be adapted more efficiently.
Photo: Urban Emanuelsson

4.4.5 Issues for ongoing investigation

The investigation shows that auditors and researchers should be included more systematically and involved earlier in the processes of designing the rural development programme. This would make it possible, in a cost-effective manner, to study and assess the effects of the funds invested into agri-environmental payments. The reporting of the effects of the resources invested should be as natural as the financial reporting of the funds that are paid out. As a result, each measure would be clearly monitored, right from its inception.

The authors proposed ongoing investigation of:

- Base payments that are obligatory and regionally differentiated.
- Increased counselling at farm level.
- That farm plans are established, on which landscape measures can then be based.
- The creation of a back door for commitments, whereby the farmer can relinquish their commitment ahead of time, at the same time as they relinquish their right to a “payment bonus”.
- Transition to value-based payments instead of just cost-based payments.

15 The scheme for conservation of traditional plant varieties within the Swedish Rural Development Programme.

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Appendix 1

Agri-environmental payments in England's rural development programme

Payments within Entry Level Stewardship (ELS)

Compulsory Requirements

Farm Environment Record

Options for boundary features

Hedgerow management on both sides of a hedge
Hedgerow management on one side of a hedge
Enhanced hedgerow management
Stone-faced hedgerow management on both sides
Stone-faced hedgerow management on one side
Ditch management
Half ditch management
Combined hedge and ditch management
Stone wall protection and maintenance
Earth bank management on both sides
Earth bank management on one side

Options for trees and woodland

Protection of in-field trees on arable land
Protection of in-field trees on grassland
Maintenance of woodland fences
Management of woodland edges
Establishment of hedgerow trees by tagging
Hedgerow tree buffer strips on cultivated land
Hedgerow tree buffer strips on grassland

Options for historic and landscape features

Maintenance of weatherproof traditional farm buildings
Take out of cultivation archaeological features currently on cultivated land
Reduced-depth, non-inversion cultivation on archaeological features (minimum till)
Management of scrub on archaeological features
Management of archaeological features on grassland

Options for buffer strips

2 m buffer strips on cultivated land
4 m buffer strips on cultivated land
6 m buffer strips on cultivated land
2 m buffer strips on intensive grassland

4 m buffer strips on intensive grassland
6 m buffer strips on intensive grassland
Buffering in-field ponds in improved permanent grassland
Buffering in-field ponds in arable land
6 m buffer strips on cultivated land next to a watercourse
6 m buffer strips on intensive grassland next to a watercourse

Options for arable land

Management of field corners Wild bird seed mixture
Nectar flower mixture
Overwintered stubble
Beetle banks
Skylark plots
Unfertilised cereal headlands
Unharvested cereal headlands
Uncropped cultivated margins for rare plants
Uncropped cultivated areas for ground-nesting birds on arable land
Reduced herbicide cereal crops followed by overwintered stubble
Extended overwintered stubble

Options to encourage a range of crop types

Undersown spring cereals
Wild bird seed mixture in grassland areas
Nectar flower mixture in grassland areas
Cereals for whole-crop silage followed by overwintered stubble

Options to protect soil and water

Management of maize crops to reduce soil erosion
In-field grass areas to prevent erosion and run-off
12 m buffer strips for watercourses on cultivated land
Enhanced management of maize crops to reduce soil erosion and run-off
Maintenance of watercourse fencing
Winter cover crops

Options for grassland outside the Severely Disadvantaged Areas (SDAs)

Take field corners out of management Permanent grassland with low inputs
Permanent grassland with very low inputs Management of rush pastures
Option for mixed stocking on grassland
Mixed stocking

Options for grassland and moorland inside the Severely Disadvantaged Areas (SDAs)

Take field corners out of management in SDAs Permanent grassland with low inputs in SDAs Permanent grassland with very low inputs in SDAs Management of rush pastures in SDAs
Enclosed rough grazing
Unenclosed moorland rough grazing

Payments within High Level Stewardship (HLS)

Options for boundary features

Management of hedgerows of very high environmental value (both sides) Management of hedgerows of very high environmental value (one side) Management of ditches of very high environmental value

Options for trees, woodland and scrub

Ancient trees in arable fields
Ancient trees in intensively managed grass fields Maintenance of wood pasture and parkland Restoration of wood pasture and parkland Creation of wood pasture
Maintenance of woodland
Restoration of woodland
Creation of woodland in Severely Disadvantaged Areas Creation of woodland outside Severely Disadvantaged Areas Maintenance of successional areas and scrub
Restoration of successional areas and scrub
Creation of successional areas and scrub

Supplements

Woodland livestock exclusion supplement

Options for orchards

Maintenance of high-value traditional orchards
Restoration of traditional orchards
Maintenance of traditional orchards in production
Creation of traditional orchards

Options for historic and landscape features

Crop establishment by direct drilling (non-rotational)
Arable reversion by natural regeneration
Maintaining high water levels to protect archaeology
Maintenance of designed/engineered water bodies
Maintenance of traditional water meadows
Restoration of traditional water meadows

Options for arable land

Floristically enhanced grass buffer strips (non-rotational)
Enhanced wild bird seed mix plots (rotational or non-rotational)
Unharvested, fertiliser-free conservation headland
Cultivated fallow plots or margins for arable plants (rotational or non-rotational)
Brassica fodder crops followed by overwintered stubble
Fodder crop management to retain or recreate an arable mosaic
Low-input spring cereal to retain or recreate an arable mosaic

Options to protect soil and water

Arable reversion to unfertilised grassland to prevent erosion or run-off
Arable reversion to grassland with low fertiliser input to prevent erosion or run-off
Preventing erosion or run-off from intensively managed, improved grassland
Seasonal livestock removal on grassland with no input restriction

Supplements

Nil fertiliser supplement

Options for grassland

Species-rich, semi-natural grassland

Maintenance of species-rich, semi-natural grassland
Restoration of species-rich, semi-natural grassland
Creation of species-rich, semi-natural grassland

Management of wet grassland for waders and wildfowl

Maintenance of wet grassland for breeding waders
Maintenance of wet grassland for wintering waders and wildfowl
Restoration of wet grassland for breeding waders
Restoration of wet grassland for wintering waders and wildfowl
Creation of wet grassland for breeding waders
Creation of wet grassland for wintering waders and wildfowl

Management of grassland for target features

Maintenance of grassland for target features
Restoration of grassland for target features
Creation of grassland for target features

Buffer strips

Enhanced strips for target species on intensive grassland

Supplements

Haymaking supplement
Raised water levels supplement
Inundation grassland supplement

Options for moorland and upland rough grazing

Maintenance of moorland
Restoration of moorland
Creation of upland heathland
Maintenance of rough grazing for birds
Restoration of rough grazing for birds

Supplements

Supplement for management of heather, gorse and grass by burning, cutting or swiping
Moorland re-wetting supplement
Seasonal livestock exclusion supplement

Options for access

Linear and open access – base payment
Permissive open access

Permissive linear access

Permissive footpath access
Permissive bridleway/cycle path access
Upgrading Countryside and Rights of Way (CRoW) Act access for cyclists/horses
Access for people with reduced mobility
Upgrading Countryside and Rights of Way (CRoW) Act access for people with reduced mobility

Educational access

Educational access – base payment
Educational access – payment per visit

Options for lowland heathland

Maintenance of lowland heathland Restoration of lowland heathland
Restoration of forestry areas to lowland heathland
Creation of lowland heathland from arable or improved grassland
Creation of lowland heathland on worked mineral sites

Options for inter-tidal and coastal locations

Sand dunes and vegetated shingle systems

Maintenance of sand dunes
Restoration of sand dunes
Creation of coastal vegetated shingle and sand dunes on arable land
Creation of coastal vegetated shingle and sand dunes on grassland

Salt marsh, mudflats and saline lagoons

Maintenance of coastal salt marsh
Restoration of coastal salt marsh
Creation of inter-tidal and saline habitat on arable land
Creation of inter-tidal and saline habitat on grassland
Creation of inter-tidal and saline habitat by non-intervention

Supplements

Supplement for extensive grazing on salt marsh
Salt marsh livestock exclusion supplement

Options for wetland

Ponds

Maintenance of ponds of high wildlife value (less than 100 m2)
Maintenance of ponds of high wildlife value (more than 100 m2)

Reed beds

Maintenance of reed beds
Restoration of reed beds
Creation of reed beds

Fens

Maintenance of fen
Restoration of fen
Creation of fen

Lowland raised bogs

Maintenance of lowland raised bog
Restoration of lowland raised bog

Supplements

Wetland cutting supplement
Wetland grazing supplement

Additional supplements

Shepherding supplement
Cattle grazing supplement
Native breeds at risk grazing supplement
Supplement for control of invasive plant species
Bracken control supplement
Supplement for small fields
Supplement for difficult sites
Supplement for group applications

Extra measures within High Level Stewardship (HLS)

Boundaries

Hedgerow restoration including laying, coppicing and gapping up
Hedgerow planting – new hedges
Hedgerow supplement – removal of old fence lines
Hedgerow supplement – substantial pre-work
Hedgerow supplement – top binding and staking
Stone wall restoration
Stone wall supplement – stone from holding
Stone wall supplement – stone from quarry
Stone wall supplement – difficult sites
Stone wall supplement – top wiring
Stone-faced hedge bank repair
Stone-faced hedge bank restoration
Earth bank restoration
Creation of new earth banks
Casting up supplement – hedge bank options
Ditch, dyke and rhine restoration

Items associated with tree planting and management

Spiral rabbit guards
Tree and shrub – whips and transplants plus planting
Tree tube and stake
Standard parkland tree/hedgerow tree and planting
Parkland tree guard – post and wire (wood)

Welded steel tree guard
Identification of orchard fruit tree varieties
Planting fruit trees
Orchard tree guard (tube and mesh)
Orchard tree guard (cattle proof)
Orchard tree guard (sheep proof) Orchard tree pruning
Coppicing bankside trees
Tree surgery, minor – to include minor pollarding
Tree surgery, major – to include major pollarding
Tree removal

Fencing in association with conservation work

Sheep fencing Post and wire Deer fencing
Rabbit fencing supplement
Permanent electric fencing
Fencing supplement – difficult sites
High-tensile fencing

Historic features

Historical and archaeological feature protection
Restoration of historic buildings

Landscape items

Wooden field/river gate
Stone gate post
Removal of eyesore
Wooden wings for gates

Resource protection

Cross-drains under farm tracks
Relocation of gates
Hard base for livestock drinker
Hard base for livestock feeder

Reversion – heathland, grass, meadow

Native seed mix
Major preparatory work for heathland recreation

Re-introduction of livestock

Cattle drinking bay
Cattle grids Water supply Water trough
Livestock handling facilities

Upland management

Grip blocking drainage channels
Grip blocking on difficult sites

Scrub and bracken control

Scrub management – base payment
Scrub management – less than 25 % cover
Scrub management – 25 % to 75 % cover

Scrub management – over 75 % cover
Mechanical bracken control – base payment
Mechanical bracken control – area payment
Chemical bracken control – base payment
Chemical bracken control – area payment
Difficult site supplement for bracken and scrub control

Access

Hard standing for car parking
Hard standing for disabled paths
Bridle gate
Kissing gate
Kissing gate for disabled access
Dog gate Timber stile Ladder stile
Step over stile in a stone wall
Step through stile in stone wall
Wooden footbridge
Bench
Helping prepare Teachers' Information Pack

Items associated with wetlands

Creation of ditches – rhines and dykes
Creation of gutters
Soil bund
Culvert
Timber sluice
Brick, stone or concrete sluice
Creation of temporary ponds – first 100 m2
Creation of temporary ponds – over 100 m2
Silt trap provision
Wind pumps for water-level measures
Drove improvement
Construction of water-penning structures

Ponds

Pond creation – first 100 m2
Pond creation – over 100 m2
Pond restoration – first 100 m2
Pond restoration – over 100 m2

Species

Otter holt – log construction
Otter holt – pipe and chamber construction
Bat/bird box
Bird strike markers
Small mammal boxes
Badger gates

Payment for advice

Professional help with implementation plan

Other environmental issues

Special projects

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