

Integrating meadow bird conservation and agriculture in an effective and innovative way



Commissioner

Klaas Sietse Spoelstra, Living Lab

Team members

Willem Aberson
Sanne Benjamins
Jens van Erp
Marko Fumic
Qianqian Jiang
Irene Klaver
Bastiaan Vergouw

25-06-2015

This report is produced by students of Wageningen University as a part of their MSc-programme.

It is not an official publication of Wageningen University or Wageningen UR and the content herein does not represent any formal position or representation by Wageningen University.

'Copyright © 2015. All rights reserved. No part of this publication may be reproduced or distributed in any form of by any means, without the prior consent of the authors.'

Profitable nature-inclusive dairy farming: how to integrate nature and agriculture in an effective and innovative way?

Executive summary

The Netherlands is an important breeding destination for meadow birds. However, the population size of meadow birds has shown a decline since the 1960s. The decline could be related to intensification of farming. This study focuses on factors in farming practices, which lead to successfully integrating meadow bird conservation into dairy farming and the reasons these practices are not widely implemented yet. To get an overview of existing agro-environmental schemes, SWOT analyses are done on 20 of those schemes. Also, in-depth interviews are held with farmers and experts to gain their insights. From this, an advice is composed on how meadow bird conservation could be improved in the Netherlands.

Firstly, it is advised to improve communication, by sharing knowledge between stakeholders. This could be done through focus groups. Agricultural nature associations (or ANVs) can be useful for this as they could organise meetings at the start and at the end of the breeding season, where stakeholders can discuss their results and talk about problems they ran into. An online platform could also be created to exchange knowledge.

A second point of advice concerns education. More education on nature-inclusive farming should be given at agricultural schools to inform young farmers. General awareness should be created in society, through education and excursions on primary- and high schools.

The third topic is policies. It is advised to provide contracts that are suitable for different types of farmers. Short-term contracts when farmers start, and long-term contracts if farmers are already applying nature conservation for a longer time to provide security. Also, policies from nature conservation organisations should be more in line with meadow bird conservation in important areas. Payments should be result-based and not management-based. Private parties should also be involved to fund the schemes next to the government. Companies could be involved to gain 'green' publicity.

Finally, technologies can be used to aid conservation of meadow birds. GPS systems can be installed in tractors, which can be used to mark and detect nests. Also, drones can be used to find nests. Next to that, drones are able to investigate the suitability of certain areas of the Netherlands for meadow birds. This spatial planning could provide knowledge on which farmers are important to apply meadow bird conservation. Contractors, who are usually considered a threat to meadow bird conservation, could implement the described technologies into their business model, distinguishing themselves as meadow bird friendly.

Summary

Meadow birds are dependent on meadows in the Netherlands, because they use these meadows to breed. Bird population size, especially of the godwit, has been decreasing since the 1960s. One factor for this decline is the intensification of agricultural practices. Biodiversity in general is declining in pastures causing both key species and a part of Dutch culture to disappear. Legislation has been adopted to counter the decline of nature, but this does not always comply with the business model of farmers, who focus on productivity in a very competitive market. Living Lab, an initiative of Kening fan 'e Greide, commissioned this project to find ways to integrate meadow bird conservation and agriculture in an effective and innovative way. This report aims to answer the question: 'What factors in farming practices lead to successfully integrating meadow bird conservation into dairy farming and what are the reasons these practices are not widely implemented yet?' To do this, analyses of different existing nature conservation schemes were done and interviews were held with experts and both farmers who apply nature conservation and those who do not. In total, 4 farmers applying meadow bird conservation were interviewed, 5 farmers who did not apply meadow bird conservation and 7 experts from different institutes were interviewed. These interviews were found to provide sufficient information to get an overview and identify main strengths and weaknesses. Twenty agro-environmental schemes were analysed, located in the Netherlands, Germany, France, Ireland, Switzerland, the UK and the USA. Innovative possibilities and technologies which provide potential new ways of implementing meadow bird protection were also looked at.

It was found that nearly all interviewees considered meadow birds as an important part of Dutch culture. At the moment, education on conservation is only given to farmers participating in some schemes and volunteers. All participating farmers note that nothing is taught during the education. General awareness for the problem is also lacking and should be increased. Multiple farmers indicate voluntary work is important for the success of a conservation scheme, while contractors generally are considered to have a negative effect because of their use of big machines and focus on time-efficiency. Multiple practices exist for protection of meadow birds, for example: creating wet patches, delayed mowing and nest protection by tracing the nests.

However, from the interviews it is found that meadow bird protection measures are hardly ever generally applicable. The scale of organisation and the focus on the short-term is a problem for the success of nature conservation. A knowledge gap exists between farmers, experts and government. According to most interviewees, communication has to be improved to solve this problem. Analyses of schemes also clearly indicated the importance of knowledge and its distribution. Multiple examples exist on how to better involve farmers with the scheme they are participating in, e.g. helping to monitor the results. Monitoring in general is an issue, as often it is not done systematically and scientific evaluation of schemes is often lacking. The analyses of the schemes also showed the importance of involving the community in nature conservation, as this saves time and money, and creates incentive for farmers. Result-based schemes were found to be very effective, as they give farmers the freedom to manage their pastures in the way they prefer. In that case, clear goals (e.g. the amount of pairs of meadow birds) have to be set to allow for clear monitoring. The schemes

showed the downside of long-term contracts, as farmers who are not familiar with meadow bird conservation can feel unwilling to commit to a project for a long period. To summarise, returning problems are a lack of education and bad communication. Agricultural nature associations (or ANVs) have proven to be very useful in acting as a link between government, farmers, experts and the community.

Mixed opinions exist on the financial aspect of nature conservation. Most farmers do not agree with the management-based payment system and regard it as one of the main reasons for not participating in schemes. Result-based payments would be much more appreciated. Increasing payments might make farmers more willing to implement nature conservation, but more money should also be used to aid volunteers in participating. Increasing the price of meadow bird products can compensate for the extra work spend on conservation, but this is a niche market. Farmers think they would greatly benefit from long-term contracts. As policy changes every few years, farmers are now reluctant to make big changes in their management and experts agree with this. Most experts also mention that most farmers focus on productivity, and need a change in mindset towards working with nature. Experts also state banks can accommodate in this. Big corporations like FrieslandCampina should, according to them, be more proactive in meadow bird conservation. Furthermore, farmers see predators as a major threat to meadow birds, which they cannot do a lot about since the predators themselves are also protected. They claim meadow birds are low on the priority list of nature conservation organisations. FrieslandCampina, as a major stakeholder, does not focus on meadow bird protection directly but on biodiversity in general and habitat quality. Farmers think the subsidies given are economically non-viable and have an own system where farmers get a premium for their milk when they fulfil environmental requirements set by FrieslandCampina. Funding also goes towards research dedicated to milk produced in biodiverse meadows. Analyses of the schemes showed governmental funding is heavily relied on to keep projects running. If this funding is terminated, it will likely lead to failure of the scheme. It was found in several schemes, that involvement of academic institutions creates understanding for the need of nature-inclusive farming and provides solid scientific evidence for the success or failure of certain conservation practices. An external factor which could be a major influence on schemes are developments on the global market. The financing of schemes is a major external influence, together with changing policies, which threaten the adaptation of nature-inclusive management.

With farming equipment developing at a high rate, it is interesting to look at innovative technologies for meadow bird protection. Both nest tracking and predator control were looked at. At the moment, nests are found manually and marked either with poles or by GPS. Drones are unmanned, remotely controlled, aerial platforms, and developments on them are promising. Using sensory equipment, they can be used to check farmlands on suitability, track wildlife and find bird nests. Visual cameras can be programmed to detect movement using visual saliency, and could be used to track birds. Thermal imaging is also a promising technology, as thermal cameras do not need an external light source or a direct line of sight. Data processing would allow a system to track nests and automatically stop farming equipment before they reach a nest. Both systems could be mounted on drones or farming equipment. For predator control, only non-lethal measures are suitable as most predators are protected species

themselves. Rosters can be used to fend off foxes and badgers, but installation has proven to be labour-intensive and thus costly.

For the advice, the produced results are looked at primarily, but creativity to come up with possible solutions for meadow bird conservation is also used, as this was asked by the commissioner. Knowledge exists on practices of meadow bird conservation, but a lack of communication between the different stakeholders often causes failure of projects. Communication should be improved both on a horizontal and vertical level, and agricultural nature associations have proven to be ideally positioned to do this job and act as a link between the stakeholders. Meetings, conferences and focus groups could bring people together to create mutual understanding. An online platform could greatly benefit all parties by serving as a portal to get in contact with each other and as an archive with all the information needed on nature conservation practices.

Another factor which needs attention is the education of farmers. Meadow bird conservation should be a part of schooling for young farmers to create a better understanding of the problem. General education in primary- or high schools should also include the subject to create awareness for the problem. For the current generation this can be done through involvement, either by involving activities like hiking routes or participation in conservation schemes. This also creates incentive for farmers, as they get more recognition for their work. An online application could be used to reach the general public, combining entertainment with education.

Contracts could be divided into short-term and long-term. This will provide a choice for farmers between 'testing out' nature conservation without too much commitment, or insurance their investments will pay off due to long-term contracts. Again, agricultural nature associations could prove an important link to decide upon which contracts are right for which farmers. In order to give farmers the freedom they prefer, result-based management should be adopted. Farmers can decide for themselves what practices they adopt, as long as the goals agreed upon are met. Goals should be straightforward (e.g. a number of indicator species present) to clearly indicate whether they are reached or not.

Agricultural nature associations can play a role in dividing payment for schemes between farmers. Their position allows them to ascertain the progress of farmers, assess the situation and create a dialogue between government and farmers create understanding of why certain goals have been reached or not. A 'last-minute' fund could help farmers with large investments, which would otherwise hinder participation in a scheme. Third parties could be involved in financing schemes, getting 'green' publicity in return. Banks could provide low-interest credit for farmers willing to invest in sustainable developments.

More research has to be done in order to see whether drones and visual or thermal cameras can prove beneficial for meadow bird conservation. All technologies look promising but have yet to be tested on a commercial scale. GPS systems to keep track of nests are already used and combination with new tracking technologies could decrease the labour-intensity of finding nests. Predators are a clear threat to meadow birds, fencing can be used to keep foxes and badgers from pastures. Contractors are seen as a threat for meadow-bird conservation, because of their focus on time-efficiency. 'Meadow bird friendly' contractors could find a niche in providing more nature friendly services.

Table of Contents

Executive summary	2
Summary	3
List of abbreviations.....	7
Overview of measures that can be taken to improve meadow bird conservation .	8
Nature conservation subsidy system in the Netherlands	10
1. Introduction	11
2. Methodology	13
2.1 Schemes	13
2.2 Interviews	15
2.3 Integration	16
3. Results	17
3.1 Internal	17
3.1.1 Interviews	17
3.1.2 Schemes	19
3.1.3 Integration	22
3.2 External	22
3.2.1 Interview	22
3.2.2 Schemes	24
3.2.3 Integration	24
3.3 Innovative technologies	25
4. Advice	27
4.1 Communication	27
4.2 Education	28
4.3 Policies	28
4.4 Financial/Subsidies	29
4.5 Techniques	29
5. Final remarks	31
References	32
Appendix A	38
Appendix E	62

List of abbreviations

In this section a list of abbreviations is stated, which are used in this report.

AES: Agro-environmental schemes. This is a short name for schemes that are made by nature conservation organisations and the government.

ANV: Agrarische natuurvereniging. A cooperative of farmers that implement nature-inclusive dairy farming in some way.

BFVW: Bond Friese Vogelwachten. Organisation based on volunteers with the objective to protect the flora and fauna in the Netherlands, especially in Friesland.

CAP: Common agricultural policy. Financing from the European Union.

DAJK: Drents Agrarisch Jongeren Contact, organisation that young farmers can be a member of. Lectures and excursions are held to spread knowledge to members.

ECA: Ecological compensation area.

ELS: Entry-level scheme. When farmers just provide the minimum amount of work in according to nature-inclusive farming, to get a subsidy.

ENP: Ergebnisorientierter Naturschutzplan. This is a result-based nature conservation plan.

EU: European Union.

GIS: Geographic information system.

LEI: Landbouw-economisch instituut, research institute working together with Wageningen University and Research Centre.

LTO: Land- en Tuinbouw Organisatie. This organisation represents the interests of agricultural entrepreneurs.

MEA: Ministry of Economic Affairs.

NNN: Natuur Netwerk Nederland/Nationaal Natuur Netwerk. Different nature conservation areas spread through the Netherlands, which are treated as one large nature conservation area.

NVWA: Nederlandse Voedsel- en Waren Autoriteit.

PBR: Payment-by-result.

SBB: Staatsbosbeheer, nature conservation organisation that operates for the government.

SCAN: Stichting Collectief Agrarisch Natuurbeheer. An information channel

Profitable nature-inclusive dairy farming: how to integrate nature and agriculture in an effective and innovative way?

providing ANV's with information on developments in nature-inclusive farming.
SNL: Subsidiestelsel Natuur en Landschap, subsidy system for nature conservation in the Netherlands.

VANL: Vereniging Agrarisch Natuur- en Landschapsbeheer. This is another a type of ANV.

WWF: World Wildlife Fund. Worldwide organisation with the objective to protect nature.

Overview of measures that can be taken to improve meadow bird conservation

This chapter will describe a number of key measures taken by farmers to improve meadow bird conservation. This list is provided to clarify the terms and characteristics of these measures before the report commences.

First, measures that were taken to improve the amount of meadow birds were mostly nest protection. However, it became clear that even when the nests were protected, the little chicks still struggled to survive. Different measures should be taken to protect the chicks (Teunissen and Willems, 2004).

It is important to know what a suitable habitat for a meadow bird should look like. Openness of the environment is an important factor. Lapwings and oystercatchers have the tendency to move to little bushes for some shelter, but other species are often found in the open field. Rest is a second feature that is important, especially for the godwit and the skylark. If there are roads, lights or other disturbances, these birds will move away (Oosterveld and Altenburg, 2004). Different measures that farmers can take to protect meadow birds are stated below.

Placing sticks to mark nests or to expel meadow birds that are present

When a farmer wants to mow particular parts of his land where meadow bird families are living, sticks could be placed to mark the nests. After this, the farmer (or contractor) is able to see where these sticks are, and is able to mow around this nest or replace the nest. When a farmer's intention is to mow after the eggs have hatched, it is also possible to place sticks with plastic bags attached. This will scare most meadow bird families off, and the mowing equipment will not kill chicks (Teunissen and Willems, 2004). Research from Teunissen and Willems (2004) showed that 70% of the present meadow bird families moved away after placing sticks with plastic bags in the parcels for 24 hours.

Alternative mowing strategies

Mowing pattern

To drive the meadow bird families off to a safe parcel of land, mowing pattern can be adjusted. Starting from the inside, working to the outside drives the meadow birds into the right direction. The chance that the meadow birds are in

front of your mowing equipment the next round is lower in this way (Teunissen and Willems, 2004).

Mosaic-management

Mosaic-management means that farmers do not mow all their grassland at the same time, but divide this and mow the land in different periods. In this way, there is always long grass for the meadow birds and their chicks to hide in (Oosterveld and Altenburg, 2004).

Creating strips of land that are not mowed, often next to ditches (Ditch side management)

These strips of land are not mowed when farmers mow for the first time. This is often a few metres on the side of a ditch. This creates an area for the meadow birds where they can flee to and hide in (Brouwer, 2005).

Delayed mowing

Certain parts of the land are not mowed before a certain time (often the 15th of June), to prevent nests being destroyed by the tractor and mowing equipment. This is because certain meadow bird species, like the godwit, need long grass (>18 cm) for their chicks to hide in. So, if a part of the parcels is mowed later than the 15th of June, godwits have a higher chance to survive (Oosterveld and Altenburg, 2004).

Creating patches of wetland

To provide in wet environment for the meadow birds, farmers put water on their lands. This causes wet patches to develop which meadow birds prefer (Brouwer, 2005).

A higher water-level on parcels

High water-levels on parcels is something that is important for the biotope of meadow birds. It is known that they prefer high water levels to find their feed (Brouwer, 2005; Teunissen *et al.*, 2005).

Herb-rich grassland

When there are more herbs in the grassland, more insects are attracted. These insects, that live on the herbs and plants are a good source of feed for young chicks, because they are not able to peck into the soil yet. Adult birds often have a preference for regular grassland which is fertilised more often. Adult meadow birds prefer this, because they use worms as a staple food, which are found more abundantly in grassland that is fertilised more often (Oosterveld and Altenburg, 2004).

Spreading of solid manure

The spreading of solid manure (sometimes mixed with straw) is an optimal fertiliser to provide enough feed for meadow birds. This solid manure lays on the surface of land which attracts insects. When slurry is injected, it has been shown that worms withdraw from the first 10 centimetres of the soil and this is how far the godwit can reach with her beak (Oosterveld and Altenburg, 2004).

Preventing predation

In the Netherlands, there are many animals that feed on the chicks of meadow

birds. Examples are: the blue heron, black crow, weasel, birds of prey and the fox. Predation is causing 24-27% of the losses of eggs; this is approximately two times more than the losses that are caused by farming equipment, according to Teunissen *et al.* (2005). The prevention of predation is dependent on possibilities and restrictions that are given by the law and nature conservation organisations (Brouwer, 2005).

Nature conservation subsidy system in the Netherlands

Within the Netherlands, the different provinces have the freedom to decide on what projects they want to invest money. This goes in accordance with each other as provinces, the government and managers of different nature conservation areas. The government provides money, together with the European Union, and this subsidy system is abbreviated with SNL (Subsidiestelsel Natuur en Landschap). Provinces are responsible for the quality of nature in the Netherlands, with for example the maintenance of the Natura-2000 areas and the Natuur Netwerk Nederland (NNN), which was formerly called the Ecologische Hoofd Structuur. This SNL is given to three different groups of nature conservation initiatives; landscape-management, agricultural nature-management and nature-management. When a request for subsidy is accepted, the subsidy will be given for the coming six years.

Some rearrangements on the subsidy system are being made in the Netherlands, this is called Agrarisch Natuur- en Landschapsbeheer 2016. This rearrangement asks for a higher effectivity and larger collectives to work together. From the first of January 2016 on, only certified collectives are allowed to ask for subsidies. So, if an initiative has been made, farmers and organisations have to work together to get a subsidy for agricultural nature-management. This is to improve the collaboration between farmers, because it is more effective to work with more farmers instead of one farmer in the area changing his/her management (Bijl, 2015)

Polman *et al.* (2015) analysed in what ways effective (profitable) agriculture could be combined with nature-inclusive farming. The main pillars in which ideas are ascribed were: 'collaboration', 'broadening', 'intensive and nature' and lastly 'extensive and nature'. With the interviews on farmers that did not actively manage meadow bird conservation (see Appendix C), it was found that most intensive farmers found it hard to imagine nature-inclusive farming in their management plan. This was considered the most interesting group within this project. Examples that were given in the report of Polman *et al.* (2015) showed that farmers need to change their mindset. There is a need for solution-based thinking, in this way the use of natural grassland is applicable for intensive dairy farmers.

1. Introduction

Meadow birds are dependent on meadows in the Netherlands, because they use these meadows to breed. Bird population size, especially of the godwit, has been decreasing since the 1960s. The godwit, according to some, has also become part of the Dutch culture. These bird species are heavily dependent on meadows to breed (Ecomare, 2015) and some species are migrating from as far as Western Africa to breed in the Netherlands (Beintema and Drost, 1986). Because of their dependency on this biotope, meadow birds (of which 47% to 80% of the European population breeds in the Netherlands (Thorup, 2006; Kening fan 'e Greide, 2015)) are used as an indicator species to observe the status of nature in the Netherlands.

Since the 1960s, the godwit population is estimated to have decreased by 75% (Kening fan 'e Greide, 2015). Though it is not entirely clear which factors are dominant, modern agriculture has had a negative impact on population size (Groen *et al.*, 2012). Agricultural trends since the 1960s have seen intensification of agriculture, increase of farm size, a change in grassland management and an increase in milk production. The result of intensive farming is the disappearance of meadows suitable for breeding. Breeding success greatly decreases on intensively used agricultural parcels (Kentie *et al.*, 2011). The problem is not just nature-related; parts of Dutch culture and heritage connected to meadow birds are also in danger of disappearance. To counter this trend, European, nationwide and regional legislation has been introduced with the aim of reducing pressure on nature and incorporating it with agriculture. However, changing a farmer's business model to include nature conservation proves difficult, as it does not always comply with modern intensive farming practices. Not all farmers are keen to change their practices. They are, however, more likely willing to comply with new measures when they include proper incentive schemes (Sanders *et al.*, 2013).

Living Lab is an initiative of Kening fan 'e Greide (or King of the Meadow), which is a citizen initiative created in 2011. The organisation tries to identify and solve problems associated with meadow birds. Kening fan 'e Greide looks at new ways to solve this issue and believes in a multidisciplinary, bottom-up approach (Kening fan 'e Greide, 2015). This report is commissioned by Living Lab. The goal of this project is to find ways to integrate nature and agriculture in an effective and innovative way. This will be done by analysing agro-environmental schemes with a similar goal that have been conducted within the Netherlands or in other places in Europe. Next to those, interviews with a number of farmers and experts are held in order to gain more insights into farming practice. Learning from past and current practices will provide insights into what does and does not work. From this, an advice on how to move forward will be provided to Living Lab. Therefore, the main research question that will be answered in this report is as follows; *'What factors in farming practices lead to successfully integrating meadow bird conservation into dairy farming and what are the reasons these practices are not widely implemented yet?'* Effective nature-inclusive dairy farming is defined as being profitable while at the same time restoring and preserving nature. In this report, nature will be defined as is directed by the commissioner; it means having an intact biotope for which the godwit is considered an indicator species.

In the following chapter, the methodology used in order to obtain results and answer the research question will be described. This is followed by a chapter summarising the obtained results. A chapter providing the advice, based on the results, will be presented after the results. Some concluding remarks on the research will be given and finally a pamphlet is created to show the content of the project in a concise manner (see Appendix E).

2. Methodology

In order to provide a comprehensive advice, a systematic approach is devised. This chapter will provide the methodology used during this project. Information was gathered in three separate ways. First, existing schemes on meadow bird conservation on farmland have been selected and examined. At the same time, primary data was collected by means of interviews with stakeholders and experts in the field. In addition to this, a literature review on innovative technologies was done. Data from these sources was concurrently analysed, which led to an understanding of successes and failures of schemes attempted so far, as well as being able to provide innovative advice for future projects.

2.1 Schemes

Existing agro-environmental schemes were chosen to be analysed according to a number of criteria. These criteria were purposefully kept broad so as not to miss any potential insights. First, the researched cases had to involve including nature into the farming practice. Secondly, they needed to deal with multiple stakeholders, as this resembles the difficulties encountered in the case of this study. Finally, sufficient information had to be available to make a relevant contribution to the study. Many schemes have been done, but not reported on properly. The focus was on national as well as international schemes to get a full scope of existing solutions and challenges and not to be limited by the insights that are common in the Netherlands. In the end, 20 different agro-environmental schemes have been examined. They were located in the Netherlands, Germany, France, Ireland, Switzerland, the UK and the USA.

In order to analyse the selected schemes, SWOT analyses were conducted on each separate scheme. Conceptually, the SWOT analysis is a tool used to analyse the internal and external environment of enterprises, organisations or, as in this case, agro-environmental schemes. It is carried out in order to obtain systematic background information for strategic decision making (Knierim and Nowicki, 2010, Abdi *et al.*, 2011). A SWOT analysis identifies strengths, weaknesses, opportunities and threats and can provide helpful information when identifying priorities in conservation efforts. They can also help define management strategies to assure biodiversity conservation (Scolozzi *et al.*, 2014). Using a SWOT analysis in the development of future plans provides a comprehensive overview of important influences, interdisciplinary coherence and a strong basis for objective decision making (Terrados *et al.*, 2007; Yuan, 2013). When goals are clearly defined, as is the case for this project, the SWOT will provide a tailor-made database on which decisions for the future can be based. It provides focus on relevant qualities and deficits of current nature-inclusive farming schemes (Knierim and Nowicki, 2010). Doing multiple SWOTs on different existing schemes will create a complete oversight to ensure no important aspects of schemes are left out of the analysis (Hayes, 2014). Summarising key issues that arise from this oversight will provide clear options for future improvement of schemes aimed at including nature on dairy farms.

A SWOT analysis is made up of four parts; strengths, weaknesses, opportunities and threats. Strengths are internal factors that aid a project to reach its desired goals, while weaknesses are negative internal attributes. Opportunities are

defined as external factors that can offer the possibility of benefits, while threats are external factors that can limit possibilities and possibly derail projects from reaching their goals (Hayes, 2014). It is important to distinguish between internal and external factors. The external situation (made up by the threats and opportunities), is composed of drivers and trends that cannot be influenced by resources available to a project, such as economic or political factors. Strengths and weaknesses form the internal factors and are within the control of an organisation, such as finance, operations, involved stakeholders and time (Knierim & Nowicki, 2010; Abdi *et al.*, 2011). Multiple schemes concerning nature-inclusive farming were analysed by means of a SWOT analysis. However, this study does not claim to provide statistical evidence, but is merely used to identify indicators and fields of interest on which current nature-inclusive dairy farming practices can be improved.

For each SWOT, a SWOT-matrix was created, as shown in Table 1. The goal of each project will be identified. Reasons for failures or successes can then be listed in their corresponding category in the SWOT-matrix. Each part of the SWOT-matrix will be subdivided into four parts; economic, technical, cultural and organisational. Dividing data into different categories is important to make sense of the information in a more structured way (Aberbach & Rockman, 2002). The economic aspect focuses on whether the project was economically viable or not, e.g. we will look at which subsidies were available, what the transition costs were needed to implement nature-inclusive related changes in the system and the difference in running costs once the project was fully running. Also the difference in profit will be looked at. The technical aspect looks at the techniques and practices implemented to make these transitions. Grazing systems, fertilisation practices, used machinery and water levels are points of attention here. The cultural aspects describes the importance of meadow birds in cultural identity, lifestyle of the farmers, their educational level, the traditions in place and their experience with the projects. Organisational aspects focus on how schemes are organised. E.g. if there are enough farmers joining, whether it can be scaled up and so on.

This method will generate a separate SWOT-matrix for each project. Each matrix might have a different focus, depending on the available information. Afterwards, all SWOTs can be analysed and trends can be identified. Once all factors have been addressed, the final steps in the process of the analysis involved exploring ways to develop and make use of strengths and opportunities, and to find ways to reduce weaknesses and contain threats (Hayes, 2014). This will be done together with the results obtained from the interviews.

Table 1 SWOT-matrix

<p>Strengths</p> <p><i>Economical</i> - ..</p> <p><i>Cultural</i> - ..</p> <p><i>Technical</i> - ..</p> <p><i>Organisational</i> - ..</p>	<p>Weaknesses</p> <p><i>Economical</i> - ..</p> <p><i>Cultural</i> - ..</p> <p><i>Technical</i> - ..</p> <p><i>Organisational</i> - ..</p>
<p>Opportunities</p> <p><i>Economical</i> - ..</p> <p><i>Cultural</i> - ..</p> <p><i>Technical</i> - ..</p> <p><i>Organisational</i> - ..</p>	<p>Threats</p> <p><i>Economical</i> - ..</p> <p><i>Cultural</i> - ..</p> <p><i>Technical</i> - ..</p> <p><i>Organisational</i> - ..</p>

2.2 Interviews

Next to conducting the SWOT analyses, in-depth interviews with a range of stakeholders have been held. Interviews are a valuable method when collecting primary data on attitudes and opinions of stakeholders in complex and sensitive areas (Baarda and de Goede, 2006). The main goal of the interviews is to gain an overview of the knowledge and opinions of the various perspectives stakeholders have. The aim is to gain insight into their experience on the topic, potential solutions they might have, their relationship dynamics with other stakeholder groups, their readiness to cooperate and their perceived challenges in the existing system. In order to do this most effectively, semi-structured interviews with open-ended questions will be held. Open-ended questions provide the interviewee the chance to organise his/her answers. This increases the validity of the research, as they are not being pushed towards a certain direction or frame of answering (Aberbach and Rockman, 2002; Kumar, 2011).

Interview subjects from various stakeholder groups connected with meadow bird conservation were chosen. The main division is between farmers and experts. Farmers are subsequently subdivided into two categories; farmers that have succeeded in combining meadow bird conservation and dairy farming and farmers that have not. Experts are members of institutes connected to the topic, representatives of nature conservation organisations, or experts from academia. Nine farmers (4 practicing meadow bird conservation and 5 who do not) were

interviewed. These interviews were found to provide sufficient information to get an overview and identify main strengths and weaknesses. Hence, adding more interviews would not have gained significant new insights. A full list of interview subjects is presented in Table 2, 3 and 4 in Appendix D.

In order to be able to make the information gathered from the interviews mutually comparable, a list of general questions was produced per main category (farmers and experts). These questions are asked to all interviewees within their category. They are based on the same data requirements, but made to fit the different individual interviewees more closely by asking a set of specific questions. Not all questions have been answered by all respondents. Whenever this occurred, the questions were omitted from the report, in order to keep it structured. The transcribed interviews can be found in Appendix C.

After the interviews are conducted and summarised (see Appendix B), the responses were structured and put into categories for further analysis. Content analysis is an academic research method that provides a systematic and objective way to make sense of the interviews and enhance understanding of the collected data. The method enables processing of large quantities of textual data (Elo and Kyngäs, 2008; Krippendorff, 2012). Our content analysis will be done in two phases. To make sure that data can be used simultaneously with the results from the SWOT analyses, the answers to all questions will be put into different categories corresponding with those used in the SWOTs. So at first, all responses will be divided into categories of strengths, weaknesses, opportunities and threats. After this, they will be subdivided into technical, cultural, economic and organisational factors, as done similarly by Alexandrov *et al.* (2005). This way of categorising answers is a top down approach as categories were chosen before interviews were held. It is helpful when, like is this case, results are compared with other sets of data, like the SWOT analyses of the schemes (Casimir and Tobi, 2011).

While all answers can provide new insights and generate new ideas, answer that are given more often by different respondents will be considered more important. The same will be done by the SWOT analyses, so a comparison can be made.

2.3 Integration

Finally, the results will be put next to those from the SWOT analyses, in order to identify overlaps and key focus areas. These areas can be viewed as key strengths, weaknesses, opportunities or threats to the success of nature-inclusive dairy farming and an advice on the key topics can be provided. Other findings done based on the results can however also provide original inputs towards the solution of the problem and will therefore also not be overlooked when producing the final advice.

The literature study on innovative technologies was kept separate. It will be integrated with the other results into the final advice.

3. Results

In this chapter, the results of the analysis of both the interviews, schemes, and innovative technologies are presented. The chapter is divided in three sections. The first part will discuss internal factors of both interviews and schemes, the second part will discuss external factors, the last part will present innovative technologies. Internal factors describe both positive and negative aspects that the project has an influence on. External factors depict aspects only influencing the project without the project having any control over this factor. A further division of both internal and external factors was made, separating interviews and project, with an integration of both parts as a final paragraph, giving similarities and contradictions found between both sections. In this way, the chapter provides an overview of our findings. The advice, based on the results, will be given in the following chapter.

Due to privacy reasons, names will not be mentioned in this chapter. Farmers who are practising meadow bird conservation will be abbreviated as farmer P-, followed by a number. Farmers who are not practising meadow bird conservation will be abbreviated as farmer NP-, followed by a number.

3.1 Internal

3.1.1 Interviews

Both farmers applying meadow bird conservation measures and farmers not applying measures (farmer P1, farmer P2, farmer P3, farmer P4, farmer NP2, farmer NP4 and farmer NP5) agree that meadow birds have cultural value in the Netherlands. However, some farmers (farmer NP1 and NP2) imply that they did not have any connection to meadow birds when growing up. All experts acknowledge the cultural value of meadow birds. However, expert 4 notes that his company focusses on nature conservation in general and only uses meadow birds as indicator species. Expert 7 notes citizens do see agricultural land as part of the natural landscape. Farmer P1 mentions he regularly sees people taking pictures on his land, indicating grasslands and meadow birds have cultural value for citizens as well. The mindset of farmers who apply conservation measures seems different. Farmer P2 states he considers his cows to be in service of meadow birds and is very proud of 'his birds'. He and farmer P4 both claim the birds have emotional value to them. Expert 1 notes that farmers practising nature-inclusive dairy farming can create goodwill in their community and 'get things done'. On the other hand, pride can also be a negative factor. Expert 1 mentions that farmers are proud people, who do not want to be different from their colleagues and therefore will not easily change management when their neighbours do not do this either. Expert 7 notices a lack of intrinsic interest for the birds in many farmers. However, this is in conflict with the opinion of expert 6, who claims a large number of Frisian farmers have a large passion for meadow birds. Expert 1 states farmers see nature conservation as messy and nature conservation lands as breeding grounds for weeds and geese. According to him, nature areas should be maintained better in order to give nature a better reputation within the farming community.

All interviewed farmers state no information was given about meadow birds during their education. Knowledge has to come from individual effort; farmer P2 taught himself about meadow bird conservation in his own time, while farmer P3

states he learned a lot from his father. Farmers P1, P2 and P3 think that providing more information during the education of farmers would increase awareness and interest. This could also help farmers who are willing, but have not started implementing yet, to make the next step. According to farmers NP1, NP2 and NP5, it would be good to also implement more nature conservation into the general education (like primary and high schools) and provide more information about nature conservation of meadow birds. Expert 6 states education is important for successful schemes on the long term. Expert 2 adds that public awareness of the problem is very important and therefore more emphasis should be put on nature conservation during education.

In terms of meadow bird conservation measures, individual farmers have found many insights in what works and what does not work in practice. A lot of techniques were tried by farmer P2 and he decided himself which method was successful by observation. Farmer P1 mentions wet patches do not work for him, even though it is heavily promoted by the provincial government. These examples concern motivated farmers, however expert 5 indicates there is a general knowledge gap between farmers, experts and governments and he states farmers need adequate information in order to know what to do and why this needs to be done.

Volunteers are, according to all practising farmers, very important for implementing meadow bird conservation, as they mark nests for farmers. Farmers P1, P2 and P3 also mark nests themselves. Farmers NP1, NP2 and NP4, however, imply that if volunteers stop coming, protection of the nests will also stop as they will not mark the nests themselves. Because farmer NP3 states volunteers are leaving a mess on his land, he is unwilling to let other people check his land. Nests are marked so they are not destroyed during mowing. Expert 1 and a number of farmers have indicated that hired contractors only focus on efficiency and do not take the time to avoid nests, even when they are marked. Because of this, all practising farmers hire no contractors for mowing. Farmer NP1 informs his contractors of the location of nests, and tells them to avoid the nests.

Farmers apply different techniques for making their pastures more suitable for meadow birds. Farmer P2 leaves a small part of his land to be farmed extensively when meadow birds are nesting on his land. He also marks nests with bamboo sticks, which are less recognizable for predators. Farmer P3 implements ditch side management and states this approach works very well, even though it is not subsidised. He also tracks nests with an application on his mobile phone by GPS. His tractors are connected to this application and automatically stop when they are within a certain distance of a nest. Farmer P1 plants small strips of corn to provide a place for chicks to find food and protection. However, expert 1 worries that planting maize is not a sustainable solution. All farmers who apply meadow bird conservation, apply manure (liquid or solid) on the surface of the field instead of injecting it into the ground, which is required by law in the case of liquid manure. By doing this, the manure attracts all kinds of insects, which are beneficial for meadow birds, as they feed on them. The interviewed experts did not mention many technical solutions for meadow bird protection on farms. Expert 5 states manipulation of the water level is a possibility for creating new habitats. Expert 1 also claims wetlands are good for attracting meadow birds. Expert 7 claims mosaic grassland management

proved a powerful tool for meadow bird conservation. Expert 4 states that his company works on water and soil pollution and expects this will also increase the quality of meadow bird habitats.

However, farmers who do not apply meadow bird conservation also have multiple technical reasons for doing so. Farmer NP3 says he has tried different mowing techniques, but stopped when they did not produce results. He, together with farmers NP2 and NP4, imply they do not wish to change the way they operate now, as they have their practices and machines already in place.

The farmers P1 and P3 experience problems with predators. They state the predator populations cannot be controlled by the farmers. This means that although measures are taken to mark and mow around the nests, these efforts will be in vain due to predation.

Communication between stakeholders is also lacking. Expert 5 indicates that the top-down approach the government uses could be a reason for this. According to him, a knowledge and communication gap exists between farmers, experts and government. Expert 6 claims farmers do not trust the government. Expert 1, 2, 6 and 7 all agree communication is an essential part for success in meadow bird conservation. Farmers P1, P3, P4, NP2 and NP3, all indicate better communication between different stakeholders would greatly benefit meadow bird conservation.

Organisation of schemes is still something that could use improvement according to the expert interviewees. SCAN is an organisation which focusses on bringing all farmers and other stakeholders together. This organisation prepares farmers for the policy changes of 2016, which will allow larger areas to work together, according to expert 7. Another problem is recognised when looking at the timescale most schemes work on. Expert 1 and 6 both indicate farmers do not look at their long-term business model but only focus on short-term profit. According to expert 6, inclusion of nature conservation into a farmer's business model would be encouraged when looking at the long term. Expert 2 says AES of 6-7 years are too short and do not provide enough certainty for farmers, causing a lack of interest. Expert 7 states the ministry can keep increasing subsidies, but farmers will never be satisfied with the compensation. More sustainable, long-term solutions need to be found. Expert 6 states that spatial planning is the key to success in meadow bird conservation. He wants to find out what works on a regional scale, while expert 5 is more open to initiatives on individual scale.

[3.1.2 Schemes](#)

From the SWOT analyses of different investigated schemes, the importance of education becomes clear. Multiple examples are found on how to provide information to farmers. For example, farmers could be involved in knowledge sharing by putting them in contact with volunteers and experts through educational meetings (European Commission, 2015f), though it is clear farmers are not willing to pay for this information (Bradbury *et al.*, 2004). Another strategy is to let farmers teach each other, as many farmers are more willing to take in information from colleagues than from an external source (European Commission, 2015i). Also, workshops and fieldtrips given by other farmers participating in the same scheme had a positive effect on farmer's incentive to

work on nature conservation and to create awareness of the responsibility of farmers (European Commission, 2015j). Monitoring the status of meadow birds in their own or other pastures together with experts has proven useful for both parties, as farmers see and understand the progress they are making and experts are able to see how farmers interpret the progress (Ark&Eemlandschap and Gebiedscoördinatieteam Eemland, 2015; European Commission, 2015a, e, f, i and n).

Monitoring the impact of schemes in general appears to be a problem. Often, specialists have to be available and paid to monitor the outcome of schemes (European Commission, 2015l), as farmers are not able to do this. Monitoring can be intensive and time consuming (Kleijn and Sutherland, 2003; European Commission, 2015b, f and i). If specialists are not available, volunteers or farmers have to be found and trained, which can prove difficult (European Commission, 2015c, e, g, h, j and k). One scheme made farmers pay for monitoring. This decreased the incentive to participate (European Commission, 2015a). Monitoring what works can also prove difficult because of the different requirements for different zones within the area (European Commission, 2015m).

Some examples exist on how the community could greatly benefit a scheme. Farmers who include civilians in their nature conservation management can benefit from the extra volunteers and get more appreciation for the work they are doing (Allen, 2005a; Ark&Eemlandschap and Gebiedscoördinatieteam Eemland, 2015; European Commission, 2015e and f). Organisation of the scheme by locals creates a community more willing to cooperate with agro-environmental schemes (European Commission, 2015c). For example, within one scheme locals themselves created a more stimulating situation by organising a competition for the best meadow (European Commission, 2015l). Participation in a scheme through paid or voluntary work increases public awareness of both the problems and solutions. This in turn creates incentive for farmers, as the effort they put into creating nature-inclusive farmlands is appreciated. It is already seen that agricultural nature associations (Agrarische Natuur Verenigingen or ANVs) are very effective in acting as link between farmers, citizens and the government, and are beneficial for communication between different parties (Bradbury *et al.*, 2004; Vickery *et al.*, 2004; Keenleyside *et al.*, 2011).

Looking at the organisation of a scheme, it is noticeable that result-based schemes are often most successful. Result-based management gives farmers freedom to decide how to achieve a goal. This gives the farmers a feeling of control (Wynne-Jones *et al.*, 2013; European Commission, 2015l) and allows them to tailor the management on their meadows in a way that suits their agronomic requirements (European Commission, 2015b). Freedom in management can also include being able to decide how much of their land farmers want to dedicate to the scheme (Johnson, 2005). Reaching the goals set for them in their own way can also give farmers a sense of pride (European Commission, 2015f), thus creating incentive to continue with nature conservation. In situations where management is decided upon by government or experts meets resistance of farmers, who see this as an intrusion for their farm work (European Commission, 2015k). It can also make payments rather complicated (European Commission, 2015h). It is noted, however, that result-based schemes often work best when the farmer already has experience with nature conservation practices and is often only available to farmers who already

have meadows with high biodiversity, based upon the presence of several indicator species (Kleijn and Sutherland, 2003; European Commission, 2015d, g, j l, and n). Sometimes a lack of clarity is present on whether the target set for the farmer was reached or not, creating mistrust of the government by farmers (European Commission, 2015f). It is stated that a change from the more conventional management-based schemes to result-based schemes should be incremental, simple and low-risk (Wynne-Jones *et al.*, 2013). Selecting indicator species seem to be a good way of making the goal clear to farmers, resulting in motivation to work towards this goal.

In contrast to what interviews have shown, analysis of different schemes show long-term contracts could be disadvantageous for the acceptance of schemes by farmers (Allen, 2005a; European Commission, 2015d). It is also stated, though, that long-term commitments give more certainty to farmers. Year-to-year agreements make it easy to adopt a scheme without strong commitment and allows farmers to try out the scheme (European Commission, 2015c). Shorter agreements are considered to be important on less intensive farms (European Commission, 2015b). Often these schemes are at an entry level, with relatively low transition costs and maintenance and can be considered a stepping-stone towards a higher level of nature-inclusive farming (Keenleyside *et al.*, 2011; European Commission, 2015c). Pilots can easily be established and used to create a scheme that is tested, stable and agreed upon by most stakeholders (Keenleyside *et al.*, 2011). Some schemes include different tiers of management (European Commission, 2015d, l and n), where farmers can move up (but not down) during their contract.

An analysis done by Finn *et al.* (2009) states that monitoring results during and after a scheme is as important as designing the scheme itself. This includes a clear set of goals with appropriate indicators to maintain motivation and clearly signal when a scheme is successful or not. Also, a lack of clarity in the implementation of a scheme needs to be avoided at all times, as it can both demotivate farmers and lead to high associated costs.

The approach of the relatively young project, called Ergebnisorientierter Naturschutzplan (ENP) in Austria (European Commission, 2015j) is noteworthy. Expected results are determined on parcel-level and required management actions needed to reach these results are determined and summarised in a 'farmers logbook'. Identification of results is done at parcel-level, in collaboration with the farmer. A midterm evaluation in the third year of the scheme takes place between farmers and scheme advisors to see if progress is going according to plan and to make sure there is time to improve management if needed. At the end of the pilot period in 2020, a final evaluation will take place where experiences are exchanged and adjustments can be made to the scheme for further implementation.

In the project Ark&Eemlandschap in the Netherlands (Ark&Eemlandschap and Gebiedscoördinatieteam Eemland, 2015) organisation and financing aspects are noteworthy. The organisation is done through the nomination and formation of a board, that includes farmers and civilians, which manages operations in the scheme. This way, received funding is sure to be distributed fairly because of the involvement of the board wherein representatives of all stakeholder groups are present. Also, a 'last-minute' budget allows the board to compensate farmers to

implement measures on the moment it is required, even when it is not anticipated. This provides farmers with more certainty.

3.1.3 Integration

Some general problems and factors are recognised through both interviews and from the analyses of schemes. Education about meadow birds is only given when farmers participate in certain schemes. However, it is clear that knowledge gained during schooling would benefit the incentive of farmers and communities to participate in nature-inclusive farming. A lack of awareness for the problem is recognised by both farmers and experts and contributes to a decrease of success in schemes. Involvement of the community is an important factor for success, as this reduces costs and acknowledgements create a feeling of pride and purpose for farmers.

Result-based management seems successful for farmers who know how to handle nature-inclusive farming, and gives farmers freedom to decide on their way of farming. This is considered positive, as both farmers and experts indicate too much control from the government decreases motivation of farmers to participate. Organisationally, it seems ANVs prove a useful platform in acting between governmental institutions, farmers, experts and the community. It also enables schemes to be tailored to specific conditions in a region, something that does not seem possible with schemes on a national level.

Some contradiction exists when looking at how long contracts of schemes should last. Experts say longer contracts would greatly benefit nature and give farmers stability in their management, while analyses of the schemes show shorter contracts were well received.

3.2 External

3.2.1 Interview

One of the main reasons of not applying meadow bird conservation that came to light during the interviews, is the way subsidies are organised. Farmers NP2 and NP3 are not happy with the subsidy system, they rather have it banned. On the other hand, other farmers think that higher subsidies will help implementing nature conservation (farmer NP1 and NP5). For example, the government should invest more money in people who are willing to go into the field and mark the nests. Farmers do not want to have the extra workload nor fund those people who are willing to do it. Subsidies can be more rewarding if farmers get paid for results and not for the measures they take, says expert 1. Farmers P1, P2 and P4 agreed on the fact that the government does not use the correct system for paying subsidies. Subsidies are also rewarded to farmers that comply with certain rules, regardless of their effectiveness. Farmer P2 indicates that if rules are not strictly met, subsidy will not be received, even though he has a lot of meadow birds on his land.

According to experts, there are some options which could make it financially more attractive to produce dairy in a nature-inclusive way. According to expert 5 and 7, nature-inclusive products could be sold for a higher price, which could increase income of the farmer. Expert 7 notices that success really depends on the drive of the farmers. If they only want to produce and make money, they

would probably never implement nature conservation on their farm. So, by changing the view of farmers, more of them will possibly consider meadow bird conservation. According to farmer NP3 an opportunity is to make the consumer more aware of the problem and make sure they are willing to pay more money for certain products.

Farmer P2 states that the constantly changing policy is not helping to improve nature-inclusive dairy farming. Farmers need more trust in the government, to be willing to apply large changes in their management. Due to short-term policy changes, farmers do not know what to expect and do not want to make big investments. Farmers NP2 and NP4 confirm that there is no security that a certain implementation of nature-inclusive dairy farming is still allowed or useable in the coming years. Farmers P1 and P2 state that it would be an option for a lot of farmers to work with contracts for a long time period, which will last for 10-20 years. This protects the farmers from the change in the government policy every 4 years or less. Farmer NP1 also mentions that he thinks that the gap between government and farming is too big. Some regulations are not suitable for farmers to imply. The interviewed experts 1 and 6 share the opinion of the farmers that the governmental system is too volatile and farmers do not always want to be dependent on them. According to these experts, this causes farmers to be suspicious towards regulation by the government, which causes less farmers to apply nature-inclusive dairy farming. Expert 5 thought that subsidies nowadays are sometimes awarded even when for instance the area is not suitable for meadow birds. Nature-inclusive policies should be more peer based instead of having a top-down approach. Farmers should be more aware that they have to work together with nature instead of making nature work for them. Furthermore, expert 6 states that it is not necessary to get every farmer involved to restore meadow bird populations. Clear goals need to be formulated. Then policy must gear towards reaching those goals.

Expert 2 considers it a threat that large cooperatives (like FrieslandCampina) have not shown enough awareness of meadow bird conservation. These cooperatives can have a lot of influence on dairy farmers (for instance, approximately 80% of the Dutch farmers is a member).

Farmers P2, P3 and P4 also thought that nature conservation organisations sometimes have goals that are not in line with meadow bird conservation. An example is that the predators of meadow birds are often protected and the issue of predation by foxes, badgers and crows is not addressed. Most non-practising farmers (NP1, NP2, NP4 and NP5) shared the opinion that nature conservation organisations do not have meadow bird conservation as a high priority. Farmer P1 even thinks that nature conservation organisations have given up on the meadow birds, and that they already consider them a closed chapter. This does not motivate farmers to start with meadow bird conservation. A high number of predators in the area makes conservation less attractive for a farmer. Farmer NP3 mentions that there is a big knowledge gap between society and farmers. Society considers different nature-related things of importance than farmers do. For example; society likes the view of geese and certain predators on the pasture, but these are a nuisance for most farmers.

The importance of collaboration of investors is mentioned by expert 4. If farmers want to include nature-inclusive farming in their management, it would be

helpful if banks provide lower interest rates for farm projects that include sustainability. Expert 4 and 7 both think that the last decades, most farmers went on the 'high production'-road. Banks and accountants also have not made farmers aware of this possibility according to these two experts. Banks have not encouraged farmers to produce in the most sustainable way, but more towards a highly productive way.

One expert of a company states that his company offers an alternative to subsidies, because they consider them economically non-viable. While the company explicitly supports meadow birds, they seem to have worked out a sound, working economic system of premiums for milk that farmers receive if they fulfil environmental requirements set by the company. There also is a lot of focus on making nature-inclusive farming economically viable, instead of dependent on government subsidies as primary mode of funding. They are also indirectly helping, by funding research on comparative qualities of milk. This is aimed to provide scientific basis for pursuing biodiversity by proving the advantages milk produced in biodiverse conditions have over conventionally produced milk. If this difference in quality is proven to be beneficial, this could result in more incentives to pursue biodiversity and meadow bird protection as the milk can be sold for a higher price.

[3.2.2 Schemes](#)

From the SWOT analyses of the schemes, it was noticed that at the moment most agro-environmental schemes are largely funded by governmental institutions. This makes these projects highly dependent on a single actor, which can cause projects to fail when funding stops. At a scheme in the USA (Allen, 2005a,b; Johnson, 2005), the funding is managed by a third party, to control governmental and non-governmental contributions and to ensure payment when a party fails to meet its promised contribution. Not only can funding be increased to help a scheme, incentive to participate can also be created by lowering costs through lowered taxes, for example (Allen, 2005a,b; Johnson, 2005).

Involvement of academic institutions creates both understanding for the need of nature-inclusive farming and provides scientific evidence for the success or failure of certain management techniques or schemes (Kleijn *et al.*, 2003). This can be an opportunity for many schemes, where evaluation of results is not done in a scientific way (European Commission, 2015f), or not done at all, so causes of success or failure cannot be indicated.

A major threat noted in most schemes are developments on the global market. The global market changes over time, depending on demand and supply. Furthermore, competition puts pressure on farmers to maximize production, especially since the ban of the milk quota (European Commission, 2015c). This could strengthen the trend towards more intensive farming. The unpredictability of the market makes farmers reluctant to sign up for long-term schemes, as these might prove costly.

[3.2.3 Integration](#)

From both the schemes and the interviews, it turned out that funding systems and management are points of attention. Farmers are not always satisfied with the way the government is funding projects and the amount of funding. The subsidy is in some cases hardly enough to cover the costs and no extra money is

earned for additional labour. In many cases in both schemes and interviews, it turned out that funding is done by governmental institutions, which makes schemes dependent on the constant support of one actor. Farmers see this as a weakness and this is also stated in scheme analyses. Finally, some farmers state that goals of nature conservation organisations (e.g. protection of predators vs. protection of meadow birds) can conflict.

3.3 Innovative technologies

With farming techniques and equipment developing at a high rate, the speed and efficiency of mowing has also increased (Steen *et al.*, 2012). This creates a range of problems; ground nesting birds and their chicks, but also hares and deer fawns risk being killed or injured during mowing operations as the animals do not have the time to react. A few technologies are recognized for their potential to deal with these problems.

In meadow bird conservation, nest detection and predator control were recognised as two important areas to apply the innovative technologies to. One of the key methods of meadow bird protection during the nesting phase includes finding the nest location, and marking them to avoid them being mowed over. So far, the most technologically advanced practice revealed from the interviews was used by farmer P3, who marks the locations of nests he finds on GPS, and enters the coordinates to the tractor's system.

However, there are other technologies that can be used for nest detection. They include the use of visual camera and thermal imaging camera systems, during day and night-time, respectively. These systems consist of a camera and an image processing algorithm, attached to a tractor (Steen *et al.*, 2012) or on a drone (Expert 3 interview; Vas *et al.*, 2015).

Drone technology is a promising development. Drones are unmanned, remotely controlled aerial platforms, fitted with surveillance equipment. Recently, drone technology has become useful for GIS measuring, precision agriculture, and wildlife protection. Studies show that drones fitted with a camera are able to detect objects in fields and are possible a solution for accurately monitoring wildlife (Martin *et al.*, 2012; Christiansen *et al.*, 2014). Expert 3 states drones are able to cover 2 hectares in 5 minutes, while fixed wing drones can cover 70 hectares in 40 minutes of operation. Multirotor drones use multiple propellers to fly, similar to a helicopter. They are able to hover in place and lift off vertically. Fixed-wing drones resemble a remotely controlled model aeroplane. Engines are electromotors with batteries providing power. According to expert 3, multirotor and fixed wing are two main types of drones. Multirotor drones have higher carrying capacity; up to 2 kg and fixed wing up to 0,7 kg. One downside of drones is that they cannot be used in wind speeds above 8m/sec, in rain or during fog. Overall, a trend towards longer flights is noted, and for regular use, a fixed wing model is recognised as more suitable. Vas *et al.* (2015) show that drones do not visibly disturb wildlife, and can thus be used to search and mark nests without interfering in the animals natural habitat. Key feature of drones is their surveillance equipment, either a visual imaging or thermal imaging camera.

Steen *et al.* (2015) note, that the detection rate of a drone can be as high as 28 out of 30 nests at an average distance of 3,8 meters. However, so far tests have only been done in cultivated fields with little crop cover. It seemed grass density

rather than driving speeds influences the rate of detection. When drones fly 3 – 10 m above the meadow, using a tracking algorithm, the wildlife rate detection is 93.3% (Christiansen *et al.*, 2014). However, the physical size of wildlife is not specified in the article, so there is a possibility that the accuracy will not apply in case of finding meadow bird nests. Though the system is not applicable for actual farming practises yet, improvement on both cameras and image processing algorithms could create a system that automatically detects wildlife and greatly increases wildlife safety during mowing operations (Steen *et al.*, 2015).

Thermal imaging is a second promising technology. Both birds and mammals are endothermic and release the metabolic heat from their bodies, which can be picked up with thermal infrared spectrum camera. As visual detection of animals hiding in the grass is very hard, thermal imaging can greatly benefit farming practices. Currently, drone-mounted thermal imaging technology is already on the market (Azooptics, 2015).

Because thermal infrared spectrum does not require an external light source, it can be used without disturbing wildlife. It is especially useful at night, when cooling produces a maximum contrast to heat production of the birds. Steen *et al.* (2012) experimented with a thermal camera attached to the front of a tractor and found out that the camera was able to detect wildlife about 4,7m before the tractor. Steen *et al.* (2012) report accuracies up to 90,8% detection rate for tractor-mounted cameras, regardless of driving speed. The target was the size of a chicken. Expert 3 states that having a camera alone is not enough; the system has to include an automatic data processing algorithm that recognises bird nests and other meadow fauna (such as deer fawns).

These examples serve to prove usefulness of using these technologies to prevent loss of nests during mowing. Indeed, farmer P3 already states the usefulness of GPS coordinates to stop farming machinery when approaching nests. Whether carried or mounted on drones or farming equipment, these technologies have shown to have the potential to bring efficiency to meadow birds protection practices.

Wildlife management in the Netherlands has also caused the population size of predators of meadow birds to flourish. The most usual predators of meadow bird eggs and chicks include foxes, badgers and stoats. Farmers P4 and NP3 note predator damage to eggs. Farmer NP3 notes that predation of meadow bird nests and chicks is a big problem. Nest predation can also be one of the reasons for not practicing meadow bird protection as incentive is lost if when nests are likely to be plundered. Non-lethal predator control measures using a temporary woven fence were tested in Eemland region. These measures are claimed to result in meadows clear of fox predation. However, installing these fences has shown to be labour-intensive and costly (Ark&Eemlandschap and Gebiedscoördinatieteam Eemland, 2015). Badgers, and other big predator of bird nests, are physically stronger and require a much sturdier permanent electric fence to deter them. For instance , a fence with 4 electric wires, from 10 to 40 cm in height. This method is too expensive to always recommend as it is not only more costly, but also increases the workload. Funds are also needed in the maintenance phase. However fences could prove a good investment in areas with a high predation rate (Poole *et al.*, 2002), such as in vicinity of nature reserves like in the case of farmer P2.

4. Advice

This chapter contains the advice written for Living Lab. This advice is based on the results gathered from the analysis of schemes, interviews and literature research. It also contains self-composed innovative solutions, as was asked for by the commissioner. Thus, it should be noted that not all propositions made in the section below are scientifically backed. For more detailed information on certain practices the results can be consulted. The chapter is divided in subsections to provide a clear overview of what could be improved for which aspects of the problem.

4.1 Communication

Universities, consultancies, research institutes and farmers all possess knowledge on meadow bird conservation practices. The problem seems to be communication between different actors. For instance, farmers must be aware of the importance and of their influence on the conservation of meadow birds. On the other hand, policy makers should be aware of the influence of their policies on the profit and workload of a farmer. Knowledge on nature-inclusive dairy farming needs to be shared. This could be done within as well as between different stakeholder groups. ANVs have proven to be ideally positioned between stakeholders and can connect them to aid in creating understanding and the sharing of findings. ANVs need to have a clear organisation, including a board and a defined set of goals. Meetings attended by different stakeholders, from policymakers to volunteers, should be held periodically to exchange knowledge on successful and unsuccessful practices. Living Lab could organise this in the form of a conference at the beginning and end of the breeding season. This would allow all parties to get an update on the current situation and exchange current knowledge. Next to this, focus groups for experts, farmers and officials would help to integrate different perspectives and create a mutual understanding. Shared monitoring of results by both members of the community, farmers and experts has proven beneficial for knowledge exchange and creating awareness, and is thus highly advisable.

For day-to-day use, an online platform could be created. The platform could be a webpage on nature-inclusive farming, with informative PDFs, a meadow bird potential map, a weblog and a forum. Online PDFs can provide the needed background knowledge, while potential for meadow bird protection in an area can be found on the map. Maintaining a weblog on meadow bird protection (for example, from a volunteer's or farmer's perspective) is important to keep the site up to date and present new information. This information could also be accessed by a broader public. The platform could also include a forum where enthusiasts can gather and exchange knowledge on successes, developments and trends and they can solve problems together. The forum is a way to provide insights into newest trends and feedback from the field. Stakeholders from different geographical and organisational backgrounds can also use the platform to get into contact with each other. It could also be available as a mobile application, serving as field guide for addressing immediate problems. The platform could contain manuals for the different schemes farmers can apply for and provide background information on meadow birds in general.

4.2 Education

The platform mentioned above will provide practical knowledge for anyone interested, but can also be used as basis for educational modules in farmer schooling. Not only techniques and practices need to be discussed, nature conservation in general should receive more attention during the education of young farmers as this is currently lacking. More education on nature conservation in school could possibly lead to more understanding.

To create awareness in general for meadow birds and their protection, education could also be extended to primary and/or high schools. This could be done in the form of field excursions to successful farmers, nest finding excursions or more intensive programs for high schoolers, e.g. internships.

Creating awareness in the current generation is as important as creating it in the next. 'Weidevogel-paden' as hiking routes, nest finding and educational excursions are conventional ideas to reach this goal, but it should be noted that it is important that meadow birds are not disturbed during the breeding season.

A farmer's incentive to participate in schemes seems to increase when they get recognition for the work he/she does. This can, next to a financial compensation, be recognition from the community the farmers are part of. Friendly competitions for farmers in the area on who has the most meadow birds or best looking meadows could create pride for the farmers who are putting effort in nature conservation. The 'Golden Godwit' could be given to farmers in different regions each year, and serve as an example of successful nature-inclusive dairy farming.

4.3 Policies

Though policies are hard to influence, there are ways to go about dealing with the policies in place. Contracts could be divided into short- and long-term. Short-term contracts allow farmers to ease into conservation practices, allowing them to adapt their management slowly when they have not implemented nature-inclusive farming before. Goals of these contracts should be relatively easy to fulfil, and should be considered a stepping stone towards contracts of a higher tier. These contracts could also serve as pilots when developing new conservation schemes, and could contribute in solving new problems.

The long-term contracts could provide stability and ensure farmers have long-term overview of their management situation. Policies are being frequently changed, and this volatility is known to cause frustration to farmers. These contracts would allow farmers to continue their management without having to change their ways of farming as often. This means changes in policy should not affect the contracts which are already made or only to a small extent. Nature conservation policies should also be made more stable in general, but this something which is hard to influence. ANVs could serve as a link between government and farmers to find the right contract for the right situation. Farmers also need to have the freedom to manage their farms in the way that best suits their needs. To allow this, we advise contracts to be result-based. Anecdote: one of the interviewed farmers mentioned that a governmental employee stumbled over the amount of meadow birds. However, he still got fined because his wet patches were too small. Farmers mistrust the government because of these kinds of situations. The goals of these result-based contracts needs to be

straightforward, with clear indicators. Management practices for establishing nature conservation should not be mandatory, but information on them should be available, e.g. through the proposed platform. This causes farmers to be more flexible in their nature-inclusive management.

Furthermore, policies from nature conservation organisations often do not match with nature-inclusive dairy farming practices. Many predators are protected and are able to forage on eggs and chicks of meadow birds. Farmers are not allowed to protect meadow birds against these predators in an effective way. This can be demotivating for the farmer who puts a lot of effort in protecting the nests. In order to keep meadow bird conservation policies effective, it is important that policy makers set comprehensive goals. They should also keep in mind that not all farmers need to apply conservation measures in order to sustain a healthy bird population. Spatial planning could be used to identify key areas for more effective meadow bird protection. Drone technology could be used to achieve this. Looking at measures that work most efficiently in these areas could be subsidised, and dialogue with farmers in these areas could provide more insight into what measures are necessary.

4.4 Financial/Subsidies

ANVs could play a linking role in delivering payment from the government to farmers participating in schemes. They are in the right position to check on the progress a farmer has made, they can assess the situation, divide payments and create a dialogue between both parties to further the understanding of why a goal has been reached or not. ANVs could also manage a 'last-minute' fund, which could finance unexpected or larger investments. These might encourage farmers to participate in schemes or continue their conservation practices as this could create the certainty wanted by farmers. Funding should not all have to come from the government. Possibilities lie in involving private parties with meadow bird conservation. By investing in schemes, these parties could be made ambassadors or sponsors of nature conservation and in this way get 'green' publicity. Though these companies could be involved with dairy farming (e.g. FrieslandCampina), this does not necessarily need to be the case. Banks could be persuaded into providing 'green' credit for sustainable development. This credit would have a lower interest rate, but only given to farmers who are ready to invest it into nature conservation.

4.5 Technologies

Some interesting innovative measures and techniques were found. For detection of nests, thermal or visual camera systems can be used, either mounted on farming equipment or drones. Instead of the conventional marking of nests with sticks, GPS tracking systems can be utilised to mark nests. Drones, mobile phones or any other device with a GPS system can be used for this purpose. Next, the coordinates of the nest found can be loaded in the GPS system of the tractor, and the farmer will be informed by the system when he/she is near a nest. While this technology can find nest after birds have settled, these technologies can also be used to find suitable areas for nests even before they are made. With GPS, satellite images or for instance with 'near infrared cameras' on drones, meadows and pastures can be analysed and information can be gathered on for instance the productivity and the diversity of the meadow among

other factors important for meadow birds. This information can be used to determine whether a certain area is suitable for meadow birds, and these areas can be mapped throughout the Netherlands. Farmers then have the chance to plan their agricultural activities in advance and can, for instance, create efficient mowing strategies, taking meadow birds into account. The mentioned camera systems are not yet in a consumer stage, however, and a better understanding of them is recommended.

Against predation, fox- and badger-proof fences could be used in areas with high densities of these species. Fox fences can be made of simple netting, while badgers demand electric fences. Although the fences are expensive and labour-intensive to construct, once installed, they could offer protection for multiple years.

Currently, the use of contractors for mowing is seen as a threat. Large equipment is used because of the focus on time and efficiency. They sometimes mow down nests, even if they are marked with sticks. The technologies described above could also be used by contractors to distinguish themselves as contractors that do take the meadow birds into account. Farmers that do seem to care about meadow birds, but who are unwilling to change their practises too much could make use of these contractors. These 'meadow bird friendly contractors' could even be in a better position to invest in these technologies and incorporate them into their business model.

5. Final remarks

It is clear that more research is needed on some topics. As shown in the interview results, the diversity of farmer's thoughts on the importance of meadow birds is remarkable. It could be beneficial to conduct in-depth research on the motivation farmers have in order to gain more information on the cause of this broad difference in opinions. Within this project, there was only time to interview a small number of farmers. Increasing this number could provide more statistical outcomes, also identifying relations between different answers.

Furthermore, noteworthy are the ongoing studies which could benefit meadow birds. For example, FrieslandCampina's research on proving the nutritive value of 'meadow milk' compared to normal milk. If the meadow's biodiversity proves to have a positive influence on the milk quality, customer appeal of the milk could increase, and so can milk prices. This is in line with making schemes less dependent on funding from the government, by having more sources of funding. This makes schemes more stable and farmer's income less uncertain.

Considering the interview methodology, there are some remarks. Most non-practicing farmers interviewed are from Drenthe, as these farmers were more easily approachable by the research team. All practicing farmers were also contacted through one organisation. In future research, it is recommended to interview farmers a more diverse geographical area. This could provide for a more realistic set of data.

References

- Abdi, M., Azadegan-Mehr, M., & Ghazinoory, S. (2011). SWOT methodology: a state-of-the-art review for the past, a framework for the future. *Journal of Business Economics and Management*, (1), 24-48.
- Aberbach, J. D., & Rockman, B. A. (2002). Conducting and coding elite interviews. *Political Science & Politics*, 35(04), 673-676.
- Alexandrov, E. O., Cowan, P. A., & Cowan, C. P. (2005). Couple attachment and the quality of marital relationships: Method and concept in the validation of the new couple attachment interview and coding system. *Attachment & human development*, 7(2), 123-152.
- Allen, A.W. (2005a). Participant Observations on Environmental and Social Effects of the Conservation Reserve Program: Results of a National Survey. *Fish and Wildlife Benefits of Farm bill Programs: 2000-2005 Update*, 199-205.
- Allen, A.W. (2005b). The Conservation Reserve Enhancement Program. *Fish and Wildlife Benefits of Farm bill Programs: 2000-2005 Update*, 115-132.
- Ark&Eemlandschap and Gebiedscoördinatieteam Eemland. (2015). *Nieuwsbrief voorjaar 2015*. year 18, nr. 1. Extracted on 20-06-2015 from www.arkeneemlandschap.nl/index.php.
- Azooptics, 2015. Wildlife Protection Systems using FLIR Thermal Imaging Cores help Save Animals in Their Natural Habitat. Extracted on 16-06-2015 from <http://www.azooptics.com/Article.aspx?ArticleID=993>
- Baarda, V. D., & De Goede, M. P. M. (2006). *Basisboek methoden en technieken*. 4^{de} editie. Noordhoff Uitgevers. ISBN 9789020733150.
- Beintema, A.J., & Drost, N. (1986). Migration of the Black-tailed Godwit. *Gerfaut* 76, p. 37-62.
- Bij12, 2015. Subsiestelsel Natuur en Landschap. Extracted on 24-06-2015 from <http://www.portaalnatuurenlandschap.nl/assets/SNL-folder-2015-paginas-DEF-incl-hyperlinks.pdf>.
- Bradbury, R. B., Browne, S. J., Stevens, D. K., & Aebischer, N. J. (2004). Five-year evaluation of the impact of the Arable Stewardship Pilot Scheme on birds. *Ibis*, 146(s2), 171-180.
- Brouwer, T. (2005). Bescherming van weidevogels in Noord-Brabant. *Natuurbalans - Limes Divergens BV*, Nijmegen.
- Casimir, G. J., & Tobi, H. (2011). Defining and using the concept of household: a systematic review. *International Journal of Consumer Studies*, 35(5), 498-506.

- Christiansen, P., Steen, K. A., Jørgensen, R. N., & Karstoft, H. (2014). Automated detection and recognition of wildlife using thermal cameras. *Sensors*, 14(8), 13778-13793.
- Ecomare (2015). 'Meadow birds'. Extracted online on 20-05-2015 from <http://www.ecomare.nl/en/ecomare-encyclopedie/water-and-land/landforms/man-made-land/grassland-biotope/meadow-birds/>
- European Commission. (2015a). Burren Farming for Conservation Programme (BFCP) - Ireland. Extracted on 02-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015b). Farm Conservation Scheme – United Kingdom, England. Extracted on 11-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015c). Grassland bird protection payments – Germany, Schleswig-Holstein. Extracted on 02-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015d). Maintenance of species rich grassland through results-based agri-environment schemes - Germany. Extracted on 08-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015e). Meadow bird agreement with agri-environment cooperatives – the Netherlands. Extracted on 02-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015f). Meadow Bird Agreements (2000-2006) – the Netherlands. Extracted on 04-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015g). MEKA programme B4 – species rich grassland scheme – Germany, Baden-Württemberg. Extracted on 05-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015h). Pastoral management plan (Gertion pastorale: HERBE_09) - France. Extracted on 12-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015i). Preservation and enhancement of species rich grassland - Switzerland. Extracted on 01-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015j). Result-based nature conservation plan (Ergenbisorientierter Naturschutzplan, ENP) - Austria. Extracted on 09-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015k). Species rich grassland (Artenreiches Grünland – Kennarten) – Germany, Rheinland-Pfalz. Extracted on 08-06-15 from ec.europa.eu/environment/nature/index_en.htm

- European Commission. (2015l). Species rich grassland programme (Flowering Meadows Scheme: HERBE_07) - France. Extracted on 02-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015m). Species-rich grassland and arable botanical management agreements (2000-2006) – the Netherlands. Extracted on 02-06-15 from ec.europa.eu/environment/nature/index_en.htm
- European Commission. (2015n). The programme Blühendes Steinburg – Germany, Schleswig-HolsteiII. Extracted on 08-06-15 from ec.europa.eu/environment/nature/index_en.htm
- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of advanced nursing*, 62(1), 107-115.
- Finn, J. A., Bartolini, F., Bourke, D., Kurz, I., & Viaggi, D. (2009). Ex post environmental evaluation of agri-environment schemes using experts' judgements and multicriteria analysis. *Journal of Environmental Planning and Management*, 52(5), 717-737.
- Groen, N. M., Kentie, R., Goeij, P. D., Verheijen, B., Hooijmeijer, J. C., & Piersma, T. (2012). A modern landscape ecology of Black-tailed Godwits: habitat selection in southwest Friesland, The Netherlands. *Ardea*, 100(1), 19-28.
- Hayes, J. (2014). *The theory and Practice of Change Management*. 4th edition. Hampshire: Palgrave Macmillan.
- Johnson, D.H. (2005). Grassland Bird Use of Conservation Reserve Program Fields in the Great Plains. *Fish and Wildlife Benefits of Farm bill Programs: 2000-2005 Update*, 17-32.
- Keenleyside, C., Allen, B., Hart, K., Menadue, H., Stefanova, V., Prazan, J., Herzon, I., Clement, T., Povellato, A., Maciejczak, M. and Boatman, N. (2011) *Delivering environmental benefits through entry level agri-environment schemes in the EU. Report Prepared for DG Environment, Project ENV.B.1/ETU/2010/0035*. Institute for European Environmental Policy: London.
- Kening fan 'e Greide (2015). 'Over Kening'. Extracted online on 20-05-2015 from <http://www.keningfanegreide.nl/over-kening>
- Kentie, R., Hooijmeijer, J., Both, C., & Piersma, T. (2011). Grutto's in ruimte en tijd 2007-2010, eindrapport. *Directie kennis, Ministerie van Landbouw, Natuur en Voedselkwaliteit, Den Haag*.
- Kleijn, D., & Sutherland, W. J. (2003). How effective are European agri-environment schemes in conserving and promoting biodiversity?. *Journal of applied ecology*, 40(6), 947-969.
- Knierim, A., & Nowicki, P. (2010). SWOT analysis: appraisal of a new tool in European rural development policies. *Outlook on agriculture*, 39(1), 65-72.

- Krippendorff, K. (2012). *Content analysis: An introduction to its methodology*. Sage.
- Kumar, R. (2011). *Research Methodology: A step-by-step approach*. 3rd edition. SAGE Publications Inc. ISBN 9781849203015.
- Martin, J., Edwards, H. H., Burgess, M. A., Percival, H. F., Fagan, D. E., Gardner, B. E., & Rambo, T. J. (2012). Estimating distribution of hidden objects with drones: from tennis balls to manatees. *PLoS one*, 7(6), e38882.
- Oosterveld, E., & Altenburg, W. (2004). *Kwaliteitscriteria voor weidevogelgebieden: met toetslijst*. Altenburg & Wymenga ecologisch onderzoek.
- Polman, N., Dijkshoorn, M., Doorneweert, B., Rijk, P., Vogelzang, T., Reinhard, S., Heideveld, A., (2015). Verdienmodellen natuur inclusieve landbouw. *Ministerie van Economische Zaken*.
- Poole, D. W., McKillop, I. G., Western, G., Hancocks, P. J., & Packer, J. J. (2002). Effectiveness of an electric fence to reduce badger (*Meles meles*) damage to field crops. *Crop Protection*, 21(5), 409-417.
- Sanders, M., Nieuwenhuizen, W., Dirx, J., & Smidt, R. (2013). *Bedrijfsvoering zit in de weg. Landschap: tijdschrift voor Landschapsecologie en Milieukunde*, 30(2), 56-66.
- Scolozzi, R., Schirpke, U., Morri, E., D'Amato, D., & Santolini, R. (2014). Ecosystem services-based SWOT analysis of protected areas for conservation strategies. *Journal of environmental management*, 146, 543-551.
- Steen, K. A., Villa Henriksen, A., Therkildsen, O. R., & Green, O. (2012). Automatic detection of animals in mowing operations using thermal cameras. *Sensors*, 12(6), 75877597.
- Steen, K. A., Therkildsen, O. R., Green, O., & Karstoft, H. (2015). Detection of Bird Nests during Mechanical Weeding by Incremental Background Modeling and Visual Saliency. *Sensors*, 15(3), 50965111.
- Terrados, J., Almonacid, G., & Hontoria, L. (2007). Regional energy planning through SWOT analysis and strategic planning tools: Impact on renewables development. *Renewable and Sustainable Energy Reviews*, 11(6), 1275-1287.
- Teunissen, W. A., & Willems, F. (2004). *Bescherming van weidevogels*. SOVON Vogelonderzoek Nederland.
- Teunissen, W.A., Schekkerman, H., Willems, F. (2005). *Predatie bij weidevogels. Op zoek naar de mogelijke effecten van predatie op de weidevogelstand*. SOVON Vogelonderzoek Nederland.

- Thorup, O., (2006) Breeding waders in Europe 2000. *International Wader Studies 14*. International Wader Study Group, UK.
- Vas, E., Lescroël, A., Duriez, O., Boguszewski, G., & Grémillet, D. (2015). Approaching birds with drones: first experiments and ethical guidelines. *Biology letters*, *11*(2), 20140754.
- Vickery, J. A., Bradbury, R. B., Henderson, I. G., Eaton, M. A., & Grice, P. V. (2004). The role of agri-environment schemes and farm management practices in reversing the decline of farmland birds in England. *Biological conservation*, *119*(1), 19-39.
- Wynne-Jones, S., Schwarz, G., Burton, R. J. F., Helgadóttir, Á., & Hopkins, A. (2013). Payment-by-results agri-environmental support for grasslands in Europe: lessons learnt for future agri-environmental support in Wales. *The role of grasslands in a green future: threats and perspectives in less favoured areas. Proceedings of the 17th Symposium of the European Grassland Federation, Akureyri, Iceland, 23-26 June 2013*, (pp. 370-372). Agricultural University of Iceland.

Table of Content Appendices

Appendix A	38
Ark & Eemlandschap – The Netherlands	38
Blühendes Steinburg – Germany	39
Burren Farming for Conservation Programme – Ireland	40
Entry-level agro-environment schemes – Europe.....	41
Ex post environmental evaluation of agro-environment schemes using experts' judgements and multi-criteria analysis.....	43
Farm Conservation Scheme – United Kingdom, England	44
Grassland bird protection payments – Germany, Schleswig-Holstein	45
Grassland bird use of conservation reserve program fields in the Great Plains – USA	46
How effective are European agro-environment schemes in conserving and promoting biodiversity? – Europe.....	47
Maintenance of species rich grassland through results-based agro-environment schemes – Germany.....	48
Meadow bird agreement with agro-environment cooperatives – The Netherlands	49
Meadow Bird Agreements (2000-2006) – The Netherlands	50
MEKA programme B4 – species rich grassland scheme – Germany, Baden-Württemberg	51
Pastoral management plan Herbe_09 - a scheme that tailors the management of ecologically valuable grassland parcels, based on a management plan involving an agro-ecological pre-assessment.	53
Payment-by-results agro-environmental support for grasslands in Europe – Wales.....	54
Preservation and enhancement of species rich grassland – Switzerland	55
Results-based nature conservation plan (Ergebnisorientierter Naturschutzplan, ENP) – Austria.....	56
Species rich grassland (Artenreiches Grünland - Kennarten) (part of PAULa) - Germany, Rheinland-Pfalz	58
Species rich grassland programme – France	60
Species-rich grassland and arable botanical management agreements (2000-2006) – The Netherlands	61

Appendix A

Ark & Eemlandschap – The Netherlands

Sources

Ark&Eemlandschap and Gebiedscoördinatieteam Eemland. (2015). *Nieuwsbrief voorjaar 2015*. From www.arkeneemlandschap.nl/index.php, year 18, nr. 1.

Summary

Ark & Eemlandschap is an association for farmers and civilians who want to contribute to grasslands that are sustainable in nature and give value to the landscape. The region (Arkemheen and Eemland) is surrounded by urban areas and an increasing pressure is felt from the surroundings. Members gather to make a stand against this pressure and create a landscape with an own identity and sustainable agricultural practices, focussing on nature-inclusive farming.

Strengths	Weaknesses
<p><i>Economical</i></p> <ul style="list-style-type: none">- Funding received is ensured to be fairly distributed because of involvement of board.- A budget is available for last minute exhibition of mowing activities, when for instance a unexpected presence of meadow birds is discovered right before. <p><i>Cultural</i></p> <ul style="list-style-type: none">- Members stimulate each other, creating incentive for farmers to make small sacrifices in production for nature and making civilians volunteer to contribute. <p><i>Technical</i></p> <ul style="list-style-type: none">- Small strokes of wet patches are created with a clear plan to keep the meadows productive.- Fox-rosters are used to lower predation.- Monitoring of results with members to educate. <p><i>Organisational</i></p> <ul style="list-style-type: none">- Farmers and civilians are members and the board consists of them as well, this makes sure both parties are heard and allows perfect	<p><i>Economical</i></p> <ul style="list-style-type: none">- Funding for projects is cut off when results are not presented within short timespans. <p><i>Technical</i></p> <ul style="list-style-type: none">- Though there are enough options, choices have to be made due to a lack of time/funding. This can also lead to less incentive to contribute.

communication.	
Opportunities <i>Organisational</i> <ul style="list-style-type: none"> - The province does not need to concern itself with managing nature-inclusive farming since it is planned that the Ark & Eemlandschap association gets the full responsibility for this. 	Threats <i>Economical</i> <ul style="list-style-type: none"> - The province had limited funding and side-projects are cancelled because of this. <i>Technical</i> <ul style="list-style-type: none"> - The province controls the possibilities for conservation practises, excluding some options because of a funding/time limit.

Blühendes Steinburg – Germany

Sources

European Commission. (2015n). *The programme Blühendes Steinburg – Germany, Schleswig-HolsteiII*. Extracted on 08-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

Payments are made to farmers to maintain species-rich meadows and pastures based on the presence of a minimum number of indicator species. The scheme is similar to others in Germany, its uniqueness lies in the fact that funding is carried out by a private party, who uses a conservation procurement auction to determine which farmer receives funding and which payment rates are applied.

Strengths <i>Economical</i> <ul style="list-style-type: none"> - No funding from government needed. - Auction makes scheme relatively cheap. <i>Cultural</i> <ul style="list-style-type: none"> - Farmer can choose to participate each year. - Farmers have been made enthusiastic about nature conservation and take additional steps outside the scheme. <i>Technical</i> <ul style="list-style-type: none"> - Meadows already in the program for multiple years are not checked thoroughly (based on trust). - No specific requirements. 	Weaknesses <i>Economical</i> <ul style="list-style-type: none"> - Available budget is constant, but sometimes the highest bids cannot be paid. <i>Cultural</i> <ul style="list-style-type: none"> - The auction design reduces the incentive to maintain the higher tier conservation when a lower one is also accepted. <i>Technical</i> <ul style="list-style-type: none"> - Species threshold needed before farmers can participate.
--	--

<ul style="list-style-type: none"> - Both farmers and biologist monitor the meadows. This way they share the workload and this allows the farmer to gain more knowledge. - Simple application process. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - No management requirements for farmers or government. - Two levels allow farmers to choose their level of ambition. 	
<p>Opportunities</p>	<p>Threats</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Because easy participation and low amount of effort required, farmers can be lazy and unwilling to act more pro-active.

Burren Farming for Conservation Programme – Ireland

Sources

European Commission. (2015a). *Burren Farming for Conservation Programme (BFCP) - Ireland*. Extracted on 02-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

The scheme focuses on conservation of semi-natural grasslands and landscapes, and works with three measures. Measure 1 is a payment plan for species-rich grassland. Measure 2 includes management-based elements, so payment for specific actions, and thus supports Measure 1. Measure 3 provides areal payments for designated habitats.

<p>Strengths</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Monitoring is paid for by farmers. - Same costs as national agro-environment schemes, but higher output. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - No long-term commitment creates incentive for farmers. - Monitoring done by trained advisors, but farmers is taught to monitor as well and this 	<p>Weaknesses</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Only €1m per year is funded, creating the need for selection out of all applications for financial support. As history of participation is one of the main criteria, new applications will not likely to be granted support. - Monitoring is paid for by farmers, so farmers can get uninvolved at the monitor process. - Farmers suffer large penalties for unwitting over-declaration of land
--	---

<p>creates understanding.</p> <ul style="list-style-type: none"> - Self-autonomy for farmers. <p><i>Technical</i></p> <ul style="list-style-type: none"> - The combination of support for capital improvements and results-based payment allows for continued grassland management, while transition is also made easy. - Easy indicators create transparency and practicality. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - No management needed, only advice necessary. 	<p>for the scheme.</p> <p><i>Technical</i></p> <ul style="list-style-type: none"> - Very strict policy for which land is eligible for the scheme.
<p>Opportunities</p> <p><i>Technical</i></p> <ul style="list-style-type: none"> - Designation of more farming land as being eligible could greatly increase effect of scheme. - Increase in subsidy allows more farmers to be included in the scheme. 	<p>Threats</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Market creates incentive for different soil usage, resulting in decline of habitat quality.

Entry-level agro-environment schemes – Europe

Sources

Bradbury, R. B., Browne, S. J., Stevens, D. K., & Aebischer, N. J. (2004). Five-year evaluation of the impact of the Arable Stewardship Pilot Scheme on birds. *Ibis*, 146(s2), 171-180.

Keenleyside, C., Allen, B., Hart, K., Menadue, H., Stefanova, V., Prazan, J., Herzon, I., Clement, T., Povellato, A., Maciejczak, M. and Boatman, N. (2011) *Delivering environmental benefits through entry level agro-environment schemes in the EU*. Report Prepared for DG Environment, Project ENV.B.1/ETU/2010/0035. Institute for European Environmental Policy: London.

Vickery, J. A., Bradbury, R. B., Henderson, I. G., Eaton, M. A., & Grice, P. V. (2004). The role of agro-environment schemes and farm management practices in reversing the decline of farmland birds in England. *Biological conservation*, 119(1), 19-39.

Summary

Agro-environmental schemes (AES) aim to compensate farmers for loss of income due to the implementation of measures to benefit biodiversity or the environment in general. They are used throughout Europe and besides biodiversity have objectives like landscape enhancement, water quality

protection and soil protection (Bradbury *et al.*, 2004). AES are known to be a key policy tool for delivering the EU environmental priorities on farmland. 'Entry-level' is a relative term describing management that varies from project to project, but is designed to deliver incremental improvements just above the environmental reference level, which all farmers must achieve in order to be approved for agro-environmental support.

<p>Strengths</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Agro-environmental schemes can be seen as a stable income next to external economic factors. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Though there is little evidence, ELS can increase farmers' environmental awareness or behaviour. It can also serve as a stepping-stone towards a higher tier of nature-inclusive farming. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Can be easily applicable to all farming systems, though there is a broad range of implementation options. - Easily increases the quantity of habitat available for wildlife. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Because the schemes are entry-level (relatively low transition costs and low maintenance), pilots can easily be established and used to create a scheme that is tested, stable and agreed upon by most stakeholders. 	<p>Weaknesses</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Payment rates can be: per hectare, per region (not per farmer), a flat rate, capped per area. This depends on the scheme. Administrative errors and problems can greatly influence the effect of a scheme. - Farmers are not willing to pay for advice only. <p><i>Technological</i></p> <ul style="list-style-type: none"> - Does not solve the problems with decrease of biodiversity on its own, but can serve as a 'basis' on which to implement further measures.
<p>Opportunities</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Farmer support networks can greatly influence the effect of schemes in a positive way. Experiences and costs can be shared and problems are solved more easily. However, this applies only when the scheme/advice is seen by the 	<p>Threats</p> <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Changes in the reference level of EU, national and regional legislation necessitates changes in ELS and payment rates of the ELS. - A lack of incentive of farmers due to unclear authority of information and unclear

<p>farmers as trustworthy and is relevant for their farming operations.</p> <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Including farmers in designing the scheme improves their understanding of the ELS and provides feedback on the environmental achievements met. - Easily adapted to contain not only EU requirements, but also national and regional needs. 	<p>payment plans.</p>
--	-----------------------

Ex post environmental evaluation of agro-environment schemes using experts' judgements and multi-criteria analysis

Sources

Finn, J. A., Bartolini, F., Bourke, D., Kurz, I., & Viaggi, D. (2009). Ex post environmental evaluation of agro-environment schemes using experts' judgements and multicriteria analysis. *Journal of Environmental Planning and Management*, 52(5), 717-737.

Summary

Scientific article that prescribes a methodology for assessing agro-environmental schemes. It claims that using a multi-criteria analysis combined with expert knowledge, will gain substantial insights and challenges for these schemes. The methodology has also been tested, and factors that influence the success of these schemes are identified. They are summarized below.

<p>Strengths</p> <p><i>Organisational</i></p> <ul style="list-style-type: none"> - The projects that are most successful focus as much on the design of the project as on the monitoring part. - Projects that are more successful are aligned to the policy goals of the subsequent policy layer. This provides more efficient backing from governmental organisations. - Clearly quantified goals with appropriate indicators contribute to maintaining motivation and clearly signal when a project is successful or not. 	<p>Weaknesses</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Unclear or inadequate monitoring of schemes leads to high associated costs. - Schemes lack a direct connection between financial and environmental information. This makes cost-effectiveness analysis difficult. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Projects have insufficient clarity in the official documentation about scheme design and how a scheme is implemented. This leads to a lack of clarity of a projects specific intention.
--	---

	<ul style="list-style-type: none"> - Inadequate design of a project, can lead to poor environmental performance, even though the project seems successful. Proxy measures should be avoided or clearly justified.
Opportunities	Threats

Farm Conservation Scheme – United Kingdom, England

Sources

European Commission. (2015b). *Farm Conservation Scheme – United Kingdom, England*. Extracted on 11-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

National Park Authority's Ecology Service and Farm and Countryside Service in UK set up a scheme to do meadow management in Peak District National Park by restrictions to cutting practices and inputs where the agreements were a minimum of five years and up to ten years according to farmers' willingness.

<p>Strengths</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - The potential to negotiate shorter agreement terms that could be terminated with no obligation for repayment if the land was sold was attractive to farmers. <p><i>Technical</i></p> <ul style="list-style-type: none"> - The time of agreement was flexible from 5 years to 10 years. - Participants were able to tailor the management of their meadows in a way that suited their agronomic requirements. - The enthusiasm and focus of the consultant tasked with designing the scheme allowed for personal feedback to every farmer who may be eligible for the scheme. 	<p>Weaknesses</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Limited funding available for the scheme compared to national schemes. Limited number of farmers can be supported. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Shorter agreements were considered to be important on less intensive farms. <p><i>Technical</i></p> <ul style="list-style-type: none"> - The evaluation highlights the complexity of habitats and stated that more work would be needed to assess options for enhancing meadows with little or no conservation value. - Observed ecological results are difficult to determine in terms of increasing conservation value or maintaining it.
Opportunities	Threats

<p><i>Organisational</i></p> <ul style="list-style-type: none"> - A new biodiversity strategy running until 2020 – to conserve and enhance natural assets and manage them sustainably, ensuring nature delivers what we need. One of the six priorities is an anchor biodiversity goal in the most relevant EU policy areas: farming, forests and fisheries. 	
---	--

Grassland bird protection payments – Germany, Schleswig-Holstein

Sources

European Commission. (2015c). *Grassland bird protection payments – Germany Schleswig-Holstein*. Extracted on 02-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

The 'Cooperation for grassland bird protection' scheme pays grassland farmers in regions around Schleswig-Holstein for the protection of grassland bird nest sites in fields when mowing, grazing and managing the fields. The scheme is funded by the Schleswig-Holstein federal state funds and organised by local organisations (€150,- and €350,- per hectare for 1 nest and multiple nests per field respectively).

Strengths	Weaknesses
<p><i>Economical</i></p> <ul style="list-style-type: none"> - Clear and easy payment plan. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Agreements on a year-to-year basis, making it easy to adopt the scheme to the temporal situation and without strong commitment. - Regional scheme contact persons allow for a personal and specialized treatment and increases farmers trust in nature conservation agreements. - Stepping stone for higher tier agro-environmental schemes. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Easy to manage since the main factor (bird nests) are easy to 	<p><i>Economical</i></p> <ul style="list-style-type: none"> - Lost nests also need to be paid for to avoid any incentive for predator control measures. <p><i>Technical</i></p> <ul style="list-style-type: none"> - A passive scheme does little to improve quality of habitat. - Only suited for areas where bird populations are relatively abundant. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Verbal agreements can cause mismatch of expectations and could lead to unaccountability of different parties. - Checking every parcel for the amount of nests and when they are lost and why is a labour intensive task. Most of this is

register.	voluntary, so active participation of the community and education is required.
Opportunities <i>Cultural</i> <ul style="list-style-type: none"> - Create a community more willing to cooperate with agro-environmental schemes through participation and education. 	Threats <i>Economical</i> <ul style="list-style-type: none"> - Fully dependent on governmental funding. - Great pressure of grass and livestock market pushes farmers to farm more intensively as opposed to the project.

Grassland bird use of conservation reserve program fields in the Great Plains – USA

Sources

Allen, A.W. (2005a). *Participant Observations on Environmental and Social Effects of the Conservation Reserve Program: Results of a National Survey*. Fish and Wildlife Benefits of Farm bill Programs: 2000-2005 Update, 199-205.

Allen, A.W. (2005b). *The Conservation Reserve Enhancement Program*. Fish and Wildlife Benefits of Farm bill Programs: 2000-2005 Update, 115-132.

Johnson, D.H. (2005). *Grassland Bird Use of Conservation Reserve Program Fields in the Great Plains*. Fish and Wildlife Benefits of Farm bill Programs: 2000-2005 Update, 17-32.

Summary

Since 1985, nearly 8 million hectares of cropland has been transformed to grassland through the Conservation Reserve Program. The Conservation Reserve Enhancement Program is a refinement of the Conservation Reserve Program to focus even more on addressing environmental issues on landscape scales, going from increasing water quality to creating new wildlife habitat. The program has greatly benefited grassland, bird and wildlife populations.

Strengths <i>Economical</i> <ul style="list-style-type: none"> - Funding is managed by a third party, receiving governmental and non-governmental contributions, which can both be substantial. This ensures payment when a party fails to meet its promised contribution. - Through subsidies and increased crop quality income stability is created. <i>Cultural</i>	Weaknesses <i>Cultural</i> <ul style="list-style-type: none"> - Long-term commitment (10-15 years) puts the bar for enrolling high. <i>Technical</i> <ul style="list-style-type: none"> - Tracts of native prairie necessary for success. - Results can vary greatly depending on plot size and shape. - Limited enrolment per state (100.000 acres).
---	--

<ul style="list-style-type: none"> - Increases environmental quality, incorporating nature in daily live (e.g. scenery, observing wildlife, hunting). <p><i>Technical</i></p> <ul style="list-style-type: none"> - Great advantage of controlled grassland over crop fields. - Farmers can decide how much of their land they dedicate the scheme. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Long-term commitment ensures long-term results. 	<ul style="list-style-type: none"> - Increase of fire hazards and weeds. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Because of the size of a program there are many different management plans for many different areas, including different funding strategies.
<p>Opportunities</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Account taxes for inflation and property taxes might create incentive. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Positive feedback from community rewards participants. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Increasing flexibility of contracts and enrolments can increase incentive. 	<p>Threats</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Greatly dependent on third party funding. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Farmers can be encouraged by other parties to remove tracts of native growth. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Lands outside the program can be converted back at the same speed.

How effective are European agro-environment schemes in conserving and promoting biodiversity? – Europe

Sources

Kleijn, D., & Sutherland, W. J. (2003). How effective are European agri-environment schemes in conserving and promoting biodiversity? *Journal of applied ecology*, 40(6), 947-969.

Summary

This is a comparative study on 62 evaluations of agro-environmental schemes in Europe. 76% of these studies were carried out in the United Kingdom and the Netherlands, however. The SWOT will summarize the evaluation.

<p>Strengths</p> <p><i>Technical</i></p> <ul style="list-style-type: none"> - Schemes are taken up easily in extensive agricultural areas, increasing chance to maintain an already high biodiversity and creating core zones. - In general, schemes have a positive outcome on biodiversity, though for both birds and plants statistics are lacking. 	<p>Weaknesses</p> <p><i>Technical</i></p> <ul style="list-style-type: none"> - Schemes are hardly taken up in intensive agricultural areas, where biodiversity is already low. This lowers chance to create new habitats outside already biodiverse areas. - Often monitoring and evaluation is lacking, either statistically or within technique.
<p>Opportunities</p> <p><i>Technical</i></p> <ul style="list-style-type: none"> - Better cooperation with academic structures can result in better evaluations, which should be used to create incentive both for the government and farmers. - Developing a general evaluation process would allow schemes to be compared and determine the most effective way of creating and protecting biodiversity. 	<p>Threats</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - A trend of reducing subsidies for the schemes hinders development.

Maintenance of species rich grassland through results-based agro-environment schemes – Germany

Sources

European Commission. (2015d). *Maintenance of species rich grassland through results-based agri-environment schemes - Germany*. Extracted on 08-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

This article gives an overview of the many implemented results-based agro-environmental schemes in Germany. Funding is given when 4, 6 or 8 indicator species are present in the meadows. Payments range from €60,- to €255,-, depending on tier and region.

<p>Strengths</p> <p><i>Technical</i></p> <ul style="list-style-type: none"> - Farmers can move up a tier within their scheme during their contract. - Scheme can be combined with other nature conservation schemes. - Indicator species are 	<p>Weaknesses</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - 5 year contracts can lower incentive to participate. - Needs active participation from farmers, lowering incentive to participate.
--	---

<p>determined through biogeographic surveys of academic level.</p> <ul style="list-style-type: none"> - Farmers monitor meadows themselves, with an expert checking the results once a year. - Effective schemes, resulting in greater conservation of species. 	<p><i>Technical</i></p> <ul style="list-style-type: none"> - The schemes focus on conservation. Only meadows with a threshold presence of indicator species are allowed to participate. - Schemes cannot be used in Natura-2000 areas.
<p>Opportunities</p>	<p>Threats</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Continued governmental funding is vital for schemes and keeping trust of farmers.

Meadow bird agreement with agro-environment cooperatives – The Netherlands

Sources

European Commission. (2015e). *Meadow bird agreement with agri-environment cooperatives – the Netherlands*. Extracted on 02-06-15 from ec.europa.eu/environment/nature/index_en.htm

de Lijster, E., & Prager, K. (2012). *The Use of Indicators in Agro-environmental Management in the Netherlands: Indicators Used by Dutch Agrarische Natuurverenigingen (ANVs) for Monitoring and Reporting Their Activities*. James Hutton Institute [et.].

Summary

A number of agro-environmental cooperatives in the Netherlands have continued to operate a form of result-based meadow bird agreement since the previous scheme. These private 'schemes' focus on grassland bird populations and support is available for farmers that protect meadow birds.

<p>Strengths</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Farmers pay a percentage of the money they receive from subsidies to their ANV, who distributes it among volunteers. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Cultural significance of cooperatives in the Netherlands, whom provide advice and support. - Result based scheme appealed to farmers' sense of pride. 	<p>Weaknesses</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Monitoring scheme relies heavily on voluntary contribution (for tracing and marking nests). <p><i>Technical</i></p> <ul style="list-style-type: none"> - By focussing too much on nest protection, there is insufficient incentive to protect meadow birds once they have hatched, which has led to a decline in meadow bird populations
---	---

<ul style="list-style-type: none"> - Through contact with volunteers and experts and training, farmers gained more knowledge on the subject. The Agrarische Natuurvereniging (ANV) facilitated this. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Cooperatives provide continuous and free training to participants. 	<p>despite conservation efforts carried out through this scheme. Quality of the habitat is not taken into account.</p> <ul style="list-style-type: none"> - Different cooperatives have different management requirements.
<p>Opportunities</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - ANV's cooperate extensively with different partners through public-private partnership structures and numerous other initiatives they are involved in. This network is now an assumed, preconceived factor. However this network creation could also provide more knowledge and impact (de Lijster & Prager, 2012). <p><i>Technical</i></p> <ul style="list-style-type: none"> - The Dutch government has ensured that through the implementation of agro-environmental schemes, nest protection must be accompanied by other agro-environmental measures at the regional level. 	<p>Threats</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Funded by CAP agro-environment money (EU). This could be discontinued.

Meadow Bird Agreements (2000-2006) – The Netherlands

Sources

European Commission. (2015f). *Meadow Bird Agreements (2000-2006) – the Netherlands*. Extracted on 04-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

The Meadow Bird Agreements was a six-year plan for the conservation of 22 meadow bird species, songbirds and other species available for (livestock) farmers in all provinces of the Netherlands, in designated areas. Participants had to achieve a set target within this six year on the existing bird densities within a specific management recipe.

<p>Strengths</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Full payment paid out when target is reached, whether management recipe is followed or not. - When target not reached, still 85% of payment paid out when management recipe is carried out properly (till 2004). - Cooperatives provide continuous and free training to participants. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Cultural significance of cooperatives in the Netherlands, whom provide advice and support. - Result based scheme appealed to farmers' sense of pride. - Through contact with volunteers and experts and training, farmers gained more knowledge on the subject. The ANV facilitated this. 	<p>Weaknesses</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Monitoring results needed much administration and many inspections. - Risk for farmers when target is not achieved despite the actions been done. <p><i>Technical</i></p> <ul style="list-style-type: none"> - No scientific evaluation on the response of meadow bird populations on agreement (meadow bird populations still declined at the end of 2006, but not enough evidence to prove a decrease in this decline). - Inspection of farmers' management system with random sampling. - Different interpretations on whether target was achieved or not (recording of nests and breeding pairs done by different people).
<p>Opportunities</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Cooperation between ANV and other cooperatives (e.g. farmers, citizen and conservation volunteers) with spread costs on administration. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Acceptance of farmer and ministerial on approach. 	<p>Threats</p>

MEKA programme B4 – species rich grassland scheme – Germany, Baden-Württemberg

Sources

European Commission. (2015g). *MEKA programme B4 – species rich grassland scheme – Germany, Baden-Württemberg*. Extracted on 05-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

This programme is open for all farmers of different environmental areas in Baden-Württemberg, Germany from the lowland (100 meters above sea level) to the mountains (1.400 meters above sea level), covered out from 2000 until now (expected up to 2020). The programme is very broad (4.800 farmers covering 44.000 acres of grassland), which is 10% of all the grassland in Baden-Württemberg. Goal of the programme is biodiversity based: protection of species rich meadows and pastures. Minimum requirement in order to success the programme is the presence of four key species per hectare from a list of 28 potential (threshold) species, rewarded with €60/ha.

<p>Strengths</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - The 'four species indicator' is sufficient enough for reaching the goal and still an acceptable agricultural output can be reached (Oppermann & Gujer, 2003). <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Open for all farmers in the area. <p><i>Technical</i></p> <ul style="list-style-type: none"> - No restricted managing system, which farmers have to persist (e.g. no fixed number of cuts and no cutting dates). <p>Organisational</p> <ul style="list-style-type: none"> - Well organised in form of information material, advice and presentation and trainings for farmers (e.g. plant identification). 	<p>Weaknesses</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Payment amount turned out to be infeasible related to workload. - Maintaining species anticipated more work than expected and monitoring and recording presence of species causes additional work. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Lack of consistent ecological monitoring of results-based part of the scheme.
<p>Opportunities</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Introduced after consultation with farmers associations. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Scientific substantiation that scheme has a well-selected species catalogue (Oppermann and Gujer, 2003). 	<p>Threats</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Low payment rate (payment divided by additional requirements) resulted in a decrease in participants (from 65.000 acres in 2003 to 44.000 acres in 2013). - Feasibility on quality of extensive grassland management: hay produced from these species-rich

	<p>meadows is mainly useable for calves or horses instead of dairy and beef cattle (due to insufficient protein content).</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Economic and administrative liabilities can cause disinterest among farmers about the programme. <p><i>Technical</i></p> <ul style="list-style-type: none"> - EU notification process added management requirements (hay use and first mowing dates).
--	---

Pastoral management plan Herbe_09 - a scheme that tailors the management of ecologically valuable grassland parcels, based on a management plan involving an agro-ecological pre-assessment.

Sources

European Commission. (2015h). *Pastoral management plan (Gertion pastorale: HERBE_09) - France*. Extracted on 12-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

It is about a hybrid scheme to maintain biodiversity and prevent fire in grassland and rangeland of Mediterranean and mountain pastoral land in France, located mainly in Natura-2000 areas.

Strengths	Weaknesses
<p><i>Economical</i></p> <ul style="list-style-type: none"> - Payments are made on the basis of management actions undertaken by the farmers. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Use of adaptive management in order to suit specific situations. <p><i>Technical</i></p> <ul style="list-style-type: none"> - The baseline is recorded using photographic evidence that can be faulty. - A result-based approach is more practical. - Management are set up by individual management plans and is therefore tailored to the 	<p><i>Economical</i></p> <ul style="list-style-type: none"> - Payment calculations are made on the basis of management time incurred by the farmer and the design of the management plan itself, which makes the scheme more complicated to operate. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Monitoring is mainly undertaken by the operators of Natura-2000 sites, predominantly natural regional parks, botanical conservatories and farm advisory organisations.

<p>specific parcel or area concerned.</p>	<ul style="list-style-type: none"> - Farmers should monitor to increase communication with other monitors. - Local level of implementation; the acceptance of, and communication with the farming community. <p><i>Technical</i></p> <ul style="list-style-type: none"> - No comprehensive ecological evaluation has been conducted so far. - No scientific data is available to evaluate the scheme as a whole.
<p>Opportunities</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Investing €5.8 billion per year in Natura-2000. 	<p>Threats</p>

Payment-by-results agro-environmental support for grasslands in Europe – Wales

Sources

Wynne-Jones, S., Schwarz, G., Burton, R. J. F., Helgadóttir, Á., & Hopkins, A. (2013). Payment-by-results agri-environmental support for grasslands in Europe: lessons learnt for future agri-environmental support in Wales. In *The role of grasslands in a green future: threats and perspectives in less favoured areas. Proceedings of the 17th Symposium of the European Grassland Federation, Akureyri, Iceland, 23-26 June 2013.* (pp. 370-372). Agricultural University of Iceland.

Summary

The article discusses the implementation of more successful payment-by-result (PBR) approaches to address the problems arising with current nature conservation schemes in Wales. These schemes currently are focused around action-based payments, but recently this focus has been criticised for not delivering 'value for money'. The SWOT will be about the PBR-approach compared to standard agro-environmental schemes and its implementation in Wales.

<p>Strengths</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Flexibility in approaches to get results allows great freedom. 	<p>Weaknesses</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - PBR requires a break from the costing of payments upon income foregone and would give additional costs.
---	---

<p><i>Technical</i></p> <ul style="list-style-type: none"> - Focuses on complementing existing action-oriented schemes, without involving radical changes. - Indicators of success are simple and clear (e.g. a number of indicator species). - System allows farmers to observe and monitor results themselves, giving them clear goal to work towards. - Ecological goals did not conflict with agricultural goals. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - No need for strict administrative requirements, as they are not locally appropriate. 	<ul style="list-style-type: none"> - Uncertainty about what amount of funding is needed beforehand, as payments are result-based. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Is hard to implement in greater areas, as different location might require different approaches and results. - Switch to PBR needs to be incremental, simple and low-risk in order to succeed, leading to higher tier schemes. This takes time and ecological goals might not be reached in the first years.
<p>Opportunities</p>	<p>Threats</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Communication and relations between farmers, monitors and coordinators need to be aligned well. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Pilot projects are paramount in order to establish a clear view on difficulties before the PBR scheme is actually adapted.

Preservation and enhancement of species rich grassland – Switzerland

Sources

European Commission. (2015i). *Preservation and enhancement of species rich grassland - Switzerland*. Extracted on 01-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

A SWOT has been made on the payment plan for species-rich grassland as part of the Ecological Compensation Areas (ECA). The first focus of this scheme is that farmers are required to maintain 7% of their holding as an ECA for benefiting biodiversity and environment. The second part is control of quality. At least 6 key species from a list of 36 or 47 species (dependent on whether the area is lowland or highland respectively) need to be present in each sampled area to qualify for the payment (ranging from €416,- to €832,- per hectare).

Minimum requirements are no or restricted use of fertiliser, no pesticide applications other than patch control of problem weeds and removal of vegetation at least once a year but not before specific dates.

<p>Strengths</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Scheme developed by a working group of all stakeholders, creating involvement and understanding from all parties. - Training events and field visits help farmers to ease into a new scheme. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Farmers are trained to teach farmers, resulting in good communication and understanding. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Low incentive needed, as it is an extra step next to standard ECA's, which Swiss farmers are mandatory to apply. 	<p>Weaknesses</p> <p><i>Technical</i></p> <ul style="list-style-type: none"> - Intensive monitoring is necessary.
<p>Opportunities</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Partly financed by government, partially by third parties. Other stakeholders could fill in holes in the budget. 	<p>Threats</p>

Results-based nature conservation plan (Ergebnisorientierter Naturschutzplan, ENP) – Austria

Sources

European Commission. (2015j). *Result-based nature conservation plan (Ergebnisorientierter Naturschutzplan, ENP) - Austria*. Extracted on 09-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

The 'result-based nature conservation plan' (Ergebnisorientierter Naturschutzplan, ENP) is a pilot project (2015-2020) which aims to improve conservation status, habitats and species find in 'High Value Farmland in Austria. The project tries to achieve these improvements by involving farmer more actively in the whole process of conservation of species. 250 farmers are expected to work with the scheme within the time the project is carried out.

Strengths	Weaknesses
<p><i>Economical</i></p> <ul style="list-style-type: none"> - Payment based on management required to achieve results per hectare, based on management based nature conservation measures. Farmers are not forced in specific management actions to achieve the results. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Regional workshops available for farmers to discuss their experiences with other ENP-farmers and learn from their experiences. - Identification of clear results at the parcel-level in collaboration with the farmer that are in is reach of achievement. This creates awareness about the responsibility of nature conservation by farmers. <p><i>Technical</i></p> <ul style="list-style-type: none"> - No specific management requirements. Aim is reaching results that are defined for every parcel within the ENP. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Expected results are determined on parcel-level. After that, required management actions needed to reach these results are determined. All summarised in 'farmers logbook' on parcel-level. - Midterm evaluation in the third year of scheme between farmers and scheme advisors to see if progressing is going according to plan, to make sure there is time for improvement of the scheme when needed. - At the end of pilot period (2020), a final evaluation will take place where experiences are exchanged. 	<p><i>Organisational</i></p> <ul style="list-style-type: none"> - Not free for all farmers in the target area. Focuses on farmers who already have experience with management of 'High Value Farmland' (farmers part of other projects on nature conservation/biodiversity monitoring). - High application criteria in comparison to other projects.

Opportunities	Threats
<p><i>Technical</i></p> <ul style="list-style-type: none"> - In addition to identification of results at end of the scheme, for each ENP-parcel unwanted developments on the pastures are detected and challenged before end of the scheme. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Results are set in conformity with local conservation objectives. 	<p><i>Technical</i></p> <ul style="list-style-type: none"> - Ecological advisers need training to make sure they are able to formulate results clear and uniform. - Farmers need training on identifying the indicators to be able to see whether or not results have been achieved. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Local conservation objectives are on a very detailed level

Species rich grassland (Artenreiches Grünland - Kennarten) (part of PAULa) - Germany, Rheinland-Pfalz

Sources

European Commission. (2015k). *Species rich grassland (Artenreiches Grünland – Kennarten) (part of PAULa) – Germany, Rheinland-Pfalz*. Extracted on 08-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

The Kennartenprogramme (PAULa agro-environment schemes) includes two results-based schemes for the protection of species rich meadows and pastures, indicated by at least 4 or 8 key species. Currently ca. 1.800 hectare of interested farmers is involved. Schemes need grazing and/or mowing at least once a year without prescribed timing of these activities. From 2007-2013 farmers get paid €225/ha for species rich grassland with at least 4 key species and €275/ha for species rich grassland with at least 8 key species. In 2014-2020 this has increased to €250,- for at least 4 and €300,- for at least 8 key species.

Strengths	Weaknesses
<p><i>Economical</i></p> <ul style="list-style-type: none"> - Support for farmers who wish to apply from a personal nature conservations advisor who is independent of the administration. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Advisors available to advice farmers on management needed to integrate agricultural operations with nature conservations. - Open for all farmers in all environmental zones within 	<p><i>Technical</i></p> <ul style="list-style-type: none"> - Limits the farmer: list of prohibited activities for farmers, e.g. drainage and ploughing grassland. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Ensuring that administrative staff and people controlling the scheme were sufficiently well qualified and knowledgeable in species identification and ecological understanding was a minor problem for the schemes implementation.

<p>Rheinland-Pfalz, when minimum amount of key species is available.</p> <ul style="list-style-type: none"> - Needs at least one time mowing/grazing a year, without prescribed timing of these activities. - Catalogue for species is based on genera/species groups for difficult identifiable species, to make the catalogue easier. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Project is mainly organised for farmers who already have a management system for species rich grassland, in order to gain more flexibility in their management. 	
<p>Opportunities</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Vegetation monitoring results of 2008-2012 showed an increase in species richness. - Turned out that a higher species richness (wider range of species groups than presented in indicator list) compared to normal grassland is achieved. - After discussions with advisors and farmers, there appears to be a change in consciousness of farmers, they are getting more aware of the interest of the nature value of their pastures, and recording species is getting part of their normal management system. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Checking done with a transect line, the longest diagonal from the meadow. Farmers walk within this 2 m broad line and record the found species. - Checked with normal control mechanism, to check whether a farmer has carried out all the agro-environmental actions applied for. 	<p>Threats</p>

<ul style="list-style-type: none"> - Intensive advisory activities caused an increasing number of contracts and extent of grassland, e.g. increase in farmers interested in participating. 	
---	--

Species rich grassland programme – France

Sources

European Commission, (2015l). *Species rich grassland programme (Flowering Meadows Scheme: HERBE_07) - France*. Extracted on 02-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

Farmers are paid (up to €165,- or €182,- per hectare) for maintaining species rich grasslands. Species richness is determined through the presence of a minimum number of botanical indicator species.

<p>Strengths</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Clear payment plan. <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Full autonomy for farmers, giving them a feeling of being in control. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Indicator species include species both beneficial for ecological diversity and agronomic requirements. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - No management required. 	<p>Weaknesses</p> <p><i>Technical</i></p> <ul style="list-style-type: none"> - Farmers must already be part of a separate, basic entry-level management-based scheme. - Monitoring needs to be done mostly by specialists. <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Only for areas included in Natura-2000, though exceptions are made.
<p>Opportunities</p> <p><i>Cultural</i></p> <ul style="list-style-type: none"> - Flowering meadows stimulates farmer and civilian involvement through competition (flowering meadow contest). 	<p>Threats</p> <p><i>Organisational</i></p> <ul style="list-style-type: none"> - Convincing authorities of validity of project was proven difficult.

Species-rich grassland and arable botanical management agreements (2000-2006) – The Netherlands

Sources

European Commission. (2015m). *Species-rich grassland and arable botanical management agreements (2000-2006) – the Netherlands*. Extracted on 02-06-15 from ec.europa.eu/environment/nature/index_en.htm

Summary

This scheme not limited to agro-environmental cooperatives in the Netherlands has been operated a form of result-based plant species agreement. This hybrid scheme is aimed to preserve and/or regenerate species-rich grassland and some arable areas covered by the scheme.

<p>Strengths</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - If the desired results were achieved, farmers received an additional 15% 'bonus' on the payment, which is a good incentive for farmers. <p><i>Technical</i></p> <ul style="list-style-type: none"> - Management requirements in the grassland and arable scheme were mandatory. - The species-rich farmland agreements limited fertiliser and/or pesticide levels and/or mowing and grazing to between restricted dates, which set up specific requirements in details. 	<p>Weaknesses</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Payment is given by the end of the 6-year agreement when the required number of species have been met, which is too long time. This could be divided into two 3-year agreements with different requirement. <p><i>Technical</i></p> <ul style="list-style-type: none"> - The range of this scheme is broad within NL, which could be difficult for monitoring - Too many inspections with different requirement makes it difficult to agree whether or not a result was achieved and to what extent. - No specific indicator species.
<p>Opportunities</p>	<p>Threats</p> <p><i>Economical</i></p> <ul style="list-style-type: none"> - Funded by CAP agro-environment money (EU). This could be discontinued.

Appendix E

Nature-inclusive dairy farming: meadow bird conservation

Background: Meadow bird species are heavily dependent on meadows to breed. Some species are migrating from as far as Western Africa to breed in the Netherlands. However, the population size of meadow birds has shown a decline since the 1960s and this is believed to be related to intensification of farming. With the disappearance of meadow birds, a part of Dutch culture vanished as well.



Objective: What factors in farming practices lead to successfully integrating meadow bird conservation into dairy farming and what are the reasons these practices are not widely implemented yet?

Methodology: To get an overview of strengths and weaknesses of existing schemes, SWOTs are made out of 20 schemes. Also, 16 interviews are done with farmers and experts to receive insights.

Advice: From the analyses, an advice was created on how meadow bird conservation could be improved in the Netherlands.

- Communication: Sharing knowledge between stakeholders is vital. This could be done in focus groups. ANVs are very useful for this, they could organise meeting at the start and end of the season where stakeholders can discuss their findings and talk about problems they ran into. An online platform could also be created to exchange knowledge.

- Education: More education on nature-inclusive farming should be given at agricultural schools to inform young farmers. General awareness should be created in society, by education and excursions on schools. Also, contractors are considered a threat for meadow birds, these people should be educated and certain contractors can distinguish themselves in a 'meadow bird-friendly' way.

- Policies: Contracts should be made suitable for different types of farmers. Short term contracts when farmers start, and long term contracts when farmers are already applying nature conservation for a long time to provide security. Also, policies from nature conservation organisations should be more in line with meadow bird conservation in important areas.

- Financial/Subsidies: Payments should be result-based. Also, private parties should be involved who fund the schemes next to the government. Companies could be involved, who then gain 'green' publicity.

- Technology: GPS can be used to mark nests in a computer, which can be installed in the computer of the tractor. Also, drones can be used to find the birds and their nests. Furthermore, drones are able to investigate the suitability of certain areas of the Netherlands for meadow birds. This spatial planning provides knowledge on which farmers are especially important for applying meadow bird conservation.



Authors:	Willem Aberson Sanne Benjamins Jens van Erp Marko Fumic	Qianqian Jiang Irene Klaver Bastiaan Vergouw
Pictures:	BoerenNatuur Kees Verhoek	