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Territorial distribution of CAP payments in the Netherlands and present and future environmental policy targets

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Territorial distribution of CAP payments in the Netherlands and present and future environmental policy targets

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ABSTRACT

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Reform of the CAP by 2013 is a key issue in the Dutch agricultural policy debate. At the moment the Single Farm Payments are based on the historic right principle, but in the future the Dutch government looks for a different justification for the direct income support. The SFP should be converted into a system of targeted payments for the delivery of public goods, as nature, landscape and environment. In this light, information on how the present distribution of CAP payments is related to environmentally sensitive areas is needed. This study therefore answers two questions: 1) to what extend are 1st and 2nd Pillar payments allocated to regions that coincide spatially with environmentally sensitive areas? 2) How are 1st and 2nd Pillar payments distributed over farms with certain intensive and extensive management features?

Keywords: CAP payments, geographic distribution, environmentally sensitive areas

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Preface

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List of abbreviations

AES	Agri-Environmental Scheme
CAP	Common Agricultural Policy
EEA	European Environmental Agency
ESU	European Size Unit
EU-SDS	European Sustainable Development Strategy
GAEC	Good Agricultural and Environmental Condition
IEEP	Institute for European Environmental Policy
HNV	High Nature Value farmland
LFA	Less Favoured Areas
LU	Livestock Unit
MS	Member States
NUTS	Nomenclature of Territorial Units for Statistics, a standard for referencing the administrative division of countries
PEBLDS	Pan – European Biological and Landscape Diversity Strategy
RDP	Rural Development Program
RSBP	Support for biological production (Regeling Subsidie Agrarisch Natuurbeheer)
SAN	Agricultural nature and landscape management scheme (Subsidie Agrarisch Natuurbeheer)
SFP	Single Farm Payment
SPS	Single Farm Payment Scheme
SMR	Statutory Management Requirements
SZL	Support for rare domestic breeds (Subsidie Zeldzame Landbouwdieren)
UAA	Utilized Agricultural Area
WAV	Wet Ammoniak Veehouderij (Law Ammonia and livestock farming)

Summary

Introduction
In the current debate on the EU budget review and the CAP Health check there is increasing attention for integration with environmental demands. Although 1st Pillar payments are meant primarily to be an income and market support and do not aim at achieving environmental objectives, there is an increasing societal request for greening the CAP.

In the Netherlands a key issue on the policy agenda for the reform of the CAP by 2013 is the model of the Single Farm Payments (SFP). At the moment the SFP is based on the historic right principle, but in the future the Dutch government looks for a different justification for the direct income support. One of the options is that direct payments should not be granted directly and unconditionally to primary agricultural producers but should be converted into 'targeted payments' for the delivery of public goods (related to non-trade concerns and societal values such as landscape and nature conservation, environmental and animal welfare concerns). These should go beyond the present requirements set under the Cross Compliance policy.

Research goal and hypothesis
This study focuses on assessing the geographic distribution of 1st and 2nd Pillar payments in the Netherlands (EC regulation No. 1257/1999) in relation to the location of environmentally sensitive areas. Two questions are answered:
1) To what extend are 1st and 2nd Pillar payments allocated to regions that coincide spatially with environmentally sensitive areas?
2) How are 1st and 2nd Pillar payments distributed over farms with certain management features?

By answering these questions a first step is made towards showing to what extend the geographical pattern of CAP expenditures coincides with areas that face environmental challenges. However, a more thorough understanding of the difficult relationships between the expenditures, the different measures, farm management decisions and environmental outcomes is needed. Especially, the relation between the CAP expenditures and the presence of areas with environmental challenges is far from understood: on beforehand, it cannot be predicted whether CAP expenditures under the first Pillar will lead to degradation or improvement of the situation in the areas with environmental challenges. With the analysis of the farm management characteristics a first attempt to a deeper understanding has been made.

Because of the sensitivity of the subject and because it is not a straightforward policy evaluation (the CAP policy expenditure is tested here against targets for which it was not originally designed for), a number of hypothesis concerning the expected relationships were formulated:

1) The environmentally sensitive areas identified in this study receive relatively higher 1st Pillar payments.
2) Within sensitive areas the most intensive farms receive higher support from the 1st Pillar then less intensive farms.
3) The sensitive areas identified in this study, especially the HNV farmland areas, will receive a relatively larger share of the agri-environmental support (AES) paid under the 2nd Pillar.
4) The most intensive farms receive no or very limited shares and amounts of the AES payments (also if calculated in payments/ha).

The selection of the environmentally sensitive areas was based on a literature review of the most important environmental problems to which agriculture contributes. This review revealed that the most important problems are related to nitrogen and ammonia emissions and loss of biodiversity in and outside agricultural lands. Based on these agri-environmental problems, 4 types of sensitive areas were selected:
1. Nitrogen: Zones most vulnerable to nitrate leaching to ground water or to surface water.
2. Ammonia: Agricultural zones of influence around nature areas with habitats most vulnerable to ammonia emissions (acidification).
3. Drought: Agricultural areas located within a buffer of drought sensitive nature areas.
4. Loss of biodiversity: Location of High Nature Value (HNV) farmland.

The selection of the farm intensity features was also based on literature review and data availability. 4 farm intensity features were used:
1. Livestock density (LU / ha UAA);
2. Intensity of land use (ESU / ha UAA);
3. Ammonia emission (kg NH3 / farm);
4. HNV farm types (presence / absence).

Methodology

To test the hypothesis the following methodological approach was adopted. First a detailed mapping of spatial distribution of CAP payments was done. As for the 1st Pillar payments, data of the 2004 CAP distribution were used. At that time the payments were still coupled to production and not subject to cross compliance. However, with the implementation of the Single Farm Payment, the spatial distribution did not change much, because the historic right model has been adopted for the SFP. The 2004 data can therefore be considered a good representation of the present SFP distribution.
The 2nd Pillar payment data refer to the entire programming period 2000-2006, and include the national co-financing. Furthermore only payments paid directly to land managers were considered: the agri-environmental support and Less favoured Areas payments.

Subsequently, the selected environmentally sensitive areas were mapped as well as the farm intensity features. This mapping was done at high spatial resolution enabling further analysis at the 4-digit postal code level, which is comparable to Nuts 5 level.

Finally, a statistical analysis (mainly correlation analysis between distribution of 1st and 2nd Pillar payments, sensitive areas and farms with specific intensity features) was carried out over all farm types together and per farm sector group.

To test the hypothesis, first an overview is given of the average CAP payments (1st and 2nd Pillar) per hectare and per farm; in and outside sensitive areas. Second, a correlation analysis is made between levels of payments per hectare and occurrence of environmentally sensitive areas. By this analysis it can be tested whether the distribution of Pillar payments is significantly higher or lower in sensitive areas. Finally, the relationship between the distribution of CAP payments (in €/hectare UAA) and the intensity of farms within sensitive areas was tested.

Results

The spatial distribution of the 1st Pillar shows that the areas of the Veenkolonien (production of starch potatoes and sugar beets), the Gelderse Vallei (calf sector) and a few areas in Noord Brabant, Friesland and Overijssel (dairy cattle farms and maize production) receive the highest 1st Pillar payments. These areas received at least €880 per ha of agricultural land but the average payment was € 1110 / ha. Areas in the provinces of Noord Holland, Zeeland, Flevoland, Limburg, the northern parts of the provinces of Friesland and Groningen and along the Dutch large rivers receive the lowest payments: on average € 330 / ha up to a maximum of € 520/ ha. In these areas arable, horticultural and permanent cropping farms dominate and these areas often receive no or practically no payments at all.

The spatial distribution of the 2nd Pillar shows that the payments are mainly concentrated in the dairy production areas especially in the peat meadow areas which are concentrated in Noordelijk Weidegebied, Centraal veehouderijgebied, Waterland/droogmakerijen and Hollands/Utrechts weidegebied. These areas received on average €1445 / ha over the whole RDP period 2000 – 2006 and at least €500 /ha. This was expected since meadow birds agreements dominate in the Agri-environmental support payments.

The analysis of the distribution of the 1st Pillar payments over the environmentally sensitive areas showed that the average payments per hectare (over all farm sectors) are higher within then outside sensitive areas. The correlation analysis between the spatial distribution of 1st Pillar payments and the location of environmentally sensitive areas showed that across all farm sectors, all sensitive areas receive significantly higher per hectare payments. This is most strongly the case for areas sensitive to nitrate leaching to surface water and buffer zones around drought sensitive nature areas. An explanation for this is that there is an over-representation of farm sectors in these sensitive areas which have historically received the highest per area payments (e.g. dairy, beef, starch potatoe and maize). When looking within farm sector types it becomes clear that the positive correlation between per hectare payments and presence of sensitive areas disappears for the dairy sector but is still maintained for the other grazing livestock, mixed and arable sector types. Apparently there are other factors then only the farm sectoral distribution causing the relatively higher per area payments in the sensitive areas. HNV farmland areas are an exception

certainly when looking at the correlation within farm sectors: these areas receive significantly lower per area 1st Pillar payments.

The correlation analysis between the spatial distribution of 1st Pillar payments and the farm intensity features showed that in all sensitive areas there is a significantly positive correlation between 1st Pillar payments per hectare and intensity of farming. This means that 1st Pillar payments are particularly targeted towards high intensive farms within sensitive areas, especially the intensive livestock farms, and thus the farms that put higher pressure on the environment. The opposite pattern was found in HNV farmland areas for HNV type farms. These farms, which are inherently extensive, receive relatively more payments per hectare as compared to non-HNV farms. This is not related to the state of their intensity but to the concentration of farms in the dairy and other grazing livestock sectors.

As for the 2nd Pillar, the distribution of AES payments over the environmentally sensitive areas showed that: across all sectors sensitive areas receive relatively higher AES payments per hectare although this does not necessarily lead to higher per farm payments. The correlation analysis between the spatial distribution of AES payments and the location of environmentally sensitive areas showed that sensitive areas receive relatively higher payments, this is particularly the case for areas sensitive to nitrate leaching to surface water, buffer areas around drought sensitive nature and HNV farmland areas. HNV farmland areas receive significantly higher per hectare AES payments. This means that relatively higher payments go to areas with the highest nature values. However, still the far largest share of AES payments (70%) go to non HNV farmland areas (18% of the total utilized agricultural area is HNV farmland and receives 30% of the total AES budget).

The correlation analysis between the spatial distribution of AES payments and the farm intensity features showed a negative correlation between AES payments and intensity variables. This means that payments are more oriented toward low intensity farming in sensitive areas. However, within HNV farmland areas there is no difference between AES per hectare between HNV farm types, which are inherently extensive, and non HNV farm types.

Conclusions and recommendations

This study serves as input for the actual debate about the greening of the CAP. It shows what share of the CAP support is going to environmentally sensitive areas that are targeted in environmental policies and societal values and by what type of farmers it is received.

To avoid drawing crude conclusions it is of importance to note that the analysis presented is not a straight forward policy evaluation: The CAP policy expenditure under the 1st Pillar is tested here against targets it was not originally designed for. The 1st Pillar CAP payments are meant primarily to be an income and market support and do not aim at achieving environmental objectives, although it is since 2005 conditional to Cross Compliance.

The aim of this study is to confront the spatial distribution of CAP expenditures with EU environmental targets. As such, it is a first step in understanding the complex

relationship between CAP expenditures, farm management decisions and environmental effects, although the relationship between high levels of CAP payments and environmental pressures / benefits is far from being understood. The present analysis deals with a spatial analysis between the distributions of CAP payments and the presence of environmentally sensitive areas and farm intensity features. It does not deal with causal relationships, nor does it clarify whether the CAP money was spent effectively in relation to reaching environmental policy targets.

From the assessment of the spatial targeting of the 1st Pillar payments it becomes clear that the average payments per hectare are significantly higher within then outside sensitive areas. This is most strongly the case for areas sensitive to nitrate leaching to surface water and drought sensitive nature areas.

In addition, the results of the analysis of farm intensity in relation to 1st Pillar payments show that within all sensitive areas there is a significantly positive correlation between 1st Pillar payments per hectare and intensity of farming. Combining these two findings, it can be stated that the major part of the 1st Pillar budget (in total more than 80% of the CAP expenditures) went to farms that were likely to deliver little environmental benefit.

On the contrary, low intensity farms received relatively small 1st Pillar payments per ha and per farm, while their contribution to delivering public goods such as maintenance and/or conservation of the environment and biodiversity is much larger.

As for the 2nd Pillar, the largest part of AES went during the programming period 2000-2006 to the farmlands with lower biodiversity values and to the more intensive farms, not matching the HNV farm management features needed to maintain biodiversity values in these areas. So it can be concluded that the (geographic) targeting of AES can be improved in The Netherlands.

The present distribution of 1st Pillar payment with a bias towards intensive farms in environmentally sensitive areas, is not in line with EU environmental objectives. Under the historic right principle, adapted by the Dutch government for SFP, management practices continue to be supported that are not likely to contribute to an improvement of the environmental conditions needed to alleviate environmental problems and to enhance biodiversity. If in the future reforms search for a further greening of the CAP, a reallocation of payments in combination with stricter environmental requirements to payment levels seems to be a serious alternative.

1 Introduction

1.1 The CAP and EU environmental objectives.

The Common Agricultural Policy (CAP) was initially designed to provide income support to farmers and to restructure the market. Still, one of the main objectives is to enforce the agricultural sector. Since the 1992 and 2003 reforms, a couple of environmental measures have been introduced in the CAP. Also the Health Check promises a further greening of the CAP, aiming at a more sustainable agriculture especially in relation to enhancing EU environmental and biodiversity policy targets.

In The Netherlands the 1st Pillar payments are decoupled from production since 2007. The single farm payment (SFP) is based on the historic right model. This is why the EU-support is in the Netherlands still strongly targeted to certain sectors, namely the dairy, calf breeding, sugar and starch sectors (Hermans et al 2006). These sectors are often characterized by quite intensive production methods.

European environmental objectives are specified in a couple of programmes and strategies that are aimed at conservation and restoration of the environmental state and of natural habitats, landscapes, flora and fauna, e.g. the 6th Environmental Action Programme (2001-2010), the EU Biodiversity strategy and the Pan-European Biological and landscape Diversity Strategy (PEBLS). The European Sustainable Development Strategy (EU-SDS) emphasizes the importance to combat a further decline of biodiversity, the necessity of a sustainable management of natural resources and to stop climate change. According to the EU-SDS these objectives should be integrated in *all* policies of the EU. Consequently, the strategy for integrating the environmental dimension into the CAP was adopted by the European Council at Helsinki (1999), which led to the CAP reform included in the Agenda 2000. This Helsinki strategy encompasses environmental requirements (cross-compliance) and incentives, integrated into the market and income policy, as well as targeted agri-environmental measures that form part of Rural Development Programmes. Furthermore, several European strategies and directives addressing agri-environmental issues were passed in the recent years: the Water Framework Directives (2000), the second action programme for the Nitrates Directive (2001) and the Strategy for Soil Protection (2006). Finally, the new legal framework for Rural Development 2007-2013 points more clearly to the direction of improving sustainability through the right balance between competitive agricultural production and the respect of nature and the environment. Within the latter, agri-environmental measures (EU Regulation2078/92) as well as the EU's Community Strategic Guidelines for Rural Development (2006/144/EC) are direct policy measures in support of agri-environmental objectives.

From the former it becomes clear that there is enough policy context for studying the relation between the Common Agricultural Policy and European Environmental objectives in more detail. Also in the current debate on the EU budget review and

the CAP Health check, including the increasing societal request for greening the CAP, the CAP is increasingly confronted with demands to meet environmental objectives (see box 1).

In this light and the expected future reforms of the CAP, information on how the present distribution of CAP payments is related to environmentally sensitive areas targeted by EU environmental policy is needed. This study aims at providing this information. After all, the present distribution over environmentally sensitive areas and farm types is the starting point from where potential future CAP reforms should be implemented.

Box 1: The Common Agriculture Policy

The major part of European Union (EU) payments in the Netherlands has been spent under the framework of the Common Agricultural Policy (CAP). In 2004 1,4 billion € of the EU CAP budget was allocated to The Netherlands (Hermans et al. 2006). The CAP comprises of two types of budgetary expenses: Direct market and income support for farmers, the so-called 1st Pillar, and a set of regulations for rural development, the 2nd Pillar. The European Agricultural Guarantee Fund (EAGF) finances direct payments to farmers and measures to regulate agricultural markets such as intervention and export refunds, while the European Agricultural Fund for Rural Development (EAFRD) finances the Rural Development Programmes of the Member States (these funds replace the EAGGF from 2007 onwards). The regulations for rural development have to be co-financed through national or regional funds.

As for the total EU, the 1st Pillar payments account for more than 80% of the CAP budget, the 2nd Pillar for less than 20%. Spending the resources of both Pillars, is connected with specific demands and objectives, to which all member states have to comply.
Cross Compliance was introduced in 2005. It specifies that all farmers receiving direct payments are subject to compulsory cross-compliance (Council Regulation No 1782/2003 and Commission Regulation No 796/2004). In total 19 legislative acts, Statutory Management Requirements (SMRs), applying directly at the farm level in the fields of environment, public health and animal welfare have been established and farmers are sanctioned in case of non-compliance. Beneficiaries are also obliged to keep land in good agricultural and environmental conditions. These Good Agricultural and Environmental conditions (GAECs) are defined by Member States, and should include standards related to soil protection, maintenance of habitats and landscape, including the protection of permanent pasture. In addition, Member States must also ensure that there is no significant decrease in their total permanent pasture area, if necessary by prohibiting its conversion to arable land. Land abandonment should also be avoided. Such measures are aimed to ensure that the positive environmental benefits of agricultural management of the land are achieved. As a condition of receipt of the single area payment, there is more flexibility for Member States in the development of GAECs which farmers must observe, than in the compliance with the SMRs.

The first environmental measures introduced in the CAP came into effect through the McSharry reforms in 1992 which led to the implementation of the first Agri-environmental Regulation (EEC 2078/92). These payments are now an important part of the 2nd Pillar payments: the Rural Development Plan (RDP).
Broader environmental objectives have also been formulated within the EU-policy, and should be realized through national and regional implementation of various EU-regulations. Payments that are directly targeted to environmental goals account for less than a third of the 2nd Pillar budget, and only 8% of the total Dutch CAP budget.

1.2 Relevance of relating CAP with environmental objectives

Farmers in the EU are managing close to half the total land surface, namely 43% or 183 million hectares (Eurostat, 2005). For the Netherlands this proportion is even 70%. Because of this CAP payments are received in very large areas of Europe and the Netherlands and are therefore an important instrument for meeting EU environmental objectives.

However, until now, an assessment of the relation between CAP payments and important EU environmental policy objectives, lacks as pointed out by the European network of Environmental Authorities (ENEA, 2006). ENEA argues that by payments of the EU structural funds, too little attention is paid to achieve environmental objectives and also to monitor these.

One of the first EU wide attempts to relate CAP expenditures with environmental objectives, was carried out by the Institute of European Environmental Policies (Farmer et al, 2008). This study provides rough evidence that according to present 1st and also 2nd Pillar payment distribution there is no link between level of payments and the presence of farms delivering certain environmental goods. Rather the opposite seemed to be the case as certainly the largest part of the payments paid under the 1st Pillar were more strongly targeted towards areas with the largest concentration of intensive farms. The contribution of this group of farms to the quality of environment and biodiversity has been rather negative as is now widely acknowledged by both European policy makers and researchers (e.g. EEA, 2005, Heath et *al.*, 2000).

In this light it is therefore relevant to assess the present distribution of both 1st and 2nd Pillar payments in a most spatially detailed manner in the Netherlands in relation to environmentally and ecologically sensitive areas and farming activities that potentially exert the highest environmental pressures.

1.3 Former research attempts, research complexity and challenges

Assessing the relation between CAP expenditures and environmental objectives is complex. Firstly, 1st Pillar payments are meant primarily to be an income and market support and do not aim at achieving environmental objectives, although since 2005 conditional to Cross Compliance. This is also why the original allocation of these payments is sectoral in nature although it also has a territorial impact. At the same time many environmental issues, such as pollution of water by nitrates, acidification and conservation (and loss) of biodiversity in Natura 2000 and HNV farmland areas, require territorially targeted policies. This is why, in the light of the recent reorientation of EU policy towards provision of environmental goods, there is a potential mismatch between the present distribution of 1st Pillar payments and reaching sustainability targets in EU agriculture. Special targeted regulations, such as 2nd Pillar payments, are therefore useful instruments in the sensitive areas where they can contribute to maintaining environmental and landscape values and consequently

contribute to achieving European environmental objectives. This however also depends on their effective territorial targeting.

Secondly, the relationship between farmland management and environmental and biodiversity quality is often very complex and indirect. Intensive farming practices may adversely affect environmental state but how the detailed mechanisms work underlying this process and what the exact impact on environmental state is, is very difficult to assess. Vice versa it is also clear that agriculture might have positive impacts on environment and biodiversity, but also for this relationship many details in our understanding are lacking. Overall it is however generally accepted that the influences of agriculture on European environment and biodiversity are large and important as is further described in Chapter 2 of this report.

Thirdly, several mid-term evaluations and monitoring programmes point out the lack of base line data and the problem of distinguishing autonomous developments from the influence of the CAP-regulations and of other policies and regulations (ECORYS and Grontmij 2003; AGRA consulting 2005; Court of Auditors 2006). Fourthly, another important problem is the lack of a detailed geographical overview of the expenditures. This problem has also been coined by the Newsletter of Farmsubsidy.org (Issue 1, Oct. 2007): '*Precise geographical information is of vital importance to understanding how the CAP works*'. The published ex-post and ex-ante evaluations are mainly carried out on national level and are aimed at assessing the procedures of the payments. They lack the geographic and thematic detail to assess the match between their spending, farmland management and environmental problems and opportunities. For EU15 information on the allocation of the CAP payments is available on NUTS3 level (ESPON 2004). However, the data that has been used for CAP support was only available on national level. The spatial disaggregation to NUTS3 was done in this ESPON study by means of a apportionment method that applies general rules for the whole territory, resulting in rough estimates of CAP expenditures per region. This however still delivered a very course distribution of payments (for the Netherlands at Province level) which was still not suitable to make an overlay with environmentally sensitive areas. After all sensitive areas cut through administrative boundaries and are usually smaller then provinces and spatially scattered.

A down-scaling to smaller geographical units and separate regulations is a first necessary step in evaluating the relation between CAP expenditures and environmentally sensitive areas. Only in this way, it is possible to assess further whether and how the expenditures are allocated to areas where environment is sensitive in terms of either environmental problems (e.g. eutrophication, lowering of water tables, etc.) and/or the need for implementing certain conditions to payments in relation to environmental, ecological and landscape value maintenance and protection (e.g. NATURA 2000, High Nature Value farmland).

1.4 Overall objective, main research questions and methodological approach

This project focuses on assessing the geographic distribution of the CAP payments, 1st and 2nd Pillar, in the Netherlands (EC regulation No. 1257/1999), in relation to the location of environmentally sensitive areas that are or will be indicated for the realisation of EU-environmental goals such as the conservation of biodiversity and the improvement of air and water quality.

The analysis also includes the relation between CAP payments and farm intensity features. As a result it will identify what type of agricultural holdings have received the largest proportion and payments per area of 1st and 2nd Pillar payments and how these are situated in relation to environmentally sensitive areas.

The first research question to be answered is: to what extend are 1st and 2nd Pillar payments allocated to regions that coincide spatially with environmentally sensitive areas? This will contribute to a better understanding of the relation between CAP payments and environmental and ecological issues and problems targeted in EU-wide environmental policy. Such sensitive areas include HNV (High Nature Value) farmland, drought and ammonia emission sensitive NATURA 2000 sites and areas that are particularly sensitive to nitrate-leaching to surface or ground water. The High Nature Value (HNV) farmland areas have specific biodiversity values occur that are dependent on a continuation of extensive (traditional) farming (see Andersen et al., 2003; EEA, 2004; Paracchini et al, 2006). In The Netherlands they mainly concern grassland areas which are important habitats for meadow and wintering birds and/or areas with a high density of green and blue (water) linear elements and specific nature values.

The second research question to be answered is: Do 1st and 2nd Pillar payments support farms with certain intensive or intensive management features more or less?

By answering these questions a first step is made towards showing how the geographical pattern of CAP expenditures is to the distribution of environmental challenges. However, a more thorough understanding of the difficult relationships between the expenditures, the different measures, farm management decisions and environmental outcomes is needed. Especially, the causality between the level of expenditures and the presence of environmental challenges is far from understood: High expenditures under the first Pillar do not necessarily relate to either environmental degradation or improvement. With the analysis of the farm management features a first attempt to a deeper understanding has been done.

A secondary goal of the study is to contribute to the development and application of methods to geographically specify the 1st and 2nd Pillar payments and confront them with different types of environmentally sensitive areas as a first step to assess the environmental effectiveness of CAP support. As such, the study serves as a pilot for similar analysis in other member states.

For the present report more detailed data are available enabling the detailed assessment of spatial relationships between payments per regulation, and features of receivers, regions as well as agricultural enterprises.

Methodological approach
The aim of this study is to confront the spatial distribution of CAP expenditures with EU environmental targets. Because of the sensitivity of the subject and because it is not a straightforward policy evaluation (the CAP policy expenditure is tested here against targets it was not originally designed for), it was decided to first formulate hypotheses concerning the expected relationships. In this way the relations assessed are clear and transparent. These hypothesis are given in chapter 3, where the methodological approach is further worked out in detail. Chapter 2 and first parts of 3 are given first as they provide the contextual information on which the hypothesis for this study are based.

To test these hypothesis, first an overview is given of the average CAP payments (1st and 2nd Pillar) per hectare and per farm in and outside sensitive areas. Second a correlation analysis is made between level of payments per hectare and occurrence of sensitive areas. Through this analysis it can be tested whether the distribution of Pillar payments is significantly higher or lower in sensitive areas. Finally, the relationship between the distribution of CAP payments (€/hectare) and the intensity of farms within sensitive areas was tested.

A more detailed description of the methodology can be found in Chapter 3 (Section 3.3 and Annex 5.

1.5 Limitations of present study

The analysis presented in this report deals with detailed spatial analysis between the distributions of CAP payments and the presence of environmentally sensitive areas and farm intensity features. *It does not deal with causal relationships*, nor does it clarify in what way the CAP money was spent effectively in relation to reaching environmental policy targets.

This study therefore only provides a better understanding of the present spatially detailed distribution of 1st and 2nd Pillar payments over areas with specific environmental problems and values which are directly and/or indirectly influenced by farming. Effects of the spending of these payments on the environment is not assessed and cannot be assessed in this study.

The main objective of this study is therefore to provide insight in the way the present 1st and 2nd Pillar payments are distributed both in terms of environmental problems and values and in terms of farm management features of the receivers. This insight is crucial for understanding the starting point from where a potential re-distribution of payments or a linking of conditions to farm payments will start in case of introduction of new CAP reforms. The focus on environmentally sensitive areas and

farm intensity indicators is not only logical from the EU environmental and biodiversity policy targets, but also from the perspective of the Health Check and 2013 reform ideas which ask for a further greening of CAP making payments more conditional to delivering environmental good and services.

1.6 Expected outcome and relevance in the current debate on the future CAP in the Netherlands

Results of this study will provide a better understanding of the starting point from where alternative distributions of CAP payments and conditions to payments have to be introduced in case of future reforms. By doing so it may also contribute to assess how in the future the CAP expenditures can become more effective in reaching new environmental targets and/or the delivery of certain environmental and biodiversity services.

At European level one of the key issues in the recent debate concerning the Health Check is how to design the CAP in a more territorial and less sectoral direction. In the Netherlands a key issue on the agenda for the reform of the CAP by 2013 is the model of the Single Farm Payments (SFP). The Dutch government argues that one of the options is that direct payments should not be granted directly and unconditionally to primary agricultural producers but should be converted into 'targeted payments' for the delivery of public goods (related to non-trade concerns and societal values such as landscape and nature conservation, environmental and animal welfare concerns).

At the moment the SFP is based on the historic right principle, but in the future the Dutch government aims at a different justification for the direct income support.

In this light the present study serves as input for the actual debate about the greening and socialisation of the CAP. It shows what share of the CAP support is already going to environmentally sensitive areas that are already targeted in green policies and societal values and by what type of farmers it is spent.

1.7 Report outline

The next chapter discusses the context of this study: the main structural and environmental characteristics of the agricultural sector and the main environmental challenges. The chapter is quite extensive since it was considered to be important to provide a good overview of the specific Dutch agri-environmental context and to adequately justify the choice for environmentally sensitive areas and farm intensity features against which the distribution of CAP payments is compared.

Chapter 3 discusses in more detail the political context of this study, i.e. the implementation of the CAP in the Netherlands especially within the scope of environmental policy objectives. Attention is also paid to a more detailed description

of the methodological approach followed in the assessments of which the results are presented in Chapter 4. As a conclusion of Chapter 3, hypothesis concerning the relation between the spatial allocation of CAP expenditures on the one hand and the sensitive areas and farm features on the other hand are formulated and the methodology to test these hypothesis is further explained. For the detailed methodological approach that has been used for the analysis, we also refer to Annex 5.

Chapter 4 presents the results of the geographic distribution of CAP payments and the results of the correlation analysis with environmental sensitive areas and farm intensity indicators. In chapter 5 conclusions and recommendations are given, especially in relation to the future reform of the CAP.

2 Agriculture and environment in the Netherlands

The goal of this chapter is to inform the reader about the state of play of Dutch agriculture, especially in relation to the environment. The information given here forms the basis for the choices made for the rest of the analysis in this report, for example the selection of environmentally sensitive areas and indicators of farm intensity. The chapter starts with a general profile of the Dutch agriculture. One should keep in mind that this description concerns all agricultural sectors, while CAP subsidies are mainly targeted to only a few sectors.

2.1 Profile of Dutch agriculture

In 2006 almost 70% of the total land area of the Netherlands is in agricultural use, accounting for 1.92 mln. ha of farmed land. Of the utilized agricultural area (UAA), 43% comprises of grassland, 52% of arable crops and 5% is used for horticulture. The agricultural landscape in The Netherlands has changed dramatically in the last century.

In terms of number of holdings and relative land use the grazing livestock sector (of which almost 50% consists of dairy farms) is by far the most important, followed by the arable and horticultural sectors (Figure 2.1). In economic terms the horticultural sectors is the most important as the production of vegetables, plants and flowers is responsible for 40% of the total agricultural production value followed by dairy production with a total contribution of almost 20% (CBS, 2008).

Arable farming is important in marine clay areas (the north and southwest) and intensive livestock farming (granivours) is more dominant in the east and south where the sandy soils dominate (see Annex 1, Map 1).

The average size of an agricultural holding is around 24 ha (CBS, 2007). Differences in size range strongly between sectors as the average arable farm size is 40 hectares and the average horticultural size is 8 hectares. The annual value of output of agricultural produce is around EUR 20.7 billion. Together with the forestry and fisheries sector the agricultural sector contributes to 1.9% of the Gross National Product (CBS, 2008).

The agricultural sector in The Netherlands has changed dramatically in the last decades. The number of farms declined strongly while productivity increased and land in agricultural use only diminished slightly (Annex 2, Table 1)

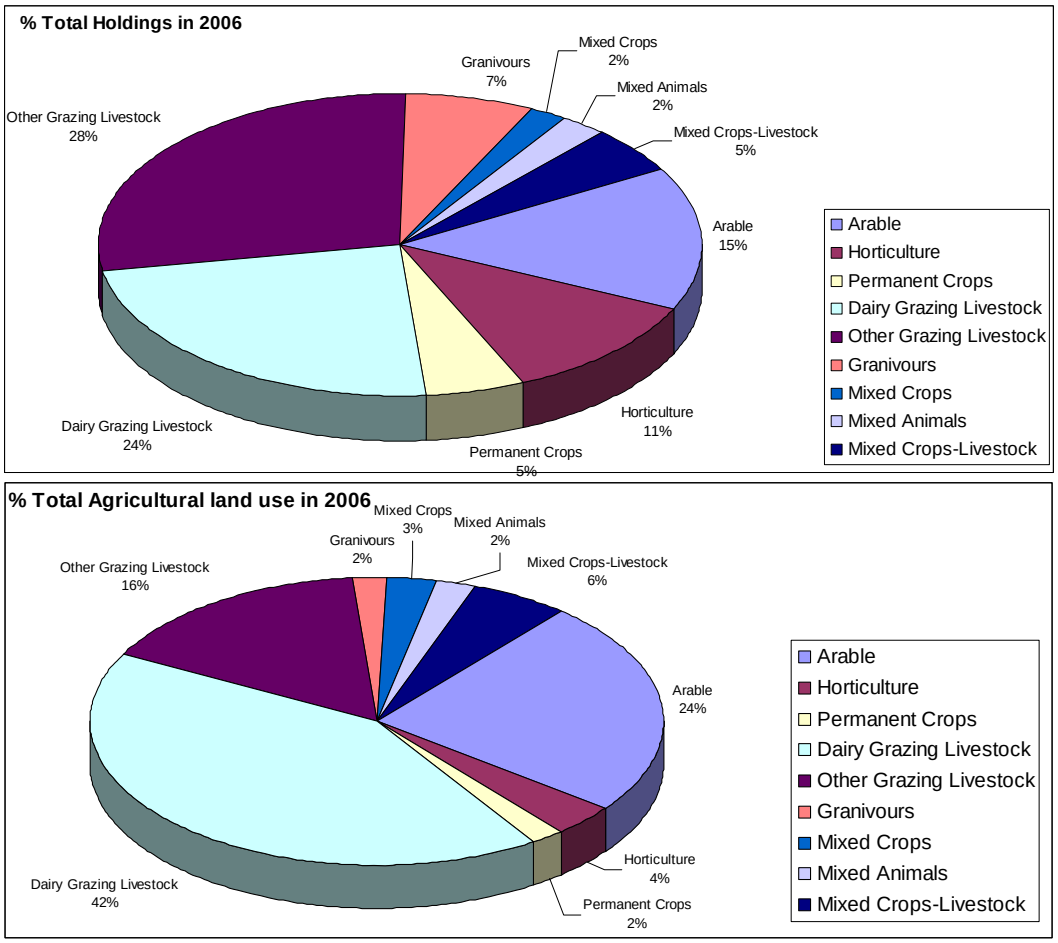


Figure 2.1 Relative distribution of holdings and area over sectoral types in 2007
Source: CBS, Land en Tuinbouwcijfers, 2006

Size

In comparison to most other European countries Dutch farms are relatively small in terms of hectares but not in terms of economic size (European Size Units) (Annex 2, Table 3). The largest farms in hectares are mostly found in the Northern parts of the country in the specialized arable and dairy sectors with average sizes ranging between 50 to 60 hectares (see also Annex 2, Tables 2 and 4). The economic size of farms expressed in average European Size Units (ESU) is largest in the dairy, pigs and poultry sectors (See Annex 2, Table 2).

Intensity

Yields in The Netherlands are high. The average milk yield of a Dutch cow is for example one of the highest in EU. The high productivity of Dutch agriculture is also reflected in average input use and stocking densities (Figure 2.2 and Annex 2, Tables 5-7). In general, the Dutch agriculture is the most intensive in Europe in terms of input use (VROM, 2004, box 2).

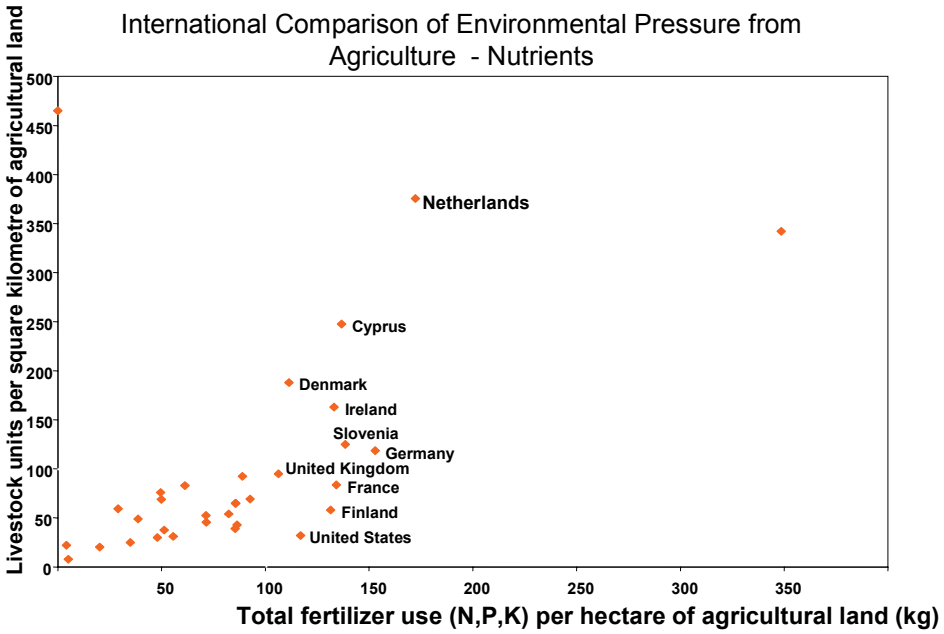


Figure 2.2 International comparison of environmental pressures from agriculture. Source: Fox and Rajsic after OECD, 2007 data

Box 2: Agricultural intensity

Agricultural intensity is a relative concept and relates to increasing production per unit of land at a given time (Turner and Doolittle, 1978 and Shriar, 2000). Intensification is an important restructuring process that has characterised European agriculture for several decades (e.g. European Commission, 1999). Intensification is understood as an increase in agricultural input use, which usually leads to an increase in the level of production per unit of land, livestock unit and agricultural working unit. Intensification often goes together with an increase in efficiency in the use of inputs during the agricultural production process. If the yield increase grows more than the use of inputs such as fertilisers, pesticides and water for irrigation, then improved crop varieties, better management and technological development have made the utilisation of inputs more efficient. However, intensification may nevertheless also result in negative externalities to the environment, such as higher emissions of nitrates to ground and surface water because of larger concentrations of livestock and/or higher fertiliser inputs per hectare.

The process of intensification has been driven by several factors. In the period just after the Second World War an important driver has been the decline of the agricultural labour force that stimulated the introduction of labour saving technologies and continuous technological development (e.g. Clout, 1972; Hoekveld, *et al.*, 1973, Yruela, 1995 and CEAS, 2000). In the last decades, the main driver for intensification has been the need for economic efficiency gains in farming, supported by price support and import restrictions provided by the CAP. However, recent CAP reforms have led to farm income support that is largely de-coupled from production, which minimises policy incentives for further intensification.
Opposite to intensive farms are extensive farms that are characterized by low inputs per production unit and also generally overall lower production levels.

2.2 Environmental problems related to agriculture

Given the former facts and figures on economic size and intensity it is not surprising that there are environmental problems directly and indirectly related to farming in The Netherlands. A part of the farms that cause environmental problems receive CAP, support, while for others, for example most farms in the granivour sector, this is much less the case.

The largest environmental problems to which the agricultural sector contributes significantly are related to (MNP, 2007):
– nitrogen emissions to water,
– ammonia emissions
– drought (in nature conservation areas) caused by lowering of ground water tables
– loss of biodiversity within farmland
The relative situation in The Netherlands was well described in some IRENA indicator fact-sheets (EEA, 2005) and several MNP studies (MNP, 2004, 2005, 2007). Overall, it is clear that input levels and emissions have decreased in last decades, but levels remain high (see Annex 2, Tables 5 and 7) and continue to adversely affect the environmental state of soil, water, air and biodiversity resources.

2.2.1 Nitrogen in ground and surface water

Although nitrate concentrations in ground and surface water have declined strongly since 1992 especially in the sandy areas, in many regions the concentration still exceeds EU standards (50 mg/l). The highest concentrations of nitrogen in ground and surface water are found in the sandy soil areas amounting to around 80 mg/l, while in clay and peatland areas this was at 40 mg/l or below (Wattel-Koekkoek et al., 2008). Especially the regions of *Noord Brabant* and the *Gelderse Vallei* where poor sandy soils and a high share of intensive livestock (including dairy farming) coincide, have poor water conditions (see Appendix 3, Figure 1).

In the European Nitrates Directive (EU, 1991) it is aimed at reducing water pollution caused by nitrates from agricultural sources. The Directive obliges Member States to designate areas in their territory (Nitrate Vulnerable Zones or NVZ) that drain into fresh surface waters and/or ground water that contain, or could contain, more than 50 mg/l nitrate if actions prescribed in the Directive are not taken. Given the former levels of nitrate concentrations in water, it is not surprising that the whole Dutch territory has been designated a Nitrate Vulnerable Zone. This also means that the Nitrates Directive Action Programme applies to the entire territory. Within these zones legislation still differs between soil types, and measures are based on soil vulnerability to nitrate leaching.

2.2.2 Ammonia emission

In the IRENA fact sheet 18 (EEA 2005) on atmospheric emissions of ammonia from agriculture it is shown that The Netherlands has the highest ammonia emission per hectare in EU15 although the total emission decreased significantly between 1990 and 2000 (see Figure 2.3).

This decline was caused by a decrease in livestock numbers and the application of low-emission spreading techniques, stables and manure storage. However, since 2002 the decline in ammonia emission seems to stagnate (MNP, 2007).

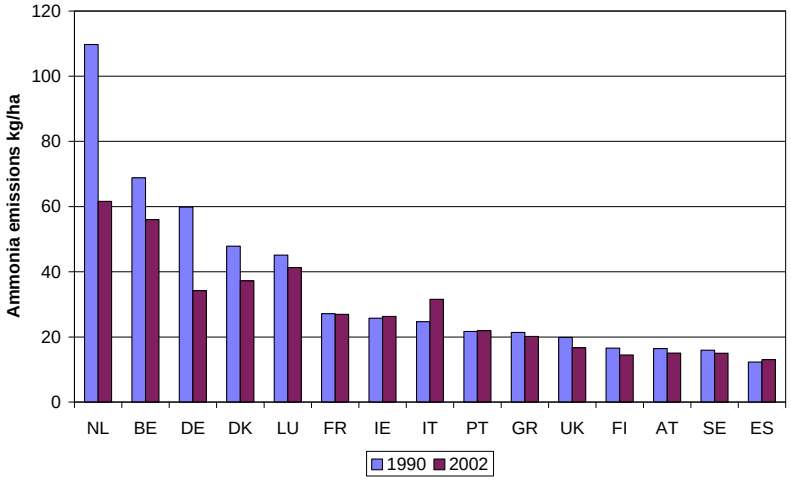


Figure 2.3: Ammonia emissions in EU-15
Source: IRENA Indicator Fact Sheet 18, data on utilized agricultural area from Farm Structure Survey, Eurostat

The emission situation in 2000 has been mapped by Alterra with the STONE model (Groenendijk et al., 2005) and gives a good overview of the regional diversity in emissions (See Appendix 3, Figure 2). It is clear that ammonia emissions and related acidification is especially a problem in the nature areas bordering with farmland where there is the strongest concentration of intensive livestock activities (especially granivoures). High ammonia emissions lead to acidification, changes in the soil fertility balance and also pollution of soil and surface waters which may lead to the loss of specific species and habitats of European conservation concern targeted in the Habitats Directive. Every habitat type can handle a maximum deposition of ammonia before it becomes adversely affected. The most sensitive habitats are high-peatland areas and shallow sweet water ecosystems, followed by forest ecosystems, species rich grasslands and moors and heathlands.

2.2.3 Drought

Another problem that is mostly affecting nature areas bordering with agricultural land, is drought caused by the lowering of water tables at levels that are suited for agriculture. The problem is most strongly related with intensive livestock activities that need lower water table levels then the original natural regime. Lower water tables enable a more intensive use of the grassland for grazing and cutting (for a longer period of the year and with higher stocking densities) and also of arable lands used for the cropping of fodder maize.

However, lower water tables are less favourable for maintaining natural habitats in a good environmental condition. It is estimated that almost all ground water dependent nature suffers from drought problems caused by too low water tables, but that this effect ranges from severe to limited. Agricultural activities are strongly contributing to these problems because of drainage and pumping practices. A national program was set up to combat the problems in the most sensitive areas but

the results are far behind the targets (MNP 2007). At the same time it was also shown that the size and extend of drought-prone areas was over-estimated (van der Gaast et al., 2008 en Van der Gaast en Massop, 2006). However, even if this over-estimation is taken into account, drought-effects of agriculture are still a serious problem in the majority of nature conservation areas in the Netherlands and prevent the maintainance of these in good conservation conditions.

2.2.4 Farmland biodiversity

Both the decline in grassland, especially wet grasslands, and crop diversity and the increase in maize and temporary grassland have generally had adverse affects on biodiversity in agricultural lands. Wild plant diversity in and around arable fields for example has declined strongly under influence of disappearance of rye and oat production and overall shift from summer to winter cereal cropping in combination with a tremendous increase in fertilizer and pesticide use. Farmland breeding birds, such as Ortolan and Corn Bunting, have also practically disappeared because rye and oat fields were replaced by corn (Hustings et al 1995, Kurstjens et al 2003 and Noorden 1999).

The effects of the lowering of water tables in grasslands has also had important adverse effects on meadow birds' feeding opportunities. Other birds have been less affected however, such as the Lapwing since they also breed in maize lands. In spite of this there are still considerable areas that can be regarded of High Nature Value (HNV) which is especially related to the presence of meadow and wintering birds still feeding, roosting and/or breeding in the more extensive farmlands (Theunissen & Willems 2004, Elbersen and van Eupen, 2007 and MNP 2004).

The MNP (2007) also reports that certain environmental conditions for nature have improved in the last couple of years. Eutrophication and acidification have declined between 1990 and 2003 with respectively 35% and 40%. In spite of this it is estimated that for about 75% of the nature areas the nitrogen deposition levels are still too high (above critical level to cause damage). Overall it is therefore clear that there are still many improvements to be made by agriculture and through targeted stimulation policies to halt further biodiversity decline in and outside agricultural areas.

2.3 Environmentally sensitive areas and farm intensity features

From the former description of the general state of soil, water, air and biodiversity resources in and outside nature conservation areas, it is clear that intensive agriculture has had and still has adverse effects on the environment. This is especially a problem where intensive farming practices meet with environmentally sensitive and ecologically rich areas. In the following an overview is given of these environmentally sensitive and/or ecologically rich areas and the main farm features used for indicating the intensity of farming. These areas and features will be used in the further spatial overlay with 1st and 2nd Pillar payments as described in the assessment results Chapter 4.

2.3.1 Environmentally sensitive areas

Environmental problems and threats to species and habitats of conservation concern are spatially diverse as their occurrence has been caused by a combination of specific intensive farming activities and local bio-physical and ecological circumstances. The areas that need special protection because of the occurrence of valuable biodiversity values (species and habitats of national or European concern) or those that have a vulnerable environmental condition have been mapped in several studies and can be indicated as environmentally sensitive areas. Following the description of the main environmental problems related to Dutch agriculture as described in the former, four types of environmentally sensitive areas have been identified. The areas are indicative for environmental problems concerning air and water quality, but also biodiversity conservation challenges. The areas identified in this section will be taken as the starting point for further analysis of CAP payment distribution.

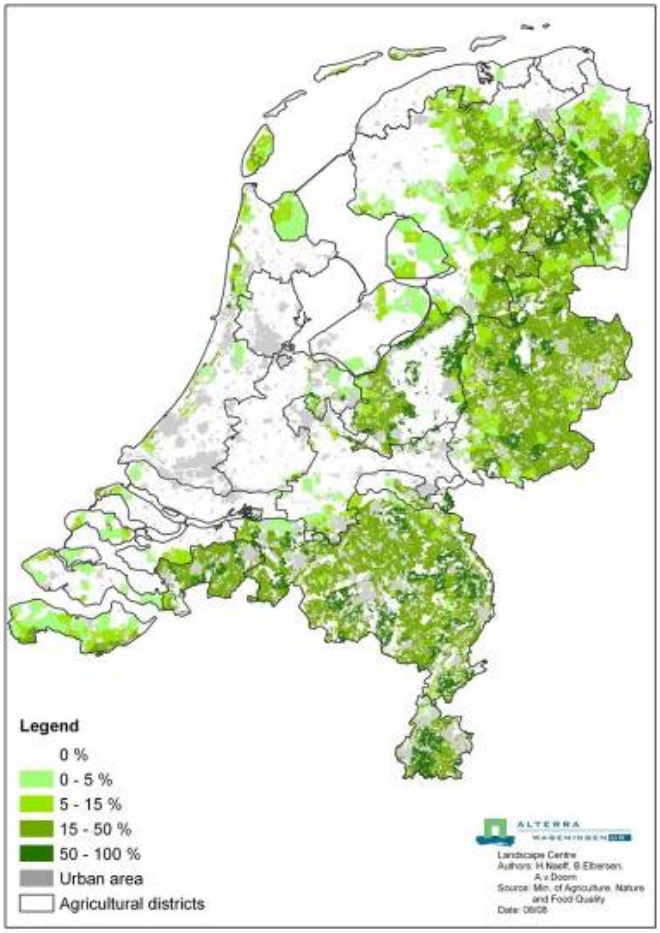
1. Zones most vulnerable to nitrate leaching

Although within the scope of the European Nitrates Directive (EU, 1991) the whole of the territory has been indicated as Nitrate Vulnerable Zone (NVZ), it is clear that some areas with specific soil and hydrological conditions are more vulnerable to nitrate leaching then others. In the Netherlands this particularly applies to the drier sandy and löss soils, which are most sensitive to leaching to ground water. Areas that are most sensitive to nitrate leaching to surface water are the places where un-deep groundwater flows into surface waters, which is the case in areas with high ground water tables and with water seepage problems, such as polders and peat lands. Especially in peat land areas the nitrogen content of seepage water is very high because of the additional mineralization of peat through the artificial lowering of water tables drying it up. Both types of areas have been mapped underneath.

Map 2.1 shows the spatial concentration of areas that are most sensitive to nitrate leaching to ground water. The map expresses these areas in terms of area shares per postal code area. The sensitive areas in the map are identified by selecting from the Dutch soil map all sandy and löss soils in combination with deep water table levels[1].

[1] Watertable level (*Grondwatertrap) VI, VII, VII* or VIII*

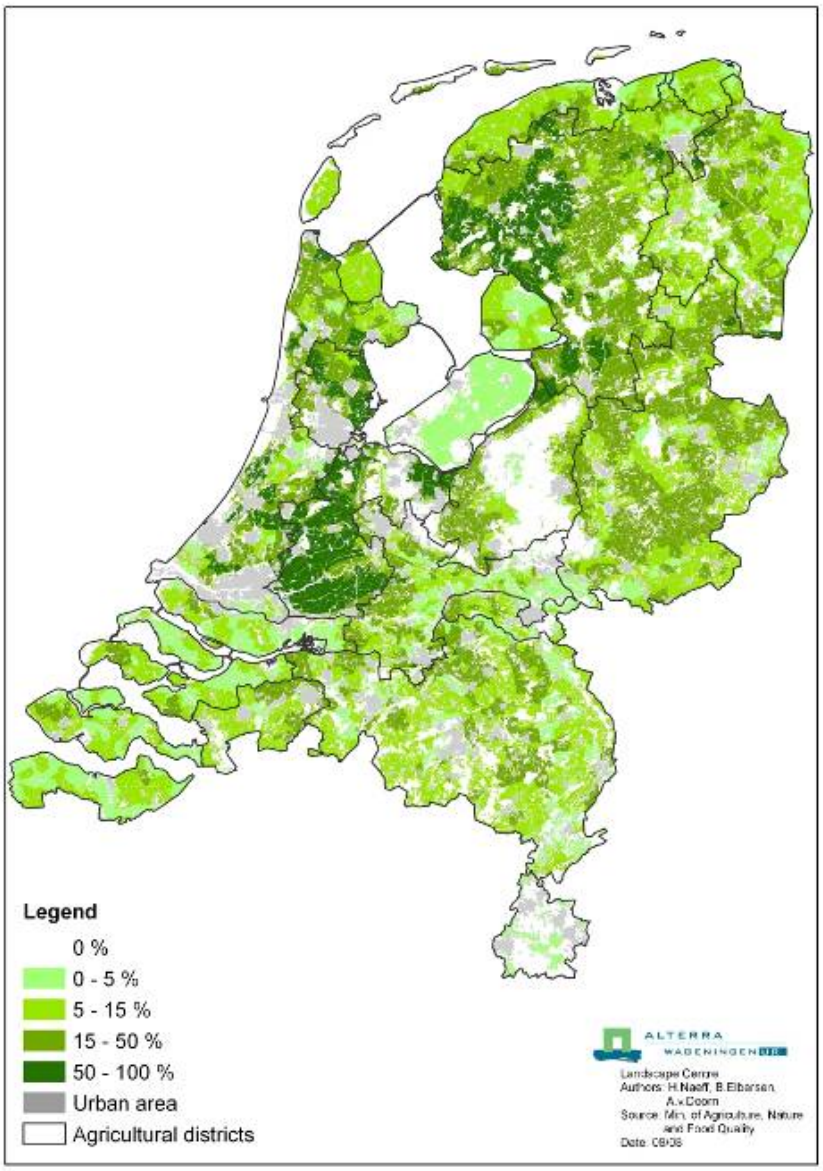
Map 2.1 Map of zones vulnerable to nitrate leaching to ground water, the map shows the share of the total UAA within a postal code area that is indicated as nitrate leaching sensitive (source: BZL-map 2002)



Overall it is clear that all higher sandy and löss areas in the east of the country come out most strongly. This map was developed within the scope of the official Ministry of Agriculture decision (*Besluit Zand en Lössgronden* (BZL, 2001 and updates in 2002 and 2003)). This decision was part of the implementation of the manure management law (*MINAS*) in the Netherlands dictating that nitrogen in water should not exceed 50 mg nitrogen per litre as specified in the EU Nitrates Directive.

Map 2.2 shows the spatial concentration of areas that are most sensitive to nitrate leaching to surface water. The map expresses these areas in terms of area shares per postal code area. The map is derived from Brouwer et al. 2003 and combines data on ground water level, soil type and land use to identify the pressure of nitrate leaching to the surface water. Areas with high ground water tables/levels, peaty soil types in arable or grassland land use are most vulnerable to nitrate leaching to surface water. The map shows clearly that the peat meadows of 'Het Groene Hart' in the western parts of the Netherlands and the southwest of Friesland are most vulnerable.

Map 2.2 Map of zones vulnerable to nitrate leaching to surface water, the map shows the share of the total UAA within a postal code area that is indicated as nitrate leaching sensitive (Source: Brouwer et al., 2003)



2. Agricultural zones of influence around nature areas most vulnerable to ammonia emissions

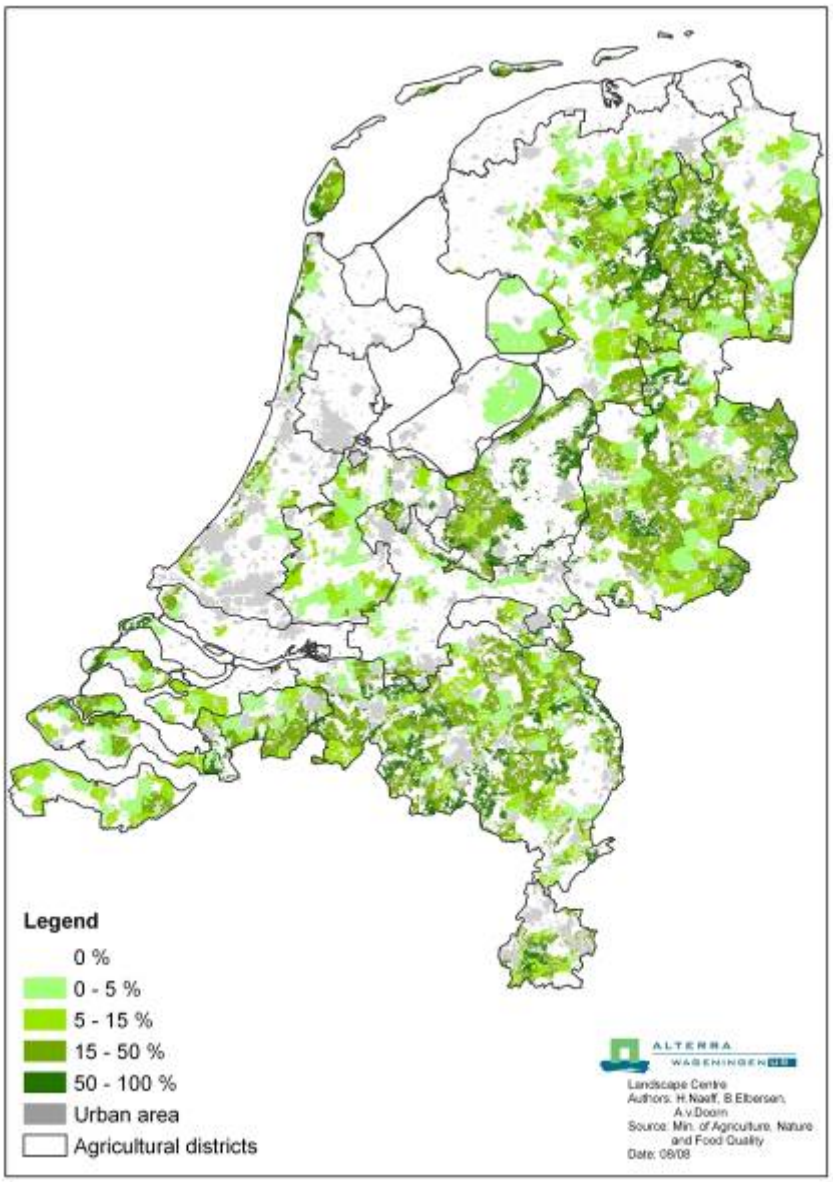
Ammonia emission leading to over-fertilization and acidification is an important threat to nature areas (*Natura 2000* areas) in many parts of the Netherlands as was discussed in the former. The national law ammonia and livestock farming (*Wet Ammoniak en Veehouderij*) indicates areas that are sensitive to ammonia emissions. Indication of areas happens on the basis of the type of vegetation and the presence of valuable and rare species and is presently further translated into ammonia emission sensitive areas appointed by regional authorities in planning documents. A national map has been developed within the scope of the national Law Ammonia and Livestock (*Wet Ammoniak en Veehouderij (WAV)*) and takes into account all larger nature areas located within the Natura 2000 network that contain habitats and vegetation types that are sensitive to acidification. This map was further discussed in the interprovincial board (*Interprovincial Overleg (IPO)*) and resulted in the *WAV-IPO* map which now serves as a guide for the implementation of ammonia sensitive areas at regional level in planning documents.

The WAV-IPO map served as a basis to produce the map of ammonia sensitive areas. This was done in two steps:
1) the *WAV-IPO* nature conservation areas within Natura 2000 that were identified according to their sensitivity to concentration of ammonia. As discussed in the former every habitat type can handle a maximum deposition of ammonia i.e. a critical load: the most sensitive habitats are high-peat land areas and shallow sweet water ecosystems (critical load ranging between 400-700 mol NH_3 per hectare per year), followed by forest ecosystems (critical load ranging between 500-1400 mol NH_3 per hectare per year), species rich grasslands and moors and heath lands (critical load ranging between 700-1800 mol NH_3 per hectare per year). For the exact mapping of the critical load per nature area see Gies et al. (2006) and Van Dobben and Bleeker (2004).

2) for the purpose of this study the above mentioned sensitive nature areas obtain a buffer zone of 3 kilometres distance. The 3 kilometre distance was taken as this is still the extend at which ammonia emission is assumed to be accountable to a clear source while any other emission outside this distance becomes part of the overall background ammonia contents in the air (see Gies et al., 2006).

The resulting Map 2.3 shows the geographic concentration of agricultural areas situated within a 3 kilometre distance of ammonia emission sensitive habitats situated within Natura 2000 areas. The map expresses these areas in terms of area shares per postal code area.

Map 2.3 Map of agricultural areas within the 3 kilometre buffer zone of ammonia emission sensitive Natura 2000 habitats, the map shows the share of the total UAA within a postal code area that is indicated as buffer zone (source: IPO-WAV map)



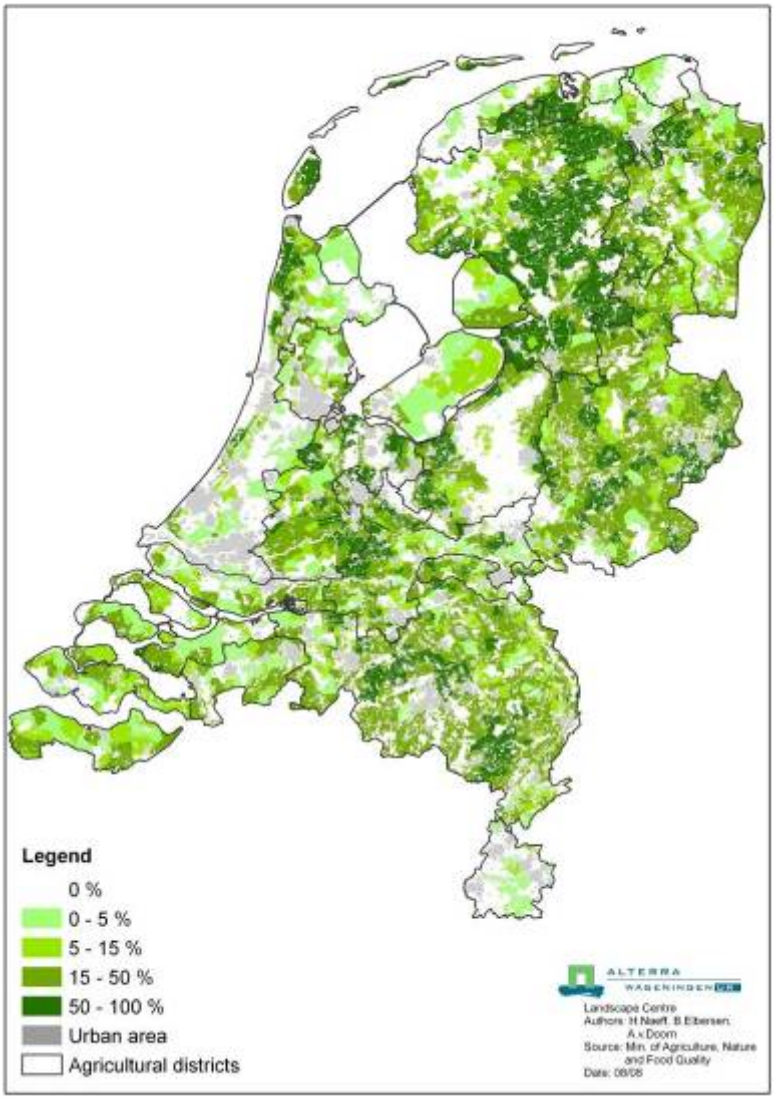
3. Agricultural areas located within a buffer of drought sensitive nature areas

A map has been produced of the pc-areas that are located within the influence zone of nature conservation areas that are sensitive to drought (see Map 2.4). The mapping of these areas was done in 2 steps:

1. The Natura 2000 areas have been selected that contain habitats that are ground water dependent (Ground water table I - IV) and thus drought sensitive.
2. The zone of influence (buffer zone) was mapped within which 95% of the hydrological influence on these habitats takes place. For further details see Van der Gaast et al. (2003). With this information the agricultural areas that were located within this zone of influence could be mapped.

The resulting Map 2.4 shows the share of a pc-area that is covered by the hydrological zone of influence of drought sensitive Natura 2000 areas. The most important agricultural areas included in the map are the peat meadow areas in the southwest of Friesland, northwestern Overijssel and the rest is scattered over the whole of the Netherlands.

Map 2.4 Agricultural areas located within the hydrological zone of influence of drought sensitive NATURA 2000 areas, the map shows the share of the total UAA within a postal code area that is located in the zone of influence



4 Farmland biodiversity: location of High Nature Value (HNV) farmland

High Nature Value farmland comprises of those areas where agriculture is a major (usually the dominant) land use and where that agriculture supports or is associated with either a high species and habitat diversity, and/or the presence of rare species. The share of HNV farmland and its management is one of the indicators of the Common Monitoring and Evaluation Framework of the EU rural development programs (CMEF).

In The Netherlands HNV farmlands are mainly associated with large shares of European populations of farmland breeding birds such as the Lapwing, Black-tailed Godwit, Ruff and Snipe, and they are also important foraging areas for several types of goose.

According to the EU-wide agreed typology (Andersen et al. 2003 and and EEA/UNEP, 2004), Elbersen and Eupen (2007) mapped the three types of HNV-farmland for the Netherlands. The resulting map is shown above (see Map 2.5). A total of 380,714 hectares was considered HNV farmland, corresponding to 18% of the total utilized agricultural area. The map includes all 3 types of HNV farmland (See box 3).

Box 3 HNV farmland types

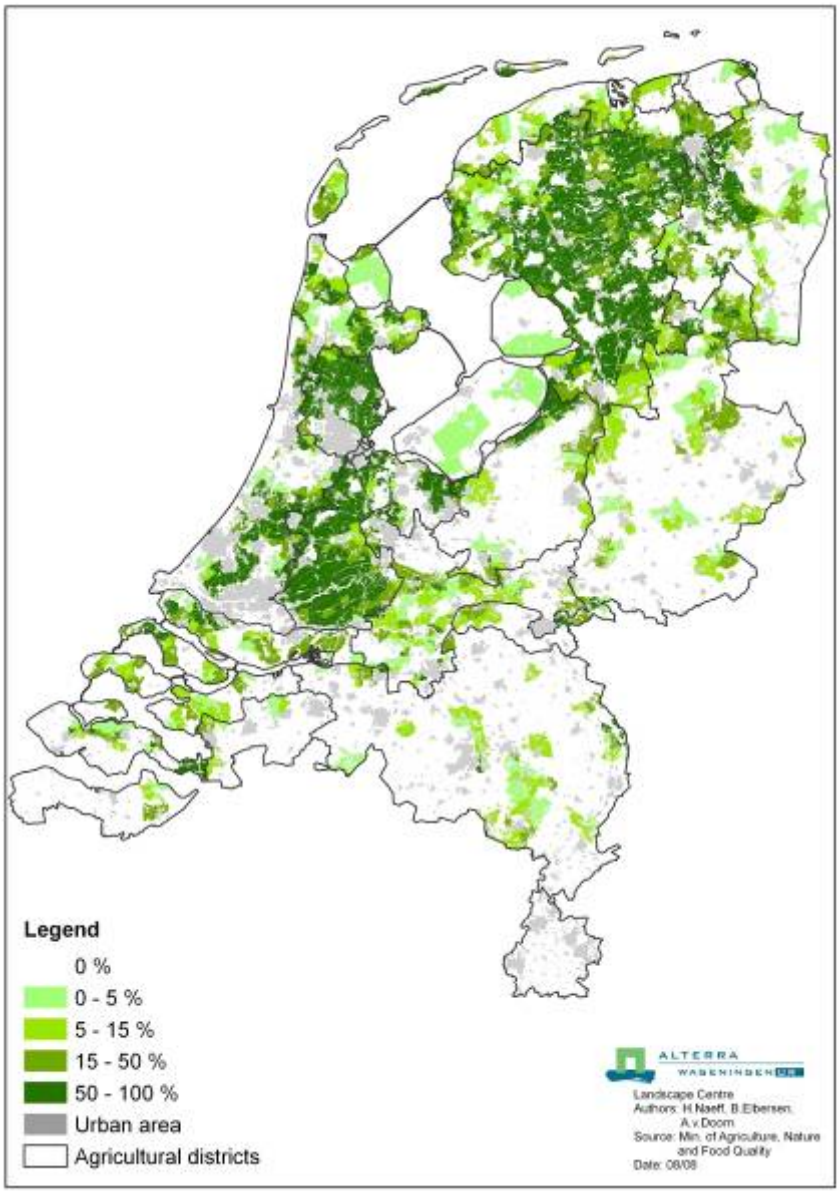
HNV farmland type 1 includes semi-natural vegetation (grasslands, dune grasslands, saltmarshes) outside protected natural areas if managed by extensive farmland practices (grazing, burning, cutting). The semi-natural vegetation within Nature conservation areas has been excluded in this map as this land is managed by nature conservation organizations instead of farmers. In can therefore not be categorized as farmland although some of the management includes agricultural practices such as grazing, with semi-wild free-ranging cattle or herded sheep, grass cutting and burning (heather).

HNV farmland Type 2 is limited to relatively small patches mostly concentrated in the peat land areas in the west and the higher sandy soil regions in the northeast and east of the country. These areas are still farmed, although relatively extensive according to Dutch standards (not European!), and do not correspond to Natura 2000 sites. They are characterized by a relatively high density of ditches and greenveins (e.g. tree lines, field boundaries, hedges). They have in many cases already obtained some national designation such as *'Nationale Landschappen'*. They are relatively rich in biodiversity, especially meadow and wintering birds and some typical vegetation. The type of meadow and wintering birds occurring in these Type 2 areas are usually similar to that occurring in Type 3 (birds of European and international conservation status), but the density of these birds is higher and the very rare species are more likely to be found here.

HNV type 3 farmland is the largest category in the Netherlands. It includes large patches of agricultural grassland and to a lower extent also some arable agricultural lands. They are usually farmed relatively intensively, although not belonging to the most intensive farmland categories in The Netherlands. Their qualification as HNV farmland areas is based on the fact that they are important habitats for farmland birds (meadow and wintering birds) often hosting important shares of populations of European and international conservation status.

The map 2.5 shows the largest concentration of HNV farmland in the western parts of the country; in the provinces of North and South Holland, and northern parts; provinces of Drenthe, Friesland and northern Overijssel. Most of these regions are characterised by wetter peat land meadow lands where agriculture has not been intensified as heavily as in other regions because of soil limiting factors and high water levels. In some other regions, like in Drenthe, the HNV areas are mostly characterised by small scale landscapes with relatively many landscape elements and small fields mixed with more natural land cover such as forests, heather and moorlands.

Map 2.5 Map of High Nature Value farmland, the map shows the share of the total UAA within a postal code area that is indicated as HNV farmland



2.3.2 Conclusions on environmentally sensitive areas and farming

Farms and farm sectors are spatially distributed due to a range of socio-economic, bio-physical and cultural factors according to a certain pattern. Within the scope of the present research it is interesting to confront the spatial distribution of farms and farm sectors with the four types of sensitive areas have been identified and to analyse the number and type of farms that is present in the different areas (see Table 2.1). Although causal relationships are not necessarily present, it is clear that the large majority of farms (85%) is situated in at least one of the environmentally sensitive areas.

Table 2.1 Relative distribution of farm types over sensitive zones

		Number of farms	**% of total farms in sensitive area**						
			Dairy dominant	Other grazing livestock	Mixed farms	Horti-culture	Arable	Grani-vores	rest
Not in sensitive areas		14140	13.1	12.2	6.3	2.5	26.7	1.0	38.2
In sensitive areas		80762	30.6	23.3	9.0	2.3	15.1	4.5	15.3
	Areas sensitive to nitrate leaching to ground water	25624	25.5	24.1	11.3	1.4	15.4	6.7	15.6
	Areas sensitive to nitrate leaching to surface water	45743	35.6	23.3	7.9	1.9	12.6	4.0	14.7
	Buffer zones around ammonia emission (acidification) sensitive nature areas	56277	28.8	23.7	9.7	2.2	14.7	5.2	15.6
	Buffer zones around drought sensitive nature areas	41662	30.4	24.8	9.0	2.2	11.9	4.8	16.9
	HNV farming areas	13666	43.5	26.9	0.5	0.6	4.0	1.0	23.5
	Total agricultural area	94902	28.0	21.7	8.6	2.3	16.8	3.9	18.7

Main conclusions from Table 2.1:

1. The large majority of farms is situated in one or more sensitive areas. On average 85% of the farms occur in sensitive areas, but for the dairy, other grazing livestock and granivour sector this is even 93%, 92% and 96% respectively. The arable sector is under-represented with only 76%.
2. Grazing livestock farms (both beef and dairy) are far more dominant in sensitive areas then in non sensitive areas and also in comparison to the average situation in Dutch farmland.
3. Dairy farms are particularly dominant in all sensitive areas with the exception of areas sensitive to nitrate leaching to ground water. In these areas there are relatively more beef (other grazing) farms and specialist granivour farms.

Since areas most sensitive to nitrate leaching to ground and surface water are usually not overlapping, one can conclude that 80% to 90% of all livestock farms, in both grazing and granivour sectors are situated in these areas, while this share is considerably lower for horticultural and arable farms. This means that the sectoral farm distribution over soil characteristics is already an important cause for a higher nitrate leaching risk. The same applies to ammonia emission sensitive nature areas as there is a higher concentration of farms with either grazing or granivour livestock around nature areas most sensitive to acidification. For drought sensitive areas again the highest concentration of farms is found in the livestock sectors. Finally, for HNV farmland areas the share of farms in the dairy and mixed classes are clearly dominant, while farms belonging to other sectors are practically not represented. Intensive farming practices occurring in HNV farmland areas are not beneficial for the conservation of nature values within them.

The clear uneven sectoral distribution of farms over sensitive areas and the diversity in levels of intensity of these farms will also have consequences for the detailed spatial distribution of 1st and 2nd Pillar payments. It will certainly be a factor of influence when assessing the effectiveness of the support in reaching environmental policy objectives. In Section 3.4 this will be further discussed.

Overall, it can already be concluded that the distribution of sectoral farm types over sensitive areas is generally not favourable from an environmental perspective. Especially areas most sensitive to nitrate leaching, acidification and loss of valuable farmland biodiversity (HNV farmland) are also characterised by a higher concentration of livestock sectors which have a relatively higher chance of leaching nitrates and emitting ammonia to the environment. Concentration of intensive livestock breeding in these places will have negative effects on the environment.

2.3.3 Farm intensity and effects on biodiversity

In the Netherlands, like in many other European regions, intensification is the main reason for the degradation of habitat quality and species diversity in agricultural lands. Decline at the community level have affected species of plants, of insects (Wilson et al 1999), and better known, of birds. Nowadays agricultural habitats harbour the greatest proportion of species of birds with unfavourable conservation status in Europe (Tucker & Heath 1994; Donald et al. 2001).

According to the review by Sanderson et al. (2005), there is a weight of convincing evidence that agricultural intensification is the direct cause for many farmland bird declines in Europe, and this is also true for the Netherlands (Dijk, et al 2007). Also relationships between grazing and vegetation have been well documented. Grazing, as long as it is causing low to medium disturbance levels, determines the relative abundance of plant species in a habitat, thus influencing the competitive abilities of plant species relative to each other, preventing one species to become dominant over the rest. The range of species present and structures in the vegetation is therefore maintained at a higher level (see e.g. Palmer and Hester, 2000; Harris and Jones, 1998; Mitchell & Hartley, 2001; Alonso et al., 2001; Stevenson and Thompson, 1993; López-Mariño et al., 2004; Reiné et al., 2000). Negative relations with intensive farming have also been demonstrated for invertebrates (e.g. Weibull et al. 2000;

Östman et al. 2001; Sunderland & Samu, 2000), mammals (e.g. Harris & Woollard, 1990) and soil ecology (e.g. Kladivko, 2001).

There are several farming practices investigated and they all show that the higher the input levels, the higher the stocking rates and the higher the disturbances of the natural cycles the more negative the effects for biodiversity are. High fertiliser inputs in agriculture for example and large concentrations of livestock rearing lead to leaching of nitrogen and cause eutrophication of surface water and soils affecting wildlife flora and fauna (e.g. shift in species). The consequences are however not always harmful. Depending on initial conditions and the degree of pollution, productivity may increase to the benefit of certain bird species (Newton, 1998). Evidence of negative effects on biodiversity comes for example from Van Wingerden et al. (1992), who found that grasshopper density and diversity decreased with increasing fertilization levels. Another study by Siepel (1990) shows a shift from larger to smaller sized invertebrate species with increasing fertilisation levels, which may be a major cause of the decrease of insectivorous vertebrates in highly fertilised samples. Nutrient inputs are obviously designed to favour crop growth and hence certain 'weed' species may be suppressed by dense crops. Similar effects may also occur due to vigorous growth of relatively few weed species which can exploit such conditions, leading to loss of plant species diversity which may in turn affect invertebrate abundance and diversity (Kleijn & van der Voort, 1997; Wilson & Tilman, 1993). Dense growth of crops can also impede access to the crop and ground by foraging birds and chicks preventing them to get enough shelter against cold and wet weather (Shrubb & Lack, 1991). Increased fertilization has also been related to the loss of structural heterogeneity of crop sward (Benton et al., 2003). Nutrition of crops, normally in combination with plant protection, increases uniformity of establishment and subsequent growth, and reduces species and structural diversity of vegetation by killing and shading out of non-crop species in favour of dense, homogeneous crop swards.

Appropriate grazing regimes on biodiversity are very beneficial to biodiversity as many studies have shown already. Stocking density is closely related to grazing pressure, which is an important controlling factor for the vegetation, and therefore also for the birds that use it as a habitat. Low stocking densities create a diverse habitat, with suitable ecological niches for many species. The range of species present and structures in the vegetation is therefore maintained at a higher level (see e.g. Palmer and Hester, 2000; Harris and Jones, 1998; Mitchell & Hartley, 2001; Alonso et al., 2001; Stevenson & Thompson, 1993; Peco et al., 2005; López-Mariño et al., 2000; Reiné et al., 2004). For farmland birds the diversity at the landscape level is very important too, and this is strongly influenced by the grassland management practices. Appropriate grassland management provides more open types of vegetation without letting these develop fully to their climax stage which results in suitable habitats for birds to winter and roost (Angelstamm, 1992; Söderström & Pärt, 2000). Another factor is that low stocking rates in the breeding season reduce the chance of egg- and chick trampling for ground breeding birds (Vickery et al., 1992). A low livestock stocking rate in winter leaves more food available for geese.

2.3.4 Features of farm intensity.

Following from the former literature review, a set of key indicators can be identified for farm intensity. By using this set of intensity indicators in the analysis, insight can be gained in the relative distribution of 1st and 2nd Pillar payments over intensive and extensive farms. This is especially relevant when looking at Pillar payments distribution within and outside environmentally sensitive areas as farming intensity is an important driver for environmental degradation and farmland biodiversity loss. The indicators proposed to be included in the analysis are given in Table 2.2.

*Table 2.2 Intensity indicators**

Indicator	Measurement/Unit	Description
Livestock density	LU/ha UAA	The average stocking rate in the Netherlands is 3.26 LU/ha while this level is at 0.9 LU/ha for the EU15 and 0.8 for EU27 (Eurostat, 2005). Only Malta shows a higher level then the Netherlands for the total farm population. If we compare the situation within sectoral farmtypes (see Annex 5, Figures 1-2) we see that both the different types of grazing livestock farms and granivores are in the top 5 EU countries with the highest density. The stocking density is a good indicator of intensity for specialised livestock farms.
Intensity of land use	ESU/ha UAA	The economic size of farms is expressed in number of European Size Units (ESU) which is a proxy for the total production capacity of a farm. The average number of size units per hectare is a good indicator for the intensity of the production and provides a good indicator for intensity irrelevant of the type of activities. It therefore enables comparison over sectors. The average number of ESU/ha amounts to 1.1 for the EU-15 while this is at 4.3 for The Netherlands. A comparison of this indicator over sectors (see Annex 5, Figures 3-5) shows that a high concentration of ESU is typical for most specialist farm types in The Netherlands.
Ammonia emission	kg NH3/farm	De Vries et al. (2007) developed an indicator of ammonia emissions on farm level, by attributing an emission factor per livestock type and calculating the total emission per farm taking stable and manure storage type into account.
HNV farmtype	Presence / absence	The HNV farm typology differentiates farms in HNV and non-HNV. Within the HNV class different HNV farms are identified according to a combination of characteristics. In general, HNV farms apply traditional and/or low input agricultural practices, and a relatively higher share of permanent grassland, semi-natural grassland and/or fallow land (for more details see Appendix 4 and Elbersen and van Eupen, 2007).

* All indicators have been calculated for the total Dutch farming population at individual farm level contained in the GIAB database.
UAA= Utilised Agricultural Area/LSU= Livestock Unit/ESU= European Size Unit/HNV= High Nature Value

3 Political context and methodology

3.1 Implementation of the CAP

3.1.1 1st Pillar

EU-Farm payments have guaranteed prices for farm commodities and supported farm incomes for a long period of time. The agricultural intensification process, as described in box 2, has been partly driven through the introduction of the CAP. The CAP stimulated increased production at higher intensity and ensured high prices of products. It can therefore be hypothesized that there is an historic link between the CAP and pressure on the environment. The overall negative effects of the CAP on environment have been addressed by the subsequent reforms that were introduced since the 1990s and especially after the introduction of the Agenda 2000 reforms.
On the other hand there is also a clear relationship between certain farmland biodiversity and the continuation of (extensive) farming: where this farming disappeared biodiversity declined.

The 2003 Mid-Term Review (MTR) of the CAP introduced the most substantial change which was the introduction of a system of decoupled payments per farm (Single Farm Payment). Moreover a cross-compliance instrument was to accompany this system making the payments conditional on recipients meeting all statutory management requirements (SMR) in the field of environmental, animal welfare and public health requirements as well as standards of good agricultural and environmental condition (GEAC). At the same time the Rural Development Regulation (RDR) (1750/99), the so-called, was also implemented which organised the so-called 2nd Pillar measures, including the agri-environmental support measures.

Cross-compliance, which became an obligatory element, implies that member states are allowed to link environmental conditions to direct payments to farmers, independent of their production level. The SFP, that was launched the first of January 2006, is decoupled from production, though for some sectors the farm payments have remained coupled. In the Netherlands this applied to the slaughter premiums for cattle and sowing seed production support for linseed. Also 60% of the payments for starch potatoes remained coupled. The Dutch Government aims at completely decoupling of all sectors by 2010. Furthermore, prices for sugar and milk are still guaranteed through the sugar and milk quota system although the size of sugar quotas have been diminished strongly since last year and the dairy quota are expected to be abolished completely in the future.

The allocation of the SFP can be based on different models. The Dutch government adopted the historic entitlement model. This model determines payments to be based on the average amount of support received annually by a farmer during the reference period (2000 – 2002). The main argument for the Dutch government choosing this model was to avoid drastic reallocations of income support (RLG 2007).

In the new system of the SFP, CAP support will no longer influence production decisions. On the other hand, since the Netherlands has opted for the historic right principle, it is not very likely that it will alleviate environmental pressures of agriculture either. After all the historic farm structures and production patterns still determine the level of support and there is no incentive to change them under the present historic entitlement model. Only a real re-distribution of payments may change this pattern.

3.1.2 2nd Pillar

The first Dutch Rural Development Plan (RDP) is structured according to 6 main goals (see Figure 3.1). As the RDP integrated both existing measures and instruments and new ones, the structure has become complex Each major goal is connected with a package of regulations, and each regulation can contribute to one or more major goals. In total there are 16 regulations within the RDP, that are indicated with letters (a-t). Furthermore, each regulation is operationalised by a set of instruments.

In the Netherlands a relatively high percentage of 2nd Pillar money was spent in the first RDP on expropriation of agricultural land in order to turn it into nature maintained by conservation organisations. This process has lead to a strong separation between farming and nature which is rather exceptional in Europe. No other member state spent that much money to take it out of agricultural production and let it be managed by nature conservation organisations creating so-called 'new' nature.

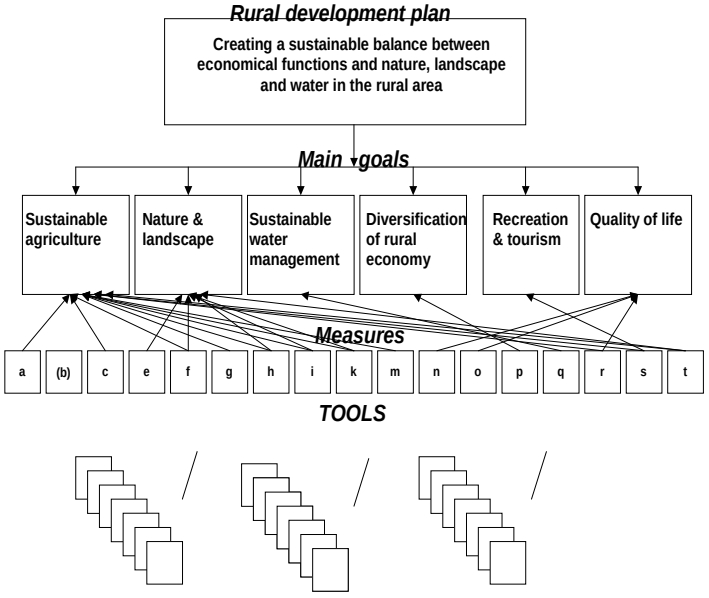


Figure 3.1: Structure of the RDP of the Netherlands (source: Ecorys 2003)

Agri-environment schemes
Although the Dutch RDP includes other environmental regulations, such as sustainable water management, the analysis of the 2nd Pillar in this study focuses on the Agri-environmental Support (AES) and the regulation for Less Favoured Areas. How this selection was made is described in annex 7.1.

The AES is part of the Rural Development Programme and gives support to farmers to take measures to conserve and enhance agri-environmental values. In this way, agricultural damage to nature and landscape values can be reduced and the management of nature and landscape by farmers be promoted. Farmers can enter into individual management agreements. They can only apply for a management agreement under the condition that their land is indicated already as a management area. In total 750.000 ha are eligible for management agreements. The agreements differ in detail, but all belong to one of the two main categories: meadow bird agreements (that prohibits changes in drainage, farming activities between April and June and restricted application of herbicides) or botanical agreements (that prohibits changes in drainage, reseeding and fertilizer application) (Kleijn et al. 2004).

An AES payment is offered for adaptations in farm management, such as changes in pasturing, ditch management, late mowing etc. The instrument effectuating this goal is the *SAN* Agricultural nature and landscape management scheme (*Subsidieregeling Agrarisch Natuurbeheer en landschap*) which is the successor of *RBON* (*Regeling Bos en Ontwikkeling Natuur*)

AES-up-take and money spent
In the investigated RDP period (2000-2006) around 113.000 farms signed a management agreement, covering 34.500 ha, which was only 1,9% of the total Dutch UAA. This makes the Netherlands, one of the member states that rates significantly below the EU average for participation in AES. The EU average is at 7% (Piorr 2003).

The recipients of the AES payments are mainly individual farmers. According to the data provided by the Dutch Ministry 193 mln. € (of which 68 mln € is coming from the EU, the rest is national contribution) was spent under this scheme during the entire RDP period. Almost half of the total AES budget was spent under SAN, the operational scheme in the last 2 years of the RDP-period. Beside AES 8% of the RDP budget was spent under the scheme to promote organic agriculture (RSBP). A number of state schemes have only been included in the RDP in terms of through-funding of commitments from the previous programming period; these include older management agreements for AES, the nature development scheme (RBON) and Support for Rare domestic breeds (SZL).

Environmental evaluation of the Dutch agri-environmental programme
In an evaluation study of MNP (2007) it was concluded that the AES measures have not been very successful in reaching nature conservation targets. Main reason for lack of effectiveness is that it turns out to be very complicated to reach the basic environmental conditions needed to restore the desired nature values. These basic

environmental conditions are often in contrast to the conditions needed for efficient agricultural production (e.g. low water levels). In areas where botanical agreements have been in place for long periods of time the existing (but low level) nature values are maintained but the nature conservation targets still remain far from being realised. For areas where meadow bird agreements were in place in the last 30 years it was concluded that the nature quality declined. The main reason given for this negative result was that AE-measures were not very effective in bringing down the overall agricultural intensity (see box 1). From this evaluation study the main recommendations for improvement of the effectiveness of AES include:

1) Increase the share of intensive management agreements which lead to a considerable decline in the intensity of the agricultural management.
2) Concentrate the support towards areas with the highest nature quality which have the highest chance for reaching the nature conservation targets under efficient AE-management
3) Concentrate support towards areas that form a buffer zone around valuable nature conservation areas in order to create environmental conditions which may have a buffering effect preventing negative disturbance of important nature values within the conservation area.

These overall recommendations are also strongly in line with the recommendations made by Schekkerman (2008)(see also Box 4).

Box 4: Agri-environmental support and Black tailed godwit chick survival in Dutch pasture lands:

In 1975 there were still 120,000 breeding pairs of this bird in The Netherlands, but their number declined to about 38,000 at present. There is overall consensus about the fact the earlier mowing practices have certainly had adverse effects on the survival rate of chicks. This effect has certainly increased as nowadays the first grass-cutting is done 3 weeks earlier then 40 years ago, probably due to improved fertilisation or climate change.

Schekkerman (2008) showed however that the agri-environmental measure to encourage later mowing practices is not sufficient to increase the survival rate of chicks. Black-tailed godwit chicks need about 20,000 insects in the first week they are born. The chances of finding these insects are much higher in tall grasses but increase even further in nutrient pore grasslands. In strongly fertilised species pore grasslands the grass mat is impermeable for the chick beak preventing it from finding the insects in the soil. Climate change makes the situation even worse. Initially godwits were able to adapt their breeding activity to the earlier mowing dates. However, since the 1980s the breeding season has no longer shifted and chicks are usually born when most grass is already cut and the peak in the feed availability has passed. Finally, predators have also become a larger threat because chicks have become an easy prey in the open monotonous short cut grasslands.

Schekkerman (2008) showed that the chick survival rate was at 0.8 chick per breeding couple in 1980 while it is now only at 0.2 chick (2005). He also showed that this survival rate was only 0.16 on early mowed pastures while it was twice at high at 0.28 on pastures with agri-environmental support for late mowing. In spite of this significant difference these measures are not sufficient to stabilise the godwit population. For this a chick survival rate of 0.6 per breeding couple is needed.

It can therefore be concluded that AES that only focuses on late mowing is not sufficient, as additional measures are also needed like creation of vegetation with a higher structural diversity which can be created by lowering nitrogen inputs and normalising the water tables. These type of measures are very costly however and it would not be feasible to finance them certainly given the recent and expected future milk price increases requiring ever higher AES sums to compensate for loss of income. Schekkerman (2008) therefore advises to focus all AES payments on a limited number of pasture areas where godwit numbers are still high and predators are limited. In these areas a combination of measures should be taken such as late and irregular mowing, low nutrient inputs and maintenance of high water tables.

3.2 CAP health check and future reforms

In May 2008 the Health Check was published by the EC setting out the legislative proposals for changes in the CAP. The Health Check was presented by the EC as 'an instrument to assess whether the CAP is working as well as it could in a larger European Union and in a shifting international context' and 'it sets out a proposal not to a fundamental reform of the CAP, as stressed by Mariann Fischer Boel but 'to streamline and to modernise the CAP' (EC, 2008).
Within the context of this study the most relevant proposed changes in the Health check are the following:

1) The SPS (Single Farm Payment Scheme) will be maintained as a farmers support instrument decoupled from production.
2) However, the historic distribution model, as also applied in The Netherlands, will no longer be maintained as it is argued that payments levels based on historic structures of production and support are becoming more distant and lead to large differences in size of payments. In the light of societal changes and market forces this is becoming more difficult to justify and a move to a flatter rate is proposed.
3) Therefore an additional modulation (shift of resources from 1st to 2nd Pillar) is proposed from the current 5% to 8% to be reached in 2012. This modulated budget should be spent within the Member State. It will lead to an increased budget to be spent under the 2nd Pillar and an opportunity to make a larger part of the CAP spending conditional to deliver environmental benefits.
4) The need has also been emphasised to make the CAP deliver goods that are more in line with what society wishes. This means that CAP support should also help to deliver public goods (e.g. non-commodity goods) such as mitigation of climate change, better water management, improved environmental quality and prevention of further biodiversity loss.
5) Because of this it is also proposed that the payments farmers receive and the obligations of farmers in the area of environment and also animal welfare and public health should be made clearer. This means that the present Cross Compliance obligations for farmers receiving SPS will be further extended with new GAECs (Good Agricultural and Environmental Condition) standards. At this moment it is proposed to introduce 2 new GAECs: one for the retention of landscape features (e.g. ditches, ponds, hedges, tree lines etc.) and the other for the establishment of buffer strips along water courses.
6) In line with the above it is also proposed to use the extra modulated share to reinforce actions in Pillar 2 to meet challenges such as improvement of the environmental conditions and hold biodiversity loss.
7) Finally, Member states are also allowed to adjust the direct aid scheme (up to 10% of their national ceilings) to provide support in case of natural disasters but also to specific sectors with specific problems which could include farms in environmentally sensitive areas.

Overall it is clear that the proposed future changes of the CAP will provide more room for both 1st and 2nd Pillar payments to be made more conditional to societal goods/benefits including the conservation of the environment and the

restoration of biodiversity. But how this should be done has to be based on a solid assessment of the way the present 1st and 2nd Pillar payments are distributed.

3.3 Hypothesis

Before further analysis is done, a set of hypotheses need to be formulated. These hypotheses ensure that the right relationships are assessed in a systematic and transparent way. Hypothesis have therefore been formulated that expresses the expected relation between the geographical distribution of 1st or 2nd Pillar payments and environmentally sensitive areas and intensity of farming.

1st Pillar payments and sensitive areas

The Single Farm Payment of the 1st Pillar aims to ensure a basic standard of living and stability of income to farmers. The baseline data of the 1st Pillar payments used for this study refer to 2004, a year in which the payments were still coupled to production. It is clear however that the spatial distribution of this 2004 data to the 4 digit postal code area is a good representation of the single farm payment (SFP) distribution situation as it was implemented from 2005 onwards. This is confirmed by a comparison of the 2004 distribution data with data from 2006 which were also distributed to 4 digit postal code regions following the official implementation rules of the SFP policy (see Annex 6). These 2006 data became available in 2008 when the draft report of this study was already available. After a comparison it was decided that the distribution patterns of the 2006 data showed such limited differences with the 2004 based distribution results that an up-date for this study would not lead to any different analysis results, let alone other conclusions. See also paragraph 3.4 and Annex 6.

In The Netherlands a relatively large proportion of direct payments goes to livestock farming (Regulation milk and dairy products, Slaughter premium, Area support for Maize, Beef premium), which is, as became clear from chapter 2, characterised by a relatively intensive production.

The dairy and cattle farms are mostly concentrated in the areas with grassland on sandy and peaty soils. These grassland areas are also those that are most strongly overlapping with environmentally sensitive areas, e.g Nitrate leaching sensitive farmland, farmland in zones of influence of ammonia emission and drought sensitive nature areas and HNV farmland.
Following this reasoning, hypothesis 1 can be formulated:
The environmentally sensitive areas identified in this study receive relatively higher 1st Pillar payments. This both applies to the total amount of payments as to level of payments per farm and per hectare.

Interesting to know is also to which type of farms, in terms of farm intensity factors, the 1st Pillar payments are targeted within the environmentally sensitive areas. . From the historic principles of a 1st Pillar farm support distribution it can be expected that

farms with a high productivity, which in the Netherlands usually coincide with the most intensive farms, obtain higher payments per farm and per hectare.
Subsequently, hypothesis 2 can be formulated as follows: within sensitive areas the most intensive farms receive higher support per hectare and per farm then less intensive farms.

2nd Pillar: AES

Farmers receiving AES have to be located in agri-environmental support areas. These have been designated in provincial and municipal plans according to the typical agri-environmental and natural values occurring in these areas. Special packages of support can be chosen according to the pre-defined values present in these areas. This means that it is clear that all payments are already targeted to the right areas, but the effectiveness of these AES depends on the up-take rate and spatial distribution. Given the objectives and implementation of the AES scheme several hypothesis can be made before the assessment.

Hypothesis 3:
Since the AES packages are more strongly orientated to grassland areas and thus to livestock farms, it is also expected that the sensitive areas identified in this study, especially the HNV farmland areas, will receive a relatively larger share of the 2nd Pillar support and also higher per farm and per hectare payments.

It is expected that extensive farmers will have higher up-take rates then intensive ones as they have to make less rigorous changes in their farming practices then the intensive ones and they have a higher chance of being located in an area eligible for AES as their extensive management practices may have also contributed to the specific nature values present. This leads to the following hypothesis:

Hypothesis 4:
The most intensive farms receive no or very limited shares and amounts of the AES payments (also in payments/ha). While the farms which are most extensive; i.e. having low stocking rates, low land use intensity (ESU/ha) and have many HNV features and thus are more supportive to maintenance of nature values, receive most.

3.4 Methodological approach

To test the hypothesis as formulated in the former paragraph, the following methodological approach has been adopted:

1. Detailed mapping of spatial distribution of CAP payments
2. Mapping of environmentally sensitive areas and analysis of farm intensity features
3. Statistical analysis (mainly correlation analysis between distribution of 1st and 2nd Pillar payments, sensitive areas and farms with specific intensity charateristics).

ed 1 Detailed mapping of spatial distribution of CAP payments.
The detailed geographical distribution of 1st Pillar payments in the Netherlands used in this study was obtained from a former study carried out by Hermans et al. (2006). In that study the data used for the geographical distribution relate to 2004. By that time the payments were still coupled to production but the spatial redistribution of these 1st Pillar payment followed the logic of a de-coupled situation expected the years after. The data of Hermans (2006) based on the 2004 data therefore give a representative geographic targeting of the direct payments paid in the following years, based on the historic right principle. This was also further confirmed by a comparison of the 2004 based distribution with a 2006 based distribution of 1st Pillar payments which were used in a follow-up study by Doorn et al. (2008). The comparison showed very small differences in spatial distribution patterns (see Annex 6).

The payment data for 2004 used for this study include all 1st Pillar payments made directly to primary producers and the payments paid to the industry and trade, like dairy payments and slaughter premiums. The latter were however first re-distributed spatially over the recipients (their addresses within postal code areas) that were likely to profit from these market measures according to their cropping areas and livestock types and numbers occurring on their farms.

Contrary to the 1st Pillar Payment data, 2nd Pillar payments were especially distributed over postal code areas within the scope of this study. To carry out this detailed spatial allocation, a database containing the addresses of the receivers and the amount of received payments per regulation was obtained from the Ministry. Subsequently, a connection was made between the support that was paid and the addresses of the receivers within every PC area. This location was determined by using the Geographical information system of agricultural enterprises (GIAB), like Hermans et al. (2006) also used for the spatial allocation of 1st Pillar payments. For a detailed description of how this detailed spatial distribution was done and what input data were used see Annex 6 (second and third section).

ed 2. Identification of sensitive areas and farm intensity features.
The identification of sensitive areas and farm intensity features has already been explained extensively in chapter 2.

ed 3. Assessing the relation between the geographic distribution of CAP-payments and sensitive areas and types of farming
To test the hypothesis, three types of analysis were done.

Firstly, an overlay of the geographical distribution of the CAP payments with the location of these sensitive areas was made. This resulted in an overview of the average CAP payments (1st and 2nd Pillar) per hectare and per farm in and outside sensitive areas. This information has also been further sub-divided over sectoral and intensity farm types.

Secondly, the distribution of CAP payments (€/hectare) in and outside environmentally sensitive areas was statistically tested. This was done through a correlation analysis investigating the relationship between the average per hectare payments and the percentage of sensitive area occurring in every postal code area. This relationship was investigated per dominant farm type per postal code area in order to externalise the influence of the bias in payments towards specific sectors. Through this analysis it could be tested whether the distribution of 1st Pillar payments is significantly higher or lower in certain sensitive areas as identified and described in Chapter 2. The detailed statistical analysis procedure is further explained in Annex 7 (sections 4 and 5).

Thirdly, the relationship between the distribution of CAP payments (€/hectare) and the intensity of farms within sensitive areas was tested according to the 4 indicators of intensity as described in Chapter 2 (Section 2.3.3 and 2.3.4). The further details of the statistical analysis followed are given in Annex 7.

4 Results

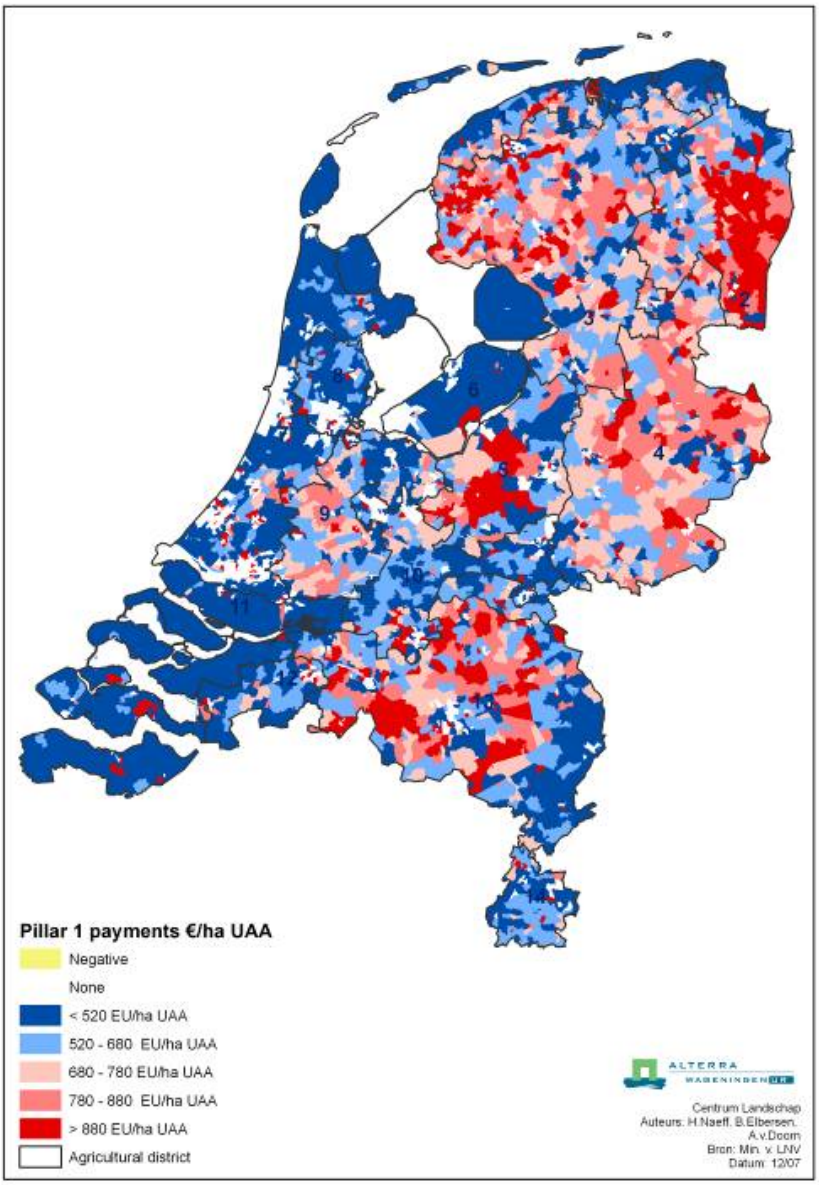
4.1 Territorial distribution of 1st Pillar payments

The total budget of direct payments from the first Pillar of the CAP is € 1.239 mln in 2004. These payments are coupled to 1,6 million ha of agricultural land, being 84% of the total Dutch UAA.
Map 4.1 shows 5 classes in which the postal code areas have been placed, based on the amounts of 1st Pillar payments received per hectare and the proportion of the total budget they represent. The dark blue areas received a relatively low amount per hectare and together they represent one-fifth of the total budget. The red areas, on the other hand, received the highest amount per hectare, and together also represent one-fifth of the total budget. In this way the dark blue area cover more hectares than the red areas.

The pc- areas that received the highest payments per hectare cover approximately 10 % of the agricultural area (222,000 ha). This involves primarily the Veenkolonien (production of starch potatoes and sugar beets), the Gelderse Vallei (calf sector) and a few areas in Noord Brabant, Friesland and Overijssel (dairy cattle farms and maize production). These postal code areas received at least €880 per ha of agricultural land. The average payment in these areas was € 1110 / ha.

The postal code areas with the lowest payments per hectare (the dark blue-areas) cover about 37% of the total agricultural land. These postal code areas are mainly located in the provinces of Noord Holland, Zeeland, Flevoland, Limburg, the northern areas of the provinces of Friesland and Groningen and along the Dutch large rivers. In these areas arable, horticultural and permanent cropping farms dominate and every hectare of agricultural land in these areas received on average €330 up to a maximum of €520.

Map 4.1 Territorial distribution of 1st Pillar payments



4.1.1 1st Pillar payments in relation to environmentally sensitive areas

In chapter 2 an overview and description was given of the main agri-environmental problems occurring in the Netherlands. Maps were also presented of areas having the largest sensitivity to agri-environmental problems. These areas include areas that are most sensitive to nitrate leaching to ground or surface water if confronted with high emissions of nitrates. Also Natura 2000 sites most likely to suffer loss of biodiversity because of ammonia deposition and water depletion effects of intensive agricultural activities requiring low water tables, are considered. For the latter 2 environmental problems, buffer zones were mapped around the most sensitive habitats within the Natura 2000 sites. Finally HNV farm land is considered as areas with great challenges to protect agro-biodiversity.

In this section it is now assessed what the relative distribution of 1st Pillar payments over these sensitive areas is and what type of farms are receiving them. In the former is was already explained that given the sectoral approach of the 1st Pillar payment distribution, a relatively large amount of payments is still going to certain sectors such as dairy, cattle farms and certain arable farms. These type of farms are most strongly concentrated in the grassland-, peat and sandy areas of the Netherlands leading to the hypothesis that all environmentally sensitive areas identified for this study obtain a significantly higher 1st Pillar area payment (€/ha). Because of the adoption of the historic right principle for the Single farm payment (SPS) it is likely that this situation continues to exist.

Secondly, it was also hypothesised that within the sensitive areas the most intensive farms would receive a significantly higher payment per hectare and per farm than the extensive types. This last hypothesis should of course also be tested within sectoral farm type groups.

Table 4.1 gives an overview of the average 1st Pillar payments per hectare and per farm in and outside sensitive areas. This information has also been further subdivided over sectoral and intensity farm types. In the analysis, export refunds are assigned to the income of the receiver. This is why the amounts in the table differ from the amounts a farmer really receives.

Table 4.1 Average 1st Pillar payments per farm type per environmentally sensitive zone

		All sectors	Dairy	Other grazing livestock	Mixed, livestock and cropping	Horti-culture	Arable	Grani-voures
Not sensitive areas	**€/ha**	**461**	**901**	**349**	**455**	**210**	**382**	**468**
	€/farm	**12178**	**30942**	**4018**	**15054**	**4535**	**13635**	**4882**
In sensitive areas	**€/ha**	**523**	**903**	**442**	**594**	**261**	**491**	**448**
	€/farm	**11248**	**27159**	**5020**	**12923**	**4380**	**13781**	**4224**
Areas sensitive to nitrate leaching to ground water	€/ha	586	984	508	649	296	638	443
	€/farm	10871	26224	4978	12127	4482	13355	4062
Areas sensitive to nitrate leaching to surface water	€/ha	514	877	420	605	256	462	465
	€/farm	11429	27019	4966	13235	4380	14701	4271
Buffer zones around ammonia emission sensitive nature areas	€/ha	545	938	461	619	265	533	456
	€/farm	10909	26783	4909	12361	4590	12521	4288
Buffer zones around drought sensitive nature areas	€/ha	544	911	481	606	274	550	442
	€/farm	11249	27260	5368	12657	4504	13580	4122
HNV farming areas	€/ha	494	901	349	455	409	382	468
	€/farm	12169	30942	4018	15054	4480	13635	4882

Main conclusions from Table 4.1:

1. For all farms together average per hectare payments are higher within then outside sensitive areas. This does not apply to the average per farm payments.
2. Relatively higher per area payments particularly occur in areas sensitive to nitrate leaching to ground water and in buffer areas around ammonia emission and drought sensitive nature areas for dairy, other grazing livestock, mixed and arable farms.
3. For the horticultural and granivour farms the payments per hectare received inside sensitive areas are generally not different from those received outside sensitive areas. One exception for horticultural farms is found in the HNV farmland areas, where payments per hectare received are much higher.

When looking at the distribution of 1st Pillar farm payments over these sensitive areas and farm types in Table 4.1 the overall conclusion is that the average payment per hectare and farm is higher within then outside sensitive areas. However, this pattern is not consistently confirmed when looking at it sector wise. The highest amount per hectare and per farm payments goes clearly to the dairy sector. This is also the most likely reason why areas most sensitive to nitrate leaching to surface water and HNV farmland areas receive the highest per farm and per hectare payments. In both sensitive area types, dairy farms dominate. For the dairy sector there is however no clear difference in per hectare payment in and outside sensitive areas although payments per farm are clearly higher outside sensitive areas. For the arable, mixed grazing livestock and mixed farms it is striking however that the payments per ha. are considerably higher in the sensitive areas as compared to the non sensitive areas. This however, does not necessarily lead to a higher payment per farm. For the arable sector this can probably be explained from the fact that starch potatoes receive a

high payment per ha. and the production of these is mostly concentrated on the lighter more sandy soils which more often coincide with the sensitive area categories.

An other observation is that payments per hectare for all other farms are significantly lower than that of the dairy farms, but both the mixed and arable farms are still obtaining a considerable payment per farm as their UAA is significantly larger than that of the grazing livestock, horticultural and granivour farms.

When comparing payments between sensitive areas we see that payments per ha. are generally higher in areas sensitive to nitrate leaching to ground water, while this generally does not lead to higher per farm payments (see Table 4.1). Probably this can be explained from the fact that per area intensity is generally higher in these areas while farm size is generally lower. In the HNV farmland areas the opposite seems to occur as payments per ha. are relatively low for most sectors and per farm payments are higher in most of the sectors. Exceptions to this pattern are however the horticultural farms in HNV farmland areas receiving relatively high (compared to the other sensitive areas) per area and per farm payment. An explanation for this can probably be related with the lower specialisation level of these farms having still activities, such as arable cropping and livestock holding which historically were subject to income and market support.

In Table 4.2 the results of an analysis are presented in which the relationship between the per area 1st Pillar payments and the presence of environmentally sensitive areas was investigated. This was done by correlating the size of the payment per ha. (Euro/ha) with the share of sensitive areas in every postal code area. This correlation was done for all postal code areas in the Netherlands with agricultural area and within postal code areas classified according to the most dominant farm types occurring in them. The main aim of this assessment was to find out whether sensitive areas receive more or less 1st Pillar payments and what possible explanations can be given for the patterns of 1st Pillar payments distribution identified. The direction of the (statistically significant) relationship is given in Table 4.2 and the real correlation coefficients are presented in Annex 8, Table 1.

When looking at the correlation results for the total farm population, it becomes clear that there is a positive correlation between the presence of sensitive areas and 1st Pillar payment distribution. This means that more 1st Pillar payments go to sensitive then none sensitive areas. This seems to be especially the case for the areas most sensitive to nitrate leaching to surface water, where the correlation was very strong (almost 0.5). From this result one can indeed confirm that sensitive areas are receiving more 1st Pillar payments per ha but an explanatory factor for this correlation is probably not related to the presence of the sensitive area itself, but much more to the over representation of specific farm types in them. The types are dairy, beef cattle and arable starch potato producer farms, which historically have been the highest net receivers of market support payments. To externalise the bias of 1st Pillar payments targeting certain sectors more strongly then others, correlations were also done within PC-areas with a dominance of one sectoral farm type (see Table 4.2).

Table 4.2 Correlations between 1st Pillar distribution and sensitive areas (see Appendix 6 for the correlation coefficients).

Correlations between 1st Pillar payment distribution and …	**Postal code areas with dominant sector *…**							
	total population (3266)	**dairy (799)**	**other grazing (816)**	**mixed livstock (483)**	**grani vores (15)**	**horticul ture (355)**	**arable (575)**	**no dominant type (50)**
Areas sensitive to nitrate leaching to ground water	+	0	+	+	0	0	+	0
Areas sensitive to nitrate leaching to surface water	+	0	+	+	0	0	+	+
Buffer zones around ammonia emission sensitive nature areas	+	0	+	+	0	0	+	0
Buffer zones around drought sensitive nature areas	+	0	+	+	0	0	+	0
HNV farming areas	+	-	-	-	0	0	0	0

* Dominant means that at least 35% of the farms is of one class
- = negative correlation; + = positive correlation; 0 = no significant correlation

Main conclusions from Table 4.2:

1. On average for the whole farming population all sensitive areas receive significantly higher per hectare payments. This is most strongly the case for areas sensitive to nitrate leaching to surface water and buffer zones around drought sensitive nature areas.
2. Explanation for this can be that there is an over-representation of sectors in these sensitive areas which have historically received the highest per area payments (e.g. dairy, beef, starch potatoe and maize).
3. When looking within sector types it becomes clear that the positive correlation between per hectare payments and presence of sensitive areas disappears for the dairy sector but is still maintained for the other grazing livestock, mixed and arable farm types. Apparently there are other factors then only the sectoral distribution causing the relatively higher per area payments in the sensitive areas.
4. HNV farmland areas are an exception certainly when looking at the correlation within sectors: these areas receive significantly lower per area 1st Pillar payments.

When looking at the correlation results made for the postal code areas with a dominant dairy farming sector it shows that no correlation is found between the presence of sensitive area categories and the payment per hectare. This confirms indeed that higher per area payments for sensitive areas can partly be explained by the dominance of dairy farms historically receiving more 1st Pillar payments. However, this is only part of the explanation since in areas where other grazing livestock and arable farms dominate the significant correlation between sensitive areas and per area payments is maintained. For the postal code areas with a dominant grazing livestock or mixed livestock sector there is a clear positive correlation of 1st Pillar payment distribution to most sensitive area categories with the exception of HNV farmland where the opposite is the case. Meaning that HNV farmland dominated by grazing or other mixed livestock activities receives relatively low payments per ha., while all other sensitive areas in this category receive higher payments per ha. The same is seen for the postal code areas with an arable cropping dominance. They show a significantly positive correlation between payments per

hectare and presence of all sensitive area categories. The explanation could be that the type of arable farms concentrated in the sensitive areas have a relatively higher share of crops such as starch potato, maize and wheat, that historically were receiving higher market support then other arable crops.

The exception is HNV farmland areas. For this sensitive area category a significant but weak negative correlation was found between 1st Pillar payments and share of sensitive area. This means that these areas, even when dominated by dairy or other grazing livestock farms, receive relatively smaller amounts of 1st Pillar payments.

From the overall assessment in Table 4.2 it is clear that nitrate leaching sensitive areas, drought sensitive areas and areas sensitive to acidification through ammonia emission are obtaining higher per area 1st Pillar support which is partly explained by the overrepresentation of dairy farms in these areas receiving higher payment per hectare, but also by the presence of certain farm types within the grazing and mixed livestock and arable sectors which have historically been receiving higher payments per hectare.

The HNV farmland areas show a different pattern however. A total of 380.714 ha land can be considered as HNV farmland, corresponding to 18% of the total Dutch utilized agricultural area. This area receives 190 mln. Euro from the 1st Pillar corresponding to only 15% of the budget of 2004. For the livestock dominated postal code areas within HNV farmland areas there is a negative correlation between 1st Pillar distribution and HNV farmland distribution. This means that, in livestock dominated areas there is generally less 1st Pillar payments going to HNV farmland.

A positive correlation between 1st Pillar payments and HNV farmland areas can be found in the areas that are dominated by horticulture and arable farming, but these type of areas are however relatively small in extend. In conclusion, it means that the hypothesis formulated in the former Chapter that *HNV farmland areas receive relatively high per area 1st Pillar payments* cannot be approved, as the livestock dominated HNV areas, which are making up the large majority of this farmland, show the opposite.

4.1.2 1st Pillar payments in relation to farm features

In Chapter 2 it was hypothesised that more intensive farms will receive higher per area and per farm 1st Pillar payments then extensive farms. In order to test whether this is indeed the case a correlation was made between distribution of payments and 3 farm intensity features:

- Ammonia emission per farm
- Stocking density per hectare
- Production intensity per hectare

The results of this analysis are given in Table 4.3 and Annex 8 (Table 2).

Table 4.3 Significant correlations between 1st Pillar payment distribution (Euro/ha) and farm intensity features (see appendix 6 for the correlation coefficients).

Correlations between 1st Pillar payment distribution and	within sensitive area				
	nitrate leaching to surface water	**nitrate leaching to ground water**	**ammonia sensitive**	**Drought sensitive**	**HNV**
Ammonia emission per farm (NH3/farm)	+	+	+	+	+
Stocking density (LU/ha UAA)	+	+	+	+	+
Production intensity (ESU/ha UAA)	+	+	+	0	0

- = negative correlation; + = positive correlation; 0 = no significant correlation
NH3= Ammonia
LU= Livestock Units
UAA= Utilised Agricultural Area
ESU= European Size Units

Main conclusions from Table 4.3:

1. In all sensitive areas there is a significantly positive correlation between 1st Pillar payments per hectare and intensity of farming. This correlation is particularly strong for livestock farms with high stocking densities and ammonia emissions.
2. This means that 1st Pillar payments are particularly targeted towards high intensive farms within sensitive areas, especially the intensive livestock farms, and thus the farms that put higher pressure on the environment.
3. The opposite pattern was found in HNV farmland areas for HNV type farms. These farms, which are inherently extensive, receive relatively more payments per hectare as compared to non-HNV farms which is not related to the state of their intensity but to the concentration of them in the dairy and other grazing livestock sectors.

The overall conclusions points to a strong relation between the amount of per hectare 1st Pillar payments and intensity. It shows that in all sensitive areas the more intensive farms receive significantly higher 1st Pillar payments then extensive farms. The relationships between intensity and amount of payment are generally very strong (see Annex 8, Table 2) but the strongest relationships are found with the livestock related intensity indicators such as stocking density and ammonia emissions per farm. The relationship with the more general indicator of intensity, ESU/ha, which is a proxy for total per hectare production capacity of a farm, is significantly positive but not very strong.

These findings are not really surprising since historically the 1st Pillar support went to the grazing livestock (dairy, beef, slaughter premia) and arable production sectors, while granivour and horticultural activities, which usually have a very intensive land use (ESU/ha) were not supported. Overall it means that 1st Pillar payments are especially biased towards the land dependent livestock and arable farming activities, which are also the most important land users in most of the sensitive areas (see Chapter 2, Table 2.2) and that the intensive categories of these types also get the highest payment per hectare. It can therefore be concluded that 1st Pillar support in sensitive areas is especially concentrated on intensive farming activities which are also the systems putting the highest pressure on the environment.

High Nature Value farm type
A separate analysis was also made in relation to 1st Pillar payment per ha. and farms categorized as HNV and non-HNV farms. How the division of HNV farms was made is described in Annex 4 and is based on a combination of farming intensity features. The principle question was whether within HNV areas farms of an HNV-type received more 1st Pillar payments. Within HNV areas (not per dominant sector) we analysed which types of farms received more payments per hectare. The results of the analysis with a t-test showed that within HNV areas, the average received amount of 1st Pillar payments is significantly higher for farms that can be classified as HNVtype farm. Outside HNV areas, the average per hectare 1st Pillar payment is significantly higher for farms that can be classified as *non* HNV.

Conclusions
1st Pillar payments tend to benefit more strongly farms that are intensive and are located in environmentally sensitive areas. This is particularly the case for intensive grazing livestock farms and less for intensive arable farms. This means that there is a bias of 1st Pillar payments to farms that have a relatively high contribution to emissions of ammonia within areas where nature values are most sensitive to acidification. This also applies to farms with a relatively high contribution to ammonia emissions located in areas that are more sensitive to nitrate leaching to surface or ground water. Finally it is also the case for farms with high land use intensity and/or stocking density in HNV farmland areas and in areas influencing drought sensitive nature areas.

The finding that 1st Pillar payments are significantly higher for HNV type farms within HNV areas can probably be explained by the sectoral bias towards dairy farms within the HNV type classification. At the same time overall payment distribution in HNV farmland is still more biased towards intensive farms.

4.2 Territorial distribution Agri-Environmental payments

The total budget of 2nd Pillar payments for both AES (Agri-environmental support) and LFA payments amounts to € 225 mln for the total RDP-period (2000-2006), which is on average € 32 mln per year. These payments are coupled to 70.000 ha of agricultural land (Koeijer & Voskuilen 2003), which corresponds to 3.7% of the total UAA.

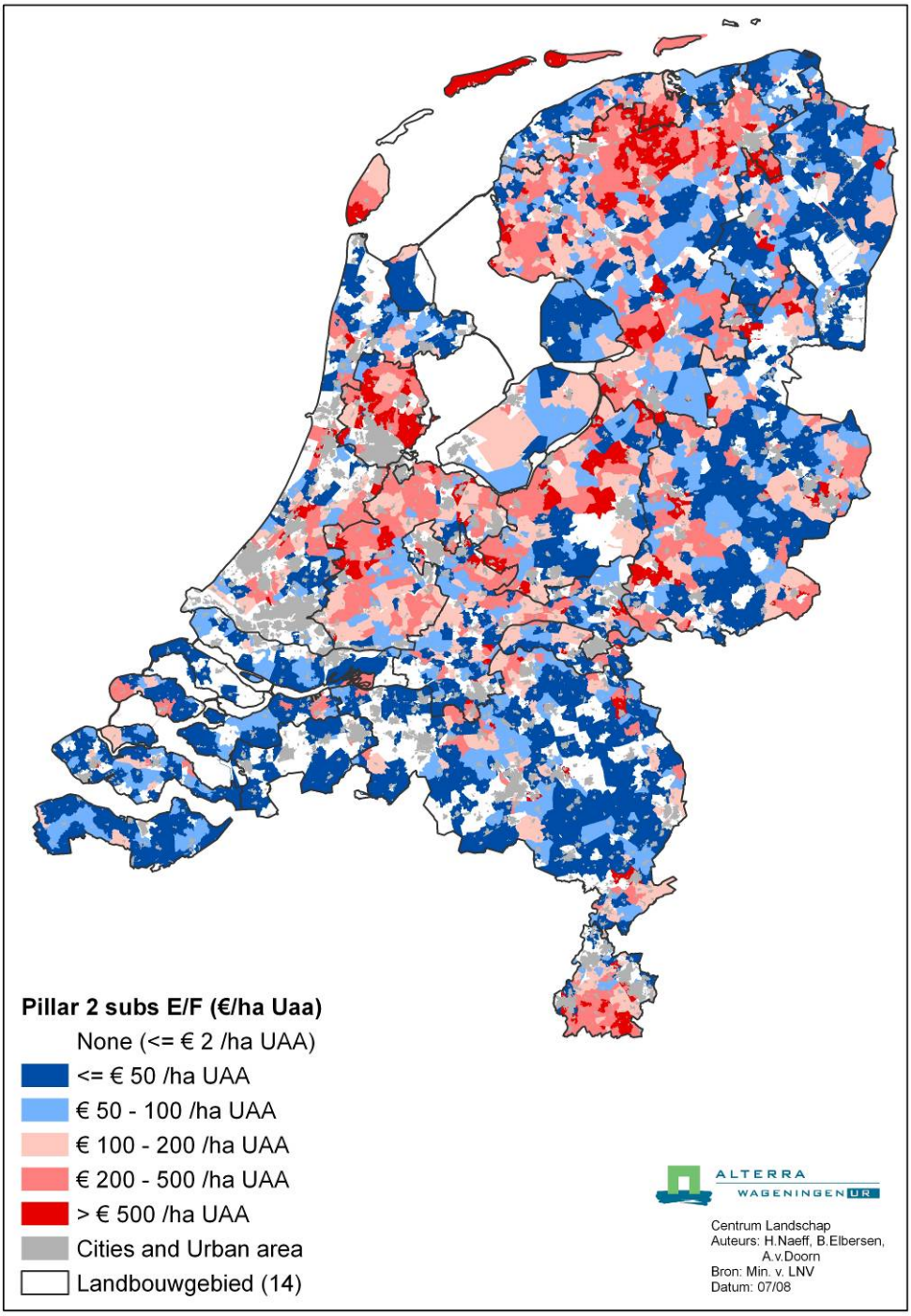
Map 4.2 follows the same logic as Map 4.1 and shows the pc-areas that received the highest and lowest per hectare payments. The thresholds for the categories of payments per hectare are in this case not established by quintiles, but are set a priori at a certain amount.

It shows that the highest receivers per hectare only cover 4 % of the agricultural area (84866 ha). This group (red in Map 4.2) received at least €500 per hectare of 2nd Pillar payments but the average payment in these areas (in those PC areas including at least 1 ha of agricultural land) was € 1445 per hectare. The farms included in this upper-

bound are mainly concentrated in the dairy production areas especially in the peat meadow areas which are concentrated in agricultural districts 3 (Noordelijk Weidegebied), 5 (Centraal veehouderijgebied), 8 (Waterland/droogmakerijen) and 9 (Hollands/Utrechts weidegebied. These districts also coincide partly with HNV farmland areas where threatened meadow birds breed, roost and feed on the wetter and lower productive grasslands. These HNV farmlands also show a large overlap with LFA areas because of the high water tables occurring in these areas. This bias of 2nd Pillar payments towards the grassland areas is therefore not a surprise as it is completely in line with the overall objectives of the agri-environmental support programme within which several meadow areas have been identified as areas in which meadow bird agreements can be signed with farmers. Also the areas identified for botanical management agreements are most strongly in the pasture land use category rather then the arable. The latter is also confirmed by the observation that the pc-areas with the lowest payments per hectare (dark blue) cover about 36% (713.810 ha) of the total agricultural land. The pc-areas covered by these farms are located primarily in the agricultural districts 2 (Veenkolonien and Oldambt), 4 (Oostelijk veehouderijgebied), 11 (Zuidwest akkerbouwgebied), 12 (Zuidwest Brabant) and 13 (Zuidelijk veehouderijgebied) (see Map 1 in Appendix 1). Every hectare in these areas received on average €21 up to a maximum of €50. These mostly include farms in the intensive livestock breeding and specialised arable sectors. Interest among these type of farms to participate in AES schemes is low as are the opportunities. In most cases management agreement are difficult to fit into their farming system and/or they do not have any land that has been identified in the agri-environmental support programme as eligible for management agreements.

From the spatial distribution of AES the hypotheses formulated in chapter 2 (farms with pasture land are more likely to enter into AES agreements then other type of farms) is clearly confirmed. Most payments go to the regions where pasture, especially peaty meadowlands, are concentrated.

Map 4.2 Geographic distribution of agri-environmental payments.



4.2.1 AE- payments in relation to environmentally sensitive areas

In chapter 2 it was hypothesised that because most AES packages are targeted towards grassland areas, especially those rich in bird and botanical diversity, it can also be expected that HNV farmland areas receive relatively large shares and amounts of AES payments. To test this hypothesis first an overview was made of the average AES payments per hectare and per farm received in the HNV area (Table 4.4). For completeness, this information is also given for all different types of sensitive areas, however in the analysis we will focus on the HNV areas since the agro environmental measures are mainly targeted to conservation of fauna and flora. Secondly a correlation was made between average per hectare AES payment and share of different sensitive areas occurring in every pc-area (Table 4.5).

Table 4.4 Average 2nd Pillar payments per farm type per environmentally sensitive zone

Average 2nd Pillar payments		All sectors	Dairy dominant	Other grazing livestock	Mixed	Horti-culture	Arable	Grani vores
Not sensitive areas	**€/ha**	**16**	**16**	**46**	**14**	**5**	**4**	**9**
	€/farm	**322**	**563**	**530**	**467**	**121**	**162**	**91**
In Sensitive areas	**€/ha**	**20**	**20**	**51**	**16**	**14**	**7**	**11**
	€/farm	**377**	**600**	**580**	**353**	**418**	**210**	**100**
Areas sensitive to nitrate leaching to ground water	€/ha	17	12	45	16	15	8	8
	€/farm	263	326	442	299	258	178	76
Areas sensitive to nitrate leaching to surface water	€/ha	20	22	52	15	12	6	11
	€/farm	358	682	621	326	206	206	107
Buffer zones around ammonia emission sensitive nature areas	€/ha	19	16	45	18	15	9	9
	€/farm	307	463	484	360	232	212	93
Buffer zones around drought sensitive nature areas	€/ha	15	18	18	18	16	11	11
	€/farm	358	543	598	368	255	274	108
HNV farming areas	€/ha	35	32	61	30	47	10	32
	€/farm	717	1074	965	879	679	359	345

Main conclusions from Table 4.4:

1. On average for all sectors together sensitive areas receive relatively higher AES payments per hectare although this does not necessarily lead to higher per farm payments. This is especially related to higher per hectare payments in areas sensitive to nitrate leaching to surface water, and the HNV farmland areas.
2. This can be explained by the high share of grassland and related grazing livestock farms in these sensitive areas. Only very limited AES payments go to the areas dominated by non-livestock farms. An exception is only horticulture in HNV farmland areas.
3. Farm in HNV farmland areas receive the highest per hectare AES payments. This applies to practically all sectors.

From Table 4.4 it becomes clear that HNV farmland areas are indeed receiving relatively large amount per hectare and farm of AES payments as compared to non-sensitive areas and also other types of sensitive areas. This is valid at the level of the whole farming population, but also when we concentrate on farms where grassland dominates, e.g. the dairy and grazing livestock types. When looking at the total amount of AES payments spend in HNV farmland areas one can also conclude that a significantly higher share goes to HNV farmland. In total 53 mln € of the 2nd Pillar expenditures went to HNV farmland areas during the whole RDP period, which corresponded to 23% of the total AES budget while HNV farmland covers 18% of the total Utilised Agricultural Area.

Table 4.5 Significant correlations between AES payments per hectare and sensitive area share per pc-area

Correlations between 2nd Pillar payment distribution and …	**Postal code areas with dominant sector ***							
	total population (3266)	**dairy (799)**	**other grazing (816)**	**mixed livstock (483)**	**granivores (15)**	**horticulture (355)**	**arable (575)**	**no dominant type (50)**
Areas sensitive to nitrate leaching to ground water	0	0	0	0	0	0	0	0
Areas sensitive to nitrate leaching to surface water	+	+	+	0	0	0	0	0
Buffer zones around ammonia emission sensitive nature areas	0	0	0	0	0	0	0	0
Buffer zones around drought sensitive nature areas	+	0	+	0	0	0	+	0
HNV farming areas	+	+	+	+	0	+	0	0

* Dominant means that at least 35% of the farms is of one class
- = negative correlation; + = positive correlation; 0 = no significant correlation

Main conclusions from Table 4.5:

1. Sensitive areas receive relatively higher AES payments, this is particularly the case for areas sensitive to nitrate leaching to surface water, buffer areas around drought sensitive nature and HNV farmland areas.
2. This can be explained by the high share of grassland in these sensitive areas.
3. HNV farmland areas receive significantly higher per hectare AES payments. This means that relatively higher payments go to areas with the highest nature values. However, still the far greatest share of AES payments (70%) go to non HNV farmland areas (HNV farmland takes 18% of the total utilized agricultural area and receives 30% of the total AES budget).

In Table 4.5 an overview is given of the correlation analysis between AES per hectare received and share of sensitive area occurring in every pc-area. Table 4.5 gives a summary of the results while the correlations coefficients are given in Annex 8, Table 3.

As expected the results confirm that the presence of HNV farmland correlates strongly with high AES payments per hectare. Not surprisingly this does not only apply to HNV farmland areas but also to other sensitive areas overlapping strongly with HNV farmland such as areas most sensitive to nitrate leaching to surface water as these most strongly coincide with wet peat land meadow lands.

On the other hand it can also be observed that the correlation between AES payments and HNV farmland areas, though positively and significantly correlated, is rather low (the correlation coefficient is not higher than 0.343 (see Annex 8, Table 3). This means that AES is also targeted to non-HNV farmland and therefore to areas with no or significantly lower nature values.

So, the hypothesis that *the presence of HNV farmland receive a relatively large share of the AES and also higher per area and farm payments* can convincingly be approved. However, another conclusion that can be drawn is that still an important amount of AES payments is also targeted to non-HNV farmland and therefore to areas with significantly lower nature value.

4.2.2 AE- payments in relation to farm intensity features

In Chapter 2 it was already explained that farmers applying for AES need to be located in areas that have been designated for agri-environmental support packages based on the occurrence of certain nature values (e.g. species and habitats of nature conservation importance) (see LNV, 2000). This means that in principle these payments have already been targeted to the right sensitive areas. In the former section this spatial targeting seemed to correspond reasonably well with where the highest high nature value farmland areas were located, although a large share of support was also targeted outside these areas. But overall the spatial targeting seems to be quite in line with the policy objective but the effectiveness of this support in terms of maintenance and/or restoration of nature values also depends on the up-take rate especially in terms of types of farms entering in these schemes. To test this, two types of statistical analysis were made which are presented in the following.

Firstly a correlation analysis was made between the average per area AES payments and the share of intensive farms occurring in a pc-area. The summary of the analysis is shown in Table 4.6 and the correlation coefficients are given in Annex 8, Table 4.

Secondly a separate analysis was also made in relation to per area AES payment and farms categorized as HNV and non-HNV farms. How the division of HNV farms was made is described in Annex 4 and is based on a combination of farming intensity features. The principle question was whether within HNV areas farms of an HNV-type received more AES. The results of the analysis with a t-test showed that within HNV areas, there is no significant difference in the average amount of payment per farms between HNV and non-HNV farms. However, farms that are an HNV type farm do receive significantly more subsidy for biological farming, but this is not the case for the other AES payments. Strikingly, outside HNV areas, the average AES payment per farm is significantly higher for farms that are *not* an HNV farm.

From the results it becomes clear that in three sensitive areas, there is a clear negative correlation between intensity and payments per ha., which means that low intensive farms generally receive more AES payments then the intensive ones. In the drought sensitive area and the HNV farmland areas this situation seems to be pointing to the

other direction meaning that there is some bias of AES payments towards higher intensive farms in terms of stocking density. This bias however does not seem to be very strong given the relatively small but significant correlation between ammonia emission and stocking density and AES payments. It is however striking that this especially occurs in HNV farmland areas where it can generally be assumed that low intensity farming systems contribute more positively to maintaining the nature values occurring then high intensity farms.

Table 4.6 Significant correlations between average per hectare AES payments and share of high intensive farms occurring per pc-area in

Correlations between 2nd Pillar payment distribution and	within sensitive area				
	nitrate leaching to surface water	nitrate leaching to ground water	ammonia sensitive	drought sensitive	HNV
NH3/farm	-	-	-	-	0
Livestock density (LU/ha UAA)	-	-	-	0	0
Production intensity (ESU/ha UAA)	-	-	-	-	0
- = negative correlation; + = positive correlation; = no significant correlation					

Main conclusions from Table 4.6:

1. In general a negative correlation between AES payments and intensity variables is found which means that payments are more oriented toward low intensity farming in sensitive areas.
2. However, within HNV farmland areas there is no difference between size of AES per hectare between HNV farm type, which are inherently extensive, and non HNV farm types.
3. Outside HNV farmland areas relatively higher AES per hectare payment go to non-HNV farm types as compared to HNV farm types. This means that AES is not specifically targeting farms that put a lower pressure on the environment.

Overall conclusions from this analysis confirm that the AES payments are most strongly concentrated towards grassland areas and thus towards livestock farms. This was expected given the types of areas appointed within the AES programme for which farmers can enter into management agreements. It was also concluded that there is indeed a relatively larger share and per area and farm payment going to HNV farmland areas. This indeed confirms that the targeting of this 2nd Pillar payment is spatially targeting the right environmentally sensitive area, although this does not mean that non-HNV farmland areas with lower nature conservation values are not receiving this support. In fact more then 70% of AES payments still went to areas not identified as HNV farmland.

Within HNV farmland areas the targeting was more strongly towards intensive then extensive farms. The same applies to farms outside HNV farmland areas. This is surprising as one would expect extensive farms more willing to participate in schemes which usually fit better with extensive farming practices. It is however also a reason for concern about the effectiveness of AES schemes. More intensive farms are also more likely to choose the more simple management packages which may have some direct positive impact on species in relation to applying later mowing

dates or protection of nests, but which may generally not lead to an improvement of the general environmental conditions in an area. It is therefore likely that in most cases AE-management goes together with a continuation of intensive farming practices which are usually counter-productive in reaching the basic environmental conditions in terms of e.g. nitrates in water, ammonia emissions, water table levels etc. needed for reaching the nature conservation targets formulated in the AES programme (see MNP, 2007).

5 Conclusions & Recommendations

5.1 Conclusions

Environmental problems in The Netherlands are related with intensity of farming. The most important environmental problems to which agriculture contributes are related to nitrogen emissions to water, ammonia emissions and loss of biodiversity in and outside agricultural lands. The latter are especially caused by nitrogen deposition leading to over-fertilization and drought caused by the artificial lowering of water tables below natural regimes. These causes have adverse effects in nature areas bordering with agricultural lands or farmland habitats hosting important bird populations. Specific sensitive areas can therefore be identified that experience stronger adverse effects on environmental state and/or species and habitat loss because of the above mentioned environmental pressures than other areas. Such sensitive areas also include farmland areas that host species of conservation concern, especially farmland birds, that depend on a continuation of extensive farming practices. These areas have been characterised as High Nature Value (HNV) farmland and have now also become an important policy target in the new Rural Development Programme (EAFRD) (Council Regulation 1698/2005). Because of this the Community's Strategic Guidelines for rural development, 2007 –2013, encourage Member States to put in place measures to preserve and develop HNV farming systems.

More then 85% of the Dutch agricultural area is covered by one or more of the four types of environmentally sensitive areas selected in this study. In these areas extra effort, especially in relation to farm management, is needed to conserve, restore and enhance environmental and biodiversity values.

In this study it was carefully assessed how both 1st and 2nd Pillar payments target these areas and different farm intensity types within them. Outside the scope of this analysis are therefore the agricultural enterprises that do not receive any CAP payments.

Although the data used refer to 2004 (1st Pillar) , it is assumed that the spatial distribution of the expenditures remained the same, as since than slight budgetary shifts have happened (for evidence see annex 6). As for the 2nd Pillar the data refer to the RDP period 2000 – 2006. The report is meant to provide a better understanding of the spatial distribution patterns of 1st and 2nd Pillar payments in the past and present in the context of the reorientation of the CAP.
In this reorientation both the EC (CAP Health Check, EC, 2008) and the Dutch government (*Houtskoolschets*) are proposing changes in the distribution of CAP payments to become more conditional to delivering more public goods such as the improvement of environmental conditions and hold biodiversity loss.

1st Pillar payments

From the assessment of the spatial targeting of payments in this study it became clear that the average payments per hectare are significantly higher within then outside sensitive areas. This is most strongly the case for areas sensitive to nitrate leaching to surface water and drought sensitive nature areas.

In addition, the results of the analysis of farm intensity in relation to 1st Pillar payments show that within all sensitive areas there is a significantly positive correlation between 1st Pillar payments per hectare and intensity of farming. This correlation is particularly strong for livestock farms characterised by intensity features such as high stocking densities and ammonia emissions per hectare. This means that 1st Pillar payments are particularly targeted towards sensitive areas and within these areas to intensive farms, especially the intensive grazing livestock farms. These farms have generally a higher pressure on the environment then the low intensive ones.

These conclusions are however not so surprising. Firstly, because all 5 types of sensitive areas are more concentrated in either the higher sandy soils or the peat land areas of The Netherlands. These areas are typically dominated by grassland and have the largest concentration of grazing livestock farms. Secondly, because farms in these grazing livestock sectors have always obtained high shares of market and income support from the CAP, e.g. the regulation milk and dairy products, slaughter premia, area support for maize and beef premia. This explains the relatively high per farm payment in 2004 for these sectors. In the decoupled SFP situation this has automatically led to high per area payment for these farms and thus for the areas where they dominate. Thirdly, the intensity of production on Dutch grazing livestock farms is high, especially for the specialised dairy farms, which has led to high price and production support per farm in the recent past. In the SFP system this automatically leads to high per area payments to areas where these type of farms dominate.

When we concentrate on the results per sensitive area type we see that areas most sensitive to nitrate leaching to ground and surface water are either concentrated on the poorer sandy soils or the wetter peat land areas. On the poor sandy soils a mix of grazing and non-grazing livestock farms is mostly found and land use consists of permanent pastures and fodder production, mostly maize. The peat land areas are almost only used for dairy cattle holding. The same applies to buffer zone areas around ammonia emission or drought sensitive nature. Both types of buffer zones are concentrated more strongly in areas with either dairy and/or grazing livestock concentrations and thus with sectors receiving high per farm and area payments from the 1st Pillar. The only exception found was for the category of HNV farmland. HNV farmland areas, with a strong concentration in the wetter peatland areas, received a relatively small part of the 1st Pillar expenditures in spite of frequent occurrence of grazing livestock farms. For the livestock dominated postal code areas within HNV farmland areas there is even a negative correlation between level of 1st Pillar area payment and HNV farmland share. However, this result is not surprising, lower intensity land use is an inherent characteristic of HNV farmland areas. This results in lower payments per hectare in these areas. It further supports that observation that 1st Pillar payments in The Netherlands are polarised, giving relatively

high support to intensive farms and low support to less intensive farms. It is likely that this situation continues to be maintained in the historic right system.

Overall, it means that it is likely that most of the 1st Pillar payments after 2006 continue to be targeted to farms that have a doubtful contribution to environmental goals. In addition, this also means that it cannot be expected that the environmental state of area most sensitive to environmental pressures of farming will gain from a de-coupled payment situation.

2nd Pillar payments
For the distribution of the agri-environmental (AES) payments and LFA support, the situation is similar to the 1st Pillar distribution: the payments are biased towards the sensitive area categories selected in this study. Farmers may enter into AES agreements only if they have farmland that is situated in areas officially identified for the presence of nature values depending on extensive farming practices for their conservation. The payment received is conditional to the type of management and biodiversity values delivered.

AES (including LFA payments) made up 30% of the 2nd Pillar payments in the first RDP period (2000-2006) and 8 % of the total CAP budget. In this RDP period, 3,7% of the Dutch agricultural area was covered by an AES agreement. This was far below the average coverage in the EU, which was at 7% in this same period.

The assessment of the spatial distribution of AES showed that payments are most strongly concentrated in grassland areas and most strongly support livestock farms. This is why the targeting of all sensitive areas identified in this study by AES-payments was high. The results confirm that the 2nd Pillar payments are targeting areas with the relatively highest agri-environmental qualities. It however does not mean that non-HNV farmland areas, with lower nature conservation values, are not receiving this support. In fact, more then 70% of AES payments still went to areas not identified as HNV farmland. Within HNV farmland areas the targeting was more strongly towards intensive then extensive farms. The same applies to farms outside HNV farmland areas. Since HNV farmland areas cover 18% of the total farmland and receive 30% of the AES the conclusion can be drawn that AES is better targeting areas of high nature conservation values.

5.2 Recommendations: towards a greening of the CAP

1st Pillar
One of the main issues in the public debate concerning the EU budget review and the CAP health check is the societal justification of the large expenditures going to agriculture. This is certainly the case for the spending under the 1st Pillar according to the SFP, which in The Netherlands is distributed according to the historic rights principle, which means that the SFP is based on the past market and production support distribution. Although these payments have largely been de-coupled from production they are still distributed according to historic structures. Such a principle

underlying the distribution of EU money does not correspond with the recent societal requests to spend public money for public goods.

In spite of the introduction of the cross compliance principle introduced with the SFP which makes payments conditional to full-filling the statutory management requirements and a number of GAEC (Good Agricultural and environmental Conditions) standards, it is still doubtful to what extent CAP expenditures are in line with the European Sustainable Development strategy objectives. After all, all farms receiving SFP have to comply with these standards and there is no mechanism making higher direct support payments conditional to delivering higher environmental standards. Furthermore, it is unlikely that the present statutory management requirements and the selected GAEC standards implemented in The Netherlands will alleviate pressures on the environment (see Farmer et al., 2008 and Swales, 2007).

The results of the analysis presented in this report show that the major part of the 1st Pillar budget (in total more than 80% of the CAP expenditures) went to farms that were likely to deliver no environmental benefit, because of relative high intensity features. Under the historic right principle, adapted by the Dutch government for SFP, it is likely that in general, financial support goes to farms of which the contribution to improving environmental conditions is doubtful. More specific: the 1st Pillar is supporting farms that have a relatively large contribution to emissions of ammonia within areas where nature values are most sensitive to deposition of ammonia. This also applies to farms with a relatively high contribution to nitrate leaching in areas that are more sensitive to nitrate leaching to surface or ground water. Finally, also relatively higher per area payments go to farms with relatively high land use intensity and/or stocking density located in HNV farmland areas and in areas within the buffer zones of drought sensitive nature areas.

At the same time it was also found in this study that low intensity farms, receive relatively small 1st Pillar payments while their contribution to delivering public goods such as maintenance and/or conservation of the environment and biodiversity is much larger.

2nd Pillar

The geographic targeting of AES can be improved in The Netherlands, certainly in the light of the recommendations made by the MNP (2007) and Schekkerman 2008) in their AES evaluation studies. MNP concluded that the overall results of AES in reaching conservation targets is limited and the reason for this is that the schemes have not been very effective in bringing down the overall intensity of farm management to re-create an overall environmental quality that is sufficient for restoring the nature values aimed at. The observations found in this study are therefore not surprising and further provide explanations for absence of effectiveness of AES schemes. They show that the largest part of AES went in the programming period 2000 - 2006 to the farmlands with lower biodiversity values and to the more intensive farms rather not matching the HNV farm management features needed to maintain biodiversity values in these areas. This study therefore

supports the recommendations already made by MNP (2007) and Schekkerman (2008) to concentrate AES more strongly towards areas with the highest nature qualities as these have the highest chance for reaching the nature conservation targets aimed at in the AES schemes.

Greening of the CAP
If the future objectives of the CAP aim for a further greening of CAP support there are roughly two ways of achieving this.
The first is to include stricter environmental obligations under the Cross Compliance package then in the present situation. Such obligations can even be made conditional to the level of payments and/or the location within a certain environmentally sensitive area. This links to the current discussion on 're-coupling' CAP payments to green services. The second is to modulate significantly larger amounts of money away from 1st Pillar payments and thus from the more intensive farmland areas toward the 2nd Pillar AES-payments to be spent in areas with the highest chance of reaching environmental and biodiversity benefits, e.g. the HNV farmland areas.

However, given the present distribution of 1st Pillar payment with clear a bias towards sensitive areas and high intensive farms in combination with the considerably larger share of CAP payments in the 1st Pillar, implementation of the first recommendation seems to result in a higher benefit for environment. A much larger group of farmers will be reached when making 1st Pillar SPS payments conditional to stricter environmental conditions and much larger shares of the total farmland area will be reached.

5.3 Further research

This study investigated the spatial distribution of 1st and 2nd Pillar payments in relation to environmentally sensitive areas and farm intensity features. Conclusions have been drawn concerning the targeting of the CAP payments: Where are the payments allocated and what is the overlap with environmentally sensitive areas? However this study does not tackle the complexity of the relationships between payments, design of measures, farm management and environmental pressures. Understanding the relation that links farm payment to management, to environmental outcomes needs much more research

With the ongoing CAP reforms the Dutch government has to investigate different payment distribution models. An interesting contribution to this debate could be to explore how the geographical distribution of CAP payments should be adapted in order to obtain more environmental benefits in line with public values. Also an analysis of the effects of the future alternative models of the CAP payment distribution (SFP moving to a flat rate model, modulation, etc) on nature, landscape and environment would provide needed input for the debate on the further greening of the CAP.

Finally, it would also be useful to get a better understanding of the effects of the Cross Compliance system. This system was introduced as an instrument to make SPS conditional to an improved compliance with environmental and animal welfare standards and delivery by the farmer of a Good agricultural and environmental condition. Evidence of whether this systems has indeed lead to an improved environmental condition of the farmland has never been shown, and most studies looking at this issue are more pointing to the absence of a positive effect (Court of Auditors 2008). Until now it can therefore not be confirmed that farmers are indeed delivering higher environmental standards when receiving SPS payments. This however, needs further assessment.

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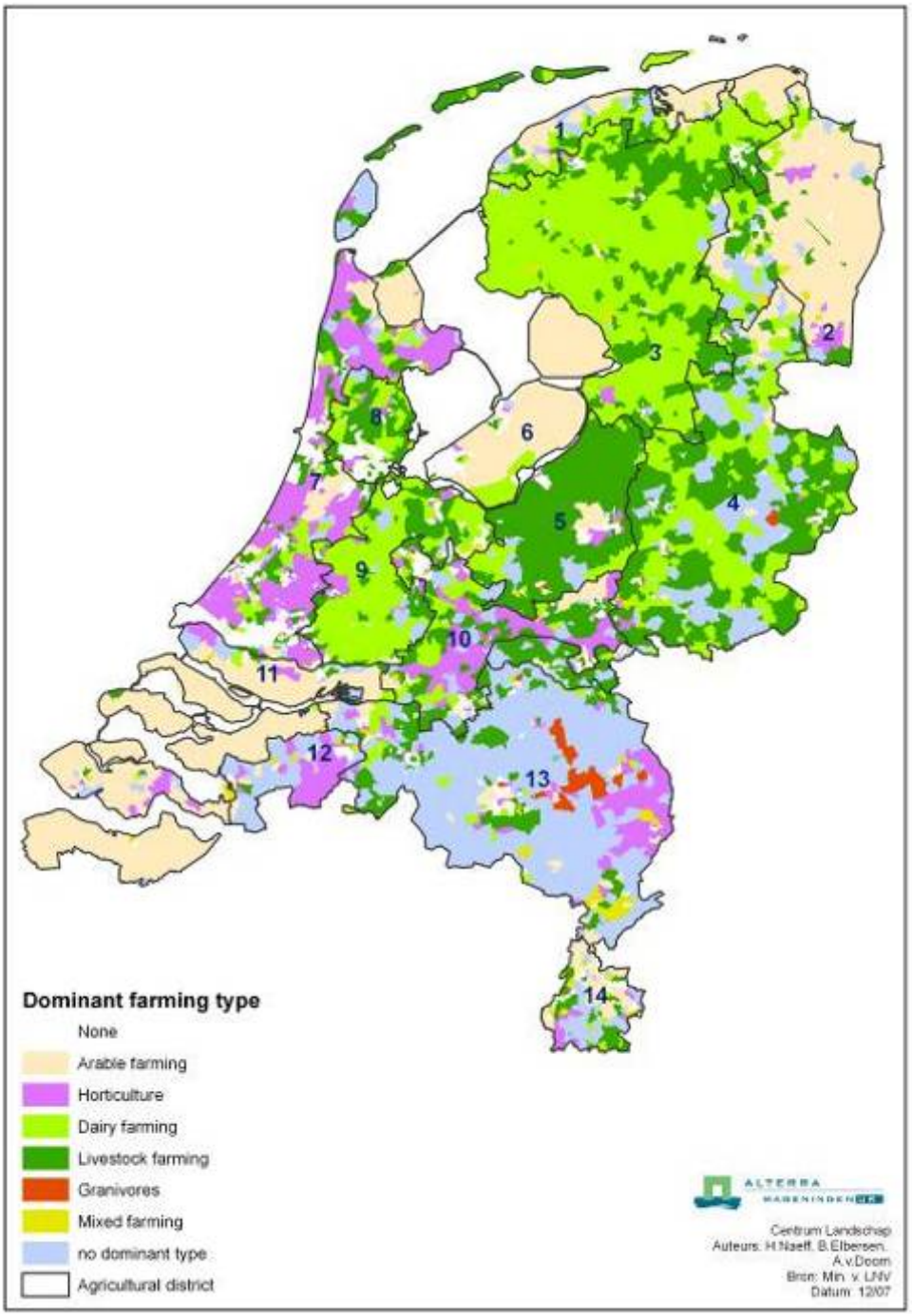
Annex 1 Maps of Agricultural districts and environmentally sensitive areas in the Netherlands

Map A1:1 Agricultural districts and dominant farm types



Annex 2 Main farming features

Table A2.1: Main changes in farming in The Netherlands (1950-2000)

	1950	1960	1970	1980	1990	2000	2006
Number of farms (*1000)	315	284	185	145	125	97	79
UAA (* 1000 ha)	2.328	2.317	2.143	2.020	2.006	1.956	1920
Productivity per hectare (index)	64	100	224	440	660	920	n.a.

Source: (Bruchem, et al., 2001 and CBS, several years)

Table A2.2: Average farm size

	UAA/farm	ESU/farm	LSU/farm
Arable	35	34	4
Horticulture and permanent crops	8	66	1
Dairy	43	112	96
Grazing livestock	15	31	21
Granivores	7	110	294
Mixed	113	52	40

Table A2.3: Average farm size in hectares and European Size Units per farm in EU countries

	UAA (ha)/farm	ESU/farm
Belgium	26.9	64.4
Czech Republic	84.2	36.3
Denmark	53.7	72.9
Germany	43.7	49.7
Estonia	29.9	4.9
Greece	4.8	6.6
Spain	23.0	18.5
France	50.4	51.7
Ireland	31.8	18.2
Italy	7.4	12.8
Cyprus	3.4	6.6
Latvia	13.2	2.1
Lithuania	11.0	2.2
Luxembourg	52.7	46.5
Hungary	6.0	2.7
Malta	0.9	4.7
Netherlands	23.9	102.6
Austria	19.1	14.8
Poland	6.0	3.3
Portugal	11.4	6.9
Slovenia	6.3	4.6
Slovakia	27.4	7.6
Finland	32.1	25.1
Sweden	42.1	21.5
United Kingdom	55.4	36.7
Bulgaria	5.1	1.7
Romania	3.3	1.1

Source: FSS, 2005

Table A2.4: Main features of 14 agricultural districts (for Map of Districts see Annex 1, Map 1)

No.	titel district	%/district total UAA			%/national total UAA			% farms/national total farms							%/national total		
		arable	grass-land	other	total UAA	arable land	grass-land	% arable	horti-culture/perm. crops	dairy	other grazing livestock	Grani-vores	mixed farms	total farms	LSU	ESU	biological farms
1	Bouwhoek en Hogeland	51.2	46.0	2.8	4.6	5.5	4.1	4.9	0.7	3.0	2.5	0.5	1.5	2.5	2.1	2.4	3
2	Veenkolonien en Oldambt	72.8	24.8	2.3	8.9	15.3	4.3	12.2	1.7	3.4	3.2	2.1	4.9	4.5	4.3	4.1	4.9
3	Noordelijk weidegebied	15.1	84.2	0.7	16.6	5.9	27.4	2.8	1.7	24.3	18.5	4.6	4.2	12.3	13	9.1	13.2
4	Oostelijk veehouderijgebied	37.1	61.3	1.7	16.2	14.2	19.5	11.5	4.3	24.7	24.0	25.3	22.5	19	21.2	10.5	15.6
5	Centraal veehouderijgebied	24.4	74.0	1.6	3.2	1.8	4.6	1.9	1.0	4.7	9.9	11.1	7.3	5.9	8.1	2.9	7.9
6	Ijsselmeerpolders	74.6	12.9	12.5	5.5	9.7	1.4	10.8	2.7	1.5	0.4	0.4	3.9	3	1.5	3.9	8
7	Westelijk Holland	26.0	48.1	25.9	6.5	4.0	6.1	4.2	41.2	5.1	5.8	0.8	5.4	10.6	2.6	32.4	12.3
8	Waterland/Droogmakerijen	14.2	83.2	2.6	1.7	0.6	2.7	0.6	0.6	1.6	2.6	0.1	0.5	1.4	0.8	0.9	4
9	Hollands/Utrechts weidegebied	6.3	92.1	1.6	5.1	0.7	9.1	0.4	2.6	9.9	7.1	1.7	1.9	5.1	4.2	3.3	6.1
10	Rivierengebied	25.5	64.1	10.4	4.6	2.8	5.8	2.6	11.0	4.1	5.8	2.4	5.0	5.4	3.6	4.3	6.1
11	Zuidwest akkerbouwgebied	78.1	13.6	8.3	10.5	19.3	2.8	23.4	6.6	1.7	3.2	1.2	8.9	7	2.2	5.6	5.1
12	Zuidwest Brabant	42.7	36.7	20.6	1.8	1.9	1.3	2.5	6.3	1.4	1.8	1.6	3.9	2.8	1.8	2.4	2.2
13	Zuidelijk veehouderijgebied	52.4	37.4	10.2	13.2	16.3	9.7	19.2	18.5	13.6	13.7	48.1	27.0	19	33.8	17.6	10.3
14	Zuid-Limburg	58.6	36.0	5.4	1.6	2.1	1.1	2.9	1.3	0.9	1.4	0.3	2.7	1.5	0.6	0.7	1.4
	Netherlands	42	51	6	100	100	100	100	100	100	100	100	100	100	100	100	100

Table A2.5: The average use of inputs in Euro per ha in 1990 and 2000 and the change

	1990	2000	Change %
Austria		290	
Belgium	1211	1110	-8
Denmark	711	733	3
Finland		358	
France	390	374	-4
Germany (Neue Bundesländer from 1995)	550	440	-20
Greece	245	339	38
Ireland	213	204	-4
Italy	347	349	0
Luxembourg (LU)	351	342	-3
Netherlands	1733	1812	5
Portugal	188	169	-11
Spain	257	254	-1
Sweden		310	
United Kingdom	268	301	13

Source: IRENA indicator fact sheet 15 based on FADN-DG Agriculture; adaptation LEI

Table A2.6 Average stocking density EU-15 countries

2000	Cattle LSU per UAA	Sheep LSU per UAA	Pigs LSU per UAA	LSU per UAA
AT	0.46	0.01	0.25	0.73
BE	1.52	0.01	1.28	2.81
DE	0.92	0.02	0.57	1.51
DK	0.51	0.01	1.05	1.56
ES	0.17	0.08	0.22	0.47
FI	0.34	0.00	0.13	0.47
FR	0.53	0.03	0.12	0.68
GR	0.13	0.25	0.07	0.44
IE	1.16	0.16	0.09	1.41
IT	0.35	0.05	0.18	0.58
LU	1.17	0.01	0.15	1.33
NL	1.48	0.07	1.44	2.99
PT	0.27	0.08	0.16	0.50
SE	0.40	0.01	0.16	0.57
UK	0.50	0.27	0.10	0.87
EU-15	0.49	0.09	0.25	0.82

Source: FSS, 2000

Table A2.7 Development of environmental impact of agriculture and horticulture, 1995-2004

	1995	2000	2002	2003	2004	2005
Use of crop protection agents (in million kg of active substance	12.61	11.38	9.70	9.55	10.66	10.70
Greenhouse gas emissions (in billion kg CO_2 equivalents)	31.7	29.1	27.4	27.1	27.0	27.2
Supply of nitrogen (N, kg per hectare)	472	394	352	353	351	341
Supply of phosphates (P_2O_5, kg per hectare)	140	125	108	112	102	107
Ammonia emissions (x million kg)	179	139	123	122	120	121

source: Landbouw Economisch Bericht, LEI, 2007. (Original figures based on RIVM/CBS, MNP, Milieucompendium, various years; Plant Protection Service

Annex 3 Emissions of nitrogen and ammonia in The Netherlands

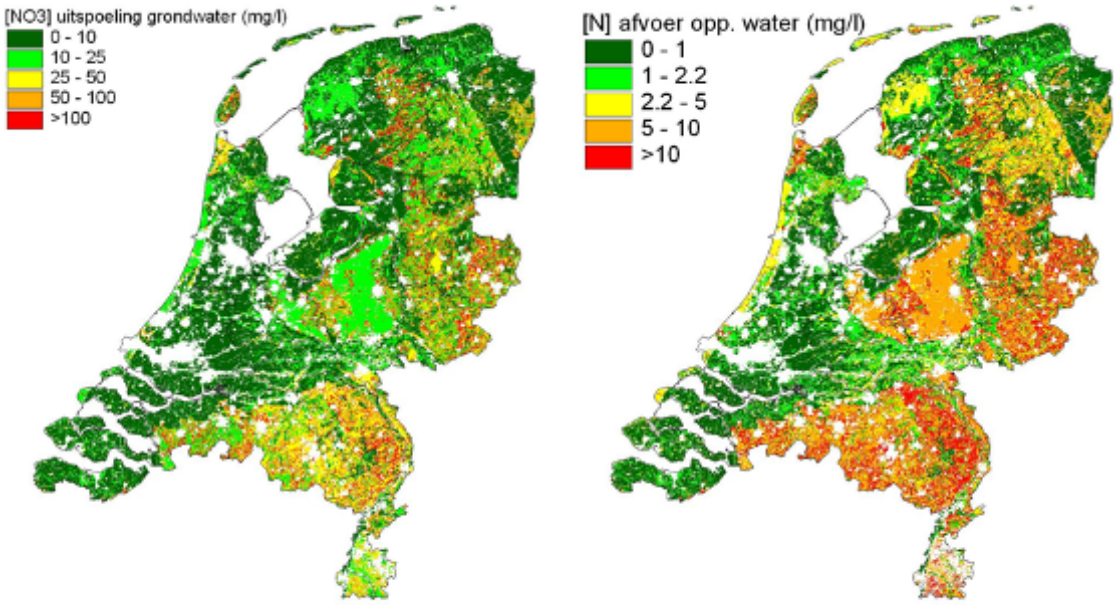


Figure A3.1 Nitrogen concentrations in leaching to ground and surface water, based on STONE model calculations*

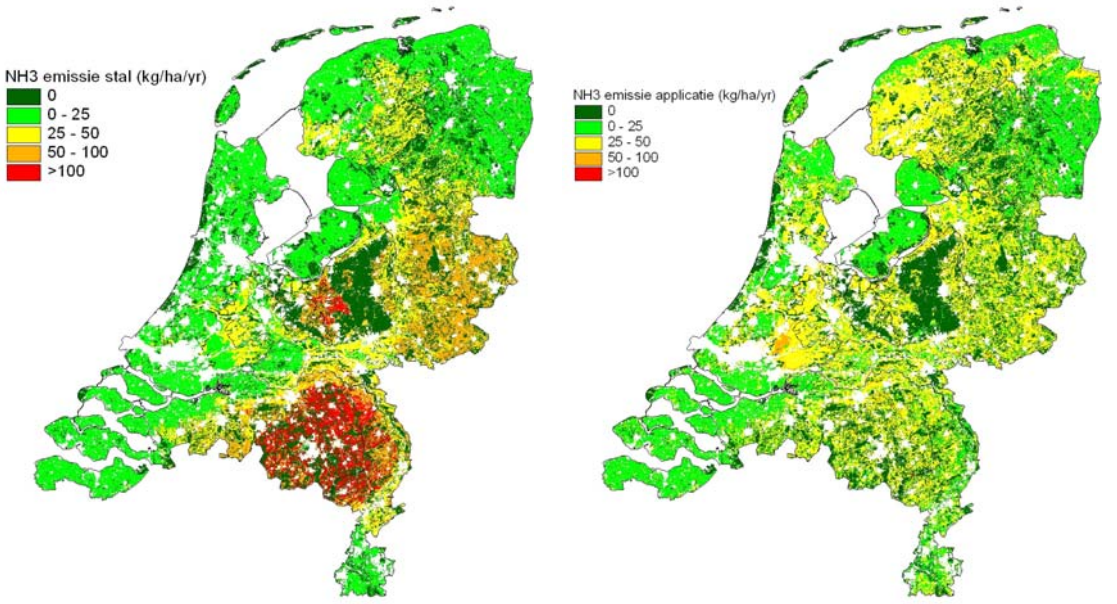
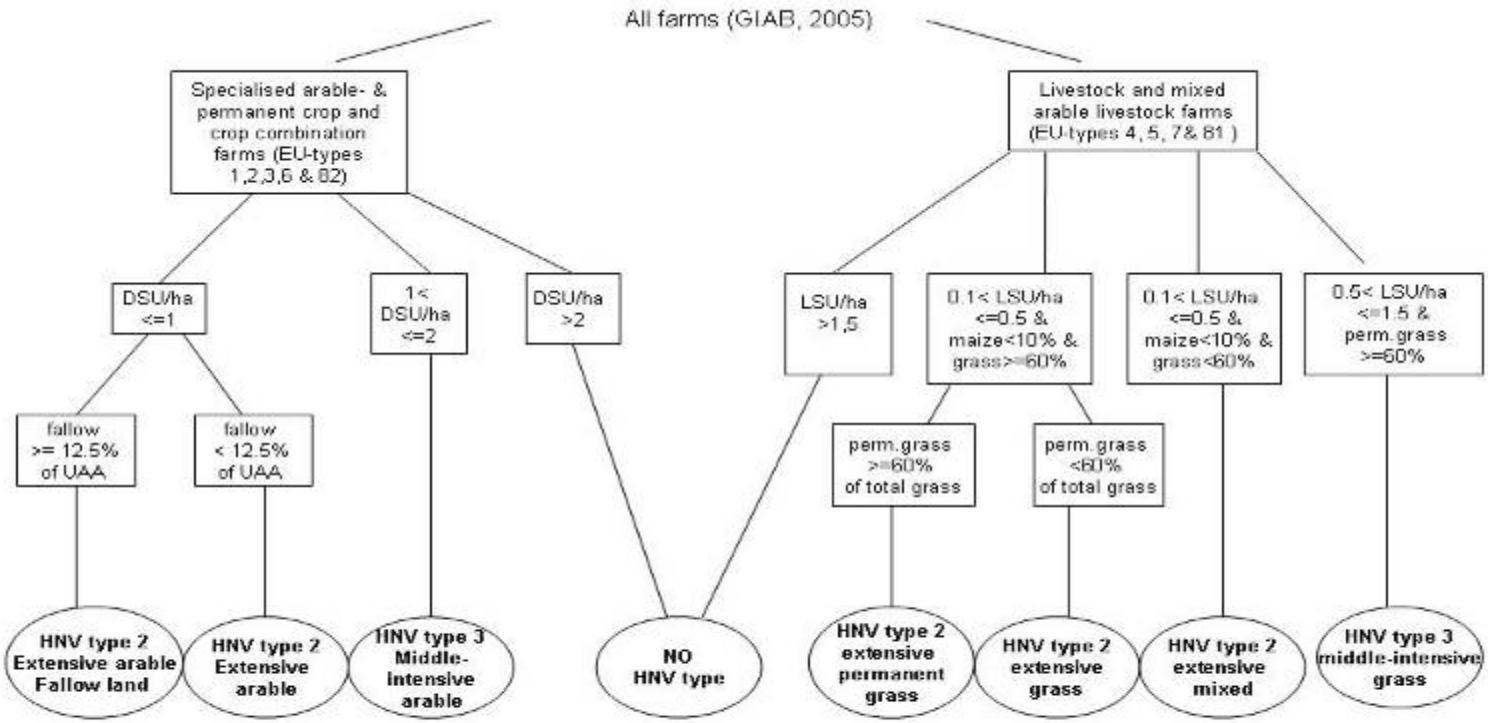


Figure A3.2: Housing and soil emission of ammonia in 2000, based on STONE model calculations*
* For explanation of STONE see Figure 1

Annex 4 Identification of HNV farmland systems

Figure A4.1: Identification of HNV farm systems indicative for HNV farmland types 2 and 3 (Full farming systems in which semi-natural vegetation is completely integrated in the farming system practically do not exist in The Netherlands; HNV farming systems for HNV type 1 areas have not been identified)



DSU= Dutch Size Units (based on standard gross margins per production animal and hectares of crop to express economic size of a farm)

LSU= Livestock Units (Grazing livestock only)

UAA= Utilised Agricultural Area

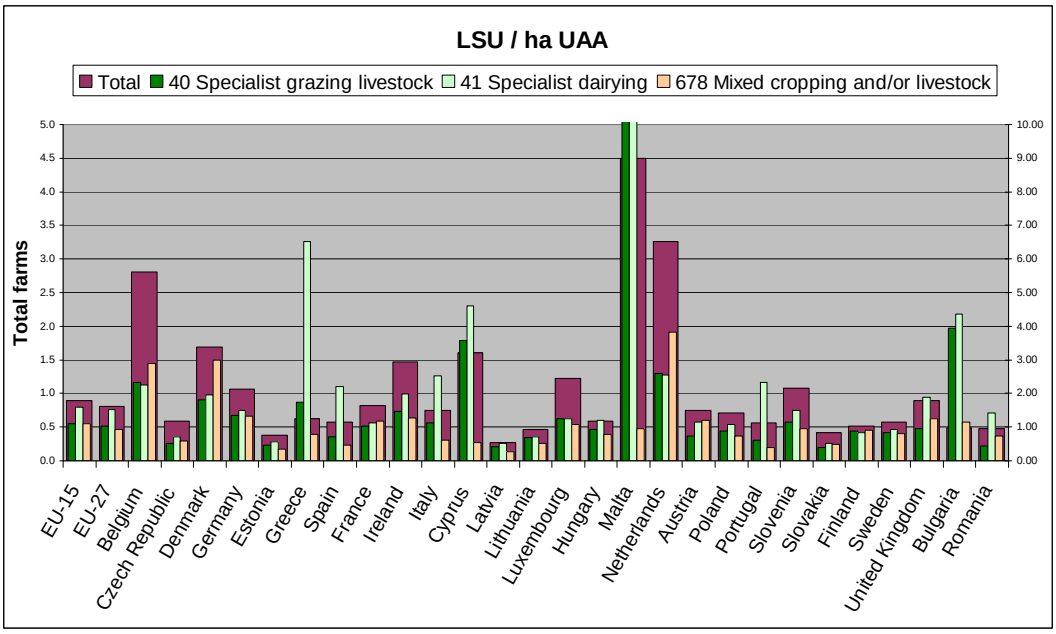
Perm.grass= permanent grass

Table A4.1: Relative share of HNV farm types 2 and 3 in farm population and agricultural area

HNV types (for definition see Figure 1)	Farms (number)	% of total farms	Number of hectares	% of total UAA
Not HNV type	58978	69.9	12758079500	64.4
Farms with grazed semi-natural grassland (HNV type 1)*	909	0.9	-	-
Extensive arable (HNVtype2)	5720	6.8	1148075200	5.8
Extensive arable fallow land system (HNVtype2)	338	0.4	72052100	0.4
Midle intensive arable (HNVtype3)	7150	8.4	3407607400	17.2
Extensive permanent grass (HNVtype2)	1865	2.2	267075900	1.3
Extensive grass (HNVtype2)	105	0.1	9876000	0.0
Extensive mixed (HNVtype2)	423	0.5	158762100	0.8
Midle intensive grass (HNVtype3)	9132	10.8	1987617200	10.0
Total	84620	100.0	19809145400	100.0

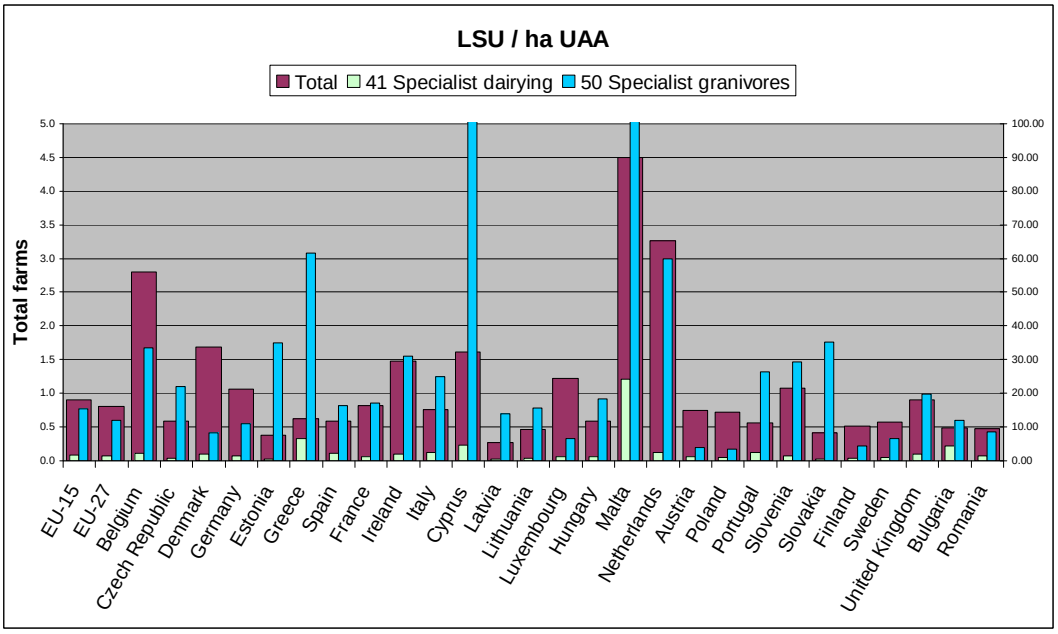
* Only the part of the farm consisting of semi-natural vegetation was regarded as HNV farmland feature, not the whole farm.

Annex 5 Comparison of Livestock Units and European Size Units per hectare over EU27



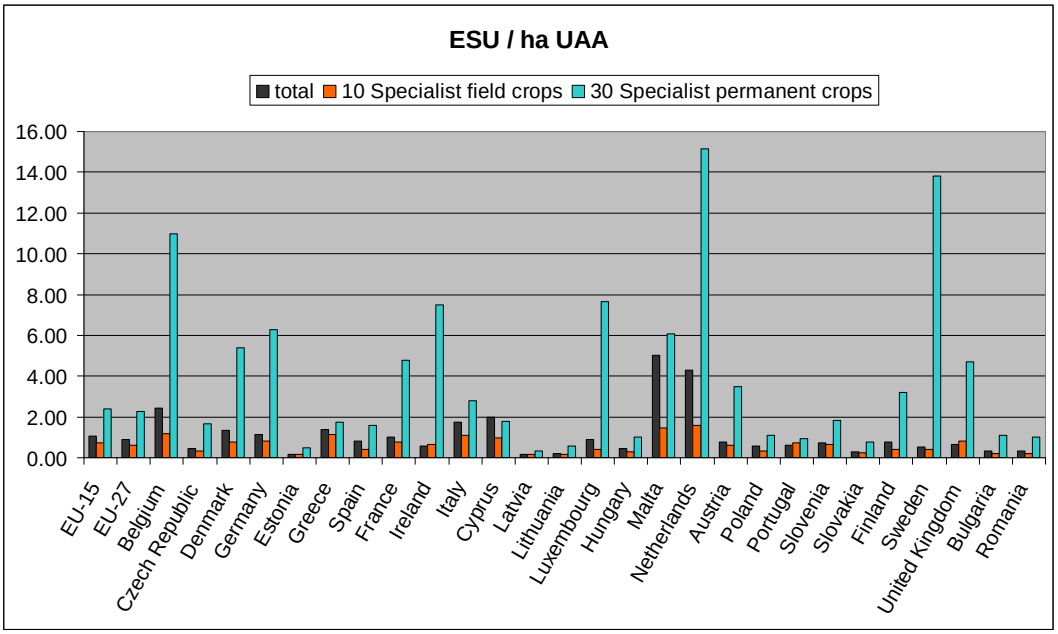
* Legend for total farms left, for other farm groups right of diagram!
Source: Eurostat, 2005

Figure A5: 1 *Livestock Units per hectare (LSU/ha) 2005 for all farms and for specialist grazing, dairying, mixed farms in EU27*.*



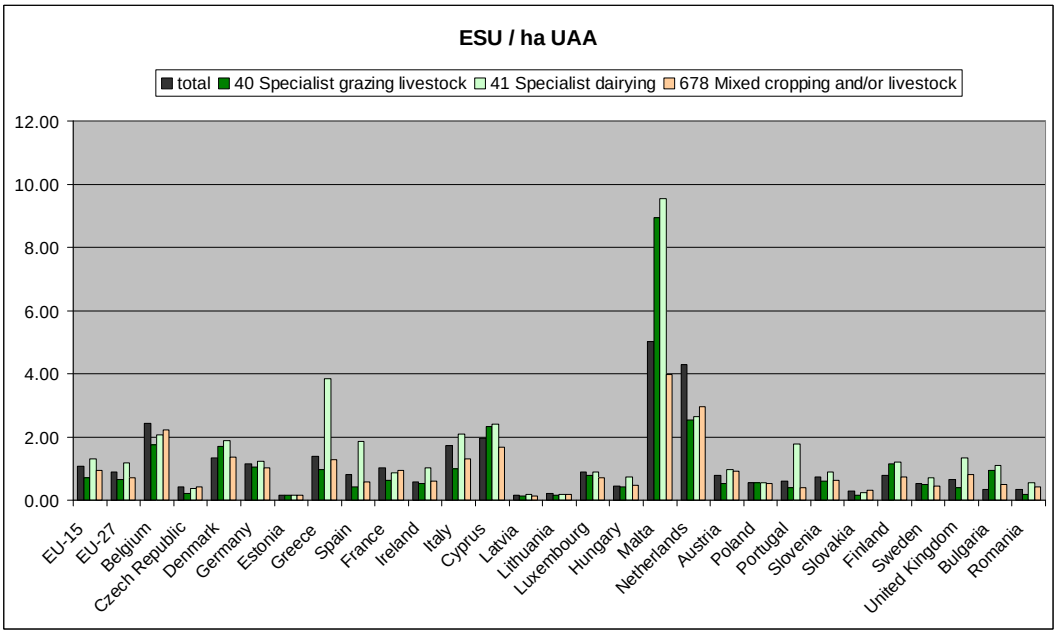
* Legend for total farms left, for other farm groups right of diagram!
Source: Eurostat, 2005

Figure A5: 2 *Livestock Units per hectare (LSU/ha) 2005 for all farms and for specialist dairying and granivores (pigs and poultry) farms in EU27*.*



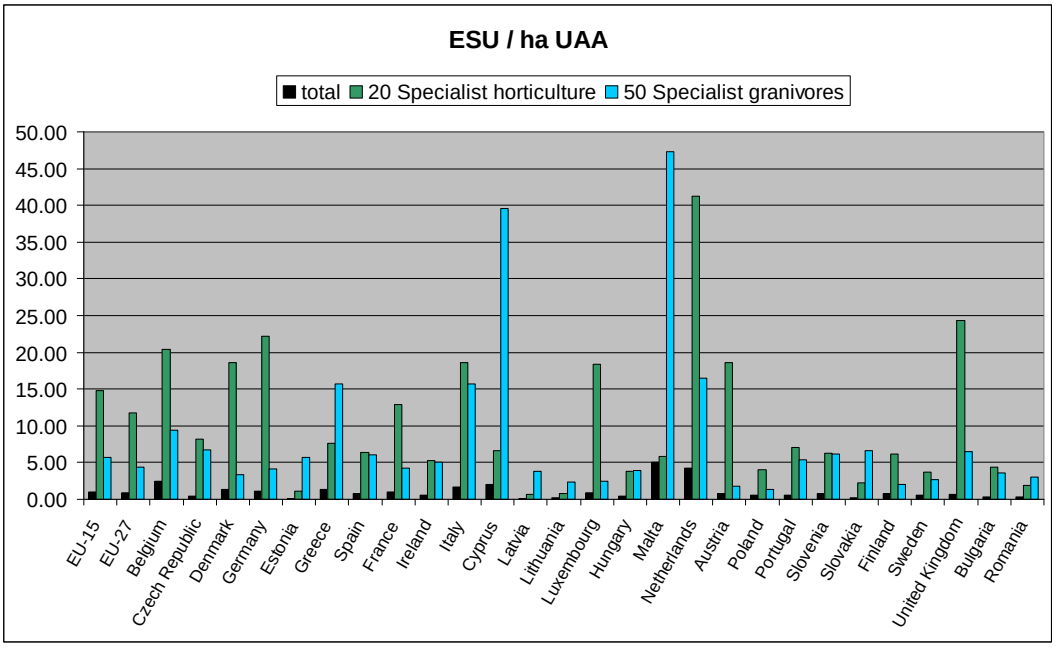
Source: Eurostat, 2005

Figure A5: 3 European Size Units per hectare (ESU/ha) 2005 for Specialist field crops and permanent crops farms EU27.



Source: Eurostat, 2005

Figure A5: 4 European Size Units per hectare (ESU/ha) 2005 for grazing livestock and mixed farms EU27.

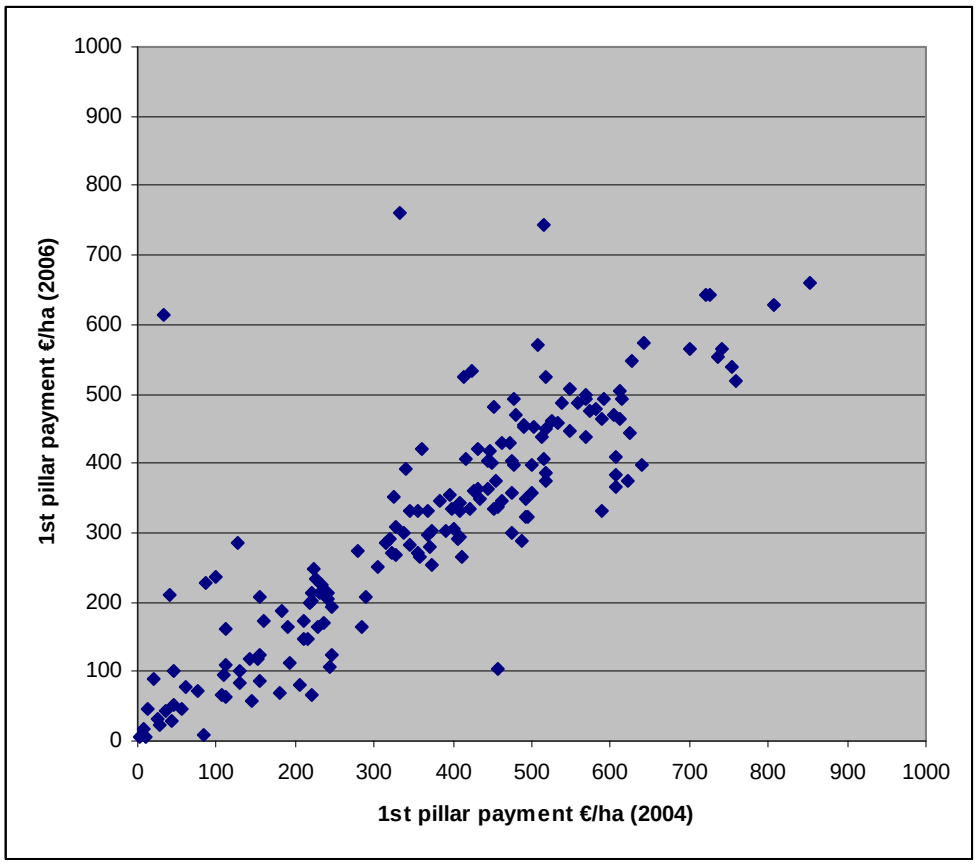


Source: Eurostat, 2005

Figure 5.5 European Size Units per hectare (ESU/ha) 2005 for specialist granivores and horticultural farms EU27.

Annex 6 Comparison of 1st Pillar payments of 2004 and 2006

To compare the spatial distribution of 1st Pillar payments used in this report (based on 2004) with up-dated data from the year 2006, the amounts spent per pc-area of both years were plotted in a scatter diagram (underneath diagram presents a summary of the total scatter diagram. A strong and significant linear relation was found between both year's data (R= 0.8). This implies that it can assumed that the differences in the expenditures between both years are minimal and that using the present 2004 data as a basis for our analysis will not deliver significantly different results from using 2006 data instead.



Annex 7 Methodology

7.1 Selection of CAP regulations and data.

As for the 2nd Pillar payments, the regulations formulated under the environmentally targeted goals of the RDP were initially selected for this analysis. These environmental goals were: I) Development of sustainable agriculture, II) Improving the quality of nature and landscape and III) Conversion to sustainable water management.

Table A7-: RDP regulations of importance for agri-environmental issues.

Regulations	**% of RDP budget[2] (mln Euro)**	**Instruments[3]**
e) problem areas and areas with specific environmental restrictions (LFA).	n.a.	SAN
f) Agri-environmental scheme	21.2	Organic Production Promotion Scheme (RSBP) SAN
h) afforestation of agricultural area	0.3	LIW (for afforestation) SAN SN
i) Other afforestation regulations	1.5	SAN SN
k) Reallotment	23.1	Farm re-establishment and winding up scheme Private site management scheme - acquisition
q) Water management in agriculture	11.9	Area-specific policy promotion scheme Area-specific water depletion control scheme LIW (water management)
t) Environmental conservation	18.3	SN LIW (environmental measures)
Regulations implemented *before* 2000		Management agreements and nature development (RBON) Rare domestic breeds
Total	**76.3**	

From the whole range of RDP regulations a selection has been made based on 3 criteria: I) The regulations have to have a clear environmental or landscape objective, II) Data of expenditures have to be available and the proportion of the budget targeted for environmental goals should be clearly distinctive and measurable, III) The receivers of the payments should be the ones with legal rights to farmland. Only in this way the paid support can be attributed to the farmland contained in the GIAB database. This latter point implies that support paid to organisations with no clear link to a farmer and related farmland location could not be included in the analysis.

[2] Source: Mid-term evaluatie van het Plattelandsontwikkelingsprogramma Nederland 2000-2006 Eindrapport, ECORYS-NEI Regionale & Stedelijke Ontwikkeling i.s.m. Grontmij Advies & Techniek, 2003

[3] SAN: Agricultural Nature and landscape management scheme, SN: Nature management scheme, LIW (Land improvement)

Resulting from this selection a list of regulations with a clear agri-environmental link was made to be further analysed in this study.

In addition to the 3 criteria for the selection of regulations, we decided to take only into account the measures of which the share of the budget was large enough (>10%). This is why regulations h and i are excluded from the analysis. Regulation k is also excluded because the budget declines steeply during the RDP period (see Figure A7-1) and the environmental goals of the accompanying instruments are not clear. In this way, the present analysis includes only the regulations e (Less Favoured Areas) and f (agri-environmental measures).

A further weakness in the data provided by the ministry for the analysis is the aggregation of expenditures of the agricultural nature and landscape management scheme (*Regeling Agrarisch Natuurbeheer*) (letter f) with the expenditures of the Less Favoured Areas scheme (letter e). Only for the more recent years (04/05 – 05/06) the expenditures were specified according to type, before 2004 there is no distinction between e and f spendings. In the analysis the calculations were done for the whole RDP-period 2000-2006, thus with combined e and f expenditures and the former RBON legislation.

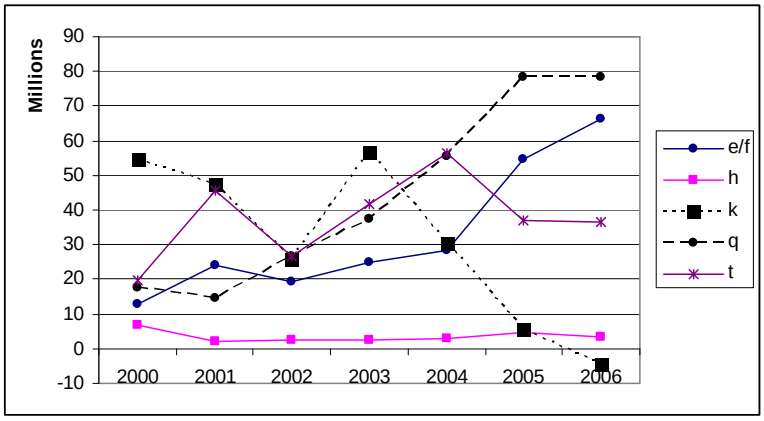


Figure A7-1: Expenditure of RDP regulation over the period 2000 – 2006, source: own calculations

The payments for agri-environmental management may only be spent in areas that are assigned as eligible area for agricultural nature conservation. Almost 116.000 ha has been indicated as such, which is based on the presence of connection with the National Main Ecological Network and other potentials for nature conservation.

7.2. Databases

Databases used for the geographic distribution of CAP payments

- The database composed by Hermans et al. (2006) has been used for the geographic distribution of 1st Pillar payments.
- The Ministry of Agriculture, Nature and food quality provided a database containing data of receivers of the 2nd Pillar expenses. The data included the addresses of recipients of payments and the amount of the subsidy per regulation per receiver. The amount concerned only the co-finance part of the EU, since these payments are open for public access. The percentage of co-financing differs, but in most cases it is 25 %, for some regulations 50%. The total amount of payments paid was calculated according to these percentages. Sometimes there has not been applied for co-financing, while this was possible. In that case the payments are not included in the database. The information was provided for the financial years starting 16 October 1999 and running through 15 October 2006.
- Geographical Information System on Agri-business database (GIAB): This database, which is available at Alterra for the years 1999 - 2004, contains x,y coordinates for each farm coupled with the data compiled by the Central Bureau of Statistics, LEI and the agricultural census on each farm's total area, employment opportunities, production type and production volume.

Databases used for the identification of environmentally sensitive areas and farm intensity features:

- Map of High Nature Value farming areas established by Elbersen and Eupen (2007)
- Map of ammonia sensitive areas (IPO-Wet Ammoniak Veehouderij gebieden)
- Map of drought sensitive areas by Gaast et al 2003
- Map of nitrate leaching areas by BZL and Brouwer et al 2003

- The GIAB database contains data on each farm's total area, employment opportunities, production type, emission rates and production volume.
- Elbersen and Eupen 2007 provided a database of a HNVfarm typology that could be applied to the GIAB data base

7.3 Mapping the spatial distribution of CAP payments

The payments of both Pillars are calculated per hectare and presented per postal code area (pc-area). The division per pc-area was chosen because it gives the most detailed information about the geographic distribution. Moreover, it is possible to aggregate the results of the postal code areas to any desired larger unit (country, province, agricultural district, water board region, habitat protection region).

To calculate the payments per hectare we used data on the utilized agricultural area from the GIAB (see paragraph 2.3) database. The total amount of the payments received per pc- area was divided by the total agricultural area in the postal code area.

The payments that are paid to the pc-areas are assumed to be spent in the same pc-areas. However, this is not always correct as there are situations where the farmers' address does not correspond (fully) to the place where the farm enterprise is located and thus where the money is really spent. This is especially of influence in those pc-

areas where nature conservation organizations or estate owners have their address. These organisations usually receive large amounts of money that is spent in a larger number of hectares either located all over the Netherlands or within the wider region in which their official post address is located.

At this moment we estimate that this mis-match could possibly occur in a maximum of 4% of the pc-areas and leads in some cases to an over- and under-representation of payments in pc-areas. A correction for this was made by firstly identifying where this was the case and secondly by re-distributing the payments to a much wider area then only the pc-area where the payment was received. For the correction for 1st Pillar a different procedure was followed then for 2nd Pillar payments. The pc areas where this mismatch occurred for the 1st Pillar payment distribution could be identified as follows:
a) pc areas that received large amounts of payments while their UAA was bellow 1 ha. For these areas a redistribution was made of the total received amounts of the 4 digit pc-area over the 2 digit pc area. After this was done there were practically no pc-areas left where the amount of payments per hectare were unrealistic (which was more than 9.000€; This threshold is based on outlier analysis, average payments of this amount were generally found, above this threshold the average payments jumped to extreme outlayers).

The pc areas where this mismatch occurred for 2nd Pillar payments could be identified as follows:
a) pc areas that received large amounts of payments while their UAA was below 1 ha.
b) pc-areas that received a disproportionately high payment per hectare above the maximum payment possible for AES. This maximum was set at €15000 per hectare which corresponds to the total payment (for 6 years) connected to the most intensive management agreement package a farmer can enter in the AES programme. For these pc-areas also a redistribution was made of the total received amounts of the 4 digit pc-area over the 2 digit pc area. The total amount of payments was redistributed and the pc areas in which the mis-match occurred were excluded from the further analysis. This correction meant an exclusion of 105 4 digit pc-areas (2.5%) and a redistribution of expenditures over the corresponding 2 digit pc-areas.

7.4 Correlation analysis

To analyse the relation between on the one hand the territorial distribution of cap payments and environmentally sensitive areas and farm features on the other hand, we carried out a range of correlation analyses.

The data input for the CAP payments are expressed per ha Utilized Agricultural Area. The data on sensitive areas are expressed as the percentage of the total UAA of the postal code area that is designated as HNV, Natura 2000, LFA etc.
The data on farm features, Livestock Units (LSU) and European Size unit (ESU) are expressed per hectare UAA. The NH3 emission is expressed as a mean per farm location.

The correlation between farm features and CAP payments was only done *within* sensitive areas (a pc-area falls within a sensitive area if 40% or more of its area is sensitive) and included only those sectors that put the largest pressure on the sensitive area. For the Ammonia sensitive and nitrate leaching areas, only the livestock dominated sectors were selected, for the drought sensitive areas and HNV farmland areas all sectors were included.

The correlation analyses were carried out in SPSS and we used Spearmans' correlation coefficient r to investigate the direction of the correlations and whether the correlation is significant. The coefficient r lies always between -1 and 1. The closer r is to +1 or -1, the stronger the likely correlation. A perfect positive correlation is +1 and a perfect negative correlation is -1.

To analyse the relationship between HNV farm type and the amount of payments received, a simple t-test was carried out to test whether the differences in the means of received payments are significantly different between farms that are a HNV farm and the farms that are not a HNV farm.

7.5 Correction for bias

To externalise the bias of CAP payments towards certain farming sectors, the correlation analysis were carried out separately for the pc-areas with a dominance of a certain sector. A sector is dominant when 35% or more of the farms in a pc-area is of the same sector. Seven categories of dominant sectors are distinguished (see also map 1 of annex 1):

The categories Dairy (801 pc-areas), Other grazing livestock (876 pc-areas), and Mixed livestock (485 pc areas)occur most strongly in either the peatland meadow areas and the sandy soil areas, The dairy and grazing farms in the wetter peatland areas are the more extensive farms, with lower stocking densities and less forage maize growing. In the south (Brabant) of the Netherlands the intensive industrial pig and poultry farms are located (the category Granivores including 17 pc-areas).

The category Horticulture (437 pc-areas) includes large greenhouse agricultural activities, and is concentrated on the Northsea coast, along the main rivers and in the south. The strong concentration of horticulture in the west of the Netherlands creates a situation where the region with the highest population concentration of the Netherlands is also the region with the highest net income from agriculture. Almost one third of all European Size Units (ESU) in the Netherlands are concentrated in this district. The category arable farming (598 pc-areas) can mainly be found in the upper northern part along the coast and along the German border, in the southwestern province of Zeeland and in the centre in the IJsselmeerpolder is where the specialised arable farming is most strongly concentrated because of the occurrence of clayish soils with high natural fertility. Mixed farming (59 pc-areas) occurs in the south.

Annex 8 Results of correlation

Table A8.1 Results of correlations between 1st Pillar distribution and sensitive areas

Spearmans correlation coefficient of Correlations between 1st Pillar payment distribution and …	**Postal code areas with dominant sector *…**							
	total population (3266)	**dairy (799)**	**other grazing (816)**	**mixed livstock (483)**	**granivores (15)**	**horticulture (355)**	**arable (575)**	**no dominant type (50)**
Areas sensitive to nitrate leaching to ground water	.158(**)	0.013	.269(**)	.162(**)	-0.107	.107(*)	.397(**)	0.101
Areas sensitive to nitrate leaching to surface water	.289(**)	-0.007	.206(**)	.267(**)	-0.311	0.026	.237(**)	.402(**)
Buffer zones around ammonia emission sensitive nature areas	.117(**)	-0.026	.159(**)	.197(**)	-0.121	0.092	.153(**)	0.046
Buffer zones around drought sensitive nature areas	.195(**)	-.089(*)	.154(**)	.265(**)	-0.100	0.081	.191(**)	0.137
HNV farming areas	.063(**)	-.167(**)	-.161(**)	-.137(**)	0.174	.117(*)	.085(*)	0.141
* Dominant means that at least 35% of the farms is of one class ** Significant at 0.01 level (two-tailed)								

Table A8.2 Correlation results between 1st Pillar payment distribution and farm features of postal code regions

Correlations between 1st Pillar payment distribution and	**within sensitive area**				
	nitrate leaching to surface water	**nitrate leaching to ground water**	**ammonia sensitive**	**drought sensitive**	**HNV**
NH3/farm	0.394 (**)	.507(**)	.470(**)	.439(**)	.563(**)
Livestock density (LU/ha UAA)	0.346 (**)	.384(**)	.418(**)	.365(**)	.425(**)
Production intensity (ESU/ha UAA)	0.158 (**)	.183(**)	.227(**)	0.001	0.012
** Significant at 0.01 level (two-tailed)					

Table A8.3 Correlation results between 2nd Pillar payment distribution and selected environmentally sensitive areas.

Spearmans correlation coefficient of Correlations between 2nd Pillar payment distribution and …	**Postal code areas with dominant sector *…**							
	total population (3266)	**dairy (799)**	**other grazing (816)**	**mixed livstock (483)**	**granivores (15)**	**horticulture (355)**	**arable (575)**	**no dominant type (50)**
Areas sensitive to nitrate leaching to ground water	0.008	-.079(*)	0.038	-0.072	0.345	-0.029	0.031	-0.042
Areas sensitive to nitrate leaching to surface water	.303(**)	.231(**)	.235(**)	-0.009	0.201	0.100	.091(*)	-0.090
Buffer zones around ammonia emission sensitive nature areas	.041(*)	-0.009	-0.008	-0.027	0.290	.109(*)	0.031	0.150
Buffer zones around drought sensitive nature areas	.247(**)	0.055	.223(**)	0.038	.607(*)	0.099	.252(**)	0.041
HNV farming areas	.326(**)	.216(**)	.322(**)	.186(**)	-0.138	.237(**)	0.059	0.132

* Dominant means that at least 35% of the farms is of one class
** Significant at 0.01 level (two-tailed)

Table A8.4 Correlation results between 2nd Pillar payment distribution and farm features of postal code regions

Correlations between 1st Pillar payment distribution and	**within sensitive area**				
	nitrate leaching to surface water	**nitrate leaching to ground water**	**ammonia sensitive**	**drought sensitive**	**HNV**
NH3/farm	-0.281 (**)	-.286(**)	-.277(**)	-.150(**)	-.062(*)
Livestock density (LU/ha UAA)	-0.273 (**)	-.274(**)	-.280(**)	-.053(*)	0.058
Production intensity (ESU/ha UAA)	-0.306 (**)	-.311(**)	-.282(**)	-.171(**)	-0.029

** Significant at 0.01 level (two-tailed)

Annex 9 Analysis of other environmentally targeted 2nd Pillar measures

A detailed assessment of the geographical distribution of 2nd Pillar payments was possible for the AES payments, since the recipients were in general individual farmers where the location of where the support was received corresponded with the location of where the money was spent.
However, other environmentally targeted 2nd Pillar measures are mainly paid to regional administrations, nature and landscape foundations etc. For these measures it is more difficult to assess the geographical distribution of the money and consequently to relate it with environmental issues. For this reason we focus in the report on the AES payments, but as an illustration how it looks like for other types of 2nd Pillar support, an explanation of the pattern of the expenditures for Sustainable water management is given below.

Sustainable water management.
The sustainable water management scheme gives support to farmers and non-farmers to implement integrated water management plans. The goal of the scheme is to convert to a water management system that is more in balance with natural processes. Regional land use must be based on the water system: agriculture and nature management uses are tuned to the local water management options.
The instruments effectuating this goal are:

- Area-specific water depletion control scheme (*Regeling gebiedsgerichte bestrijding verdroging*). This scheme can be deployed for water management measures which contribute to combating water shortage in areas with natural habitats and agricultural use. The scheme ended in 2001 and continued through the area-specific policy promotion scheme.
- Payments for land improvement: water management (*Landinrichtingswerken, Onderdeel waterbeheersing*) Payments are offered for works carried out by water boards and provincial authorities for the benefit of water supply and drainage in connection with other land improvement works for nature management and agricultural purposes.

The first recipient of the Sustainable water management scheme are mainly Water boards (Waterschappen), Polder boards (Hoogheemraadschappen), municipalities and provinces. These organisations are supposed to further distribute this money to smaller land users inf necessary. Because the distribution of this money goes in 2 steps from the central government to large institutes the final spatial distribution could not be made because we were not in a position to obtain further information from all these separate organisation on to whom the money was further distributed. A desaggration to pc area could therefore not be made only to provincial level (See Figure A9.1).

Geographic distribution of sustainable water management payments (letter q)

Since the receivers of the payments for sustainable water management are mostly regional or national institutes like water boards, municipalities, provinces and national administration offices of the ministry of Agriculture, Nature and Food quality, the geographic distribution can not be made as detailed as for other payment schemes. We limited the analysis for this payment category therefore to presenting the distribution of this subsidy by province, see Figure A9.1.

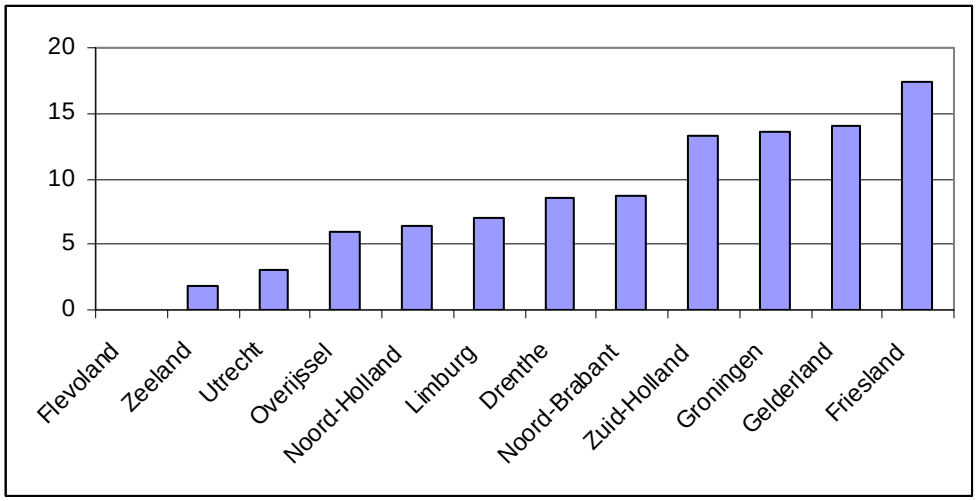


Figure A9.1 Distribution of 2nd Pillar payments for sustainable water management by province

The province of Friesland receives most payments for sustainable water management.

According to the data provided by the ministry 308 mln euro was spent under the sustainable water management scheme. Considering the goal of the scheme it can therefore be hypothesised that drought prone areas are important receivers of this support but this could no further be analysed in this study.