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# Analysis of implementation of the Nitrates Directive by other Member States of the European Union

## Germany, Belgium (Flanders), Denmark, Spain (Catalonia), Ireland, the Netherlands


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The authors certify that no elements of their past or present activities have affected their impartiality in the writing of this report.

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# Contents

# Table of recommendations

# Executive Summary

In June 2013 and September 2014, France was condemned by the Court of Justice of the European Union for insufficient application of the Nitrates Directive. Regardless of the changes already made by France in the delimitation of its vulnerable zones and to its action plan, the ministries in charge of ecology and agriculture wanted to be accurately informed of the choices of our European neighbours, their successes and their visions for the future, etc.

The countries or regions concerned by the mission are Germany (Bavaria), Belgium (Flanders), Denmark, Spain (Catalonia), Ireland and the Netherlands.

After researching information that already exists in the departments or that is accessible on the Internet, trips were organised. The reception everywhere was constructive and open. The mission carried out significant analysis, comparative and summary work that is covered in this report which summarises the factual information collected for each theme, in a way that is common to all of the countries visited:

1. general concept of vulnerable zones and action programmes,

2. content of the action programmes with prohibited periods for applying fertilisers, calculation of storage capacities, limitations of land application, calculation of the fertilisation balance and additional measures,

3. technical and financial assistance,

4. assessment of the effectiveness or efficiency of the programmes,

5. consistency with other European Directives.

In the appendix, a monograph on each of the countries visited provides the findings and references on which the report summaries are based.

The main information retained by the mission is the following:

- All of the countries visited, with the exception of Denmark, were confronted with disputes, sometimes severe, with the Commission, but these were resolved several years ago. As regards Germany, the 2015 – 2018 action programme is still under discussion.

- The objectives in terms of water quality, methods for evaluating the status and measuring progress are not laid down by the Nitrates Directive and differ considerably from one country to another.

- Everywhere, once the mandatory measures were implemented according to the most obvious procedures, the progress in reducing the pollution of water resources by nitrates is now much slower. Indeed, even if nitrate leaks are stopped completely on the surface, migration into the soil towards the groundwaters and mainly the renewal of this water may require many years.

- The various countries have a simultaneous and global approach for fertilisation and land applications; on this subject, they have developed national (or

regional) regulations, the objectives of which exceed those of the Nitrates Directive alone. Apart from Spain, the countries visited deal with phosphorus and nitrogen in the same texts. Depending on the countries, these regulations integrate the water quality (WFD) and air (DNEC) quality concerns, and the protection of soils and recycling of mineral elements, involving farming practices. Even when they have classified their entire territory as a vulnerable zone, the States are led to grade the intensity of the measures taken in order to more specifically target the most sensitive zones. From this point of view, the choices made throughout the EU tend to be similar.

- The obligations are substantially reinforced for the territories that obtain a derogation to the limit of 170 kg of livestock-origin nitrogen applied per hectare and per year. In fact, five Member States out of the six visited obtained a derogation to the limit of land-applicable nitrogen, in return for strict provisions. These often become more restrictive when extending these derogations to new 4-year action programmes (for example: the Netherlands: "phosphate" limit of 173,000 t of national annual consumption of P205).

- The mandatory measures of the directive are difficult to implement systematically throughout the territory, a fortiori when it is vast. The measures are therefore systematically adapted not as a general rule but in their local or cyclical implementation. Therefore, many points are added to the regulations of each country in order to adapt on one hand to the climate, to the farming methods and crop conditions, but also sometimes to the magnitude of the risks for the quality of the waters for certain practices. This is how noteworthy exceptions can be made for crops covering shallow surfaces, for practices that are carried out on a one-off basis, etc. The additional measures or reinforced actions vary significantly in type and magnitude depending on the countries. In a tense context, in particular due to the small size of the territories, regulatory, technical and societal creativity is high. The phasing out of milk quotas poses new challenges, for which some of the countries visited want to negotiate new regulatory provisions.

- In Denmark, the Netherlands, and Belgium (Flanders), the calculation and control of the fertilisation balance are based on operational integrated information systems, and sometimes directly filled in online by stakeholders. These information systems give very accurate knowledge on the practices and flows of fertilisers. CAP (Common Agricultural Policy) data (crop types and surfaces), livestock identification data, possibly completed with mandatory declarations, and remote declarations of land application logbooks, transportation of fertilising elements, and soil analyses, are grouped in this way. Through systematic cross-checking of the information, these data help to produce budgets during and at the end of campaigns, constitute the basis for warning or advising farmers and are used to better target on-site controls.

- Research and development programmes for farmers are implemented in almost all of the countries. These programmes, or their results, are often evaluated by independent scientific experts. The existence of an independent scientific reference or validation committee for example, for establishing fixed values included in the regulations seems to encourage the context of negotiation instilling a level of trust with the Commission. In addition, in several Member States, the members of the mission have noticed advisory mechanisms for prominent farmers that know how to make use of European funds and anticipate regulatory changes.

- The situation seems ripe in all of the States for establishing action programme impact simulations and estimating the time frames within which these are likely to allow the various water resources to return to a good chemical and biological status (within the meaning of the Water Framework Directive).

The report concludes on the proposal to organise a multilingual working day in France at the end of 2015 setting out this benchmarking, and expanding mutual knowledge on a forward-looking vision on the implementation of the Nitrates Directive.

# Introduction

In June 2013 and September 2014, France was condemned by the Court of Justice of the European Union for insufficient application of the Nitrates Directive.

Regardless of the changes already made by France in the delimitation of its vulnerable zones and to its action plan, the ministries in charge of ecology and agriculture wanted to be accurately informed of the choices of our European neighbours, their successes and their visions for the future, etc.

The aim of the mission was therefore to collect and compare the provisions made in various countries pursuant to the Nitrates Directive and their implementation procedures. Also, the political, environmental and agricultural contexts behind the reasons for adopting this variety of provisions had to be included. The questions put to the mission more specifically concerned the procedures governing the land application of fertiliser on sloping, flooded or frozen land; the storage of effluents on farms, etc. They also concerned the negotiation conditions with the Commission in particular concerning derogations to the limit of 170 kg of nitrogen from livestock manure per hectare and per year for each farm.

The countries and regions concerned by the request were Germany (Bavaria), Belgium (Flanders), Denmark, Spain (Catalonia), Ireland, the Netherlands and Italy.

After work on the information that already exists in the departments or that is accessible on the Internet, between February and April 2015 the members of the mission, signatories of this report, therefore met on site with the competent departments of the various countries. All of the above-mentioned countries were visited with the exception of Italy due to lack of references and insufficient contacts within the required time limits.

The trips were organised in close collaboration with the above-mentioned applicant divisions of the ministries, with the French embassies in the countries visited, and sometimes certain embassies for these countries in Paris. The welcome received everywhere was constructive, open, documented, interactive and interesting.

On return, the mission carried out important analysis, comparison and summary work, covered in this report, which jointly summarises the factual information collected by theme for all of the countries visited. It includes the analyses and comparative tables of the provisions retained in the various countries by theme. Monographs for each country have been inserted in the appendices that summarise the main information collected for the same country or region.

The mission concludes with the main information that it has drawn from this work and ultimately formulates a recommendation.

# 1 The approaches mobilised for each country in order to delimit the vulnerable zones and set out the action programmes

Directive 91/676/EC of the Council, known as the "Nitrates Directive", aims at reducing and preventing the pollution of waters caused by nitrates from agricultural sources. The text requires the Member States to monitor (nitrate concentration and trophic status) all types of water bodies. The Nitrates Directive only mentions one, non-quantified objective, i.e. reducing or preventing pollution caused by nitrates from agricultural sources (Article 1). However, it requires a certain number of precise actions, i.e.: delimiting vulnerable zones (VZ) where nitrate contents exceed or have a tendency to exceed 50 mg/l and where there is a risk of eutrophication (Article 3); then establishing on one hand a code of good agricultural practice on a voluntary basis and on the other hand an action programme (Article 5) applicable to VZ and a monitoring programme to assess the effectiveness of the action programme. Every 4 years, a report (Article 10) must be submitted to the Commission, listing the actions taken in and outside of VZ, and providing a delimitation of the VZ, the status of the waters in VZ as well as an estimation of the time scale of response of the water resources to these actions.

## 1.1 Monitoring of the water and zoning of the territories of the Member States.

The concept of the implementation of the Nitrates Directive within a country is firstly based on the delimitation of vulnerable zones where the measures will be applied, which is based on the monitoring of water resources. Nevertheless, the monitoring programmes are not studied in detail in this part of the report, but in Part 4, which through this monitoring provides an assessment on their effectiveness and efficiency. This Part 4 will highlight their significant heterogeneity in terms of sampling location, sampling frequency and interpretation of the analysis results.

The criteria for declaring that a zone is vulnerable are simple and identical for all of the countries visited with regard to nitrates strictly speaking (content exceeding 50 mg/l or even 40 mg/l if the trend is up on recent years).

However, although these thresholds are demanding for groundwaters, they are only rarely reached in surface or coastal waters, even when they are affected by eutrophication.

The 50 mg/l threshold for nitrates was consistent with Directive 75-440 on the quality of water intended for human consumption known as "drinking water"; once appealed and because this eutrophication phenomenon can be observed in surface waters with even lower nitrate contents, the Commission recommends a lower threshold applicable to surface waters in order to define the vulnerable zones in some watersheds[1].

[1] Research, in the Netherlands for example (PBL, 2008. water voor nu en later. Ex ante evaluatie KRW. Planbureau voor de Leefomgeving, 2008), shows that eutrophication can be controlled by a wide range of measures some of which do not relate to good practices in terms of nitrates, but are very efficient (control of phosphorus, treatment of urban discharges, development of banks, etc.).

The delimitation of Vulnerable Zones (VZ) which results from this follows one of the two following logics according to the countries (or autonomous regions within certain countries):

1. The country or region is classified in its entirety as VZ on one hand because dictated by the quality criteria of the water resources for most of the territory – in particular due to the risk of marine eutrophication (BE-FL, IR, NL) or sometimes because it is more difficult for the administration to accept and monitor a treatment which is geographically differentiated, in particular for the storage of effluents between farmers (DE, DK, IR).

   The choice of one classification for the entire country or region may have also been preferred at the end of the disputes (BE-FL).

   The Commission seems to prefer classification of the entire territory as a vulnerable zone and takes this choice into consideration during procedures for derogations to the limit of 170 kg N/ha requested by one or other of the Member States.

   In this situation, sometimes the existence of geographical delimitations within the VZ is observed where the procedures for implementing measures (BE-FL, DK, NL) differ.

2. The country or region only retains a portion of its territory as VZ. This is the case of Catalonia (70%) as for most of the other regions of Spain. 17% of the UAA (Utilised Agricultural Area) is classified as VZ throughout the whole of Spain. In this case and in the case of other countries joining the European Union, there was an extension over time of the areas classified as VZ at the express request of the European Commission due to the eutrophication risk. For example, 3 extensions over the last 20 years in Catalonia have doubled the initial area classified as VZ.

## 1.2 National applications of action programmes prescribed by the directive

### 1.2.1. The transposition choices.

The mechanisms for applying the directive are based, according to the Member States, on:

- either an overall regulation of the fertilisation (organic and mineral) which includes the measures of the action programmes provided for in Appendix III of the Nitrates Directive (DE, BE-FL, NL, SP) as well as, if applicable, the requirements set out in the codes of good agricultural practices which become in effect mandatory. This choice does not exclude the implementation of environmental measures elsewhere;

- or a framework that chooses "integrated" or joint implementation of the Nitrates Directive and the Water Framework Directive (WFD) (DK and to a less extent IR). These countries therefore integrate the measures of the action programmes provided for in the Nitrates Directive, and the provisions including the considerations set out in the WFD. In this case, the additional measures provided for in the WFD contribute to the achievement of the objectives laid down by the Nitrates Directive. The Danish government uses a policy that it refers to as the "agri-environmental" policy.

More generally, it is noted that the Member States are increasingly choosing mechanisms fostering a more integrated approach for the protection of the water quality.

Furthermore, it can be noted that the national regulations, either at the request of the Commission (current situation in DE, SP), or following legal proceedings (all countries with the exception of DK) or after reaching the conclusion of stagnation of the results obtained (DK), or even in exchange for granting derogations to the limit of 170 kg N/ha/year, integrate increased requirements in relation to agricultural practices (increase in the surface area of VZ, reinforcement of the storage measures, increased limitations on land application conditions, establishment of increasingly strict standards in terms of nitrogen content of organic effluents).

These changes may seek to mitigate the problems emerging from "structural surpluses" (surplus of livestock manure in relation to land application and usage possibilities by the crops of a country or vulnerable zone), and the resulting pressure on the environment. Thus, the Netherlands, as well as the Belgian Flanders, have developed an effluent export policy when the production of organic nitrogen fertilisers dominated by intensive farming exceeds the agricultural production requirements. Within the framework of their 5th action (2014/2017) these countries have established, since 1 January 2014, a mechanism that forces farmers to treat and/or export a proportion of the surplus effluents. The quota of effluent to be treated is set on a yearly basis according to, on the one hand, the balance between the production of effluents, the level of requirements for crops and, on the other hand, the storage capacity on the national and regional level. In this way, the Dutch and Flemish authorities hope to promote more efficient use of the quantity of effluents available. But they are also placed as organic fertiliser exporter producers in relation to neighbouring countries. Their current concern is even to have certain livestock manures recognised by the Commission that have been treated in an extremely advanced way (until obtaining a product that has the same fertilising behaviour as a mineral fertiliser) such as mineral type fertilisers, because they have an action process that would enable them to develop a domestic and export market.

### 1.2.2. A national framework and growing regional differentiations

Regardless of the administrative organisation of the States (centralised, federal or regional), a national framework is defined. Then the implementation may remain under the responsibility of a regional level (Länder (DE), or Autonomous Communities (SP)). In all countries, the regional level or national government adapt the national provisions to the local level (for example according to crops or productions in DK, according to soil and climate zoning in IR).

Throughout the programmes, changes are made to the actions, which include more and more actions adapted to local conditions. Starting from observation of the limits

encountered through the implementation of uniform rules for achieving the pollution reduction objectives, the Member States increasingly adapt the actions to the nature of the soils, to the hydraulic system of the region, and to specific characteristics even going so far as the implementation procedures adapted to each farm (e.g.: specific excretion values calculated on each farm, see the Netherlands monograph, Appendix 13); delimitation of zones between which land application periods, nitrogen limits per crop and quantity of nitrogen mineralised by the soil (SP-CA; DK; DE draft order) are differentiated; and definition of priority zones with reinforced requirements (BE-FL).

In some cases, the regulations go far beyond the measures expected by the Commission. In Denmark, over the past few years, the authorities have set nitrogen dose limits to be applied to crops that correspond to a target yield that is 15 to 18% below the economic optimum. This choice results in significant financial losses for farmers (preventing them, for example, from producing bread-quality wheat). This choice is not without risks from the economic viability point of view for farms (DK) but seems possible in a country where half of the 40,000 farmers have multiple activities and leads the Ministry of Agriculture to consider ways and means to implement the financial assistance possibilities offered by the WFD.

Furthermore, the countries visited chose to establish zones in which the content of the measures can differ.

*Table: specific zoning of the Member States visited*

| Country | Soil and climate zones[2] | Reinforced action zone |
|---|---|---|
| Germany | None | Possibility of limited reinforced action when the pollution threshold is high. Such a differentiation is considered in the draft text under development |
| Denmark | 4 soil types<br><br>(national mapping by Aarhus University) | Considered in a high-risk coastal zone (high N/P pressure) |
| Spain (Catalonia) | Division into 12 zones | Miscellaneous catchment protection zones or water courses of ecological interest. The programme under negotiation will introduce the zones with high density of livestock ("ZADG") to reduce the structural surpluses |
| Belgium (Flanders) | No, but variable standards applied according to types of soils. | Zones defined, according to the quality of the water resource, as a priority for the management of nitrogen residues at the end of the cultivation period<br>Zones with surplus cattle with obligation to treat the slurry<br>Miscellaneous catchment protection zones or water courses of ecological interest. |
| Ireland | 3 zones<br><br>(A: South-West: B: West; C: North) | "TEAGASC" (Irish Agriculture and Food Development Authority) assistance programme and catchment supply zones (concerns 60,000 farmers) |
| The Netherlands | 4 soil regions: clayey, peaty, sandy, loamy. | Yes for regions that exceed the thresholds. (sandy and loamy soils as well as factory farming). |

## 1.3 Acceptability of action programmes by the Commission and infringement procedures

### 1.3.1 Acceptability of action programmes

The Commission closely monitors the content and application of action programmes.

The reports drawn up by the Member States at the end of each action programme (i.e. every 4 years) enable the Commission to keep informed of the changes in the status of water bodies and the effect of the Nitrates Directive application measures on them. The Commission draws up a summary of these national reports which is presented to the European Parliament.

[2] The zones defined by the Member States do not correspond entirely to the zoning proposed by the study commissioned by the Commission in 2011

Deeming certain results to be insufficient, the Commission requests the States to reinforce their programme. The Commission accepts the designation of vulnerable zones limited to part of the territory, but it sometimes asks the States to extend these zones (SP). On this subject, it sometimes has recourse to legal proceedings. When an infringement procedure is not justified, its main action lever is the renewal of the derogation to the annual limit of 170 kg N /ha from livestock manure, a derogation granted for the duration of an action programme (for a period of 4 years) to some Member States based on a request duly justified from the technical and scientific point of view.

In this regard, the Netherlands and the Commission agreed on a phosphorus limit for the entire country, whereas the discussions between the Commission and Germany are ongoing. The Commission has suspended the granting of the derogation to Germany thus marking its willingness to obtain tightening of the measures in the new action programme. The draft text that has been under discussion and preparation for almost a year now is giving rise to exchanges between the parties, a debate in which German farmers are showing hostility towards these changes.

Finally, the Commission has ordered various agronomic studies from Wageningen University or its subsidiaries, which it uses as a basis for assessing the national provisions adopted pursuant to the directive.

### 1.3.2 The infringement procedures.

In general, as soon as it considers that a Member State is not complying with the requirements of the directive and in order to improve the provisions made by each State, since publication of the directive, the Commission has started infringement procedures. At the end of the process, these may give rise to a decision by the Court of Justice of the European Union (CJEU). The Member State must then comply with the terms of the Court's decision.

The infringement procedures started for application of the Nitrates Directive are summarised in Appendix 5[3]. They concern the designation of vulnerable zones only for countries that have chosen the designation for only part of their territory or else concern the existence and content of the action programmes.

Among the grievances behind the procedures, the following in particular are listed:

- no definition of vulnerable zones or a definition that does not comply with the criteria set out in the directive (BE-FL, SP-CA),

- the content of the action programmes.

Thus, by way of illustration, the procedures started against two States will be cited:

[3] This concerns the procedures started against the countries referred to in the mission letter and against France.

For Catalonia, the grievances during various procedures concerned the following points:

- no designation of good farming practices and vulnerable zones of autonomous communities (1998);
- no establishment of action programmes (2000)
- non-compliance with several directives and, in particular for nitrates, failure to designate the Rambla de Mojácar as a vulnerable zone (2003)

In the case of Germany, the Commission disagreed on the estimation of the quantities of nitrogen applied according to the land application processes. It considered that the German texts led to acceptance of a greater quantity of fertiliser being applied by farmers than the provisions of the directive[4].

Under these procedures, the Commission intends to improve the general quality of the action programmes. Stricter measures, improvement of fertilisation methods and reinforcement of their enforceability is noted. It also expects an educational effect and increased awareness of the obligations imposed by the directive. However, it considers that there are still a number of problems regarding the land application of fertilisers and concerning the measures relating to livestock manure storage capacities. Furthermore, it is monitoring the changes in practices (in particular biogas production industry) and confirms as of now that the action programmes must meet these changes in an adequate manner[5].

[4] Case C-161/00.

[5] source "report of the Commission to the Council and the European Parliament", on the implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources, based on reports drawn up by the Member States for the 2008-2011 period, COM (2013) 683 final.

***Directive 91/676/EEC summary – grievances of the disputes***

| Subject of the dispute/part of Directive 91/676/EEC | | | Dispute | Germany | Spain | Belgium (Flanders) | Ireland | The Netherlands |
|---|---|---|---|---|---|---|---|---|
| Articles | Article 3 | | Spain | | C71-97 | | | |
| | | Article 3 §1 | Spain Belgium Ireland | | C416-02 | C221-03 | C396-01 | |
| | | Article 3 § 2 | Spain Belgium Ireland | | C416-02 | C221-03 | C396-01 | |
| | | Article 3 § 4 | Spain Ireland | | C416-02 | | C396-01 | |
| | Article 4 | | Spain | | C71-97 | | | |
| | Article 5 | Article 5 § 4 | Germany (Spain) Belgium Ireland | C161-00 | C161-00 | C221-03 | C396-01 | |
| | Article 6 | | | | | | C396-01 | |
| Appendix II | A: Code of good agricultural practices | A 1 | The Netherlands | | | | | C322-00 |
| | | A2 | The Netherlands | | | | | C322-00 |
| | | A4 | The Netherlands | | | | | C322-00 |
| | | A 6 | The Netherlands | | | | | C322-00 |
| | P2 | | Germany Spain | C161-00 | C161-00 | | | |

When the grievances of a dispute concern several articles of the directive or several sections of the appendices, the dispute number is repeated.

The complete table is shown in Appendix 5 describing the articles in question.

# 2 Comparative analysis of the measures

## 2.1 Types of fertilisers

In order to compare the various measures of the action programmes, the members of the mission initially examined the provisions that apply to fertilisers. They noted that their classification varies significantly between countries, even if there is still a distinction between 3 types of fertilisers according to the origin (organic, i.e. animal, or mineral, i.e. chemical) and, for organic fertilisers, according to the status of the phase (solid or liquid).

The following table explains the differences in classification according to the specific and varied types of livestock manures or fertilisers: Ireland distinguishes farm manure, chemical fertilisers, and other fertilisers; Germany distinguishes straw manures, all other fertilisers including growing substrates together in a single group; NL, DK, BE-FL, SP-CA distinguishes solid, liquid and chemical:

***Typology of the effluents (each colour corresponds to a class of fertilisers)***

| Typology | IR | DE | NL, DK, BE, SP |
|---|---|---|---|
| Solid livestock manures | | | |
| *Manure* | * | ** | |
| * *Solid animal waste*<br>* *(Droppings)*<br>* *Solid phases from separation* | | | |
| Liquid livestock manures<br>* *Slurry*<br>* *Liquid manure*<br>* *Urine*<br>* *(Droppings)*<br>* *Liquid phases from separation* | | | |
| Other organic fertilisers<br>* *Composts,*<br>* *Mushroom farm litter*<br>* *Treatment plant sludge*<br>* *Silage*<br>* *Digestates* | | | *** |
| Chemical fertilisers | | | **** |
| Other,<br>* *Soil products*<br>* *Growing substrates, crop additives* | | | |

*** farm manure, ** straw manure, *** according to whether liquid or solid**
****** Spain: distinguishes the sub-category of chemical fertilisers with slow decomposition (coated, etc.)**

## 2.2 Prohibited periods for applying fertilisers

Land applications are prohibited during the coloured periods of the following tables, which initially show these prohibitions for each fertiliser and for grasslands then, on the next page, summarise the prohibitions for examples of crops and soils:

***prohibition for manure***

| country | | June | VII | VIII | IX | X | XI | XII | I | II | III | IV | May |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BL | Manures and composts | | | | | | | | | | | | |
| NL | Solid manures and dry treatment sludge on arable, clayey, peaty land with the exception of grasslands | | | | | | | | | | | | |
| NL | Land application of manures and dry treatment sludge on arable, clayey, peaty land with the exception of grasslands | | | | | | | | | | | | |
| DK | Solid effluents and silage | | | | | | | | | | | | |
| ES | Winter cereals, manure | | | | | | | | | | | | |
| | Spring cereals, manure | | | | | | | | | | | | |
| | Citrus fruits, manure | | | | | | | | | | | | |
| IR | Farm manure | | | | | | | | | | | | |
| DE | DWTP (Drinking Water Treatment Plant) sludge compost manure | | | | | | | | | | | | |

***prohibition for slurry***

| country | | June | VII | VIII | IX | X | XI | XII | I | II | III | IV | May |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BE-FL | Land application prohibited on Sundays, public holidays and, along the seashore, on Saturdays | | | | | | | | | | | | |
| | DWTP slurry and sludge on any arable land and on any crops | | | | | | | | | | | | |
| DK | Liquid effluents with the exception of silage | | | | | | | | | | | | |
| ES | Winter cereals, slurry, vulnerable zones 3, 6, 7,10 | | | | | | | | | | | | |
| | Spring cereals, slurry | | | | | | | | | | | | |
| | Citrus fruits slurry | | | | | | | | | | | | |
| IR | Slurries Other organic fertilisers | | | | | | | | | | | | |
| DE, | Crop land/major crops | | | | | | | | | | | | |
| draft order | Market gardening, horticulture | | | | | | | | | | | | |
| | Grasslands slurry | | | | | | | | | | | | |

***case of grasslands***

| country | | June | VII | VIII | IX | X | XI | XII | I | II | III | IV | May |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NL | Land application of manures and dry treatment sludge on arable, clayey, peaty land with the exception of grasslands | | | | | | | | | | | | |
| | Land application of DWTP slurry and sludge on any arable land and on any crops | | | | | | | | | | | | |
| DE | Grassland (draft order) | | | | | | | | | | | | |

***presentation by country***

| country | | June | VII | VIII | IX | X | XI | XII | I | II | III | IV | May |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BE-FL | Land application prohibited on Sundays, public holidays and, along the seashore, on Saturdays | | | | | | | | | | | | |
| | Manures and composts | | | | | | | | | | | | |
| | Livestock fertiliser on clay (with the exception of permanent grasslands) | | | | | | | | | | | | |
| NL | Solid manures and dry treatment sludge on arable, clayey, peaty land with the exception of grasslands | | | | | | | | | | | | |
| | Grasslands | | | | | | | | | | | | |
| | Arable, sandy and loamy land, all crops | | | | | | | | | | | | |
| | DWTP slurry and sludge on any arable land and on any crops with the exception of grassland | | | | | | | | | | | | |
| | Grasslands | | | | | | | | | | | | |
| DK | Liquid effluents with the exception of silage | | | | | | | | | | | | |
| | Solid effluents and silage | | | | | | | | | | | | |
| ES (42 case: qq ex) | Winter cereals, manure | | | | | | | | | | | | |
| | Winter cereals, slurry, vulnerable zones. 3, 6, 7,10 | | | | | | | | | | | | |
| | Winter cereals, chemical fertiliser | | | | | | | | | | | | |
| | Spring cereals, manure | | | | | | | | | | | | |
| | … slurry | | | | | | | | | | | | |
| | … chemical fertiliser | | | | | | | | | | | | |
| | Citrus fruits, manure | | | | | | | | | | | | |
| | … slurry | | | | | | | | | | | | |
| | … chemical fertiliser | | | | | | | | | | | | |
| IR | Farm manure | | | | | | | | | | | | |
| | Other organic fertilisers | | | | | | | | | | | | |
| | Chemical fertilisers | | | | | | | | | | | | |
| DE, draft order | Crop land/major crops | | | | | | | | | | | | |
| | Grasslands | | | | | | | | | | | | |
| | Market gardening, horticulture | | | | | | | | | | | | |
| | DWTP (Drinking Water Treatment Plant) sludge compost manure | | | | | | | | | | | | |

A few comments on the table by country:

- In Denmark, and Germany (according to the current status of its draft fertilisation order), prohibition starts at the end of the summer harvest; it finishes on 1 February (for liquid effluents), or 31 January respectively; derogations are possible:

    1. in Denmark, for slurry on rapeseed or on grasslands, which can be applied up to 1 October;

    2. in Germany, 60 kg of organic nitrogen can be applied per hectare before 1 October also on rapeseed, ryegrass, catch crops, winter barley or nitrogen-fixing intermediate crops (CIPAN); to date, straw manures are not subject to restriction; this may change in the next fertilisation order;

- In Ireland, Belgium/Flanders, and the Netherlands, specific, and relatively different calendars exist depending on the fertilisers; the following specific features can be noted:

    1. in Flanders, prohibition is generally from 1 September to 15 February; for the remainder of the year, it is prohibited to apply fertiliser at night, on Sundays and public holidays (and on the seashore, also on Saturdays); relaxations are possible for manures and composts (prohibited only from 15 November to 15 January), or even for nitrogen-fixing intermediate crops, which may benefit from a time lag;

    2. in the Netherlands, prohibition mostly extends from 1 September to 1 February, but it is combined with numerous special conditions, and a noteworthy exemption: solid manures and dry treatment sludge can be applied all year round on arable land covered with vegetation;

    3. In Ireland (grasslands included):

        - *Farm manure:* from 1 November to 12 (zone A), 15 (zone B) or 31 (zone C) January.

        - *Other organic fertilisers:* from 15 October to 12 (zone A), 15 (zone B) or 31 (zone C) January.

        - *Chemical fertilisers:* from 15 September to 12 (zone A), 15 (zone B) or 31 (zone C) January.

    4. In Catalonia: the calendar of prohibitions is more detailed; it takes into consideration the type of fertiliser, the type of crop, the use of irrigation or not and the type of vulnerable zone, etc.

Conclusion: in the countries visited, the prohibited periods for applying fertilisers differ mainly according to 2 types of climate:

- on the one hand in Northern Europe, prohibition to apply fertilisers during the autumn and winter when the risks of leaching by rain are high especially if the soils are uncovered between two crops;

- on the other hand in Southern Europe, prohibition to apply fertilisers mainly in spring and summer when the soil is uncovered between two harvests and the two months preceding the next sowing (with the exception of irrigated crops).

Within each type of climate, the countries describe in detail these prohibited periods fairly accurately according to the types of fertilisers and types of crops.

## 2.3 Storage capacities

### 2.3.1 Storage pits and areas

The land application prohibition period goes hand in hand with an obligation for liquid-tight storage of animal dung throughout this entire period. The required storage time varies from 4 to 7 months according to the climate and type of livestock farming. The

minimum storage capacity is calculated by multiplying the number of months of prohibition of applying fertiliser by the monthly production (in volume) for a certain number of types of animals and livestock farming methods. These production data are the same as those that are used (but expressed in kg of nitrogen) for the fertilisation balance. The necessary storage capacity therefore varies with the prohibition times but also with the type of livestock farming. The calculation of storage capacities necessary for each farm is specified in all of the action programmes, but it is fairly specific from one country to another. This storage corresponds to significant investments, so each country tries to stay as close to reality as possible in order to limit the investments.

These calculations in particular are based on fixed excretion values by animal and by type of livestock farming method; the Netherlands: 66 types, Catalonia: 52, Ireland: 22, etc. The regulatory storage time is used to determine the volume of storage. The degree of detail of the tables that are used to determine the necessary volume of storage varies significantly from one country to another with a highly variable number of types of livestock farming methods.

***Storage capacities in months***

<table>
<tr><th></th><th>BE (Flanders)</th><th>NL</th><th>DK</th><th>SP (Catalonia)</th><th>IR</th><th colspan="2">DE</th></tr>
<tr><td>Cattle</td><td rowspan="3">Stable manure: 3 months<br>9 months minimum for animals in buildings; 6 months with free range</td><td rowspan="3">7 months min.</td><td rowspan="3">6 months min.</td><td>Manure: 6 or 7 months according to zone and irrigation</td><td>16, 18, or 22 weeks according to the zone</td><td rowspan="3">6 months min.; 9 months in 2020?</td><td>Straw manure: currently free; next order: 4 months minimum</td></tr>
<tr><td>Pork pigs</td><td>Slurry: 4, 5, 6 months according to zone and irrigation</td><td>100 pigs and over: 26 weeks</td><td></td></tr>
<tr><td>Chickens</td><td>Dry droppings: 5 or 6 months according to irrigation zone; liquid droppings: as slurry above</td><td>2,000 spaces for poultry and over: 26 weeks</td><td></td></tr>
</table>

Remarks:

- Ireland: the volumes treated or exported outside of the farm are deducted from the mandatory storage capacities. The storage capacities can be reduced for livestock other than dairy cows, if they spend the winter grazing without producing more than 85 kg of N/ha (or 130 for deer, goats and sheep) during prohibited periods for applying fertilisers;

  Polluted water storage (10 or 15 days of production), and silage storage are also specified according to the standards on necessary capacities for 4 types of fodder and 2 types of storage.

- Belgium/Flanders: farmers must export or treat anything that they cannot apply. The joint storage of effluents by several farmers is possible. A farmer has the right to have smaller storage capacities if they can demonstrate that they can export their livestock manure.

- Germany: according to the current terms of the fertilisation order, the minimum storage capacity for effluents is 6 months; the draft order specifies 9 months by 2020; to date, straw manure is not subject to this requirement, but a storage of 4 months on liquid-tight ground may be required.

- The Netherlands: the minimum storage time for effluents is 7 months, but numerous exceptions are specified justified by a scientific committee, whose work is recognised by the Commission; farmers must export anything that they cannot apply.

- Spain (Catalonia): minimum storage capacities ranging from 4 months for animal dung (farms generating slurry and located in irrigation zones with a predominance of grass) up to 7 months (farms generating manure and located in mainly perennial dry crop zones).

The Commission's action has led to an increase in the minimum number of months of production of effluents to be stored in the regulations of all countries. This corresponds to the months of prohibited land application, with the exception of Spain where animals are not necessarily in livestock buildings during those periods.

### 2.3.2 Field storage

This type of storage is generally considered as temporary, and intended to facilitate transport before land application. Under no circumstances does it give any country the right to reduce the capacities of the above-mentioned storage pits and areas.

The maximum field storage times accepted by the Commission vary considerably from one country to another as shown in the graph below, because highly varied constraints are associated to these times:

In some countries, field storage is prohibited:

- The Netherlands, but this prohibition is related to one major exception: manure can be applied all year around if the soils are clayey and covered with vegetation;

- Belgium/Flanders: only the storage of solid livestock fertilisers is allowed for a period of one month maximum. For this category, field storage is not possible between 15 November and 15 January. In any case the stored fertiliser must be covered and a limit of 10 m minimum must be respected between the stored fertiliser and the boundary of the plot, or water course.

Field storage is possible in other countries, in increasing order of duration:

- Catalonia: maximum of 4 months if the dry matter is greater than 20%, otherwise this duration is reduced to 45 days. Poultry droppings must be covered with a watertight tarpaulin;

- Germany: 6 months maximum for manures, 48 hours maximum for poultry droppings (time limit for transfer and land application);

- Ireland: Field storage is only authorised during authorised land application periods, in order to favour, it would seem, the organisation of the farmer's work (transport). Therefore, its duration may not exceed 11 months. Storage sites must be located at least 20 m away from water courses and a certain distance away from drinking water supply sites and karsts (50 to 200 m);

- Denmark: maximum storage of 12 months is permitted for composted effluents (with minimum content of 30% of dry matter), provided that the stock is located at least 15 m away from water courses, and 25 m away "from a water supply zone". A register of stored manure exists, because the piles can only come back to the same place after 5 years[6].

## 2.4 Limitations of land application

### 2.4.1 Case of waterlogged soils

In accordance with the directive in its appendix defining good agricultural practices, the countries studied prohibit land application on waterlogged, wet or flooded soils. To specify these situations, some countries identify specific meteorological or agronomic conditions: "flood plains", "waterlogged soils", "weather (rain announced)", and "risk of flooding". Indeed, these factors may increase the risks of inappropriate flows of nitrogen towards the environment.

- Ireland: prohibition is extended to flood plains or waterlogged land when rain is forecast within the next 48 hours;

- Germany: prohibition concerns waterlogged soils and flooded land;

- Spain (Catalonia): land application is authorised in flood plains but only outside of flood risk periods, incorporation is mandatory on the day of application; application is prohibited on flooded soils except if the crop makes this inevitable (case of rice).

### 2.4.2 Case of frozen and snow-covered ground

The directive stipulates (Appendix II, point A, § 3) that the codes of good agricultural practice must include provisions on the land application of fertilisers on frozen or snow-covered ground and that the fertilisation balance of the action programmes must take climatic conditions into account (Appendix III, point 1 § 3).

The countries visited produce fairly diverse definitions of "frozen ground". Those where the climates are the most severe give rules or practical guidelines (mechanical

[6] In other countries, the period of time after which the piles of manure can come back to the same place has not been specified

possibility of rapid ploughing in, measurement of the thickness effectively frozen, thaw throughout the day, absorption potential by vegetation during the thaw, absence of risks due to the condition of the ground or leaching, and temperature on the surface of the ground).

| | Germany | Belgium Flanders | Denmark | Spain Catalonia | Ireland | The Netherlands |
|---|---|---|---|---|---|---|
| Frozen ground: prohibition | Ground is frozen if it is agglomerated and does not thaw on the surface throughout the day. | | Mandatory thaw over 20 cm throughout the day | Thawing throughout the day allows this | | |
| Snow-covered ground: prohibition | In the current text, t land application authorised if snow cover < 5 cm thick. | | Prohibition on snow-covered ground over more than 90% of the surface snow cover > 0.5 cm thick. | Prohibition | | Dry snow cover is taken into account not surface sleet. |
| Other considerations | - vegetation absorption capacity<br>- absence of risks of leaching, clogging | | ploughing in within 6 hours | | Verification before land application by measuring the surface temperature of the ground | Persistent freezing Specific case for certain soil types-crop pairs frozen clayey soil with a cereal crop |

- Denmark imposes thawing over a thickness of 20 cm throughout the day and ploughing in within 6 hours of the fertilisers applied to uncovered soils. Land application is prohibited on snow-covered ground. Ground is considered to be snow covered when more than 90% of its surface is covered and when the layer of snow exceeds 0.5 cm thickness;

- Germany (Bavaria) prohibits land application on frozen ground but tolerates exceptions if there are no risks of leaching or clogging if the plant cover can absorb the fertilisation during the thaw; the regulations under reform estimated that the daily thawing of the ground was sufficient for it not to be considered as frozen: the new definition (draft order) is the same: ground is frozen at depth if there is no surface melting throughout the day. Land application is prohibited on snow-covered ground (previously, land application was prohibited if snow cover was more than 5 cm);

- The Netherlands consider that ground is snow covered when it is completely covered with "dry snow" (no sleet) and that the meteorological conditions indicate "persistent freezing"; and that ground is frozen when slurry cannot be applied because it cannot be ploughed into the soil. One exception is specified for land application of fertilisers on frozen clayey soil growing a cereal crop and under certain meteorological conditions;

- In Ireland, the temperature is checked using a thermometer placed on the ground;

- In Catalonia, ground is defined as frozen if it does not thaw throughout the day;

***Summary presentation of the characteristics used***

| Arguments used | Germany | Denmark | Spain | Flanders | Ireland | The Netherlands |
|---|---|---|---|---|---|---|
| for frozen ground | | | | | | |
| • agglomerated | X | X | | | | |
| • freezing thickness | | X (20 cm) | | | | |
| • thaw throughout the day | | | X | | | |
| • surface thaw | X | | | | | |
| • weather forecast of persistent freezing | | | | | | X |
| • surface temperature > 0° | | | | | X | |
| • possible ploughing in | | X (6 h) | | | | |
| • plant/absorption capacity | X | | | | | |
| • leaching, clogging risk | X | | | | | |
| for snow-covered ground | | | | | | |
| • level of cover | | X (> 90%) | | | | |
| • thickness | | X (> 0.5 cm) | | | | |
| • type of snow (dry snow and no sleet) | | X | | | | X |
| prohibited / authorised | | | | | | |

### 2.4.3 Distance to water courses

The report commissioned by the Commission, "recommendation for the measures relating to Directive 91/676" (final report of the Wagenigen consortium – December 2011 Part D – § 3.7 p. 56-57), gives general recommendations on the conditions for applying fertilisers close to water courses.

On one hand, this report notes that there is a risk of applying fertiliser directly on aquatic surfaces due simply to the lack of precision of the devices or inappropriate work of operators. On the other hand, indirect pollution of the surface waters may be

caused by leaching or lixiviation and may be significant on sloping land, soils with low seepage capacity and highly permeable soils. Buffer strips may prove to be effective, but their effectiveness depends on their width, the plant cover, the soil, the sub-soil and the hydrology.

Along aquatic surfaces potentially sensitive to eutrophication but not disturbed, the report recommends buffer strips that are at least 25 m wide. Along small water surfaces (small channels, small water courses), the report recommends widths taking into account several factors:

- the slope (by distinguishing slopes less than 2%, slopes from 2 to 8%, and slopes steeper than 8%),
- the method for applying fertilisers (application, injection),
- the type of water course (small drainage channel, small natural water courses).

In the case of pastures, the need for appropriate fences is pointed out. The report notes that the pattern of rainfall, the relief, slopes, types of soils, underlying rock masses, and agricultural practices also need to be taken into account.

The various European countries have frequently drawn up their regulations taking the slope as the first element then specifying the additional constraints adapted to their specific conditions which are fairly diverse. In order to clarify the comparison, the following tables distinguish the situations of gentle, moderate or steep slopes.

They show how much the minimum distances cited vary in the various regulations (the minimum cited being 50 cm for the Netherlands, 1 m for Germany, 2 m for Denmark, etc.) but this corresponds to different situations; each country has its own definition of what is a "water course", which finds its basis in texts other than those taken pursuant to the Nitrates Directive.

#### *2.4.3.1 Gentle slopes and proximity of water courses*

| Germany | Belgium-Flanders | Denmark | Spain (Catalonia) | Ireland | The Netherlands |
|---|---|---|---|---|---|
| Draft: if slopes less than 4%: Prohibition within 4 m, reduced to 1 m in the event of precise land application. Order that is coming to an end: minimum distance of 3 m, distance reduced to 1 m in the event of precise land application. | It is prohibited to apply fertiliser: 1° within 5 metres inland, from the upper edge of the embankment of the surface water body; 2° within 10 metres of the Flemish ecological network; 3° within 10 metres when a steep slope is adjacent to the surface water body. | Buffer strip of 2 m mandatory along lakes (> 100 m2) and natural water courses (APAE II). From 2012 (CGA (French General Council for Agriculture)), creation of 10 m buffer strips without crops (with the exception of permanent grassland or energy crops), or crop protection products, or fertilisation along the largest water courses and lakes. | On slopes less than 10% for natural water courses appearing on the 250,000 scale map, the land application of type 1 and 2 fertilisers is authorised: - beyond 5 m if land application is carried out at ground level, - otherwise beyond 15 m of distance. | General prohibition of land application - mineral nitrogen < 2 m from a water course, - organic nitrogen < 5 m (10 m within 15 days preceding or following land application). - farm manure < 20 m. Close to a karst: 15 m for organic N and 50 m for manure. Close to a lake: 20 m. Additional constraints may be set by the local authorities or in karstic land | No land application within 50 cm on covered ground and within 5 m on uncovered ground. |

It is noted that some countries reduce the land application prohibition distances[7] close to surface waters (Germany, Spain) for gently sloping land provided that the application is carried out using precision equipment.

[7] Except dung in pasture

#### *2.4.3.2 Moderate slopes and proximity of water courses*

| Germany | Belgium-(Flanders) | Denmark | Spain (Catalonia) | Ireland | The Netherlands |
|---|---|---|---|---|---|
| Prohibition in the case of slopes > 10% and risk of leaching on non-agricultural neighbouring land<br>Along a water course: prohibition < 5 m, from 5 m to 20 m immediate ploughing in:<br>-- if uncovered ground, sown in the case of crops in lines, or<br>-- if sufficient cover in the case of no crops in lines,<br>-- if after nitrogen-fixing intermediate crops or direct sowing. | On steeply sloping land, fertiliser must be applied:<br>1° on cultivated soils via injection for livestock manure or other liquid fertilisers;<br>2° on uncultivated soils in a single operation via injection for livestock manure,<br>by direct ploughing in for chemical fertilisers<br>solid chemical fertilisers must be ploughed in within one hour following land application. | in the case of slopes steeper than 10%, prohibition to apply livestock manure, digestates and chemical fertilisers in a buffer zone of 20 m along water courses, lakes (> 100 m2) and coastal waters. | On slopes > 10% if natural water courses appearing on the 250,000° map, authorised application of type 1 and 2 fertiliser:<br>- beyond 25 m if land application is carried out at ground level,<br>- otherwise beyond 50 m | In the case of slopes steeper than 10% no livestock fertilisation within 10 m of surface waters.<br>In the case of slopes steeper than 15% Prohibition of land application on crops other than grassland | In the case of slopes between 7% and 18%: Land application of manure is authorised<br>- if sowing is carried out within 8 days (with the exception of potatoes, sugar beet).<br>- if the slope is less than 300 m long and is divided into strips within 100 m of a crop (other than potatoes, sugar beet.) |

### 2.4.4 Steep slopes

The definitions of a steep slope differ depending on the countries; some indicate a maximum gradient beyond which any land application is prohibited: the Netherlands (18%), Spain (15%), Ireland (15% increased to 20% in the case of grasslands).

Some stipulate provisions for moderate slopes, i.e. from a much lower gradient than that above which land application is prohibited:

- Germany – Bavaria: the regulations do not give gradient thresholds for defining steeply sloped ground but take into account the absence of leaching from a moderate slope (10%).

- Belgium – Flanders: above a gradient of 15%, land application is prohibited on arable soil. Without describing in detail the gradients below this limit, indications are given to take into account the types of effluents, and the types of soil cover for which ploughing in or injection are mandatory.

- Denmark does not indicate slope thresholds, but lays down rules according to the types of effluents and the proximity of water for moderate to steep slopes.

| Germany | Belgium-<br><br>(Flanders) | Denmark | Spain (Catalonia) | Ireland | The Netherlands |
|---|---|---|---|---|---|
| in the case of slopes steeper than 10% prohibition if **risk of leaching** on neighbouring land | The land application of fertilisers is prohibited on plots of arable land with slopes > 15%. | For slopes from 10 to 21% the following are excluded:<br>- **digestates** of plant origin<br>- **effluents, liquid phases** of less than 12% MS,<br>- land application **via injection of effluents close to water**<br>- liquid chemical fertilisers. | steeper than 15%, prohibition | In the case of slopes steeper than 15% prohibition of land application on crops other than grasslands. For slopes steeper than 20% Prohibition of land application including on grasslands | Steep slope (> 18%): prohibited |

## 2.5 Fertilisation balance

The land application regulations must be based on a balance between the foreseeable nitrogen requirements of crops and the nitrogen supply to crops from the soil and from fertilisers. This balance is checked using calculations made based on standard data (or standards) established by the national (DK, IR, NL) or regional (SP, BE, DE) authorities. The degree of detail seems irrespective of the possibility or not of using real data or derogations. In the most "regulated" and restricted situation, the standards to be used are updated every year based on the results of the monitoring sites and data collected; the tools thus proposed are considered effective by farmers (DK).

According to the nitrogen pressure and the size of the country (surface area/number of farmers), the supervision and monitoring of fertilisation are administered to varying degrees. Treatments and exports of quantities of organic nitrogen produced above the regulatory land application capacities (BE-FL, NL) are combined with the willingness to promote livestock manure as much as possible and to give preference to them whilst restricting the use of mineral nitrogen (DK). Accurate knowledge of the fertiliser flows is necessary to control the implementation of provisions relating to this balance requirement.

It is noted that the data supplied by research bodies and approved by a scientific committee receive favourable credit from the Commission.

Finally, the fertilisation balance takes into account the addition of phosphorus in most cases. In fact, this constitutes a highly limiting factor in high livestock density zones.

### 2.5.1 Limit of nitrate inputs on crops

For most cases[8], this involves not exceeding a total nitrogen limit calculated for each crop for each farm. The standards used for each crop vary according to:

[8] In DE, currently there is no limit per crop strictly speaking, but the draft fertilisation order stipulates regional maximums per crop.

- their yields (DE),
- previous crops (DK, NL) or succession of crops (BE-FL),
- the nature of the soils (4 in DK, 2 in BE-FL, 5 in NL),
- irrigation possibilities (DK, SP),
- types of fertilisers (BE-FL, SP).

There is a great deal of data (276 standards in DK, 210 crops/5 soil types in NL, etc.); they are presented in the form of tables. The use of national (DK) or regional (DE) software applications facilitates their usage by farmers or their advisers. High-performance databases of the crops in place on a given farm, are compiled using CAP files.

The target yield standards relate to national (NL, IR) or regional (SP, BE) data. The yield variations may also be taken into account by adding or removing a quantity of nitrogen pro rata of the number of quintals produced; each farmer estimates the requirements for their crops according to their previous yields (DE). The nitrogen limits adopted may stem from an intentionally reduced reference compared to the yields usually noted. (DK) (see 1.2.2.).

Some countries not only indicate the total nitrogen supply limit per crop, but also its breakdown by type of fertiliser:

- organic and mineral (SP-CA),
- animal fertiliser, chemical fertiliser and other fertilisers (BE-FL).

Nitrogen residues from the soil contribute to the requirements of crops; they are calculated (analyses/modelling) and supplied by the authorities (DK), deduced from the succession of crops and/or evaluated based on periodic soil analyses (BE-FL, DE, NL). A "nitrogen index" is used for certain crops, according to the last time grass was cultivated (IR, SP-CA).

**Derogations** to the maximum supply limits calculated are possible:

- if greater requirements are demonstrated (SP-CA for intensive fodder for example, BE-FL for high-yield crops),

- for some types of crops; a few examples:

    - bread-quality wheat (50,000 ha concerned) within the economic optimum limit defined every year (DK);

    - potatoes and numerous vegetables, derogation for a maximum increase of 10%, granted to the plot (BE-FL);

    - sugar beet (+15 kg N/ha year), potatoes (+30), wheat on clay (+15 spring; +20 winter) or spring barley on clay (+30)(NL)

- if the farmer demonstrates through the budget method that they have under-fertilised for 3 years, in the fourth year they can add extra fertiliser (NL);

- exceptionally[9], if there is a risk of loss of a significant part of the harvest, after heavy rainfall (NL).

[9] After opinion by an approved expert.

The derogation may be granted provided that soil analyses are performed and the corresponding technical opinion is followed (BE-FL).

### 2.5.2 Nitrogen production according to animal types

The quantity of nitrogen (and phosphorus) contained in livestock manure is defined on an inclusive basis according to animal types, their age, their zootechnical performance, their livestock farming system (ES-CA, DK, NL) or their feed (DE). The data is established either on a national level (DK, IR, NL, DE), or on a regional level (BE, ES).

| | BE-FL | DE | DK | SP-CA | IR | NL |
|---|---|---|---|---|---|---|
| Number of animal categories taken into account: | 61 | > 70 | (1) | 52 | 27 | 66 |

(1) a great deal of detailed data according to the type of animal, its age and its level of performance; they are also defined by livestock farming system.

These data may change over time (DE, DK).

Grass-fed, open air or semi-extensive livestock farming is taken into account using data specific to this method of farming (NL, DE[10]) or by proportional reductions (SP-CA). They are not listed elsewhere, whether this concerns the standard itself (IR), or whether this farming system is not practised much (DK, BE-FL, SP-CA).

The use of the actual nitrogen productions (noted) from livestock is sometimes authorised. This provision enables farmers to benefit from the efforts that they make to to optimise low N (and P) feed; this concerns:

- pigs: mandatory option, under certain conditions, with a nutritive budget justifying the type of feed (BE-FL), or requiring justification and authorisation from the authorities (SP-CA);

- poultry: possible option with a nutritive budget justifying the type of feed (BE-FL);

- the entire farm (NL), using a specific standard for each farm (holding specific excretion BEX). An "ANCA" (Annual Nutrient Cycling Assessment) system currently tested in the dairy sector based on farm specific references will be extended during the 6th programme, if it obtains satisfactory results.

It should be noted that countries that do not authorise the use of farm specific data, meet this concern of high-performance farmers by:

- updating the data every year according to the zootechnical performances collected by a highly centralised knowledge system (DK). In addition, standard data can be modified using corrective formulas, in the event of deviations observed (amount of milk delivered, slaughter weight, etc.);

- integrating N and P reduced feed in the table of fixed data for pigs and poultry (DE); the draft text may replace the standard level and the "reduced" level with more precise (and higher) values based on the zootechnical performances.

[10] Accurately in the draft fertilisation order.

Quantification of the evaporation of nitrogen from livestock manure at every stage of its use is difficult to identify, because it is not always described in national or regional standards (BE-FL, IR, SP-CA, DK). It is not or hardly taken into account for animals out to pasture (IR, NL, DE).

Nitrogen losses in the stable, in storage, or even during transport, are fixed at a flate rate in order to convert the raw nitrogen content of livestock manure into net flat rate input values at the time of land application (BE-FL, DE).

The evaporation levels noted are variable, according to the stages taken into account, in particular land application itself:

examples:

- for liquid bovine effluent: 10% to 30%
- for bovine manure: 20% to 40%

Levels of effectiveness corresponding to the available nitrogen and that can be used by the crop, throughout the year of land application, are applied to these quantities of organic fertilisers. These levels are indicated to farmers in order to be used in their fertilisation calculations. They are variable between countries, but also over time, within the same country. It has therefore been possible to reinforce them over time to further limit nitrate inputs (DK, NL).

Examples of reinforcements:

- for pig slurry: 55% to 80%
- for bovine slurry: 50% to 70%
- for straw manure: 25% to 45%

A system of land application standards based on the quantity of active nitrogen applied is proposed to farmers, as an alternative to the system based on the total quantity of nitrogen applied. It therefore requires two limits, one for the total quantity of active nitrogen and the other for nitrogen from animal fertilisers, according to the crops (and their successions) and the nature of the soil (BE-FL).

The availability/effectiveness coefficients may depend on the P index[11] or according to the C/N ratio for composts for 5 groups of fertilisers; this concerns the fixed nitrogen inputs from 39 types of organic fertilisers (IR).

### 2.5.3 Fertilisation supervision

Based on crop requirements (and residues) supplied by the authorities, farmers (or their advisers) must devise a fertilisation plan in order to guarantee the balance of their fertilisation. This document, mentioned by the directive for establishment of the code of good agricultural practices, is recommended by all countries. It is explicitly mandatory in the following cases:

[11] The "phosphorus index" indicates the soil's level of richness in phosphorus measured via a soil analysis to be repeated every 5 years.

- for calculating the quota of usable nitrogen for each farm, based on the sum of the requirements of the crops declared to the CAP and according to mandatory standards (DK, NL)

- if fertilisation is greater than 80 kg/ha N/year; it must, if necessary, be completed with a provisional irrigation plan (SP-CA)

The fertilisation carried out is formalised, in all countries, through the keeping of a fertiliser usage register, also mentioned by the directive for establishment of the code of good agricultural practices. However, exemptions are stipulated for small or grassland farms[12] (DE, DK, SP-CA).

These documents are:

- either kept by the farmers and made available to the authorities during inspections (IR, NL, DE, SP-CA[13]);

- or declared directly to the authorities (DK, BE-FL)[14] who then carry out a systematic administrative check.

Compliance with the balance is monitored:

- globally via surveys on certain crops and certain zones, and by ongoing experimentation on the real budget in the dairy sector (NL);

- through a global budget for nitrite fertilisation (on the farm) generalised to apply to the entire territory with a balance that must not be exceeded on farms as a three-year average (DE);

- through nitrate residue thresholds per ha to be respected after harvest: the values not to be exceeded varying according to the crops and soil types (BE-FL);

- through administrative checking and analyses (DK);

- through on-site document checking (See checks 3.3).

## 2.6 Limitation of fertiliser inputs from livestock

### 2.6.1 General situation

Among the mandatory measures of the Nitrates Directive, care should be taken to ensure that the quantity of livestock manure applied annually does not exceed a quantity containing 170 kg of nitrogen per hectare.

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[12] Grasslands receiving less than 100 kg N/ha (during grazing and without other fertilisers), farms of less than 10 ha UAA or fertiliser < 500 kg N/farm/year (DE); farms that have less than 10 LU or a load of less than 1 LU/ha or receiving less than 25 t of livestock manure (DK); farms that have more than 50 ha non-irrigated or 25 ha irrigated or less than one ha of greenhouses or 4 ha as horticulture (ES-CA).

[13] The next action programme (under negotiation) plans the computerisation of these measures, with remote declaration of the provisional plan and logbook which can be updated when land applications are carried out, for any farm larger than 2 ha.

[14] The declaration is global for the farm and not for each plot (BE-FL)

To meet this requirement, some countries supervise the use of livestock manure using declarations transmitted on an annual basis by farmers and cross-checked with the national data[15] (BE-FL, DK) limiting their use in the standards distributed for each crop (SP-CA, BE-FL, DK, NL).

Other countries have adopted a system of equivalence of animal numbers and their nitrogen (and phosphorus) productions:

- Definition of a Livestock Unit (LU) corresponding to approximately 100 kg of nitrogen produced; a table, updated every year, defines the corresponding number of livestock units and quantity of nitrogen for each type of animal and production system. Livestock manure application therefore can be no greater than 1.4 LU/ha for pigs and poultry (in order to take into account phosphorus inputs) and 1.7 LU/ha for cattle, sheep or goats (DK).

- Creation of "nutritional element emission rights" managed by the authorities to limit the number of animals present on each farm. Provided they respect this outline, farmers are free to change their animal types, develop their farm[16] while treating the additional effluents, and buy or sell the rights with other farmers (BE-FL).

- A phosphate quota replaces a dairy quota (2013 is used as a reference) (NL).

In the event of excess nitrogen for its own land application capacities, the farm must "export" the excess proportion of its livestock manure outside of the farm. The options include:

- the transfer of raw effluents to other farms that are able to recycle them (all countries), with monitoring of the flows through knowledge of contracts (DK) or by monitoring effluent transfers (BE-FL, DK, NL);

- transformation or treatment by:

    - methanisation (DE, NL, BE-FL),
    - composting (DE, NL),
    - biological treatment (BE-FL, NL),
    - burning (e.g. poultry droppings NL), for cement works.

Transformed products are "exported" raw or dehydrated (following phase separation) in the form of easy-to-transport and phosphate-concentrating granules.

To guarantee monitoring of what happens to the effluents, some countries have implemented treatment certificates, issued by the authorities (BE-FL) or mandatory declarations at every stage (DK).

To provide a little flexibility to farms located in particularly dense zones, it is mandatory to treat and/or export any increase in effluent production (BE-FL, DE, NL, draft under way for SP-CA), sometimes with the need to acquire additional land at the same time (NL).

[15] CAP data, animal identification, declaration from fertiliser distributors, etc.

[16] Subject to an ecological authorisation necessary for any extension, issued by the authorities.

A question hanging in the balance: Chemical or organic nitrogen?

To date, fertilisers manufactured from organic waste are themselves considered as organic by the European regulations, even if they look and behave like mineral fertilisers. This is the case of digestates from methanisation and to which an animal product/plant product ratio must be applied to calculate the final organic nitrogen input in order to comply with the quantity of 170 kg N/ha/year. The same applies with ammonium sulphate from the stripping of ammonium vapours produced during transformation processes or recovered in livestock buildings.

The fact of not being recognised as "chemical" fertilisers, not counting livestock manure, significantly limits their recycling. The change in status of these fertilisers may be considered. There is a strong demand for this in the Netherlands.

### 2.6.2 Derogations to the limit of land application of 170 kg of organic N/ha/year

The directive lays down the possibility for Member States to authorise the land application of a quantity of effluents above the threshold of 170 kg per hectare, subject to justification of target criteria and examination by the Commission and vote by the Nitrates Committee. This derogation is granted to the Member State for a period of 4 years. Authorisations are then issued on a yearly basis to each farmer that makes a request, according to the criteria set out by the authorities (and validated by the Commission).

5 out of the 6 countries visited requested this derogation, in order to better recycle nitrogen from livestock manure to reduce the mineral nitrogen inputs (IR, DE) and/or to absorb an excess production of organic nitrogen (BE-FL, DK, NL).

Bovine, mainly dairy, livestock benefit from this derogation: although it concerns less than 1% of German farms, it affects 11 to 13% in Ireland or in Belgian Flanders (approximately 6% of the UAA), and reaches 27% in the Netherlands (i.e. 58% of livestock and 30% of grassland surfaces).

***Table of derogations granted to the Member States visited***

| country | limit (kg/ha N) | % UAA | % farms |
|---|---|---|---|
| DE | 230 (suspended) | <1 | <1 |
| DK | 230 | 4 | 3.2 |
| BE-Fl | 250 | 12 | 10 |
| IR | 250 | 5.2 | 11.4 |
| The Netherlands | 250 (farms with more than 70% of grasslands) or 230 (sandy and loamy soil and more than 80% of grasslands)) | 45 | 32 |

- Some derogations are granted per plot (BE-FL)
- 250 kg N/ha on grassland or on corn with grass sown before or after harvesting, grassland or rye cut followed by corn
- 200 kg N/ha on winter wheat followed by a catch crop or on sugar beet

In order to be authorised to depart from the 170 kg N/ha/year, farmers must meet certain conditions:

- farm 80% of UAA as grassland (IR, NL) or practice 4 cuttings per year on plots with derogations (DE) or not exceed the corresponding animal load per hectare (DK);
- have a fertilisation plan (BE-FL, IR, NL) and a record of the continuous use of fertilisers (NL);
- carry out soil analyses (N and P) yearly (BE-FL, IR) or every 4 years (NL);
- limit phosphate fertilisation (BE-FL, DE, DK, IR, NL)
- other constraints may be added such as conditions on N and P content, sowing and ploughing dates (BE-FL), and other limits[17] (DK). The European Commission also requests reinforced on-site checks, i.e. 5% (BE-FL, DK, IR) to 7% (NL) instead of 1%.

When examining the request for renewal of the derogation, the Commission had to reinforce its requirements in all of the countries visited. This was the case for taking into account a national phosphorus limit (NL), but also for reinforced monitoring of waters (BE-FL) and for modelling of the impact on the quality of the receiving body of water (IR), for monitoring the transport of effluents (BE-FL), and for carrying out a global nitrogen budget in all of the farms of a territory (DE), etc.

[17] Plant digestates can be applied up to 170 kg N/ha in the same way as livestock manure. Therefore, the sum of the plant and animal digestates must not exceed 230 kg N/ha.

To date, the German request for renewal of the derogation has been suspended for the last two years, due to adoption of a new order on fertilisation (under discussion), that takes into account the Commission's latest recommendations.

## 2.7 Additional measures and reinforced actions

The additional measures and reinforced actions included in the action programme and that become mandatory within the meaning of Article 5 paragraph 5 of the directive vary significantly. Some countries have very few, and others develop them more broadly.

However, it should be highlighted that the visits have not always made it possible to distinguish between the measures considered as being part of the ND action programme, the measures under large scale experimentation with a view to ultimately deciding to make them subsequently mandatory under the ND or even those implemented under other directives. Indeed, some States may offer voluntary programmes with patrimonial objectives, anticipating the implementation of mandatory measures, such as Bavaria and Bade-Wurtemberg. These voluntary programmes also use very diversified partnerships, such as the Kooperation programme in Lower Saxony (drinking water distributors, farmers, water consumers, tax departments).

### 2.7.1 Nitrogen-fixing intermediate crops and catch crops

During the trips, from the information sent by the contact persons it was not always possible to clearly distinguish, on the one hand, the information concerning nitrogen-fixing intermediate crops in the strict meaning of nitrate traps (i.e. crops destroyed and thus releasing the nitrogen trapped for the benefit of subsequent crops during the next spring), and on the other hand, the information concerning catch crops, which may sometimes be winter grasslands harvested for fodder and which are therefore similar to simple intercropping.

- In Bavaria, the surface area of nitrogen-fixing intermediate crops would be 44,789 ha (winter grasslands) and 88,122 ha of crop residues;

- In Denmark, the nitrogen-fixing intermediate crops are fairly well developed. The increase in surface areas of nitrogen-fixing intermediate crops is noted for high-risk zones under the WFD. Soil coverage is mandatory for farms of 20 ha, fertilisation inputs on nitrogen-fixing intermediate crops are prohibited and these cannot be destroyed before 20 October. Soil covering requires a surface area of nitrogen-fixing intermediate crops established according to the livestock density (expressed in number of livestock units per hectare – LU/ha "livestock unit/ha"): for establishments that have a livestock density < 0.8 LU/ha, the mandatory covering of nitrogen-fixing intermediate crops amounts to 10% of the UAA with a reduction in quota of 17 kg N/ha; when the density is > 0.8 LU/ha the mandatory covering is 14% of the UAA and the reduction in quota is 25 kg/ha;

- In Catalonia, nitrogen-fixing intermediate crops are not included in the action programmes, but this measure would however seem interesting when the soil, climate, irrigation and crop itinerary conditions are right.

### 2.7.2 Grass strips

The mission notes that in most cases the practice of grass strips is a voluntary measure assisted under agri-environmental measures (AEM) (2nd pillar of the CAP). Some measures regarding grass strips are in fact prohibitions for land applications close to water courses.

- Denmark stipulates buffer zones of 2 m along the edge of natural water courses (APAEII) and lakes larger than 100 $m^2$. For 10% to 21% slopes, 10 m wide buffer zones without crops (unless grassland or energy crops) without fertilisation or pesticides is stipulated along the banks of the largest water courses;

- Bavaria has 7,953 ha of grass areas and 2,577 ha of grass strips along water courses and sensitive areas;

- The Netherlands: the pressure on the land is such that this measure is not taken into consideration;

- Ireland: the country is in itself a huge grass zone;

- Spain (Catalonia): no information on the notion of grass strips. Nevertheless, a land application prohibition zone is stipulated along water courses of varying width according to the slope and method of land application. In this country, the most severe agricultural constraint is water shortage.

### 2.7.3 Treatment of effluents

As indicated in the § above on limitation of the land application of livestock-origin fertilisers, three countries (BE-FL, DE and NL) have made the treatment of livestock manure mandatory when the quantities of nitrogen to be applied on a given territory exceed the usage capacities by grasslands and crops, and one region (SP-CA) is about to do this.

## 2.8 Land application practices implemented

The mission has also noted that the practices vary a great deal according to the States:

Examples:

- in the Netherlands, it is prohibited to plough grasslands, but a number of exceptions exist for specific cases; in Ireland ploughing of grasslands is prohibited for 6 weeks: from 16 October to 30 November. Some herbicides are prohibited in Ireland (glyphosate);

- slurry application using nozzles is prohibited in Denmark, and Belgium (Flanders);

- ploughing in must be immediate in Denmark, Germany, Belgium (Flanders), and the Netherlands, either by direct injection, or by ploughing immediately after application. This requirement encourages the use of direct injection equipment which also limits the evaporation of nitrogen and thereby prohibits land application on frozen ground.

# 3 Assistance

Assistance with implementation of the Nitrates Directive requires varied actions, the nature, organisation and magnitude of which depend on the agricultural and environmental context and combine with the administrative organisation, professional, organisation and organisation of agricultural research and development (in the outreach sense) in each country concerned. The mission was able to note that although they were organised differently in each country, similar types of actions were implemented for technical assistance.

## 3.1 Establishing "standards" and adapting them to situations

The action programme consists of measures that aim to balance the nitrogen budget of crops and limit nitrogen leaks into the environment. These budget calculations and leak evaluations are made based on fixed values or limits on production per animal, crop nitrogen consumption standards or graphs (see 2.5.). All of the action programmes are therefore based on scientific and technical data supplied by public agronomic and livestock farming research bodies, backed or not by technical institutes (or their equivalents).

The Commission is highly attentive to the fact that the values used are established by scientific bodies within the framework of transparent and independent evaluations and not by bilateral discussions between the State and the technical bodies of the profession. This is why most countries have chosen to use works published in peer-reviewed journals.

Some countries have set up independent scientific committees in charge of evaluating the measures or their development (NL). In a number of countries research & development programmes are established specifically: in addition to collecting the information necessary for an evaluation in view of shared results between the various stakeholders at the end of the programme, these research & development programmes are intended for building areas of future development of the regulations ("Agricultural Catchment Programme" in Ireland, "ANCA" in the Netherlands).

***Agricultural Catchment Programme (Ireland)***

Organised by the TEAGASC national research and development body (// INRA) the programme funded by the Ministry of Agriculture (DAFM: Department of Agriculture, Food and Marine) has a multipartite governance: DAFM and the Ministry of the Environment, local authorities, farmers and land owners and their organisations, group of European scientific experts, agricultural unions, milk producer unions, livestock farmer unions, the Environmental Agency and Teagasc.
The results were presented to farmers both in a "one to one" approach and in small on-site discussion groups. Scientific publications in peer-reviewed journals were drafted and an international symposium brought together European scientists and also scientists from New Zealand and Austria.
The programme is currently continuing with a second phase of research

## 3.2 Publicising the texts and preparing future changes to the regulations

Establishment of the Nitrates action programme is always accompanied with actions for disseminating and making new texts widely accessible, providing software to make the computations necessary for correct implementation of the measures: calculation of the

storage volume based on the animals present, calculation of the organic (or total) nitrogen that can be applied depending on the crops.

In Ireland, Belgium (Flanders) and the Netherlands, this does not only involve implementing the Nitrates Directive but also improving the competitiveness of the farms by optimising the management of mineral elements. This is the development message conveyed by the public and private advisory bodies.

***Example of advisory mechanism (Ireland)***

The programme established for a cost of €2 million per year for the first four years of the programme now amounts to €5 million, i.e. €1.5 million per year.

- Private consultants (approximately 300), and employees of Teagasc public backed research institutes (also approximately 300) simultaneously contribute to this network.
- The programme was co-funded by remainders of European credits transferred by rural development programme credits (Knowledge transfer))
- In return for an incentive of €1,000/farmer/year, farmers are invited to work in "discussion groups" of approximately fifteen, coordinated by advisers, in order to receive training, exchange regulatory, technical or economic information, proven techniques, and make progress on the implementation of this directive. They include approximately 6,000 in Ireland for "milk" groups and 4,900 for "meat" groups. These discussion groups pre-existed before the programme but their funding has enabled the number of farmers actively participating to double or even triple and has encouraged them to carry out soil analyses even though they are not mandatory. These analyses form the basis for the discussions held at these meetings.
- Currently, 45,000 farmers carry out these analyses on a voluntary basis and for 25,000 farmers to do so in a mandatory way within the framework of a derogation (/170 kg of N).

The main incentive presented to farmers is to have the capacity to benefit economically from the changes imposed by the texts, which helps to support the costs of managing fertilisers: soil analyses to better balance their nitrogen budget, slurry pits, etc. Compliance with the directive is rarely highlighted with professionals. Moreover, the relevant texts are located in several different laws (e.g. NL).

Some professional bodies take advantage of this to convey even more integrated messages and provide a service to their members (see "smart farming" in Ireland).

***Example of "smart farming" extension actions (Ireland)***

"Improve Farm return with better resource management" (http://smartfarming.ie)

The main agricultural union wants to provide an economic service to its members. It proposes a group approach targeting analysis of the compared performances of farms within the group concerning:

- reduction of all inputs for farms
- maintaining soil fertility,
- energy,
- grass management,
- inputs and waste,
- machinery.

An approach that therefore moves away from the strict regulatory approach and that nevertheless includes these new challenges and constraints

## 3.3 Developing effective declaration and monitoring tools and discouraging fraud

The establishment of the action programme and its checks has often resulted in the creation of new standardised tools for monitoring practices because farmers must often transmit them to the authorities:

- Provisional land application book;
- Fertilisation logbook;
- Fertiliser transport declaration;
- Water analysis plan;
- Soil analysis results.

Sometimes States are also required to be familiar with these data, not only to check the data for each farmer but also to meet the Commission's reporting requirements (e.g.: phosphorus limit accompanying the derogation for the Netherlands).

In several countries (BE-FL, NL), this data is managed by the same body that centralises livestock data and the associated declarations to the CAP. These public bodies carry out systematic computer checks on completeness and consistency, then carry out on-site checks.

The levels of control, as provided for in the community rules, are always heightened in farms that benefit from a derogation.

The mission notes that the computer tools developed for grouping and analysing all of the necessary information are extremely powerful. In some cases (BE-FL, IR, SP-CA, etc.) these databases are used, in addition to the checks, to send summary information to the actual farmer. The Netherlands is trying to shift the burden of collecting and sending this data on to the bodies that provide services to farmers (fertiliser sellers, animal hauliers, dung hauliers, etc.).

The mission gained the impression that the checks and the centralisation of related data were accepted better using this method – but was not always able to meet practitioners.

# 4 Assessment of the efficiency and cost-effectiveness of the action programmes, from the environmental or socio-economic point of view including the financial aspects

By assessing cost-effectiveness and efficiency, this part explains the procedures for monitoring the action programmes described in Part 2 and the results produced on the environmental level and on the socio-economic level, including the financial aspects.

## 4.1 Monitoring programmes

### 4.1.1 Environmental monitoring.

The environmental monitoring used for delimiting vulnerable zones, already analysed in Part 1, is the same used for assessing the situation of and changes in water resources.

The Nitrates Directive only defines a nitrate content for water resources in order to delimit vulnerable zones (50 mg/l). This delimitation must also take into consideration the risk of eutrophication, but no figure is indicated for this This is logical because no homogeneous definition of this phenomenon exists in Europe, which in addition cannot be quantified in the same way in the various types of water bodies. The sole environmental objective of the directive is to "reduce pollution" but there are no exact thresholds to be achieved for water resources and no period within which to do so. But it may be interpreted that the aim is to eliminate the vulnerability of territories to nitrates from agricultural sources and, due to the former Directive 75-440 on the quality of water intended for human consumption, all of the countries considered that the aim was not to exceed the level of 50 mg/l in the waters. It should be added that the directive concerning nitrates from agricultural sources (91-676 EEC) cannot achieve the objectives for aquatic resources or environments alone when they are also polluted by nitrates from urban or industrial sources, or are at risk of eutrophication from factors other than nitrates from agricultural sources.

Due to the vagueness of the objectives described above and the existence or absence of differentiation between vulnerable and non-vulnerable zones and therefore the diversity of the action programmes between countries, the environmental monitoring systems established by the countries are highly heterogeneous in terms of both content and conception. This is reflected in the density of observation points (from 1 to 200 points per 1,000 km2), the sampling frequency per point (from 1 to 20 per year) and in particular the types and locations of sampling points. Indeed, some countries (DE, DK, BE-FL, NL) want to assess the status of the waters "directly affected by agricultural activities", i.e. free of pollution from industrial or urban sources, with specific monitoring. This is limited to the surface waters in livestock farming zones or to shallow or karstic-type surface waters (root zone or < 5 m) and therefore involves monitoring "pressures" rather than the "environmental status". The other countries have set up monitoring of the water resources that is representative of all situations. As pollution can flow for a long time before joining non-surface underground aquifers and accumulating there for several decades, the first type of monitoring ("pressures") initially presents a situation that is more degraded than the second type of monitoring ("environmental status") which subsequently shows the progress more easily.

Due to these conceptual differences, the monitoring results do not enable the situations of the countries to be compared easily: for example, Germany chose to select sampling

locations only where the nitrate level in the water was higher than the 50 mg/l threshold. The concentration of monitoring points in these particularly polluted zones indicates Germany is in a much more degraded situation than other Member States, which is undoubtedly not the case. These choices of sampling locations are also being changed: in Bavaria for example, the number of nitrate monitoring points should be multiplied by 5.

Nevertheless in all countries, the water resource monitoring used for Nitrates Directive reporting has changed over the last few years so that it is aligned with the type of water resource monitoring required in the Water Framework Directive, with its "monitoring" network (long-term monitoring representative of all water bodies) and its "operational" network (monitoring for 6 years specific to the parameters causing poor environmental status). The Flemish region uses the ND monitoring and the WFD monitoring separately in order to analyse trends in pollution from agricultural sources and from other sources differently.

However, to date, the ND maintains the principle of a campaign of nitrate measures with exploitation of the data every 4 years instead of 6 years for the WFD; In each country some contact persons have voiced their desire for convergence towards a programme of measures and periodicity, and reporting/evaluation every 6 years.

### 4.1.2 Socio-economic monitoring

The collection of socio-economic information is much less structured than environmental monitoring; however such collection is required by the ND which requires in its Article 5 that the additional measures be based on their efficiency and their cost. Furthermore, all of the contact persons met recognise that the main obstacle to implementing the measures lies in their cost for farmers.

However, in all of the countries or regions visited a permanent dialogue exists between the representatives of the farming profession and the public authorities, which highlights the implementation difficulties and makes it possible to choose measures that are more widely accepted by economic stakeholders, although protest movements still take place as in Catalonia, for example, where an association has challenged in court the addition of municipalities to vulnerable zones. This dialogue in particular concerns the financial aid that may make certain actions realistic, either during the initial years before the inclusion of new mandatory actions in the programmes, or over time when they relate to other policies that are eligible for subsidies in the rural development or environmental domain.

More precise socio-economic monitoring may take several forms which are sometimes coordinated by the public authorities: either university or professional association initiatives (DK, ES, NL, etc.), which publish economic analyses based on experiments with collection of economic data, or research programmes dedicated to controlling pollution, or demonstration and consulting operations aimed at farmers (BE-FL, SP-CA, IR, etc.) already mentioned in Part 3.

## 4.2 Results and prospects

Despite the significant heterogeneity of the environmental monitoring programmes and the absence of a common analysis table for eutrophication, the European Commission uses the results to compare the situation of countries in terms of pollution by nitrates

from agricultural sources. The following table is a result of this and shows very different situations:

| Country | DE | BE-FL | DK | ES-CA | IR | NL |
|---|---|---|---|---|---|---|
| No. of pts (underground + surface) | 162 + 300 | 2,974 + 859 | 595 + 161 | 4,770 + 3,733 | 211 + 252 | 1,308 + 457 |
| Density (pts/1,000 km²) | 1.3 | 207 | 17.5 | 16.8 | 6 | 42.5 |
| > 50 mg/l groundwater | 51% | 22% | 19% | 23% | 0% | 13% |
| > 25 mg/l additional freshwater | 3.6% | 43% | 16% | 5.5% | 1% | 0% |
| % of improvement 2011/2008 | 66% | 34% | 29% | 30% | 55% | 30% |
| % of deterioration 2011/2008 | 17% | 31% | 30% | 29% | 3% | 10% |

***Table drawn up based on the report of the Commission to the Council and the European Parliament on the Nitrates Directive of October 2013***

The percentage of points exceeding 50 mg/l in groundwater varies from 0% (IR) to 22 or 23% (BE-FL, ES-CA), except for countries that have measurement networks that are significantly different from those of other countries (DE: 51% exceeded but only the most polluted points are monitored, and NL: 13% but deep waters are not included). The percentage of points exceeding 25 mg/l in surface water varies from 1% (IR) to 43% (BE-FL). The Netherlands declare 0% exceeded but do not monitor the same types of water courses as the other countries: in particular, they do not take into account the waters that come from foreign countries.

Interpretation of these results must take into account the heterogeneity of the monitoring but it can nevertheless be concluded that the most polluted situations are in the zones with structural surpluses in livestock farming (NL, BE-FL, DK) or with intensive crops (ES). The trends noted from the first action programmes are deceptive in that the results show an effective reduction in average nitrate contents for the first years (approximately from 1995 to 2002) but then relative stagnation, with the exception of Ireland. Indeed, the comparison between 2008 and 2011 shows that approximately one third of the points improves while another third deteriorates and the last third stagnates.

All of the countries that have tried to estimate the time it takes for water resource quality to react to the ND action programmes have experienced methodological difficulties, because this requires modelling work that is difficult to generalise beyond a specific territory. Nevertheless, an interesting approach (ES) successfully estimates that the aquifers in Spain, with strict application of the measures of the action programmes in force, could achieve the good status in 2027 with the exception of 6 to 10% where more time will be needed. This result will provide Spain with the justification for requesting a derogation from the time frames of the WFD.

The results of the socio-economic monitoring fluctuate according to changes in the cost of mineral fertiliser and the prices of agricultural products, but show that:

- although prevention of pollution by nitrates is now accepted by the farming profession under pressure to protect the environment, farming communities protest to varying degrees about the difficulties they have in complying with the

Nitrates Directive obligations. In Germany, the consequences of the draft text under discussion are considered very difficult from the economic and financial point of view. Relaxations for farmers located in zones where the 50 mg/l threshold is respected would be welcome and would contribute to better compliance with the new rules envisaged;

- the possibility of using financial aid to attenuate the negative economic consequences of reinforced measures for some farmers could contribute to better acceptance of the reinforcement of actions by the agricultural sector. Thus, in Germany, Bavaria promises optional measures funded by the KULAP (Kultur Landschaft Programm) then, in a second stage, funding of the measures is eliminated. A similar arrangement exists in the neighbouring state of Bad-Würtemberg. But these financial aid mechanisms assume that public finances are sufficient. Other forms of aid exist for rural development (ES for example);

- Denmark would also like to develop financial assistance arrangements for some farmers. To this end, it is studying whether the provisions of the WFD would authorise the use of such financial measures;

- the establishment of certain provisions that may seem expensive or intrusive is combined with promoting the progress achieved through "smart farming". Therefore, these provisions can be established more easily because they are economically neutral or favourable (including CAP aid in some cases). These measures which involve changing crop or livestock farming practices correspond to fairly low costs, below €1 per kg of N avoided: mineral fertilisation reduced in favour of the recycling of livestock manure (IR), land application equipment developed with conductivity analysis of the nitrate content and ploughing in of slurry (ES-CA), changes to the pig feeding system (BE-FL, ES-CA, NL, DE, DK), grass strips with CAP funding (2nd pillar);

- however, significant investment actions are not economically sustainable without significant financial aid: storage capacities or covering of pits (approximately €10 to €20 per N stored[18], significant public aid), treatment of livestock manure[19] (approximately €2 to €4 per kg of N treated[20]);

- to our knowledge, only Denmark has evaluated ex-post the cost-effectiveness of the various action programme measures: in the Danish context, a certain number of actions reduce nitrate leaks at a cost of €1 to €2 per kg of N (restoration of wetlands, changes in livestock feed, nitrogen-fixing intermediate crops) whereas other actions require €4 to €11 per kg of N (organic farming including the reduction of nitrogen fertilisers, afforestation, reduction of livestock load) but offer other non-recorded advantages. These orders of magnitude are confirmed by evaluations of the financial profitability targeted on specific measures (ES, IR, NL): some measures are in the interest of farmers with fairly short-term benefits. Significant penalties in some countries, for example in the event of non-compliance with thresholds or absence of soil analyses (BE-FL, NL), reinforce the financial profitability of the measures for farmers or fertiliser transporters;

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[18] These figures are from French practices (PMPOA assessment (French programme to control pollution of agricultural origin) which will eventually provide on average 25% of the aid), but give an idea of the efforts that had to be agreed in all of the Member States

[19] The treatment of effluents cannot be analysed only from the nitrates point of view because methanisation requires a global approach with biomass supply or may suddenly become non-profitable following a change in energy prices (ES)

[20] These figures are from French practices (ITP study) but give an idea of the efforts that had to be agreed in all of the Member States

- finally, the ND does not prevent some countries (IR, NL) from considering the development of dairy livestock farming in a context where quotas are phased out (whilst providing supervision).

# 5 Consistency with other environmental policies

The action programmes of the Nitrates Directive have by nature an impact on various environmental policies:

- **Soil and waste policies**: the Nitrates Directive limits the quantities of nitrogen applied to the soil but does not guarantee the control of heavy metals, due to the content of the fertilisers applied. However, the impact of the metals present in animal waste or compost which incorporates livestock-origin organic waste can be reduced at source via reduced zinc or copper pig feed; the impact of chemical fertilisers, in particular cadmium contained in phosphorus fertilisers, should present a limited risk after revision of the European rules that apply to fertilisers.

- **Countryside and unpleasant odours**: the significant impact of livestock manure storage installations and applied materials can be controlled by systems similar to those concerning other economic activities.

- **Biodiversity**: grass strips[21] along water courses have a very positive effect on biodiversity; they are also often integrated in Natura 2000 zones or special protection areas for birds. The reduction in eutrophication periods is favourable to the diversity of populations in surface aquatic environments.

- **Climate and air policy**: several countries (IR, ES, etc.) highlight that the fixed values, included within the ND application texts for calculating the production per animal and the quantity of nitrogen that can be applied, underestimate the gaseous nitrogen compound emissions from agriculture, thus giving a more favourable result than the carbon footprint calculated for livestock farming artificially and without guaranteeing sustainability. Furthermore, in territories where land application surfaces are limited, the limit of 170 kg N/ha leads livestock farmers to choose farming methods that evaporate the nitrogen contained in slurry or manure as much as possible, whether this is inside livestock buildings, in storage pits or in fields, thereby increasing the greenhouse gas emissions. The Nitrates Directive could be presented in a different way in order to encourage livestock farmers to consider nitrogen from livestock as a valuable asset that must not be sent into the atmosphere but that must be recycled as much as possible through land application (with immediate ploughing in), so as to reduce N2O and NH3 emissions. This would significantly reduce the manufacture and use of chemical fertilisers thereby also reducing CO2 emissions. It should also be noted that optimising the feed of dairy cows to reduce nitrogen production within the framework of the ND may correlatively contribute to reducing methane emissions into the atmosphere.

The greatest problem nevertheless remains the link between the Nitrates Directive that dates back to 1996 and the Water Framework Directive that dates back to 2001. The ND is a "basic measure" of the WFD, and its provisions are mandatory and can no longer receive public aid. The WFD's programme of measures must:

- identify the water bodies for which ND actions are not sufficient to achieve good chemical[22] or biological[23] status;

[21] The difference between grass strips and buffer strips is not always expressed clearly in the texts of the various States: nevertheless we can conclude that grass strips are not a measure of the ND but constitute good agricultural and environmental conditions (GAEC) for the CAP, whereas this is different for buffer strips which involve no fertilisation (and no pesticides) over a variable distance between banks and crops

- integrate actions in addition to these basic measures that must be conducted on these water bodies in order to achieve this good status in the most cost-effective way possible. This also involves specific and time-restricted environmental monitoring of the water body to check how the water body changes ("operational control"). Finally, if all of these measures do not enable the good status to be achieved before 2027, a derogation to this time frame must be justified with the European Commission through various socio-economic considerations.

The WFD is a modern approach in its concept: firstly, it sets the environmental impact objectives then defines action programmes to achieve them in an economically viable way; it evaluates the results periodically. The ND, which is an older concept, only defines action objectives without specifying in advance what the results will be on the environmental or socio-economic level. The stakeholders we met in the various countries all believe that the ND's action programmes were justified and effective during the first few years. But with regard to certain parts of their territory, the question now is whether they need to be completed with new more cost-effective measures (i.e. less expensive for the same environmental result) that will be included in the WFD's programme of measures (making it possible to receive public aid). This concerns, for example, the following measures:

- the highly enhanced treatment of livestock manure to transform it into additives with exactly the same fertilising behaviour from the nitrogen point of view as the behaviour of chemical fertilisers;

- eutrophication risk prevention actions which in some cases concern more cost-effective parameters than nitrates to control this phenomenon, such as the phosphorus content or sunlight;

- monitoring of the nitrate contents of water bodies, quantification of the objectives and planning, to be integrated into the WFD monitoring and programmes of measures and according to the same principles: distinction between monitoring of pressures and monitoring of aquatic environments and at an annual frequency: reporting according to the WFD periodicity; estimation of future trends through modelling.

[22] According to the nitrate content

[23] According to the degree of eutrophication

# Conclusion

To conclude, the mission has learned the following:

– **All of the countries visited, with the exception of Denmark, have been confronted with sometimes severe disputes with the Commission, but these problems were resolved several years ago**. Their action programmes have since been relatively constant and have been taken as the basis[24] for implementing the WFD. As regards Germany, the 2015 – 2018 action programme is still under discussion.

**– The objectives in terms of water quality, methods for evaluating the baseline status and measuring progress differ from one country to another**

- Although the common objective of the Member States is to reduce nitrogen pollution, it must be noted that the conceptions of environmental monitoring are so different between the States that they prevent any serious comparison of water status between countries. Moreover this was not an objective of the ND[25]. However, this monitoring makes it possible to monitor changes over time in the same territory.

- All of the contact persons met emphasise that this improvement was apparent during the first few years of implementation and despite the extension and often reinforcement of actions, water status is now improving at a slower rate.

- Therefore, within vulnerable zones States are focusing on identifying the most fragile territories in order to target and adapt their regulations and make them more relevant and effective.

– **The various countries have a simultaneous and global approach to fertilisation and land applications; on this subject, they have developed national (or regional) regulations, the objectives of which exceed those of the Nitrates Directive alone. Apart from Spain, the countries visited deal with phosphorus and nitrogen in the same texts.** Depending on the countries, these regulations integrate the water quality (WFD) and air quality (DNEC) concerns, protection of soils and recycling of mineral elements, by changing farming practices.

– The Nitrates Directive's action programmes have over time become fairly similar between the States with regard to the mandatory measures in vulnerable zones and are clearly identified in Appendix III (prohibited periods for applying fertilisers, storage capacities, balanced fertilisation and limitation of nitrogen inputs from livestock per hectare and per year). However, many details of these regulations (tables of fixed values, calculation procedures), are quite heterogeneous from one State to another.

– **The obligations are substantially reinforced for the territories that obtain a derogation from the limit of 170 kg of N/ha and per year.** In the light of the experiences of the countries visited, a request for derogation from the 170 kg N/ha limit per year, requires in-depth analysis of the advantages (what improvements of the

[24] The "basic measures" referred to in the WDF are the measures that were required under European regulations before the WFD came into force, and this includes the the nitrates action programme. However the "WFD programme of measures" (or SDGE in France) only includes the additional actions in order to achieve good water status.

[25] The ND does not set any quantified environmental or socio-economical result objectives but only objectives regarding the actions to take to reduce and prevent water pollution by nitrates from agricultural sources. The criteria listed for water status are only mentioned to delimit vulnerable zones

budget for which farms, improvement in the recycling of effluents, etc.) and disadvantages (cost of administrative management for all stakeholders and in particular livestock farmers, and technical justifications requested by the Commission, etc.). The practice is to avoid starting a derogation procedure if a dispute has not been resolved.

– **The mandatory measures of the directive are difficult to implement systematically throughout the territory, especially when it is vast. The content of the regulations relates to agriculture in each country and region. The measures are therefore systematically adapted** not as a general rule but in their local or cyclical implementation. Therefore, many points are added to the regulations of each country in order to adapt to the climate, to the farming methods and to crop conditions, but also sometimes to the magnitude of the risks for water quality due to certain practices. This is how noteworthy exceptions can be made for crops covering small surface areas or practices that are carried out on a one-off basis, etc.; The measures are, for example, adapted to the soil and climate contexts (in particular ES, IR, NL, DK, Flanders). Each farmer therefore knows how to qualify the soils they cultivate according to a simple and standardised grid.

– Depending on the countries, the additional measures or reinforced actions and specific provisions differ significantly in magnitude and nature. For example, the practice of nitrogen-fixing intermediate crops is not common, the mandatory treatment of livestock manure also, etc.

– In Denmark, the Netherlands, Belgium (Flanders), **the calculation and control of the fertilisation balance are based on operational integrated information systems** sometimes directly filled in online by stakeholders. These information systems provide very accurate knowledge about practices and fertiliser flows. CAP (Common Agricultural Policy) data (crop types and surfaces), livestock identification data, possibly completed with mandatory declarations, and remote declarations of land application logbooks, transportation of fertilising elements, and soil analyses, are grouped in this way. Through systematic cross-checking of the information, these data help to produce budgets during and at the end of campaigns, constitute the basis for warning or advising farmers and are used to better target on-site controls.

– Research and development programmes for farmers are implemented and developed in almost all of the countries. These programmes or their results, evaluated by independent scientific experts, are a true asset in the negotiations both for farmers and for the Commission.

– The situation seems favourable in all of the States for establishing action programme impact simulations and estimating the time frames within which these are likely to allow the various water resources to return to a good chemical and biological status (within the meaning of the Water Framework Directive).

1. *A multilingual working day setting out this benchmarking may be organised in France at the end of 2015 to share the results with the ministries and bodies we met. This seems appropriate since everywhere the members of the mission benefitted from relevant, interactive, and open discussions … and requests for subsequent exchanges. Also by capitalising on the report (translated in advance into English), this seminar could provide an outlook on the prospects for implementation of the Nitrates Directive. CGAAER (French General Council for Agriculture, Food and Rural Areas) and CGEDD (French General Council for the Environment and Sustainable Development) could be asked to organise it. A period of preparation would make it possible to include the situation in France and invite our partners to give a presentation, leaving it up to them to choose how to participate, including the possibility of presenting overview documents or new bilateral or multilateral proposals.*

| | | |
|---|---|---|
| **Jean Gault** | **Muriel Guillet** | **François Guerber** |
| General Engineer of Bridges, Water and Forests | Inspector General of veterinary public health | General Engineer of Bridges, Water and Forests |

| | | |
|---|---|---|
| **Claire Hubert** | **François Paulin** | **Marie Christine Soulié** |
| General Engineer of Bridges, Water and Forests | General Engineer of Bridges, Water and Forests | Inspector General of sustainable development administration |

# Appendices

# 1 Letter of assignment

Private Secretary at the Ministry of Ecology, Sustainable Development and Energy

Private Secretary at the Ministry of Agriculture, Agrifood and Forestry

Paris, 9 December 2014

to

Mr Patrice Parise

Vice-Chairman of the General Council for the Environment and Sustainable Development

Mr Bertrand Hervieu

General Council for Food, Agriculture and Rural Spaces

France has been condemned twice by the European Union Court of Justice on the application of the Nitrates Directive. After a first condemnation in June 2013 relating to the designation of vulnerable zones, a second order of the Court, relating to the fourth nitrate action programmes, was handed down on 4 September (the conclusions of the Advocate General were handed down on 16 January 2014).

The system for transposing the directive has been amended in recent years in anticipation of these condemnations, but new changes are going to be necessary.

The revision of vulnerable zones at the end of 2012 was deemed insufficient by the European Commission and a new revision has been undertaken in the basins for the end of 2014. The question of criteria for delimiting vulnerable zones is raised, especially relating to continental eutrophication.

Similarly, a national nitrate programme was adopted end 2011 and amended in 2013 and regional programmes were signed in 2014. A review of certain measures in this system is required in the light of the conclusions of the Court order.

During discussions with the Commission departments, the application methods of the directive were evoked for other member States with more satisfactory results in terms of extension of vulnerable zones, content of action programmes and mobilisation of the derogation system provided by the directive to the ceiling of 170 kg of organic nitrogen per hectare and per year.

The Embassies were sent a questionnaire this Autumn on implementing the Nitrates Directive, including questions on extending vulnerable zones, taking continental eutrophication into account, the existence of one or more action programmes and areas with reinforced monitoring of the eutrophication risk. Feedback was received for sixteen member States, but more in-depth information is required.

To assist the ministries in continuing with the necessary changes for correct application of the Nitrates Directive and prepare the replies for the Commission, and to position

these in the European context of implementation of the Nitrates Directive, it seems essential to carry out an expert assessment of local implementation of the directive in different European countries along with the problems posed and the solutions adopted.

This will require especially:

- broadening the multi-criteria approaches that some countries have been able to mobilise to delimit the vulnerable zones;

- having more precise knowledge of action programmes adopted in other States and how they are implemented from both a regulatory and socio-economic support viewpoint. It will also be useful to analyse how derogation systems have been negotiated with both the Commission and with the stakeholders.

The mission will reposition this analysis in the context of agricultural features in each of these countries, mainly the dominant production system in the territories in question.

Priority is being given to Germany, Netherlands, Spain, Italy, Denmark, Ireland and Belgium in the different countries to be studied.

The mission will benefit from contacts established within the community "nitrates" committee and information already compiled by the Directorate of Water and Biodiversity and the Directorate General of agriculture and agrifood policies and territories on foreign regulations when implementing the directive. The mission could thus rely on the report produced by the students of the junior enterprise of Sciences Po in 2010 on the comparison of regulatory provisions as notified to the Commission.

The mission outcome will take the form of regular discussions with the departments in both ministries, then a public report comprising sheets for each State involved to be prepared for end January 2015.

Elisabeth Borne Philippe Maugin

# 2 List of persons encountered

## 2.1 France

### 2.1.1 Ministry of Agriculture, Agrifood and Forestry

**CGAAER:**

- Mr Philippe Balny, IGPEF

- DGPE:
  - M Rik Vandererven, Deputy SDPE
  - Mrs Emma Dousset, BESEC representative
  - Mathieu Dourthe, BESEC

### 2.1.2 Ministry of Ecology, Sustainable Development and Energy

- CGEDD:
  - Mr Philippe Quèvremont, IGPEF

- DEB:
  - Mrs Claire Griszz Deputy Director DGALN/DEB/GR
  - Mr Philippe Jannot , DEB, Office of Natural Resources and Agriculture

## 2.2 Germany

### 2.2.1 Federal Government (Bonn)

- Ministry of Agriculture:
  - Dr Werner Kloos, Deputy Director General, Agriculture;
  - Mr Oswald, Head of the Plant Crop Bureau and member of the Nitrates Committee (Brussels);
  - Mrs Friederike Haniel, Head of the Environment and Resource Protection Bureau;
  - Mrs Kristin Strupp, responsible for relations with the European Parliament, on behalf of her "International Affairs" colleague.

- Ministry of Environment:
  - Mrs Ostermeyer-Schlöder, Head of the Nature and Environment Protection Bureau in Agriculture;
  - Mrs Sandra Golder;
  - Mrs Dr Frauke Grimm, WR I 3 Bureau, protection of surface waters and groundwaters.

### 2.2.2 Land of Bavaria:

- Ministry of Agriculture of the Land:

- Mr Ludwig Wanner, Head of the Protection Bureau for resources in agriculture; fertilisation and protection of plants;
- Martin Schüssler, community and international affairs.

- Environment Ministry of the Land:

  - Mr Michael Haug, Head of Groundwater and Water Supply Protection Bureau;
  - Dr Andreas Kolbinger;
  - M Mayir.

- Bavarian Farmers Union:

  - Mr Georg Wimmer, Deputy Secretary General;
  - Mrs Maria Stemmer, responsible for environmental issues.

- Bavarian Agricultural Agency:

  - Mr Rudolf Ripper, Head of the Organic Farming, Ground Crops and Resource Protection Institute;
  - Dr Matthias Wendland, Mr Nüssland.

## 2.3. Belgium

- Rural Space Management Agency (VLM):

  - Mrs Ria Gielis, Director of the Mestbank (manure bank);
  - Mr Koen Desimpelaere, Head of the Fertilisation Department;
  - Mr Kevin Grauwels, Flanders representative to the Nitrates Committee;
  - Mrs Annick Goossens, Nitrates Directive expert

- French Embassy:

  - Mrs Christiane Nuissier, Assistant to the Manager of the Economics Department for Benelux.

## 2.4. Denmark

- French Embassy:

  - Mr Michel Lallemand, Head of the Economics Department;
  - Mrs Yasmine Crozier, Economics Department.

- Landbrug&Fødevarer (Danish Agriculture and Food Council):

  - Mr Henrik Bang Jensen, Counsellor, Energy and Environment Directorate;
  - Mr Kitt Andersen, Chief Consultant, water and nature.

- Ministry of the Environment:

  - Mrs Henriette Hossy, Agronomist;
  - Mrs Mette Hee Christensen, Lawyer;
  - Mrs Lydie Wibke.

- Ministry of Agriculture: AgriFish Agency Control Centre

    - Mr Morten Ejrnæs, Head of Unit;
    - Mr Allan Kjær Andersen;
    - Mr Jakob Møgelvang.

## 2.5. Spain

- French Embassy:

    - Mr Hervé Reverbori, Counsellor for Agricultural Affairs in Spain and Portugal.

- ANPROGAPOR (equivalent to the National Pig Federation):

    - Mr Miguel Angel Higuera Pascual, Director

- Technical University of Madrid:

    - Mr Miguel Quemada, Lecturer-Researcher

- Ministry of Agriculture, Food and Environment:

    - Mr Arnaldo Cabello Navarro, Deputy Director General of Livestock Production Means and colleagues
    - Mr Victor Manuel Arqued Esquía, Deputy Director General of the planning and sustainable use of water
    - Mr Carlos Escartín, Deputy Director General of the integrated management of the Hydraulic Public Domain

- Independent Authority of Catalonia:

    - Mr Miguel Molins Elizalde, Director General of Agriculture and Livestock;
    - Mr Juan Godia, Deputy Director of Agriculture;
    - Mr Jaume Boixadera, Head of the Department of soils and environmental management of the agricultural production.

- Catalan Water Agency:

    - Mr Antoni Munné, Head of the Department of Control and Improvement of Aquatic Ecosystems and colleagues

## 2.6. Ireland

- Ministry of the Environment:

    - Patrick Duggan.

- Environment Agency:

    - Donal Daly,
    - Mrs Niamh, Irish member of the Nitrates Committee

- Ministry of Agriculture:

- Bill Callanan, Senior Inspector, Environment & Engineering Services Division,

- Min. Agriculture: Jack Nolan, Irish member of the Nitrates Committee

  Irish Farmers Association:

  - Thomas Ryan, responsible for the environment and infrastructures
  - Catherine Lascurettes

## 2.7. Netherlands

- Ministry of Agriculture:

  - Emar Geemmeke, Environment and Fertiliser Programme Coordinator, member of the Nitrates Committee in Brussels;
  - JacobVan Vliet

- French Embassy:

  - Bernard Boidin, Economic Counsellor

# 3 Reference texts

## 3.1 Germany

- Nitratsituation im Grundwasser Bayerns, Bavarian Environment Agency;
- Notice from the Bavarian Ministry of Environment;
- Nitrat Bericht 2012 der Bundesregierung (nitrates report at the end of the fourth action programme, 2012;
- DüngeVo: fertilisation order, February 2007, consolidated, modification in progress;
- Report 2004, second action programme;
- Report 2012, fifth action programme;
- Nitrate order reform issues, Bayerische Landesanstalt für Landwirtschaft, January 2015;
- "yellow paper": guidelines for the fertilisation of fields and meadows, Bayerische. Landesanstalt für Landwirtschaft;
- Bayerische Landesanstalt für Landwirtschaft Internet site;
- JE: junior entreprise, sciencesPo.

## 3.2. Belgium

- Decree relating to fertilisers of 22 December 2006 and modifications of 22 December 2006, 19 December 2009 and 6 May 2011;
- Order relating to dispensations of 8 July 2011;
- Decision 2011/489/EU of 29 July 2011 granting a derogation to the region of Flanders;
- Order fixing the threshold values of nitrate residues of 10 February 2012.

## 3.3. Denmark

- Danish Nitrate action programme (DNAP) 2004-2015: APAE III (Action Plan for the Aquatic Environment) then Green Growth Agreement (GGA) since 2009;
- Order on Commercial livestock, livestock manure, silage...order no. 764, 28/06/2012;
- Diaporama "Implementation of the Nitrates Directive in Denmark" Environmental Protection Agency;
- Danish policy measures to reduce diffuse nitrogen emissions from agriculture to the aquatic environment, Aarhus university, environmental protection agency,

Department of Food and Resources Economics, the Geological survey of Denmark and Greenland.

## 3.4. Spain

- Zonas vulnerables designadas en Cataluña Decretos 283 / 1998 de 21 de octubre, 476 / 2004 de 28 de diciembre y Acuerdo de Gobierno de 28 de julio de 2009;
- Decreto 136 / 2009 de 1 de septiembre_approbacion del programa de actuacion aplicable en las zonas vulnerables de Cataluña. NB: there is a non-validated translation of this decree into French including a revision in force since 16 April 2014;
- Informe cuatrieno 2008-2011 Ministerio de Agricultura, Alimentacion y Medio Ambiante Julio 2012;
- Real Decreto 324/2000 de 3 de marzo_normas de ordenacion de explotaciones porcinas y Orden 506 / 2010 de 2 de noviembre_Cataluña_excrecion de nitrogeno del ganado porcino mediante la alimentacion;
- Real decreto 1514/2009 de 2 de octubre_proteccion de las aguas subterraneas;
- Diaporama on Patrical modelling.

## 3.5. Ireland

- Report for Ireland for the period 2008 – 2011_EPA_June 2012;
- Ireland's third Nitrates Action programme_Strategic Environmental Assessment_Environment, Community and Local Government_January 2014;
- Statutory Instruments n° 31 of 2014 Good Agricultural practice for Protection of Waters regulation 2014;
- Commission Implementing Decision of 27 February 2014_ 2014/112/EU;
- Explanatory handbook for good agricultural practices for the protection of waters regulations 2014 Status 2013 and trends in N & P of groundwaters, rivers, lakes and estuarine and coastal waters_EPA 2014.

## 3.6. Italy

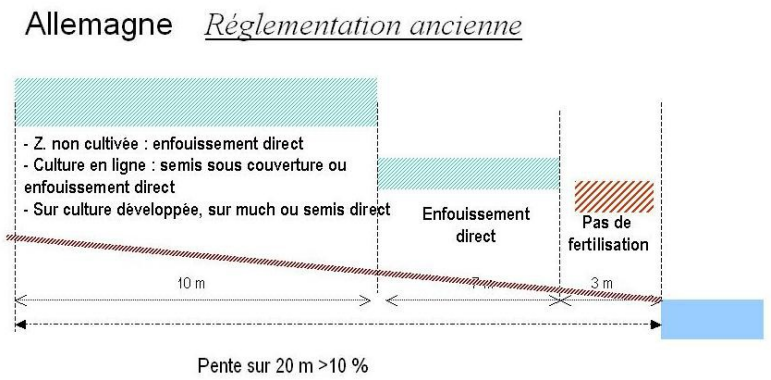
- Note Adviser on Agricultural Matters 30 January 2015;
- ERSAF report, Lombardy region "attuazione della direttiva nitrati in Lombardia", November 2009;
- "piano strategico nazionale nitrati", national rural network 2007 – 2013, ISMEA / Ministry of Agricultural Policies;
- JE: junior entreprise, sciencesPo.

## 3.7. Netherlands

- Implementation of the Nitrate Directive in the Netherlands; WJ Willems PBL (Netherlands Environmental Assessment Agency); June 2013;
- Agricultural practice and water quality in the Netherlands in the period 1992 2010; RIVM (National Institute for Public Health and the Environment); 2012 http://www.rivm.nl/bibliotheek/rapporten/680716008.pdf;
- Comparison of the Nitrates Directive in six EU member States: Junior Consulting Sciences Po; 2010;
- Website of the Ministry of Economic Affairs, heading "Mest" in Dutch;
- Decision 2014/291/EU of 16 May 2014 - renewal of the derogation to the ceiling of 170 kgN.ha;
- Dutch manure policy; Emar Gemmeke Ministry of Economic Affairs; 10 December 2013;
- Project 2012 - 2014 Annual Nutrient Cycling Assessment (ANCA) Wageningen University;
- Fifth Dutch Action Programme (2014-2017) (draft dd 20-2-2014) document extremely precise and accessible, but long;
- Baumann, R.A. et al., Agricultural practice and water quality in the Netherlands in the period 1992-2010, RIVM report 680716008/2012;
- Law on soil protection (Wbb): http://wetten.overheid.nl/BWBR0003994/geldigheidsdatum_20-04-2015
- Use of fertilisers (Bgm); application of the Law on soil protection: http://wetten.overheid.nl/BWBR0009066/geldigheidsdatum_20-04-2015
- Application rule of the Law on soils regarding the use of fertilisers (Ugm): http://wetten.overheid.nl/BWBR0023115/geldigheidsdatum_20-04-2015
- Law on fertilisers (metstoffenwet) (Msw): http://wetten.overheid.nl/BWBR0004054/geldigheidsdatum_20-04-2015
- Application decree of the Law on fertilisers (Ubm): http://wetten.overheid.nl/BWBR0019031/geldigheidsdatum_20-04-2015
- Application decree of the Law on fertilisers regarding fertilisers (Urm): http://wetten.overheid.nl/BWBR0018989/geldigheidsdatum_20-04-2015

# 4 Slopes – water course distance

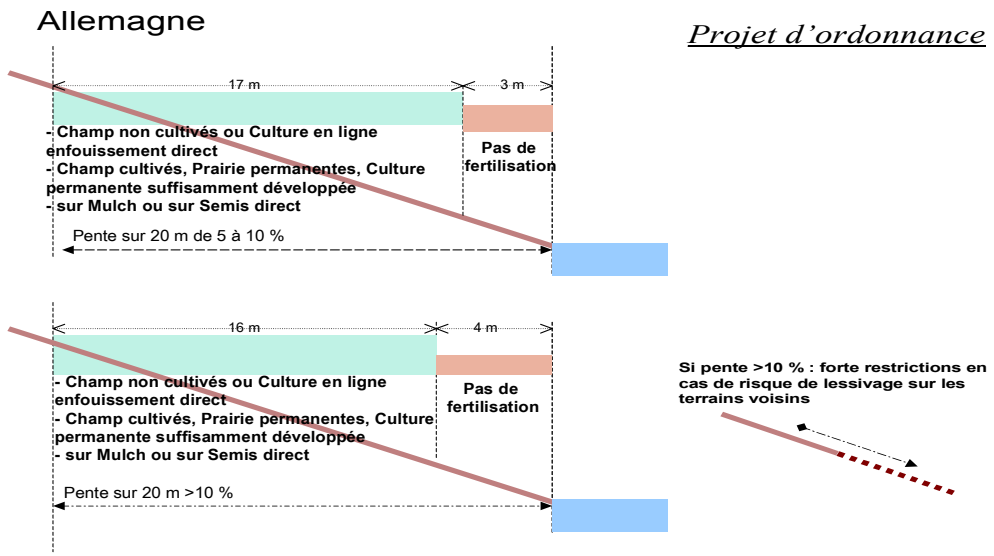
Germany:




NB: direct incorporation = carried out directly with an incorporator or by incorporation within four hours of application

**1. Old text:** It is important to avoid drift towards the surface water. For areas under cultivation, there is a slope of over 10% in the first twenty metres next to any surface water:
No fertilisation in the first three metres
Direct incorporation only in the ground between 3 and 10 m,
On the rest of the area:
- For non-cultivated land, input by direct incorporation only
- For cultivated fields with crops in rows, fertilisation only on sowings under cover or by direct incorporation

Without crops in rows, only on crops developed sufficiently or on mulch on or direct sowing



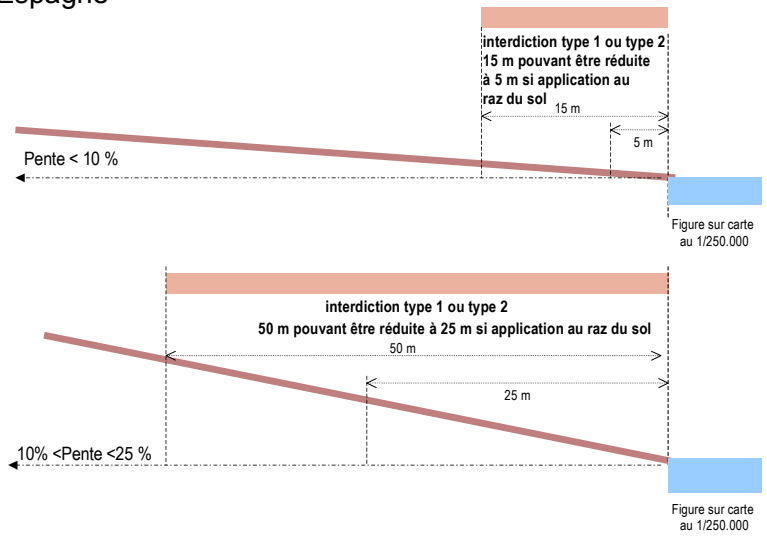

**2. Draft legislation:** It is important to make sure that nothing is carried towards the surface water and neighbouring surface areas.

2.1 For crops, permanent grassland and permanent crops that are next to any surface water for the first twenty metres, there is a slope of:
- 5 to under 10%, no fertilisation in the first three metres
- 10% or more, no fertilisation in the first four metres
In addition: In non-cultivated fields or crops in rows, between three (respectively four) and twenty metres from the body of water, application permitted only by direct incorporation
In cultivated fields, permanent grassland or permanent crops, between three (respectively four) and twenty metres from the body of water, application permitted only on crops developed sufficiently or on mulch or on direct sowing]

**2.2** Land application prohibited if slope > 10% (measured on the top 20 m):
the first three metres from the crest must not be fertilised with N or P2O5; the next seven metres: direct incorporation below: arable land without crops: cultivate the land
if crops: nitrogen-fixing intermediate crops required, legal specifications to be clarified (derog. strawed manure but not droppings). Only for fertilisers "with essential nutrient content".
Distance from water courses: 3 m (4 m in the next legislation); can be dropped to 1 m if precision application; 5 m distance for a slope > 10%
Localised, stricter measurements possible: Bade Wurtemberg: 5 m

Note that the water course is defined by law and the ditches are taken into account.

Espagne



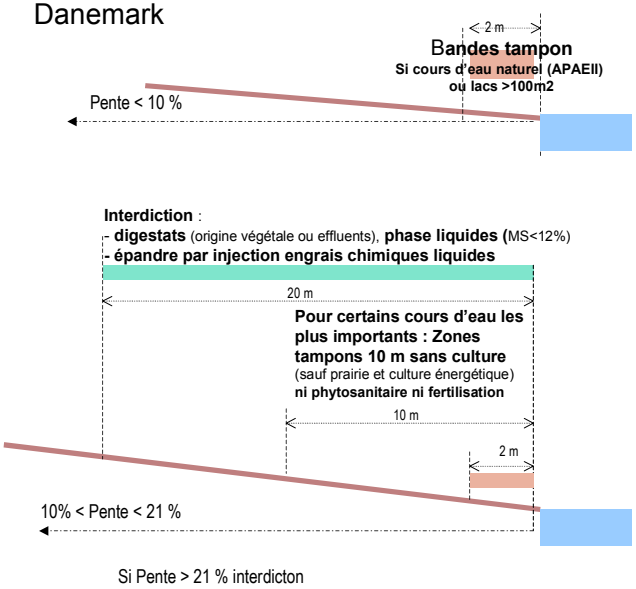

Spain

Beyond 5%, land application precautions to be taken to avoid application to avoid carrying by runoff; banned over 15%

The slope (> or < 10%) and the type of land application (whether or not incorporation) are taken into account to define minimum distances from water courses, that differ depending on whether or not they are mapped to 1:250000

Over 10% slope, the minimum distances between land application and water points or water courses are increased

Danemark




Denmark:

slope of ground

- ban on applying livestock manure, digestate and chemical fertiliser in a 20 m buffer zone on a slope more than 6° (= 10%) the length of water courses, lakes of more than 100 m2 and coastal waters.

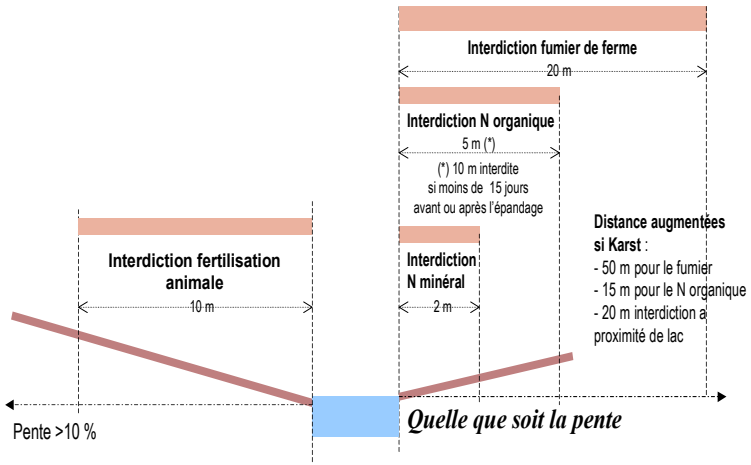
the following are excluded for slopes 6° to 12° (= 10 to 21%): digestates (plant origin or livestock manure), liquid phases <12% dry matter, injection application of livestock manure near water and liquid chemical fertilisers.

proximity of water courses

It is important to prevent any flow towards the water points (including via ditches or drains). Mandatory 2 m buffer strip the length of lakes (> 100 m2) and natural water courses (APAE II). Since 2012 (CGA), creation of 10 buffer zones without crops (except permanent grassland or energy crops), crop protection products or fertilisation along water courses (the largest, no precise definition) and lakes, with a goal of 50,000 ha (currently 25,000 ha).

Maintenance was financed by agri-environmental measures until 2015.

Irlande




-Si Pente >15% interdiction d'épandage sur culture autre que prairie

- Si Pente >20% interdiction d'épandage sur prairie

Ireland:

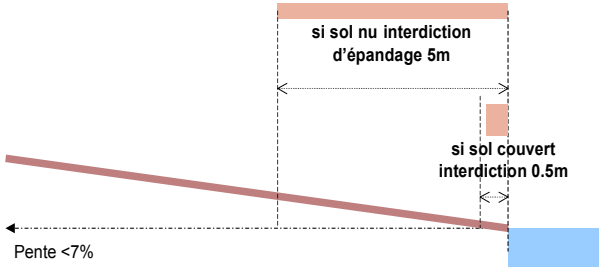
Ban on land application on grassland sloping > 20% or on other sloping ground > 15%

no animal fertilisation less than 10 m from surface water on sloping ground > 10%

Near water courses: General ban on applying mineral N less than 2 m from a water course, organic N less than 5 m – increased to 10 m in the two weeks preceding or following the banned application periods - and farm manure at less than 20 m.

These distances are changed to 15 m for organic N and 50 m for manure near a karst and 20 m near a lake

Pays Bas




-Si 7% < pente < 18 % épandage de fumier autorisé si semis dans les 8 j et bandes de 100 m de culture autres que Pdt betterave sucrière

- Si pente >18 % épandage interdit

Netherlands

The Third Action Plan rules are maintained

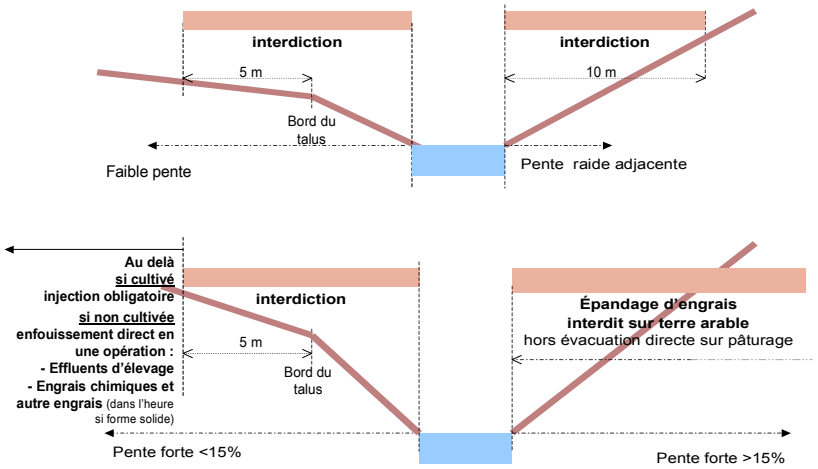
Steep slope (> 18%): banned

Slope (> 7% and < 18%): permitted if manure and if * sowings carried out within one week -

except for potatoes, sugar beet, if the slope is more than 300 m long and is intersected by strips of at least 100 m of another crop than the three above.

Water course: no application less than 50 cm away on covered soil and less than 5 m away on bare ground

Flandre




It is prohibited to apply fertiliser:

1. up to 5 metres going inland, from the upper edge of the bank for the surface body of water;
2. up to 10 metres from the Flanders ecological network;
3. up to 10 metres when a steep slope is adjacent to the surface body of water.

**On steeply-sloping ground**, the fertiliser must be applied:

1. On the cultivated ground, by injection into the clods for the livestock manure or other liquid fertilisers;
2. On non-cultivated ground, by a single injection for the livestock manure, by direct incorporation for the chemical fertilisers. Solid chemical fertilisers must be incorporated within the hour.

application of fertiliser is banned in arable land plots with > 15% slope.

# 5 Dispute summary

| | | | | Germany | Belgium Flanders | Spain | | | Ireland | Netherlands | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Description of grievance | Curia no. C161-00 | Curia no. C221-03 | Curia no. C71-97 | Curia no. C161-00 | Curia no. C416-02 | Curia no. C396-01 | Curia no. C161-00 | Curia no. C322-00 |
| Articles | Article 3 | §1 | Waters affected by pollution and waters which could be affected by pollution if action pursuant Article 5 is not taken shall be identified by the Member States in accordance with the criteria set out in Appendix I. | | X | X | | X | X | | |
| | | §2 | Member States shall, within a two-year period following the notification of this Directive, designate as vulnerable zones all known areas of land in their territories which drain into the waters identified according to paragraph 1 and which contribute to pollution. They shall notify the Commission of this initial designation within six months. | | X | | | X | X | | |
| | | §4 | Member States shall review and if necessary revise or add to the designation of vulnerable zones as appropriate, and at least every four years, to take into account changes and factors unforeseen at the time of the previous designation. They shall notify the Commission of any revision or addition to the designations within six months. | | | | | X | X | | |
| | Article 4 | | - 1. With the aim of providing for all waters a general level of protection against pollution, Member States shall, within a two-year period following the notification of this Directive: (a) establish a code or codes of good agricultural practice (b) set up where necessary a programme ...<br>- 2. Member States shall submit to the Commission details of their codes of good agricultural practice ... | | | X | | | | | |
| | Article 5 | | Member States shall establish action programmes in respect of designated vulnerable zones taking account of scientific data and environmental conditions. Action programmes shall be implemented within four years of their establishment and shall consist of the measures of Appendix III and those of good practices, along with additional measures or reinforced actions if the implementation of action programmes cannot suffice. A programme to monitor the nitrate content of surface water and groundwater at selected measuring points is defined and reviewed every four years. | X | X | | X | | X | X | |
| | Article 6 | | The Member States designate the vulnerable zones and monitor the nitrate concentration in freshwaters at surface water sampling stations and groundwater aquifers. The reference methods of measurement set out in Appendix IV shall be used. | | | | | | X | | |
| Appendix II | Code of good practice | A 1) | periods when the land application of fertiliser is inappropriate; | | | | | | | | X |
| | | A 2) | the land application of fertiliser to steeply sloping ground; | | | | | | | | X |
| | | A 4) | the conditions for land application of fertiliser near water courses; | | | | | | | | X |
| | | A 6) | procedures for the land application of both chemical fertiliser and livestock manure, ... | | | | | | | | X |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Appendix III | P2 | | These measures will ensure that, for each farm or livestock unit, the amount of livestock manure applied to the land each year, including by the animals themselves, shall not exceed a specified amount per hectare. | X | | | X | | | X | |

***Summary table of disputes regarding Directive 91/676/EEC*** *(and if appropriate other EEC directives simultaneously*

| CURIA code and Country | Order and recourse date | Directives evoked in the requirements |
|---|---|---|
| C71-97<br>Spain | Order of 1998<br>recourse of 1997 | • directive 91_676/EEC: firstly, by failing to designate areas considered vulnerable and communicate these designations to the Commission and, secondly by failing to establish the codes of good agricultural practice and to communicate them to the Commission |
| C161-00<br>Germany supported by Spain and Netherlands | Order of 2002<br>recourse of 2000 | • directive 91_676/EEC: by failing to adopt all the laws, regulations and administrative provisions necessary in order to comply with the obligations laid down in Article 5(4)(a) and point 2 of Appendix II of Directive 91/676/EEC (/quantity of livestock manure applied incorporating animal dung itself/calculation of nitrogen leaks/calculation method for application/consideration of atmospheric fallout) |
| C322-00 Netherlands | Order of 2003<br>recourse of 2000 | • directive 91_676/EEC: by failing to adopt the necessary legislative and administrative provisions laid down in Article 4 and Article 5(4) and (5) and in paragraphs A(1), (2), (4) and (6) of Appendix II and paragraph 1(2) and (3) and paragraph 2 of Appendix III |
| C396-0, Ireland | Order 2004<br>Recourse of 2001 | • Directive 91/676/EEC Article 3 (1), Appendix I, Article 3 (2) and/or (4), Article 5, Article 6 (1): identify fully the waters and notify them to the Commission, designate the vulnerable zones in application of Article 3 (2) and/or (4), establish action programmes in accordance with Article 5, proceed correctly and fully with the monitoring and review of waters in accordance with Article 6 (1) a) to c) |
| C416-02, Spain | Order of 2005<br>recourse of 2002 | • directive 91_676/EEC: 92/676/EEC, by failing to designate Rambla de Mojácar as a vulnerable zone in breach of the provisions of Article 3 (1), (2) and (4),<br>• directive 75_442/EEC: by failing to adopt the measures necessary to comply with the obligations incumbent upon it by failing to take the necessary measures to ensure that the waste from the pig farm located at the locality of "El Pago de la Media Legua" will be disposed of or recycled without endangering human health and without harming the environment<br>• directive 91_271/EEC: by failing to ensure the treatment of urban wastewater from the agglomeration of Vera<br>• directive 85_337/EEC: failing to assess the effects prior to executing or modifying this impact assessment project<br>• directive 80_68/EEC: failing to carry out the necessary hydrological studies in the polluted area |
| C121-03, Spain | Order of 2005<br>recourse of 2003 | • directive 75_442/EEC: waste from pig farms<br>• directive 85_337/EEC: prior to the construction of said farms or modification of their projects, no assessment of their effects<br>• directive 80_68/EEC: failing to carry out the necessary hydro-geological studies in the polluted area regarding pig farms<br>• directive 80_778/EEC: quality of water intended for human consumption exceeding, in several public water distribution networks in the Baix Ter region, the permitted maximum concentration for the "nitrates" parameter |
| C221-03, Belgium | Order of 2005<br>recourse of 2003 | • directive 91_676/EEC: Directive 91/676/EEC - Transposition incomplete - Protection of water against pollution by nitrates from agricultural sources - Failure to define polluted waters or waters likely to be polluted - Incorrect and insufficient designation of vulnerable zones - Code of good agricultural practice: Poor standard - Action programme: Poor standard and incomplete application |
| C151-12, Spain | Order of 2013<br>recourse of 2012 | • directive 91_676/EEC: regarding the protection of water against pollution by nitrates from agricultural sources<br>• directive 2000_60_EC: - framework for a community action in the field of water policy ---- Member States shall ensure the establishment and/or implementation of: (a) the emission controls based on best available techniques, or (b) the relevant emission limit values, or (c) in the case of diffuse impacts the controls including, as appropriate, best environmental practices set out in Council Directive 96/61/[EC] of 24 September 1996 concerning integrated pollution prevention and control |

| | | |
|---|---|---|
| | | • Council Directive 91/271/EEC concerning urban waste-water treatment |

# 6 Germany Monograph

## 6.1 Persons met

Federal Government (Bonn)

- Ministry of Agriculture:
  - Dr Werner Kloos, Deputy Director General, Agriculture;
  - Mr Oswald, Head of the Plant Crop Bureau and member of the Nitrates Committee (Brussels);
  - Mrs Friederike Haniel, Head of the Environment and Resource Protection Bureau;
  - Mrs Kristin Strupp, responsible for relations with the European Parliament, on behalf of her "International Affairs" colleague.
- Ministry of Environment:
  - Mrs Ostermeyer-Schlöder, Head of the Nature and Environment Protection Bureau in Agriculture;
  - Mrs Sandra Golder;
  - Mrs Dr Frauke Grimm, WR I 3 Bureau, protection of surface waters and groundwaters.

Land of Bavaria (Munich):

- Ministry of Agriculture of the Land:
  - Mr Ludwig Wanner, Head of the Protection Bureau for resources in agriculture; fertilisation and protection of plants;
  - Martin Schüssler, community and international affairs.
- Environment Ministry of the Land:
  - Mr Michael Haug, Head of Groundwater and Water Supply Protection Bureau;
  - Dr Andreas Kolbinger;
  - M Mayir.
- Bavarian Farmers Union:
  - Mr Georg Wimmer, Deputy Secretary General;
  - Mrs Maria Stemmer, responsible for environmental issues.
- Bavarian Agricultural Agency:
  - Mr Rudolf Ripper, Head of the Organic Farming, Ground Crops and Resource Protection Institute;
  - Dr Matthias Wendland, Mr Nüssland.

## 6.2 Document references

- Nitratsituation im Grundwasser Bayerns: nitrates, state of groundwaters in Bavaria, Bavarian Environment Agency;
- Notice from the Bavarian Ministry of Environment;
- Nitrat Bericht 2012 der Bundesregierung: nitrates report at the end of the fourth action programme, 2012;

- DüngeVo: fertilisation order, February 2007, consolidated, modification in progress;
- Report 2004, second action programme;
- Report 2012, fifth action programme;
- Nitrate order reform issues, Bayerische Landesanstalt für Landwirtschaft (Bavarian agricultural research station), January 2015;
- "yellow paper": guidelines for the fertilisation of fields and meadows, Bayerische. Landesanstalt für Landwirtschaft;
- Bayerische Landesanstalt für Landwirtschaft Internet site;
- JE: junior entreprise, sciencesPo.

## 6.3 Context

### 6.3.1. Water quality

Water quality is measured at many points, under the:

- European Environment Agency: 800 points,
- Water Framework Directive: about 4,000 points,
- Nitrates Directive: 160 points.

The 160 points in this nitrates network were chosen from the start based on presumed high nitrate contents; it is therefore unsurprising that today 49% of measuring points still show contents higher than 50 mg/l (five years earlier: 60%).

Given these results, the Commission has sent Germany reasoned observations. There are many in Germany who regret this choice. If the measuring network had been constructed on simple statistical criteria, like in other member States, German nitrate policy would be shown in a more favourable light.

The plan is therefore to improve the representativeness of the monitoring programme. Thus, in Bavaria, the number of sampling points under the Nitrates Directive will be multiplied by five in the next action programme (i.e. in application of the upcoming fertilisation legislation): Germany should therefore be better placed in the community concert, probably somewhere in the middle.

For this reason, the derogation from the application of 230 kg of organic nitrogen per hectare and per year has not been renewed in Germany since 2014. This derogation benefited approximately 1,100 livestock farms (total number of German farms: 230,000). The Commission is suspending de facto the question of granting a new derogation from the contents of the draft amendment to the fertilisation decree currently in force.

Land of Bavaria: according to the Bavarian Ministry of Environment, the surface water quality in terms of nitrates can be estimated as satisfactory. Conversely, the situation is more worrying for the groundwaters: 24% of Bavarian bodies of groundwaters are of

insufficient quality and this could increase to 30% in 2021 according to a risk analysis by this ministry (more than 50 mg nitrates per litre).

As in Ireland, phosphates are more of a problem for the surface waters.

The members of the mission detected a certain tension between the ministerial departments, civil society, environmental organisations and the agricultural profession. The farmers are denouncing a bureaucracy that they believe is hindering structural changes and taking general measures that ignore agricultural requirements.

### 6.3.2. Germany and its agriculture

From an environmental viewpoint, German agriculture features a two-tier system in the West of the country:

- a great many small, part-time farms that can nevertheless be intensive (e.g.: car workers at Volkswagen in Lower Saxony or BMW in Bavaria),

- huge dairy or pig farms operating full-time, mainly in Lower Saxony or North Rhine-Westphalia; Bavarian dairy production is also partly made up of similar farms. If the country had to define "super-vulnerable" areas, it would look firstly at the huge herds in these regions.

In the East of the country, agriculture is a reflection of its past and has many huge farms inherited from collectivist structures.

The Land of Bavaria agricultural union plays a key role in the positions taken by the profession nationally. The German agricultural profession is sometimes able to have its main claims presented by Bavaria at the Bundesrat (Länder Parliament).

The farmers come from all sociological backgrounds. They are under strong pressure from society in terms of environment and protecting the water resource in many small regions. Lower Saxony, for example, has entered into precise agreements with the drinking water distributors (frequently the municipal authorities), which are financed partly by water taxes (as part of "environmental services payment") and also by aid from the Land, the European Union and even Berlin.

### 6.3.3. Institutional organisation

a. At federal level: the federal government is the contact for the European Commission. It sets out the framework for the entire German agricultural policy: in this particular case, the application of the Nitrates Directive in Germany is based on the 2006 fertilisation legislation (DVo, Düngeverordnung) which was amended in 2007 but is still in force in 2015. The German system is therefore relatively stable. It is also incumbent on the federal government to communicate the report cited in Article 10 of the directive; the 2012 version coincided with serious observations by the Commission (see below).

b. At regional level: the Länder are responsible for implementing the national framework. They have the capacity to adapt the provisions to their own context, but without consequently mitigating the measures: they can only make them stricter or delay the application periods (without shortening them). To date, Bavaria has not strayed from the federal decree and the same is true of the other Länder. The bans on application are the same, as are the protection of banks of water courses.

### 6.3.4. History of introducing the directive

The entire country was declared a vulnerable zone from the start. This was decided to ensure equal treatment of farmers, Länder and sectors. All professionals were in favour of this principle. In addition, difficulties in determining vulnerable zones could be avoided. The fertilisation legislation included phosphate-related provisions from the start.

The Commission had formed a recourse against Germany which resulted in order of the CJEU dated 14 March 2002. The main grievance retained by the Court related to the rules on "limiting the application of fertilisers". Thus the amount of livestock manure applied must not contain more than 170 kg nitrogen/ha (except for derogation). The Court judged that this limit was assessed in relation to the "amount of nitrogen added to the soil" and not, as stated in the German regulations, "the amount of nitrogen actually penetrating the soil". These amounts are fixed absolutely.

At that point, Germany started drafting new fertilisation legislation and immediately it received an initial draft (in 2013), the Commission sent the German government a letter of observation that denounced:

- excessive pollution of groundwaters,
- insufficient drop in the number of pollution points and slowing down of the reduction in pollution overall.

This letter also contained proposals (see comparative table in Appendix 1 attached to this sheet). The members of the mission picked out the following from these proposals: nitrogen balance at crop end: 20 kg/ha, possibly 30 kg; application periods on certain soils: ban from 1 September to 1 April; grass cultivation: ban from 1 October to 1 February; arable crops in continental climate: ban from 1 August to 1 February; strict restriction if slope greater than 2%; fertilisation banned on any slope greater than 15%; the ceiling of 170 kg/ha is reduced by 20% in overloaded regions, etc.).

Faced with the major difficulties raised by these proposals, a federal assessment and proposal group was formed, including representatives of the Länder, members of the federal administration and recognised, independent competent personalities. Initial proposals were formulated in 2012. The group is likely to finish its work during Summer 2015 and the new fertilisation legislation will be decided before the end this same year.

## 6.4 Contents of mandatory action programme measures

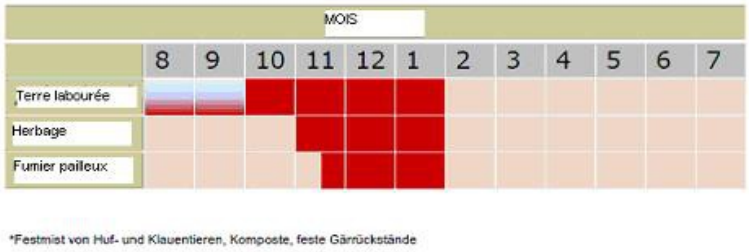
The German provisions have to day essentially the characteristics detailed below in terms of nitrates, although the measures also involve phosphates:

- The following are deemed to be fertilisers: manure, slurry, liquid manure, chemical fertilisers and products for the soil, crop substrates and crop adjuvants.
- The following are deemed to be "fertilisers with essential nutrient content": fertilisers with a total N content of > 1.5% dry weight, or where the P2O5 content is > 0.5% dry weight P2O5.
- UAA: the entire surface cultivated by the farmer, including fallow land.

- The provisions are relatively simple (examples: very few prohibited periods; few references applicable to production of animal dung, etc.)
- Fertilisation plan (campaign start): the farmer is not required to write it down (this could change in the next legislation).
- The nitrogen budgets are prepared per crop block (a global nitrogen budget will be mandatory in the next legislation).

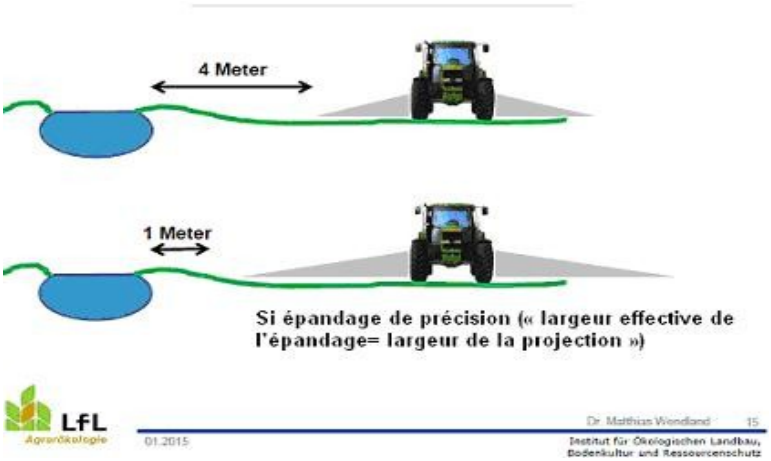
### 6.4.1 Application prohibition periods

The application prohibition periods, according to the text currently in force, are shown in the table below for all fertilisers. The strawed manure on the last line includes manure from mammals, composts and digestates:

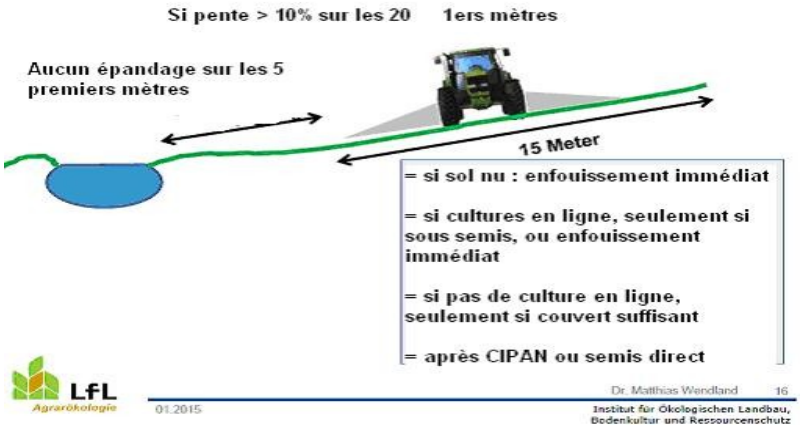



### 6.4.2 Proximity of water courses

- Precision application can be applied up to 1 m from water courses.



- Where there is a > 10% slope, the first five metres from the water course are banned: :

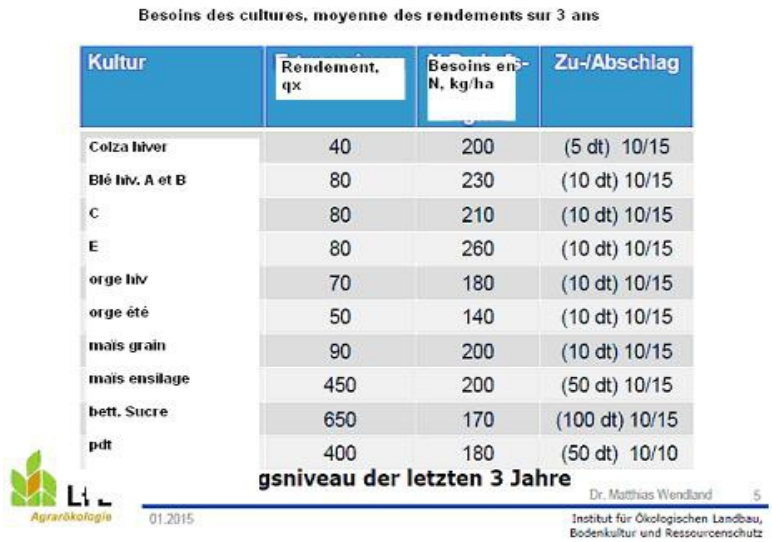



### 6.4.3 Balancing crop needs and inputs

Farmers have software programs (in Bavaria, the public applied research station LfL, Landesanstalt für Landwirtschaft, makes them available to farmers); they can program the management of organic livestock manure (nitrates and phosphates) based on:

a) crop needs, that take account of expected yields:

***Average crop need (dt = quintal)***


Besoins des cultures, moyenne des rendements sur 3 ans

| Kultur | Rendement, qx | Besoins en N, kg/ha | Zu-/Abschlag |
|---|---|---|---|
| Colza hiver | 40 | 200 | (5 dt) 10/15 |
| Blé hiv. A et B | 80 | 230 | (10 dt) 10/15 |
| C | 80 | 210 | (10 dt) 10/15 |
| E | 80 | 260 | (10 dt) 10/15 |
| orge hiv | 70 | 180 | (10 dt) 10/15 |
| orge été | 50 | 140 | (10 dt) 10/15 |
| maïs grain | 90 | 200 | (10 dt) 10/15 |
| maïs ensilage | 450 | 200 | (50 dt) 10/15 |
| bett. Sucre | 650 | 170 | (100 dt) 10/15 |
| pdt | 400 | 180 | (50 dt) 10/10 |



b) Average N and P content of dung per type of animal raised. See Appendix 2 that focuses on poultry by way of illustration.

c) Minimum percentages of nitrogen reaching the soil, after losses in the housing units and during storage and after application, see Appendix 3.

d) Minimum effectiveness values of the nitrogen in animal or organo-mineral fertilisers in the year of application, see Appendix 4.

## 6.5 Contents of additional measures and reinforced actions in action programmes

The additional, mandatory measures are the following:

- On bare ground, incorporation must be immediate, i.e. within four hours at most from the start of application.

- In arable crops, after harvesting the main crop, where a second crop is planned (winter crops or catch crops), 40 k of ammonium N per ha or 80 kg of slurry or liquid manure can be applied.

## 6.6 Implementation tools

The two, very rich Länder in Southern Germany can still subsidise programmes of voluntary agri-environmental measures that are proposed to the farmers to protect the natural environment (Kulap programme in Bavaria, Mekka programme in Baden-Würtemberg), These programmes are co-financed by the European Union (second pillar) and the federal government (certain measures). The government of the Land of Bavaria is implementing the following strategy in terms of nitrates:

- step 1: promotion of optional measures financed by Kulap (see Appendix 5),

- step 2: application of community rules without financing.

A few examples quoted by the Bavarian farmers' union:

- EAFRD credits (2013 figures), see table in Appendix 5.
- Extensive grass cultivation along water courses and in sensitive areas: 32,046 ha.
- Nitrogen-fixing intermediate crops 44,789 ha (winter grass cultivation) and mulch 88,122 ha
- Reconversion of arable crops to grass the length of water courses and in super-sensitive areas: 7,953 ha.
- Grass strips/water courses, super-sensitive areas: 2.577 ha.
- Agro-ecology in arable crops and surfaces attracting bees: 16.949 ha.
- Sowing in rows or direct sowings: new measure 2015
- Abandonment of intensive crops in super-sensitive areas for the water resources: new measure 2015
- Structural and landscape elements: new measure 2015

In 2015, it is possible in Bavaria to combine greening and KULAP measures, mainly for the grass strips the length of water courses.

The Bavarian farmers union wished to point out to the mission a few other measures that it has initiated:

- Farmers' soil projects (http://www.boden-staendig.eu/projekte/bodenstandig).
- "Flower frame": the farmers union and the Bavarian beekeepers agreed on bee-attracting strips on the ends of corn fields (or other crops) (http://www.bayerischerbauernverband.de/bluehende-rahmen)
- "Intermediate game hunting crops": the farmers union and the Bavarian hunters agreed on special intermediate crops that encourage game (http://www.bayerischerbauernverband.de/pm26-zwischenfrucht)
- Numerous cooperation programmes on a voluntary basis in water catchment and protection areas between the farmers and drinking water distributors http://www.lfu.bayern.de/wasser/trinkwasserschutzgebiete/kooperation_mit_landwirten/index.htm

The members of the mission state that the Land of Bavaria has set up an applied research station in Freising which has produced some outstanding work in support of the Nitrates Directive. In particular, it has developed numerous computer programmes to support the farmers in:

- dimensioning slurry storage ditches;

- calculating crop needs, nitrogen and phosphate products according to the species, livestock rearing methods, the age of the animals, etc.;

- calculating budgets at the farm (optional to date) for fertilisation programmes (they do not need to be in writing).

## 6.7 Other information

The mission contact persons note that the European Union water policy falls under European texts with varying purposes and scope; the dynamics that prevailed at the launch of the Water Framework Directive could in this sense be relaunched and broadened to position the nitrates action programmes in a more consistent and effective framework.

## Appendix 1 of the Germany Monograph: Fertilisation decree

Comparison: 2007 text, draft new decree, initial demands by the Commission, position of the Bavarian farmers union. (Source: Bavarian farmers union - Environment and Nature Draft new fertilisation decree, version of 18 December 2014. Positions compared: current regulations; draft regulations; initial demands by the Commission

| | réglementation actuelle | Projet de décret du 18.12.2014 | Demandes initiales de la Commission | Position du syndicat des agriculteurs bavarois |
|---|---|---|---|---|
| **général** | | | Toutes les mesures prescrites par la directive nitrates doivent être transcrites dans le décret | Les durcissements réglementaires des dernières années suffisent à améliorer la protection des eaux. Les mesures volontaires doivent être prioritaires. |
| **Plan prévisionnel** | - Système ouvert d'entrée sortie, l'agriculteur est libre de choisir le besoin des cultures<br>- système ouvert de supplément/ déduction<br>- pas d'obligation papier<br>- pas de limite systémique | - Calcul du bilan inchangé, obligation de registre papier ;<br>- système unique d'entrée sortie pour toutes les cultures tous les agriculteurs d'Allemagne avec des maxima régionaux<br>- supplément et déduction fixes<br>- les chiffres du plan de fertilisation, de la fertilisation réalisée, et du bilan doive être cohérents. Exemptions pour les entreprises non soumises au bilan.<br>- Horticulture/maraîchage : groupage possible jusqu'à 2 ha | - Stricts maxima de fertilisation car système allemand trop flexible<br>- le niveau de rendement doit être fixé par les instances publiques<br>- obligation pour toutes les exploitations de chiffrer leur besoin minimal d'azote<br>- | - Aucun élément positif : la proposition allemande contient des maxima fertilisation (azote total) comme demandé par la Commission<br>- de stricts maxima, et une forte diminution de la fertilisation, signifieraient la mort de la céréaliculture de qualité<br>- encore de la paperasserie ! On peut accepter, si ces maxima stricts sont supprimés<br>- plan de fertilisation écrit : uniquement si le solde azoté n'est pas respecté<br>- l'agriculteur doit pouvoir continuer à faire des plan par type de culture |
| **Bilan nutritif** | - Sur base surfacique | - Sur base surfacique<br>- solde azote abaissé de 60 à 50 kg<br>- coefficient plus élevé pour le lisier de porc<br>- coefficient plus élevé pâturage en plein air<br>- seuil relevé à 15 ha, 2 ha en maraîchage, & maximum 750 kg d'azote animal<br>- le gouvernement fédéral prépare un bilan « seuil de ferme » pour 2008 : application commençant par les exploitations de 2000 places d'engrais ou 3 UGB/ha | - Egalité entre la fertilisation & les besoins azotés, pas d'excédent au bilan<br>- (éventuellement) abaissement du seuil azote à 20 ou 30 kg | - On ne peut pas à la fois baisser le seuil d'azote & baisser les pertes prévisionnelles<br>- possibilité d'incorporer au calcul les pertes inévitables<br>- les restrictions d'épandage impliquent des pertes plus élevées |
| **Phosphates** | - Solde phosphates 20 kg/ha sur moyenne de 6 ans | - Sur terre riche en phosphates, fertilisation dès 2018 à concurrence de 75 % des prélèvements cultures, dès 2020 : 50 %<br>- autres dispositions inchangées | - Pas de demande, mais directive cadre eau | - Les limites phosphates contraignent l'épandage de lisier. Vrais risques de recours aux engrais chimiques |
| **Périodes d'épandage** | - Terres labourables : 1.11. – 31.1<br>- herbages : 15.11. – 31.1.<br>- Fumier pailleux : pas de restriction | - Terres labourables : de la récolte de la culture principale au 31 janvier.<br>- Exception période du 1.10 au 31.1 colza, ray-gras, CIPAN, semés avant le 16 septembre .<br>Orge d'hiver après céréales semé avant le 2 octobre<br>- herbages : 01.11. - 31.01.<br>- Fumier pailleux : 15.11. - 31.01.<br>- Au cours de l'automne : Max. 30kg Ammonium-N ou 60kg N-total | - A moduler selon région climatique, risque de lessivage... ex. :<br>- Terres labourables : Alpin: 1.9. – 1.3. Continental:1.8. – 1.2.<br>- Forts risques de lessivage 1.9. – 1.4.<br>- herbage: ab 01.10. – 1.2.<br>- Fumier pailleux : interdiction abrégée, jusqu'à deux mois de moins que pour le lisier | - Ne pas étendre les interdictions d'épandage<br>- en Bavière, les sols sont plus praticables à l'automne<br>- il est contre-productif de réduire les périodes d'épandage<br>- Avec le changement climatique, les périodes de végétation s'allongent<br>- par temps froid, pas de nitrification<br>- harmoniser les CIPAN (15.9.) Avec le verdissement (1.10)<br>- ouvrir l'option d'agents bloquant la nitrification<br>- les ministres de l'agriculture des Länder sont unanimes pour reconnaître que ce n'est pas une bonne pratique de fertiliser sur paille de maïs<br>- fumier pailleux : aucune base objective pour les restrictions, mais la jurisprudence communautaire nous y oblige |
| **Capacités de** | - Responsabilité les Länder. | • Base de six mois | • 9 mois minimum pour tous | • Ne pas faire des 9 mois une obligation |

| | | | | |
|---|---|---|---|---|
| **stockage** | - 6 mois pour tous<br>- pas de spécification pour le fumier pailleux | • si pas de surface d'épandage ou plus de 3 UGB / ha : 9 Mois<br>• fumier pailleux : 4 mois | • fumier pailleux : min. 1 mois de plus que la durée d'interdiction d'épandage | réglementaire<br>• fortes mutations structurelles en vue<br>• nombreuses petites exploitations avec une surface faible |
| **Techniques d'épandage d'enfouissement** | - Certaines techniques sont interdites...<br>- Enfouissement dans les 4 h<br>- critère décisif : teneur significative en azote | - Sur sols cultivés : à partir du 01.01.2020 ;<br>- herbages à partir du 01.01.2025<br>- épandage de liquide : uniquement en bande, sur le sol, ou incorporé<br>- exceptions possibles pour motif structurel ou naturel<br>- sol non cultivé : épandage possible (hérisson vers le bas) incorporation avant 4h<br>- plafond à partir de 2020 pour les engrais minéraux<br>• spécifications supplémentaires (épandage, précision de dosage) à partir de 2020 | - Des spécifications plus précises sont nécessaires en matière d'épandage, et des descriptions plus concrètes | - Tenir compte du point de vue des agriculteurs en matière de réduction d'émissions.<br>- Refus de forfaits techniques ; toutes les techniques ne valent pas pour toutes les régions / toutes les exploitations<br>- l'évolution structurelle sera accélérée<br>- Pendillarts /injection ne conviennent pas aux herbages. Problèmes de qualité alimentaire si sécheresse<br>- .... |
| **Sols saturés d'eau, inondés, gelés, ou enneigés** | • Épandage interdit si sols :<br>• inondés<br>• saturés d'eau<br>• gelés , exception si le sol dégèle pendant la journée<br>• couverture de plus de 5 cm de neige<br>• risque de lessivage | • Épandage interdit si sols :<br>• inondés<br>• saturés d'eau<br>• les 5 cm de neige disparaissent<br>• sol gelé, exception si :<br>▪ couverture végétale<br>▪ absorbe la fertilisation lors du dégel s'il n'y a pas de risque de lessivage<br>▪ pas de risque de colmatage | - Pas de fertilisation si sols saturés gelés ou couverts de neige | - La définition du sol gelé s'est précisée<br>- ... |
| **proximité des cours d'eau, terrains en pente** | - Distance minimale de 3 m<br>- exception : 1 m minimum si technique précise<br>- éviter les lessivages dans les eaux superficielles<br>- terres labourables en bord de cours d'eau, dont la pente> 10 % sur les 20 premiers mètres<br>- 3m pas d'épandage<br>- 3 – 10m : enfouissement direct<br>- au-dessus :<br>- sol non cultivé : incorporation immédiate<br>- sol couvert par des cultures en ligne : semis dérobé ou incorporation immédiate, si pas de cultures en ligne : uniquement si la couverture du sol est suffisante ou si semis direct | - Distance minimale de 4 m<br>- exception : 1 m si technique précise<br>- nouveau : lessivage dans un terrain voisin non agricole interdit<br>- terres en bord de cours d'eau, dont la pente> 10 % sur les 20 premiers mètres :<br>- 5 m pas d'épandage<br>- de 5 à 20 m : incorporation immédiate, si sols couverts suffisamment, etc. | Epandage interdit à moins de 2 m<br>Fortes restrictions si pente> 2 %<br>interdiction totale si pente> 15 % | Les demandes de la Commission conduiraient à 10 % de jachère voire 50 % en viticulture<br><br>promouvoir la coopération volontaire plutôt que la contrainte réglementaire<br>faisable via le verdissement et le programme KULAP |

| | | | | |
|---|---|---|---|---|
| **170 kg N/ha** | - Azote animal | - Tous fertilisants organiques, y compris digestat<br>- exception possible pour digestat, si respect des conditions ( épandage à faible émission, bilan respectant les soldes azotés, etc.), et si l'herbage bénéficie d'une dérogation<br>- Derogation lisier sur herbages sera demandée à Bruxelles après conclusion du nouveau décret | - 170 kg N azote animal | - D'accord pour l'égalité lisier et digestat, mais :<br>- ménager des derogations |
| **Délégation aux Länder** | | - Les Länder peuvent prendre des dispositions réglementaires pour des régions à plus de 50mg Nitrate/litre ou plus de 40 mg et tendance croissante<br>- plafonnement de l'épandage complémentaire à 10 %<br>- capacité stockage portée à 7 mois allongement de l'interdiction d'épandage de 4 semaines en maraîchage<br>- seuil de minimis revenu à 10 ha<br>- dispense pour les exploitations dont le solde est < 35 kg<br>- hors de zones sensibles : seuil de minimis porté à 20 ha | - Critères d'identification de régions très chargées<br>- définition de contraintes particulières pour ces régions<br>- fertilisation à concurrence de 80% maximum du besoin des cultures dans ces régions | - Refus de délégation aux Länder !<br>- le décret fertilisation s'applique à toute l'Allemagne<br>- promouvoir la coopération et le conseil dans les régions à problèmes (mesures agri environnementales) |

S'adresser à Martin Erhardsberger, expert environnement au syndicat des agriculteurs bavarois

## Appendix 2 of the Germany Monograph: Average dung per raised animal (a few examples)

Number of animal categories for the production of nitrogen:

Standard values with no possibility of case-by-case calculation:

- poultry: about forty (about 5% of the N production)
- pigs: about twenty (25%)
- cattle: about fifteen (70%)

Online calculation software program, to establishing the provisional manuring plan and check compliance with ceiling values, for example in Bavaria.

Examples:

| | Kategorie | Mode de production | | Production par an | |
|---|---|---|---|---|---|
| | | | | kg N | kg $P_2O_5$ |
| | 1 | 2 | 3 | 4 | 5 |
| 129 | Dindes | | | Par animal et par an | |
| 130 | Coqs | 22,1 kg de croissance, jusqu'à 21 semaines d'élevage (56,4 kg aliment consommés) | Aliment standard | 0,975 | 0,552 |
| 131 | | | N /P réduit | 0,905 | 0,428 |
| 132 | Poules dindes | 10,3 kg de croissance, 16 semaines élevage (26,7 kg aliment) | Aliment standard | 0,526 | 0,238 |
| 133 | | | N-/P-réduit | 0,497 | 0,231 |
| 134 | Coqs à partir de la sixième semaine | | Aliment standard | 0,914 | 0,507 |
| | | | N-/P-réduit | 0,845 | 0,337 |
| 135 | Poules dindes à partir de la sixième semaine | | Aliment standard | 0,473 | 0,253 |
| | | | N-/P-réduit | 0,444 | 0,199 |
| 136 | | | | | |
| | | | | | |
| 137 | Volailles de moins de 5 semaines, 20 % coqs, 50 % poules dindes | | Aliment standard | 0,057 | 0,042 |
| 138 | Canards | | | Par place et par an | |
| 139 | Canards de Pékin | 19,5 kg de croissance par place/an ; 6,5 séries (3,0 kg croissance par tête) jusqu'à 26 jours d'engrais | | 0,605 | 0,344 |
| 140 | Pingenten | 15,4 kg de croissance par place/an ; 4 séries ; 2,7 kg femelles, 5,0 kg mâles (ratio = 1:1) | | 0,576 | 0,357 |
| 141 | Oies | | | par l'an | |

## Appendix 3 of the Germany Monograph: (draft DüngeVo)

***After losses in the housing units, during storage and evaporation during application, minimum added value of nitrogen organic fertilisers applied.***

***Coefficients of total nitrogen content (%), evaporation is therefore the difference compared to 100 (e.g. cattle slurry reaching the ground: 70% nitrogen content; total evaporation: 30%); Open air: same coefficients as for the strawed manure***

| | Leaving the housing unit [26] | | Reaching the ground [27] | |
|---|---|---|---|---|
| Species | Slurry | Strawed manure, grazing animal liquid manure [28] | Slurry | Strawed manure, grazing animal slurry [29] |
| Cattle | 85 | 70 | 70 | 60 |
| Pigs | 80 | 70 | 70 | 60 |
| Poultry | | 60 | | 50 |
| Other (horses, sheep, etc.) | | 55 | | 50 |

## Appendix 4 of the Germany Monograph: minimum effectiveness value of nitrogen in animal or organo-mineral fertilisers in the year of application

**Minimum effectiveness value of nitrogen in animal or organo-mineral fertilisers in the year of application**

| **Fertilisers** | **Minimum effectiveness of nitrogen during the year of application as % of total nitrogen** |
|---|---|
| Slurry/cattle | 50 |
| Slurry/pigs | 60 |
| Manure/cattle/sheep/goats | 25 |
| Manure/pigs | 30 |
| Dry dung | 60 |
| Poultry or rabbit manure | 60 |
| | |
| Slurry/cattle | 90 |
| Slurry/pigs | 90 |
| Liquid sludge from treatment plants (< 15% dry matter TM) | 30 |
| | |
| Compost/Mushroom | 10 |

[26] nitrogen produced by the animals, reduced by losses in the housing unit and during storage

[27] nitrogen leaving the housing unit reduced by evaporation losses at application

[28] grazing animals: split based on the number of days actually out to pasture

[29] Note by members of the mission: the table above shows that between liquid cattle manure leaving the housing unit and reaching the ground, it loses 15% of its nitrogen content by evaporation (85 - 70)

| | |
|---|---|
| | |
| | |
| Liquid digestate | 50 |
| Solid digestate | 30 |

## Appendix 5 of the Germany Monograph: Provisions of the Bavarian KULAP programme, voluntary agri-environmental measures regarding water (federal and community co-financing (EAFRD)

| Climate measurements | Subsidy |
|---|---|
| **Pastures** | |
| extensive management for ruminants; no chemical fertilisers | |
| B20 (max. 1.40 LU (livestock unit)/ha except forage) | €169/ha |
| B21 (max. 1.76 LU/ha) | €120 |
| if mountain pasture, minimum 0.10 LU/ha | |
| B22 (max. 1.40 LU/ha grass forage) | €80/ha |
| B23 (max. 1.76 LU/ha grass forage) | €55/ha |
| Grass or cultivatable lands | |
| B25/26 - low emission application: by injection or using shoes | |
| If equipment ownership, | |
| max. 18 m3/LU | |
| or fermenters (B25) | |
| max. €54/ha | €1.50/m3 |
| **Cropland/per plot** | |
| B28 grass reinstated at edge of water course or in sensitive area | €370/ha |
| B29 (in peatbog) | €570/ha |
| B10 organic farming, if entire farm: | |
| - cropland and pastures | €273/ha |
| - gardened land | €468/ha |
| - perennial crops | €975/ha |

| Soil and water protection | Subsidy |
|---|---|
| **Pastures/per plot** | |
| B30 - extensive maintenance of pastures along water courses or in sensitive areas; no fertilisation or crop protection treatment | €350/ha |
| | |
| **Cropland/per plot** | |
| B34 - grass strips/soil and water protection | €920/ha of grass strip 1) |

| | |
|---|---|
| B35 - winter nitrogen-fixing intermediate crops | €70/ha3 |
| B36 - winter nitrogen-fixing intermediate crops, wild varieties | €120/ha 1) |
| if combined with B10 | €90/ha |
| B37 - sowings of mulch, crops in rows | €100/ha |
| if combined with B10 | €70/ha |
| B38 - direct sowing in rows | €150/ha |
| if combined with B10 | €120/ha |
| B39 - abandonment of intensive crops, protection of water and sensitive areas | €250/ha |
| if combined with B10 | €125/ha |

| Biodiversity – specific varieties | |
|---|---|
| **Pastures/per plot** | |
| B40 - maintaining the specific variety in the pastures | €250/ha |
| B41 - extensive pastures in woodland | €250/ha |
| **Cropland/per farm** | |
| B44 - diversified rotation with protein plants (pulse) | |
| B45 - diversified rotation with large-grain protein plants | €85/ha 2) |
| if combined with B10 | €50/ha |
| B46 - diversified rotation with old varieties | €120/ha 2) |
| if combined with B10 | €70/ha |
| Cropland/per plot | |
| B47 - annual bee-attracting surfaces | €600/ha |
| B48 - bee-attracting surfaces in woodland | €600/ha 1) |
| B49 - restoration of hedges and trees, including D, €20/m2 for the planning | €2.70/m2 |

| Landscape heritage | subsidy |
|---|---|
| **Pasture** | |
| summer mountain pasture, four months | €50/LU |
| **Pastures/speculation** | |
| B50 - hay milk, extensive feed supply, combined with B10, B20 and B21 | €100/ha |
| **Pastures/per plot** | |
| B51 - haymaking on slopes | |
| Slope 30 to 49% | €450/ha |
| Slope > 50% | €650/ha |
| **B52 - Recognised mountain pasture crops** | |
| Open | €30/ha |
| closed | €50/ha |
| additional first 30 ha | €30/ha |
| B55 - terraced vineyards, steep slopes | €1,300/2,400/3,500/ha |
| B56 - restoration of stone walls, steeply-sloping vineyards | €100/m2 of visible wall |
| B57 - isolated trees | €8/tree |

| Installation aids: (first and second year): | subsidy |
|---|---|
| cropland and pastures | €350/ha |
| gardened land | €915/ha |
| perennial crops | €1250/ha |

# 7 Belgium Monograph (Flanders region only)

## 7.1 Persons met and main document references

Rural Space Management Agency (VLM):

- Mrs Ria Gielis, Director of the Mestbank (manure bank);
- Mr Koen Desimpelaere, Head of the Fertilisation Department;
- Mr Kevin Grauwels, Flanders representative to the Nitrates Committee;
- Mrs Annick Goossens, Nitrates Directive expert.

French Embassy:

- Mrs Christiane Nuissier, Assistant to the Manager of the Economics Department for Benelux.

| | |
|---|---|
| Ref1: | Decree relating to fertilisers of 22 December 2006 and modifications of 22 December 2006, 19 December 2009 and 6 May 2011; |
| Ref2: | Order relating to derogations of 8 July 2011; |
| Ref3: | Decision 2011/489/EU of 29 July 2011 granting a derogation to the region of Flanders; |
| Ref4: | Order fixing the threshold values of nitrate residues of 10 February 2012. |

## 7.2 Nitrates context:

### 7.2.1 Water quality

Water quality is monitored by two different measuring networks:

- Under the Water Framework Directive: about 200 points
- under the Nitrates Directive: more than 600 surface water monitoring points and 3,500 groundwater monitoring points.

The results show a slight improvement in nitrate contents in surface waters (about 75% of contents are less than 50 mg/l, which is nevertheless still five to ten points below target: between 80 and 85%) and relative stability of nitrate contents in groundwaters and of phosphates in surface waters (0.3 to 0.5 mg/l against a target of 0.1).

This monitoring must be continued and in the next two or three years VLM intends to develop modelling of the impact of action programmes on the quality of water resources, in order to be able to announce deadlines for achieving good water status in N and P.

### 7.2.2 Flanders and its agriculture

The region has six million inhabitants. The agricultural sector accounts for 0.75% of GDP and 11% of exports. It comprises 25,200 farms (of which 52% farm less than 15 ha) and 618,000 ha of UAA.

Flanders is the centre of intensive livestock farming (1.3 million cattle, 6.1 million pigs and 29 million poultry) and fairly well developed industrial crops: 151,500 ha cereals, 35,700 potatoes, 20,800 ha beet and 228,400 ha of permanent grassland; it is faced with an almost standard situation of structural nitrogen surplus.

### 7.2.3 Institutional organisation

Implementation of the Nitrates Directive in Belgium falls entirely under the remit of regions, not the federal level. The Flanders regional government has a ministerial department in charge of the environment, natural resources and energy that makes policy decisions. Preparation and operational implementation of these decisions including monitoring, assessment and control are delegated to the Rural Space Management Agency (VLM).

VLM is a public establishment of 659 people in charge of the Nitrates Directive as well as other policies targeting sustainable development in rural or peri-urban areas. It has three divisions including one called "Manure Bank" (Mestbank) that manages, gives information and controls anything to do with fertilisation and livestock manure.

## 7.3 History of introducing the directive

Nitrates Directive implementation in Flanders is based on the 2006 Decree on fertilisers, when the vulnerable zone was extended to the entire territory. This was above all due to risks of eutrophication of the North Sea coastal waters and also had the advantage of making it easier to present actions to the farmers and obtain their agreement.

This decree was amended in 2007 to introduce the notion of nutrient emission rights to allow growth in agricultural activity subject to stabilisation of water pollution pressures. Only minor amendments have been made to it since then. It is important to note that the regulations have changed over time from the producer to the user of fertiliser.

This decree followed the resolution of disputes with the European Commission on the delimitation of vulnerable zones and various measures from previous action programmes. The Flanders region was thus able to negotiate its first derogation in 2007 from the 170 kg N/ha limit that was however rendered considerably more restrictive when renewed in 2011.

Since then, relations with the Commission have been more direct and adjustments have been easier. The new action programme that commenced in 2015 will be presented and discussed with a view to approval during the year. For the moment no huge change is planned compared with the previous 2011-2014 programme, and this includes the derogation from the 170 kg N/ha limit.

## 7.4 Contents of mandatory action programme measures

The decree (ref1 art3) uses the term "fertiliser" generically and then distinguishes between:

- "chemical and artificial fertilisers", including ammonium sulphates from stripping
- "livestock manure" in the form of:
    - "solid animal fertiliser", including: "manure" (if dry matter>20% and not including poultry excrement), mushroom compost (Champost), droppings, standardised plant biodegradable waste and waste from fishfarms,
    - "liquid fertiliser": slurry, digestates
- "other fertilisers" such as composts, silage seepage, purification sludge and polluted water

### 7.4.1 Application prohibition periods and methods

The application of livestock manure, other fertilisers and chemical fertilisers on arable lands not permanently covered is banned from 1 September to 15 February. In

addition, application is also banned at night and on Sundays and public holidays and, in coastal areas, on Saturdays, except for chemical fertilisers

Provision is made for a few exceptions to this period (Ref1 Art8 § 1, 3 and 4):

- 15 November to 15 January for manures and composts;
- 15 October to 15 February for animal fertiliser on clay soils excluding permanent grassland; after harvest, all solid fertiliser other than animal (a few exceptions); on a case-by-case basis for fertilisers with retardant.

Delay for nitrogen-fixing intermediate crops until 10 September in exceptional weather conditions.

Application conditions requiring mandatory incorporation within two hours for slurry and 24 hours for manure are demanding. To be more precise, the regulations support the prevention of atmospheric emissions as follows:

- other fertilisers and livestock manure
  - injection or drop pipes in grassland and cultivated land,
  - injection or incorporation within two hours (immediately on Saturday for livestock manure) on non-cultivated arable land, but the time is increased to 24 hours for manure, compost and other fertilisers with low ammoniacal nitrogen and incorporation is not mandatory for manure or mushroom compost on grassland or land cultivated with winter cereals, green compost, etc.
- treated or processed livestock manure: no incorporation in the soil if ammoniacal N content < 1 kg/1,000 kg (1,000 l)

### 7.4.2 Storage capacities

Minimum required (Ref1 Art. 9 §1):

- 9 months for animals still in the housing unit,
- 6 months for free-range animals,
- 3 months for housing unit manure.

No obligation for poultry: manure removed from the building after each cycle.

The government sets the minimum capacities in m3 based on the type of animal and housing unit. The farmer has the option of demonstrating that lower capacities, including removal, are not harmful to the environment.

There are storage construction rules (Ref1 Art11). Slurry storage can be arranged with other farmers (agreements or collective infrastructure) or via individual or collective treatments (Ref1 Art10). Six months capacity for polluted waters from crops permanently under glass; option of lower storage capacity where removal is proven (Ref1 Art9 §2).

Storage in the field: Réf1 Art8 §6

Storing solid animal fertiliser "in the field" is only permitted in the following conditions:

- the fertiliser is stored for application within one month at most,
- there is no storage between 15 November and 15 January,

- the storage location and the boundary of the plot and the surface water are at least 10 metres apart,

- the storage location and the homes of third parties are at least 100 metres apart.

In practice, only covered manure is stored in the field (but for poultry); its effects on the soil are currently being studied.

### 7.4.3 Balancing crop needs and inputs

The farmer can choose between two systems of application standards for their entire farm[30]. The nitrogen ceilings are determined for each crop (two types of grazing, twelve types of crop), the type of soil (sandy or non-sandy), taking into account crop needs, reserves in the soil and mineralisation (ref1 art13 §1 to 3):

1) A system based on the total amount of nitrogen applied that complies with the maximum quantities indicated in the tables, i.e. a ceiling for total nitrogen from all sources and a ceiling for each of the **three types of fertiliser** (animal, chemical or other):

*Example on sandy soils: limitation of quantities to be added*

| Main crop | kg N total per ha and per year | kg N animal fertiliser | kg N from other fertilisers | kg N from chemical fertilisers |
|---|---|---|---|---|
| Winter wheat or tritical | 200 | 100 | 100 | 100 |
| Corn | 205 | 170 | 170 | 35 |

By derogation, the maximum quantities can be increased for successive crops (eleven crop cycles)

*Example of application standards for crop combinations on sandy soils*

| Crop combinations | kg N total per ha and per year | kg N animal fertiliser | kg N from other fertilisers | kg N from chemical fertilisers |
|---|---|---|---|---|
| Winter wheat or tritical followed by one crop | 250 | 170 | 170 | 80 |
| Corn preceded by a harvest of grass or forage rye | 270 | 170 | 170 | 100 |

2) A system based on the amount of active nitrogen applied that lays down **two ceilings**, one for total amount of active nitrogen and the other for nitrogen from animal fertiliser; the various tables are set out as previously based on the crops and soil type.

[30] NB: a Flemish business = one or more farms, each corresponding to a site

The notion of active nitrogen is defined by the table below:

| Type of fertiliser | Percentage of active nitrogen compared with the total nitrogen share |
|---|---|
| Chemical fertilisers | 100% |
| Livestock manure from fertiliser treatment | 100% |
| Liquid fraction after separation of liquid animal fertiliser | 60% |
| Liquid animal fertiliser, except from livestock manure from fertiliser treatment and the liquid fraction after separation of liquid animal fertiliser | 60% |
| Other fertilisers, except for the certified and plant biodegradable waste and other fertilisers containing nitrogen in this form that only releases a limited part of the total nitrogen during the year of application, as stated in Article 13 (9) | 60% |
| Solid animal fertiliser | 30% |
| Other fertilisers containing the nitrogen in such a form that only a limited part of the total nitrogen is released during the year of application, as stated in Article 13 (9) | 30% |
| Manuring by grazing of livestock | 20% |
| Certified and plant biodegradable waste | 15% |

*Example on sandy soils: limitation of quantities to be added*

| Main crop | kg N animal fertiliser per ha and per year | kg active N per ha and per year |
|---|---|---|
| Winter wheat or tritical | 100 | 160 |
| Corn | 170 | 135 |

By derogation, the maximum quantities can be increased for successive crops (eleven crop cycles)

*Example of application standards for crop combinations on sandy soils*

| Crop combinations | kg N animal fertiliser per ha and per year | kg active N per ha and per year |
|---|---|---|
| Winter wheat or tritical followed by one crop or tritical followed by a following crop | 170 | 180 |
| Corn preceded by a harvest of grass or forage rye | 170 | 200 |

Derogations from the amounts of nitrogen input (10% maximum) apply per plot for potatoes, numerous vegetables and crops with a yield higher than a minimum yield – provides the farmer provides proof of the yield, a soil analysis in Spring and a residue analysis in the Autumn by an approved laboratory and complies with the application opinion issued by the laboratory (ref1 art13 §12 to 16)

In addition to the above, thresholds for nitrate residues in the soil per ha must be met after harvest (01/10-15/11): the values that must not be exceeded vary between 70 and 90 kg N/ha depending on the crops and soil types. These analyses (0.90 m deep) are ordered by Mestbank from approved laboratories (ref1 art14 §1 and 2).

Where there is failure to comply with these residual values, corrective measures are imposed on the farmer, in proportion to the noted surplus (25 to 130 kg/ha) according to the soils (ref1 art14 §3 to 9):

- each plot in the farm is analysed at the farmer's expense and a fertilisation opinion is drawn up,
- obligation to maintain a fertilisation plan and register[31],
- audit of the farm and support for the farmer,
- limitation of permitted quantities (80 to 60%) according to the residue level and the type of soil,
- Installation of nitrogen-fixing intermediate crops.

### 7.4.4 Amount of livestock manure applied no more than 170 kg nitrogen/ha/year per farm

Farmers are required to make an annual declaration to the Mestbank, as are those who store collectively or treat livestock manure, producers and distributors of fertilisers or cattle feed, importers or exporters of fertiliser and transporters of approved slurry (Ref1 art23, 47, 48, 49, 58 and 59).

The declaration by the farmers (done at the same time as the CAP declaration) contains the following information:

- number of animals present on 01/01 and the average number of animals per species (cattle numbers are provided by the VZW databank) in n-1,
- the storage capacity in m3,
- the amount in m3 of slurry stored on 01/01 and its composition in N and P2O5 in kg,
- chemical fertilisers used in n-1 (in kg N and P2O5),
- map of the farm (land and facilities),
- a "crop plan" year n (crop rotation forecast per plot),
- all the elements of a "nutritive budget" n-1 (actual excretion N and P2O5),
- the quantity (in kg N and P2O5) of livestock manure (including in pasture), other fertilisers and chemical fertilisers in n-1 applied to their land outside Flanders.

[31] This is slightly more restrictive than the declaration obligations described on this page that apply to all farmers

and the repurchase contracts for their animals, the production of supply and polluted water with their contents in N and P2O5.

An N and P "slurry balance" is drawn up every year by Mestbank for each business using these data. Compliance with 170 kg N/ha x year is verified especially.

Logs kept up to date by:

- the farmers: register of their overall herd (excluding cattle),
- producers, distributors, importers and exporters of more than 10 T N/year livestock manure or more than 300 kg P2O5: register for quantities (N and P2O5 in kg) and type of fertiliser,
- any farmer of a collective slurry storage or treatment or processing facility: register for livestock manure and other fertilisers.

Exchanges in fertilising matter – called "sales" – must be registered with the Mestbank by both farmers and sellers, fertiliser distributors, hauliers, etc. These sales can consist of selling livestock manure or fertilisers, putting animals to graze with other farmers ("repurchase contract") or transporting fertilisers or polluted waters from a farm. A "transfer document" indicating the quantities of N and P transported is drawn up and sent to the Mestbank prior to transport. Confirmation is received from Mestbank within seven days.

Calculation method for livestock manure production (Ref1 Art27 and 30 and Appendix Ref1 Art34 and 35). The farmer can choose between two calculation methods (Ref1 Art25):

- flat rate system, using the flat rate N and P quantities produced per type of animal and used mainly for cattle herds. The flat rate N and P quantities produced are detailed for 61 types of animal.

| Type of animal | P2O5 kg/animal/year | N kg/animal/year |
|---|---|---|
| Dairy cow 6,500 to 6,750 kg milk/year | 32.5 | 103 |
| Pig 20 to 110 kg three-phase feed | 5.33 | 10.9 |
| Laying hen | 0.18 | 0.35 |

- nutrient balance system, by using the actual excretion quantities (with justification of the type of feed), used mainly by pig and poultry farms; this system is mandatory for pigs if the non-pig herd is >200 animals (Ref1 Art26). NB: the calculation of the nutrient balance does not seem to be described in the decree (see Ref1 Art27 p 35).

Coefficient of evaporation (Wee Ref 1 art 27 §5):

The Flemish government sets nitrogen losses in the housing unit, in storage and during transport to convert the gross nitrogen rate from livestock manure into a net rate at the time of application (= net flat rate standard).

The production tables indicate a "gross" production to which a variable coefficient is applied, taking account of the fact that the animals spend part of the time outside the buildings. For example, for cattle:

- 10% for liquid livestock manure,
- 15% for solid livestock manure,

- 20% for manure.

**Derogation**

The derogation granted at the end of 2007 permitted application, under certain conditions, up to 200 kg N/ha/year on winter wheat followed by a catch crop or on beet and up to 250 kg on grassland or corn with grass sown before or after harvest. This derogation concerned 83,500 ha and 3,300 farms.

In 2011, a new derogation was granted for the same maximum quantities and the same crops plus grass cultivation or mown ryes followed by corn, but with more restrictive conditions described in ref3. This derogation expired at the end of 2014.

The conditions include:

- precise monitoring for the processing of slurry,
- conditions of N and P2O5 contents,
- keeping a manuring plan with registration within seven days at most,
- an N and P analysis in the soils every 5 ha before 1 June and for 6% of plots before 15 November,
- restrictions on ploughing or sowing dates,
- monitoring of the herd and transported livestock manure (GPS, nutrient contents),
- reinforced monitoring of water on 150 sites with mapping,
- on-site checks for 5% of farms and 1% of transport and an annual report,
- This derogation was renewed under more stringent conditions (e.g. checks of 7% of farms and 2% of transport).

## 7.5 Contents of additional measures and reinforced actions in the action programme

### 7.5.1 Targeted phosphorous measures

Ref. 1 art 13 § 4: an annual ceiling of phosphate per ha and per year, decreasing from 2011 to 2017, is fixed in a table according to fourteen types of crop; nevertheless, the maximum amount can be increased, by taking account of crop needs, reserves in the soil and mineralisation, to 95 kg/ha/year up to 2016 (90 kg from 2017).

Case of certified plant biodegradable waste: taking into account of 50% of phosphorous found in the compost.

The particular case of phosphorous-saturated soils only relates to a small area at regional scale (3 to 4,000 ha) but is the subject of significant restrictive measures: its fertilisation is limited to 40 kg P205/ha x year (ref1 art 17 §1 to 3).

### 7.5.2 Treatment and export obligations

Where there is surplus slurry (in P or N and per business), the Mestbank lays down an obligation of treatment, calculated from the pressure of municipal production for the municipality(ies) where the group of businesses concerned is located (Ref1 art28 and 29).

The percentage to be treated is 0.6% per tranche of 1,000 kg N net surplus of the group, increased by 10%, 20%, 30% and up to 60% max. depending on the pressure (NTR if <5000 kg N net). Where several municipalities are involved, the production pf each is weighted.

To meet this obligation of treatment, the group of businesses can choose between:

- lowering the N production,
- cancelling the equivalent in N and P emission rights,
- obtaining treatment certificates issued by the Mestbank. The "treatment" consists of exporting outside Flanders:
    - raw livestock manure,
    - "final products" after conversion: compost, methanisation, biological treatment (WWTP).

The installations are set up through private initiatives collecting in most cases from a large number of farms.

For liquid livestock manure, the most usual treatment is biological (separate from domestic livestock manure or agro-industrial treatments). It is easier to find export outlets for solid livestock manure (the conversion process into mineral concentrates remains expensive and of little interest as the Commission classifies them as animal fertilisers). Methanisation means introducing carbon-rich elements and completing the process with downstream treatment.

### 7.5.3 Soil cover during the Autumn

Nitrogen-fixing intermediate crops and catch crops are only mandatory for farmers seeking a derogation or for plots where the post-harvest residues have exceeded the limit. Where a nitrogen-fixing intermediate crop is sown after a cereal crop, the permitted fertilisation ceiling is slightly higher.

### 7.5.4 Controlling the herd

The N and P2O5 contents were replaced in 2007 by "nutrient emission rights" (NER-D) that limit the number of animals on each farm. The Mestbank allocates these rights to the farmers (Ref 1 art 30 to 36).

Sample conversion of N or P contents into nutrient emission rights (NER-D) – Art. 30 of the fertiliser decree

| Type of animal | value | Emission rights |
|---|---|---|
| Dairy cow, separately from production of milk | 127 | NER-DR |
| 20 to 110 kg pig, two- or three-phase feed | 18.33 | NER-DV |
| Laying hen | 0.57 | NER-DP |

| | | |
|---|---|---|

Provided this outline is respected, the farmers are free to change their type of animal (conversion table), expand their farm[32] while treating the additional livestock manure and sell or purchase rights with other farmers. If the farm is not passed on to a family member, 25% of the rights must disappear and give rise to a new treatment of the relevant livestock manure.

Based on its experience, VLM believes that this system has proved fairly complex for Flanders which from the start had a structural surplus; it would be more relevant for areas with more margin for increasing the herd.

### 7.5.5 Reinforced actions

Areas where there is no favourable change in nitrate contents in surface or groundwaters are declared "target areas" and the post-harvest residue nitrogen thresholds have dropped there by 20 kg/ha. Numerous soil analyses determine the requirement for additional measures (nitrogen-fixing intermediate crops, reduced application periods, export of livestock manure). In practice, these target areas are "dotted" all over the region and the farms are controlled once every two or three years for one of their residual nitrate analyses in post-harvest soils.

## 7.6 Implementation tools

### 7.6.1 Advice and checks

A network of private but approved consultants intervene in addition to the VLM online tools and its "Coordination Centres" to adjust the inputs to each plot with balance calculations that can culminate in reduced inputs below regulatory ceilings, mainly for cereals and, with greater difficulty, for potatoes, vegetables and horticultural productions (Ref1 art62 and 63).

The Mestbank has numerous data for use in cross-referencing the declarations made and produces all the slurry balances for the businesses. The checking pressure on agricultural businesses for a measurement is about 33%.

The Mestbank checks land applications, the herd, fertiliser transport (1%), residual nitrogen, etc.

### 7.6.2 Computer tools

The farmers remotely[33] declare the different types of fertiliser inputs, transport and treatment of livestock manure during the previous campaign, the crops envisaged for the next campaign (based on a cadastral map) and the number of animals present. This is done at the same time as the CAP declaration. Any item declared as completed forms the basis for statistics and sanctions if any, whereas any item declared as planned may if appropriate trigger alarms regarding the permitted doses per hectare. These alarms are used by both the farmer to adjust their activity and by VLM to advise concerning the risks and draw up its checking programme.

Only recognised hauliers are accredited to transport livestock manure and other fertilisers; they have an online geographic positioning system (GPS) and must draw up a document for every trip, with prior declaration and confirmation online to Mestbank.

Decision-making tools are mandatory in horticulture and used extensively for cereals and beet.

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[32] subject to a necessary ecological permit for any extension, issued by the Mestbank

[33] VLM is happy to arrange a presentation of its remote declaration system.

### 7.6.3 Economic instruments

Mestbank has a comprehensive legal arsenal to sanction farmers, hauliers or fertiliser suppliers: for example, €1 per kg for excess N or P for application or sale, doubled if this occurs again within the next five years; fine proportional to the excessive nutrient emission rights with corrective measures the following year; numerous fines for missing or late declaration, documents, certificates, GPS localisation, etc., also doubled for a repeated offence; possibility of prohibiting transport of fertilisers (Ref1 art54), etc.

Penalties for failing to comply with the directive (€1 per kg of nitrogen above ceilings) can represent significant amounts for a farm. For this reason, the advance declaration of planned crops automatically generates information for the declaring farmer about the nitrate risks (see § 7); doubling fines for repeated offences is a strong incentive. The sums collected are paid to the "Minafonds" that collects all types of environmental fines. The Ministry of Environment uses this fund to subsidise various actions, not necessarily involving nitrates.

Some infringements can lead to criminal charges with a risk of one week to one year of imprisonment/fine up to €100,000 (Ref1 art71).

A general provision authorises the Flemish government to take incentive measures (Ref1 art43). A compensatory indemnity is possible where application is restricted in forest or ecologically-rich areas (Ref1 art41bis § 7).

Incentive measures (financial) for fertiliser conversion facilities, extending storage capacities, performing soil and fertiliser analyses and using livestock manure (Chapter VIII supervision policy).

# 8 Denmark Monograph

## 8.1 Persons met and document references

French Embassy:

- Michel Lallemand, Head of the Economics Department; Yasmine Crozier, Economics Department.

Landbrug&Fødevarer (Danish Agriculture and Food Council):

- Henrik Bang Jensen, Counsellor, Energy and Environment Directorate; Kitt Andersen, Chief Consultant, water and nature.

Ministry of the Environment:

- Henriette Hossy, Agronomist; Mette Hee Christensen, Lawyer, Lydie Wibke

Ministry of Agriculture: AgriFish Agency Control Centre:

- Morten Ejrnæs, Head of Unit,
- Allan Kjær Andersen
- Jakob Møgelvang.

## 8.2 Documentary references

- Danish Nitrate action programme (DNAP) 2004-2015: APAE III (Action Plan for the Aquatic Environment) then Green Growth Agreement (GGA) since 2009;
- Order on Commercial livestock, livestock manure, silage...order no. 764, 28/06/2012;
- Diaporama "Implementation of the Nitrates Directive in Denmark" Environmental Protection Agency;
- Danish policy measures to reduce diffuse nitrogen emissions from agriculture to the aquatic environment, Aarhus university, environmental protection agency, Department of Food and Resources Economics, the Geological survey of Denmark and Greenland.

## 8.3 Context

### 8.3.1 Water quality

The bodies of water are split between 23 River Basin Management Plans (RBMP). Substantial reductions in diffuse pollution have been recorded, but a deferral of objective was required for coastal bodies of water. The groundwaters are close to 50 mg nitrates/l.

The groundwater monitoring network comprises approximately: 100 control points (5 m below the surface of the ground), 1400 deeper points (GRUMO) and 5500 active abstraction wells and boreholes for the water tables. The Danes distinguish between older water tables and tables formed more recently.

### 8.3.2 Denmark and its agriculture

Denmark has more than 40,000 farmers, half of whom operate part time (dual workforces). There are 750,000 plots made up into 300,000 blocks of one to ten plots (i.e. an average of some 10 ha per block). The UAA is 2.6 M ha, i.e. 62% of the country's surface area (52% cereals, 11% forage areas, including 6% permanent grassland); the average farm size is 66 ha (161 ha per farm full time).

There are 24,000 livestock farms and a herd of 500,000 dairy cattle (4.9 Mt milk/year). The dairy cattle farm situation has been stable until now thanks to quotas. But nowadays many farmers would like to increase their production, for which they need an advance environmental permit which is issued subject to compliance with application rules (load/ha). Pig production (20 million/year) has dropped significantly in recent years due to exports of piglets to Poland, Germany and the Netherlands.

### 8.3.3 Institutional organisation

The Nitrates Directive is implemented jointly by the Ministry of Agriculture and the Ministry of Environment (Danish Environmental Protection Agency). In addition, the Danish agency Agrifish, under the supervision of the Ministry of Agriculture, is in charge of controlling fertiliser application, catch crops and plant cover. The 98 municipalities are responsible for storing manure, slurry and silage in conjunction with the Ministry of Environment.

The Danish authorities use the studies by the Danish Centre for Environment and Energy at Aarhus University and the Research and Consultancy Institute of the Ministry of Climate and Energy, Geological survey of Denmark and Greenland as a basis for monitoring and controlling the effectiveness of action programmes.

### 8.3.4 History of introducing the directive: an old struggle against nitrogen and phosphorous pollution

Denmark has been acting since 1985 to reduce water pollution by nitrates, as the entire country was severely impacted. The whole of Denmark was classified as a vulnerable zone when implementing the Nitrates Directive. This was a political choice to allow prior arrangements to continue and ensure equal treatment for all farmers.

The Danish authorities have adopted a global approach; given its interest in other issues such as phosphorous and emissions (gaseous and particles), Denmark is applying the WFD and the Nitrates Directive jointly. Both texts are perceived as extremely complementary and give rise to an integrated water protection policy targeting the polluting effects of agricultural activities.

This policy is based on the extended water quality and quantity monitoring network described on the previous page and which covers the soil root areas (= one metre deep) groundwaters and coastal and marine waters.

For each action programme, long-term quantitative objectives are fixed and assessed from leached nitrogen analyses. Since the last action programme (Green Growth Agreement 2009-2015), the quantified objective is fixed at a reduction in pollution of:

- 21,000 t N in the root area,
- 19,000 t N in the aquatic environment.

of which 9,000 t N relate to the goal of the third action programme 2014-2015 that mainly sets the following goals:

- 13% reduction in its nitrate emissions in 2015 compared with 2003,
- 50% reduction in the phosphorous surplus during the 2002-2015 period.

In 2013, a report from the independent national commission (set up specifically to make recommendations to the government) deemed it necessary to replace the current system by a more targeted approach, as improvements in water quality are stagnating despite the more stringent measures under the European regulations.

## 8.4 Contents of mandatory action programme measures

Order 764, chapter 1, section 3 provides the following definitions:

- Liquid livestock manure: slurry (88% of livestock manure), liquid manure, urine
- Solid livestock manure: manure (8% of livestock manure), dung, droppings
- Chemical fertilisers

Silage seepage and digestates are specific categories.

### 8.4.1 Application prohibition periods and methods

(PA p.7, ch.2.2 of the GGA 2009-2015, diaporama EPA)

- Ban on applying liquid livestock manure from harvesting to 1 February.
- Slurry can be used on crops that consume large amounts of nitrogen, such as winter oilseed rape, or grassland up to 1 October and on grass seeds under contract up to 15 October
- Ban on applying solid livestock manure and silage seepage (and chemical fertiliser) from 15 November to 1 February.

  Total ban on manures during the Winter.

The GGA has set dates clearly (in all circumstances not beyond 1 October), unlike the previous provisions that started "on the date of the harvest".

### 8.4.2 Storage capacities

The obligation to have storage means was among the first measures introduced in 1987. The storage capacities must be of a size to hold more than six months livestock manure production. In reality, the storage time is more than nine months for 90% of livestock manure production (mainly slurry).

Storage in the field:

Possible for the past ten years for composted livestock manure: organic fertilisers made up of at least 30% "dry matter" (that can be any type of manure). They must be covered with impermeable material (tarpaulin).

Storage must comply with the regulatory stipulations (at least 15 m away from water courses or the public highway, 25 m from water supply points, etc.) and there must be no risk of pollution for the groundwaters or surface water.

The maximum storage time is twelve months in the same place; this storage location may not be used again for five years.

The farmer keeps a register of the manure heaps, with storage dates and locations.

### 8.4.3 Balancing crop needs and inputs

(see p. 15 of the Danish Action Programme 2008-2015. Technical and scientific support from the Research Institute Aarhus University).

The crop season extends from 01/08 to 31/07.

All the calculations of the provisional fertilisation balance are based on "standard data" (norms) disseminated by the Danish authorities. They are prepared every year based

on results from monitoring sites and entered data. The tools proposed in this way are deemed effective by the farmers.

Crop needs:

Every year, at the campaign start, the Ministry of Agriculture (Danish AgriFish Agency, DAA) sets the nitrogen application ceilings for each crop, corresponding to a yield objective. There are 276 standards based on pre-crops, the type of soils (four types of soil with mapping available) and irrigation options. The yield objective has been 10 to 15% below the economic optimum (since 1998) and is today 18% less than this optimum (estimated economic losses of €150 to 200M a year for the country).

| Crops | Coarse sand | | Sandy soil | | Irrigated sandy soil | | Clay soil | | Yield correction kg N/q | P and K indicative standards | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| standards | Yield q/ha | kg N/ha | Yield q/ha | kg N/ha | Yield q/ha | kg N/ha | Yield q/ha | kg N/ha | | kg P/ha | kg K/ha |
| Wheat (winter) after winter oilseed rape | 52 | 115 | 70 | 123 | 70 | 136 | 87 | 134 | 1.3 | 20 | 65 |

These data are then adjusted with the nitrogen residue of soils calculated from numerous analyses feeding into modelling, according to the geographical situation and taking climate conditions into account. The variations are from - 25 to + 10 kg N/ha between 1996 and 2010.

All these elements are used to calculate the quota of applicable nitrogen per crop and, by addition, the operating quota for the campaign (implemented since 1991). This quota is set before 01/08 based on CAP declarations.

| surface area | Previous crop | crop | N required/ha (sandy soil) | N residual/ha | N quota/ha | Quota N kg/crop |
|---|---|---|---|---|---|---|
| 25 ha | Grassland with 50% clover | corn | 167 | - 87 | 80 | 2,000 |

Derogations are possible for bread wheats (no reduction in yield compared with the optimum), within the limit of 50,000 ha for the entire country.

Inputs

Using these data (calculated nitrogen quota), the farmer decides on the fertilisation based on the nitrogen production of their herd (set by national standards: see page 87), supplemented by mineral fertilisation. Maximising the use of livestock manure by the farmer is appropriate; use of chemical fertilisation is restricted.

An “efficiency rate of manure” is applied, corresponding to the immediately available nitrogen (100% for mineral fertiliser and x% for organic N). These rates are indicated to the farmers for consideration in their fertilisation calculations and have been boosted over time (e.g. pig slurry 55% in 1994, 60% in 1998, 75% in 2003; cattle slurry 50%, 55% and 70%).

Fertiliser accounts involve all farms with more than 10 LU mineral necessary (fertilisation plan) or a load of more than 1 LU/ha, or that receive more than 25 t of livestock manure. These documents must be submitted before 31/03 for the n-1

campaign to the DAA. Similarly, fertiliser distributors are required to advise the DAA of their individual deliveries. The other farmers are exempted from a fertiliser tax of 5 DKK/kg N (€0.7/kg N) if they register their fertilisation voluntarily.

The report sent to the authorities includes:

- the total surface area and the surface area compatible with the size of the farm (called harmony area (see pages 86 and 87),
- the applicable nitrogen quota,
- the use of different sources of nitrogen (livestock manure, mineral fertilisers, other organic fertilisers) based on crops,
- stocks of different fertilisers,
- contracts, if livestock manure is sold,
- livestock density (livestock units = LU, see page 88),
- surface area with nitrogen-fixing intermediate crops,
- use of derogation.

The table is pre-filled using animal data (Central Husbandry Register) and CAP crop data (General Agricultural Register).

The data collected (Register of fertilizer accounts) are used by the ministry to monitor flows and verify that use of organic and total fertilisers is below fixed quotas. This also allows the standard data to be adjusted for the following year.

Nationally, the surface areas removed from agriculture every year are deducted from the global assessment and the corresponding nitrogen quotas are neutralised.

In addition, the next two tables illustrate how the system operates using a sample crop rotation over several years (Table 1) and a sample fertilisation balance calculation in a farm (Table 2).

Table 1: sample crop rotation and N requirements (for a farm with 2.3 LU/ha (livestock unit = LU)),

| surface area | Crop in year n-1 | crop | N requirement (sandy soil) | N of the harvest of year n-1 | N ceiling | Total N kg |
|---|---|---|---|---|---|---|
| 20 ha | Nitrogen-fixing intermediate crops | Barley (clover <50%) | 94+162 | -25 | 231 | 4620 |
| 15 ha | Barley with clover | Hay with less than 50% clover | 241 | 0 | 241 | 3615 |
| 15 ha | Hay with less than 50% clover | As above | 241 | 0 | 241 | 3615 |
| 25 ha | Hay with -50% clover | corn | 167 | -87 | 80 | 2000 |
| 10 ha | corn | corn on nitrogen-fixing intermediate | 167 | 0 | 167 | 1670 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | crop | | | | |
| 15 ha | corn | Corn with <50% clover | 167 | 0 | 167 | 2505 |
| Total | 100 ha | | | | | Quota N = 18,025 |

The nitrogen produced by the livestock is calculated per farm in the same way, i.e. from standards disseminated by the authorities, per species and type of animal. Organic fertilisation is the preferred method of balancing the fertilisation; mineral fertilisation simply adjusts the needs of crops.

Table 2: calculation of the fertilisation balance in livestock on a farm of 100 ha of utilised agricultural area

| | Number of head of cattle | LU | kg N per head | Total kg N | effectiveness | kg N |
|---|---|---|---|---|---|---|
| Dairy cows | | | | | | |
| 9,093 kg of milk (slurry) | 148 | 174.1 | 128.6 | 19,032.8 | 70% | 13,323 |
| Heifers 0-6 months (strawed manure | 34 | 6.9 | 22.5 | 765 | 45%) | 344 |
| Heifers 6-28 months (slurry) | 118 | 45.4 | 36.6 | 4,318.8 | 78% | 3023 |
| Total | | 226.4 | | | | 16,690 |
| Mineral fertiliser | | | | | | +1,335 |
| Quota N/100 ha | | | | | | 18,025 |

The maximum load per ha is verified systematically by a computer check.

At the end of March, the farmers must send the authorities a report on amounts of fertilisers actually used during the past year. The majority of non-livestock farmers also maintain the various documents required, which exonerates them from a tax on fertilisers. Only the smallest farms are not required to produce this report.

The authorities have a very comprehensive information system to carry out the controls (CAP, animal identification, fertiliser register, crop yields, zootechnical performances, etc.) that ensures consistency of declared data.

### 8.4.4 Amount of livestock manure applied no more than 170 kg nitrogen/ha/year per farm

Calculation method: The nitrogen contents (phosphorous and potassium) of livestock manure are given according to standards set by the Danish authorities based on the type of animal and its performance level; they change over time:

| | 1985 | 1996 | 2004 | 2006 |
|---|---|---|---|---|
| Production/dairy cow | 6,300 | 7,600 | 8,917 | 9,231 |
| Kg N/cow | 123 | 128 | 134.5 | 137.4 |
| G N/kg milk | 19.5 | 16.8 | 15.1 | 14.9 |
| Kg P/cow | | 23.0 | 21.6 | 20.0 |

The standard data are thus defined per livestock system:

| Heavy dairy cow (2009) | Type of livestock manure | Content in kg N |
|---|---|---|
| Tied up housing system with channel | manure | 69.2 |
| Loose housing system with stalls | slurry | 136.3 |

They can be modified using corrective formulas (DNAP p. 16) if there is a discrepancy (amount of milk delivered, slaughter weight, etc.), as all production data are sent to the Central Husbandry Register.

A common unit has been defined to facilitate the calculations and verify the permitted densities. Regardless of species (DNAP p. 17) about 100 kg nitrogen produced corresponds to one livestock unit (LU). A table published every year lists the number of livestock units and the corresponding amount of nitrogen for each type of animal and production system. The farmer can therefore calculate their production:

| | Number of animals | LU | Kg N/animal | Total kg N | N effective | kg N |
|---|---|---|---|---|---|---|
| Dairy cows (9,093 kg milk)-slurry | 148 | 174.1 | 128.6 | 19,032.8 | 70% | 130323 |
| Heifers 0-6 months-manure | 34 | 6.9 | 22.5 | 765 | 45% | 344 |

The Danish Harmony Rules link animal production to the soil. So for each campaign, a farm cannot apply more than:

- 1.4 LU/ha for pigs and poultry (to take account of phosphorous inputs; this was requested by the Commission to grant the derogation from 170 kg N/ha)
- 1.7 LU/ha if it has cattle, sheep or goats

Option of application on another farm provided there is an agreement stating the surface area, duration and start date. The corresponding LU number is then deducted from the producer farm.

| Pig slurry | 75% |
|---|---|
| Cattle slurry | 70% |
| Mink slurry and droppings | 70% |
| Liquid manure (slurry) | 65% |
| Manure (deep litter) | 45% |

There is no difference for grazing animals, as this does not occur very often. Sludge from WWTP has a 45% N content.

A derogation can be granted up to 2.3 LU/ha (230 kg N/ha/year) if two thirds of the farm's livestock are cattle.

Plant digestates can be applied up to 170 kg/N/ha in the same way as livestock manure. The sum of plant and animal digestates must then not exceed 230 kg N/ha.

## 8.5 Contents of additional measures and reinforced actions in action programmes

- In areas of low denitrification capacity, load reductions can be applied (e.g. 0.7 LU/ha), especially in the Natura 2000 areas: See Environmental Approval Act for Livestock Holding (2007) applying to livestock farms with more than 75 LU.

The contact persons encountered today see a need to adapt the measures that can no longer be the same in all countries.

- In the areas at issue under the WFD, the River Basin Management Plans take into account measures that also have an impact on the nitrates and which can receive financial aid. They contain additional measures and are part of the action plan:
    - 10 m buffer strips, increase in nitrogen-fixing intermediate crop areas, ban on certain crops, wetlands, etc.
- Ground cover (see Order 928):

Mandatory for farms over 10 ha; no fertiliser input on nitrogen-fixing intermediate crops before 20 October. It must be followed by a spring crop.

- for farms < 0.8 LU/ha: nitrogen-fixing intermediate crop mandatory on 10% UAA (excluding grassland) with 17 kg N/ha quota reduction
- for farms > 0.8 LU/ha: nitrogen-fixing intermediate crop mandatory on 14% UAA (excluding grassland) with -25 kg N/ha quota reduction

Possibility also of sowing winter crops (winter green fields) on site if planting is early.

Goal of 140,000 additional ha (2015). There is a global ceiling in operation, with a nitrogen quota calculated annually (see fertilisation balance 2.4.4.).

- Targeted phosphorous measures:

The Third Action Programme for the Aquatic Environment includes phosphorous targets. The aim is to halve it in 2015 compared with 2001/2002.

50% reduction in its phosphorous surpluses in 2015 compared with 2002.

Tax on mineral phosphorous added to cattle feed.

A map of vulnerable zones for phosphorous was produced following the Environmental Approval Act for Livestock Holding (2007).

Cultivation practices:

No crops after harvesting (before spring crop) before:

- 01/11 in clay soils
- 01/02 in sandy soils

except for nitrogen-fixing intermediate crops and organic agriculture.

It is prohibited to plough up grassland from 01/06 to 01/02

## 8.6 Implementation tools

Every year, the DAA communicates the recommendations to the farmers via the Internet: crop standards, livestock manure, LU, etc.

Declaration of all the data (see the three databases: Central Husbandry Register, General Agricultural Register and Register of Fertiliser Accounts) and cross-checking between them and the data from slaughterhouses and dairies, fertiliser and seed bills, etc. Consistency is checked systematically (warning system).

Checks shared between:

- the 98 municipalities, in conjunction with the Ministry of Environment, for the storage of livestock manure and the application ban periods

- the DAA, under the supervision of the Ministry of Agriculture, is in charge of controlling CAP conditionality and on-site checks of fertiliser application, of catch crops and plant cover and of administrative checks of fertilisation limitation (6,000/year)

The on-site checks are based on a risk analysis (2/3) and random selection (1/3).

1% relating to the conditionality.

4.2% of farms on the national register.

Failure to comply leads to anything from a warning to a fine.

Livestock farms are controlled every three years, the other farms every six years. Organic farms are controlled annually.

The Ministry of Environment checks the minimum control intervals.

The high availability of recent technical and economic information that can easily be cross-referenced means that the authorities or universities can analyse in detail the results obtained and the profitability of different parts of the action programme, as well as the financial profitability for the farmers and the economic profitability for the entire community. The last document reference given in § 2 above is an example that provides vast amounts of information to the mission's analysis of efficiency of action programmes.

## 8.7 Other information

For contact persons encountered in the Ministry of Agriculture, the question arises of consistency between the WFD and the Nitrates Directive. The WFD allows measures to be adapted locally and permits financial compensation for voluntary measures. To continue reducing pollution levels in the water whilst maintaining the current level of agricultural activity, they view the WFD as a useful tool, with a potential link also with implementation of the Habitats Directive.

# 9 Spain Monograph (Autonomous Authority of Catalonia)

## 9.1 Persons met and main document references

French Embassy:

- Mr Hervé Reverbori, Counsellor for Agricultural Affairs in Spain and Portugal.

ANPROGAPOR (equivalent to the National Pork Federation):

- Mr Miguel Angel Higuera Pascual, Director

Technical University of Madrid:

- Mr Miguel Quemada, Lecturer-Researcher

Ministry of Agriculture, Food and Environment:

- Mr Arnaldo Cabello Navarro, Deputy Director General of Livestock Production Means and colleagues
- Mr Victor Manuel Arqued Esquía, Deputy Director General of the planning and sustainable use of water
- Mr Carlos Escartín, Deputy Director General of the integrated management of the Hydraulic Public Domain

Independent Authority of Catalonia:

- Mr Miguel Molins Elizalde, Director General of Agriculture and Livestock;
- Mr Juan Godia, Deputy Director of Agriculture;
- Mr Jaume Boixadera, Head of the Department of soils and environmental management of the agricultural production.

Catalan Water Agency:

- Mr Antoni Munné, Head of the Department of Control and Improvement of Aquatic Ecosystems and colleagues

***dcumentary references***

| | |
|---|---|
| Ref1 | zonas vulnerables designadas en Cataluña Decretos 283 / 1998 de 21 de octubre, 476 / 2004 de 28 de diciembre y Acuerdo de Gobierno de 28 de julio de 2009 |
| Ref2 | Decreto 136 / 2009 de 1 de septiembre_approbacion del programa de actuacion aplicable en las zonas vulnerables de Cataluña. NB: there is a non-validated translation of this decree into French including a revision in force since 16 April 2014 |
| Ref3 | Informe cuatrieno 2008-2011 Ministerio de Agricultura, Alimentacion y Medio Ambiante Julio 2012 |
| Ref4 | Real Decreto 324/2000 de 3 de marzo_normas de ordenacion de explotaciones porcinas y Orden 506 / 2010 de 2 de noviembre_Cataluña_excrecion de nitrogeno del ganado porcino mediante la alimentacion |
| Ref5 | Real decreto 1514/2009 de 2 de octubre_proteccion de las aguas subterraneas |
| Ref6 | Diaporama on Patrical modelling. |

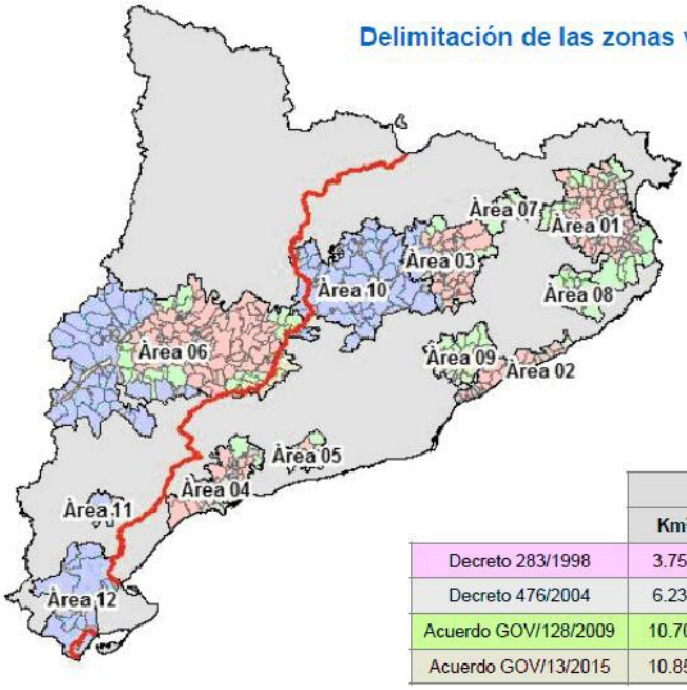
## 9.2 Context

### 9.2.1 Water quality

In Spain, given the Mediterranean hydric stresses, intensive livestock farming is concentrated in a limited number of regions and productive crops are in irrigated areas.

The vulnerable zones only relate to 17% of the entire Spanish UAA, despite discussions with the European Commission on potentially extending them to up to 30% of UAA.

Concerning Catalonia, water quality is monitored by measuring the nitrate content at several points once a year. The Catalan Water Agency (ACA) responsible for monitoring and the mission both agree that this should be increased to four measurements a year to assess the vulnerability criteria better, while reducing the number of points. The results have nevertheless been used as a justification for adding municipalities to the vulnerable zones in Catalonia in 2004 and 2009 and then suggesting an additional minor extension in 2015. The vulnerable zones shown on the map below (red outlines the Ebre catchment area) account for 70% of the UAA in Catalonia (ref1 and 3). Note that a dispute by an association against classification by ACA as a vulnerable zone is currently under way.




| | AREA | | MUNICIPIOS | |
|---|---|---|---|---|
| | Km² | % | Núm. municipios | % |
| Decreto 283/1998 | 3.753 | 11,7 | 204 | 21,5 |
| Decreto 476/2004 | 6.231 | 19,4 | 317 | 33,5 |
| Acuerdo GOV/128/2009 | 10.701 | 33,3 | 417 | 44 |
| Acuerdo GOV/13/2015 | 10.850 | 33,8 | 422 | 44,6 |

The contact persons met in Catalonia have very diverging opinions of the advantage of such delimitation. Conversely, all the contacts emphasise that agricultural pollution is now due more to irrigation areas rather than intensive livestock farming.

Between the 2008-2011 period and the 2004-2007 period, there were as many quality deterioration points as there were improvements, for both surface water and groundwaters (ref3 p303 and following). For the future, the Ministry of Agriculture, Food and Environment is preparing under the Water Framework Directive (WFD) a parameter table with thresholds for quantifying the eutrophication phenomena in lakes, coastal waters or estuaries as a supplement to the table that already exists for rivers (10 mg/l $NO_3$ and 0.2 $P_2O_5$ upstream in water courses and 25 mg/l $NO_3$ and 0.5 $P_2O_5$ downstream).

In addition, work on modelling pressures and the state of aquatic environments, tied to the Jucar Basin and extrapolated to the whole of Spain (Ref6, Patrical model of the University of Valencia) has been useful to estimate the due dates for feedback on the good condition of groundwaters. Two scenarios are modelled: (I) reversal of the trend and improvement in agricultural practices and (ii) optimum nutrient dosage. The scenarios suggest that 6% to 10% of groundwater bodies will not return to good

condition before 2027, which means asking the Commission for a derogation from the WFD deadlines.

### 9.2.2 Catalonia and its agriculture

The region has 7.6 million inhabitants in an area of 32,100 km². The UAA of 1,148,000 ha, including 355,000 ha of permanent grassland, has 55,000 farms. It is an area of intensive livestock activity (mainly 13,700 livestock farms with 6.7 million pigs, 43.9 million poultry birds and 540,000 head of cattle) and frequently-irrigated crops, either perennial (olive and fruit trees and vines) or mainly sown in the Autumn (cereals, forage crops). A significant proportion of the region is far from fertile or cannot be irrigated and is set aside for extensive livestock farming. As elsewhere in Europe, production is increasing whilst the number of farmers is dropping.

The development of pig farming has been supported in Spain by the so-called integration policy that concerns 60% of production in Catalonia (compared to 47% on average in the country). This policy is based on an original breakdown of roles - formalised by contract - between the farmer who provides the buildings and labour only and the integration company that owns the animals, supplies the animal feed and markets the products. The importance of integration companies (the largest one in Spain has 4.2 million pigs) facilitates compliance with environmental requirements as these large companies run serious commercial risks, at national scale, if they are found to have failed to comply with an environmental regulation, even locally. The authorities are planning to develop livestock farming in the future, but outside vulnerable or dense zones (e.g., development will be more in Aragon than in Catalonia).

### 9.2.3 Institutional organisation

The application of the Nitrates Directive in Spain is based on a few national transposition texts ensuring a common legal basis for the various Autonomous Communities (seventeen "regions"); the State is responsible for relations with the European Commission and implementation is almost entirely the responsibility of the Autonomous Communities. For example, each region has drawn up its own nitrogen production tables per animal or nitrogen needs per type of crop (see information on Catalonia in § 4.3). Two public bodies implement this directive in Catalonia: firstly, the Catalan Water Agency (ACA) is in charge of monitoring the quality of water resources (in conjunction with the Ebre Hydrographic Confederation for the section of this basin located in Catalonia) and secondly, the Directorate General of Agriculture and Livestock defines and monitors the action programme.

## 9.3 History of introducing the directive

In Catalonia, the 2006 Decree (ref2) incorporated into a single text everything concerning nitrates and livestock manure management, including installations classified under the IPCC Directive (livestock farms with more than 40,000 poultry and more than 2,000 pigs or 750 sows). Certain measures therefore apply also outside vulnerable zones; in the remainder of the monograph, the description of measures relates to the vulnerable zones, but it will be indicated if some measures also apply outside vulnerable zones.

This text follows on from several disputes ongoing since 1998 and resolved in 2005 between Spain and the European Commission. These disputes concerned the following breaches in the obligations under the Nitrates Directive:

- lack of designation of good agricultural practices and vulnerable zones of autonomous communities (1998);

- no action programmes prepared (2000);
- failure to comply with several directives and, especially for nitrates, failure to designate the Rambla de Mojácar as a vulnerable zone (2003).

The 2006 decree has only been amended since by the introduction of rational feeding of animals (see § 4.4). Nevertheless, a revised action programme is being negotiated between the authorities and the agricultural profession in Catalonia, with 2015 as its intended finalisation date. The new features envisaged during the visit (March 2015) are marked "PA 2015" in the next paragraphs, although they may still be amended. In particular, certain measures that are currently limited to the vulnerable zones could be extended to the entire region under this new action programme.

## 9.4 Contents of mandatory action programme measures

The decree (ref2 art2) classifies fertilisers as follows:

- Type 1 = organic fertiliser with slow mineralisation N and C/N > 10 (cow, rabbit, sheep, goat or horse manure, compost, pig manure, solid part of pig liquid manure, poultry droppings with rice bran, straw, etc.).
- Type2 = organic fertilisers with easy-to-mineralise N and C/N < 10 (pig slurry, poultry droppings, cattle slurry, digestates, treatment sludge, untreated residual waters - type 2a corresponds to solid poultry droppings, type 2b to all others.
- Type 3 = industrial nitrogen fertiliser.
- Type 4 = slow-release industrial nitrogen fertiliser (low solubility, with retardant, etc.). They include mineral fertilisers covered by a semi-permeable membrane.

The decree also uses the following vocabulary:

- Mineral fertiliser: type 3 and type 4 fertilisers,
- Organic fertilisers: type 1 or type 2 fertilisers,
- Droppings: excrement from poultry farms.

### 9.4.1 Application prohibition periods and methods

The general principle is to ban the application of fertilisers during periods when the ground is bare between harvesting and two months before the next sowing. This means fairly different application prohibition periods for different types of crop. These are shown in the next table taken from the decree (ref2 art4 and Appendix 1):

| Crops | Type of fertiliser | | |
|---|---|---|---|
| | Type 1 | Type 2 | Type 3 |
| Winter grass for seed or forage (wheat, barley, oats, tritical, etc. except for rye grass) | January - August | Vulnerable zones 3, 6, 7 and 10:<br>April - August and 15 Dec. - 15 January<br>Other vulnerable zones:<br>April - 15 September | June - 15 September |
| annual rye grass (alone or in a mix) | December - 15 July | April - 15 July | May - July |
| Spring barley, wheat and oats | March - November | May - December | June - December |
| Corn and sorghum seed or forage | 15 June - December | August - 15 January | September - February |
| Corn and sorghum seed or forage | 15 June - December | August - 15 January | September - February |
| Permanent grassland | March - November | November - December | November - January |
| Sunflower | July - December | 15 July - January | August - February |
| Rice | June - January | June - 15 February | September - February |
| Lucerne | All year except for a two month interval before sowing | 15 February - December | All year |
| Other extensive herbaceous legumes (peas, beans, carob, etc.) | All year except for two months before sowing | All year except for one month before sowing | All year |
| Oilseed rape sown in Winter | December - 15 July | Vulnerable zones 3, 6, 7 and 10:<br>March - July and 15 Dec. - 15 January<br>Other vulnerable zones:<br>March - July | May to 15 August |
| Oilseed rape sown in Spring | May - November | May - January | May - January |
| Olive, vine, orchards, almond, hazelnut, carob, walnut, pistachio | May - November | July -15 January | November - January |
| Citrus | May - November | June - January | December - February |
| Poplar | August - December | September - February | September - February |

NB: the start or end months or dates for the period are included in the ban; the vulnerable zones numbered 1 to 12 are shown on the map in the section above on water quality and are the result of differences explained in the section below on reinforced actions.

An exceptional derogation to the bans is possible in exceptional weather conditions for perennial crops and for new crops following two, three or four months of land lying fallow.

It is mandatory to apply slurry with equipment fitted with distribution or dispersion devices; the 2015 action programme provides for fitting slurry tanks with a conductivity meter. In spray or drip irrigation systems, it is prohibited to mix water with animal fertilisers.

### 9.4.2 Storage capacities

Minimum storage capacities from four months of animal dung (farms creating slurry and located in mainly grass irrigation areas) up to seven months (farms creating manure and located in dry, mainly perennial crop areas) (Ref2 art14 and 15).

Storage volume = Flat rate volume per animal (as per 52 different types) x Minimum period in months:

- manure: 6 or 7 months depending on areas and irrigation,
- dry droppings: 5 or 6 months depending on areas and irrigation,
- liquid droppings or slurry: 4, 5 or 6 months depending on areas and irrigation.

There are storage construction rules (Ref3 p233): register IT 210 of technical stipulations for farms; prior separation of unpolluted water.

Storage in the field (Ref2 art19):

This type of storage does not reduce the storage capacities above, but it is possible up to 45 days if dry matter > 20%, or up to four months otherwise, in the following conditions:

- more than 3 km from fixed storage facilities,
- on impermeable ground not liable to flooding,
- less than 100 T per farm,
- with impermeable covering for poultry droppings.

### 9.4.3 Balancing crop needs and inputs

A provisional irrigation plan has been drawn up, including solutions in a crisis to ensure a regular and efficient water supply (ref2 art7).

A provisional management plan for animal dung is required for all farms (or group of farms that manage their livestock manure together) that exceed a load of 80 kg N/ha. This is drafted by an accredited technician who is approved by the departments of agriculture and environment and has to be reviewed if nitrogen production increases by more than 1,500 kg or 50% or if the herd increases or application surfaces diminish (ref2 art21 and 25).

It is mandatory to split type 3 inputs into two parts at least, except for crops lasting less than four months (ref2 art6).

For each crop cycle (or year for a perennial crop), there are three nitrogen limits to be respected: total N, organic N and mineral N (ref2 art5, point2 and annex3). These limits differ depending on whether it is a dry crop or irrigated crop (in this case, the limits are lower to take account of nitrogen input via irrigation water). Appendix 3 of the decree details these limits for thirteen types of cereal or pasture, eleven types of tree crops and 22 types of market-gardening crops. The maximum quantities that can be applied per ha vary according to whether the plots are inside or outside a vulnerable zone. They can be increased in some cases.

Example: limitation of quantities to be added in vulnerable zones

| Main crop | | kg N total per ha and per year | kg N animal fertiliser | kg N from chemical fertilisers and irrigation water |
|---|---|---|---|---|
| Winter wheat or tritical | dry | 170* | 170 | 120*** |
| | irrigated | 210 | 170 | 150 |
| Corn | dry | 170** | 170 | 120*** |
| | irrigated | 210 | 170 | 150 |

* 210 in vulnerable zones 3, 7 and 10

** 190 in vulnerable zones 3, 7 and 10

*** 150 in vulnerable zones 3, 7 and 10

### 9.4.4 Amount of livestock manure applied no more than 170 kg nitrogen/ha/year per farm

The quantities of organic nitrogen than can be applied in the vulnerable zones are limited to 170 kg per ha per year; the limit is lowered for some crops to 150, 130, 75 or 60 kg N/ha per year (Ref2 art5 annex3). The maximum quantities of organic nitrogen that can be applied outside the vulnerable zones are higher: 250 kg N/ha for artificial and permanent grassland or horticultural crops and 210 kg N/ha for fallow land (ref2 art24 annex9.1 9.2).

**Calculation method for livestock manure production** (ref2 annex2):

The quantities of nitrogen included in animal dung are defined on a flat-rate basis for 52 types of animal and livestock farm.

| Type of animal | N kg/animal x year |
|---|---|
| Dairy cow | 80.22 |
| Fattening pig 20 to 100 kg | 7.25 |
| Laying hen | 0.50 |

These flat-rate quantities can be reduced if the farmer can prove that production is lower or disposed of without risk for the environment (treatment with compost production, for example) and if they obtain authorisation from the competent agriculture and livestock services.

It has been possible since 2010 to take a lower quantity of nitrogen into account in the excrement in the case of rational feeding of fattening pigs, i.e. when standardised feeds are used and the supplies received are registered (ref4).

**The evaporation coefficients** are not explicitly stated in the Catalonia action programme[34] but they are included in the figures in Appendix 2 to the decree (ref2).

In so-called "semi-extensive" livestock farms, the quantities of organic nitrogen are reduced in proportion to the time spent by the animals outside the buildings.

Lower evaporation is one objective of the action programme. This has already made itself felt through a reduction in the flat-rate quantity of nitrogen produced per fattening pig, subject to the metering of water and feed and built-in watering and cleaning conditions on the farm.

An animal dung management register is kept up-to-date (i) for livestock farms inside and outside vulnerable zones and (ii) for the crops located in vulnerable zones (ref2 art22 and 23). It gives the quantities of nitrogen produced by the animals, the quantities extracted from pits, the quantities (kg N or volumes) applied with dates and types of crop benefiting from this and the quantities imported to or exported from the farm with records of dispatchers and recipients. This logbook must be updated within seven days of any operation and kept at the disposal of the authorities for five years. The 2015 action programme provides for a mandatory remote declaration system for all farms over two or three ha[35], both inside and outside vulnerable zones, and formalised agreements in advance between livestock farmers and other farmers providing for fertiliser trading.

**Derogation**

After studying and reviewing the recent experience of Lombardy, Catalonia has decided not to request a derogation. Dairy farms with high productivity are rare in Catalonia and they are the only type of livestock farm that would benefit from this type of derogation. But above all, as seen in Lombardy, there are too many conditions laid down by the Commission for it to be of interest to farmers.

## 9.5 Contents of additional measures and reinforced actions in action programmes

### 9.5.1 Targeted phosphorous measures

Fertilisation has to be adjusted to comply with a maximum value of 150 mg P per kg of dry ground (ref2 annex4). This is for agronomic rather than environmental reasons: phosphorous accumulates in limestone soils over the years, but it does not pollute the waters (except in the case of sandy soils or shallow water tables).

### 9.5.2 Reinforced actions

The vulnerable zones are themselves broken down into twelve territories corresponding to:

- slightly different application prohibition periods,
- different nitrogen ceilings for the crops,
- a different quantity of nitrogen mineralised by the soil.

The 2015 action programme envisages defining high animal density areas with greater restrictions.

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[34] In Spain, only the Andalusia action programme indicates figures: nitrogen evaporation for manure and slurry in housing units or stored outside account for 50% of the nitrogen produced for pigs and poultry, 35% for cattle and horses and 30% for sheep, goats and rabbits

[35] Threshold under discussion

The other zonings that involve protection perimeters of water catchments or distances around water courses are inspired more by other directives than by the Nitrates Directive.

## 9.6 Implementation tools

### 9.6.1 Advice and controls

Ref3: The animal dung management centres authorised by the competent division have the necessary skills. Publication of a technical file, information days and seminars, information handed over when livestock farmers request permits.

Specific advice is issued to farmers who take out the "global farm contract", which assumes a significant change in nitrogen management with certain agri-environmental measures.

4.8% of farms are controlled.

### 9.6.2 Computer tools

Ref3: software program for the application management register provided by the GESFER committee, Ruralcat Internet site of the Department of Agriculture, Food and Environment.

The 2015 action programme provides for introduction of a mandatory remote declaration system that will replace the registers and be usable online to define reasoned control plans.

### 9.6.3 Economic instruments

Ref3 indicates the elements validated technically by the regional authorities; these references are used by the public authorities and promoted to farmers, but the implementation rates have yet to be established.

- Organic nitrogen is sought after by farmers who pay to acquire it, but at a lower cost than mineral nitrogen.

- Priority to modernisation of certain irrigation networks with a positive impact on reducing leaking nitrates in irrigated crops; aids in modernising application equipment.

- Profitability of the pig slurry injection equipment: the cost of €6/ha (labour additional) and €1.5 to 2.6/ha (equipment) should be offset by the reduced evaporation and savings in mineral fertilisation (€1.22/kg N on average).

- Recommendation to purchase a conductivity meter (€360 each) to analyse the N content of the slurry and fine tune the application.

- An N analysis in the soils every 4 ha costs €8/ha but brings in 15.

- The volume of slurry produced by each pig can be reduced by 23% by managing the water supply better, which saves €1.5 per m3 of slurry.

- Feed reducing the production of nitrogen can decrease the surfaces for application, with savings of €50/ha of application.

# 10 Ireland Monograph

## 10.1 Persons met and main document references

Ministry of the Environment:

- Patrick Duggan, Senior Adviser, Department of the Environment, Community and Local Government

Environmental Protection Agency:

- Donal Daly, WFD Integration & Coordination Unit
- Mrs Niamh, Irish member of the Nitrates Committee

Ministry of Agriculture:

- Bill Callanan, Senior Inspector, Environment & Engineering Services Division,
- Jack Nolan, Irish member of the Nitrates Committee

Irish Farmers Association:

- Thomas Ryan, responsible for the environment and infrastructures
- Catherine Lascurettes, responsible for dairy sector

French Embassy:

- Laura Torrebruno, Head of Economics Department
- Alizée Juanchich, Agriculture and Environment Attaché

| | |
|---|---|
| Ref1: | Article 10 Report for Ireland for the period 2008 – 2011_EPA_June 2012 |
| Ref2: | Ireland's third Nitrates Action programme_Strategic Environmental Assessment_Environment, Community and Local Government_January 2014 |
| Ref3 | Statutory Instruments no. 31 of 2014 Good Agricultural Practice for Protection of Waters regulation 2014 |
| Ref4: | Commission Implementing Decision of 27 February 2014_ 2014/112/EU |
| Ref5: | Explanatory handbook for good agricultural practices for the protection of waters regulations 2014 |
| Ref6: | Status 2013 and trends in N & P of groundwaters, rivers, lakes and estuarine and coastal waters_EPA 2014 |

## 10.2 Context

### 10.2.1 Water quality

Surface water and groundwater quality is better in Ireland than in a good number of European countries and nitrates are only a problem in very few places; phosphates have more impact on the aquatic environments, with a particular risk of marine eutrophication:

- 5,673 bodies of surface water, of which 54% are in good ecological condition, and 756 bodies of groundwater, with 85% in good chemical condition.
- The nitrate pressure is estimated at 404,000 T/year of N produced by the animals and 360,000 T/year of mineral N.

### 10.2.2 Ireland and its agriculture

- Ireland has a population of 4.6 million. The added agricultural value accounts for 2% of GDP;
- 139,830 farms, farming 4,555,500 ha UAA including 4,190,000 grassland (PP) and 385,000 ha cultivated (133,600 ha cereals).
- over 75% of the agricultural production value comes from relatively low-intensity cattle farming: the average yield is 5,000 kg of milk/cow/year. Livestock farming is founded on feeding with grass, virtually without any additional cereal feed.
- agriculture resisted the 2009 crisis relatively well and is attracting young people: installations are going back up.
- exit from the milk quota system: the manifesto[36] Food Harvest 2020 plans to double milk production in the next five years due partly to increased yields and partly to moderate reconversion of suckling livestock farming to dairy farming. It also plans for a 40% increase in beef production[37] (90% of this production is exported, mainly to the United Kingdom). This growth is based on an assumption of maintaining highly predominant grazing production.

### 10.2.3 Institutional organisation

- The Ministry of Agriculture (Agriculture, Food and Marine Department) is responsible for implementing the Nitrates Directive. The Ministry of Environment relies on the Environmental Protection Agency and regional communities to implement the water policy. Public agricultural research and advice are entrusted to TEAGASC (Irish Agriculture and Food Development Authority). There is a large private farm advisory sector.

### 10.2.4 History of introducing the directive

- The Nitrates Directive was implemented for the first time in 2006 after a lengthy dispute with the European Commission. Nitrates and phosphates were involved from the start, especially because it was clear as soon as the regulations were set in place that the eutrophication problems in Ireland could only be controlled by actions on phosphates.
- The regulatory system has remained stable since the transposition of the directive in 2006; the initial provisions have since been softened slightly.

[36] This is clearly a guideline document dating from 2010, not a programme in the strict sense.

[37] There are one million dairy cows and one million suckling cows in Ireland

## 10.3 Contents of mandatory action programme measures

The entire country was classified as a vulnerable zone from the start.

The decree defines three categories of fertiliser:

- farmyard manure (mix of excrement and litter for all types of animal except poultry),
- other organic fertilisers (any type of liquid manure from livestock activities apart from farmyard manure),
- chemical fertilisers.

### 10.3.1 Application prohibition periods and methods

Three pedoclimatic zones: zone A South-East; zone B West; zone C North

- Farmyard manure: 1 November to 12 (zone A), 15 (zone B) or 31 (zone C) January.
- Other organic fertilisers: 15 October to 12 (zone A), 15 (zone B) or 31 (zone C) January.
- Chemical fertilisers: 15 September to 12 (zone A), 15 (zone B) or 31 (zone C) January.

### 10.3.2 Storage capacities

The storage capacity must be sufficient for a minimum number of weeks of liquid manure production, with the forecast volume estimated by a flat rate stipulated in the texts. The number of weeks is based on the usual grazing time of the animals. Normally sixteen weeks (zone A), eighteen weeks (zone B), twenty or 22 weeks (zone C or north of zone C). These rules include exceptions: livestock farms with less than 100 pigs or 2,000 poultry spaces: 26 weeks; stags, goats or sheep: six weeks.

Storage capacity

| Type of animal | Storage capacity m3 per week |
|---|---|
| Dairy cow per animal | 0.33 |
| Pig fertiliser slurry (varies with the dry matter content of feed) per animal | 0.024 to 0.053 |
| Hen (1,000 hens) | 0.81 |

Storage in the field is prohibited outside application periods

### 10.3.3 Balancing crop needs and inputs

The farmer is required to respect the fertilisation balance on his farm. The total nitrogen inputs on a farm (ground inputs, applications and chemical fertilisers) must not exceed the maximum needs of crops.

The balance is calculated using the method of balances on the farm with the following elements:

- Determined on the farm:
    - the "phosphorous index" indicates the nitrogen and phosphorous content of the soil from a soil analysis that is repeated every five years

for each plot (at least one sample every 4 ha). The annual analyses deemed essential for accurate, effective running of all N + P fertilisation are among the actions promoted strongly by the farm advisory system. They are mandatory when the farmer benefits from a derogation from the application ceiling of 170 kg organic N per ha.

- Determined by the regulations for
  - The production of nitrogen by the farm animals

| Type of animal | P2O5 kg/animal space/year | N kg/animal space/year |
|---|---|---|
| Dairy cow | 85 | 13 |
| Pig | 9.2 | 1.2 |
| Laying hen | 0.56 | 0.12 |

  - the "nitrogen index" defined for fourteen previous crops or according to date when last ploughed, for pastures;
  - inputs are estimated at a flat rate, according to 39 types of organic fertilisers with coefficients of availability depending on the phosphorous index or as per the C/N ratio of composts for five groups of fertilisers
  - for pastures the maximum N and P requirements by taking into account the input from animal excrement at pasture according to the number of animals grazing and the mowing rate
  - the maximum permitted N and P inputs, with details for eighteen ploughed crops, 25 vegetables and twelve fruit, as per the nitrogen and phosphorous indices

    Nitrogen input ceiling based on the nitrate content of the soil (nitrate index rated from 1 to 4 e.g. 4 very high content)

Table: maximum nitrogen inputs (N/ha)

| Main crop | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Winter wheat | 190 | 140 | 100 | 60 |
| Corn | 180 | 140 | 110 | 175 |

The farmer records the characteristic elements of their practices and keeps them at the disposal of the authorities for at least five years.

### 10.3.4 Derogation from the ceiling of 170 kg organic N/ha/year

- Granted since 2007 up to end 2010, renewed for the 2011 to 2013 period, then for the 2014 to 2017 period, this derogation has involved 5,093 farms, i.e. 11.4% of LU on 5.19% of the UAA (of 45,000 subject to the programme). These farms are monitored and undergo reinforced control; they must draw up and send to the authorities a provisional application timetable and carry out soil analyses.
- This derogation allows farms that request it and which have an UAA that includes over 80% grassland to apply up to 250 kg organic N/ha. The 70% grassland rate adopted in 2007 enabling a farm to benefit from the derogation was raised to 80% in 2014.
- The argument for obtaining successive derogations is that grass yields are high (high net precipitations, long growing season) causing a significant export of nitrogen.

- This derogation is a major issue for Ireland, where the policy is to maintain a very strong grass-fed production system and thus allow the most dynamic farmers to expand their activity.
    - The estimated extra annual expenditure per farmer to meet the conditions to benefit from the derogation is €1,000. Monitoring and control are reinforced for benefiting farms. The additional soil analyses bring knowledge and encourage these farms to benefit from these derogations by thinking more about their fertilisation. Correlatively the administration is developing computerisation and remote declaration to cope with the reinforced controls without increasing the staff required.

## 10.4 Contents of additional measures and reinforced actions in the action programme

### 10.4.1 Targeted phosphorous measures

The phosphorous fertilisation balance is calculated every year. It takes into account the phosphorous index of the soil estimated every five years (see above).

### 10.4.2 Treatment and export obligations

Any farm with a structural surplus must provide proof of its exports. The mission heard no mention of treatment of slurries or manures nor export outside Ireland.

## 10.5 Implementation tools

### 10.5.1 Advice and controls

The advisory system mobilises private consultants (about 300) and officers from the applied research institute Teagasc (about 300 also). In return for an incentive of €1,000/farmer/year, cofinanced by the EAFRD, the farmers are encouraged to work in groups of about fifteen, run by these consultants, to train, exchange regulatory, technical or economic information, recipes for success and make progress in implementing this directive. There are about 6,000 "milk" groups in Ireland and 4,900 "meat" groups. "Smart farmers" is an entirely voluntary programme launched by the profession[38] which works on all environmental impacts of farms and attempts to convert the new environmental regulations into economic opportunities.

### 10.5.2 Controls and computer tools

Only those farmers who benefit from the derogation have to remotely declare their CAP information and fertilisation practices. A compliance check is then run by computer using the various declarations from the farm when it benefits from the derogation or during controls on site. Computer tools for entering, controlling and analysing the practices of all the farms are under development.

### 10.5.3 Economic instruments

Public credit of €8M (i.e. €2M a year) has supported the farmers during the first programme, €5M for the second (€1.5M a year), of which the farmers have paid half.

An assessment research programme - the Agricultural Catchments Programme - was carried out over four years (phase 1 of €8M) and is currently running for a further four years (phase 2 of €6M). It involves six fairly large catchment areas that are

[38] http://smartfarming.ie/

representative of situations existing in the country. It has been used to experiment with certain agronomic actions by measuring their environmental impacts, but also by analysing their socio-economic requirements, which is both a source of scientific results and a remarkable tool for steering public policy.

# 11 Netherlands Monograph

## 11.1 Persons met and document references

Ministry of Agriculture:

- Emar Gemmeke, Environment and Fertiliser Programme Coordinator, member of the Nitrates Committee in Brussels;
- JacobVan Vliet,

French Embassy:

- Bernard Boidin, Economic Counsellor

| | |
|---|---|
| ref1 | Implementation of the Nitrate Directive in the Netherlands; WJ Willems PBL (Netherlands Environmental Assessment Agency); June 2013 |
| Ref 2 | Agricultural practice and water quality in the Netherlands in the period 1992 2010; RIVM (National Institute for Public Health and the Environment); 2012<br>http://www.rivm.nl/bibliotheek/rapporten/680716008.pdf |
| Ref 3 | Comparison of the Nitrates Directive in six EU member States: Junior Consulting Sciences Po; 2010 |
| Ref 4 | Website of the Ministry of Economic Affairs, heading "Mest" in Dutch |
| Ref5 | Decision 2014/291/EU of 16 May 2014 - renewal of the derogation to the ceiling of 170 kgN.ha |
| Ref6 | Dutch manure policy; Emar Gemmeke Ministry of Economic Affairs; 10 December 2013 |
| Ref 7 | Project 2012 - 2014 Annual Nutrient Cycling Assessment (ANCA) Wageningen University |
| Ref8 | Fifth Dutch Action Programme (2014-2017) (draft dd 20-2-2014) document extremely precise |
| Ref9 | Baumann, R.A. et al., Agricultural practice and water quality in the Netherlands in the period 1992-2010, RIVM report 680716008/2012 |
| Ref10 | Law on soil protection (Wbb): http://wetten.overheid.nl/BWBR0003994/geldigheidsdatum_20-04-2015 |
| Ref11 | Use of fertilisers (Bgm); application of the Law on soil protection: http://wetten.overheid.nl/BWBR0009066/geldigheidsdatum_20-04-2015 |
| Ref12 | Application rule of the Law on soils regarding the use of fertilisers (Ugm): http://wetten.overheid.nl/BWBR0023115/geldigheidsdatum_20-04-2015 |
| Ref13 | Law on fertilisers (metstoffenwet) (Msw): http://wetten.overheid.nl/BWBR0004054/geldigheidsdatum_20-04-2015 |
| Ref14 | Application decree of the Law on soils regarding the use of fertilisers (Ubm): http://wetten.overheid.nl/BWBR0019031/geldigheidsdatum_20-04-2015 |
| Ref15 | Application order of the Law on fertilisers regarding the fertilisers (Urm): http://wetten.overheid.nl/BWBR0018989/geldigheidsdatum_20-04-2015 |

## 11.2 Context

### 11.2.1 Water quality

The nitrate monitoring network aims to analyse agricultural pollution: this excludes water polluted by industrial or urban sources and water entering the country already polluted by countries located upstream. Secondly, samples are taken of "water influenced mainly by agriculture", i.e. in livestock farming or livestock manure applications zones at the outlet of agricultural drains or root zones.

The results of the WFD monitoring are as follows:

- 724 bodies of surface water, of which 0.5% are in good ecological condition, and 23 bodies of groundwater, with 61% in good chemical condition.

- The nitrate pressure is 489,000 T/year of N produced by animals of which 433,000 is recycled in agriculture and 253,000 T/year of mineral N. 179,000 T/year P2O5 produced by the animals.
- The goal under the Nitrates Directive is for the nitrate concentration in the upper layer of surface waters to be below 50 mg per litre on average for a type of soil (clay, sandy, loamy and peaty). From the start, a specific monitoring network was set up to concentrate on "water influenced mainly by agriculture". Concentrations were seen to have dropped significantly after the first action programmes, but now the improvement is increasingly slow, more especially in the areas of sandy and loamy soils in the South and East of the country.
- Eutrophication is monitored using Chlorophyll a, N and P parameters.

### 11.2.2 Agriculture in the Netherlands

The agricultural sector accounts for 1% of the country's GDP. Agriculture is very intensive. Nearly 60% of production is exported, directly or through the food industry,

69,000 farms (-2.2% a year), including 35,800 livestock farms, cultivate 1,850,000 ha of UAA, including 960,000 ha grassland, 530,000 ha ploughed, 240,000 ha silage corn and 120,000 ha horticulture; 70% of cows are put out to graze.

Livestock farming is highly developed: 3.9 million cattle including 1.5 million dairy cows, 12.4 million pigs and 97.9 million poultry birds. Close to 70 million tonnes of animal liquid manure are produced every year.

### 11.2.3 Institutional organisation

The Ministry of Economic Affairs has a department in charge of agriculture which is responsible for regulations on the use of nitrates and phosphates in agriculture (application of the Nitrates Directive and its derogations) and works in conjunction with practitioners. The Ministry of Infrastructures has a department in charge of the environment which is responsible for implementation of the WFD and its measures in conjunction with the local authorities.

Numerous responsibilities in the Netherlands are delegated to the practitioners themselves. Thus, "environmental cooperatives" have emerged and act as the contact for public authorities and civil society on behalf of their members.

### 11.2.4 History of introducing the directive

- 26% of the country is below sea level. Implementation of the Nitrates Directive is therefore part of the culture of cooperation between stakeholders and collective responsibility to do with water management (polder model). For centuries, Netherlands society has been organised around controlling water, with the corollary of an undisputed capacity of citizens, including farmers, to consult each other and cooperate in implementing objectives defined by this consultation. (See also CGAAER report 12079 "benchmarking mission (... Netherlands ...) of agri-environmental measures for the water issue", June 2013). Regulations to protect natural spaces from livestock manure were initially introduced more than thirty years ago (1984) by limiting pig and bird populations. They have been gradually reinforced.
- First action programme: Dec. 1995 - Dec. 1999; second programme 2000 to 2003; third programme 2004 to 2009; fourth programme 2010 to 2013; fifth programme 2014 to 2017.
- More severe measures have been applied to sandy and loamy soils since 2014 and are struggling to reach the objectives: the fertilising value coefficient of pig

slurry has been raised from 70 to 80% in the fifth plan for crops sensitive to leaching (such as corn). The application ceilings have been reduced by 20%.

## 11.3 Mandatory action programme measures

The entire country was classified as a vulnerable zone from the start.

The regulations distinguish between three categories of organic fertilisers: liquid animal dung (slurry or liquid fraction of manure, etc.), solid animal dung (manure or solid fraction of slurry, etc.) and "others" (compost, mushroom layers, WWTP sludge, etc.).

The measures in the fifth programme therefore differ between regions and also due to a patchwork of exceptions according to crops, types of soil (which corresponds more or less to the regions), previous crops, type of fertiliser inputs, crop condition, etc. For example:

- It is prohibited to plough grassland (in general); there are miscellaneous exceptions to resolve "certain agricultural problems". They are found in different articles of regulatory texts.
- Grass on clay or peat can be ploughed from 1 February to 15 September if a crop with a high demand for nitrogen is sown immediately after ploughing.
- Clay ground can be ploughed from 1 November to 31 December if the following crop is not grass.
- Sandy soils can be ploughed to grow hyacinths and tulips.
- Grassland that has lost more than 25% of production covering at least 5% of the farm can be ploughed at certain periods (has to be certified by an expert and declared to the authorities).

### 11.3.1 Application prohibition periods and methods

Application is prohibited from 1 September to 1 February in general (but extended for two weeks in September for application of solid manure on clay soils). There are numerous exceptions, the main one being the possibility of applying solid manure to arable land that has been sown. Note also the authorisation for fertiliser application in winter on growing crops (vegetables and cereals).

### 11.3.2 Storage capacities

The regulations demand a minimum capacity of seven months storage for all livestock manure (six months in the previous programme). It sets out the obligations for designing installations (separation of water, etc.), the mandatory distances from houses and the volumes.

| Type of animal | Storage capacity per animal in m3 (over seven months) |
|---|---|
| Dairy cow 6,500 to 6,750 kg milk/year 20 mg/100 g milk/slurry | 14.6 |
| 20 to 110 kg pig slurry | 0.75 |
| Laying hen droppings | 0.012 |

The regulations allow storage in the field as this is very infrequent: the farms can in fact apply manure to covered clay soils all year round and field storage in this densely populated country would not be tolerated by the population.

### 11.3.3 Balancing crop needs and inputs

- The balances are calculated for each farm.
- The flat-rate values to be used in the calculations are provided by the research bodies and the practitioners and approved by a scientific committee before figuring in the regulations.
- The farm's organic N and P inputs are estimated from regulatory standards drawn up by the research bodies and practitioners and approved by a scientific committee. These standards give details for 66 types of animal and/or livestock farming modes. They take account of times spent in housing units or outside. The farmer can also use a specific standard per farm (holding specific excretion BEX) that he draws up himself over several years and with controls. The farmer can then benefit from the effects of optimising the composition of the feed for their animals.

| Type of animal | P2O5 kg/animal/year | N kg/animal/year | Evaporation and losses in livestock building kg/animal/year |
|---|---|---|---|
| Dairy cow 6,500 to 6,750 kg milk/year 20 mg/100 g milk/slurry | 39.8 | 109.5 | |
| Pig 20 to 110 kg slurry | | 9.9 | 1.4 |
| Laying hen | - | 0.21 | 0.083 |

- The provisions of the regulations are defined nationally but the fertilisation ceilings are specific to each of the four pedoclimatic regions (clay, peaty, sandy and loamy soils), where the nitrogen and phosphorous dynamics are felt to be different. Distinction is made between three levels of phosphorous content - high, moderate and low. Certain measures also take into account the nitrate concentration in underlying waters.
- The standard needs of crops are laid down by the regulations for N and P, with differences shown for 120 crops and five regions. The productivity of certain crops (potatoes, beet, etc.) is taken into account. The standards have been maintained globally for the 5th programme, but application standards have dropped for leaching-sensitive crops (corn, etc.), mainly to accelerate progress in areas with sandy or loamy soils (pig farming areas), where the underlying aquifers are struggling to meet their objectives;
- Standard nitrogen needs in year of harvest

| Main crop | kg N total per ha and per year sandy or loamy soils | kg N total per ha and per year clay soils |
|---|---|---|
| Winter wheat | 160 | 245 |
| Corn in farms with derogation | 140/112 (loamy soils) | 160 |
| Corn in farms without derogation | 140/112 (loamy soils) | 185 |

- The quantities of P and N exported from the farm are estimated using systematic sampling for the liquid animal dung. Solid animal dung is assessed at a flat rate currently, but work on setting a reliable sampling method is reaching its conclusion.
- Note that there are no obligations to split fertiliser inputs.
- The provisional fertilisation plan is recommended but not mandatory while the fertilisation register (CEP) is mandatory and kept for five years.

### 11.3.4 Derogation

- The Netherlands obtained its first derogation from the application ceiling of 170 kg N per ha in 2005. Nine thousand farms covering 30% of grassland benefit from the derogation.
- A condition of the derogation is compliance with a maximum quantity of phosphorous "consumed" by the entire country (annual consumption of P2O5: 173,000 t).
- Initially, a derogation could be granted for the application of 250 kg N per ha per year if the farm had more than 70% grassland. Conditions became more severe for the sandy or loamy soils in the South and Centre in 2014. Only farms with more than 80% grassland can now obtain a derogation for application of 230 kg N maximum.
- It is mandatory under a derogation to draw up a provisional fertilisation plan and keep fertilisation registers; soil analyses must take place every four years. They cost 9 euros/ha. It is prohibited to apply phosphate as a supplement.

## 11.4 Supplementary action programme measures

### 11.4.1 Targeted phosphorous measures

In 2002, granting the derogation to the organic nitrogen ceiling of 170 kg N per ha in a livestock farming area resulted in a ceiling of 173,000 t for the entire country for its annual consumption of P2O5. This is still in place. Also, beyond the fertilisation balance, the phosphorous quota system in force for pig and poultry farms was extended to cattle farms by the "milk" law: ("a phosphates quota therefore replaces the milk quota"). There is nevertheless a plan to expand livestock farming. According to Wageningen, the sector could grow by 20% by 2025. Dairy farmers are already well on the road to production growth, as they have been systematically exceeding their quota since 2007.

### 11.4.2 Treatment and export obligations

The introduction of an organic nitrogen application ceiling has led many farms with a structural surplus to sell their livestock manure to other farms. But this segment is now saturated: the "Netherlands farm" can no longer apply any more organic nitrogen and it is now obliged to export (after possible treatment). The mean national objective is that a dairy farmer can only ultimately grow if they treat 75% of the extra dung and acquire enough land to apply the remaining 25%.

Four possible treatment paths:

- Incineration: 30% of poultry droppings are incinerated, i.e. 400,000 t a year, which produces 36 MW of electricity. This also produces 60,000 t of ash, which contains 13% phosphate but no nitrogen. It is recycled in cement works.
- Composting
- Manufacture of granules after pressing livestock manure: easy to transport and export (mineral concentrate). The production process is as follows: as rearing livestock on straw is non-existent - for straw is rare -, the liquid and solid phases can be separated. The solid phase comes from compressing the organic matter, up to a low humidity content (10%) and it is formed into phosphate-rich granules. The liquid phase can undergo reverse osmosis; the filtering residue is rich in nitrogen, like a liquid fertiliser.
- Biological treatment, gasification of the nitrogen

- 20% of slurry therefore no longer returns directly to Netherlands agriculture. 15% is exported to neighbouring countries: Germany (memorandums have been signed with the Länder of North Rhine-Westphalia, Lower Saxony and Saxony-Anhalt), Belgium (Flanders) and France; 6% is processed to become fertiliser, burned or bio-fermented.

## 11.5 Implementation tools

### 11.5.1 Advice and controls

Agricultural development in the Netherlands is arranged and paid for by the farmer associations (or unions). Research is cofinanced and guided by the State and the practitioners.

The control of farms benefitting from a derogation has been reinforced. The coherence of various computerised declarations is controlled, supplemented by on-site controls. 7% of farms using the derogation are controlled on site (50% random, 50% guided).

The control of flows between farms is especially strict and supervised by a specific body. Any transport of fertiliser must be accompanied by a bill of lading drawn up by a registered company and must take place in a georeferenced lorry. The livestock manure load must be sampled and analysed. This rule will shortly be applied to solid livestock manure once a reliable, independent sampling method has been found. 97% of livestock manure is transported under this system. The main exception is transport to another farm less than 10 km away of livestock manure from a farm that uses at least 80% of its livestock manure production on its own farmland.

The action programme indicates that dissuasive flat-rate administrative fines are handed down. Reinforcing of controls is planned:

- for trading companies and the cancellation of the right to operate is being investigated for proven evaders;
- introduction of a "black box" system fixed in the lorry to control journeys of vehicles carrying the livestock manure;
- independent and random sampling and analysis of cargos, with a second level control by the NWMA (Dutch Food and Consumers Product Safety Authority).

**Computer tools**

There is a centralised database of all declarations.

**Economic instruments**

## 11.6 Other information

The Dutch are hoping to obtain a regulation whereby the organic livestock manure processed into fertiliser granules (mineral concentrate, less than 10% humidity) with a similar action to the mineral fertilisers can be used as mineral fertilisers, thus limiting the need to import fertilisers into the Netherlands.

# 12 PRESENTATION OF FRENCH ACTION PROGRAMME

Février 2015

PROCTECTION OF WATERS AGAINST POLLUTION CAUSED BY NITRATES FROM AGRICULTURAL SOURCES

In France, Nitrate regulation has been jointly drawn up by the Ministry in charge of Environment and by the Ministry in charge of Agriculture to implement Directive 91/ 676/EEC

## 12.1 Competent authorities for nitrates regulation in France.

At national level:

- National guidance text: designation of Vulnerable Zones (VZ)
- National Action Programme (5th NAP)

At the river basin level: (6 river basin districts in France + 5 overseas):

- designation of vulnerable zones by the "*préfet de bassin*" (State administration authority for a river basin district)

At the regional level (22 regions in France):

- the Regional Action Programme is drawn up ( RAP, since the 5th AP) by the "*préfet de région"* (State administration authority in a region)

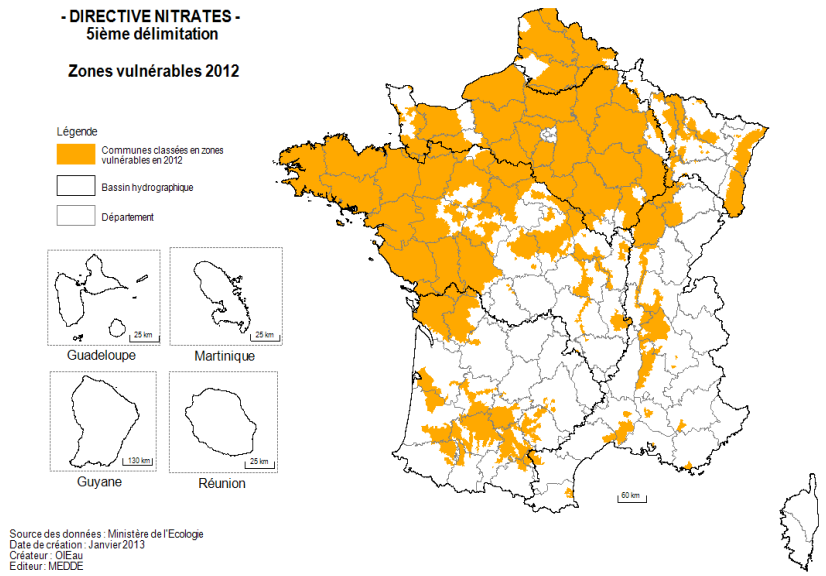
NB: Since the 5th NAP (i.e. from 2014 onward) there is no longer any definition of action programmes at the departmental level (there are 97 departments in France).

## 12.2 Vulnerable zones.

The following criteria are used to identify the VZ:

| | Waters which could be affected by pollution | Waters affected by pollution |
|---|---|---|
| Freshwaters, groundwaters | Nitrates content in-between 40 and 50 mg/L and no significant downward trend | Nitrates content higher than 50 mg/L |
| freshwater lakes, other freshwater bodies, estuaries,coastal waters and marine waters | Main characteristics showing a trend to eutrophication[39] that can be controlled by reducing nitrogen input | Eutrophicated waters that can be controlled by reducing nitrogen input |

The map below shows the delimitation of VZs in force since 2012, following several revisions; another extension is currently being submitted for public consultation. The subsequent result is to be transmitted to the European Commission:




57% of national Utilised Agricultural Area (UAA) is in VZ and subject to the implementation action programmes; 43% of UAA is in Non Vulnerable Zones where farmers implement the Code of Good Agricultural Practices on a voluntary basis.

## 12.3 Action programme

The 4th AP was for the period 2009-2013. There was until then one AP per "Department" based on national orientations. Since the 5th NAP starting 2013 November 1st, there is only one National AP whilst regional APs may clarify or strengthen some modalities at their level. This 5th AP aims at improving the readability of French AP and **ensuring a common regulatory base in all VZs**.

[39] Surface waters with more than 18 mg/L of nitrates are assessed through other parameters so as to decide upon eutrophication

* **The national AP** contains 8 measures:

- 6 baseline binding measures (according to Appendix III of the nitrates directive) reinforced compared to the 4th AP:
  1- prohibited periods for applying fertilisers
  2 – storage capacity for livestock manure
  3 – limitation of application of fertilisers based on fertilisation balance
  4 – provisional fertiliser plan (estimation) and logbook by the farmer
  5 – limitation of 170 kg N / ha of UAA per year for land application of livestock manure
  6 – specific conditions for application of fertiliser (near watercourses, on sloping lands, waterlogged, flooded, frozen or snow-covered land)

- 2 additional binding measures (according to nitrates directive article 5-5):
  7 – soil covering in order to absorb soil nitrogen (since 4th AP)
  8 – planted strips along watercourses (since 4th AP)

*__Combined to regional AP:__ additional measures and measures reinforcing the national AP taking into account agro-pedo-climatic characteristics and nitrates pollution in specific areas

- strengthening of measures 1, 3, 7 and 8 of national AP
- additional measures: including measures targeted on specific zones (water catchments where Nitrates concentration >50mg/L, watershed with green algae blooms, high density livestock zones)

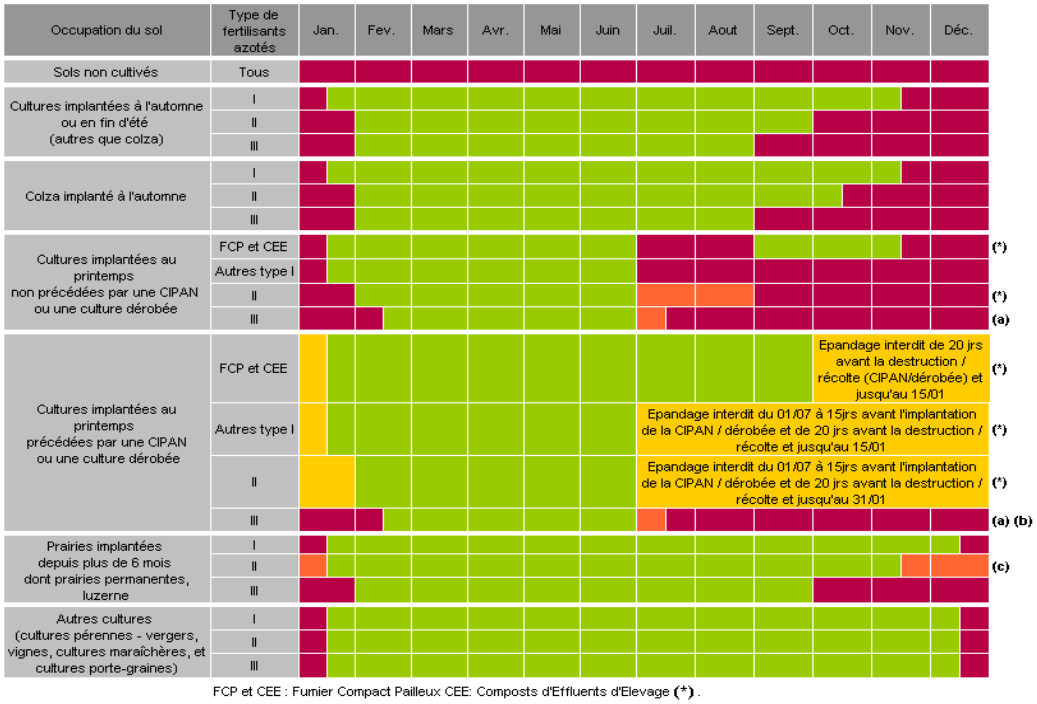
It also enhances the role of technical and scientific support in the Regions ("GREN": regional expert groups on nitrates under the authority of the "*préfet de région"*)

## 12.4 Details of the AP measures.

### 12.4.1 Prohibited periods for applying fertilisers:

Three different types of fertilisers are defined: type I = high C/N ratio and low proportion of mineral nitrogen (farmyard manure of any livestock except poultry, some standardised composts); type II = low C/N ratio with organic nitrogen (slurry, poultry manure, unprocessed digestate…); type III = mineral fertiliser.

These are the national measures to be completed by the RAP:




FCP et CEE : Fumier Compact Pailleux CEE: Composts d'Effluents d'Elevage (*).

### 12.4.2 Manure storage facilities.

The national AP determines a **storage capacity expressed in months of manure production**, depending on the type of livestock farming – cattle and sheep, dairy or not, pigs or poultry - and on the location – zone A = almost all of Brittany, Pays-de-la-Loire, Basse-Normandie; zone B = Alsace, Dordogne, Aquitaine, Haute-Normandie, Ile-de-France, Picardie, Poitou-Charentes; zone C= Bourgogne, Rhône-Alpes; zone D = Auvergne – as described in the following table:

| Animal species | Type of livestock manure | Time spent outside the buildings | Zone A | Zone B | Zone C | Zone D |
|---|---|---|---|---|---|---|
| **Dairy cattle** (dairy cows and renewal herd) and **dairy goats and sheep** | Manure | ≤ 3 months | 5.5 | 6 | 6 | 6.5 |
| | | > 3 months | 4 | 4 | 4 | 5 |
| | Slurry | ≤ 3 months | 6 | 6.5 | 6.5 | 7 |
| | | > 3 months | 4.5 | 4.5 | 4.5 | 5.5 |
| **Suckler cattle** (suckler cows and renewal herd) and **goats and sheep other than dairy** | All types (manure, slurry) | ≤ 7 months | 5 | 5 | 5.5 | 5.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | > 7 months | 4 | 4 | 4 | 4 |
| **Fattening cattle** | Manure | ≤ 3 months | 5.5 | 6 | 6 | 6.5 |
| | | 3 to 7 months | 5 | 5 | 5.5 | 5.5 |
| | | > 7 months | 4 | 4 | 4 | 4 |
| | Slurry | ≤ 3 months | 6 | 6.5 | 6.5 | 7 |
| | | 3 to 7 months | 5 | 5 | 5.5 | 5.5 |
| | | > 7 months | 4 | 4 | 4 | 4 |
| **Pigs** | Manure | | 7 | | | |
| | Slurry | | 7.5 | | | |
| **Poultry** | All types (manure, slurry) | | 7 | | | |
| **Other species** | | | 6 | | | |

In addition, **compact manure** (with a lot of litter) stored at least 2 months under the animals or on a storage platform and not likely to cause liquid leaks as well as dried **poultry manure** without litter (at least 65 % dry matter) can be stored on agricultural plots under the following conditions:

- where manure application is allowed and in areas unlikely to be flooded and out of high infiltration zones (karst);
- storage duration limited to 10 months;
- the quantity of manure stored must correspond to the amount of fertilisers applicable on the plot
- no storage on the same location for the next 3 years;
- for poultry manure, the heap has to be covered by a waterproof gas-permeable tarpaulin.

### 12.4.3 Limitation of land application of fertiliser based on fertilisation balance.

**Nitrates Directive – annexe III:**

Limitation of the land application of fertilisers […] to be based on a balance between

(i) the foreseeable nitrogen requirements of the crops, and

(ii) the nitrogen supply to the crops from the soil and from fertilisation (organic and mineral)

**French AP:**

Calculation of the nitrogen balance before application:

- according to a method clearly defined in the National AP including some rules: targeted yields, soil analysis obligations,…

- and regional detailed guidelines (parameters and equation to be used for each culture), based on the work of regional expert groups (GREN) and fixed by regional order

Came into force in September 2012; National reference:
http://www.comifer.asso.fr/index.php/bilan-azote.html

### 12.4.4 Provisional fertilisation plan and Logbook

National AP:

For each agricultural plot (fertilised or not), the farmer must:

- have a **provisional fertilisation plan** summarizing the main elements of the calculation of the nitrogen dose to be applied in accordance with national and regional operational guidelines (measure 3°)
- have and keep up to date a **logbook** with information on implemented cover, fertiliser application, type of management of the period between main crops (ex :catch crop implantation and destruction..)

The logbook also contains information on livestock and on manure exchange (transfer slips recording information on the type of product, the quantity of N exchanged..).

### 12.4.5 Limitation of 170 kg N/ha of UAA per year for land application of livestock manure

Limitation of the quantity of nitrogen from livestock manure spread on the farm each year:

- 170 kg N/ ha of Utilised Agricultural Area,
- Without prejudice to respect of the fertilisation balance (measure 3°), and of fertilisation bans (e.g.: N fixing crops, unfertilized strip along water courses..).

The quantity of nitrogen from livestock manure on the farm equals:

number of animals * amount of available N produced per animal
+ import of nitrogen from livestock manure coming from other farms
- export of nitrogen from livestock manure leaving the farm
- nitrogen from livestock manure eliminated through processing (e.g.: denitrification or methanisation plant)

*Amount of N produced by animal set in national AP's table for each type of animal.*
*N = excreted nitrogen – gaseous losses of nitrogen in livestock building and during the storage.*
So far, France has not applied for any derogations.

### 12.4.6 Specific conditions for application of fertilisers

*Near watercourses:

- Type III: prohibited within 2m of water courses and on grass strips (measure 8°);
- Types I & II: prohibited within 35m from water courses, or 10m where a 10m wide and unfertilised grass strip is present along the water course.

*On sloping land:

- General case:
  - Type II prohibited where the slope is steeper than 10% (15% if downhill there is a grass strip, a hedge or continuous natural embankment),
  - Types I and III prohibited where the slope is steeper than 15% (20 % if downhill there is a grass strip, a hedge or continuous natural embankment),

- Particular provisions for perennial crops and grassland.

*Waterlogged, flooded land:
- Prohibited for all types of fertilisers

*Frozen or snow-covered land:
- Prohibited for all types of fertilisers on snow-covered grounds
- Prohibited for all types of fertilisers on frozen soils, except for compact manure, compost of livestock manure and other organic products applied in order to prevent soil erosion.

### 12.4.7 Soil covering in order to reduce nitrogen leaching during rainy seasons

The rules are set by the NAP. The main ones are:

1° relevant purposes of such measure;
2° cover implantation is mandatory prior to crops sown in spring: catch crop, intermediate cover, volunteer oil seed rape, volunteer cereals (maximum 20 % of surface to be sown with spring crop), crushed and buried crop residues after grain corn, sorghum and sunflower;
3° cover implantation is mandatory after oil seed rape and prior to crops sown in autumn and winter: oil seed rape regrowth are allowed;
4° no chemical destruction (some exceptions are provided).

The NAP also provides for the possibility to adapt the main rules in regional AP (5°):

When, in application of some regional adaptation, the soil is not covered prior to a spring sown crop, a post-harvest nitrogen budget has to be calculated and on-farm registered.

### 12.4.8 Grass strips along water courses.

The rules are in the NAP and are as follows:
- permanent grass and/or wooded strips must be set up and maintained along water courses, and lakes or ponds covering at least 10 ha;

– the strip must not be fertilised or treated with pesticides (+ other management rules to be respected).

## APPENDIX

## REGULATION REFERENCES

For the 5th Action Plan, the regulation references are the following:

National guidance regulation:

- Decree dated 10/10/2011 (new architecture),
- Decree dated 7/05/2012 (content of Regional AP, reinforced measures)
- Interministerial order dated 20/12/2011 (Regional Expert Group on Nitrates – GREN - role, composition, etc.)
- Interministerial order dated 7/05/2012 on Regional AP and reinforced measures
- Interministerial order dated 23/10/2013: instructions for Regional AP

National action programme (operational regulation)

- Interministerial order on National AP (19/12/2011)
- Interministerial order on National AP (23/10/2013) modifying the order dated 19/12/2011
- Regional Prefectoral order: regional guidelines to estimate nitrogen doses to be applied to crops implement (measure 3 of National AP) - summer 2012 + undergone revision

Regional action programmes (operational regulation):

- Regional Prefectoral orders: Regional APs (spring or summer 2014)

Other operational rules:

- Regional Prefectoral orders: GRENs creation (March 2012)

# 13 Project for an international seminar on implementation of the Nitrates Directive

## 13.1 Goals

1. Having shared experiences between participants on implementation practices for the Nitrates Directive (mainly based on the CGAAER and CGEDD report), in conjunction with current results and future prospects, each country or region identifies new concrete actions to achieve the objectives of this Directive more easily or more quickly.
2. Future prospects: exchange of views on the community system protecting water
3. (Potentially): on the fringes of the seminar, or the following day, working meeting with the delegations of certain countries.

## 13.2 Participants

The bodies in charge of implementing the Nitrates Directive from the spheres of agriculture or environment in the six countries or regions that were benchmarked in 2015, namely Germany, Belgium (Flanders), Denmark, Spain (Catalonia), Ireland and the Netherlands: two or three participants per country: +/- 18 people:

- Representatives from MAAF and MEDDE,
- Organisers and a few experts: +/- 12 people;
- Possibly, the countries contacted but not visited during the benchmarking: Belgium (Wallonia), Italy (Lombardy) and Great Britain: one or two representatives per country: +/- 6 people
- It would be useful to call on an expert who is very familiar with how the Commission operates and its objectives for the ND and the WFD

I.e. 40 to 60 people.

## 13.3 Proposed timetable

Each country is invited at the end of 2015 by the General Councils, based on the final report of the benchmarking mission, which should be translated into English beforehand, with a request for a contribution to be validated in the following month. The final content is thus finalised in October and the final contributions complied in November, for a seminar to be held early in 2016.

## 13.4 Place and logistics

- Creation of a steering committee: general councils, technical divisions,
- Sub-contracting to a specialist organiser,
- Paris or La Défesne: auditorium for sixty people with simultaneous English/French interpretation,

- Travelling, accommodation and other charges: paid for by participants,
- Provisional budget: €20,000

## 13.5 Provisional content

- 09.30: words of welcome, objective and programme for the day
    - Presentation of the benchmarking report, comments or recent additions
    - Possibility of rapid presentation by Lombardy or Wallonia
- 10.45: Themed discussions (45' per theme including 15' for the initial presentation)
    - Theme 1: livestock manure (storage capacities, evaporation, derogation to the 170 kg), presentation by Germany
    - Theme 2: fertilisation balance (regional calculations and references, nitrogen-fixing intermediate crops, grassed strips), presentation by France
    - Theme 3: monitoring and control of practices (transport equipment, application or soil analysis and fertiliser traceability, remote declaration and information system), presentation by Belgium
- 12.30: buffet lunch and informal discussions
- 14.00: Themed discussions (continued)
    - Theme 4: treatment and enhancement of organic fertilisers in structural surplus areas (technologies and profitability, equivalent products to mineral fertilisers, outlets), presentation by the Netherlands
    - Theme 5: applied research and advice to farmers (organisation, pilot experiments, appropriation of results and generalisation), presentation by Ireland
    - Theme 6: effectiveness of actions (costs/advantages of different measures), presentation by Denmark
    - Theme 7: environmental impact (monitoring of water resources, modelling of the impact of measures, link with the WFD objectives), presentation by Spain
- 17.00: round table of initiatives envisaged by the participations, creation of discussion groups of two to three countries to continue with discussions and initiatives
- 18.00: conclusion and end of seminar

## 13.6 Products

Publication of contributions on the Internet, trilingual guidance note.

# 14 Glossary of Abbreviations and Acronyms

| Acronym | Meaning |
|---|---|
| **ACA** | Catalan Water Agency (SP) |
| **ANCA** | Annual Nutrient Cycling Assessment |
| **APAE** | Action programme for the aquatic environment (DK) |
| **BE** | Belgium |
| **BE-FL** | Belgium-Flanders |
| **BEX** | Nitrogen production per farm |
| **CBCPA** | Code of good agricultural practices |
| **CGAAER** | General Council for Food, Agriculture and Rural Spaces |
| **CGEDD** | General Council for the Environment and Sustainable Development |
| **CIPAN** | Nitrogen-fixing intermediate crops |
| **CJEC** | Court of Justice of the European Communities |
| **CJEU** | Court of Justice of the European Union |
| **CURIA** | Name of the site of the European Court of Justice |
| **DAA** | Danish AgriFish Agency |
| **DAFM** | Department of Agriculture, Food and Marine (IR) |
| **WFD** | Water Framework Directive |
| **DE** | Germany |
| **DK** | Denmark |
| **DKK** | Danish kroner |
| **DN** | Nitrates Directive |
| **DNAP** | Danish nitrates action programme |
| **ES** | Spain |
| **ES-CA** | Spain-Catalonia |
| **EAFRD** | European Agricultural Fund for Rural Development |
| **GGA** | Green Growth Agreement (DK) |
| **IPPC** | Directive 96/61/EC on integrated pollution prevention and control |
| **IR** | Ireland |
| **LU** | Livestock Unit |
| **NL** | Netherlands |
| **AP** | Action programme |
| **CAP** | Common Agricultural Policy |
| **RBMP** | River Basin Management Plan |

| | |
|---|---|
| **UAA** | Utilised Agricultural Area |
| **WWTP** | Wastewater Treatment Plant |
| **EU** | European Union |
| **ZADG** | High animal density areas (Spanish acronym) |
| **VZ** | Vulnerable zone |