



**Ministry of Environment
and Food of Denmark**
Environmental
Protection Agency

Overview of
the Danish regulation of nutrients in
agriculture

&

the
Danish Nitrates Action Programme
cf. Council Directive of 12 December 1991
concerning the protection of waters against pollution
caused by nitrates from agricultural sources
(91/676/EEC)

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1 INTRODUCTION

This document describes both the general agricultural regulation with respect to reducing nutrient losses from agricultural activities to the aquatic environment and the actual Danish Nitrates Action Programme according to the Nitrates Directive, as it is implemented in national acts and orders.

The Nitrates Action Programme is presented separately in chapter 3, while other features of the Danish regulatory framework for nutrient management are depicted in chapter 2 in this document.

The combined effects of the general agricultural regulatory measures and the specific elements in the Danish Nitrates Action Programme ensures fulfillment of the objectives of the Nitrates Directive and contribute to fulfillment of the objectives of the Water Framework Directive.

Pursuant to articles 5, paragraph 7 of the Council Directive of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC), the Member States are obligated to review and if it is necessary to revise their action programmes at least once every four years.

The previous Danish Nitrates Action Programme described the implementation of the Nitrates Directive in Denmark for the period 2008 to 2015. On December 21, 2015, the Environmental Protection Agency announced to extend the validity of the Danish Nitrates Action Programme 2008-2015 until a revised Programme had been prepared.

The Danish authorities informed the Commission on March 18, 2016 about the revision of the Danish Nitrates Action Programme, concerning the removal of the reduction of the nitrogen application standards.

The revised Nitrates Action Programme is described in chapter 3 of this document.

New and revised legal elements, regulating nutrient management in Denmark in general, can be found in further detail in chapter 2 of this document.

1.1 EFFORTS AND ACHIEVEMENTS

Since the late 1980's, Denmark has pursued a comprehensive and efficient approach to improve the environmental state of groundwater and surface water regarding nitrate concentrations, especially directed towards reductions in nitrate leaching from agricultural sources. The first Action Plan on the Aquatic Environment was adopted in 1987 and has since then been followed by subsequent Action Programmes to ensure that sufficient efforts were made to reduce the loss of nitrogen and phosphorus to the aquatic environment.

With the aim of fulfilling the obligations pursuant to the Nitrates Directive (91/676/EEC) sufficiently, the Action Plan II 1999-2003 (Action Plan II for the Aquatic Environment) was adopted in 1998. In 2003, a final evaluation of the agricultural measures in the Action Plan I, Action Plan for a Sustainable

Agriculture and Action Plan II showed that the annual nitrate leaching from the root zone water from agriculture was reduced by 48%, which fulfilled the reduction target set in 1987.

In 2004, Action Plan III for the aquatic environment was adopted, the aim being a further reduction in nitrate leaching of 13% compared to the nitrogen leaching in 2003. The target was to be obtained by 2015. The measures to reduce nitrogen losses included, among others, further restoration of wetlands, voluntary 10 m buffer strips and tightened requirements for growing of catch crops.

In 2008, a mid-term evaluation of Action Plan III was performed, including recalculation of the nitrate leaching for 2003 using updated N leaching modelling systems. The evaluation showed that there was not yet any significant decrease in the modelled nitrate leaching during 2003-2007 and that it was unlikely that the aim in AP III would be fully attained by 2015.

As a consequence, the AP III was replaced by the Green Growth Agreement in June 2009. This plan included a new concept for defining the aim of nutrient regulation. The previous Action Plans provided goals for the reduction of nitrogen leaching from the root zone water, whereas the aim of the Green Growth Agreement was to further reduce the annual load of nitrogen to marine waters. The N load to marine waters has stepwise been reduced, as planned measures for point sources and agriculture has been implemented.

The first River Basin Management Plan for 2009-2015 to fulfil the targets in the Water Framework Directive was adopted in 2014. The second generation of River Basin Management Plans for 2015-2021 have been finalized in June 2016.

1.2 THE POLITICAL AGREEMENT ON FOOD AND AGRICULTURE

On 22 December 2015, the Danish government and supporting political parties in the Danish Parliament reached an agreement on a Food and Agricultural Package. The agreement includes a diverse package of measures, initiating a shift in the way environmental regulation of the agricultural sector is carried out: from a general regulation to a more targeted approach. The aim is to improve the ability of the food and agricultural industry to increase primary production and exports, ensure a more level playing field – in due interaction with the protection of nature and the environment.

1.2.1 Elements, implemented in national legislation

One central element in the agreement is to remove the reduction of nitrogen application standards for farming, which have been reduced by approximately 20% compared to the economically optimal level. The removal of the reduction of the nitrogen application standards takes place stepwise by removing two thirds in spring 2016, coming into effect during the crop season 2015/16 and by removing the remaining one third with effect from the crop season 2016/17 and onwards. This change in regulation presupposes a revision of the Danish Nitrates Action Programme.

In order to avoid an increase in nitrate leaching due to this adjustment, measures to avert have been established in 2017, consisting of the following:

- Changes in regulation of establishment of mandatory catch crops and use of other areas as alternatives to the catch crops (see chapter 2.4.7)
- Additional establishment of (mini-)wetlands (see chapters 2.4.1 & 2.4.2)
- Afforestation(see chapter 2.4.4)
- Targeted catch crop scheme (see chapter 2.4.8)

Furthermore, the Danish government proposes a new and more emission based regulation of livestock holdings when granting permits to installations for animal husbandry. The regulation ensures a simpler and flexible regulation designed as a permit based on an environmental assessment of the production area in the stable, and ensure general regulation of the spreading of the manure. This regulation is described in further detail in section 2.2.

Coming into effect from 2017, the Danish government adjusts the so-called harmony rules” limiting the amount of nitrates from livestock manure per hectare, to ensure that the requirement is aligned with the requirement of the Nitrates Directive. The Nitrates Directive specifies the amount of livestock manure per hectare to 170 kg N. This element is described in further detail in section 2.1.1.

Due to this alignment of the harmony rules, a new direct phosphorus regulation is introduced, which is described in detail in section 2.1.3. It shall be noted that the phosphorus regulation is not a measure in the implementation of the Nitrates Directive.

1.2.2 Future elements in national legislation: Targeted regulation

A new geographically targeted environmental regulation of agriculture will be established in Denmark as from August 2019. This new targeted regulation of nitrogen will introduce a restriction, where needed, on the individual farm's leaching of nitrogen pursuant to the Water Framework Directive.

According to the political agreement on a Food and Agriculture Package of December 2015, the targeted regulation will be based on four main principles:

1. The leaching access in each coastal water body is differentiated geographically in order to meet the nitrogen target in each coastal water body (in total 90 coastal water bodies in Denmark). In the calculation of the leaching access, the average retention from the root zone to the coastal water body is taken into account.
2. For each farm, a leaching permit to the aquatic environment is appointed. The permit is calculated as the maximum nitrogen leaching from the root zone per hectare (kg N per hectare). Each farm within a catchment area will be appointed the same leaching permit per hectare.
3. Each farmer is given flexibility in the choice of instruments (e.g. catch crops, buffer strips, reduced nitrogen application etc.) in order to comply with the leaching permit. The instruments all contribute to reduce nitrogen leaching at farm level, and the relevant combination of instruments will help farmers ensure that the leaching permit is not exceeded. The number of instruments that the farmers can choose from will expectedly be increased up to the implementation of the targeted regulation.

4. Compensation to farmers for costs involved with the compliance of the reduced leaching permit. It is expected that the targeted regulation will contribute to a reduced nitrogen contribution to the coastal water bodies.

The specific principles and elements for the targeted regulation are currently being developed in detail.

1.3 OBJECTIVES OF REGULATING NUTRIENTS IN AGRICULTURE WITH RESPECT TO THE FUTURE DEVELOPMENT OF THE AQUATIC ENVIRONMENT

The main objective of the implementation of the Nitrates Directive is reducing water pollution caused or induced by nitrates from agricultural sources and preventing further such pollution, cf. the Nitrates Directive, art. 1.

The effect of the implementation of the Nitrates Directive also contribute to fulfillment of the objectives of the Water Framework Directive.

According to the River Basin Management Plans (RBMPs) for 2015-2021 concerning coastal waters, the focus is on reducing the nitrogen loads, as the primary reason for the missing fulfillment of the environmental objectives is a too high nitrogen load. The most important anthropogenic source to the nitrogen load to coastal waters is the loss of nitrogen from arable land.

In Denmark, watercourses and streams are relatively short compared to major rivers in Europe. The national monitoring programme and the scientific studies indicate that the ecological water quality in Danish rivers and streams is not affected significantly by emissions of nitrogen and phosphorus. Emissions/discharges of phosphorus are the most important pressures to obtain good ecological water quality in lakes. A range of new measures will reduce the discharge of phosphorus in the catchment areas to lakes.

2 OVERVIEW OF THE DANISH REGULATION OF NUTRIENTS IN AGRICULTURE

In this chapter, the general agricultural regulation with respect to limiting and reducing nutrient losses from agricultural activities to the aquatic environment is described. In combination with the specific elements in the Nitrates Action Programme (chapter 3), these measures contribute considerably to meeting the objectives of the Nitrates Directive and of the Water Framework Directive.

The features in this chapter are to be understood as a non-exhaustive list of the central elements in Danish regulation of nutrients in agriculture. In addition to these key elements, a number of supplementary initiatives, as e.g. municipal action plans for drinking water areas or awareness and education campaigns, are also contributing to the protection of the aquatic environment against pollution, caused by nutrient losses from agriculture.

2.1 OPTIMIZING NUTRIENT FLOWS IN AGRICULTURAL PRODUCTION SYSTEMS

One central objective of the Danish agricultural regulation is to optimize the Nitrogen cycle within the agricultural production system by increasing efficiency of (re)using nutrients from organic sources, as e.g. animal slurry, within the system and by limiting the introduction of chemical fertilizers to the system to a maintainable amount, while reducing losses from the system to an environmentally compatible level. Following and optimizing the Nitrogen flow both at farm and at national level are the main objectives of the elements in Danish agricultural regulation, which are briefly described in the following sections.

2.1.1 Danish “harmony rules”

Harmony rules set requirements for the minimum size of the area a livestock holding must have available for spreading livestock manure from the respective livestock production. The requirement is defined as a limitation in livestock units per hectare (LU/ha), based on the content of nitrogen in the respective livestock manure (ex. storage), where 1 LU is equal to 100 kg N in livestock manure in the best modern production system with the lowest ammonia emission. Thereby the harmony rules implement the Nitrates Directive’s requirement to limit the amount of manure per hectare to max. 170 kg N, corresponding to 1.7 LU/ha in the best production system. From August 2017, the LU requirements are defined as a limitation in kg N per hectare. If livestock manure is transferred outside the farm, the numbers of transferred livestock units must be calculated on the basis of the nitrogen content.

From 2002 until 2017, Denmark had imposed a tightened requirement for holdings producing pigs, poultry and fur bearing animals, as the harmony rules for these categories of livestock productions have been adjusted to 1.4 LU/ha. From 2017, the harmony rules are - as a consequence of the latest political agreement (see section 1.2) - aligned to the Nitrates Directive limit of 170 kg N ha⁻¹ a⁻¹, corresponding to 1.7 LU ha⁻¹ a⁻¹.

This implies that farms producing livestock can spread manure on a smaller area leading to lower costs of transportation. The adjusted harmony rules enable the farmers to cover a higher share of their nitrogen fertilization demand with livestock manure instead of mineral fertilizer. However, neither fertilizing standards for the respective crops, nor the obligation to comply with the Nitrates Directive limit of 170 kg N/ha on farm scale is compromised. Furthermore, the farmer still has an incentive to utilize the nutritious value of manure on a larger area, if this value (e.g. co-application of organic matter) exceeds the costs of transportation.

2.1.2 The nitrogen standard quota at farm level

The yearly amount of nitrogen that is permitted at farm basis is calculated taking into account the characteristics of the area and is based on a balance between the foreseeable nitrogen requirement of the crops and the nitrogen supply to the crops from the soil and from fertilization.

The optimal relationship between the nitrogen requirements of the crops and nitrogen supply is set every year on basis of trials. This is done for four different soil types, covering the range of typical soil types in Denmark and for irrigated sandy soil. In addition, the relationship between prices for nitrogen and crops is taken into account, and the economically optimal fertilization rate for the respective crop is calculated. On the basis of the composition and distribution of crops and soil types at farm level as well as the crop-specific nitrogen standards (in total more than 250 different standards), the nitrogen demand for economic optimal production is automatically calculated for each farm.

The nitrogen supply to the crops from the soil is taken into account in several ways. As different amounts of nitrogen residues remain after the harvest of a crop, this is taken into account, when the standard of the following crop is set. Consequently, the individual standards are differentiated with regard to the residual effect of the previous crop, which has to be withdrawn from the crop's standard the following year.

Under the principle of having a balance between the uptake of nitrogen in the plants and the nitrogen supply to the crops, the farm nitrogen quota is adjusted every year, according the actual amount of plant available nitrogen in the soil, called "the nitrogen prognosis". SEGES, The Knowledge Centre for Agriculture and the Danish Pig Research Centre in cooperation with Aarhus University provide the result on whether the adjustment is negative or positive in specific geographical areas in the respective year, due to yearly variations in temperature and extent of rainfalls in the wintertime.

Hence, the overall nitrogen standard quota predominantly depends on the specific crop, but also on the type of soil, the pre-crop, climatic conditions, precipitation and irrigation.

The total use of livestock manure, chemical fertilizers and other fertilizers must not exceed the standard nitrogen quota on farm level. Any surplus application of nitrogen fertilizers compared to the quota is regarded as a violation to the rules.

Controls (see also section 2.3) are performed at farm level, where all parameters of the production are checked.

2.1.3 The revised phosphorus regulation: direct phosphorus ceilings at farm level

As a consequence of the changes in regulation, according to the latest political agreement on Food and Agriculture (section 1.2), a revised regulation addressing phosphorus is introduced in 2017.

So far, the so-called Danish harmony rules have regulated the application of phosphorus (P) in an indirect way: by setting limitations based on the amount of manure-N applied to the field, the use of phosphorus is also limited via the N/P-ratio in the manure. As the N/P-ratio is different for the various livestock types, the level of indirect P limitation has varied correspondingly (see also Table 2.1).

2.1.3.1 General and strict phosphorus ceilings

Introduction of direct P ceilings, at different levels throughout the country, depending on geographical location (and livestock manure type):

- General P ceilings, which cover at least 76 % of the area.
- Stricter ceilings, which cover up to 24 % of the area, covering catchments of P-vulnerable aquatic environment.

The revised phosphorus regulation addresses all types of fertilizers, i.e. all types of organic fertilizers (manure, biogas digestate, degassed plant biomass, sludge from sewage water treatment, etc.) and industrial/mineral fertilizer. Applied phosphorus from the various types of fertilizers will be registered through the fertilizer accounting system like nitrogen has already been registered from the different types of livestock manure in the previous years. The direct P ceilings in the time period 2017-2022 are shown in Table 2.1.

Table 2.1 Indirect P limitation in the previous regulation, based on “harmony rules” and the direct phosphorus ceilings in revised direct P regulation for the years 2017-2022

kg P/ha ¹	”Harmony rules” (2015)	2017-2020 (strict ceilings from 2018)		2020-2022 ²	
		General (76% of area)	Strict (24% of area)	General (76%)	Strict (24%)
Poultry	Up to 55	43	30	35 ²	30
Mink	43	43	30	35 ²	30
Slaughter pigs	34	39	30	35	30
Sows and piglets	Up to 37	35	30	35	30
Cattle	27	30	30	30	30
Derogation farms	36	35	35	35	35
Organic waste	30	30	30	30	30
Industrial fertilizer	No limit	30	30	30	30

¹ Dispensation opportunity for some special production systems, e.g. closed systems like greenhouses.

² The ceilings for mink and poultry will already apply from 2019 (until 2022).

The strict phosphorus ceilings will be introduced in 2018-2020 (technically not feasible before 2018) and will apply to farms with areas located in the catchment areas of large lakes included in the River Basement Management Plans (RBMP).

2.1.3.2 Options to alter phosphorus ceilings based on individual measurements

There is an option to differentiate the explicit terms for the maximum application of phosphorus from manure based on specific measurements. The majority of farms conduct tests every 3 to 5 years to get indications of the soil phosphorus status in the fields (estimated as a phosphorus number¹). If the phosphorus number is lower than 4.0 as an (area-weighted) average on farm-level, the phosphorus ceiling at farm level can be raised in accordance with the step-wise model shown in Table 2.2.

Table 2.2 Options to raise the P ceiling, based on the average P-status at farm level

P-status in soil (P number)	Extra P (kg P/ha)
≥ 4.00	+ 0
3.50 - <4.00	+ 1
3.00 - <3.50	+ 2
2.75 - <3.00	+ 4
2.50 - <2.75	+ 6
2.25 - <2.50	+ 8
2.00 - <2.25	+ 10
1.75 - <2.00	+ 12
< 1.75	+ 14

As seen from Table 2.2 the P ceiling can be raised by up to 14 kg P/ ha. However, there is a maximum limit to the ceiling of 45 kg P/ha. Moreover, the option of raising the P ceilings does not apply to some special soils, e.g. soils with more than 10 % organic matter (ground water influenced soils: JB 11 according to the Danish classification system) and other special soils (the so called “JB 12” according to the Danish classification system) due to an increased risk for P loss from those soil types.

2.1.3.3 Phosphorus regulation from 2022

Table 2.1 shows that specific phosphorus ceilings will be set until 2022. The P ceilings for 2022 and onwards will be determined in connection with the next generation of RBMPs and nature plans. However, it is imperative that the average level of environmental protection will follow the levels shown in Table 2.3.

¹ The phosphorus number is calculated by the so-called Olsen P test. 1 mg P per 100 grams of soil sample corresponds to 1P-number- unit. The recommended level is considered to be a phosphorus number between 2.0 and 4.0; at this level the crops have the amount of phosphorus available needed for optimal growth and at this level the amount of applied manure is equal to the amount removed by the plants.

Table 2.3 Future level of environmental protection

	2018	2019	2020 -2021	2022 -2024	From 2025
Average limit for level of protection (kg P/ha)	34.7	34.5	33.2	32-33	30-31

2.1.3.4 Monitoring and control mechanisms for average national phosphorus fertilization

Phosphorus field balances are monitored as part of the national monitoring programme NOVANA that includes the Agricultural Catchment Monitoring Programme (LOOP). In this programme, the field balances for phosphorus including all types of fertilizers are monitored. Thereby, the trend in the field balances can be observed and evaluated within an appropriate period of time. This evaluation will ensure the necessary basis for a possible decision on revisions of the phosphorus regulation.

Moreover, the average level of environmental protection over time, as presented in Table 2.3, is used as an additional control mechanism:

- On the one hand, the tightening of the average level of protection during the years will secure tightening of the specific phosphorus ceilings for the different livestock types and areas from 2022 and onwards. The average of the ceilings, calculated on basis of the amount of phosphorus in the respective livestock manures, has to be within the range indicated in Table 2.3.
- As the maximum allowed phosphorus fertilization rate does not directly correspond to the actual applied amount of phosphorus, the future level on environmental protection (as given in Table 2.3) will on the other hand also be used as the respective reference threshold value to follow the total amount of phosphorus used in agriculture in Denmark, not only taking farms with livestock manure, but all kinds of phosphorus fertilizers into account. Based on the fertilizer accounting system (see section 2.1.4) , the actual average fertilization rate (in kg P/ha), including all types of phosphorus fertilizer, i.e. including livestock manure, organic waste and industrial fertilizer will be monitored annually after each completed - and hence reported - planning period (lasting from August to July, resp.).

An additional “indicator system” is introduced that will allow for an approximation of the expected actual phosphorus application already during the respective planning period, using data from the Danish agricultural monitoring programme (LOOP) , the national husbandry register (CHR) data from “Statistics Denmark” (concerning sales of phosphorus containing industrial fertilizer). Should either the indicator system or the new monitoring system show that the actual annual average phosphorus fertilization rate on agricultural soils in Denmark might exceed or has actually exceeded the levels given in Table 2.3, the ceilings, including the general ceilings, (given in Table 2.1 for the time period 2017-2021) for maximum phosphorus application will be reduced accordingly.

2.1.4 The Fertilizer Accounting System

Danish farmers, using livestock manure on their holding, may sign up with the Danish Register of Fertilizer Accounts. Signing up is mandatory for a large

proportion of holdings, while it is voluntary for other farmers, depending on their annual monetary turnover and amount of livestock manure at farm level. The Danish AgriFish Agency ensures the mandatory signing-up of farmers to the Fertilizer Accounting System's register through an automatic IT-check based on the Danish Central Business Register (CVR) data of all farms.

Every year, the Danish AgriFish Agency publishes guidelines to the farmers, which include Nitrogen fertilization standards for all individual crops, the standard nitrogen and phosphorus contents in different livestock manure types and the required minimum nitrogen efficiency rate (see chapter 2.1.4.1). On the basis of this compiled information, the maximum allowed total amount of nitrogen and phosphorus that may be used on the farm within the respective cropping season is automatically calculated.

By the end of March each year, farmers are obliged to submit their annual fertilization account containing the following information on the previous cropping season (August-July) to the Danish AgriFish Agency for registration and control:

- Total area and harmony area of the holding
- The automatically calculated nitrogen quota (max. total amount of N to be used for fertilization, see also details below);
- The automatically calculated phosphorus ceiling (max. total amount of P to be used for fertilization, see also details below)
- Use of nitrogen and phosphorus for fertilizer: livestock manure, mineral/inorganic fertilizers as well as other organic fertilizers (e.g. sewage sludge);
- The compulsory utilisation efficiency of nitrogen in livestock manure and other organic fertilizers;
- Storage of livestock manure, mineral fertilizer and other organic fertilizers from one year to the next;
- Information on livestock manure contracts (i.e. written agreements on import/export of manure from/to holding);
- Information on livestock density
- Area with catch crops
- Information about using the derogation from the Nitrates Directive.

2.1.4.1 Accounting for livestock manure in the fertilizer accounting system

The content of nitrogen and phosphorus in livestock manure must be calculated using nationally defined standards. Standards are set for different types of livestock, taking the housing system into account. The residual nitrogen supply from manure application in previous years is also included in the manures efficiency, which has to be accounted for (Table 2.4).

Table 2.4: Efficiency rate of manure for N fertilization, to be accounted for in the Fertilizer Accounting system

Type of manure	Efficiency
Pig slurry	75%
Cattle slurry	70%
Mink slurry	70%
Poultry slurry	70%
Liquid fraction after slurry separation	85%
Deep litter	45%
Solid manure	65%

These efficiency requirements can only be realized, if losses of nitrogen, primarily in form of ammonia are avoided to a large extent during spreading. In this way, these provisions promote the investment in and use of advanced slurry application techniques.

Livestock manure from grazing animals must be regarded as applied with an N efficiency of 45-65%. Furthermore, livestock manure can only be applied in areas where it may and can be applied with machinery.

If fertilizers are applied on areas owned by another farmer, the tenancy must be documented by a written agricultural tenancy agreement.

2.1.4.2 Accounting for chemical and other types of fertilizers in the fertilizer accounting system

The use of chemical fertilizers and other fertilizers (e.g. sewage sludge) must also be accounted for in the Fertilizer Accounting System. Retailing companies, delivering nitrogen and/or phosphorus fertilizers to farms in the register, are obliged to report yearly to the Danish AgriFish Agency about the deliveries (information about farm (VAT numbers), quantity as well as content of N and P, resp.) and this information will automatically be transferred to the respective fertilizer accounts.

2.2 REVISED REGULATION OF LIVESTOCK HOLDINGS AND THE USE OF MANURE

All establishments, expansions or modifications of livestock holdings must give notice or receive a permit complying with the Environmental Approval Act of Livestock Holdings.

The act sets minimum thresholds in order to ensure environmental protection in terms of odour and ammonia emissions from livestock animal housing systems.

The local authorities assess the environmental impact on a local and national scale together with the minimum requirements. If the approval is given, it will be on a set of conditions that ensures no significant deteriorating effect on the surrounding environment.

The Danish parliament has adopted a new and more emission based regulation of livestock holdings when granting permits to installations for animal husbandry to be implemented in 2017. The regulation ensures a simpler and more flexible

regulation designed as a permit based on an environmental assessment of the production area of livestock in the stable. Besides being simpler and easier to enforce and control, this method targets the emissions of ammonia from livestock holdings in a more precise way.

As a prerequisite for this emission-based regulation of permits for installations for animal husbandry the Danish Parliament has adopted a separate regulation of the actual installations for the animal production sites (stables, storage vessels i.e.) and the regulation of the spreading of the livestock manure on arable land. Thus, this revision of regulation implies that the permit for the holding from 2017 does not contain any limitations regarding the spreading of livestock manure, which are regulated through comprehensive, general environmental rules instead.

Since the leaching of nitrate from livestock manure is more pronounced than the nitrate leaching from commercial fertilizers, the revised regulation of the spreading of livestock manure will also include additional requirements to ensure a reduction of nitrate leaching. This regulation consists of individual requirements for establishing catch crops designed for each holding based on information from the fertilizer accounting system instead of individual assessments by the local municipalities like previously.

2.2.1 A general catch crop scheme for holdings, using organic manure

The individual requirement to establish catch crops for holdings using organic manure such as livestock manure is aimed at ensuring the sufficient protection towards nitrogen leaching to sensitive Natura 2000-areas in catchment areas, where the amount of applied organic manure has increased since 2007 and at contributing to the reduction of nitrogen leaching to coastal water bodies, where a reduction of nitrate leaching is necessary in order to obtain the environmental objective according to the RBMP's.

It is the aim of this catch crop scheme to ensure a level of environmental protection that corresponds to the level of protection ensured by the present system for livestock permits at a national level.

This catch crop scheme will be introduced from August 2017. It is expected that the area covered by the catch crop scheme for holdings using livestock manure will cover approximately 34.000 hectares by the time the scheme is fully implemented.

These catch crops are mandatory and are not compensated. The requirement may be fulfilled by using alternative measures such as establishing energy crops, early establishment of winter crops etc., cf. the Order on plant cover and cultivation-related measures.

This catch crop scheme is included in the Nitrates Action Programme and is therefore also described in section 3.2.1.

2.3 CONTROL SYSTEM AND INSPECTIONS

Compliance with the numerous agricultural rules is checked systematically. The majority of holdings are controlled on the basis of the information reported in

their Fertilizer Accounts (Section 2.3.1). Smaller farms are inspected based on a different scheme (Section 2.3.2). Moreover slurry tanks have to be inspected on a regular basis (Section 2.3.3).

2.3.1 Controls of farms, registered in the Fertilizing Accounting system

The vast majority (approx. 90%) of all Danish farmers must submit data to the Fertilizer Accounting system each year, which is administrated by the Danish AgriFish Agency. All submitted fertilizer accounts are automatically checked at submission by the IT-system, according to a set of previously defined risk criteria.

Besides this fully automatic administrative control, holdings are controlled administratively. Holdings to be subjected to administrative control of the information reported in the Fertilizer Accounting System are chosen based on an annually defined set of crucial criteria. Approximately 2.5 % of all holdings are checked in this way each year (data for cropping season 2012/13).

Besides the administrative control, administrative staff of the Danish AgriFish Agency also inspects farms. These on-site inspections cover control of crop rotation planning, including plant cover and catch crops, integrated fertilizer accounting and planning, but also the provisions regarding application of the amount of livestock manure – and hence the nutrients N and P - to land each year (“harmony rules”). These on-spot inspections regarding fertilizer accounts support the control carried out on basis of the annually submitted data in the fertilizer accounting system. Approx. 1.9 % (data from 2014) of all agricultural holdings are inspected annually.

2.3.2 Control of nitrate regulation on smaller farms

Most of the farms, which are not registered in the Fertilizer Accounting System are small and have insignificant nitrates emissions. They farm only approx. 3.9% of the whole agricultural area (2013) with an average size per holding of 9.3 ha. In comparison, the holdings registered in the fertilizing accounting had an average farm area of 62.9 ha per holding, covering 96.1 % of the agricultural area.

The non-registered farms are obliged to pay a tax on purchase of mineral and processed organic fertilizers of DKK 5.00 (= approx. 0.67 €) per kg N. This puts a significant restriction on their use of fertilizer. The farms must also meet the same livestock density requirements as other holdings (“harmony rules”). The Danish Order on commercial livestock, livestock manure, silage, etc. regulates all livestock holdings above the size of 3 livestock units (LU), independent of their size. This order regulates all relevant environmental issues concerning storage of manure, storage of silage, drains etc. and other types of manure and fertilizer. From August 2017 the livestock holdings regulated by the order has been updated and specified.

The councils of the Danish municipalities are the supervisory authority for environmental inspections on all agricultural farms. The municipalities must inspect all livestock farms of more than 3 LU regularly (every 3-6 years). The frequency of inspections is not only determined by the size of the farm, but by a systematic appraisal of the environmental risks as well.

Changes in the control system are under consideration from August 2017. For example all the livestock farms that have been subject to regular inspection cf. the Danish Order on environmental inspection will continue to be so until they make changes, expansions or modifications that require a permit complying with the Environmental Approval Act of Livestock Holdings. The livestock holding with a permit cf. the Environmental Approval Act of Livestock Holdings will also be subject to regular inspection.

The regular inspection of the farms with livestock holdings will focus on the installations on the farms. Supervision of compliance with the rules regarding the farm's associated areas in the Danish Order on commercial livestock, livestock manure, silage etc., will be carried out with reactive supervision.

2.3.3 National scheme for slurry tank inspections

Danish farmers are obliged to ensure an inspection of their slurry tanks (with a capacity above 100m³) at least every 10 years by an authorized inspector. The demand applies to all open and closed tanks for storage of liquid animal manure and silage fluid. The inspection is obligatory every 5 years, if the slurry tank is located within less than 100 meters from an open water course or lake (above 100m²). The purpose of the inspection is to evaluate the risk for leakage of slurry/liquid from the tank.

The inspections must be carried out by authorized inspectors. They have special training and are officially authorized. They must be able to carry out both inspection and maintenance of the slurry tanks. About 40 active authorized inspectors carry out about 2,300 slurry tank inspections annually. The inspections reports are sent to the local municipality and to a central inspection secretariat that carry out quality control of the reports and random quality checking of the inspections.

2.4 OTHER RELEVANT MEASURES IN THE RIVER BASIN MANAGEMENT PLANS, GREENING ETC.

Below, further measures that lie beyond the obligations of the Nitrates Directive, but of which many are supplementary measures in the context of the Water Framework Directive (WFD) Article 11 (4), are listed, as well as further measures. They are designed and implemented in addition to the basic measures according WFD Article 11 (3), e.g. the Nitrate Directive, with the aim of achieving the objectives established pursuant to WFD Article 4.

The package of the political agreement on Food and Agricultural (see chapter 1.2) includes an agreement on new measures in the coming River Basin Management Plans to reduce the load of Nitrogen on Danish coastal waters in order to make it possible to achieve good ecological status in the coastal waters. See Table 2.5 for a list of these measures and their estimated effects in 2021.

Table 2.5 New measures to reduce the load of Nitrogen to Danish coastal waters and their estimated reducing effect for N loss to coastal waters by 2021

Measures	N reduction (tons N/a)
Establishment of wetlands	1,253
Establishment of mini-wetlands	900
Afforestation (new forests)	150
Set-aside of farmland on organogenic soils in river valleys	150
Improved Wastewater treatment	44
Acquisition of fishfarms	84
Limitation on use of Ecological Focus Area (EFA) as alternatives to area with mandatory catch crops plus effect from replacing EFA buffer strips with other EFA elements after annulment of regulation on statutory buffer strips. (the EFA area can be established by buffer strips, catch crops, fallow land, coppice and GAEC landscape elements*)	867
A targeted regulation of nitrogen leaching at farm level	3,513
Total N reduction effect of new measures in 2021	6,961

* not an element of the RBMP, but the Danish implementation of EFA in the CAP.

It is estimated that the measures and baseline effects all together will reduce the Danish land based load on Danish coastal water from approx. 57,000 tons Nitrogen/year to approx. 49,500 tons Nitrogen.

2.4.1 Wetlands

Constructed wetlands are well-established measures in Denmark, and therefore substantial knowledge about the possibilities and efficiency of the wetland projects exist.

2.4.2 Constructed mini-wetlands

It is expected that about 1,000 mini-wetlands is established in 2021 with an assumed average effect of about 900 kg N per year per installation. Mini-wetlands are generally expected to reduce the N transport by up to 25 percent in connected drains from the fields, when preconditions as to the size of the catchment area, drainage discharge of N (volume and concentration) and type of soil etc. are met.

The efficiency of the measure depends on the correct location of the mini-wetlands. In order to obtain the full N-effect, mini-wetlands have to be located in areas with a mean drainage discharge of about 35-40 kg N per hectare per year, draining on average app. 100 hectares of catchment area.

2.4.3 Set aside of farmland

The effect is achieved by changing the use of farmland from intensified use with high use of fertilizers to extensive use with limited or no use of fertilizers.

2.4.4 Afforestation

It is expected that about 1,000 hectares of new forest per year is established with a reduction average of about 30 kg N per year per hectare is expected. Afforestation

is a well-established measure in Denmark, and therefore substantial knowledge about the possibilities and efficiency of the projects exist.

2.4.5 Acquisition of fish farms

In Denmark, each fish farm has a quota to produce fish, based on a quota for the use of feed. These feed quotas can be bought and result in a reduced load of Nitrogen from the bought fish farms.

2.4.6 Future targeted regulation

From 2019, the farmer's use of nitrates leaching will be restricted based on the sensitivity of the coastal waters and the farmlands ability to retain or transform Nitrogen. The restriction will be imposed pursuant to the Water Framework Directive (for more details see section 1.2.2).

2.4.7 Limiting the use of Ecological Focus Areas as alternative to the requirement for the general obligatory catch crops

As a condition for receiving the green payment under the Common Agricultural Policy (CAP) direct payments, farmers must comply with three greening requirements, including the requirement of ecological focus areas (EFA). To increase the environmental effect of the EFA-areas, the option to fulfil the national general requirement of catch crops with EFA-areas has been changed.

According to Danish legislation, the EFA areas can be established by buffer strips, catch crops, fallow land, coppice and landscape elements. Furthermore, farmers are also required to establish mandatory catch crops as a result of other national legislation.

According to the national Fertilizer Act, farmers are given the flexibility to replace mandatory catch crops with alternative measures such as fallow land, coppice and buffer strips. These elements may also be included in the EFA. In order to increase the nitrogen-reducing effect of the EFA greening requirement, the flexibility of choosing the EFA-fallow land, EFA-coppice and EFA-buffer strips as alternatives to mandatory catch crops was removed in 2016. By not allowing farmers this flexibility, an increased effect in terms of reduction of nitrogen loss is obtained.

2.4.8 Intermediate targeted catch crop scheme

As part of the political agreement on the Food and Agricultural Package of December 2015, the Danish government has introduced an intermediate N-reduction initiative to promote the sowing of additional catch crops. The scheme is designed as a de minimis aid scheme for voluntary establishment of additional catch crops. In order to ascertain the achievement of the N-reduction targets in 2017 and 2018, the Ministry of Environment and Food will impose an additional obligatory N-reduction requirement on farmers, in case the voluntary scheme does not reach its targets for 2017 and 2018.

The two parts of this scheme are presented in the following.

2.4.8.1 Voluntary part

The Danish government has launched a de minimis aid scheme for voluntary establishment of additional voluntary catch crops in 2017-2018 in order ensure the

necessary reduction of nitrogen loss. The scheme targets areas with a specific need for reduction of nitrogen leaching to the aquatic environment.

The voluntary catch crops must be additional to the national mandatory requirement for catch crops on 10 or 14% of the farms crop base area, and they may not be established on the same area used for catch crops to meet the EFA-requirement under direct payments. The farmer's costs from laying out the voluntary catch crops are compensated through national de minimis aid. The scheme has been designed to ensure the necessary reduction of nitrogen loss to coastal waters and groundwater. The need for compensatory measures for groundwater is determined for specific geographical areas in order to avoid groundwater deterioration. Sufficient financial means have been allocated for the catch crop scheme and additional funds could be allocated, if needed.

Before the entrance to the years 2017 and 2018, the ministry calculates the need for a further nitrates effort for the year in question, which is translated into a corresponding need for additional catch crops in the individual water catchment areas, in numbers of hectares and as a percentage of crop base area. The calculation will be based on estimates for the need for reduced nitrates contents in groundwater bodies and coastal waters, adjusted with an estimate of the soil nitrates retention in the water catchment area concerned.

If the calls for voluntary agreements in 2017 and 2018 do not produce the sufficient number of hectares with additional catch crops, the ministry will impose mandatory requirements for additional catch crops in order to reach the N-reducing reduction targets set for the scheme in these years. The Ministry can choose to postpone a portion of the necessary catch crops in 2017 to 2018 (no more than 10 % of the total need) (see section 2.4.8.2).

2.4.8.2 Obligatory part

In water catchment areas, where insufficient uptake by farmers for the voluntary catch crop scheme is identified, farmers will be met with a mandatory requirement for catch crops the same year, or alternatively a reduced fertilizer norm the same year, ensuring the achievement of the target effect.

When the deadline for application in the voluntary crop scheme expires April 21, 2017 and 2018, the ministry calculates whether there is a need for a further requirement for obligatory catch crops in each water catchment area in the year in question.

If only a small further obligatory requirement is needed following the voluntary scheme, the ministry may decide to meet the residual need through e.g. a general correction of the nitrogen norms or other sufficient measures as alternative to introducing an additional obligatory catch crop requirement.

With this regulatory backdrop for the voluntary catch crop scheme, it is ensured that the targets of the measure will be reached for all catchment areas and ground water bodies with a reduction need, regardless of the amount of calls for voluntary agreements.

2.4.8.3 Norm reduction in case farmers do not meet their obligations for voluntary and obligatory catch crops

After the deadline for application in the voluntary crop scheme, April 21, the ministry calculates and announces the obligatory catch crop requirement as a percentage of the crop base area for each farm in the catchment area, designated at the detailed geographical level of "ID15", i.e. at the level of water catchments with an average area of approx. 15 km².

After that, the farmer is bound by the commitment for voluntary catch crops as well as the possible additional obligatory requirement for supplementary catch crops.

If the farmer opts-out of the voluntary or obligatory requirement, or noncompliance is detected during control, the fertilizer norm for the farm in question is reduced correspondingly to the breach of voluntary or obligatory requirement according to a conversion factor between the nitrogen reduction effect of catch crops and fertilizer norm reduction for the planning period. This norm reduction will contribute to meeting the objective of the Nitrates directive. Furthermore, if the farm fertilizes in excess of the reduced fertilizer norm, the farm will be in breach with the Fertilizer Act, see section 3.3.

2.4.9 Link between collective N-measures under the RDP and the new targeted regulation

In connection with the agreement on the Danish Agricultural Package of December 2015, extra funds have been allocated to collective N-reducing measures under the Danish Rural Development Programme (RDP) (wetlands, mini-wetlands, afforestation, cf. Table 2.5). The nitrogen-effect of these collective measures is well-documented by Aarhus University.

On top of these measures, a residual need for nitrogen reduction will be addressed by targeted regulation cf. section 1.2.2.

In order to obtain an overview of the total expected effects of the nitrogen-measures, the consolidated effects of each nitrogen-reducing RDP-scheme will be calculated when the application calls are completed. This is already a standard operating procedure.

3 THE DANISH NITRATES ACTION PROGRAMME

This Danish Nitrates Action Programme constitutes of:

- Regulatory elements from The Danish Nitrates Action Programme 2008-2015, which was prolonged on December 21, 2015, supplemented by the following measures:
- Removing the reduction of the nitrogen application standards,
- Introducing a general catch crop scheme for holdings, using organic manure such as livestock manure and changing the limit from 140 kg N to 170 kg N per hectare per planning period of manure and other organic fertilizer to be applied for certain agricultural holdings, and
- Introducing targeted catch crop scheme – norm reduction in cases of non-compliance.

In this chapter, the Danish Nitrates Action Programme is summarised. In contrast, other sections in this document depict features of the broader Danish framework for nitrates regulation. The programme is supplemented with regulation addressed for the authorities administration, rather than a regulation addressed directly for the farmer. The regulation in order no. 1324 of 15 November 2016 § 6 (demands on distances) is an example of such a regulation. Also the programme is supplemented with a new direct regulation of phosphor. The new regulation of phosphor is not a part of the Nitrates Action Programme.

In general, Denmark will ensure a sufficient Nitrates Action Programme, covering all relevant elements, required by the Nitrates Directive. The Nitrates Action Programme has an emphasis on efficient measures and high standards for registration of information, control and monitoring systems.

3.1 MINOR TECHNICAL ADJUSTMENTS IN THE REVISED PROGRAMME

A number of supplementary obligatory measures have been added to the 2008 – 2015 programme (Table 3.1). They consist of a number of technical adjustments in the Order on commercial livestock, livestock manure, silage etc.

These technical adjustments constitute of measures to ensure correct regulation. The most recent adjustments (2016) consist of the following:

- Land application of sedimentary materials that build up in slurry tanks
- Closing periods for solid manure as a consequence of revised prohibition of soil tillage
- Housing systems for fur production, equivalent to the regulation of other animal housing systems
- Uniformity in spreading of all kinds of manure, digestate and fertilizer

Alarm systems on liquid livestock manure storage containers and the establishments of barriers surrounding liquid manure storage containers are no longer part of the programme, but the obligations are still part of the national regulation.

The adjustments are considered to be minor and within the framework of the programme 2008-2015.

3.2 NEW MAJOR MANDATORY MEASURES, INCLUDED IN THE REVISED PROGRAMME

Apart from a number of minor technical adjustments (see section 3.1), further mandatory measures of significantly larger impact will be added to the revised programme from August 2017, as described below.

3.2.1 A general catch crop scheme for holdings, using livestock manure

In connection with the future emission-based approval system for livestock holdings that will come into force August 2017, the previous conditions on manure application will be transferred from individual approvals to general regulation. The individual requirement for holdings using organic manure such as livestock manure to establish catch crops is aimed at ensuring the sufficient protection with regards to nitrogen leaching to sensitive Natura 2000-areas in catchment areas, where the amount of applied organic manure has increased since 2007 and at contributing to the reduction of nitrogen leaching to coastal water bodies, where a reduction of nitrate leaching is necessary in order to obtain the environmental objective according to the RBMP's.

The conditions concerning nitrogen regulation of manure application are included in the Nitrates Action Programme as mandatory measures.

3.2.2 Targeted catch crop scheme – norm reduction in cases of non-compliance

As part of the political agreement on the Food and Agricultural Package of December 2015, the reduction of the nitrogen application standards has been removed and Danish government has introduced an intermediate initiative to reduce N-losses through promoting the establishment of additional catch crops in 2017 and 2018 (see also 2.4.8 for more details). The scheme consists of a voluntary part and a mandatory requirement for catch crops, in case the voluntary scheme does not reach its targets

After the deadline for application in the voluntary crop scheme, the farmer is bound by the commitment for the voluntary catch crops as well as the obligatory requirement for additional catch crops and will no longer be able to opt-out of any of these requirements without consequences.

If the farmer opts-out afterwards, or non-compliance is detected during control, the fertilizer norm for the farm is reduced corresponding to the non-compliance with the voluntary and/or obligatory requirement and according to a conversion factor between the nitrogen reduction effect of catch crops and the fertilizer norm reduction for the planning period. This norm reduction will contribute to meeting the objectives of the Nitrates directive. Furthermore, if the farmer fertilizes in excess of the reduced fertilizer norm, he will be in breach with the Fertilizer Act and will be sanctioned accordingly cf. Annex III point 1.3 of the Nitrates Directive.

This is similar to current practice for the general catch crop requirements and additional catch crop requirements for holdings using organic manure.

3.2.3 Regulation with respect to other nutrient-containing products

It is currently being evaluated, whether the regulation of application of other nutrient-containing products, such as e.g. waste, to agricultural land should be included in the general regulation of fertilizer use.

3.3 OVERVIEW ON THE DANISH NITRATES ACTION PROGRAMME

The Danish Nitrates Action Programme constitutes of the measures described in Table 3.1. The reference in the table is to the actual regulation spring 2017. During time, the regulation may be adjusted.

Table 3.1 Overview of the Danish Nitrates Action Programme

Nitrates Directive	Measures	
91/676/EEC	Order on commercial livestock, livestock manure², silage, etc. (Act on environmental approval etc. of livestock holdings/Act on environment/Act on Farms use of fertilizer and plant cover)	Order on plant cover and cultivation Order on the agricultural use of fertilizer Act on Water extraction (Act on agricultural use of fertilizer and plant cover)
Annex II, A, 1) Periods when the land application of certain types of fertilizer is inappropriate	<p>Period, when liquid livestock manure, degassed plant biomass, or slurry tank sediments shall not be applied – with exemptions.</p> <p>Period, when solid manure shall only be applied to the soil on areas subsequently to be cultivated during winter.</p> <p>Period where solid manure, silage effluent, mineral N fertilizer shall not be applied to the soil.</p> <p>Period where liquid livestock manure shall not be applied to perennial crops that are not harvested annually.</p> <p>Period where silage effluent shall not be applied to the soil, unless it is applied to vegetated areas or areas, subsequently to be cultivated during winter.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock, livestock manure, silage, etc., § 29.</p>	

² In the “Order on commercial livestock, livestock manure, silage, etc.” the definition of livestock manure also includes digestate (e.g. anaerobically treated slurry) amongst other organic fractions.

Nitrates Directive	Measures	
<p>Annex II, A, 2) The land application of fertilizer to steeply sloping ground</p>	<p>Livestock manure, degassed plant biomass, and mineral fertilizer may not be applied on sloping areas within a certain distance to surface waters (open water courses, lakes larger than 100m² or coastal waters) – with exemptions.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock, livestock manure, silage, etc., § 30.</p>	
<p>Annex II, A, 3) The land application of fertilizer to water-saturated, flooded, frozen or snow-covered ground</p>	<p>It is not permitted to apply livestock manure, degassed plant biomass, silage effluent, residue water and mineral fertilizer to soil that is water-saturated, flooded, frozen or snow-covered.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock, livestock manure, silage, etc., § 30.</p>	
<p>Annex II, A, 4) The conditions for land application of fertilizer near water courses</p>	<p>Livestock manure, degassed plant biomass, silage effluent, residue water and mineral fertilizer may not be applied in a way and to such areas that could risk surface loss to water courses (including drains), lakes larger than 100m² or coastal waters.</p> <p>Livestock manure, degassed plant biomass, silage effluent, residue water and mineral fertilizer must not be applied on areas regulated in the act on water courses.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock, livestock manure, silage, etc., § 30.</p>	
<p>Annex II, A, 5) The capacity and construction of storage vessels for livestock manures</p>	<p>Requirements for the design of stables, stalls and other facilities for animals to insure that groundwater and surface water is not polluted, incl. requirements for the respective floor material being long-lasting and impermeable for moisture as well as resistant to the impact of livestock animals or tools and devices, used in the area. An appropriate drainage system for collection of liquid livestock manure and residue water shall be established.</p> <p>With regards to livestock manure:</p>	

Nitrates Directive	Measures
	<p>Requirements to the capacity of storage facilities for livestock manure and degassed plant biomass, securing availability of storage tanks of a certain share of livestock manure production and required efficiency of the fertilizer effect. Adequate storage capacity may be met by contractual storage on other property or delivery to the biogas plant, manure treatment plant or manure storage facility.</p> <p>Other liquids like washing water, residue water or silage effluent need to be taken into consideration, when determining needed storage capacity.</p> <p>Periods, where livestock animals are free ranging, may be taken into account when determining needed storage capacity.</p> <p>Requirements for storage of solid fertilizer or slurry tank sediments in solid, closed systems with water collection or in special cases (e.g. compost) in heaps in the field, if risk for contamination of water courses (including drains), lakes larger than 100m² or coastal waters can be excluded.</p> <p>Requirements to the establishing silage sites and requirements to placing, storage of unopened and opened wrap bales.</p> <p>Requirements for the material used for construction of storage containers for liquid livestock manure, silage effluent, degassed plant biomass and residue water, being long-lasting and impermeable for moisture as well as resistant to the impact of covering, stirring, emptying, etc. of the tank.</p> <p>Requirements for the drainage and effluent collection system to be tight and resistant to pumping pressure, etc.</p> <p>Requirements to the frequency of emptying and maintaining of the facilities for storage of livestock manure, degassed plant biomass, silage effluent and residue water.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock,</p>

Nitrates Directive	Measures	
	livestock manure, silage, etc., § 8, with regards to livestock manure: § 9, § 11, § 12, § 13, § 14, § 15, § 16, § 18, § 22, § 23, § 24, § 25, § 26 and § 37.	
Annex II, A, 6) Procedures for the land application	<p>Application of liquid manure and degassed plant biomass may only be carried out by means of trailing hoses, trailing foot/shoe applicators or by injection.</p> <p>Application of livestock manure, degassed plant biomass and mineral fertilizers must be carried out using a technique that ensures uniformity of spreading.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock, livestock manure, silage, etc., § 28 and § 30.</p>	
Annex II, B, 7) Land use management		<p>Land use management through the fertilizer accounting system.</p> <p>Ref. consolidated Act no 388 of 27/04-2016 on agricultural use of fertilizer and plant cover § 22 (1), § 23 (3), order no. 1055 of 10/07-2016 on agricultural use of fertilizer, § 11 (1).</p>
Annex II, B, 8) The maintenance of a minimum quantity of vegetation cover	<p>From August 2017: Individual additional requirement for certain holdings using organic manure to establish catch crops aimed at ensuring the sufficient reduction in nitrogen leaching.</p>	<p>General requirement for approx. 240,000 ha mandatory catch crops on farms nationwide.</p> <p>Farms with a certain annual turnover from crops or livestock or combinations thereof and a total area of 10 hectares or more, shall establish a minimum amount of catch crops.</p> <p>Ref. order no. 1056 of 01/07-2016 on plant cover and cultivation § 2 (1-2).</p> <p>If farmers do not comply with the requirement, the Fertilizer quota for the farm is reduced correspondingly. This reduction will be taken into account when assessing, if the farm has fertilized in excess of the Fertilizer quota. If farmers do fertilize in excess of the Fertilizer quota, they will be in breach with the Fertilizer Act and sanctioned accordingly.</p>

Nitrates Directive	Measures	
<p>Annex II, B, 9) The establishment of fertilizer plans on a farm-by-farm basis and the keeping of records on fertilizer use</p>		<p>Obligation to prepare fertilizer accounts in the fertilizer accounting system.</p> <p>Ref. consolidated Act no 388 of 27/04-2016 on agricultural use of fertilizer and plant cover § 22 (1), § 23 (3), § 11 (4). Order order no. 1055 of 10/07-2016 on agricultural use of fertilizer, § 11 (1), § 15 (5).</p> <p>Farms registered in the Fertilizer Accounting system are obliged to prepare and submit a fertilizer account every year. Farms are obliged to register, if they have a certain annual turnover from crops or livestock or combinations thereof, and more than 10 livestock units, a stocking density above 1.0 LU per ha or receive more than 25 tonnes of livestock manure or other organic fertilizer during the planning period. Other farms can register to avoid a tax on the use of nitrogen in chemical fertilizers. From August 2017 the LU requirements are defined as a limitation in kg N per hectare.</p> <p>The fertilizer account contains key figures on the use of nitrogen.</p>
<p>Annex II, B, 10) The prevention of water pollution from run-off and the downward water movement beyond the reach of crop roots in irrigation systems</p>		<p>Farmers need permission for water intake for irrigation. Permissions are issued for a limited period.</p> <p>Ref.: Consolidated Act no 125 of 26/01/2017 on Water extraction § 22.</p>
<p>Annex III, 1.1 Periods when the land application of certain types of fertilizer is prohibited</p>	<p>See also Annex II, A, 1).</p> <p>Requirements to the capacity of storage facilities for degassed plant biomass. Adequate storage capacity may be met by storage on other property or delivery to the biogas plant, manure treatment plant or manure storage facility.</p> <p>Further requirements for the storage of degassed plant biomass.</p> <p>Requirements to the capacity of storage facilities for silage</p>	

Nitrates Directive	Measures	
	<p>effluent and residue water.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock, livestock manure, silage, etc., § 9.</p>	
<p>Annex III, 1.2 Capacity and construction of livestock manure storage vessels</p>	<p>With regard to livestock manure, see Annex II, A, 5) and including taking into account residue water and silage effluent.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock, livestock manure, silage, etc., § 9.</p>	
<p>Annex III, 1.3</p> <p>Limitations of the land application of fertilisers, consistent with good agricultural practice and taking into account the characteristics of the vulnerable zone concerned in particular: soil conditions, soil type and slope;</p> <p>Climatic conditions, rainfall and irrigation;</p> <p>Land use and agricultural practices, including crop rotation systems</p> <p>Fertilizer use must be based on balanced fertilization.</p>	<p>See also Annex II, A, 2).</p> <p>Requirements to the capacity of storage facilities for degassed plant biomass, silage effluent and residue water.</p> <p>Requirements to the application: The nutrients in livestock manure, degassed plant biomass, silage effluent and residue water may only be applied to crops with a nitrogen standard or a normative standard for phosphorus and potassium.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock, livestock manure, silage, etc., § 9, and § 27.</p>	<p>In each planning period, farms subject to registration in the Fertilizer Register pursuant to the Act on agricultural use of fertilizer and plant cover must not apply more nitrogen for fertilizer purposes than the Fertilizer quota calculated for the farm. The farm nitrogen quota and the content of nitrogen in livestock manure shall be calculated in accordance with stipulated standards. If farmers fertilize in excess of the Fertilizer quota, they will be in breach with the Act.</p> <p>If farmers do not comply with general or targeted catch crop requirements, the Fertilizer quota for the farm is reduced correspondingly. The norm reduction will be taken into account when assessing, if the farm has fertilized in excess of the quota.</p> <p>Ref. consolidated Act no 388 of 27/04-2016 on agricultural use of fertilizer and plant cover, § 5.</p>
<p>Annex III, 2,</p> <p>The amount of livestock manure applied to the land each year, including by the animals</p>	<p>With regard to livestock manure: The nutrients in livestock manure, degassed plant biomass, silage effluent and residue water may only be applied to crops with a nitrogen standard or a normative standard for phosphorus and potassium.</p>	

Nitrates Directive	Measures	
<p>themselves shall not exceed an amount containing 170 kg N</p> <p>Member States may calculate the amounts referred to on the basis of animal numbers.</p>	<p>With regard to livestock manure: A maximum of 170 kg N per hectare per planning period of manure and other organic fertilizer may be applied on agricultural holdings (with exemptions for holdings, making use of the conditions in the derogation).</p> <p>The operator of an agricultural holding must be able to document availability of sufficiently large spreading area. If an agricultural holding has greater quantities of manure available, including manure received from other farms, than what can be applied to its respective spreading area, written agreements shall ensure that excess manure is disposed of by specified solutions.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock, livestock manure, silage, etc., § 27, § 31, § 33 and § 34.</p>	
<p>Additional measures according to Article 5, paragraph 5</p>	<p>With regard to lakes and coastal waters: Restrictions of application of fertilizer. See also Annex II, A, 2) and Annex II, A, 4).</p> <p>With regard to degassed plant biomass: restrictions to storage. With regard to residue water: requirement to drains from stables. See also Annex II, A, 5).</p> <p>With regard to degassed plant biomass: Requirements to containers and means of application. See also Annex II, A, 5).</p> <p>Until August 2017: The total quantity of livestock manure and degassed plant biomass applied on an agricultural holding shall not exceed an amount corresponding to 1.4 livestock units per hectare per planning period. Manure produced on agricultural holdings with cattle, sheep, or goats may be applied in quantities corresponding to 1.7 livestock units per hectare per planning period.</p> <p>With regard to degassed plant biomass: A maximum of 170 kg</p>	

Nitrates Directive	Measures
	<p>N per hectare per planning period of manure and other organic fertilizer may be applied on agricultural holdings.</p> <p>Ref. Order no. 1324 of 15/11-2016 on commercial livestock, livestock manure, silage, etc., § 31, § 30, § 11, § 12, § 18, (§ 31, § 18) and § 23.</p>

3.4 OVERVIEW OF IMPLEMENTING ACTS AND ORDERS IN DANISH LEGISLATION

Denmark has implemented the Nitrates Directive mainly via parts of a number of orders and acts. In the following current acts and orders (1-8), the Danish implementation, which applies to the whole territory, of both the code of good agricultural practice and the measures to be included in the action programme can be found:

1. Act on Environmental protection no.1189 (27/09/16) as amended (until August 2017)
2. Consolidated Act on environmental approval etc. of commercial livestock/ Act on commercial livestock and use of fertilizer etc. no. 442 (13/05/2016) and no. 256 (21/03/2017) as amended
3. Order on commercial livestock, livestock manure, silage, etc. no. 1324 (15/11/16) as amended
4. Consolidated Act on agricultural use of fertilizer an plant cover no. 388 (27/04/16) and no. 433 (03/05/2017) as amended
5. Order on agricultural use of fertilizer in the planning period 2016/2017 no. 1055 (01/07/16) as amended
6. Order on plant cover and cultivation-related measures no. 1056 (01/07/16) and subsequent changes as amended
7. Consolidated Act on Water extraction no 125 (26/01/2017)
8. Order on monitoring the status of surface water, ground water and [...] no. 1001 (29/06/2016)

The consolidated Act on charge of nitrogen contents in fertilizers has a supplementary effect to the legislation 1 –8:

9. Consolidated Act on charge of nitrogen contents in fertilizers no 1357 of 18. November 2016

As indicated above, it is not the complete acts and orders, but only parts of them, i.e. a number of specific paragraphs, which implement or contribute to implement the Nitrates Directive.