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At the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV)

SRU German Advisory Council on the Environment

Opinion

Amendment of the Fertiliser Application Ordinance (DüV):

Limiting Nutrient Surpluses Effectively

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Amendment of the Fertiliser Application Ordinance (DüV): Limiting Nutrient Surpluses Effectively

Opinion of the Scientific Advisory Board on Agricultural Policy and of the Scientific Advisory Board on Fertiliser Issues respectively, at the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV), as well as the German Advisory Council on the Environment, regarding the amendment of the Fertiliser Application Ordinance (DüV)

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Summary

Despite notable progress over the last twenty years, the agricultural sector in Germany has not succeeded in realising certain environmental key targets. For example, the target of reducing maximum national nitrogen surplus at + 80 kg N/ha/year is still far from being achieved. Consequently, not only the quality of surface water and ground water is suffering from current nitrogen surpluses, but also targets regarding biological diversity are negatively affected. The Fertiliser Application Ordinance (DüV) is the central instrument for ensuring best practice in fertiliser use and a reduction in nutrient surpluses originating from agriculture. Likewise, the Fertiliser Application Ordinance is the central instrument of Germany's action programme for fulfilling the requirements of the EU Nitrates Directive. The action programme has to be evaluated every four years and, where necessary, updated. The German Fertiliser Application Ordinance was evaluated in 2012 by a Federal Government-Laender Working Group, which concluded emphatically, that additional measures have to be implemented in order to attain the targets. The EU has also clearly highlighted a need for changes. Against this background, and also in view of the far-reaching instances of failure to achieve various national and EU environmental goals, this opinion is being issued by the Scientific Advisory Board on Agricultural Policy and the Scientific Advisory Board on Fertiliser Issues (both based at Germany's Federal Ministry of Food, Agriculture and Consumer Protection - BMELV), and the German Advisory Council on the Environment. These three consultative committees endorse the proposals made by the Federal Government-Laender Working Group as an important step in the right direction. In various areas, the two Scientific Advisory Boards and the German Advisory Council on the Environment consider more far-reaching measures to be necessary. The central recommendations are as follows:

1. An **amendment of the Fertiliser Act** (Düngegesetz), to establish best practice in direct fertilisation activity, matching the needs of plants and soils in such a way, that adverse effects to the natural environment are avoided to the greatest possible extent. In addition, a legislative basis should be established, allowing to record all relevant nutrient flows (e.g. also digestates from biogas plants and feedstuff) passing the farm gate in a farm-gate balance.

2. While farm-gate balances should become obligatory in the medium-term, in the short term improvements regarding the reliability of currently applied **nutrient comparisons** should be made. The recommendations by the Federal Government-Laender Working Group represent substantial improvements compared to the current situation: firstly, the recommendations regarding an area-related nutrient balance subjected to a plausibility check, secondly, the proposal to raise the minimum quantity that is booked when

calculating nitrogen excretions; and thirdly, the proposal to reduce "unavoidable" nitrogen surpluses. Over the medium-term, however, it must become an obligatory requirement to conduct a farm-gate balance in order to monitor the environmental compatibility of nitrogen and phosphorus management. The legislative and the technical-administrative prerequisites need to be established to pursue this aim.

3. Measures regarding a better management of organic fertilisers aimed at preventing nutrient losses. This includes: extension of the **prohibition periods** for applying organic fertilisers on arable land; extending **minimum capacity of storage vessels** for livestock manures and digestates, and tightening-up technical requirements (e.g. trail hose or soil injection instead of splash plates) for **field application** procedures for fertilisers. This would reduce the losses, not only of nitrogen, but also of phosphorus. In the near future, stronger restrictions should be imposed on the application of **phosphorus fertilisers** for those soils, which are rich in phosphorus, ensuring a well-balanced phosphorus budget, while the phosphorus balance should be negative for those soils in the medium-term (starting from 2020). In the case of optimally-supplied soils, the aim must be to achieve balanced phosphorus budgets by 2020.
4. Better checks on compliance with the Fertiliser Application Ordinance, **more severe sanctions** in case of contravention, and a **more stringent implementation** of rules governing the use of fertiliser.

In order to make it easier and quicker to adapt to the amended regulation of fertiliser use, the two Scientific Advisory Boards and the German Advisory Council on the Environment recommend to include corresponding investments at Federal level into the agricultural investment support programme of the Joint Task for the Improvement of Agricultural Structures and Coastal Protection (abbreviation: GAK), and into the rural development programmes at the level of the individual Laender. In order to meet these challenges (and others), Germany should make full use of the option, within the context of the Common Agricultural Policy reform, of transferring resources from the first to the second pillar of the CAP. The Scientific Boards view the implementation of the measures proposed as a great chance to make a substantial contribution to accomplish the agriculture-related environmental goals that the Federal Government has set.

1. Factors prompting action

The "Ordinance on the application of fertilisers, soil ameliorants, growing media and plant aids, according to the principles of best practice in the process of using fertiliser" (Fertiliser Application Ordinance – "DüV"), governs the rules for best practice in the application of fertilisers on agricultural production areas, and also for the reduction of risks arising from the application of fertilisers[1] (Article 1 of the Ordinance); it also stipulates the proper use of all fertilisers. The Ordinance thus contributes to the implementation of the EU Water Framework Directive (Directive 2000/60/EC) and to the EU Marine Strategy Framework Directive (Directive 2008/56/EC). Beyond this, it serves the purpose of implementing the rules that are based on EU law within the framework of the EU Nitrates Directive of 1991 (Directive 91/676/EEC). It is the central instrument in the German action programme for implementing this directive.

The aim of the Nitrates Directive is to reduce the pollution of waters caused by nitrates from agricultural sources, and to prevent further pollution of water bodies. In order to guarantee a general level of protection against pollution for all bodies of water, Member States were required to set up rules of best practice and, if necessary, to provide financial assistance for the purpose of ensuring compliance with them. The Member States were also obliged to identify vulnerable zones, and to produce action programmes for them, or implement nationwide action programmes. Germany's action programme encompasses the nation's entire agricultural production area. At an interval of no more than four years, the Member States conduct an evaluation of their respective action programmes, update them – if necessary – and submit a Report on the Implementation of the Nitrates Directive to the EU Commission. Among other things, the Report presents the measures adopted and the results obtained from the nitrates measurement network.

Nitrogen (N) is a main nutrient of plants and thus of particular importance for agricultural production, and an ingredient in animal feed (protein). Using fertiliser to replace nutrients withdrawn with the harvest is a prerequisite for high agricultural yields and for maintaining soil fertility. However, over the medium to long term, fertiliser application at a level that goes beyond what is removed (particularly, if the soil has a sufficient supply) leads to substantial adverse effects on the environment, particularly because of reactive nitrogen compounds. The same also applies to phosphorus.

[1] Here and henceforth in this document, for reasons of simplification the term "fertiliser" stands for fertiliser, soil improver, growing media, and plant aids.

Germany evaluated the Fertiliser Application Ordinance in 2012 (relevant for the reporting period 2010 - 2013 of Germany's action programme), and identified a need for changes (Federal Government-Laender Working Group, 2012). The EU also urged on the need for changes, a need that partially goes beyond the results of the national evaluation. It is against this background that the Scientific Advisory Boards for Agricultural Policy and for Fertiliser Issues respectively, and the German Advisory Council on the Environment, state their views concerning the amendment of the Fertiliser Application Ordinance.

The Opinion at hand focuses on the Fertiliser Application Ordinance, while keeping in mind that a broader approach is required for reducing the nitrogen emissions from agriculture. References are made to the Report by the Scientific Advisory Board on Agricultural Policy - "Reduction of nitrogen emissions in agriculture" (1993) - and the deliberations relating to this, stated in the report "The future of livestock production in Germany" (2005), as well as to the statements published by the Scientific Advisory Board on Fertiliser Issues in 2009 ("Reduction of nitrogen surpluses in agriculture by means of improving nitrogen efficiency in the use of fertiliser") and also in 2011 ("Using phosphorus sustainably as a limited resource, through recycling and through increased phosphorus efficiency in the use of fertiliser"). The German Advisory Council on the Environment has comprehensively outlined the need for action in a special report ("Environmental problems and agriculture") in 1985 and in 2008 in the chapter on agriculture, forming part of the "Environmental Report 2008: Environmental protection in the shadow of climate change ".

Over the past twenty years, numerous regulations were defined, aiming at reducing nutrient-based pollution in agriculture. Despite a variety of efforts, so far these goals (e.g. stated in the Federal Government's Sustainability Strategy, the EU Water Framework Directive and the National Emission Ceiling Directive) are not realised. This also contributes to the failure of realising higher-level environmental goals such as defined in the National Strategy on Biodiversity. These developments are what prompted the three scientific advisory committees to formally submit a jointly formulated opinion.[2]

[2] This current opinion concerns itself with the Fertiliser Application Ordinance (DüV) as one regulatory policy instrument. The Scientific Advisory Board on Agricultural Policy will examine agriculture's nitrogen-related issues more fully in its reports on the husbandry of farmed animals and on climate protection in agriculture and forestry, which are both currently being drawn up (status: August 2013). The Scientific Advisory Board on Fertiliser Issues is currently drawing up a statement of its views on the application of organic substances as fertilisers in agriculture. In 2014, the German Advisory Council on the Environment will publish a special report on nitrogen-related issues.

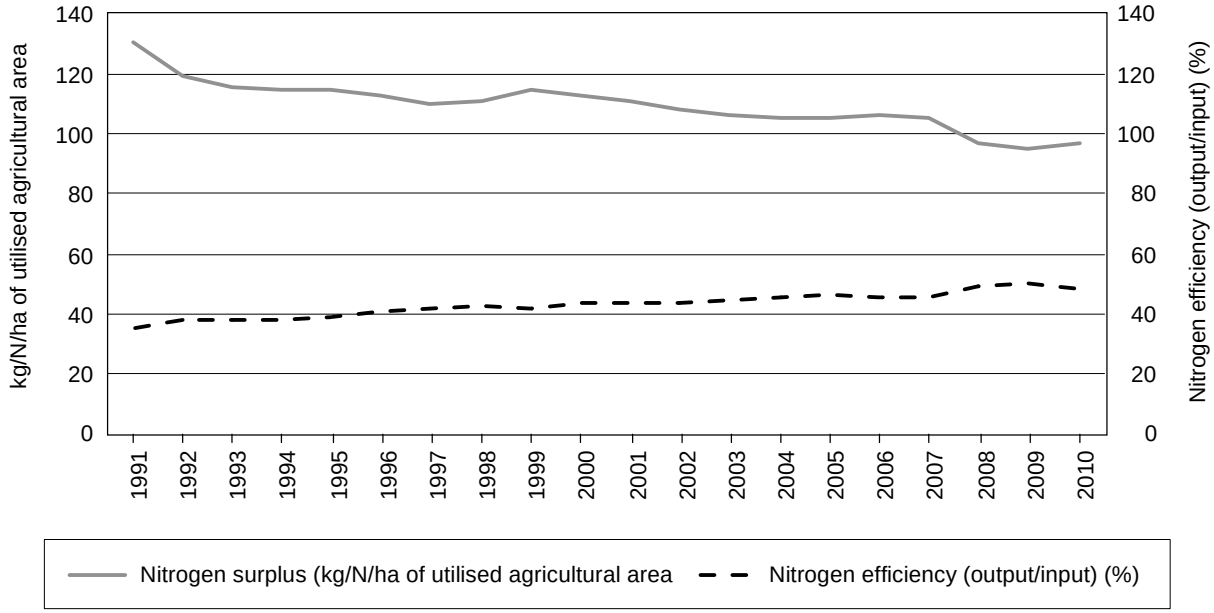
2. Nutrient surpluses in German agriculture

Within the European Union, Germany ranks among the six north-west European countries with the highest yields per hectare (ha) of agricultural production area, yet it is also one of the six countries with the highest national nitrogen surplus (Eurostat, 2010). For a long period (approx. 1950 to 2000), nutrient surpluses for nitrogen and phosphorus were associated with significantly increasing yields per unit of land, and an increase in soil fertility, and accumulation of nutrients in the soil; by contrast, it is now appropriate to conclude that, in many regions of Germany, the nutrient storage capacity of soils has been reached. Simultaneously, over the last decade, yield growth rates have been declining, particularly in cereals. Thus, the current positive national balances for nitrogen are to a very significant extent associated with nutrient losses, which emerge in a variety of ways (Nieder et al., 2007).

Against this background, within the framework of Germany's Sustainability Strategy (Federal Government, 2002 and 2012), the Federal Government set the requirement that by 2010 the nitrogen-surplus element of the national nutrient balance (farm-gate balance) in Germany must be reduced to 80 kg N/ha of agricultural production area (measured as a three-year average). A further reduction is required by 2020. The three-year average was indeed reduced, from 130 kg N/ha for 1990/91/92 to 97 kg N/ha for 2009/10/11, but still fell well short of the reduction target set for 2010 (see Fig. 1). Simultaneously, however, nitrogen use efficiency (i.e. the ratio between the withdrawal of nitrogen through agricultural products, and the application of nitrogen in production) significantly increased.

When interpreting the nitrogen balances in terms of time and area, a number of factors should be highlighted, which do not primarily relate to improved practices in fertiliser use. For instance, the reduction in nutrient surpluses is partly caused by the reductions in herd size in the new Laender (in the early 1990s) (Nieder et al., 2007). Moreover, the national nutrient balance surplus does not reveal anything about the regional distribution of nutrient-based pollution; on the contrary, it rather has the effect of levelling out the major regional differences. Stable and high positive nitrogen balances are particularly found in the centres of animal husbandry in northwestern Germany, with nitrogen excretion of animals on the increase (Germany's Environment Ministry and BMELV respectively, 2012). Some studies indicate, that in regions of intensive livestock production and bioenergy production, and in regions with special crop cultivation (e.g. vegetables), nitrogen surplus tends to stagnate or even increase over time (Heidecke et al., 2012; Taube and Schütte, 2013).

Figure 1: National N-balance surplus and efficiency of nitrogen use: Germany 1991 – 2010 (three-year averages)



Sources: Destatis (no year) and Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) (2013), authors' calculations.

In Figure 1, not all relevant N-flows are taken into account. Especially the release of nitrogen due to the mineralisation of soil organic matter from land-use change, for example the break-up of grasslands (Hoffmann et al., 2012, p. 11; Osterburg et al., 2009), and the abolition of binding requirements on set-aside of agricultural land in 2008.

The high use of N-fertilizer is also caused by the ratio between agricultural product prices and fertiliser prices (Federal Government-Laender Working Group, 2012, p. 82). Given that fertiliser prices are declining in terms of this ratio, the use of nitrogen fertiliser can be expected to increase rather than decrease under current legislative framework conditions.

Nitrate pollution of bodies of water

Apart from phosphorus, a high nitrate concentration is mainly responsible for the eutrophication of water bodies. To a substantial degree, nitrogen surplus from agriculture causes nitrate pollution, thereby endangering the European protection goals stated in the Nitrates Directive and in the EU Water Framework Directive (good chemical and environmental condition of water bodies by the year 2015), and also in the EU Marine Strategy Framework Directive (good condition of the environment by the year 2020).

The Nitrate Report for Germany (Federal Ministries of the Environment and of Food, Agriculture and Consumer Protection respectively, 2012) classifies the pollution intensity of

water bodies into various categories. Overall, the status for rivers and lakes ranges from good to satisfactory, whereas the assessment of coastal water bodies is a lot worse. Accordingly, nitrate pollution levels in the coastal waters of the North Sea have increased significantly since the last reporting period. In 2008, because of eutrophication effects, each of the assessed 28 German transitional and North Sea coastal water bodies failed to achieve the “good chemical status” to be achieved by 2015, as stipulated by the EU Water Framework Directive (in this regard see also the German Advisory Council on the Environment, 2004, 2008).

The values obtained by the measurement network of the European Environment Agency indicate nitrate pollution throughout Germany. While the nitrates report identifies regional clusters with nitrate levels above 50 mg/l, the threat posed to ground water close to the surface is not restricted to a few areas and regions. Among special pollution measurement points, which were selected in 1995 because (among other reasons) they were characterised by distinctly high levels of nitrate and also by being clearly related to agricultural production, the average concentration of nitrate was still above 50 mg/l at almost every second measurement point.

The nitrates report confirms that "the impact of agriculture, while not representing the sole path of entry for the high nitrate concentrations in ground water close to the surface, represents the most significant path of entry by a clear margin" (Germany's Environment Ministry and its Ministry of Food, Agriculture and Consumer Protection respectively, 2012, p.5).

Ammonia emissions

Besides the pollution of water bodies by nitrates, ammonia (NH_3) emissions is another quantitatively significant path for nitrogen loss from agriculture. In Germany, more than 95 % of all ammonia emissions result from agricultural activities. Ammonia, or ammonium, formed in the air after conversion (NH_4^+), contributes strongly to the dry and wet deposits of nitrogen compounds and thus to eutrophication and acidification effects. At high concentrations, it harms plant tissue and leads to imbalances of nutrients in oligotrophic ecosystems. It also causes an acidifying effect in soils and plays an indirect role as a climate-relevant gas. With regard to the national permissible emissions, ammonia is subject to the so-called NEC Directive (2001/81/EC) (NEC = National Emission Ceilings). At a national level, this establishes maximum emission quantities applicable since 2010; the limits relate to the air pollutants sulphur dioxide (SO_2), nitrogen oxides (NO_X), ammonia (NH_3), and volatile organic compounds (without methane, NMVOC). The maximum value, set at 550 kt (kilo tonnes)/year for Germany (corresponding to approx. 30 kg/ha of utilised agricultural area per year), was slightly exceeded in 2010 (552 kt) and clearly exceeded in 2011 (563 kt) (CEIP, 2013).

The deposits of ammonia or ammonium also directly and adversely affect efforts to reach the goals of the Convention on Biodiversity and of the National Strategy on Biodiversity: this is due to the above-mentioned eutrophication effects as plant communities, which are adapted to soils poor in nutrients, are endangered and displaced by plants that thrive on nitrogen. The ecosystems, which develop on soils, that are poor in nutrients, are thus irrevocably changed. Generally, increasing the presence of nitrogen reduces the quantity of species (Bobbink and Hettelingh, 2011). Stevens et al. (2004) calculated that, with increased deposits of nitrogen, the quantity of plant species is reduced by one species per year for each 2.5 kg N/ha. Relating this to the average European amount of nitrogen deposit, this would correspond to a 23% decline in the richness of species attributable solely to ammonia emissions. In livestock producing regions, the ammonia concentrations in the ambient air are higher than those in arable regions by a factor ranging from seven to twenty (Dämmgen and Sutton, 2001). Main sources of ammonia emissions from agriculture are buildings that house farmed animals, storage areas for livestock manure, and the application of organic fertilisers in the field. The latter applies particularly, if the slurry or digestate from biogas facilities is not incorporated into the soil directly, or not directly applied to the soil surface (dragging hose process, trailing shoe process), but applied with a splash-plate or other comparable application systems.

Nitrous-oxide emissions

Nitrous oxide (N_2O) is of substantial importance for climate change effects, even in small quantities, because of its high greenhouse-gas effect (a factor of 310 compared to CO_2). Agriculture directly causes 7.2 % of Germany's climate-relevant gas emissions (data from 2010; Germany's Federal Environment Agency, 2012,). Additionally, emissions from land use and land use changes are also relevant, with the result that in total, approx. 11 % of the greenhouse-gas emissions are attributable to the agricultural sector (Federal Environment Agency, 2010). Current N_2O emissions in German agriculture correspond to 39.4 m. t of CO_2-equivalent (European Environment Agency, 2012), contributing 58% of the total greenhouse-gas emissions of agriculture. According to Dämmgen (2005), more than 68 % of the direct N_2O emissions in agriculture are attributable to mineral and organic nitrogen-based fertilisers. Indirect N_2O emissions from nitrate leaching and ammonia emissions are not included.

Phosphorus

Apart from nitrogen, the use of phosphorus as a fertiliser is of greatest relevance, because of resource scarcity and its environmental effects (highest eutrophication potential of all nutrients). Phosphorus resources are limited and, from the present perspective, can only be retrieved at ever-rising cost. Furthermore, an increase in the contamination with heavy metals as a side effect is expected in the future. In most industrial nations, in the past the low-cost availability of phosphorus has led to high accumulation levels in soils. For that reason, a reduction in the use of phosphorus-based fertiliser is frequently possible without the risk of reduced yields. By contrast, in many developing countries and emerging economies, there is a decidedly high demand for phosphorus – not solely for the urgently needed boost to productivity in plant production, but also to increase phosphorus reserves in the soil, due to a depletion of soil nutrients for decades. Because of the need for a global increase in food production, the industrialised nations bear a particular responsibility for dealing efficiently with phosphorus as a limited resource.

Enrichments of the soil with phosphate (P_2O_5), beyond the level appropriate for optimum plant growth, also cause concern in terms of protection of water bodies. Diffuse deposits coming from agriculture continue to represent one of the most important sources of pollution to water bodies. The regional concentration of farms with livestock production and biogas facilities, with the resulting positive phosphate balances, must be viewed as a particular problem in this regard. The main path for phosphate leaching is soil erosion: this is why the prevention of erosion serves as the most effective means of reducing pollution. Yet, it is also necessary to limit the enrichment of phosphate in the soil, so that its level does not exceed the necessary available amount of phosphate (content-level C), particularly for reducing phosphate leaching into water bodies, via erosion, flow through coarse pores, and drain water.

3. The Fertiliser Application Ordinance in its current form

The Fertiliser Application Ordinance lays down the principles governing the application of fertiliser (calculation of the fertiliser requirement, use of field-test results), timing of application of fertiliser, and rules governing (minimum) distances to water bodies. Moreover, it contains quantity limitations regarding the total amount of nitrogen from manure to be distributed. A key instrument that is used, is a nutrient comparison of nitrogen and phosphate, which is based on a field balance at farm-level. Beyond this, the tolerable nutrient surpluses for the nutrients nitrogen and phosphate are defined. Farmers are required to maintain records of fertiliser applications. The Annexes of the Fertiliser Application Ordinance provide information on the following: nitrogen-content levels of plant-based products, nitrogen release from the soil due to different pre-crops, nitrogen use efficiency of different organic fertilisers, rules on fertiliser application techniques, as well as key figures for nutrients excreted by livestock.

In 2011, the Federal Ministry of Food, Agriculture and Consumer Protection assigned a Federal Government-Laender Working Group the task of evaluating the Fertiliser Application Ordinance. This Working Group included the contributions of representatives of the Federal Ministries of Food, Agriculture and Consumer Protection and of the Environment respectively, and of ministries at individual state (Laender) level, in addition to those of experts from various institutions engaged in research and consulting at Federal Government and at individual Laender level. The Working Group has assessed the Fertiliser Application Ordinance in its current form, proposed options for amendments, and analysed these options in terms of their effects on the supply of nutrients to plants, environmental effects, implications for individual farms and for regions, and in terms of how they can be monitored (Federal Government-Laender Working Group, 2012). The aim of this evaluation was also to provide a basis for the strategic environmental review of the German action programme in order to fulfil the requirements of the EU Nitrates Directive.

The result of the evaluation highlights both, a clear need for improvements, and also obvious opportunities for improvements of the existing regulations in almost all relevant areas: planning of fertiliser use, specific restrictions due to certain locations and certain soil conditions, periods of fertiliser application, storage capacities and maximum application rates of organic fertilisers (including manure and digestates from biogas plants), techniques used for applying fertiliser and incorporating it into the soil, methods and allowed surpluses used in nutrient comparisons, requirements to record data; the issue of farm enterprises without any agricultural land and livestock farms lacking (sufficient) agricultural area, and mechanisms for monitoring and for imposing sanctions).

In the view of the two Scientific Advisory Boards and of the German Advisory Council on the Environment, crucial reasons for the failure of reaching the targets of the Nitrates Directive and of the Water Framework Directive to the desired extent are the existing regulations regarding nutrient comparisons. In many situations, particularly regarding farms with a high share of grass and forage production, the nutrient comparisons do not provide meaningful results due to missing data on forage yields. Another central reason for failure is identified in the lack of sufficient monitoring and sanction mechanisms.

4. Recommendations for the amendment of the Fertiliser Application Ordinance

The Scientific Advisory Boards on Agricultural Policy and on Fertiliser Issues respectively, at the Federal Ministry of Food, Agriculture and Consumer Protection, and also the Federal Government's German Advisory Council on the Environment, consider the proposals by the Federal Government-Laender Working Group (2012), concerning the amendment of the Fertiliser Application Ordinance to be an important step in the right direction, and they recommend, that these proposals are implemented. In various areas, measures that go further than those proposed by the working group are considered to be necessary.

The Scientific Advisory Boards for Agricultural Policy and for Fertiliser Issues respectively and the German Advisory Council on the Environment…

… emphatically urge an **amendment of the Fertiliser Act** (Düngegesetz) as a prerequisite for the amendment of the Fertiliser Application Ordinance. The definition of best practice of fertiliser use, as defined in the Fertiliser Act, should be broadened. Apart from securing the proper supply of nutrients to crops and maintaining or improving soil fertility, Article 1 of the Fertiliser Act does indeed declare it a purpose of the Act to prevent and avert possible risks to the natural environment. However, according to Article 3 (2), use of fertiliser according to best practice explicitly serves the purpose of the first two objectives only. Thus, it is recommended to insert into this section, that best practice includes arranging the type, quantity, and timing of use of fertiliser to match the needs of the plants and of the soil, in such a way that dangers to the natural environment are avoided to the greatest extent possible.

  An amendment of the Fertiliser Act is also necessary in order to expand the upper limits to all types of organic fertilisers including e.g. biogas digestates in the Fertiliser Application Ordinance. In addition, the authorisation in the Fertiliser Act to issue rules concerning the recording of nutrient flows at farm-level should be extended to include all data recordings, that are necessary for setting up a farm-gate nutrient balance for nitrogen and phosphate. If this proves to be impossible within the Fertiliser Act, a legislative basis of this kind should be created elsewhere (in other legislation). This also applies to the recommended requirement to set up farm-gate balances for biogas facilities and for landless enterprises engaged in animal husbandry.

… see the urgent necessity, as recommended by the Federal Government-Laender Working Group, to **determine the fertiliser requirement** at farm-level according to scientifically established rules and methods, to implement the results in the **planning records of**

fertiliser use, and to document this in accordance with minimum standards to be defined. They agree with the assessment, that the provision of a free EDP tool can make it easier to implement what is necessary for individual enterprises. They also agree that generalized upper limits for nitrogen application from organic and chemical fertiliser, as demanded by the European Commission, are not appropriate in the pursuit of the stated objectives. The relevant target value is the nutrient surplus.

… emphasise, as does the Federal Government-Laender Working Group, that the existing regulations for setting up **nutrient comparisons** at farm-level are insufficient. No reliable data are available for yields of grasslands and other fodder crops at the level of individual fields or farms: thus, a field-related nutrient balance for farms with fodder-crop production does not provide reliable results. The Federal Government-Laender Working Group has made recommendations regarding (1) the field-related balance to be checked for plausibility, (2) an adjustment of the booked losses of nitrogen excreted by livestock, resulting in a de facto reduction of the maximum limit for the application of organic nitrogen fertiliser, and (3) a reduction of the "unavoidable" surpluses of nitrogen (cultivation of vegetables). These recommendations represent substantial improvements compared to the current situation and should therefore be implemented. However, over the medium-term (if possible, to be already applied to the reporting period 2020 to 2026) it should become an obligatory requirement to switch to the farm-gate balance in order to monitor the environmental compatibility of the management of nitrogen and phosphate on farms. The juridical assessment of the Federal Ministry of Food, Agriculture and Consumer Protection is that the Fertiliser Act does not in its current form provide a foundation for making a farm-gate balance an obligatory requirement. It is therefore necessary to create the legal prerequisites for recording all nitrogen-related and phosphate-related flows of material that are required to complete the farm-gate balance (apart from the figures already recorded in the data, e.g. sales of products of plant and animal origin, purchases of feed and of animals have to be recorded). In the context of future evaluations, a check should also be made to determine whether the currently permissible nutrient surplus limits are sufficient for reaching the environmental goals that have been set.

… urgently recommend, with regard to an obligatory **farm-gate balance**, that within the period of the next action programme the necessary technical/administrative prerequisites are created and implemented, in addition to the legal foundations, ensuring that this balance method becomes the standard as soon as possible. An EDP-based, uniform nationwide and

easily to handle tool should be developed for the farm-gate balance. Operational prerequisites of individual farms and applicability for all agricultural enterprises have to be taken into account. To minimise the time and resources required for farmers to set up a farm-gate balance, this tool should be linked with the existing bookkeeping systems.

… support the proposal to stipulate specifically the **rules for distances for fertiliser application** from water bodies, and the proposed general obligation to avoid run-off, to reduce direct and indirect inputs of nutrients into water bodies.

… support the proposed **prolongation of prohibition periods** for the application of organic fertilisers (on arable land, usually beginning with the harvesting of the main crop; introduction of this regulation without a transition period) and the **extension of minimum capacities of storage vessels** for livestock manures (raised to nine months in farms lacking sufficient agricultural areas of their own, with a transition period). They also support the recommendation to include farm enterprises without any agricultural land / livestock farms lacking (sufficient) agricultural areas and biogas plant enterprises. As there is not yet a scientific consensus on the capacity of grassland to absorb nutrients in autumn compared to those in spring, there is a need for more research. If necessary, prohibition periods for applying organic fertilisers have to be adjusted for grasslands.

… support the recommendations to tighten-up the requirements governing **the technology used for spraying organic fertilisers in the field** and also for **incorporating organic fertilisers into the soil**, in order to reduce losses of nutrients; in this regard they go beyond the Federal Government-Laender Working Group's recommendations. The term "immediate incorporation" should be defined precisely, in such a way that incorporation into the soil takes place within a time limit of one hour. For both, arable land and grassland, the transition periods set for new standards on organic fertiliser application techniques should be shortened compared to the Federal Government-Laender Working Group proposals. Germany should be guided by the regulations applied in neighbouring countries with high levels of livestock farming. A regional differentiation could be made with respect to transition periods to account for differences in agricultural structure.

… regard as a minimum requirement the Federal Government-Laender Working Group's proposal that, based on a six-year average, a phosphate surplus must be prohibited for soils rich in **phosphate** (P_2O_5) (soil-supply levels D and E). The proposal to limit the phosphate surplus to 20 kg phosphate (P_20_5) per ha for soils of the supply level C grants the farms

generous adaptation periods. However, the farms will use the adaptation period for changes solely if it is already clear today that in the period 2020 to 2026 of the action plan for richly-supplied soils, it will be a requirement to use fertiliser at a level below that of the withdrawal (depletion), and that no phosphate surplus will be permitted for soils of the supply level C. The Scientific Advisory Boards and the German Advisory Council on the Environment consider this amendment necessary to implement efficient and sustainable fertiliser use in agriculture.

… emphatically advocate the recommendation of the Federal Government-Laender Working Group, that the upper limit set in the Fertiliser Application Ordinance for the field application of nitrogen sourced from organic fertilisers, should not solely include nitrogen compounds from livestock manure but include nitrogen compounds from all organic fertilisers and, accordingly, also **digestate** of plant origin, sourced from biogas facilities and from organic waste.

… consider it essential to implement the Fertiliser Application Ordinance more effectively, and support the Federal Government-Laender Working Group's proposals for making it easier to **monitor compliance** and for **imposing sanctions** in case of violation. Additionally, farms obliged to set up a farm-gate balance should be required to report the result to an authorised official body (web-based database). These data should not be used solely for monitoring purposes, but also for identifying areas with potential for optimisation. The same should apply for the reports required according to the ordinance on the marketing and transportation of organic fertiliser. If the results of the farm-gate balance exceed the permissible surplus for nitrogen or phosphate, as proposed by the Federal Government-Laender Working Group, farmers should have to hire extension services in order to reduce surpluses on their own costs. In the case of repeated or severe breaches of the regulations, mandatory orders should be issued to the farmer by a public authority. Breaches of these mandatory orders should be subject to sanction as an administrative offence, as should any breach of an obligation to consult extension services.

… advocate, with the aim of improving the **implementation of regulations on fertiliser use in accordance with the law**, the introduction of a requirement for biogas facilities and landless enterprises engaged in cattle husbandry to set up a farm-gate balance and to report the results to an authorised body (web-based database). A more effective implementation could also be attained, if the public authorities were granted a broader scope of action in monitoring the sales on mineral fertiliser through e.g. the traders in agricultural

commodities. It is also necessary to provide sufficient resources for organisational bodies authorised to undertake checks. Monitoring activity should primarily be carried out in regions where environmental problems due to nutrient surpluses are obvious, for instance in priority areas as defined by the Water Framework Directive.

… consider it to be urgently necessary for rules that establish the law relating to fertiliser (and other environmental protection issues) to make sufficient provision, both for **compliance checks**, and for imposing **effective sanctions** against breaches of the rules. The system of monitoring compliance and sanctions should be independent of the cross-compliance mechanism.

If the recommendations stated above are implemented, with regard to amendment of the Fertiliser Application Ordinance and the Fertiliser Act, this is an important step towards reaching the environmental policy goals stated in Chapter 1, aiming at the protection of water bodies, at maintaining biodiversity and at reducing adverse climate effects. The requirements for adaptation will be diverse within the agricultural sector, depending on the production structures of the individual farms, the skills of the farm managers, the techniques available for applying organic fertilisers, the natural location-specific conditions, and the regional possibilities for redistribution of organic fertiliser among farms. There will be a greater-than-average need to adapt on farms with a high livestock density, in regions characterised by large numbers of livestock and numerous biogas facilities. Apart from farms, operators of biogas facilities would also be affected by the recommended changes in fertiliser legislation.

To make the process of adaptation in fertiliser use easier and to speed it up, the Scientific Advisory Boards on Agricultural Policy and on Fertiliser Issues respectively, and also the German Advisory Council on the Environment, recommend to include corresponding investments in the extension of minimum capacity for storage vessels for organic fertiliser - in the case of old facilities (for which a transition period up to 2020 was recommended) – in investment support programmes with declining rates of financial support over time. At Federal level, this could be included in the agricultural investment support programme, within the Joint Task for the Improvement of Agricultural Structures and Coastal Protection ("GAK"); similarly, at the level of individual Laender, it could be included in the rural development programmes. In a similar way, financial assistance can be provided to bring about a faster implementation of emission-reducing techniques for fertiliser application. To meet these challenges (among others), Germany should make full use of the option, within the framework of the Common Agricultural Policy reform, to transfer funds from the first pillar of the CAP to the second.

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