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# ENRD Thematic Group (TG) on sustainable management of water and soils

## Improving soil and water management through management plans

September 2018

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## 1. Introduction

### 1.1 Scope of the paper

This paper has been prepared on behalf of the [ENRD TG on the sustainable management of water and soils](#) to inform EU and MS level discussions on how nutrient management plans (NMPs) could and should be facilitated in relation to better soil and water conservation through Rural Development Programmes (RDPs).

The paper builds on the working document on NMPs produced for the second TG meeting and the outcome of the [second](#), [third](#) and [fourth](#) TG meetings held, respectively, on 15 December 2017, 22 March 2018 and 16 May 2018. It also integrates the lessons learnt from the projects and examples provided by TG members.

The paper aims to:

- Provide examples of where NMPs are a legal requirement and how this interacts with potential support through RDPs; and
- Provide possible recommendations on how NMPs, where beneficial to soil and water management, could be more widely and more effectively designed and implemented through the 2014-2020 RDPs. The primary purpose of this analysis is to support the implementation of the current RDPs, though it is also relevant to discussions about the role and place of NMPs in the CAP post-2020.

The analysis focuses on Nutrient Management Plans, but, in discussion with the Thematic Group on water and soils at its [third meeting](#), it was noted that nutrient management was only part of the picture to improving the sustainable management of soils and water in the EU. Erosion, compaction, soil organic matter, water availability and soil health are all important considerations. It was therefore suggested that the TG should take a more systemic view to improving soil and water management through the use of **soil management plans**. The following sections of this report address mainly the use of nutrient management plans, as these are where past efforts have largely focussed, but also draw recommendations and conclusions in the context of soil management plans – consistent with the TG discussions.

The report begins with the background to nutrient management plans, their key benefits and a description of their place in existing legislation. Examples of how nutrient management plans have been used within RDPs are described and followed by recommendations for improved implementation of soil management plans through RDPs in the current and future programming periods.

### 1.2 What are nutrient management plans and what are their benefits?

Nutrient management plans set out the required soil nutrient management needs in a given area and how those needs can and should be met through specific actions. In the case of nutrient management in agriculture, plans address the need (and in some cases requirement under EU law) at the farm level to ensure that the nutrients applied to land in a given area do not leach out (diffuse) into soils or surface and ground waters. They thus include appropriate application rates, times, locations and practices. Nutrient management plans are primarily aimed at the farm or holding level but can be applied to broader areas where collective action may be needed, or where nutrient management is critical to achieving objectives in a particular area, such as a water catchment or nitrate vulnerable zones (NVZ).

The main benefits of nutrient management plans are:

- The assessment of the nutrient requirements of different crops is undertaken prior to the application of fertilisers. This helps to **raise awareness about resource efficiency** and the use of finite resources, such as phosphorous;
- Nutrient requirements and needs are seen in the context of the capacity of the crops to utilise those nutrients and the land to absorb any excess, such as in relation to soil type, slope or proximity to water courses. This helps to **improve knowledge for farmers and land managers** about the implications of inappropriate use of nutrients in relation to soil and water objectives, as opposed to just crop requirements;
- **Farmers and advisors are able to identify actions** to more effectively manage nutrients and thus support implementation and targeting of activity on farms; and
- Inspectors and the competent national authority are allowed to **check and review the approaches being taken** on a farm or broader areas, such as a water catchment or Nitrate Vulnerable Zone (NVZ).

The potential benefits of requiring actions set out in NMPs to be implemented through RDPs include:

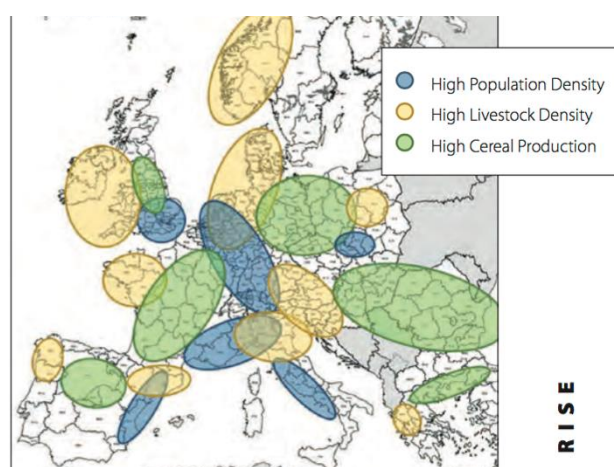
- Clarity on the legal requirements for the farmer to reduce diffuse pollution from agriculture;
- The provision of support to farmers to **incentivise the development of plans** that go beyond existing requirements set out in law and offer a more systemic view of soil and water management planning;
- Identification of the RDP measures that can be used to support **the implementation of actions** to improve soil and water management; and
- Provision of **advice and training** to farmers to help them understand the importance of nutrient management and their role in managing soils and water beyond the benefits to crop and livestock management.

### 1.3 Background and context

All crops need nutrients in order to grow and develop. In natural systems these come from the breakdown of organic matter in soils and minerals from rocks and sub-strata. Conventional farming systems are highly modified from their natural counterparts. In conventional cropping systems, nutrients (mainly nitrogen, phosphorous and potassium) are added to the soil in order to promote enhanced yields that would not be achieved through natural processes<sup>1</sup> or in the timescales necessary for annual crop cycles. In conventional livestock production systems nutrient inputs are directed at animal consumption either through feed additives or forage (such as pastures and silage), while excess nutrients are generated in the

<sup>1</sup> This is primarily as most agricultural cropping systems are highly modified from matter that would naturally increase the fertility of the soil is removed in the form of the crop.

**Figure 1: Regional concentration of cereal production, livestock and human population**



Source: Figure 14 cited in Buckwell et al, 2014

form of manures and slurry, which due to the concentration and specialisation of production systems, is often greater than the carrying capacity of the land to absorb those nutrients. Where crop and livestock production operate together, the excess nutrients generated from livestock production can be used to meet the nutrient requirements of crops. However, 'the development of modern agriculture in an urbanised society has been characterised by a strong move towards specialisation' and the separation of these systems (Buckwell *et al*, 2014<sup>2</sup>) (Figure 1).

In simple terms, it is the excess presence of nutrients, either through over application in cropping systems or excess generation in livestock systems, that results in nutrients not being taken up by plants on the land and leading ultimately to the leaching (diffusion) of nutrients into natural systems and water courses. The application rates of nitrogen and phosphorous to agricultural land in the EU have varied over time. Nitrogen application increased by 5% between 2006 and 2015, whereas phosphorous, a finite resource which has to be imported into the EU, declined in use by around 20% during this period<sup>3</sup>.

The presence of excess nutrients in ecosystems is harmful to the environment. EU agriculture is responsible for 94% of ammonia emissions (2015) (largely from the storage and application of manure and fertilisers)<sup>4</sup>, and 70% of nitrogen entering EU rivers and lakes. Climate impacts are also notable, with over 2% of the total EU greenhouse gas (GHG) emissions arising from artificial fertilisers. This is around 20% of all GHG emissions from agriculture. The future evolution of these impacts will vary, with increases in some areas (such as agriculture GHG emissions) and potential declines in others. For example, the European Environment Agency (EEA) reporting of ecosystems with critical loads of nitrogen leading to eutrophication noted that the EU-28 ecosystem area, in which the critical loads for eutrophication were exceeded, peaked at 84% in 1990 and decreased to 63% in 2010 (in EEA member countries). The area in exceedance is projected to further decrease to 54% in 2020 for the EU-28, assuming current legislation is implemented (EEA, 2017<sup>5</sup>). However, these trends are not uniform across the EU, with future projections suggesting declines in most areas but some 'hot spot' areas will remain in western France and the border areas between Belgium, Germany and the Netherlands, as well as in northern Italy<sup>6</sup>.

In European agriculture the key challenge for nutrient management is therefore to ensure that the right levels of nutrients are available for production when they are needed, that excess nutrients are reduced, and are prevented from entering natural ecosystems and watercourses. Recent interest in addressing these issues has been encouraged by Commissioner for Agriculture and Rural Development Phil Hogan in his remarks on the future CAP. "*I deem it absolutely essential to enhance our policy tools in relation to inputs. Proper nutrient management on farms is vital and will receive more attention in the future CAP than is currently the case.*"<sup>7</sup> The Commissioner also announced that a platform for on-farm nutrient management is being established. The platform will be directly accessible for farmers, to enable informed decisions on nutrient requirements and it can "*have the positive knock-on effects of boosting water use efficiency and emissions reduction*". These statements are reinforced in the 'Future of Food and Farming' paper (COM(2017) 713 final), which asks that "*it*

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<sup>2</sup> Buckwell A, Nordang Uhre A, Williams A, Poláková J, E H Blum W, Schiefer J, J Lair G, Heissenhuber A, Schießl P, Krämer C and Haber W (2014) Sustainable Intensification of European Agriculture. A review sponsored by the RISE Foundation.

[https://ieep.eu/uploads/articles/attachments/a39b547e-8abe-49d8-94ec-77f751378e34/111120\\_BROCH\\_SUST\\_INTENS\\_DEF.pdf?v=63664509854](https://ieep.eu/uploads/articles/attachments/a39b547e-8abe-49d8-94ec-77f751378e34/111120_BROCH_SUST_INTENS_DEF.pdf?v=63664509854)

<sup>3</sup>[http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental\\_indicator\\_-\\_mineral\\_fertiliser\\_consumption](http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_mineral_fertiliser_consumption)

<sup>4</sup>[http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental\\_indicator\\_-\\_ammonia\\_emissions](http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_ammonia_emissions)

<sup>5</sup><https://www.eea.europa.eu/data-and-maps/indicators/exposure-of-ecosystems-to-acidification-14/assessment>

<sup>6</sup><https://www.eea.europa.eu/data-and-maps/figures/exposure-of-ecosystems-to-eutrophication>

<sup>7</sup> Speech at European Policy Centre Dialogue on Water & Agriculture in Europe, Thursday 28th September 2017, Brussels.

*should be explored how an obligatory EU-wide requirement to have a nutrient management plan and incentives for precision agriculture, forming part of any Member State CAP strategic plan, could improve results”.*

RDPs have a key role to play in the reduction of diffuse pollution from agriculture and the management of nutrients and have done so over successive programming periods. Support for extended buffer strips, modification to ploughing regimes, low- or no-input agriculture, reduction of stocking densities, and capital support for slurry and manure management infrastructure, including anaerobic digesters are just some of the types of actions that are supported through RDPs. More generally guidance on Best Environmental Management Practices (BEMP) has been produced that address nutrient inputs and use (JRC, 2015)<sup>8</sup> as well as other detailed publications and recommendations on the subject (see Alterra et al, 2011 and Buckwell et al, 2014). Good soil and nutrient management is important for all farmers, but there are some areas where actions need to be targeted, such as those farms in Nitrate Vulnerable Zones (NVZ), and the right locations within farms (such as individual fields which are sloping, have free draining soils or are close to water courses). Centralised targeting of the application of nutrient management actions at the Member State or regional level is clearly possible, as has been the case for NVZs, yet at the smaller scale the targeting process becomes more challenging and lack of data a significant barrier. Here, the production of ‘nutrient management plans’ for individual farms can help to identify both the areas where nutrient and input management is an issue, as well as raise awareness among farmers of these issues and the actions needed to address them.

## 2. Nutrient Management Plans and the reference level

The work of the Thematic Group is targeted towards improving the delivery of RDPs in the current programming period, and thus to identify what role RDPs should play in the requirement or use of NMPs to improve soil and water management. While there are no doubt advantages to having NMPs in place and implemented across all farms, whether or not these can or should be paid for through RDPs depends on what is required to be implemented under national law – e.g. whether a Member State has chosen to require nutrient management plans to be set up in order to implement an EU Directive or Regulation, such as the Nitrates Directive. In addition, the effectiveness of NMPs and associated actions depends on the content of those management plans, what actions are required, and how they are targeted, monitored and communicated to farmers.

Nutrient management plans are not a new approach in the EU and have been in use in the CAP for several years. For example, they have been supported in basic agri-environment programmes in the two previous programming periods, as well as forming part of the Statutory Management Requirements (SMR) of Cross Compliance (Regulation (EU) No 1306/2013) – notably SMR1 in relation to the Nitrates Directive (Council Directive 91/676/EEC). In the past, management plans that address nutrients or aspects of nutrient management have taken a variety of forms, including soil management plans, water management plans, crop protection management plans and manure management plans. They have also formed component parts of other, broader management plans, such as River Basin Management Plans (RBMPs) required by the Water Framework Directive where Member States are required to develop plans to demonstrate how they will reach good ecological status of their water courses and set out many of the actions required at the local level.

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<sup>8</sup> See Chapter 5 on nutrient management in:

<http://susproc.jrc.ec.europa.eu/activities/emas/documents/AgricultureBEMP.pdf> and further information here <http://susproc.jrc.ec.europa.eu/activities/emas/agri.html>

The relationship between nutrient or related management plans' actions in law, and those actions supported through RDPs, is illustrated in Figure 2 for three Member States (Austria, Estonia and Spain).

Figure 2: Management plans in the 2014-2020 programming period for selected Member States



**Source:** Own compilation based on various sources including the ENRD CP RDP screening exercise 2017/18; Examples of RDP-related support for NMPS provided by the Thematic Group members; and desk-based research relating to Member State choices on the implementation of EU soil and water-related legislation at the national level.

RDPs should be used to support only those actions that go beyond the requirements under national law and operate in accordance with the polluter pays principle. For example, RDPs can support actions that enable NMPs to be implemented, provide advice and training, or the undertaking of more systemic plans that encompass soil management rather than just nutrients or fertilisers, etc.

Nutrient and other management plans were removed from some RDPs in the previous programming due to possible risks of overlap with the existing legal requirements. For example, in England (UK) four options for management plans (soil, manure, nutrient and crop protection) were initially considered and eventually withdrawn at the start of the 2007-13 programming period as they were too close to the reference level, with very little added value for public expenditure<sup>9</sup>. In Bulgaria some requirements were removed because of potential overlap with national legislation. In Italy, although there was no duplication with cross compliance requirements, integrated crop management was becoming more and more an industry standard for efficient farms, particularly those aiming to increase productivity by rational use of technical inputs and machinery. For this reason, a few regions decided to withdraw support for management plans from their RDPs<sup>10</sup>. A synthesis of management plans appearing in agri-environment schemes in the 2007-13 period can be found in Table 2 in Annex 1.

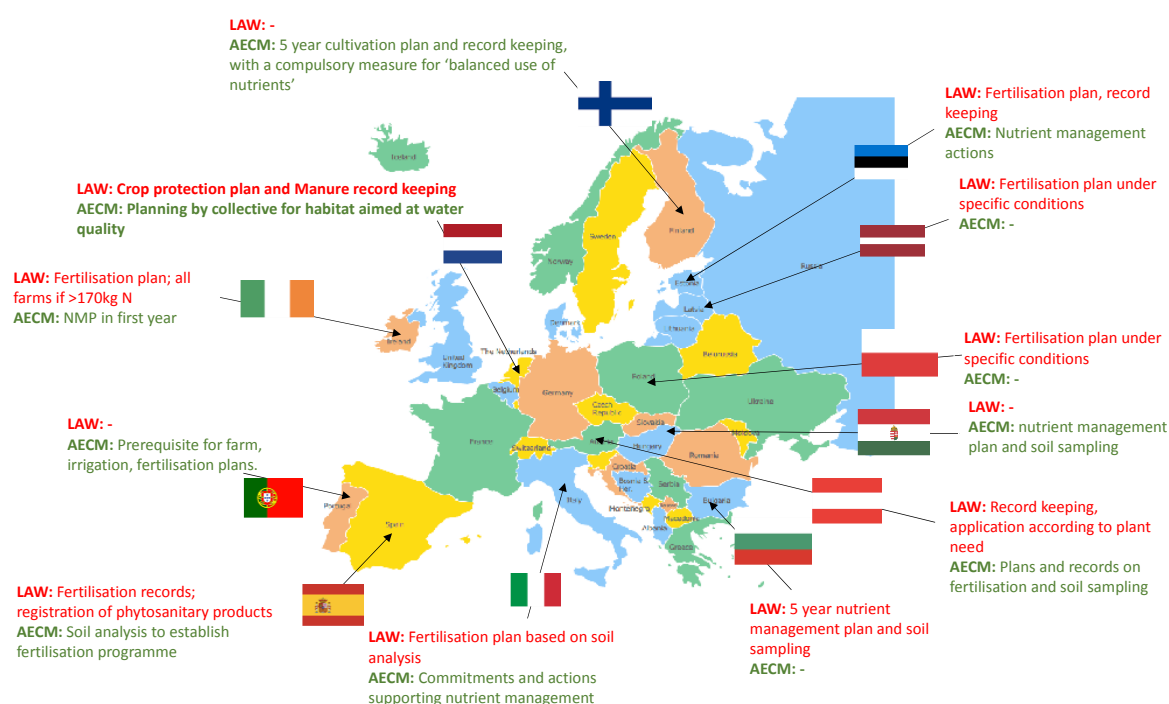
<sup>9</sup> The distinction between the requirements of the agri-environment Soil Management Plan and those of the GAEC Soil Protection Review were insufficient and the Crop Protection Plan covered what should be good farming practice.

<sup>10</sup> In consequence, these regions suffered a lower uptake rate of agri-environment schemes as a whole (Keenleyside, C., Allen, B., Hart, K., Menadue, H., Stefanova, V., Prazan, J., Herzon, I., Clement, T., Povellato, A., Maciejczak, M. and Boatman, N. (2011) Delivering environmental benefits through entry level agri-environment schemes in the EU. Report Prepared for DG Environment, Project ENV.B.1/ETU/2010/0035. Institute for European Environmental Policy: London).



In the current period (2014-2020) across the EU, some Member States (e.g. Bulgaria, Estonia, Italy, Latvia, Lithuania, Poland, Portugal and Spain) require that NMPs (and other types of management plans) are developed as a response to the implementation of existing Regulations and Directives (such as the Nitrates Action Plans required by the Nitrates Directive). In these cases, NMPs become a requirement of cross compliance (through the Statutory Management Requirements) and therefore cannot be supported through RDPs. Where this is not the case, such as Austria and Hungary, Member States have chosen to use RDPs to develop and implement management plans and associated actions, often through the agri-environment-climate measure (M10) (Figure 3). In addition, the geographical area over which NMPs are required in a given Member State under national law can vary (even through the transposition of the same EU Directive). For example, most Member States reviewed here require NMPs to be implemented as a result of the Nitrates Action Plan and only within Nitrate Vulnerable Zones (NVZ). In some cases, implementation of NMPs extends to the whole country or region, such as Ireland and the Italian region of Emilia Romagna (see Table 1 in Annex 1).

Figure 3: Location of nutrient management plans in national law or under AECM



**Source:** Own compilation based on various sources including the ENRD CP RDP screening exercise 2017/18; Examples of RDP-related support for NMPs provided by the Thematic Group members; and desk-based research relating to Member State choices on the implementation of EU soil and water-related legislation at the national level. **Notes:** In Finland the requirement in the RDP to use the 'balanced use of nutrients' measure includes the following actions: five-year crop rotation plan; an annual crop plan; soil fertility test every five years; parcel-specific notes; quality test of fields once during the commitment period; one-day training or online exam; and buffer strips on parcels adjacent to waterways.

### 3. RDP and related support for NMPs addressing soil and water management

This section sets out selected examples of where nutrient management plans or related actions have been implemented to address soil and water management. These range from the RDP design phase, through implementation of specific measures, to demonstration programmes.



In Finland, national funding was used to support the design of RDP measures for nutrient management by assessing the potential of using nutrient field balances in nutrient management plans.

Under the agri-environment-climate measure (AECM), RDP support has been made available in some Member States (e.g. Hungary - **Box 2**) to provide the evidence base needed to support the development of NMPs. This adaptable measure has also been used to provide a range of related activities addressing nutrient management, that can help implement NMP actions, whether set out in national law or in RDPs (**Box 3**). RDP support has been used to build the technical capacity of both farmers and advisors to support the development of nutrient management planning (**Box 4**), as well as providing support for the implementation of new technologies and machinery, such as direct slurry injection (**Box 5**). In the context of slurry application, it should be noted that there are varying legal and voluntary requirements across the EU. For example, in the Netherlands, it is a legal requirement to apply slurry through direct injection and no other forms of slurry application are permitted.

Beyond EAFRD support, LIFE funding has been used effectively in Spain to demonstrate the benefits of nutrient management (through organic farming and crop rotations) and how these can be sustainable without the need for CAP support, as well as demonstrating the potential for making accessible all the available technical knowledge for self-management through a web tool (Box 6).

**Box 1: Using national funds to assess the feasibility of using field nutrient balances in NMPs in Finland**

In **Finland** national support was used by the Ministry of Agriculture and Forestry during the preparation for the 2014-2020 RDP period, to analyse possibilities for using nutrient field balances in nutrient management plans. The idea was rejected for mainstreaming into RDPs, mainly due to difficulties in estimating crop yield and defining what is a good balance for different plants and soils and weather conditions. While relatively easy to calculate, their interpretation is not straightforward due to a lack of a solid scientific basis. A further project 'Benefit from nutrient field balances' was then financed to gather more information to support such assessments by quantifying the variation in nitrogen balances in practical farming and in controlled field experiments as affected by fertilisation, soil properties and crop rotations.

**Box 2: Use of AECM support to create precision nutrient management plans in Hungary**

In **Hungary**, the agri-environment-climate measure (AECM) (M10) is used to support sustainable soil management and the development of NMPs. Management zone soil samples and lab analysis are used as a basis for nutrient management plans at an individual farm level in the Vértesalja area covering a highly eroded landscape. The farms targeted are within a 280-hectare area and focus specifically on corn, wheat, barley and sunflower production. The management plan is developed by a consultant, with information on field size and location provided by the farmer. The consultant creates a GIS database from the information provided combined with multi-year satellite imagery and, if available, soil scanning results and/or yield maps and other available spatial information. This is used to develop a management zone-based soil sampling approach, where the average size of a zone is 3 ha. This detailed design is then provided to the sampling technicians equipped with automated soil samplers on 4x4 vehicles. Soil laboratory analysis is performed for 14 soil chemical and physical parameters according to local country-specific standards. The sample results form the basis of the nutrient management plan that is calculated for the farmer for selected fertilisers. In some cases, a better fertiliser combination is recommended by the consultant, but the farmer makes the final selection decision.

**Box 3: Use of AECM support to implement nutrient management-related actions.**

The use of nutrient management or fertilisation plans supported under M10 is considerably varied. Sometimes support is provided for the creation of a nutrient management plan without further linked actions, sometimes no plan is required to support nutrient management actions, and in other cases both a plan and linked set of actions to implement the plan are supported. The following are illustrative and non-exhaustive examples of the types of support provided through M10 to address nutrient management.

MS	Plan in RDP	Supported actions
AT	Yes	10.1.1 – Environmentally sound and biodiversity-promoting management – greening equivalent measure; 10.1.2 – input reduction, which requires a ban on fertiliser use over whole area; 10.1.6 and 10.1.7 – providing soil cover when land is not under other crops; 10.1.8 – direct seeding; 10.1.17 – stopping cultivation on areas threatened by nutrient leaching; 10.1.18 – preventative surface water protection (which also requires land to be taken out of production/soil cover/buffer strips)
EE	No – condition of entry	10.1.2 – regional water protection – in NVZs to keep land under vegetative cover over winter or grass. Beneficiaries of this must participate in water protection training. 10.1.3 – regional soil protection; 10.1.4 – Environmentally friendly horticulture
IT-ER	No – condition of entry	10.1.1 – integrated production – (relates to specific crops) requires that a ‘fertilisation plan’ is developed 10.1.3 – fertiliser use – sets out a series of actions that farmers must commit to for a five-year period on arable farms. 10.1.4 – Conservation agriculture and increasing soil organic matter 10.1.8 – Management of buffer strips to reduce N leaching
IE	No – condition of entry	Actions involving reduced fertiliser inputs are supported by ongoing advisory support, as well as compulsory mid-cycle review of the Nutrient Management Plan, and a reactive review should the farming system or intensity change at any time.  GLAS (Green, Low-carbon Agri-environment Scheme) also provides various options for land management activities that are in keeping with minimising nutrient use and leaching, e.g. minimum till, buffer strips, restricting access of cattle to water courses, environmental management of fallow land, etc.

**Box 4: RDP-supported nutrient management approaches in Sweden, through training and the creation of wetlands.**

In **Sweden, Gotland**, M111 (Vocational training and information actions) was used in the previous programming period to provide free advice to farmers (training courses, field excursions, newsletters, etc.), on approaches and the benefits of reducing nutrient run-off and reducing greenhouse gas emissions. The project financed through this measure (Greppa Näringen – catch the nutrient) was determined through a

national evaluation to be strongly correlated with the decreased levels of nutrients in water.

In the **Kristianstad** area of **Sweden**, this same project led to the application of RDP funding in the current period (through the basic services and village renewable measure (M7)) to support a farmer in the creation of a wetland in the agricultural landscape to help capture nutrient run-off from the farm and protect water bodies. The project aimed to achieve the reduce loads of nutrients in the stream Västra Orulundsån and to increase the biodiversity of plants and animals in the area. These objectives were achieved by financing the construction of a 1.7 ha wetland that cleans the water while at the same time providing a popular biotope for rare species. The project initially received advice from the advisor Naturvårdsingenjörerna within the Greppa Näringen project. A place that was suitable for constructing the wetland was identified and the application for support from the rural development programme was submitted. The process took a couple of years but when the application finally was granted the project could start. As a side benefit, the wetland can be used to store water for irrigation in dry periods. [https://enrd.ec.europa.eu/projects-practice/vatmark-kylinge-creating-wetland-tackle-eutrophication\\_en](https://enrd.ec.europa.eu/projects-practice/vatmark-kylinge-creating-wetland-tackle-eutrophication_en)

#### **Box 5: RDP supporting precision nutrient application through direct slurry injection**

In **Slovakia**, support for investments in agricultural holdings (M4.1) has been used to invest in new machinery for applying liquid fertilisers on cropland in order to protect ground and surface waters. The project contributed to enhancing the viability of the agricultural holding AT GEMER in the Nitra region of south-west Slovakia. Innovative agricultural technologies were used in the application of liquid fertilisers in crop production with the aim of distributing liquid slurry correctly with respect to the protection of ground and surface waters. This involved the development of irrigation networks on the farm over 200 ha for utilising the water-diluted liquid digestate from a biogas plant and liquid manure. Increased efficiency, soil protection, conservation of soil fertility and soil quality has been achieved along with the creation of up to 10-15 permanent and seasonal jobs on the farm. [https://enrd.ec.europa.eu/projects-practice/new-machinery-effective-application-liquid-manure-arable-crops\\_en](https://enrd.ec.europa.eu/projects-practice/new-machinery-effective-application-liquid-manure-arable-crops_en)

#### **Box 6: Using LIFE funding to demonstrate the benefits of more effective nutrient management**

In **Spain**, LIFE funding (**Crops for better soil, and sigAGROasesor**) has been used to demonstrate the benefits of effective nutrient management and increase the technical capacity of farmers.

- The **Crops for better soil project** aimed to demonstrate that organic farming with crop rotation is profitable without calculating CAP subsidies; to re-introduce autochthonous crops with added value for the soil and production; to develop new practices to improve performance and product quality and motivate farmers to move to organic farming. Participating farmers who volunteer receive professional training on organic production. Farmers contributed their own ideas which were evaluated by the agronomists. Soil samples were taken in all the plots to analyse respiration, pH, EC, MO, N-P-K, structure and texture. At the end of the project measurements were repeated. (<http://traditional-crops.com>)
- The **sigAGROasesor project** aimed to help farmers and farm managers to manage more efficiently and sustainably their crops, by making accessible all the available technical knowledge for self-management through a web tool, capable of making recommendations customised in real time for each agricultural plot, based on a series of specific variables and values. The project developed several Decision Support Tools (HAD) including: a HAD to recommend varieties; a HAD on fertilisation which analyses the nutrient balance at plot level and recommends the quantity and the optimal moment of application; the HAD for irrigation which assesses the water balance at the plot level and recommends quantity and time of irrigation; and the HAD for control which estimates the risk of the appearance of a disease at plot level. A total of 25 pilot programmes have been launched

among the five participating Spanish Autonomous Communities (Andalusia, Basque Country, Castilla-La Mancha, Catalonia and Navarre) to manage the validation and calibration of the various tools of the sigAGROasesor platform. (<http://agroasesor.es/en/el-proyecto.html>)

In **Italy**, the **HelpSoil LIFE funded project** (2013-2017) has been used to demonstrate the positive impacts on restoring soil functionality and improving the environmental performance of agriculture through improved soil management plans and conservation agriculture on 20 demonstration farms in the Po Valley and Veneto areas of Italy. Farmers, agronomists, and agriculture associations and companies were the main partners involved in the design and implementation phase of the initiative. The project tested and demonstrated conservation agriculture techniques combined with innovative management practices for agricultural soils with the aim of:

- Strengthening the ecological functions of the soils (carbon sequestration, increased fertility and edaphic biodiversity, protection against erosion);
- Encouraging efficiency in water use and irrigation practices;
- Increasing the efficiency of fertilisation, in particular the usage of animal effluents; and
- Reducing the use of pesticides for the control of plant pests and diseases.

Dissemination and communication actions were intended to reach – through an adequate initiative mix (website, open farm days, newsletters, seminars and conferences) – a wide number and type of relevant stakeholders (farmers, private and public technicians, citizens, institutions). Sharing knowledge between the demonstration farms has helped to improve the approach to conservation tillage practices in the area both from a farm productivity and environmental perspective. (<http://www.lifehelpsoil.eu/download/>)

***Box 7: Transnational cooperation through an EIP-AGRI operational group to develop a nitrogen calculator for organic and conventional agriculture***

In **Germany** an Operational Group from North Rhine-Westphalia in Germany is helping German organic farmers to prevent nutrient loss in their soils. A research institute from the Netherlands is a partner in this Operational Group. “The Louis Bolk Institute had developed a nitrogen calculator for organic and conventional agriculture,” says Operational Group coordinator Rachel Fischer. “The calculator model uses data on local weather, local soil structures, yield and fertiliser input, which is why we couldn’t just use the Dutch version.

“Researchers from the Institute are now helping us adjust the model to the situation in North Rhine Westphalia, specifically for organic farming. The tool will provide a useful support for farmers and advisers involved in nutrient management.” Ms Fischer is convinced that a transnational cooperation has many advantages: “This cross-border partnership has helped us a lot – and not only in the development of the calculator. We discovered that our partners from the Louis Bolk Institute had already conducted research on many issues that are also relevant to us, and vice versa. It definitely benefited us to look across the border.”

More information on the Operational Group ‘Nutrient management and long-term growth in yield in organic market farms’: [www.netzwerklaendlicher-raum.de](http://www.netzwerklaendlicher-raum.de) or in the EIP-AGRI Operational Groups database.

## 4. Recommendations

Drawing on the examples identified above, this section sets out proposed recommendations to support the better management of soil and water through the use of nutrient (and other) management planning in the 2014-2020 RDPs with reflections for policy developments beyond 2020.

In the fourth meeting of the Thematic Group, draft recommendations and conclusions were discussed in the context of three ‘lenses’ to ensure they are fit for purpose in improving the environmental

effectiveness of RDP implementation and the design of schemes to achieve local soil and water objectives. These were: the transferability of policy tools to different contexts across the EU; the benefits to farmers of achieving soil or water objectives on the ground; and the support managing authorities may need to implement the recommendations. The outcomes of this discussion have been taken into account in the conclusions and recommendations set out below.

The following recommendations are described in detail in the sections below:

- Ensuring that RDP support adds value to soil and water management
- Improving targeting and monitoring
- Encouraging and supporting action on the ground
- Working together to achieve results
- Soil management plans in the next programming period

#### 4.1 Ensuring that RDP support adds value to soil and water management

1. ***Soil Management Plans (SMPs), including a clear nutrient management plan component, that set out priorities, such as addressing erosion, compaction, soil health, water status and nutrient use, would provide a more complete picture of the actions needed on farms.*** Nutrient Management Planning is an important tool for addressing nutrient excess generated through different farming practices and ensuring the efficient use of inputs for production across the whole farm holding. Yet this is only part of the challenge in improving the management of soils and water where they are at risk on farms. To ensure benefits to farmers through the more sustainable management of soils and raising awareness of the risks and opportunities from different management approaches requires ongoing training and support (see recommendation #12).
2. An effective soil or nutrient management plan should include as a minimum: the careful analysis of land conditions (holding or field parcel); an understanding of what are the best management techniques for addressing any issues identified (and where these can be supported through RDPs); the integrated planning of land management decisions at the local level; and ensuring that the management plan and associated actions are implemented.
3. Ensuring the utility and effectiveness of a management plan requires a number of supporting conditions:
  - o Guidance (potentially in the form of a template) on how to prepare a consistent management plan and in which cases such a plan is needed;
  - o Guidance on how long a management plan should remain valid and when a new plan should be prepared; and
  - o The certification of soil testing laboratories to validate the initial assessment, ongoing monitoring and reviewing the effectiveness of the plan.
4. ***Soil management planning should be a prerequisite of support for soil and water management actions implemented through RDPs.*** This has the dual benefit of protecting and improving the management of the main basis of agricultural production (soils) and improving the environmental benefits of SMPs. In some contexts, greater acceptance of the use of management plans could be ensured through maintaining a voluntary approach for farmers.
5. Where Member States have chosen to implement soil or nutrient management plans through national law, support provided through RDPs must only be provided to actions that deliver

added value above the legal requirements. It is essential that *in the development of RDPs, careful consideration is given to where RDP support can add value to existing National or Regional requirements*. This requires the collaboration and involvement of: those ministries responsible for the implementation of legislation relating to soils and water; those ministries responsible for designing and implementing RDPs; different stakeholder groups with interests in or that may be impacted by the requirements of SMPs.

## 4.2 Targeting and monitoring

Targeted measures can have more specific and adapted benefits for farmers, with lack of targeting of payments to environmental priorities a recurring criticism of the CAP (ECA, 2011<sup>11</sup>).

6. Targeting for management plans should ensure that the right RDP interventions are directed towards the right farms and field parcels. This should be coupled with clear guidance for which measures and interventions, and for what duration a management plan should be prepared.
7. Management plans should *set out clear priorities (linked to the needs assessment carried out in RDP design) to be addressed in a given area or holding and highlight the benefits to farmers from both an environmental and production perspective*, particularly where alternative fertilisation or management practices are promoted.
8. Good implementation requires *ongoing monitoring and review to ensure the actions implemented through the plans are delivering the desired results* within an appropriate timeframe and allow for modifications of the plans as necessary. Soil and water quality monitoring is technically challenging; therefore, farmers and land managers should be provided with a baseline assessment against which their progress is monitored. RDP or national support can be used to establish such a baseline along with support for ongoing monitoring. In Sweden, farm level nutrient monitoring has led to a database of around 19 000 farm-level balances from around 8 500 farms undertaken as part of normal advisory visits.

In developing the monitoring tools and indicators, a *careful assessment of the ability to measure impacts of management practices should be undertaken*.

## 4.3 Encouraging and supporting action on the ground

9. *Demonstration farms and pilots, combined with dedicated extension services and advice through RDPs, should be developed* to encourage farmers to adopt SMPs and discover how they will benefit from their implementation.
10. The development of SMPs can raise awareness of the practicalities and benefits of soil and water management priorities to be addressed on individual holdings. Yet in order to deliver meaningful impact, it is important that a tangible link is made between the requirements of the plan and the implementation of actions necessary to achieve the plan's objectives. *Here RDPs should be used to set out clearly which measures or packages of measures can and should be used in different contexts to implement SMP identified priorities*. For example:

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<sup>11</sup> European Court of Auditors (2011) Is agri-environment support well designed and managed? Luxembourg: Publications Office of the European Union, Special Report No 7/2011). [http://www.eca.europa.eu/Lists/ECADocuments/SR11\\_07/SR11\\_07\\_EN.PDF](http://www.eca.europa.eu/Lists/ECADocuments/SR11_07/SR11_07_EN.PDF) .



- a. **M4** (4.1) in Slovakia is used to support investment in machinery and irrigation infrastructure to apply nutrients in a more targeted and efficient manner;
  - b. **M7** (7.2) in Portugal is used to support integrated production based on the nutritional needs of plants. Such an approach could be used to help implement SMPs;
  - c. **M10** (10.1.1) in Finland is used to put in place a five-year cultivation plan involving soil quality analysis and fertility analysis, along with record keeping. Other AECM measures are then tailored on the basis of the cultivation plan, such as M10.1.2 relating to the spreading of slurry on fields. A similar approach is taking place in Italy – ER.
11. Ongoing **training for farmers and farm technicians** is vital for them to be able to implement actions necessary for delivering SMPs. For example, the use of Measure 7.2 in Portugal for integrated production requires beneficiaries to demonstrate special qualifications either from curricular training or from the attendance of specific vocational training courses in integrated production.
  12. **Pilot and demonstration farms** where soil management plans have been developed and actions implemented to show the benefits and impact of using SMPs can encourage the wider uptake of soil and water management actions and help to develop new approaches. Here support through other EU funds can be used, such as LIFE funding, or the use of Operational Groups supported through EIP-AGRI could play an important and complementary role alongside support through RDPS.
  13. When planning how management plans should be put in place, managing authorities should consider whether land is ‘rented’ or ‘owned’ and therefore if any specific implementation conditions are needed to ensure there is sufficient ownership of the plan and that it is implemented over successive years.

#### 4.4 Using NMPs in a multi-actor approach to improve working together to deliver results

Delivering nutrient or soil management is, in many cases, required to address issues in areas larger than individual farm holdings, such as NVZs. However, the actions to implement these plans are required at individual farm level. Further details and recommendations on multi-actor approaches can be found on the respective TG report on multi-actor approaches.

14. **Going beyond farm level** – For effective soil and water management, support for the implementation of soil management plans through cooperatives or multi-actor approaches should be explored through the use of RDP measures (e.g. M16 or M10);
15. **Vertical integration** – In its focus group on nutrient recycling, one of EIP-AGRI’s conclusions noted that *“there is a need for setting up cooperation between different types of stakeholders to improve tailor-made production of fertiliser products as well as enhance marketing of such novel products. Here RDP support, again through M16, could be used to link technology suppliers, product blenders and marketers to transfer experience and expertise and cooperating locally to think out of the box and explore new markets for recycled nutrients (e.g. organic farming, landscape management, public domains etc.) and work on acceptance by tackling existing legal barriers. Develop business models while looking at the environment and integrate environmental protection and sustainability in procurement and marketing.”* EIP-AGRI Focus Group on Nutrient recycling – Final Report<sup>12</sup>

<sup>12</sup> [https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri\\_fg\\_nutrients\\_recycling\\_final\\_report\\_2017\\_en.pdf](https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/eip-agri_fg_nutrients_recycling_final_report_2017_en.pdf)



## Annex 1: Summary tables

Table 1: Presence of NMP in SMR or RDP

	NMP in SMR	Area	NMP in RDP (M10)
AT	<b>Nitrate Action Plan</b> requires: record keeping and application according to plant needs <b>AT Water Act</b> requires: limits to fertiliser application near water <i>NMP not explicit</i>		Plans and records on fertilisation and soil sampling
BG	Five-year nutrient management plan and soil sampling with laboratory analysis was required under the anti-erosion plan.		
EE	<b>EE Water Act:</b> Fertilisation plan Record keeping	NVZ	Crop rotations Water protection training Regional soil protection Environment-friendly horticulture
ES-CL	Fertiliser records (SMR1) Registration and appropriate use phytosanitary	NVZ	Soil analysis to establish programme of fertilisation
FI	-		Five-year cultivation plan, including soil analysis and fertility analysis Record keeping
FR	Nitrates Directive has been implemented in France through a national action programme (Decree 2011/1257 of 10 October 2011) which specifies the actions to be implemented in the vulnerable zones. 4) fertilisation plan requirements and fertiliser spreading logbook	NVZ	
HU			Management zone soil samples and lab analysis are used as a basis for precision nutrient management plans at an individual farm (280 hectares – corn, wheat, barley, sunflower production) in a highly eroded landscape (Vértessalja area).
IE	Record keeping required If farming > 170kg and < 250kg Nitrates Derogation is required, which in turn requires a fertilisation plan to be created.	ALL	Nutrient management plan in first year of AECM
IT-ER	N Directive for NVZs (and applied to all land via XC) requires farmers to adopt a fertiliser management plan based on a standard set of soil analyses (based on sampling), and to set a specific nutrient balance for each crop.	ALL	M10.1.3 (fertiliser use) sets out a series of actions that farmers must commit to for a 5-year period on arable farms (see below). There are also measures for conservation ag & increasing SOM (10.1.4) & management of buffer strips to reduce N leaching (10.1.8)
LV	In NVZs "a person, who applies fertilisers over an area of 20 ha and more, as well as grows vegetables, fruit trees and berry bushes over an area of 3 ha and more, shall prepare and implement a <b>fertilisation plan</b> "	NVZ	
NL	Crop protection plan and farmers are required to keep records of manure application and use. These are requirements of the Nitrates Directive and derogations in the Netherlands. The farmer has to have a balance for nutrients on his farm at the farm-level (not at parcel level, but the type of parcels is relevant for the amount of nutrients that are supposed to be utilised by the plants. Excess manure is registered and has to be transported off the farm.		A number of the AECM do involve support for management that is beneficial for soils and water, but no management planning is required. In most cases, an overarching plan is developed by the 'collective' but there is no specific nutrient management plans at the parcel level. One habitat scheme under the AECM measure is specifically aimed at water quality and the planning concerning this could be seen as a type of nutrient management plan.
PL	<b>Nitrate Vulnerable Zones</b> For each NVZ local water management authorities draw	NVZ	

	NMP in SMR	Area	NMP in RDP (M10)
	<p>up action plans aimed at the reduction of nitrogen emission from agriculture. The rules defined in the plans apply to the whole country.</p> <p>Within this there is an obligation to draw up a <b>fertilising plan</b> for farmers who:</p> <ul style="list-style-type: none"> <li>- run breeding or raising of poultry above 40 000 places or breeding or raising of pigs over 2 000 places for pigs weighing more than 30 kg or 750 places for sows;</li> <li>- operate more than 100 ha of agricultural land located on NVZ.</li> </ul> <p>Farmers are also obliged to provide details of a <b>plan to balance amounts of nitrogen</b> and of sale contracts of natural fertilisers in case they are produced in excess to farm area. To all farmers this applies as follows:</p> <ul style="list-style-type: none"> <li>- training on the use of pesticides,</li> <li>- certification of sprayers,</li> <li>- rules on disposal of packaging, cleaning and washing machinery.</li> </ul>		
PT	<p><b>Pre-requisite for AECM</b></p> <p>Farm management plan Irrigation plan Fertilisation plan (including record keeping)</p>		<p>The AECM (M7.2.1) looks as if it pays to maintain IP, but requires a few additional actions depending on type of farm (e.g. min/max LU/ha; soil vegetative cover, min till practices)</p> <p>There is also a measure for soil conservation (M7.4.1 – direct drilling; and 7.4.2 – grass cover between rows for permanent crops) which seems also to cover some of the additional actions mentioned under the M7.2.1 above.</p>

Table 2: Inclusion of management plans in entry-level agri-environment schemes 2007-13

Member State / Region	Plan	General	Grazing	Input
Belgium (Flanders)				X
Bulgaria				X
Estonia		X		
Finland (Åland)		X		
France				
Corsica	X			
Guadeloupe	X			
Guiana	X			
Martinique	X			
Reunion	X			X
Germany				
Brandenburg and Berlin		X		
Niedersachsen and Bremen			X	
Rhineland Pfalz		X		
Sachsen	X			
Schleswig-Holstein				X
Thuringen	X			
Ireland		X		X
Italy				
Abruzzo			X	
Emilia Romagna				X
Friuli Venezia Giulia	X			
Lazio		X		X
Liguria	X			
Lombardia				X
Marche	X			X
Molise	X			
Piemonte			X	
Sicily	X	X		
Toscana	X			
Umbria	X			
Veneto	X	X		
Luxembourg				X
Netherlands		X		
Poland		X		
Portugal (Azores)	X			
Slovenia			X	
Spain				
Andalucia		X		
Balearic Islands	X			
Basque Country	X			X
Castilla la Mancha			X	
Extremadura	X			
La Rioja		X		X

Member State / Region	Plan	General	Grazing	Input
Sweden		X		X
United Kingdom				
Northern Ireland		X		X
Scotland	X		X	X
Wales		X		

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