

## Working Document

### Background briefing: Nutrient management plans

#### 1.1 Introduction

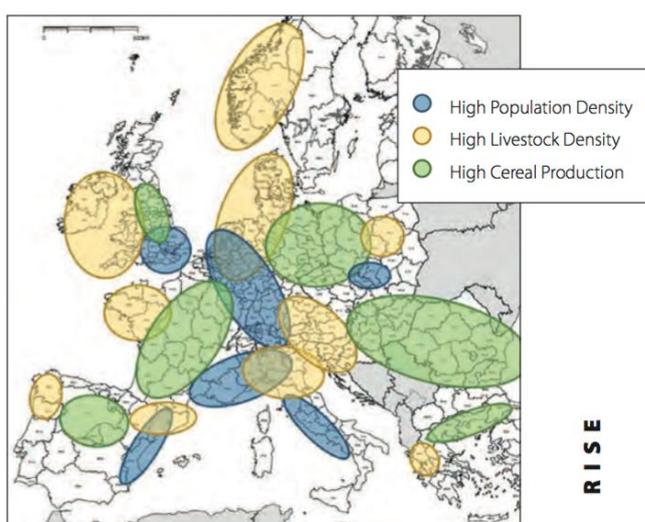
The overall aim of this short briefing is to:

- provide a summary of experience to date with nutrient management plans (and similar related plans) in the field of rural development policy and its relationship to the sustainable management of soils and water; and
- identify knowledge gaps and areas where research for the TG could add value in the context of RDPs.

#### 1.2 Nutrients – too much of a good thing?

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 or sub-strata. Conventional farming systems are highly modified from their natural counterparts. In conventional cropping systems, nutrients (mainly Nitrogen, Phosphorous and Potassium (NPK)) 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 cropping cycles. In conventional livestock production systems nutrient inputs are directed at animal consumption either through feed additives or forage (such as pastures and silage), in addition excess nutrients are generated in the form of manures and slurry, which due to the

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



Source: Figure 14 cited in [Buckwell et al, 2014](#)

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) (**Error! Reference source not found.**).

In simple terms, it is the excess presence of nutrients, either through over application in cropping systems or excess

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

generation in livestock systems that leads 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 responses over time. Nitrogen application has increased by 5% between 2006 and 2015, whereas phosphorous, a finite resource which has to be imported into the EU, has declined in use by around 20% between 2006 and 2015<sup>2</sup>.

The presence of excess nutrients in ecosystems is harmful to the environment. EU agriculture is responsible for 94% of ammonia emissions (largely from the storage and application of manure and fertilisers); 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 varies, 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 notes the following. 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. The area in exceedance is projected to further decrease to 54 % in 2020 for the EU-28, assuming current legislation is implemented. However, these trends are not uniform across the EU with future projections suggesting declines in most areas, with the exception of some 'hot spot' areas in western France and the border areas between Belgium, Germany and the Netherlands, as well as in northern Italy<sup>3</sup>.

In European agriculture the key challenge for nutrient management is therefore to ensure that the right levels of nutrients are available to 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 spurred on by Commissioner Hogan in his thoughts and intention 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>4</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*".

RDPs have a key role to play in these activities and have done so over successive programming periods. Support for extended buffer strips, modification to ploughing regimes, low- or no-input agriculture, 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) have been produced that address nutrient inputs and use (JRC, 2015)<sup>5</sup> as well as other detailed publications and recommendations on the subject (see Alterra et al, 2011b and Buckwell et al, 2014). Importantly actions need to be targeted to the right farms, such as those 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 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 much more

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<sup>2</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>3</sup> <https://www.eea.europa.eu/data-and-maps/figures/exposure-of-ecosystems-to-eutrophication>

<sup>4</sup> Speech at European Policy Centre Dialogue on Water & Agriculture in Europe, Thursday 28th September 2017, Brussels.

<sup>5</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>

onerous 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 amongst farmers of these issues and how they can be addressed through RDP supported activities.

### 1.3 What are nutrient management plans?

Management plans set out the required 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 case 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 through 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).

Nutrient management plans are not a new approach in the EU and have been in use in the CAP for a number of 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 take a variety of forms, including: Soil management plans; Water management plans; Crop protection management plans; 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.

Nutrient and other management plans were removed from some previous RDPs in the previous programming for a variety of reasons. For example, in England (UK) four options for management plans (soil, manure, nutrient and crop protection) were withdrawn at the start of the 2007-13 RDP because the Commission considered that these were too close to the reference level, with very little added value for the public expenditure<sup>6</sup>. In Bulgaria some requirements were removed because of duplication with national legislation. In Italy, although there was no duplication with GAEC 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 this support from their RDPs and, in consequence, have suffered a lower uptake rate of agri-environment schemes as a whole (Keenleyside et al, 2011).

### 1.4 What are the benefits of nutrient management plans?

The main benefits of nutrient management plans are:

- That an 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;

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<sup>6</sup> It was argued by the Commission that manure and nutrient management plans duplicated a forthcoming legislative requirement under the revised Nitrates Action Programme; that there was insufficient distinction between the requirements of the agri-environment Soil Management Plan and those of the GAEC Soil Protection Review; and that the Crop Protection Plan covered what should be good farming practice.

- That 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 **raise awareness amongst farmers** and land managers about the implications of excess or inappropriate use of nutrients in relation to soil and water objectives, as opposed to just crop requirements;
- **Identify remedial actions** to address excess nutrients and thus support implementation and targeting of activity on farms;
- They allow inspectors and the competent national authority to **check and review the approaches being taken** on a farm and throughout a water catchment or NVZ.

### 1.5 Summary of examples of nutrient management plans from across the EU.

The following are some selected examples of where nutrient management plans have been implemented in the previous programming period (2007-13) or earlier. To date there has not been a comprehensive review of the use of nutrient management plans in the current (2014-2020) programming period *which could be a useful next step in the work of the Thematic Group*.

Results from a review of entry-level agri-environment schemes from the 2007-13 period are included in Table 1 below. Table 1 includes different types of management plans used in Member States. The most relevant to the Thematic Group and most similar to nutrient management plans are 'Management plan - inputs', with the other types of plans included to show the context and use of management plans in RDPs more broadly<sup>7</sup>. Input management plans here include those RDPs where a farmer is required to set out a plan of operations for the holding or farm detailing the amount of inputs (fertilisers) to be used on the holding. Some examples of nutrient management plans are set out below for England (UK) and Bulgaria.

**England, UK (2014-2020):** Nutrient management planning is an eligibility requirement of some agri-environment-climate scheme options (under the Countryside Stewardship scheme), such as the conversion of arable land to grassland with low inputs. Applicants must demonstrate they are using a recommended fertiliser management system across the farm for the duration of the agreement, seek advice to adopt a plan if one is not in place, or demonstrate their qualification for exemption<sup>8</sup>. In implementing the plan, farm records must confirm that: applications of N and P fertiliser to each crop in each land parcel as planned before any N or P is applied; and periodic soil testing is undertaken on relevant areas (every 5-7 years). Advice is provided to applicants through the Farm Advice Service along with recommendations on fertiliser management systems provided in scheme guidance (Box 1).

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<sup>7</sup> **Management plan – general:** This action describes the requirements to set out a plan of operation for the holding or farm area outlining the environmental management to be implemented. Example: Lazio (Italy) – the farmer is required to commission an action plan, prepared by a qualified professional that should record the type, manner and timing of implementation of interventions. The plan should also include the identification of land parcels where different types of operations will be carried out.

**Management plan – grazing:** This action describes the requirements to set out a plan of operation for the holding or farm outlining that specifically relates to the use of grazing animals. Example: Abruzzo - farmers are required to establish a five-year grazing plan to encourage the renewal of grassland areas.

<sup>8</sup> including the following criteria: >80% of land is grassland, no more than 100kg N/ha is applied per year as organic manure, no more than 90 kg N/ha yr is applied from manufactured fertilizer, and no organic manure is brought onto the farm site.



Table 1: Inclusion of 'management plans' in entry-level agri-environment schemes 2007-2013

Member State / Region	Management Plan	Management Plan - General	Management Plan - Grazing	Management Plan - Input
Belgium (Flanders)				X
Bulgaria				X
Estonia		X		
Finland (Aland)		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
Sweden		X		X
United Kingdom				
Northern Ireland		X		X
Scotland	X		X	X
Wales		X		

Source: Keenleyside et al, 2011

### Box 1: Example of nutrient management plan guidance in England.

There are several recommended fertiliser management systems available, as well as guidance and advice, e.g:

- RB209(the Fertiliser Manual) which helps farmers and land managers better assess the fertiliser required for the range of crops they plan to grow. Other sources of fertiliser nutrient advice are also available; and
- The industry Tried and Tested Nutrient Management Plan <http://www.nutrientmanagement.org/assets/12027>

There are a number of tools available to help Agreement Holders comply with the requirement to plan farm nutrient use efficiently. These include:

- PLANET:a software tool to help farmers with field level nutrient management;
- MANNERNPK: a software tool that provides farmers and advisers with a quick estimate of crop available nitrogen, phosphate and potash from applications of organic manure. It is available at: [www.planet4farmers.co.uk/Manner](http://www.planet4farmers.co.uk/Manner); or
- ENCASH: a software tool that allows farmers and advisors calculate the nitrogen in manure produced by different types of permanently housed pigs and poultry.

All three software tools are on the PLANET website at: [www.planet4farmers.co.uk](http://www.planet4farmers.co.uk). There may be other packages providing a similar service.

**Bulgaria (2007-13):** The Bulgarian soil erosion control scheme (part of its 2007-13 RDP) has a pre-application requirement to prepare a **five-year anti-erosion plan**. One of the actions under the soil and water protection scheme requires farmers to take soil samples for analysis of nitrogen, phosphorus and potassium and prepare and implement a **five-year nutrient management plan** with the support of an advisor or qualified agronomist. The costs of these specialist services have not been covered since the end of 2009, when these services were no longer provided free of charge by the government advisory and laboratory service<sup>9</sup>, but agri-environment payments were not changed to reflect this additional cost, nor was provision transferred to the free Farm Advisory Service (FAS) (Keenleyside et al, 2011).

### 1.6 Nutrient management plans – key challenges and opportunities.

There are a number of challenges in realising the benefits from nutrient management plans.

- **Content:** The plans need to be accurate, addresses the relevant area(s) of a farm or holding and includes the necessary safeguards to reduce diffuse water and soil pollution;
- **Enforcement:** The plan and actions detailed in it need to be implemented. This has been one of the main issues with the implementation and use of management plans in the past (along with duplication with existing reference level requirements). For example, in England (UK) agri-environment payments for nutrient management plans were made for the plan to be

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<sup>9</sup> The free advice was funded under measure 143 provision of advisory services to farmers; in Bulgaria and Romania until 2009 this covered RDP measures for young farmers, semi-subsistence and agri-environment, but from 2010 to 2013 it only provided free advice for the semi-subsistence measure. Until the end of 2009 under this scheme the National Agriculture Advisory Service (NAAS) advisors were paid to develop the whole package of the necessary documents of the farmers to participate in the agri-environment schemes. This also included the **preparation of the nutrient management plans**. The requirement for soil N, P, K analysis was not included in the payment calculation because when the measure was designed (NAAS) had a laboratory doing this analysis free of charge for farmers. Due to structural reforms the situation within NAAS was changed and the laboratory is not part of the advisory services anymore. The payment rates were not changed correspondingly.

produced, but not to implement the actions within the plan (although this was assumed to be implicit). In response to the plans being withdrawn from the scheme by the Commission (on the approval of the RDP) additional management options were introduced in the agri-environment scheme to address water quality<sup>10</sup> along with targeted advice provision.

- **Monitoring:** Plans need to be reviewed to see if they are effective in preventing nutrient leaching from farms. This requires ongoing monitoring checks and can necessitate soil sampling and analysis.
- **Advice:** Whilst most farmers will have a good understanding of the nutrient needs for their crops, they may be less aware of the implications of different nutrient management approaches on the environment and water courses, particularly where these impacts are not seen on the same farm (as is often the case in catchments). Advice and support for implementing actions is therefore important to ensure that management plans are implemented effectively and that farmers understand the rationale for doing so.

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<sup>10</sup> Including: in-field grass areas to prevent erosion and run-off; 12m buffer strips for watercourses on cultivated land (wider strips are thought to have greater impact); enhanced management of maize crops to reduce soil erosion and run-off; maintenance of watercourse fencing; and use of winter cover crops (to reduce nitrate leaching and reduce runoff at a field scale).

## References and further reading:

Alterra, Plant Research International Wageningen, NEIKER Tecnalia, ITP and JTI (2011a) Farming practices in relation to water pollution risks, *Recommendations for establishing Action Programmes under Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources*. Alterra, Wageningen-UR, Wageningen.

<http://ec.europa.eu/environment/water/water-nitrates/studies.html>

Alterra, Wageningen, P R I, NEIKER Tecnalia, ITP and JTI (2011b) Recommendations for Measures, *Recommendations for establishing Action Programmes under Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources*. Alterra, Wageningen-UR, Wageningen. <http://ec.europa.eu/environment/water/water-nitrates/studies.html>

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