

Climate change: be part of the solution

Focus on: nutrient management

Effective nutrient management for crops and livestock is an essential activity on all farms. Good nutrient management planning can bring a number of important benefits: minimising emissions of greenhouse gases from nitrogen (N) inputs, reducing the incidence of diffuse water pollution, and helping farmers save money through optimising productivity.

WHAT IS THE PROBLEM?

Nitrogen emissions to air from farms include ammonia (NH_3), nitrogen dioxide (NO_2) and nitrous oxide (N_2O), a greenhouse gas¹. Nitrous oxide is particularly significant because it is about 300 times more damaging as a greenhouse gas than carbon dioxide (CO_2) and is one of the biggest contributions agriculture makes to climate change.

Every process and farm activity that interacts with soil organic N or returns or adds nitrogen to the soil (in the nitrate or ammonium form) increases the likelihood and extent of nitrous oxide formation.

Soil nitrous oxide emissions originate from three sources: soil microorganism activity (55%); organic manure applications (18%); and nitrogen fertiliser applications (27%).

How can nutrient management be part of the climate change solution?

Efficient use of nutrient inputs on a farm is important for the climate as well as productivity. By improving nitrogen efficiency, less nitrous oxide will be released, reducing agriculture's contribution to climate change. The launch of the Government's Low Carbon Transition Plan (July 2009) requires the agricultural industry to voluntarily reduce greenhouse gas emissions to at least 6% lower than currently predicted by 2020. Effective nutrient management is central to achieving this target and demonstrating the industry's ability to act without regulation.

What does a nutrient management plan involve?

Planning is necessary to balance nutrient supply to the

¹ In addition to these direct emissions, nitrous oxide is released during the manufacture of nitrogen fertilisers (as well as carbon dioxide from fossil fuels used in the process). These are considered as indirect greenhouse gas emissions associated with agriculture.



demands of a crop on a field-by-field basis, or with livestock to balance nutrient intake with those needed for growth and lactation.

A planning approach essentially involves:

- Testing, to establish what nutrients are lacking and where
- An assessment of the nutrient resources that are already at the farmer/land manager's disposal (e.g. manures, slurries, digestate)
- An assessment of how best to fill the gap between the two

A good plan must include all nutrient-based activities: safe and secure nutrient storage, management and timely use according to recognised recommendations. See 'Fertiliser Manual (RB209)'.

A wide range of tools, supporting information and advice are available to develop and continually improve upon the nutrient management capabilities of a farm. Tools range from paper based systems, such as [Tried & Tested](#), to more advanced software systems for those more acquainted with the process (see [FIND OUT MORE](#), on page 4).

PLANT NUTRIENTS²

It is important to estimate, as accurately as possible, the amount of nitrogen required by the crop and to apply it in response to periods of crop demand. The amount of fertiliser required will be influenced by yield potential, but also by soil type, previous crop, previous fertiliser and manure use, and winter rainfall which will affect soil nutrient supply.

Opportunities from effective crop nutrient planning

- Potential reduction in the farm's direct and indirect greenhouse gas emissions of nitrous oxide and in levels of diffuse water pollution
- On farms where both organic manures and purchased fertilisers are used, the two sources must be accurately integrated to meet crop needs. Financial savings in nitrogen fertiliser in excess of £100 per ha can be realised through more efficient use of nutrients in manures
- Better use of organic materials to maintain or increase soil organic matter content
- More efficient use of manufactured fertiliser can result in financial savings

Risks of not carrying out crop nutrient planning

- The application of excess nutrients is uneconomic and can lead to increased emissions of nitrous oxide and diffuse water pollution; or
- The use of too little nutrient risks nitrogen deficiency and a tailing-off of crop performance with consequences for yield, quality and farm income

Neglecting to measure soil nutrient supplies through assessment or soil analysis can lead to wrong decisions on the amount of nutrient applied, risking additional greenhouse gas emissions and water and air pollution. If soil pH, phosphate, potash or sulphur supplies are limiting then the nitrogen applied cannot be utilised efficiently by the crop.

Uneven spreading of applied nutrients due to inconsistent materials, or the inadequate maintenance, setting and calibration of spreading equipment can



lead to excess nitrogen in some parts of the field and/or nutrient deficiencies in other parts of the field, also leading to poor nitrogen utilisation.

What action can be taken?

- Test or assess, as appropriate, the [nutrient content of soils](#) for:
 - Nitrogen: every year, at around the same time, establish the soil nitrogen status, using the soil nitrogen supply (SNS) or, in an arable or ley/arable situation, the soil nitrogen analysis (SMN) method, to account for the variabilities resulting from the previous crop, rainfall and soil type
 - Soil pH and other nutrients (phosphate, potash and magnesium): conduct soil analysis every 3-5 years on every field and maintain, run down or build-up soil reserves as recommended for the crop or crop rotation
- Assess the risk of other nutrient deficiencies and take corrective actions to apply the nutrient(s) required:
 - Test or assess the nutrient content of all organic materials to be applied to soils or crops. Laboratory testing of manures and slurries will provide a more precise evaluation of their nutrient content and can be a very worthwhile expenditure
 - Calculate additional fertiliser nutrients by using ['Fertiliser Manual \(RB209\)'](#) which includes guidance on the use of lime, fertilisers and organic manures
 - Maintain, set, calibrate and check spreading accuracy of all slurry/manures application equipment and fertiliser spreaders according to manufacturers' instructions and for each batch of material spread
 - Use known organic materials and good quality fertiliser products from your own farm or reputable suppliers. A currently registered [FACTS Qualified Advisor \(FOA\)](#) can help with these decisions

² For simplicity's sake, we have only covered nitrogen in respect to nitrous oxide.

ANIMAL FEED NUTRIENTS

Opportunities from effective animal nutrient planning

Planning animal nutrient requirements enables optimum use of feed supplements to deliver economic benefits and reduce the amount of nitrogen (and phosphorus) excreted.

- Avoiding excess nutrients in the diet and/or making dietary nitrogen more available potentially allows the amount of nitrogen in the diet to be reduced per unit of production. This gives cost savings without adversely affecting animal performance
- Improvements in the feeding regime of livestock can optimise the nitrogen utilisation rate and so reduce nitrogen excretion. This may be achieved by managing animals in smaller groups based on their individual feed requirements. The opportunities are greatest for pigs and dairy farms with parlour feeding (however group/phase feeding may not always be practical if labour and housing facilities are limited or if livestock systems are based primarily on grazing). Advice should be sought from an animal nutritionist on more precise

formulation of feeds for pigs and poultry, and on rations for ruminants including forages

Risks of not carrying out animal nutrient planning

- Inaccurate assessment of an animal's actual nutritional needs can lead to some animals receiving more or less than their nutrient requirements. This could then lead to increased diffuse water pollution through loss of excreted nutrients into soils and water, with added potential for nitrous oxide emissions
- Reducing nitrogen per unit of production also increases the risk of loss of production, and can result in poorer animal welfare

What action can be taken?

- Test or assess the nutrient content of non-manufactured animal feeds, especially forages
- Consider the benefits of animal nutritional advice and group feeding to plan feeding rations as part of an overall nutrient management plan
- Consider using feeders that can deliver different diets within the same building



FIND OUT MORE

- Recent studies by IGER suggest that improvements in good nutrient management practices can reduce N₂O emissions by 10-15% based on current production levels
- Read the [Farming Futures Fact Sheet 20: Focus on soil management](#)
- Read the [Farming Futures Fact Sheet 17: Focus on anaerobic digestion](#)
- Watch the [Farming Futures video case study on smart technology and nutrient management](#)
- Watch the [Farming Futures video case study on how to measure your farm's carbon footprint](#)

A wide range of tools, supporting information and advice are available:

- [Tried & Tested](#) - a paper based nutrient management plan developed by the industry (NFU, AIC, FWAG, LEAF and CLA). An aid to making nutrient planning and recording simple and practical for you and your farm through advice, guidance and examples of best practice.

To request a free copy call 024 7685 8896 or email nutrientmanagement@nfu.org.uk.

- [Defra Fertiliser Manual \(RB209\)](#)
- Planet – a software package based on the 'Fertiliser Manual (RB 209)', visit www.planet4farmers.co.uk
- Guidelines for Farmers in NVZs, visit [Defra web pages](#)
- Codes of Good Agricultural Practice, visit [Defra web pages](#)
- Codes of practice for the protection of water pollution from the storage and handling of solid/fluid fertilisers, visit www.agindustries.org.uk
- For FACTS Qualified Advisers/agronomists in nutrient management, visit www.basis-reg.com

Other tools are in development and will be available towards the end of 2009:

- HGCA Nitrogen Guide
- [MANNER-NPK software](#)



FARMING FUTURES

For news, events, and links to stories about how other farmers are managing climate change on their farms, please visit: www.farmingfutures.org.uk

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