



Land management changes required to tackle nitrate pollution

Researchers have identified a range of effective measures for livestock farmers to tackle nitrate pollution and bring water quality in line with European standards. Reducing grazing time was found to be the most effective measure, but also the most costly. However, other compromise solutions, such as applying fertiliser more efficiently and correcting soil deficiencies, would also be effective and could save farmers money overall.

Intensive farming is a major cause of nitrate pollution. Overloading fields with manure by grazing too many animals or using too much fertiliser on soils causes nitrate leaching - the draining of nitrogen-containing compounds from the soil into water systems. High levels of nitrates in water can be harmful to people and the environment. In the EU, legislation under the Nitrates Directive 91/676/EEC¹ aims to reduce nitrate pollution and has had some success.

In this study, the researchers applied computational methods to estimate the cost-effectiveness of various nitrate leaching reduction measures on hypothetical farms in the UK. They looked at different types of land: grassland used for breeding of livestock or dairy and sheep farming, and grassland used only for grazing or silage production. For each farm type, they estimated total nitrogen production. They used models to predict how nitrates would be taken up by grass or lost to water systems depending on different variables, such as climate and type of grass or soil. In the UK, the government has created Nitrate Vulnerable Zones (NVZs), which have covered 62 per cent of England since 2010.

A range of nitrate pollution mitigation measures and their cost-effectiveness were considered. These were divided into plant-based approaches, such as the type of seeds sown, animal-based approaches, such as no grazing, manure-based approaches, such as uniform application of manure, and fertiliser-based approaches. The researchers also considered combined approaches, including the NVZ zones, which restrict manure application by weight and time of year.

Their results show that most nitrate leaching mitigation measures are effective, but that relative effectiveness depends on local conditions, such as soil type and climate. For dairy herds, measures that reduced the number of animals and duration of grazing, and careful management of fertiliser and manure application, were most effective – leading to average reductions in leached nitrogen of around 31-32 per cent a year (from a baseline average of 27.5 kg of nitrogen leached per hectare per a year), but came with a high cost, estimated to be around £172-700 (€197-800) per hectare per year, on average. For beef herds, reducing the length of the grazing season was the most effective measure, reducing nitrogen leaching by an average of 18 per cent each year (from a baseline average of 26 kg of nitrogen leached per hectare per a year) and costing around £138 (€157) per hectare.

These results suggest that the most effective measures tend to be the most expensive, but other strong compromise solutions were identified. For example, correcting sulphur and potassium deficiencies in soil on dairy farms would reduce nitrate pollution to lesser extent but at a lower cost, and could potentially save farmers money - savings of around £93 (€106) per hectare per year were calculated, with average reductions in leached nitrogen of around 21 per cent. Similarly, adjusting fertiliser rates according to soil mineral nitrogen content could lead to average net financial savings of £172 (€196) per hectare per year for dairy farmers and moderate nitrate leaching reductions of 2-16 per cent.

The introduction of Nitrate Vulnerable Zones and associated measures in the UK was found to be very effective, at a small cost. However, costs incurred by the farmer, for instance, from lower milk production levels (as a result of reduced feed concentrates by dairy cows – a nitrate mitigation measure), may mean that compliance is not financially viable – depending on the market value of milk. The researchers conclude that financial or legal incentives may need to be considered to encourage farmers to adopt these nitrate leaching mitigation measures. The EU foresees financial support to farmers under the CAP, for adapting to new standards and agri-environmental measures.

1. http://ec.europa.eu/environment/water/water-nitrates/index_en.html

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