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Measuring the impacts of the Nitrates Directive on nitrogen emissions

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The EU's Nitrates Directive has led to significant decreases in nitrogen pollution in Europe, a new study suggests. Modelled scenarios with and without implementation of the Directive showed that it had resulted in a 16% reduction of nitrate leaching by 2008. These improvements could be further increased as implementation becomes stricter, the researchers conclude.

More nitrogen is applied to agricultural land, in the form of fertilisers and manure, than is removed in harvested crops and animal products. The majority of this surplus is lost to the environment via nitrate leaching into water bodies and through emissions of ammonia, nitrous oxide, nitrogen oxides and nitrogen gas. The surplus thus pollutes both air and water, leading to eutrophication and soil acidification.

The Nitrates Directive requires EU Member States to identify areas that are vulnerable to nitrogen pollution, known as 'nitrate vulnerable zones' (NVZs) and to implement action programmes to prevent and reduce pollution, for example, by limiting fertiliser and manure-use during certain times of the year, and by setting out conditions for their application.

This research was carried out as part of a wider EU-commissioned study which investigated the impact of the Nitrates Directive[1]. Using data from the GAINS model, EUROSTAT and FAOStat, researchers quantified the impacts of the Directive using the MITERRA-Europe model to compare scenarios with and without implementation of the Directive. Although the Directive was first adopted in the EU-12 in 1991, this study focused on the period from 2000 to 2008, when the level of implementation was more advanced.

The results suggested that, in the EU-27, total nitrogen losses from agricultural soils in 2008 amounted to 13 megatonnes. More than half was in the form of nitrogen gas emissions, a fifth was leaching of nitrates and another fifth was as ammonia emissions. Between 2000 and 2008 all forms of nitrogen loss fell, and the scenario results indicated a clear impact of the Directive.

In the scenario with Directive implementation, nitrate leaching was projected to be 7% lower than the scenario without the Directive in 2000, and 16% lower by 2008. Furthermore, according to the model estimates, the Directive had reduced nitrous oxide emissions by 3% compared to the scenario without the Directive in 2000 and by 6% by 2008. Similar effects were shown for ammonia emissions which were 1.1% lower with the Directive in 2000 and 3% lower in 2008.The greatest effects of the Directive were found in regions with high livestock density and fertiliser consumption, such as in Belgium, Ireland, the Netherlands and the UK.

The results indicate that the implementation of the Nitrates Directive in the EU-27 has already produced significant decreases in nitrogen emissions. Further decreases are expected with designation of more NVZs and stricter implementation of the action programmes. These improvements could be assisted by introducing new measures, such as decreasing protein in livestock diets. Separating manures into liquids and solids could also assist efforts by allowing nitrogen and phosphorus to be applied more efficiently.

1. The report "The impact of the Nitrates Directive on gaseous N emissions. Effects of measures in nitrates action program on gaseous N emissions" was contracted by DG Environment. See http://ec.europa.eu/environment/water/water-nitrates/pdf/Final_report_impact_Nitrates_Directive_def.pdf