

Effects of organic fertiliser and autumn fertiliser application on Nitrogen use efficiency on arable farms

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Intensive use of nitrogen fertilizer in some regions of Germany led to nitrogen pollution of the ground water and therefore to negative environmental effects. In 2016, European Court of Justice condemned the Federal Republic of Germany for violating the European Nitrates Directive (91/676/EEC). In the course of this, a demonstration project with a set of early indicators was developed to monitor nitrate loads from agricultural land. The monitoring approach combines analytical and calculatory indicators and aims at determining the effects of political measures on agricultural nitrate loads. Here, we focus on calculatory indicators i.e. nitrogen balances at field scale in five regions in Germany. These balances describe the total nitrogen loss potential. To further evaluate this potential, on-farm data from 48 farms is analysed with the concept of nitrogen use efficiency (NUE) to compare arable farms at field scale. Nitrogen output was used as indication for yield and a target value of $80 \text{ kg N ha}^{-1} \text{ a}^{-1}$ was set as a desirable minimum output to ensure productivity. In order to account for unavoidable losses, the target value for the nitrogen surplus was set to $50 \text{ kg N ha}^{-1} \text{ a}^{-1}$ and for the efficiency between 70 and 90 % NUE. The results show decreasing NUE with increasing amounts of organic fertilizer application. Likewise, excessive nitrogen fertilization in autumn reduces nitrogen use efficiency and thus increases nitrogen loss potential. This approach offers the possibility to identify potentials for the optimization of nitrogen use and thus to reduce nitrogen loads from arable farm land to ground and surface water.

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