Policy options to improve nutrient recycling

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Command and control
- Minimum manure storage period
- Manure spreading time
- Ban on broad ban spreading
- List of allowed technologies
- Obligation to process manure

Economic instruments
- Create monetary incentive to reduce pollution
- Freedom how to deal with issues
Economic instruments to use N in manure more efficiently

- N fertilizer tax (Austria, Finland, Sweden)
- Below economic fertiliser standards (Denmark, Flanders on voluntary basis + subsidy)
- Post harvest nitrate residues measurement (Flanders and France)
N fertiliser taks: Why should it not work?

- Simple and cheap to administer
- In line with carbon tax
- Farmers show to act as economic agents many times
- Economic optimum: marginal product of N-fertilizer = N fertilizer price / output price
N fertiliser taks: Why does it not work?

- Low price elasticity for fertilizer
- Fertilizer use is more responsive to commodity prices
- Intensive agriculture: economic optimum = technical optimum
- Not always a clear link between fertilizers and N leaching: no spatial implementation
- 40% difference in fertilizer use according to farm accounts versus official registration
Winter wheat yield response curve to N fertilisation (kg N/ha)

Source: YARA, 2012
N fertilisation use per UAA (kg/ha) for different countries

(source: Bel et al., 2002)
Suboptimal N fertilisation rates

- In Denmark since 1998: maximum rates of plant available N-application to 10% below economic optimum
- Incentive to use all available N as much as possible
What is link between fertilization and nitrate residue?

Source: D’Haene et al, 2014
Criticism to below optimum fertilisation rates

- Farmers lose profit
- High incentive to use N as possible on high value crops but lower on low value crops
- Only possible if N use is monitored correctly!
- Denmark supplemented the policy with command-and-control measures later (2003)
- Voluntary instrument in Flanders: adverse selection
Nitrate residue measurements

- Measuring residual nitrate in agricultural soils to a depth of 90 cm
- Sample taken between 1 October and 15 November
- = estimation of amount of nitrate possibly leaching to ground and surface water
- Instrument used in Flanders since 2004 in Bretagne since 2014
Measures in case of exceedance

- Soil sampling and professional fertilisation advice
- Fertilisation plan
- Auto-control of nitrate residue: soil sampling and analysis by accredited laboratories but farmer has to pay
- Catch crops
- Decreased fertilisation standards above 3rd and 4th threshold value
Evolution in number of parcels sampled

Number of parcels

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Evolution in mean nitrate residue per crop type

Nitrate residue in kg NO$_3$-N/ha

- Grassland
- Maize
- Beets
- Cereals
- Potatoes
- Vegetables
- Fruits
- Ornamental horticulture
- Other crops

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Limitations to nitrate residue measurement

- Sampling variability
- Weather influence
- Costly
Conclusion: policy options to improve nutrient recycling

- 2 policy targets => 2 policy instruments

- Reduction N leaching: nitrate residue measurement
- Reduction of resource depletion:
  - tax on N fertilizers
  - Below economic optimum fertilisation

- In combination with command and control?
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