Regulating nutrient use and farming practice

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Outline of the presentation

- Introduction
- OECD's instrument mixes project
- Arguments for using instrument mixes
- Arguments for restraining the number of instruments
- The instrument mixes used to address nutrients run-off in Denmark, the Netherlands, the UK and the US
- Possible instruments to address total nutrient amounts.
- Possible instruments to address other aspects of the problem.

Introduction

- OECD has been studying the environmental effectiveness and economic efficiency of instrument mixes used for environmental policy for several years.
- Have looked at:
  - Household waste management (Netherlands, UK)
  - Residential energy efficiency (Canada, UK)
  - Regional air pollution (Canada, Sweden)
  - Emissions to air of mercury (Norway, Sweden, US)
  - ➢ Non-point sources of water pollution in agriculture (Denmark, Netherlands, UK, US [Chesapeake Bay])
- Findings from that project represent the main input for this presentation

Arguments for using instrument mixes

- The 'multi-aspect character' of many environmental issues.
  - Where, when, and how a product is used can be just as important as the total quantity used.
- Non-environmental market failures that affect the market where the environmental problem occurs:
  - Information failures
  - Incomplete property-rights
  - Market power
- The need to address non-environmental policy priorities.
  - Social concerns, sectoral competitiveness concerns, etc.
- Positive interactions between some types of instruments.
  - Taxes and labels, trading systems and taxes, etc.

Arguments for restraining the number of instruments used

- Additional instruments might increase administrative costs.
- One instrument might limit the flexibility offered by another instrument:
  - A nutrient application standard can hamper the functioning of a tax or permit system, etc.
- Redundancies – some instruments do not provide any additional environmental or economic benefits.

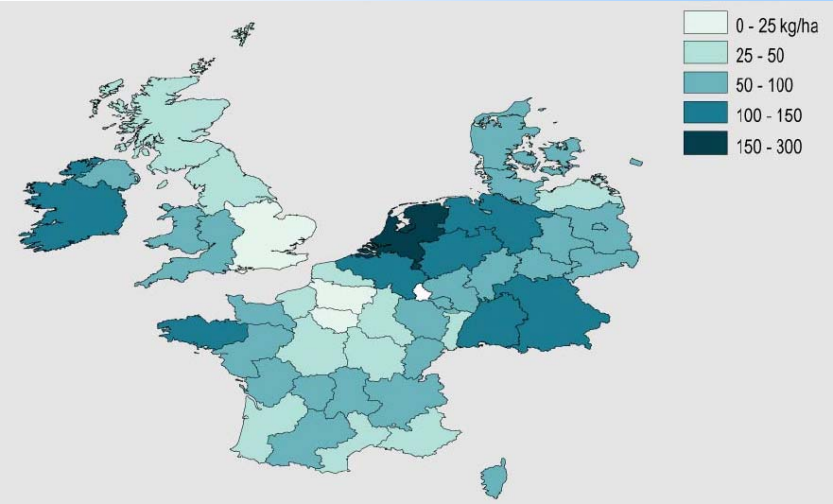
Non-point sources of water pollution in agriculture

The case study can be downloaded for free at
www.olis.oecd.org/olis/2004doc.nsf/linkto/com-env-epoc-agr-ca(2004)90-final

The focus **in this presentation** is only be nutrients run-off

Environmental problems related to non-point sources of water pollution

Nitrogen surpluses in Europe, 1999



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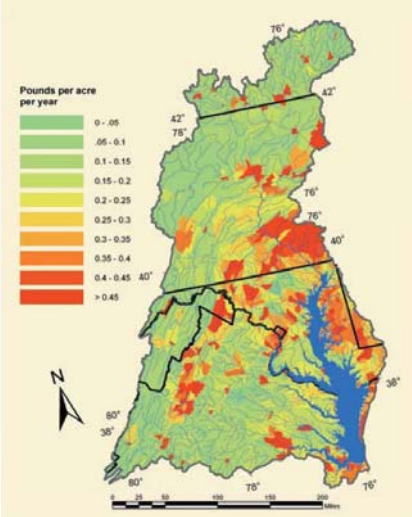
Source: RIVM (2004), www.rivm.nl/bibliotheek/rapporten/500031001.pdf

Environmental problems related to non-point sources of water pollution

Phosphorous reaching the Chesapeake Bay



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Source: www.chesbay.state.va.us/Publications/cost%20effective.pdf

Characteristics of the nutrients application problem

- *Plants need nutrients* to grow – the amount depends on a number of factors, including the weather.
- However, nutrients can *e.g.* contribute to *pollution of drinking water* and to *eutrophication* of fresh- and salt waters.
- It ***is*** a multi-aspect problem: In addition to the total amounts of nutrients applied, it is also important *when*, *where* and *how* they are applied, etc.
- Hence, one needs to apply *several* instruments.
- One should have a holistic approach, taking *all sources* of nutrients into account – not only chemical fertilisers.

Instrument mixes addressing non-point sources of water pollution

United Kingdom
- Upper limits on nitrogen use per area unit, restrictions on timing, information
- Cross-compliance requirement in EU agriculture policy (CAP)

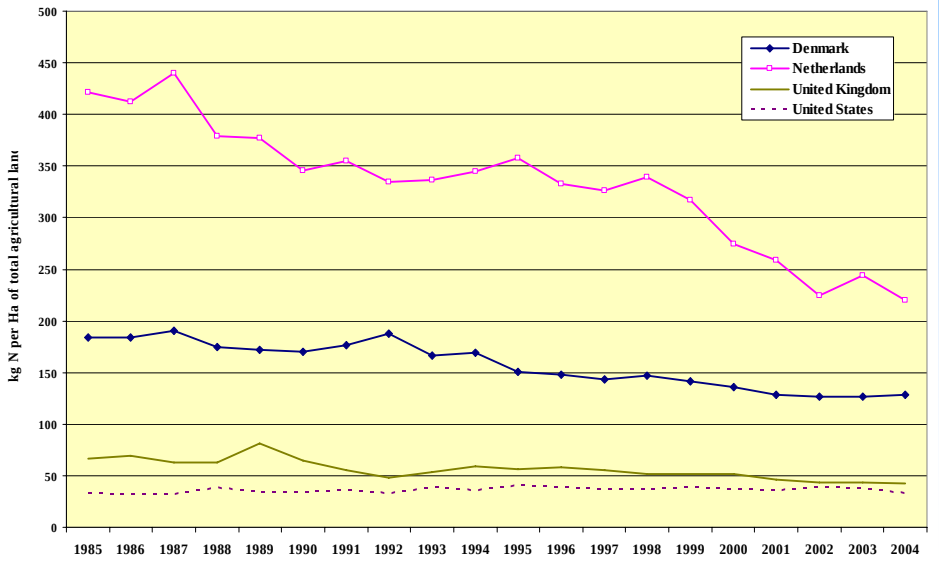
Denmark
- Nitrogen quotas for each farm – 10% below what is agronomical optimal
- Significant fines for non-compliance
- Upper limits on nitrogen use per area unit, restrictions on timing
- Subsidies for conversion to wetlands or forests

Netherlands
- Accounting system for nitrogen and phosphorous – MINAS – with large fees if levy-free surpluses were exceeded
- Quotas on animals per farm, restrictions on timing
- Tradable Manure Quota System, Manure Transfer Agreements
- Previous system replaced by application standards + animal quotas from 1.1.06.

United States, Chesapeake Bay
- Federal subsidies for “conservation measures”
- Compulsory or voluntary *Nutrient Management Plans* at State level
- Lacking regulations on land-use conversion

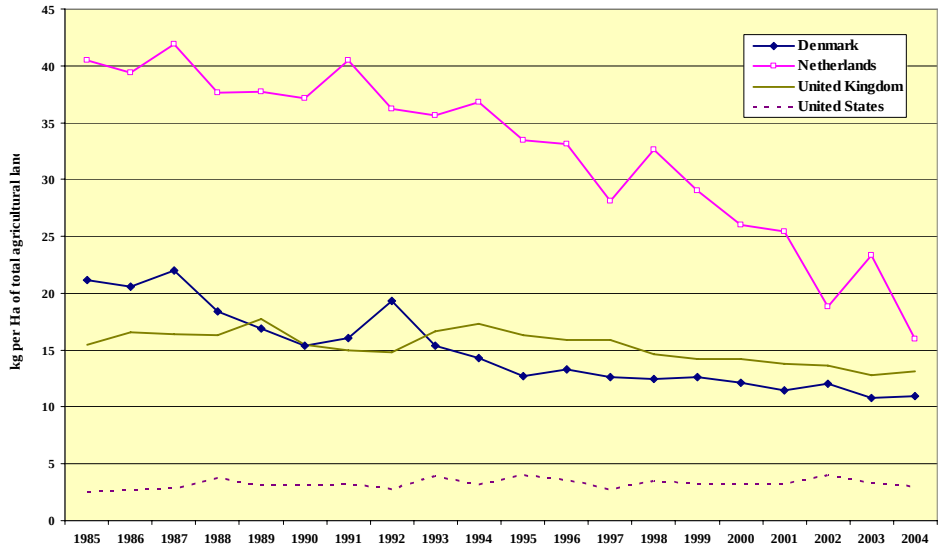
Nitrogen surpluses

kg nitrogen per ha agricultural land



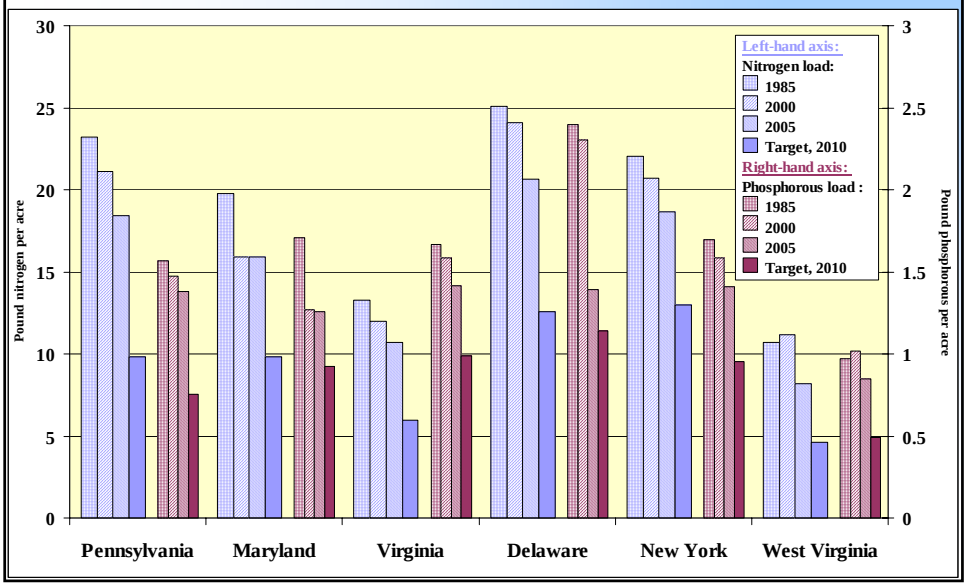
Phosphorous surpluses

kg nitrogen per ha agricultural land



Nutrient loads to the Chesapeake Bay

Edge-of-stream, Pounds per acre



Possible instruments to address the total amount of nitrogen applied I

1. Tax only on commercial nitrogen-containing fertilisers
   - Unfortunately, such a tax would cause an additional burden on vegetable production *while making animal production more profitable*.
   - It would also provide unintended incentives to increase livestock levels, leading to greater manure production through more intensive protein feeding, larger acreages devoted to nitrogen-fixing plants.
2. Model 1 + tax on nitrogen in livestock manure.
   - Very complicated to find simple and reasonably accurate ways to estimate the nitrogen content in manure for taxation purposes.
   - One – not very precise – possibility is to tax each animal farmers hold.
3. Model 2 + tax on nitrogen-fixing plants.
   - Would have to be done in a summary, inaccurate, way.
   - All the models above would give farmers an *incentive to change their crop composition*, towards plants with less need for nitrogen – which would tend to *increase* nitrogen leaching.

Possible instruments to address the total amount of nitrogen applied II

4. Tax on the nitrogen surplus – at *farm level*
   - Would take into account the purchase of feed, seed grain, commercial fertiliser and nitrogen capture from nitrogen-fixing plants, minus sold feed, other vegetable and animal products and sold livestock manure.
   - Requires keeping track of all sales between individual farms, and would therefore be administratively very complicated.
5. Tax on the nitrogen surplus – at *sector level*
   - Would *tax the supply of nitrogen through feed and commercial fertiliser from those who sell these products to agriculture*, allowing them to pass on the tax in the price of the products, and by *reimbursing those who purchase nitrogen from agriculture*, assuming that this reimbursement also will be passed on back to agriculture.
   - Very important administrative advantages could thus be obtained by moving the levying of tax and the reimbursement of taxes away from primary agriculture, while the environmental effects of the instrument would remain unchanged.
   - Ought to be supplemented by a tax on nitrogen-fixing plants, to avoid unwanted changes in farmers' crop composition.
   - That would require the calculation and payment on the part of the individual farmer.

Possible instruments to address the total amount of nitrogen applied III

6. Tax on the nitrogen surplus – at the *national level*
   - The calculation of the nitrogen surplus could be further simplified if all domestic trading in animal and vegetable goods were excluded.
   - This could be done by basing the calculation on imports and exports of nitrogen (on a *national* basis) through feeds, fertilisers and agricultural products. The importers and exporters could pass on and pass back the taxes and reimbursements to the farmers, who would change their behaviour on the basis of the price effects of the tax.
   - Also this alternative ought to be supplemented by a tax on nitrogen-fixing plants.
   - It is, however, likely that such a model would *not* be compatible with EU's rules on the internal market.

Possible instruments to address the total amount of nitrogen applied IV

- The tax rates should be set at a level that reasonably well reflect the *"marginal" environmental damage* caused by nitrogen application – *i.e.* the environmental damage (if any) caused by the application of an additional kg N.
- Only a tax on the N-surplus calculated at *farm level* would allow applying tax rates that vary from region to region – reflecting any major differences in the marginal damages caused by N application.
- As the administrative costs of such a tax would be very high, it would make more sense to *address any exceptional local problems with other instruments* – in addition to a tax on the N surplus calculated at a *sector level*.
- Instead of taxes, a similar tradable emission permit system could be introduced.
- From an *economic* point of view, the permits ought to be auctioned – but *politically* it could be easier to "grandfather" them to the relevant firms.
- If a tax on the nitrogen surplus was introduced, a largely similar tax on the *phosphorous surplus* could piggy-back on the administrative set-up of the N tax.

Possible instruments to address "other aspects" of the problem

- A tax or a tradable permit system should be supplemented by other instruments, that address *where*, *when* and *how* the nutrients are applied.
- *Training and information measures* can play a role – but there is no *guarantee* that a well-informed farmer would behave in an environmentally friendly way, unless he has an incentive to do so.
- *Bans* on nutrients application in certain time periods, and in some areas (*e.g.* close to lakes and rivers), might be appropriate – if very serious environmental harm otherwise could be caused.
- It can be important to have instruments in place that (*to some extent*) prevent agricultural land from being converted into housing areas, etc., – *if* such conversion would lead to an increase in nutrients run-off.

Conclusions

- Nutrients are vital to plant's growth – but too large application can lead to serious environmental problems.
- All sources of the problem should be addressed, including – but *not only* – chemical fertilisers.
- The related environmental problems have several 'aspects' – it is not enough to *only* address the total amounts applied.
- Taxes on nutrient surpluses, calculated at a sector level, could effectively address 'the total dimension'.
- Such taxes could be supplemented by additional instruments to address any particular local problems, and instruments to address the 'other aspects' of the problem.
- Training and information can play a role to address the where-, when- and how- dimensions of the problem – but some regulatory 'clout' could be necessary.
- Other OECD work has cast doubts on the environmental effectiveness of voluntary approaches for environmental policy.