Groundwater Protection in Denmark – from a practical view

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Danish groundwater policy

- Groundwater is the only source for drinking water in Denmark.
- Danish groundwater policy is based on protection rather than purification.
- Drinking water shall be produced from the purest possible groundwater source.
- This means that we protect our groundwater from contamination.
- General regulation is often enough, but not always.
Groundwater Protection in Denmark

Danish Environmental Protection Agency

  - Nitrate: 6,800 km²
  - Pesticides: 714 km²

Municipalities (98)

- Measures: why? which?, where?, who?

Water Works (2,670)

- Protection 2005-......
- The water consumers pay for the protection
Groundwater Protection in Denmark

Implemented so far – nitrate and/or pesticides

- ~14 Water Works / Water cooperations
- ~275 Farms / Forests
- ~5,000 hectares with restrictions
  - 500 ha forest (existing)
  - 750 ha forest (new)
  - 3,750 ha farmland
Status in the municipality of Aarhus
Protection by the Water Works

15 years with voluntary agreements with farmers - no use of pesticides:

- 160 agreements with farmers
- Ever lasting restrictions.
- Compensated – for value loose.
- 1.400 ha farmland
- 250 ha afforestation

- Remaining: 7.000 ha!
- Costs: 0,15 € / m³ = 6 €/person/yr.
Voluntary - semi-voluntary – non-voluntary

Agreements between water works and farmers

**Voluntary agreements**
- The farmers are free to say “yes” or “no”.
- Flexible.
- Compensation
- Taxable

**Semi-Voluntary**
- If the farmer says “no” then the municipality will impose restrictions.
- Some Flexibility.
- Compensation
- Tax free.

**Non-Voluntary**
- The farmer says “no” and the municipality impose restrictions
- Not flexible
- Compensation - Tax free.
- So far only a few municipalities have imposed restrictions. Requires visionary and brave politicians.
Aarhus: Actionplan for the “Beder-area”

No use of pesticides in vulnerable areas.

Status - May 2017:

- 95 farmers are involved.
- 35 semi-vulnerable agreements by the water works – so far.
- 13 bans are notified by the municipality – so far (expropriation of restrictions).
- The farmer organisation will bring some of these cases to court.
- The possibilities for land swaps are currently being investigated.

No use of pesticides in vulnerable areas.
Value of agricultural land in Denmark

- Average: 20.000 €/ha since 2011.
- (16.000 – 25.000 €/ha).

Compensation

Typically one-time compensations for the value loose of the land/farm

<table>
<thead>
<tr>
<th>Land use</th>
<th>No use of pesticides (€/ha)</th>
<th>No use of pesticides and max. 25 mg nitrate/l (€/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture (intensive)</td>
<td>5.000 - 8.000</td>
<td>10.000 - 16.000</td>
</tr>
<tr>
<td>Agriculture (ekstensive)</td>
<td>700 - 2.000</td>
<td>700 - 2.000</td>
</tr>
<tr>
<td>Forest</td>
<td>700 - 2.000</td>
<td>700 - 2.000</td>
</tr>
<tr>
<td>Windbreaks, scrups, etc.</td>
<td>0 - 700</td>
<td>700 - 2.000</td>
</tr>
<tr>
<td>Courtyard, etc. (farms)</td>
<td>700 - 6.000</td>
<td></td>
</tr>
<tr>
<td>Land parcels (houses)</td>
<td>0 - 700</td>
<td></td>
</tr>
</tbody>
</table>

The variations in the value and the depreciation are based on area size, soiltype, location and terrain conditions etc.
Promotion of alternative income
A way to reduce value loss of land – and to reduce the compensation paid by the water works

Crops that can be grown with low loose of nitrogen and no use of pesticides

**Biomass production for biogas**
- Whole crop
- Clover grass

**Bio-refining of grass**
- Extraction of protein from grass
- Extraction of other high-value components

**Miscantus for roofs**
- Environmentally friendly cultivation
- High value crop
Supervision and control

Restrictions also means supervision and control

- Notification of the farmers
- GPS-tracking of control route
- Foto documentation
- Analysis of plant material (250 pesticides)
- Control report for each property
- Fines if necessary
Conclusions
Groundwater protection by the water works in Denmark

- 7,500 km² has been designated by the state as priority areas for groundwater protection.
- Less than 1% has been protected so far.
- Some of the bigger water works have made agreements with farmers.
- Taxation is one of the obstacles to voluntary agreements.
- So far only a few municipalities have imposed restrictions. Requires visionary politicians.
- In the town of Aarhus groundwater protection will cost 0.15 Euro /m³ = 6 euro / person / year.
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