Ammonia abatement in Denmark
April 2013

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# Danish Agriculture

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<table>
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<tr>
<td>National territory</td>
<td>4.3 mill. hectares</td>
</tr>
<tr>
<td>Agricultural area</td>
<td>2.6 mill hectares (6 pct. permanent grass)</td>
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<tr>
<td>Number of agricultural holdings</td>
<td>55,000 holdings</td>
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<tr>
<td>Number of livestock holdings</td>
<td>30,000 holdings</td>
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<tr>
<td>Annual production of pigs for slaughter</td>
<td>23 mill. pigs for slaughter</td>
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<tr>
<td>Annual milk production</td>
<td>4.5 bn. kg milk</td>
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Livestock density
Focus for the media and politicians

Before 2001-2003

• Nitrate pollution of the ground water (health)
• Fish killing in response to periods of oxygen deficit in fjords and coastal waters

Now - also

• a growing a concern for biodiversity and vulnerable nature
  • More focus on ammonia emission
  • More focus on phosphorous
• local ‘response’ to increase in livestock production.
  • Focus on odour from pigs and slurry
Overview, Action Plans

1985     NPo Action Plan
1987     Action Plan I on the Aquatic Environment
         (objective 49% reduction of nitrate leaching)
1991     Action Plan for Sustainable Agriculture
1998     Action Plan II
2000     AP II Midterm evaluation
2001     Ammonia Action Plan (as set out in Action Plan II)
2004     Action Plan III
2009     Green Growth
Nitrogen in agriculture
Nitrogen leaching from agriculture

Nitrogen leaching
(average for Denmark)

Nitrogen leaching in each catchment
Utilization of slurry (1991) compared to chemical fertilizers

<table>
<thead>
<tr>
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<th>Sep/okt</th>
<th>Nov/dec</th>
<th>April/mai</th>
<th>June</th>
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<tbody>
<tr>
<td>Winterwheat</td>
<td>20 %</td>
<td>30 %</td>
<td>75 %</td>
<td>50 %</td>
</tr>
<tr>
<td>Springbarley</td>
<td>20 %</td>
<td>30 %</td>
<td>70-90 %</td>
<td>30 %</td>
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</table>
Regulatory measures encompassed all livestock production. Control and inspection by local authorities every 3. Year by Local authorities.

Demands to animal housing (Floors ect.)

Storage capacity

- 7-9 month

Cover on storage container, compost and manure yards
Regulatory measures due to spreading livestock manure with the purpose to reduce ammonia emission and nitrate leaching

• Periods of spreading (Not allowed to use livestock manure from harvest (August) to 1. February. Thou allowed in the autumn on grass and winterrapeseed)

• only band spreading and injection of slurry is allowed (no overall spreading)

• It is mandatory to inject slurry used in grass and on “bare soil”

• Solid manure shall be incorporated into the soil within 6 hours when spreading on bare soil
Regulatory measures on use of fertilizers and winter plant cover. Control and inspection by state authorities

• Mandatory fertilizer plans

• Mandatory demands for late crops (grass, beets, catch crops)

• Standards on utilization of animal manure N (70-75 % slurry)

• Maximum limits for plant-available N applied to different crops (nitrogen standards which are 10% below economic optimum)

• Max. 140 kg N/ha from animal manure (170 kg N/ha from cattle holdings)
Voluntary measures

• 16,000 hectares wetlands

• 170,000 hectares organic farming mostly dairy farms
New local actions plans for the aquatic environment

• 10 meter buffer zones along streams and lakes
• Additionally 140,000 ha late crops
• More wetlands
• Restrictions in soil management in the autumn
Environmental achievements

Nitrate:

- 1985-2003: Nitrate leaching reduced with 48% (Chemical fertilizer (N) 49%)

Phophorous:

- 1985-2003: Surplus reduced with app. 50% (25 kg P/ha => 13 kg P/ha)
- 2004 (AAE III): Surplus reduced with 50% (2015) => 7 kg P/ha

Ammonia:

- 1990-2007: Reduced with app. 30%.
- Green Growth (2009): New standards (30% reduction compared to best practice 2005-2006) and demands for max. deposition on nature (vulnerable nature compassed by Habitat Directive (0.2-0.7 kg N per hectare))
Agriculture production
Whats on its way for animal manure?

**Biogas:**

- 6% of the slurry is today treated in biogasplants
- Utilization is increased from 75 to 85%, energi is produced and the methanemission is reduced.

**Slurryseparation:**

- 10% of the slurry is separated and dry matter is exported to other farms.
- Drymatter compressed to pills and exported (high dry matter and P)
- Dry matter could be used for burning (energyproduction)

**Acidifikation:**

- Reduced ammoniaemission and improved utilization of nitrogen
Surveillance of surface water quality
Surveillance of Lakes