Controlled drainage and other SCIEN drainage technologies

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Controlled drainage demonstration sites in Denmark

- Birkelse (2012)
  Sandy soil. Ditch drainage

- Bredkjaer (2012)
  Clay soil. Pipe drains.

- Hedemark (2012)
  Clay soil. Pipe drains.

- Hofmansgave (2012)
  Sandy soil. Pumped area. Funded by Baltic Compass
Project: Controlled drainage as a measure to reduce the outlet of nitrogen to the aquatic environment (2012-2015)

Objective:
To obtain the necessary documentation so that controlled drainage can be recognized as a measure to reduce the outlet of nitrogen and phosphorus to the aquatic environment (in order to meet the goals of the WFD)
Hofmansgave demonstration site

Crop rotation:
Maize - winterwheat

Control well
Measuring well
Drainage system at Hofmansgave
Nitrogen in drainage water at Hofmansgave 2012-13 (reference year), mg N/l (total-N)
Outlet of nitrogen from drain 1-4 at Hofmangave 2012-13 (reference year)

<table>
<thead>
<tr>
<th></th>
<th>Ha</th>
<th>Run-off, mm</th>
<th>Total-N mg/l</th>
<th>Kg N per ha</th>
<th>Kg N per 210 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain 1</td>
<td>6,2</td>
<td>213</td>
<td>15,0</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Drain 2</td>
<td>5,4</td>
<td>241</td>
<td>13,3</td>
<td>32</td>
<td>28</td>
</tr>
<tr>
<td>Drain 3</td>
<td>4,2</td>
<td>288</td>
<td>14,9</td>
<td>43</td>
<td>31</td>
</tr>
<tr>
<td>Drain 4</td>
<td>3,8</td>
<td>282</td>
<td>10,6</td>
<td>30</td>
<td>22</td>
</tr>
</tbody>
</table>

Percolation: 210 mm in 2012-13
Effects of controlled drainage

Water level is raised during autumn and winter

- Increased NH4-N in soil
- Increased deep percolation
- Increased denitrification
- Nitrous oxide emission?
- Reduced N and P outflow through drains

- Increased sedimentation in drain pipes?
- Increased deep percolation

Denitrification

Redox boundary
Implementation of controlled drainage (CD) in Denmark

- CD is hopefully a recognized measure in 2016
- Maybe 10% of the agricultural area is suitable for CD
- CD is probably not profitable for the farmer by itself
- Maybe CD is profitable as an alternative to compulsory catch crops and reduced N quotas
- CD will probably often be combined with constructed wetlands and riparian buffer zones in order to optimize nitrogen removal
Controlled drainage can level out the inflow of drainage water to a constructed wetland.
Riparian buffer zones

Controlled drainage
Thank you for your attention!

Project homepage:
www.vfl.dk/hofmansgave
or
www.vfl.dk/kontrolleretdraening

The Hofmansgave demonstration site is partly funded by BALTIC COMPASS