Nitrogen management in Czech agriculture

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Current situation in Czech agriculture

4 239 thous. ha of agricultural land
\textit{(nitrate directive vulnerable zones \sim 50 \%)}
3 017 thous. ha of arable land (71 \%)

Agroregister:
55 000 enterprises (> 1 ha), \sim 3 650 thous. ha of agric.land
\text{= used agricultural land}

Share in acreage:
25 \% natural persons
45 \% companies
30 \% co-operatives
<table>
<thead>
<tr>
<th>Farm acreage (ha)</th>
<th>Number of farms (%)</th>
<th>Share on farmland (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5</td>
<td>58,9</td>
<td>1,2</td>
</tr>
<tr>
<td>5 – 10</td>
<td>11,3</td>
<td>1,1</td>
</tr>
<tr>
<td>10 – 50</td>
<td>18,2</td>
<td>5,5</td>
</tr>
<tr>
<td>50 – 100</td>
<td>3,6</td>
<td>3,6</td>
</tr>
<tr>
<td>100 – 500</td>
<td>4,4</td>
<td>13,5</td>
</tr>
<tr>
<td>500 – 1000</td>
<td>1,5</td>
<td>15,7</td>
</tr>
<tr>
<td>1000 – 2000</td>
<td>1,4</td>
<td>27,8</td>
</tr>
<tr>
<td>&gt; 2000</td>
<td>0,7</td>
<td>31,7</td>
</tr>
</tbody>
</table>

70 % of farms (small) ~ 2 % of total acreage
2 % of farms (large) ~ 60 % of total acreage
Average consumption of inorg.fertilizers and manure
(converted into kgs of nutrients per 1 ha of agricultural land)

- Inorganic fertilizers
  - N
  - P2O5
  - K2O

- Manure (livestock excrements)
Trends in numbers of livestock

- Cattle
- Pigs
- Poultry/10
- LU/ha

<table>
<thead>
<tr>
<th>Year</th>
<th>Cattle</th>
<th>Pigs</th>
<th>Poultry/10</th>
<th>LU/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>0.81</td>
<td>0.33</td>
<td>0.43</td>
<td>0.37</td>
</tr>
<tr>
<td>1990</td>
<td>0.81</td>
<td>0.33</td>
<td>0.43</td>
<td>0.37</td>
</tr>
<tr>
<td>1995</td>
<td>0.51</td>
<td>0.33</td>
<td>0.43</td>
<td>0.37</td>
</tr>
<tr>
<td>2000</td>
<td>0.43</td>
<td>0.33</td>
<td>0.43</td>
<td>0.37</td>
</tr>
<tr>
<td>2005</td>
<td>0.37</td>
<td>0.33</td>
<td>0.43</td>
<td>0.37</td>
</tr>
<tr>
<td>2010</td>
<td>0.33</td>
<td>0.33</td>
<td>0.43</td>
<td>0.37</td>
</tr>
</tbody>
</table>
Number of livestock (in livestock units per 1 ha of agricultural land)
... cattle (in livestock units per 1 ha of agricultural land)
... pigs (in livestock units per 1 ha of agricultural land)

INPUTS = fertilizers + manure + atmospheric N fixation + N deposition + seed
N balance – farm distribution
(survey data on 14 % of vulnerable zones area)
Time schedule of the implementation of Nitrate Directive in Czech Republic

• Codes of good agricultural practice (nitrate) 2003

• I. Designation of Vulnerable Zones III/2003

• I. Action Programme since I/2004
  – Map data (Action Programme measures in LPIS)
  – Publications, lectures, consultancy, internet,…
  – Support of investment requirements
  – Monitoring (water, effectiveness of the AP)

• Revision of Vulnerable Zones IX/2007

• II. Action Programme since IV/2008
Designation and revision of Vulnerable Zones

Legend
- main rivers
- main reservoirs
- main agglomeration

Vulnerable zones - designation and revision
- initial designation (2003)
- revision - new zones (2007)
- revision - canceled zones (2007)

Elaboration: T. G. Masaryk Water Research Institute, public research institution; September 2008
Data source: T.G.M, WRI, COSMC, AWMA, CHMI, CRI, ARCDATA Praha
Canceled nitrate vulnerable zone (revision since IX/2007)
C95% = 25,9 mg/l
Added nitrate vulnerable zone (revision since IX/2007)
Koncentrace NO3 - profil 502-006

C95% = 39,07 mg/l
Implementation of Action Programme and its revision

First Action Programme since 2004
- One Action Programme for all Vulnerable Zones in CR
- Measures are specified according to soil and climatic conditions

Revision of the Action Programme in 2008
- Reasons for changes
  - evaluation of first Action Programme
  - recommendation of EC
  - research results
Implementation of Action Programme and its revision

Revision of the Action Programme in 2008

- Main changes
  - limits of nitrogen for crops
  - designation of soils with high risk of water infiltration
  - change of manure storage capacity requirements from 3-4 month to 6 months (since 2014)
  - ban of farmyard manure storage on fields (since 2014)
  - buffer strips without fertilization (3 m from rivers, streams, ponds, lakes etc.)
Measures of the Action Programme

1. Periods with prohibition of fertilizing
2. Limitation of fertilizing based on crop N needs
3. Limitation of input of organic nitrogen into soil
4. Storage of fertilizers and manure
5. Rotation of crops, counter-erosion measures
6. Farm management near water courses
The period of ban on fertilizing

| Agricultural plot with cultivated crop or prepared for establishing of crop stand | Period of ban on fertilization |
| --- | --- | --- |
| Crop or culture | Climatic region* | Fertilizers with rapidly releasable nitrogen | Inorganic nitrogenous fertilizers |
| Crops on arable land (with the exception of grass and clover plant -grass stands), permanent cultures | 0 - 5 | 15. 11. - 31. 1. | 1. 11. - 31. 1. |
| | 6 - 9 | 5. 11. - 28. 2. | 15. 10. - 15. 2. |
| | 6 - 9 | 5. 11. - 28. 2. | 15. 9. - 15. 3. |

The application of fertilizers with slowly releasable nitrogen on arable land is banned in the period from 1. 6. to 31. 7., (this provision is not applicable in the case of subsequential cultivation of winter crops and catch crops) and in the period from 1. 12. to 31. 1.
Effect monitoring of the Action Programme

Main principles

- Survey on farms in vulnerable zones (approx. 300 farms, annually)
- Verification survey of compliance with the requirements of the action programme in farms in vulnerable zones (approx. 30 – 40 pilot farms, annually)
- Evaluation of the developments in soil nitrogen contents from the viewpoint of cultivated crops, agritechnical methods and weather conditions (experimental plots, farm plots)