Nitrates Directive implementation in Lombardy (Italy)

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(1) Lombardy Region – DG Agriculture
(2) ERSAF – Regional Agency for Agriculture and Forests of Lombardy

• Physical setting
• Agriculture and animal husbandry
• Environment and vulnerability
• Regulations and administrative procedures
• Derogation
• Main challenges envisaged
1. General information

AREA  23,870 km²
POPULATION  9,973,000
MUNICIPALITIES  1,531
CULTIVATED LAND  939,000 ha

2. Soils

Soil Map of Lombardy – scale 1:250,000 (ERSAF, 2013)
2. Soils

Soils of Lombardy (ERSAF)

2. Climate

Average rain [mm year⁻¹]

Annual average temperature[°C]
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Vic (Barcelona) 17-18th December 2014

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1. Crops and cropping systems

<table>
<thead>
<tr>
<th>CROP</th>
<th>Area (ha)</th>
<th>% UAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>374,263</td>
<td>32%</td>
</tr>
<tr>
<td>Rice</td>
<td>93,667</td>
<td>8%</td>
</tr>
<tr>
<td>Wheat / winter cereals</td>
<td>88,087</td>
<td>7%</td>
</tr>
<tr>
<td>Grassland (P and T)</td>
<td>344,032</td>
<td>29%</td>
</tr>
</tbody>
</table>

Year 2014

UAA (Utilized Agricultural Area)
939,000 ha
(SIARL 2014)
2. Livestock sector

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATTLE</td>
<td>1,597,859</td>
<td>1,513,317</td>
<td>1,539,997</td>
<td>1,526,811</td>
<td>1,534,671</td>
</tr>
<tr>
<td>SWINE</td>
<td>4,885,319</td>
<td>4,480,615</td>
<td>4,633,827</td>
<td>4,726,366</td>
<td>4,659,212</td>
</tr>
<tr>
<td>POULTRY</td>
<td>32,681,328</td>
<td>33,564,625</td>
<td>35,264,453</td>
<td>32,582,756</td>
<td>32,422,399</td>
</tr>
<tr>
<td>OVINE-GOATS</td>
<td>186,699</td>
<td>175,226</td>
<td>176,282</td>
<td>175,837</td>
<td>176,528</td>
</tr>
<tr>
<td>BUFFALO</td>
<td>9,709</td>
<td>7,624</td>
<td>8,369</td>
<td>8,251</td>
<td>7,339</td>
</tr>
<tr>
<td>RABBITS</td>
<td>315,131</td>
<td>310,742</td>
<td>331,750</td>
<td>315,111</td>
<td>319,093</td>
</tr>
<tr>
<td>EQUINE</td>
<td>22,291</td>
<td>21,040</td>
<td>22,347</td>
<td>23,318</td>
<td>24,019</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>53,883,446</td>
</tr>
</tbody>
</table>

3. Organic Nitrogen from manure

Data 2014 N from manure kg year⁻¹

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>N from manure kg year⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATTLE</td>
<td>75,296,408</td>
</tr>
<tr>
<td>SWINE</td>
<td>36,588,741</td>
</tr>
<tr>
<td>POULTRY</td>
<td>12,400,247</td>
</tr>
<tr>
<td>OVINE-GOATS</td>
<td>815,297</td>
</tr>
<tr>
<td>EQUINE</td>
<td>614,388</td>
</tr>
<tr>
<td>BUFFALO</td>
<td>329,423</td>
</tr>
<tr>
<td>RABBITS</td>
<td>96,076</td>
</tr>
<tr>
<td>TOTAL</td>
<td>126,160,581</td>
</tr>
</tbody>
</table>
4. Total Nitrogen managed in agriculture

<table>
<thead>
<tr>
<th>N source</th>
<th>Tons N</th>
</tr>
</thead>
<tbody>
<tr>
<td>N from manure*</td>
<td>126,161</td>
</tr>
<tr>
<td>N from mineral fert.**</td>
<td>96,000</td>
</tr>
<tr>
<td>N crops needs (MAS)*</td>
<td>186,391</td>
</tr>
</tbody>
</table>

* Data 2014; ** Data 2012-ISTAT

5. Biogas plants and manure treatment

- 380 plants
- 290 Mwe
- Solids-Liquid Separators for Digestate - 250
- Treatment N Removal and Recovery - 8
- N Stripping systems 15
- Biogas Plants
  manure = 54%
  (4 mil. t/year)
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1. Water quality status – surface water

Source: MAITM (2013)
1. Water quality status – groundwater

<table>
<thead>
<tr>
<th>Period</th>
<th>Monitoring sites (%) of total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-25 mg/l</td>
</tr>
<tr>
<td>2008-2011 (679 monitoring sites)</td>
<td>58</td>
</tr>
<tr>
<td>2012 (727 monitoring sites)</td>
<td>64</td>
</tr>
</tbody>
</table>

Source: MATTM (2013)

3. Vulnerability to nitrate leaching

Source: University of Milan – DST (2013) – Weights of Evidence modeling
4. Nitrate concentration in rivers (Oglio river)

Source: University of Parma – DSA (2009)

5. Soil protection capacity

Source: Soil Information System - ERSAF
6. Denitrification

Source: CNR – University of Pavia (2011)

7. Nitrate leaching from cropping systems

Model ARMOSA
(University of Milan – DISAA)
**ARMOSA**

*Sites:* 7  
*Scenarios monitored:* 12  
*Soil Types:* 7  
*Sources of nitrogen:* mineral fertilizer, digestate, pig and cattle slurry  
*Irrigation systems:* under drip irrigation, sprinkler irrigation, flooding irrigation  
*Crops:* maize, soyaben, ryegrass, sorghum, millet, barley, meadow, alfalfa

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**ARMOSA MONITORING**

- N-NO<sub>3</sub> (soil solution) leaching  
- N uptake (crops)  
- N emission (NH<sub>4</sub> and NOx)  
- Crop Yields  
- Water Drainage  
- Soil water content (%)  
- Water table depth and quality (N-NO<sub>3</sub>, N-NH<sub>4</sub> and PO<sub>4</sub>)  
- Irrigation canals (farm input and output, N-NO<sub>3</sub>, N-NH<sub>4</sub> and PO<sub>4</sub>)  
- Meteorological data (T, rain, U, Radiation, wind speed and direction)
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1. Regulations

**National Level**

DM 7 aprile 2006: Criteria to Regions for Action Plans

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**Regional Level**

ZVN designation
D.g.r. VIII/3297/2006

Action Plan
D.g.r. IX/2208/2011

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2. Nitrates Vulnerable Zones (NVZ)

- 419 municipalities are in vulnerable zone
- 216 municipalities are in partially vulnerable zone

ERSAF Ente regionale per i servizi all’agricoltura e alle foreste

UAA (Utilized Agricultural Area)
939,000 ha

60% of arable land is within NVZ

2. Nitrates Vulnerable Zones (NVZ)  

- Informatic procedure (PGN)
- Mandatory for livestock farms with > 1,000 kg N and no breeding farms with > 3,000 Kg N
- Based on respect of Nitrates Directive limit, MAS (Maximum Application Standard for each crop) and storage capacity (minimum 120 days for cattle, 180 days for pigs)
- Closing periods in winter (90/120 days: NOV - FEB)
- Provided for both NVZ and nNVZ (MAS, storage capacity)

3. Action Plan

<table>
<thead>
<tr>
<th>Nitrates Procedure (PGN)</th>
<th>% in nNVZ</th>
<th>% in NVZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cattle and Swine</td>
<td>1.3%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Swine</td>
<td>10.0%</td>
<td>2.5%</td>
</tr>
<tr>
<td>No breeding</td>
<td>47.6%</td>
<td>17.3%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>32.4%</td>
<td>67.6%</td>
</tr>
</tbody>
</table>

Number of FARMS in nitrates procedure: 12,467

Farms involved - nitrates procedure distribution - 2014
3. Action Plan

NITRATES PROCEDURE (PGN)
FARM NITROGEN MANAGEMENT PLAN

• Annual N and manure/slurry production estimation (considering animal number, housing systems, treatments)
• Manure/slurry storage need
• Crops/fields for land application
• Mineral N allowed to integrate crop fertilization

Registration of land distribution (application date, rate, field, crop), manure delivery (to biogas plant, other farmer, amount, date)
3. Action Plan (PGN procedure scheme)

FARM STRUCTURE AND MANAGEMENT - SiarI
Agricultural information system Lombardy

Livestock housing
Buying and selling
Treatments
Storage

Allevamenti
Regulatory compliance
Organic nitrogen load kg N ha⁻¹
Storage compliance
Distribution scheme
Compliance to maximum nitrogen uptake

Cropping systems

3. Action Plan

CONTROLS

• ADMINISTRATIVE: 100% of farms
• ON FIELD: 4% of farms
  selected through a Risk Analysis procedure

COMPLIANCE

RESULTS OF A RL INVESTIGATION

• 92% of farms compliant at administrative control were compliant at “on field” control
• 50% of farms NOT compliant at administrative control were compliant at “on field control
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2011/721/UE
applicable to Lombardy, Piedmont, Emilia Romagna and Veneto

- \( N \) from manure that can be spread = 250 kg/ha/year, with efficiency of 0.65;
- Manure types eligible: cattle manure and clarified fractions of pig slurry;
- For pig slurry solid/liquid separation shall ensure a \( N/P_{2O5} \) ratio of 2.5 or higher; moreover the resulting solid fraction shall be exported outside derogation farms;
- Spreading period: 2/3 of the effluent must be used by June 30 of each year, while the remaining 1/3 must be used by November 1 of the same year;
- Techniques of manure spreading resulting in low emission of nitrogen must be used; they are currently classified as BAT in EU documents (BREF, 2003);
- Eligible crops: maize (monoculture or followed by winter herbage), other winter and summer cereals followed by cover/catch crops, permanent and temporary grassland;
- Increased controls on farm/field and monitoring activities (not only water quality, but also dynamic of \( N \) and \( P \) in soil profile and losses through the root zone);
- Soil sampling/analysis to control residual nitrates and phosphorus in derogation farms
- Also no breeding farms can apply for derogation, if they fertilize with manure;
- Derogation applies yearly and on an individual basis.
2. Farms applied for derogation

During the first three years of implementation, a relative low number of farms (around 250 per year) applied for derogation.

<table>
<thead>
<tr>
<th>Province</th>
<th>Total</th>
<th>Cattle</th>
<th>Cattle and Swine</th>
<th>Swine</th>
<th>Swine no breeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bergamo</td>
<td>25</td>
<td>22</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Brescia</td>
<td>109</td>
<td>83</td>
<td>2</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Cremona</td>
<td>52</td>
<td>46</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Lodi</td>
<td>20</td>
<td>18</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Milano</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mantova</td>
<td>58</td>
<td>56</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Pavia</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Farms having applied for derogation in 2014

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1. Looking at the Action Plan (and Derogation) 2016-2019

MAIN CHALLENGES

ENVIRONMENTAL IMPROVEMENTS
COMPETITIVE AND SUSTAINABLE FARMS

- simplifying administrative procedures
- controlling the total N distributed on fields
- fostering the use of manure in place of mineral fertilizers
- intensifying soil and cropping systems monitoring

Thank you