

Nitrate Directive: how to manage nitrogen in intensive dairy farming

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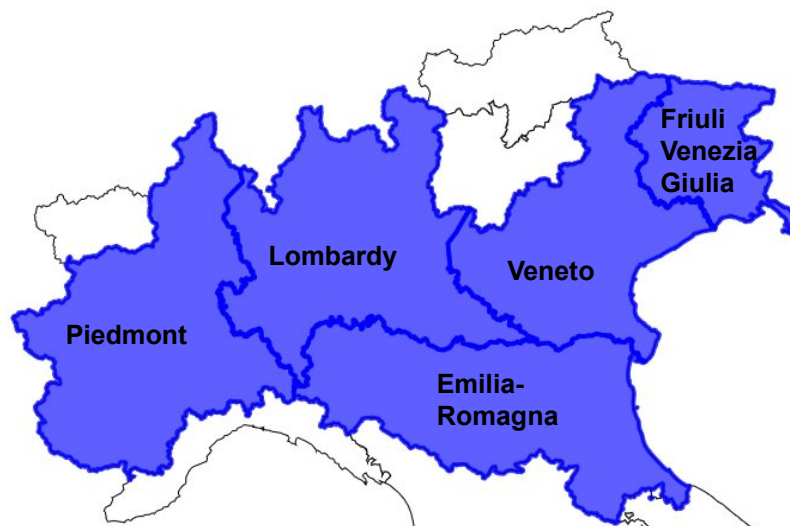
*CRPA - Centro Ricerche Produzioni Animali
Reggio Emilia, Italy*



Northern Italy. Why?

This presentation is mainly focused on the regions of Northern Italy that have designated Nitrate Vulnerable Zones:

- Piedmont
- Lombardy
- Veneto
- Friuli Venezia Giulia
- Emilia-Romagna



These regions account for 68% of dairy cattle, 61% of other cattle, 85% of pigs and 80% of poultry of the total livestock reared in Italy. Derogation request refers to these regions.



PART I – Overview of water quality and implementation of Nitrates Directive

PART II – Characteristics of cattle sector and N management

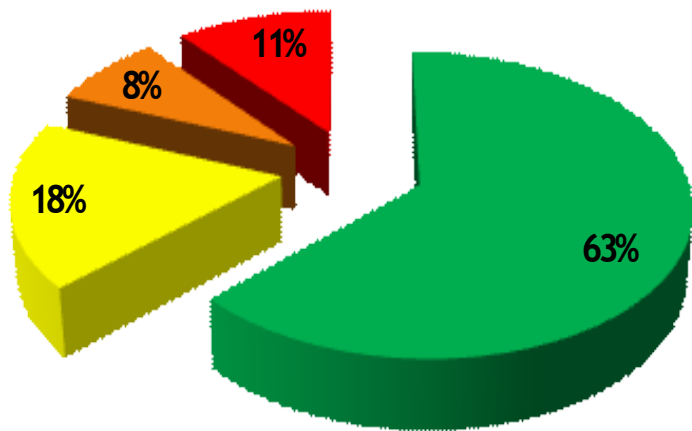
PART III – Derogation request: key elements and basic conditions



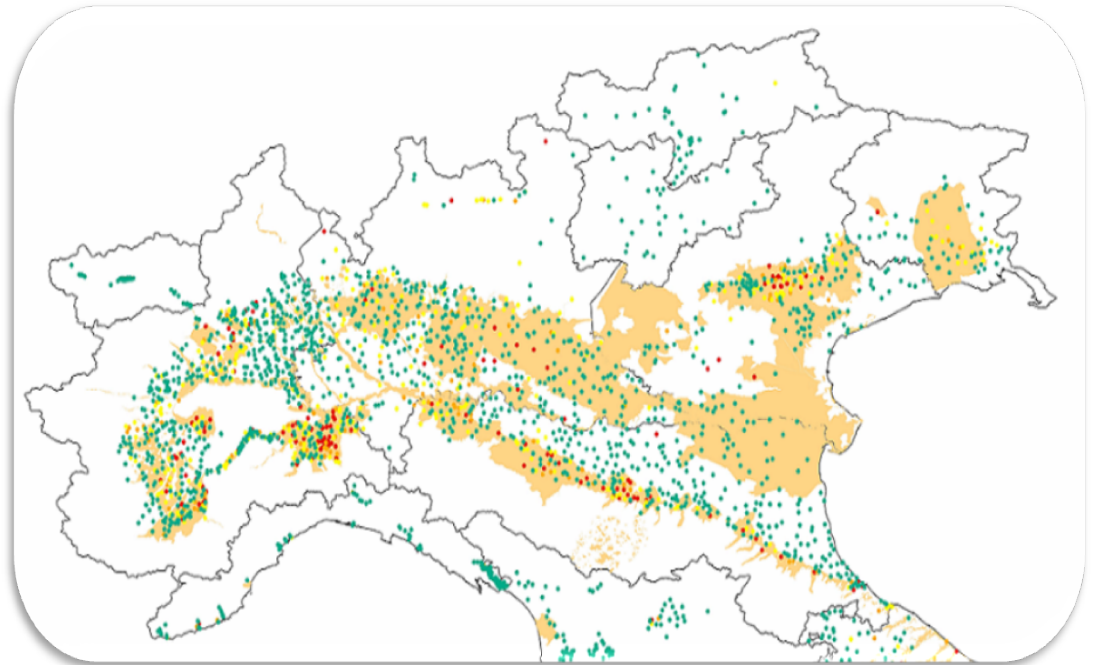
PART I – Overview of water quality and implementation of Nitrates Directive



Nitrate concentrations in groundwater in the regions of Northern Italy (period 2004-2007)



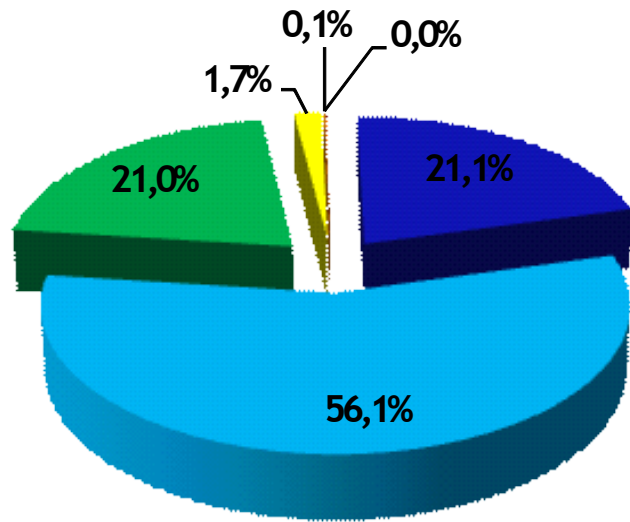
■ 0-24,99 mg/l ■ 25-39,99 mg/l ■ 40-50 mg/l ■ >50 mg/l



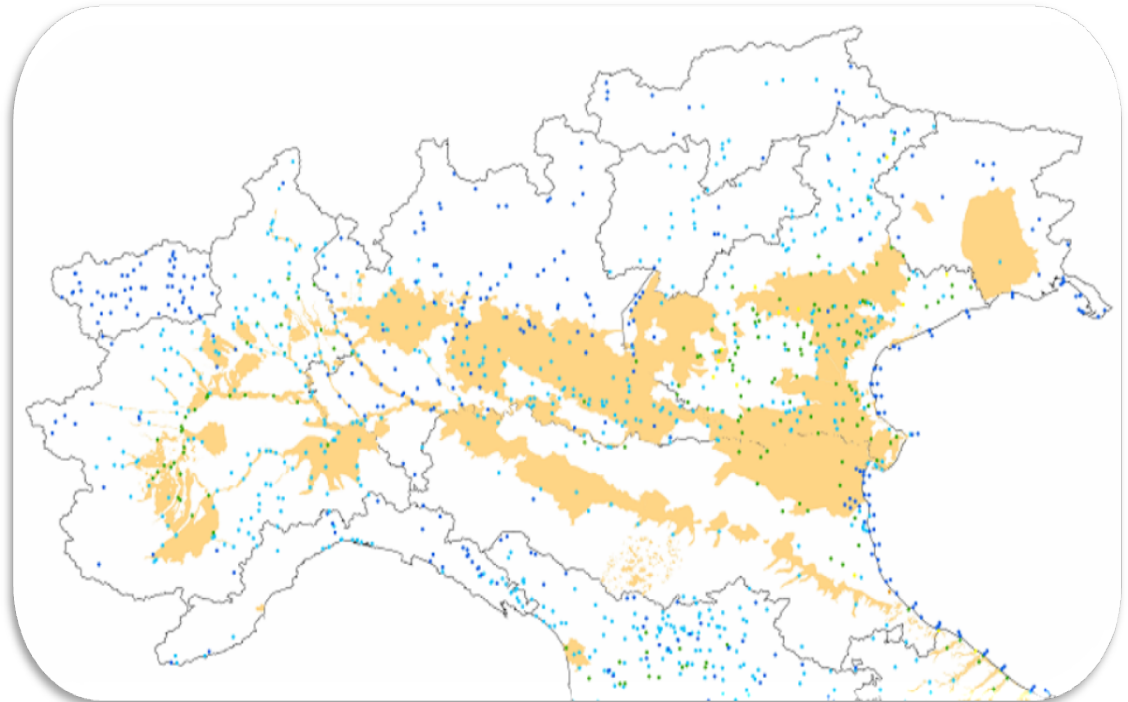
Data from Ministry of the Environment



Nitrate concentrations in surface waters in the regions of Northern Italy (period 2004-2007)



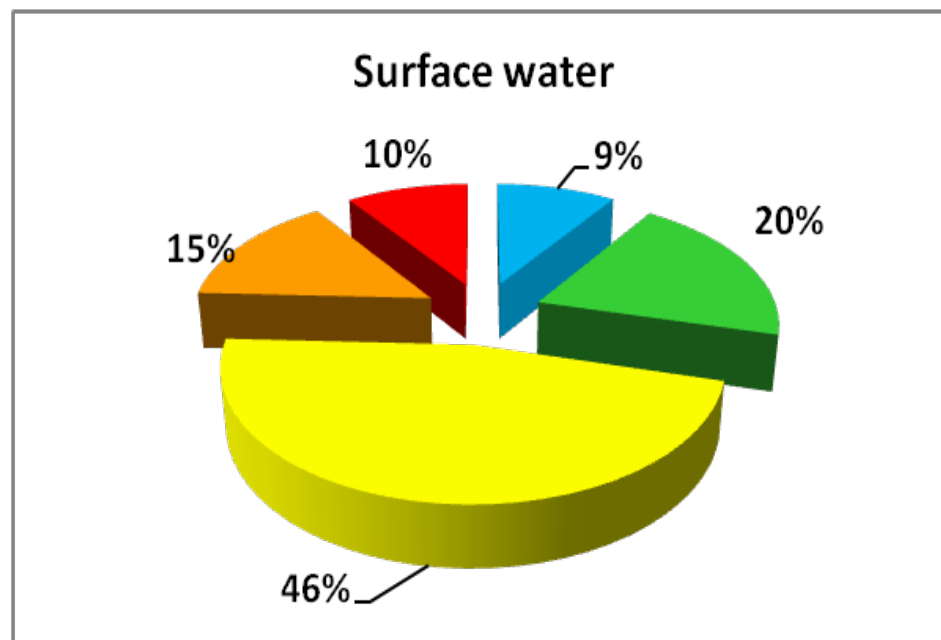
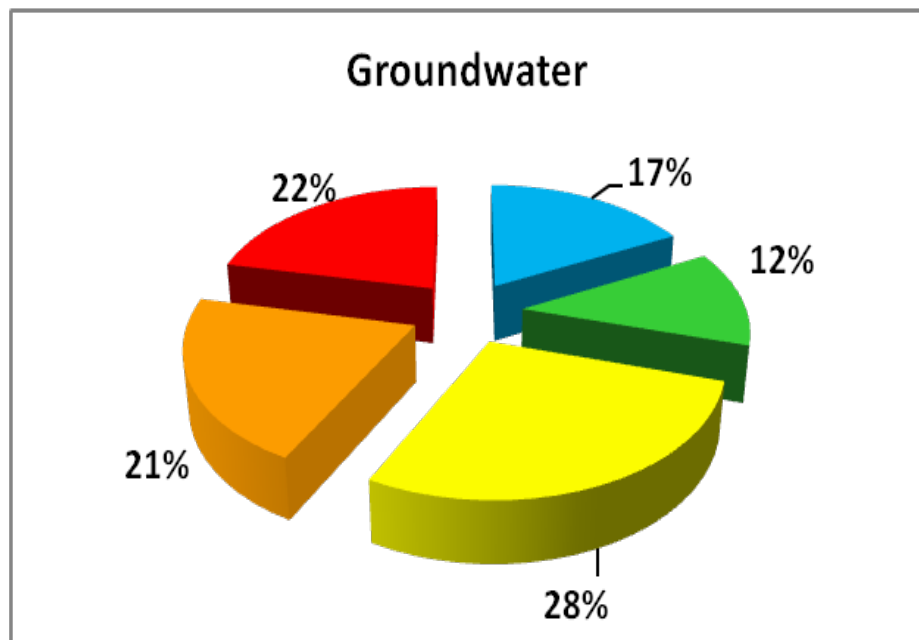
■ 0-1,99 mg/l ■ 2-9,99 mg/l ■ 10-24,99 mg/l
■ 25-39,99 mg/l ■ 40-50 mg/l ■ >50 mg/l



Data from Ministry of the Environment



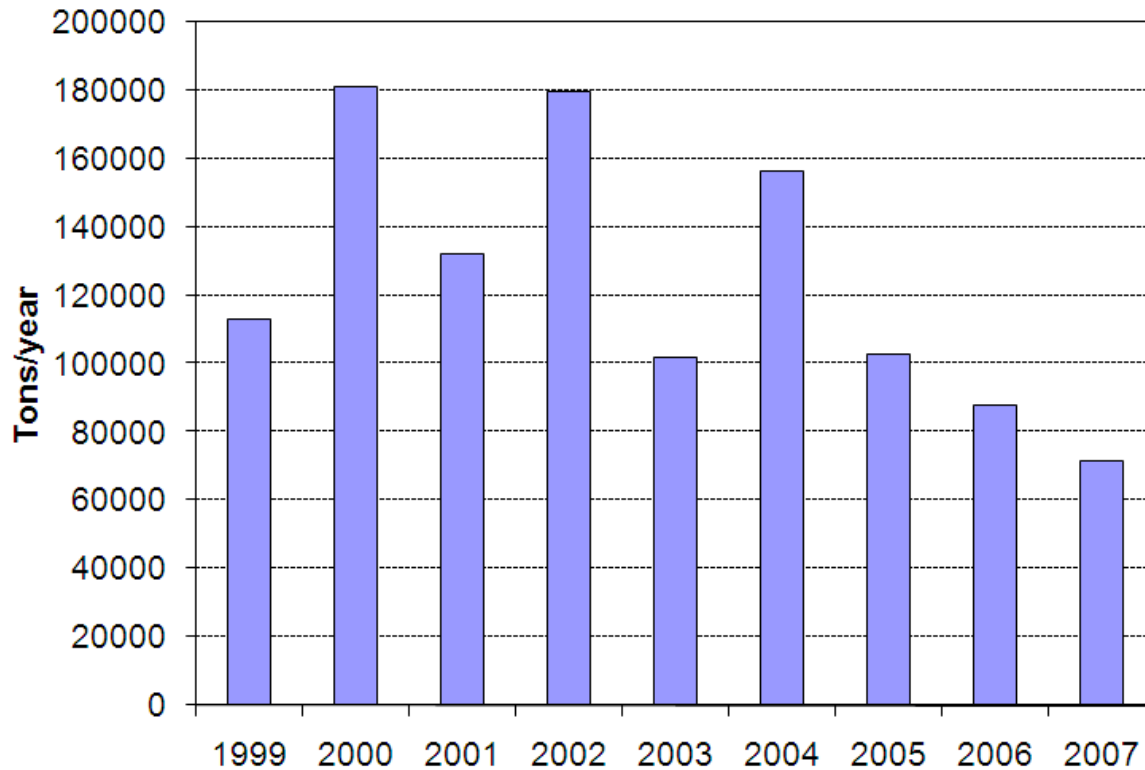
Trends in nitrates in Northern Italy between the periods 2000-2003 and 2004-2007



- stability
- weak increase
- strong increase
- strong reduction
- weak reduction



Total N loadings from the Po river to the Adriatic sea *(from Basin Authority)*



The Po river collects water from Piedmont, Lombardy, Emilia-Romagna and part of Veneto.

So far, no clear relation has been proved between agricultural management and the occurrence of algal blooms in the Adriatic sea. However, animal husbandry is one of the potential contributors to the degradation of both groundwater and surface water.



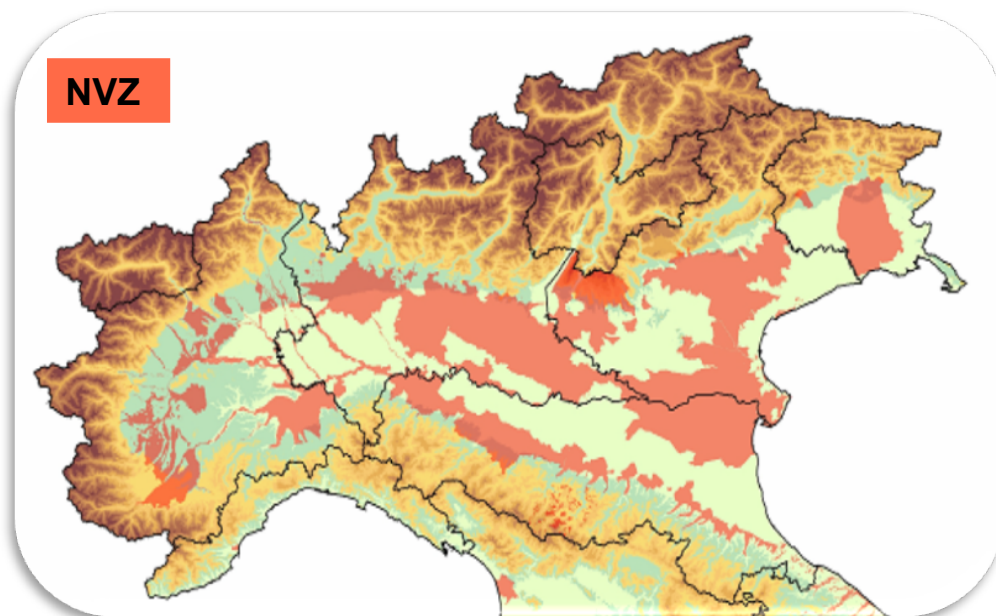
Experience of implementation of Nitrates Directive in Italy

Main aspects:

- ◆ Considerable enlargement of designated vulnerable zones
- ◆ Adoption of compliant Action Programmes in all Regions
- ◆ Strict measures also in ordinary zones



Nitrate Vulnerable Zones in Northern Italy



NVZs as a percentage of regional plain areas

Piedmont	54%
Lombardy	56%
Emilia-Romagna	57%
Veneto	60%
Friuli Venezia Giulia	53%

from 12701 km² (year 2003) to 27541 km² (year 2008)*

*Regions: Piedmont, Lombardy, Emilia-Romagna, Veneto, Friuli Venezia Giulia



Key measures in the Action Programmes

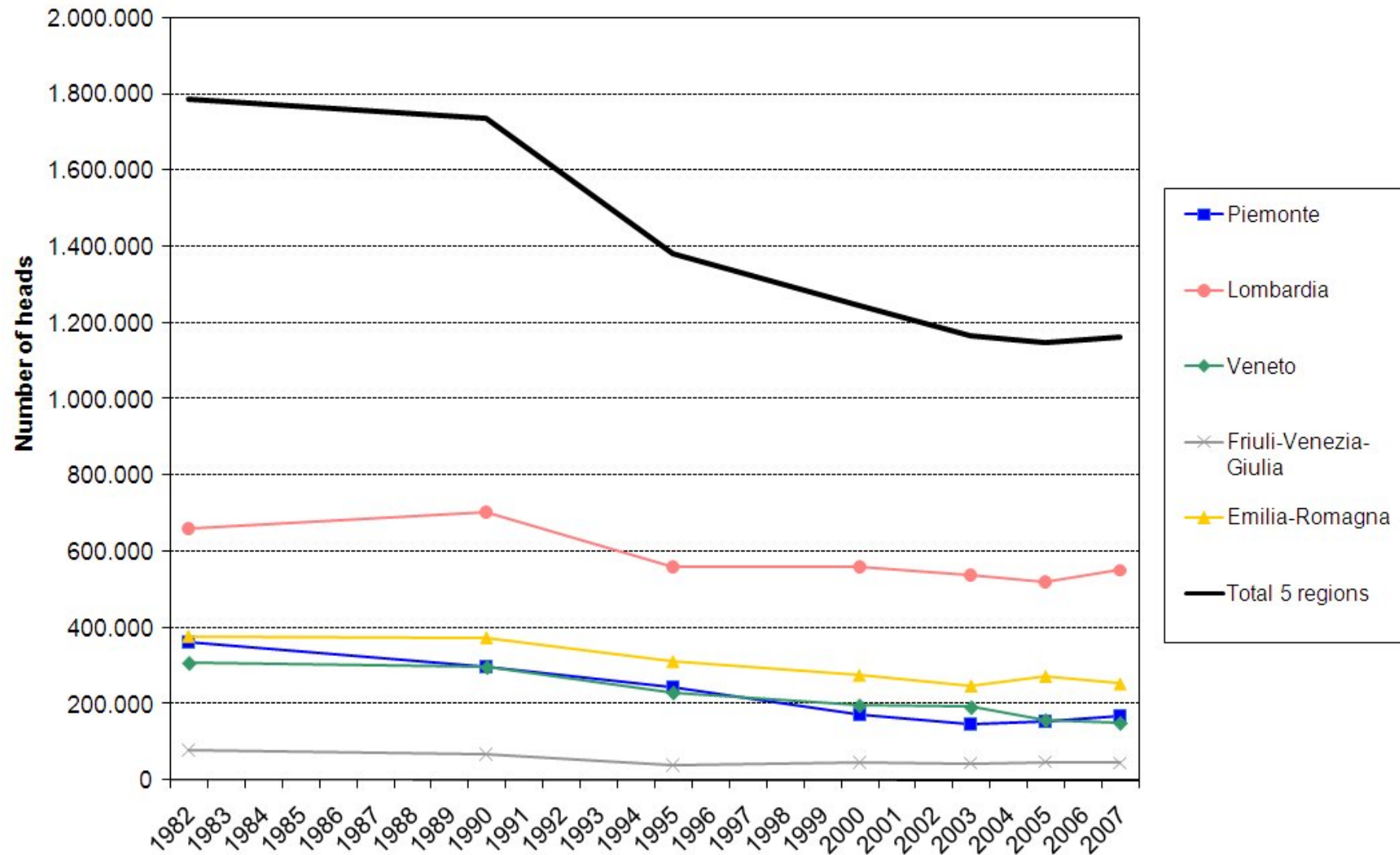
- ◆ Limit of 170 kg N/ha/year of livestock manure N
- ◆ Minimum storage capacity of 6 months for slurry (exception of dairy cattle manure in case of farms with a rotation including grasslands, 4 months), 3 months for solid manure
- ◆ Closed periods for manure spreading (4 months in NVZ)
- ◆ Buffer strips along rivers and other water bodies
- ◆ Compulsory fertilisation plan to be notified to the competent authorities
- ◆ Limit on the rate of N fertilisers that may be applied to individual crops, based on N crop uptake
- ◆ Minimum levels of manure N efficiency



PART II – Characteristics of cattle sector and N management



Trends in dairy cattle farming in the 5 regions from 1982 to 2007 (CRPA, based on ISTAT)



Main cropping systems for different farm types (University of Turin, modified by CRPA)

Crop	Dairy cattle	Beef cattle	Suckling cows	Pigs
Maize (%)	25-47	45-72	32-38	48-69
Grassland (%)	22-36	8-9	39-48	0-3
Winter cereals (%)	16-30	18-31	11-22	19-27
Other crops (%)	8-14	2-15	1-9	1-16

Maize is grown both for the production of grain and for silage.

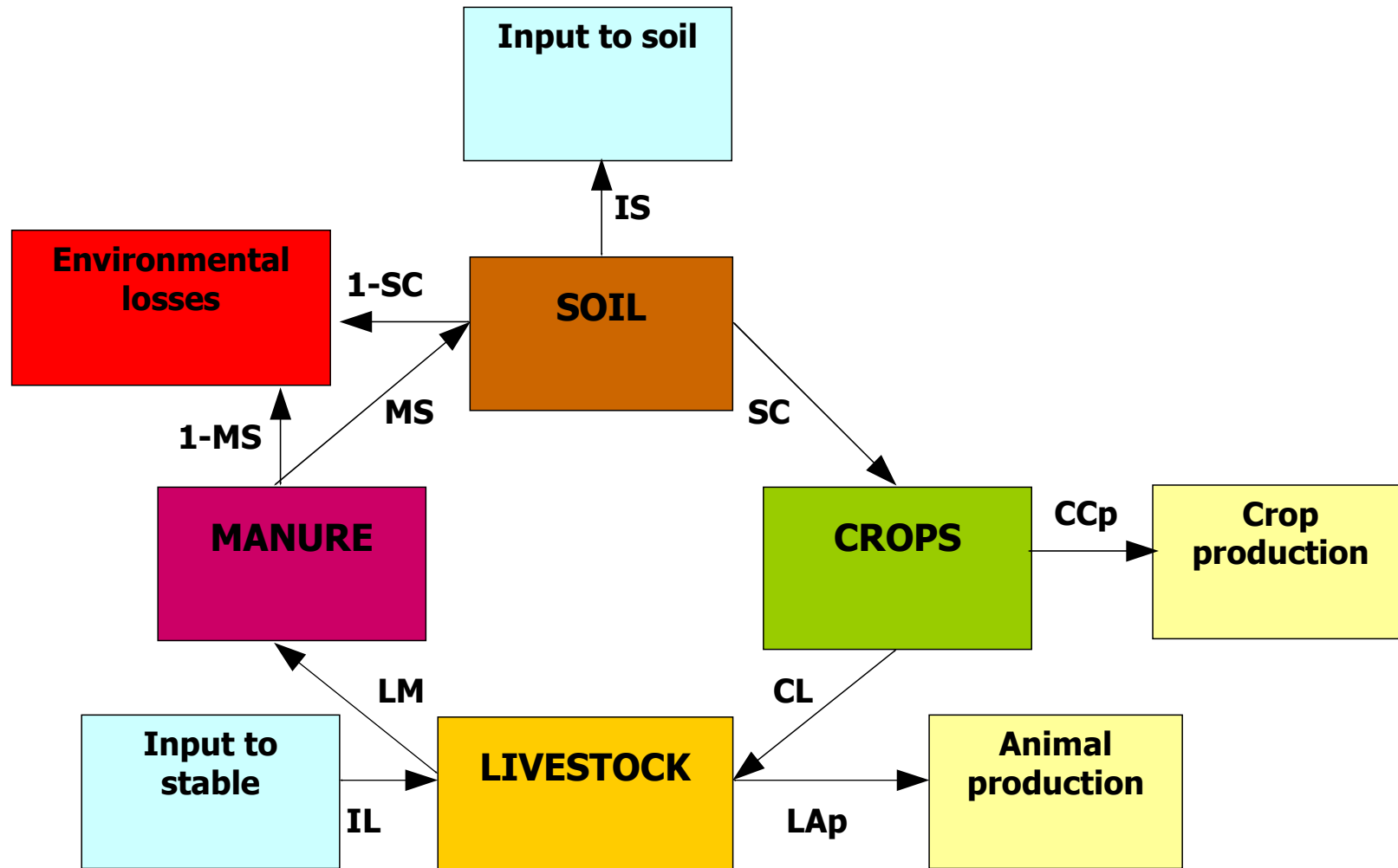
Grazing is very rare in Italy.

White clover is the dominant legume during summer in most meadows.

Lucerne is frequently cultivated in pure stands in temporary meadows.



Farm gate N cycle and balance. Alternative approach?



Farm gate nitrogen balance for some groups of dairy farms (*various, Italy*)

	Intensive dairy farms		Parmigiano-Reggiano
	Piedmont	Emilia Romagna	Emilia Romagna
Nitrogen inputs (kg ha⁻¹)			
Fertilizers	120	96	65
Purchased feeds and roughage	303	274	218
Purchased animals	1	1	1
Leguminous N-fixation	10	15	22
Atmospheric deposition	30	18	18
Total N inputs	464	404	324
Nitrogen outputs (kg ha⁻¹)			
Sold manure	7	0	9
Sold animals	10	19	17
Milk	93	62	54
Crops	16	22	13
Total N outputs	126	104	93
Nitrogen surplus	338	300	231



Farm gate nitrogen balance for some groups of dairy farms (*Green Dairy Project*)



	Scotland	Southern Ireland	South West England	Brittany	Pays de la Loire	Aquitaine	Basque contry	Galicia	North Portugal
Inputs (kg N/ha)	181	301	330	193	154	238	352	457	754
Outputs (kg N/ha)	47	61	64	76	61	83	95	108	252
Surplus (kg N/ha)	134	240	266	117	93	155	257	349	502
Surplus (kg/1000 l milk)	16	28	27	22	19	26	14	18	15
Conversion rate (Inputs/outputs)	26	20	19	39	40	35	27	24	33



Farm gate nitrogen balance for a demo dairy farm (*LIFE project OptiMa-N*)

	Cotti demo dairy farm	
	2005	2006
Nitrogen inputs (kg ha⁻¹)		
Mineral fertilizers	123	85
Organic fertilisers	24	33
Purchased feeds and roughage	71	77
Leguminous N-fixation	65	65
Atmospheric deposition	16	16
Total N inputs	299	276
Nitrogen outputs (kg ha⁻¹)		
Sold manure	-	4
Sold animals	2	3
Milk	28	29
Crops	29	41
Total N outputs	59	77
Nitrogen surplus	240	199



Measures to reduce the N surplus at farm level

At the moment, the “surplus” indicator is not required by environmental legislation, because it is considered too difficult to calculate for the large number of farms that must be controlled. Farmers should be encouraged to use it, as it can show clearly the strategy for reducing environmental impacts.

Main suggestions to reduce N surplus (to be discussed):

- ◆ Reduce the amount of purchased fertilisers
- ◆ Increase the N use efficiency of manure
- ◆ Optimize the protein level and quality in the feed rations
- ◆ ...



PART III – Derogation request: key elements and basic conditions



Type of derogation and manure eligible

Farms with at least 70% crops with high nitrogen demand and long growing season

I. Cattle manure

II. Clarified fraction of pig slurry (provided that the ratio N/P_2O_5 is equal or exceeds 2.5)

The 2.5 value well corresponds to the ratio between N and P_2O_5 in the main crops allowed in derogation farms and ensures that application of P does not exceed crop requirement when nitrogen in manure corresponding to crop uptake is applied



Cropping systems eligible for derogation

- Maize (late maturing hybrids, whole plant to be harvested)
- Maize + winter herbage (to be harvested)
- Winter cereal + summer herbage (to be harvested)
- Permanent and temporary grassland (with less than 50% of leguminous plants)



Maximum standard application rates

Crop	N crop uptake (kg/ha)	N from manure (kg/ha)	N from mineral fertilisers (kg/ha)
Maize FAO 600-700	270	250	85
Maize + winter herbage	300	250	115
Winter cereal + summer herbage	270	250	85
Permanent and temporary grassland	300	250	115



Manure N and fertiliser N efficiency

- Manure N efficiency in derogation farms shall be at least 0.66 (slurry) or 0.50 (FYM). This is achieved by:
 - Better timing in manure spreading (i.e. spring application)
 - Manure splitting to meet crop demand
 - Low emission spreading techniques
- Mineral N fertiliser is set at 1 (as in non derogation farms, according to the AP)



Questions or remarks?

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