Nitrogen related research and policy activities in Italy:

The Ammonia experience in Italy

D'Elia I., Vialetto G., Colonna N., Correnti A., Racalbuto S., Schimberni M., De Marco A.

ENEA

Valli L.

CRPA

Introduction

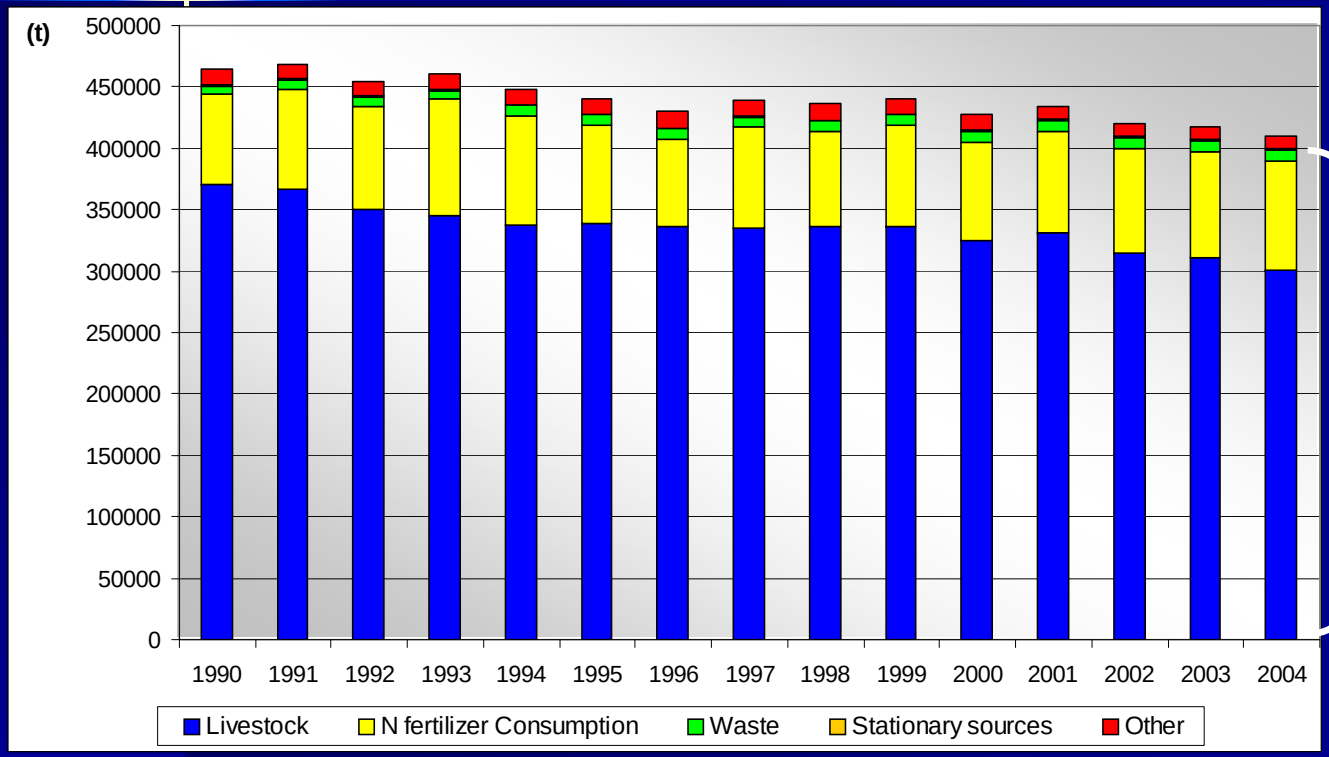
Ammonia is one of the main pollutant causing acidification and eutrophication processes, and one of the most important contributors to the formation of secondary PM.

The Göteborg protocol and the European NEC Directive 2001/81/EC have fixed for Italy the same national ceiling for ammonia emissions of 419 kt per year to be reached in 2010

Index

1. The Italian NH_3 emission time series
2. The Rains-Italy model
3. A way to estimate input data
4. Ammonia livestock abatement technologies
5. The National NH_3 emission reference scenario
6. Different N fertilizer scenario analysis

The Italian NH_3 emission time series: 1990-2004



Agriculture sector represents the 90% of total NH3 emissions (70% from livestock and 20% from fertilizer consumption)

The Rains-Italy model

Harmonization with national/local emission inventories

Activity input data trend:
-energy scenario
-non energy activity scenario

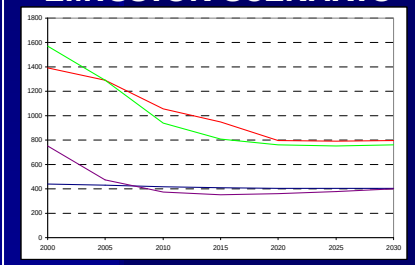
Emission inventory

Control Strategy definition (% of technology application by sector by fuel/activity)

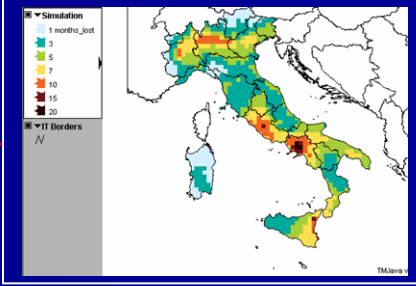
INPUT SCENARIO DEFINITION (CLE, MTFR...)

RAINS-Italy

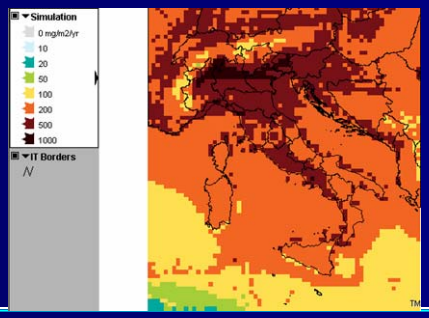
EMISSION SCENARIO



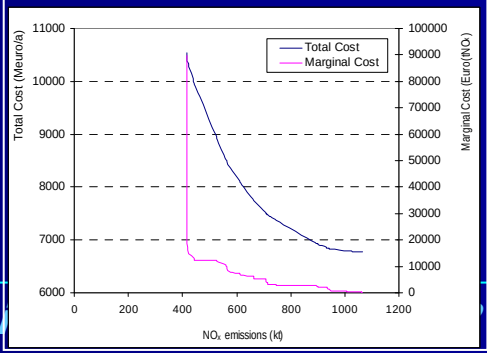
HEALTH&ENV IMPACTS



DEP&CONC MAPS



COST CURVES



A way to estimate input data

- **Livestock Projections**

Key factors

(n° capi)i = number of i-animals

PC_i = i-animal meat production

CC_i = i-animal meat consumption

CC_{tot} = total meat consumption

Pop= population

PL = milk production

PL_{tot} = total milk production

PU = egg production

CU = egg consumption

A way to estimate input data

- **Livestock Projections**

$$(n°capi)_i = \left(\frac{(n°capi)_i}{PC_i}\right) \times \left(\frac{PC_i}{CC_i}\right) \times \left(\frac{CC_i}{CC_{tot}}\right) \times \left(\frac{CC_{tot}}{Pop}\right) \times (Pop)$$

- $(n°capi)_i/PC_i$ = efficiency of the process
- PC_i/CC_i = import / export
- CC_i/CC_{tot} = meat consumption structure;
- CC_{tot}/Pop = total meat consumption per capita;
- Pop = population

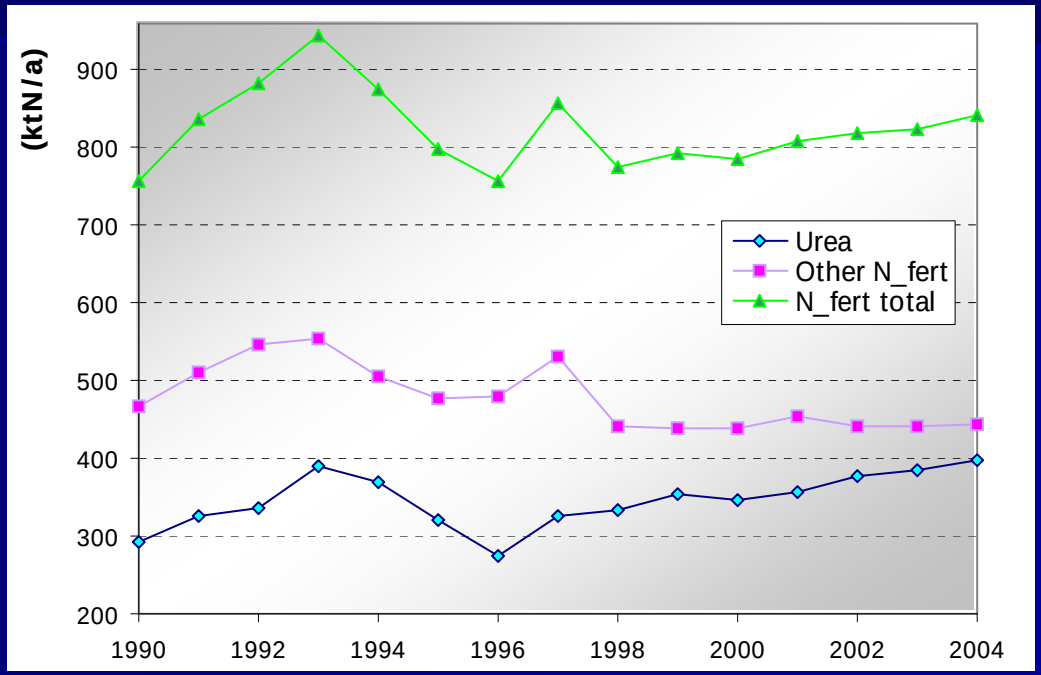
Number of animal projections

A way to estimate input data

- N fertilizer consumption projections

Fertilizer consumption depends on extreme variable factors

The same approach applied for livestock is not applicable to predict fertilizer consumption



EFMA Hypothesis: a 5% N fert consumption reduction for ITALY in *2005-2015*

1% Urea consumption reduction (*2005-2015*)

8.5% other N fert consumption reduction (*2005-2015*)

Ammonia livestock abatement technologies

Analysis of BAT diffusion in intensive livestock: pigs&poultry

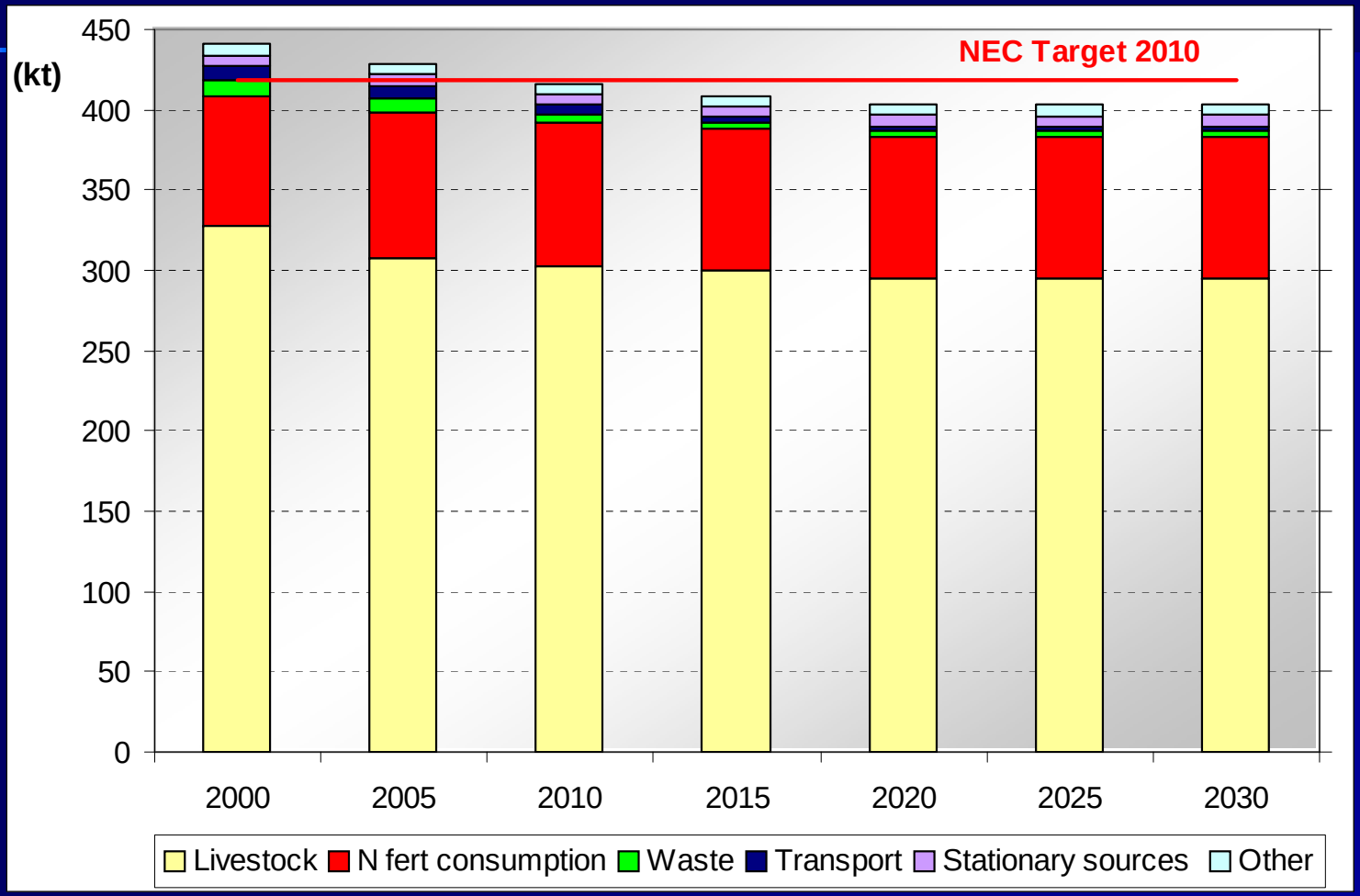
The Italian territory was divided in 4 zones (south and islands were not considered)

Pig and poultry (divided in laying hens and other poultry) farming were not considered and they were divided in IPPC and not IPPC farming

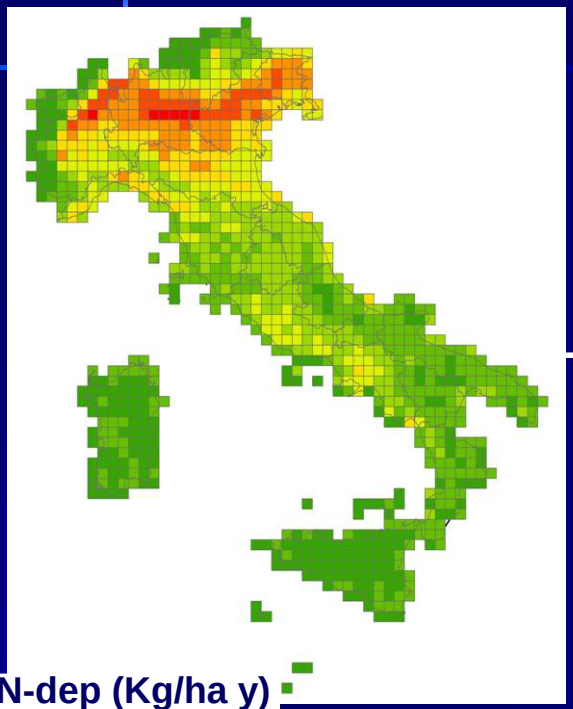
The BAT applied for each farming and stage (housing, storage and application) were described and their diffusion were estimated

Moreover the potential for an increase BAT penetration in 2010 were investigated

The national NH_3 emission reference scenario

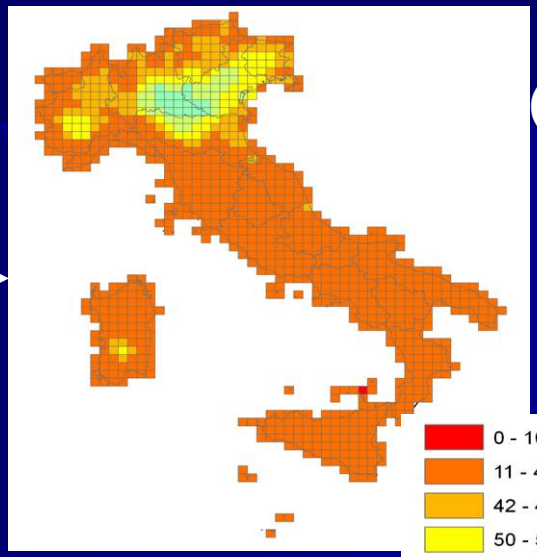


Total N deposition in CLE scenario 2020

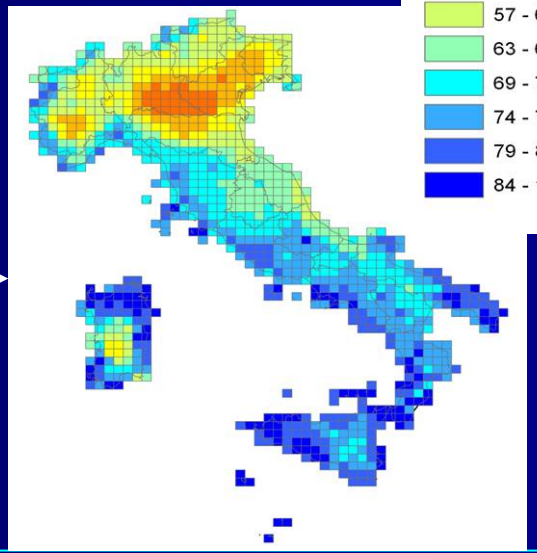


N-dep (Kg/ha y)

- 1.40-4.63
- 4.64-7.03
- 7.04-9.54
- 9.55-12.93
- 12.94-18.03
- 18.04-26.59
- 26.60-38.47
- 38.48-57.10



N-dep red
(% of the total)



N-dep ox
(% of the total)

- 0 - 10
- 11 - 41
- 42 - 49
- 50 - 56
- 57 - 62
- 63 - 68
- 69 - 73
- 74 - 78
- 79 - 83
- 84 - 100

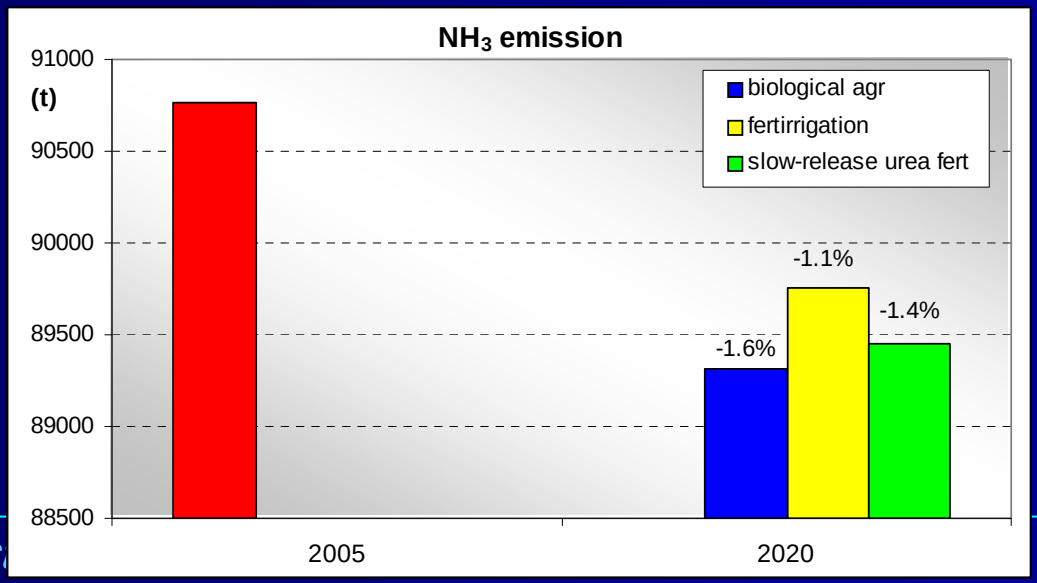
The most intensive agricultural areas (Po plain) are the areas with the highest N deposition

Different N fertilizer scenarios were performed

Different N fertilizer scenario analysis

3 Hypothesis to reduce NH3 emissions from N fertilizer consumption:

1. **N fertilizer Substitution (a 3% biological agriculture increase every 5 year till 2020);**
2. **Increasing N fertilizer use efficiency (80% of irrigated farm at 2020 using fertirrigation)**
3. **Decrease urea volatilization (controlled fertilizer release: a 5% urea substitution with slow-release urea fertilizer)**



Conclusion

Due to the increasing importance of NH_3 and Nitrogen in general new analysis are in progress in Italy:

- develop a methodology to estimate effects and costs of different policies to reduce agriculture impact on air and water following an integrated approach

- evaluate the impact of the same policies through air pollutants and the link with green house gases

- evaluate the effects in term of cost and emission reductions of increasing BAT penetration

The aim is to estimate in a more accurate way emissions and impacts considering the N cycle with an integrated approach