Seventh International Conference on Agricultural Statistics

Modernization of **Agricultural Statistics** in Support of the Sustainable Development Agenda

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THEMATIC SET B
SUSTAINABLE AGRICULTURAL PRODUCTION AND CONSUMPTION
Capturing the environmental impact of agricultural activities

Environmental sustainability of the use of pesticides.

A case study: "the Po River basin"

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Summary

1. Pesticides are among the best regulated chemicals in Europe
2. Why do we study Po basin area?
3. Why do we study banned pesticides?
4. Results
5. What are the implications?
6. Conclusions

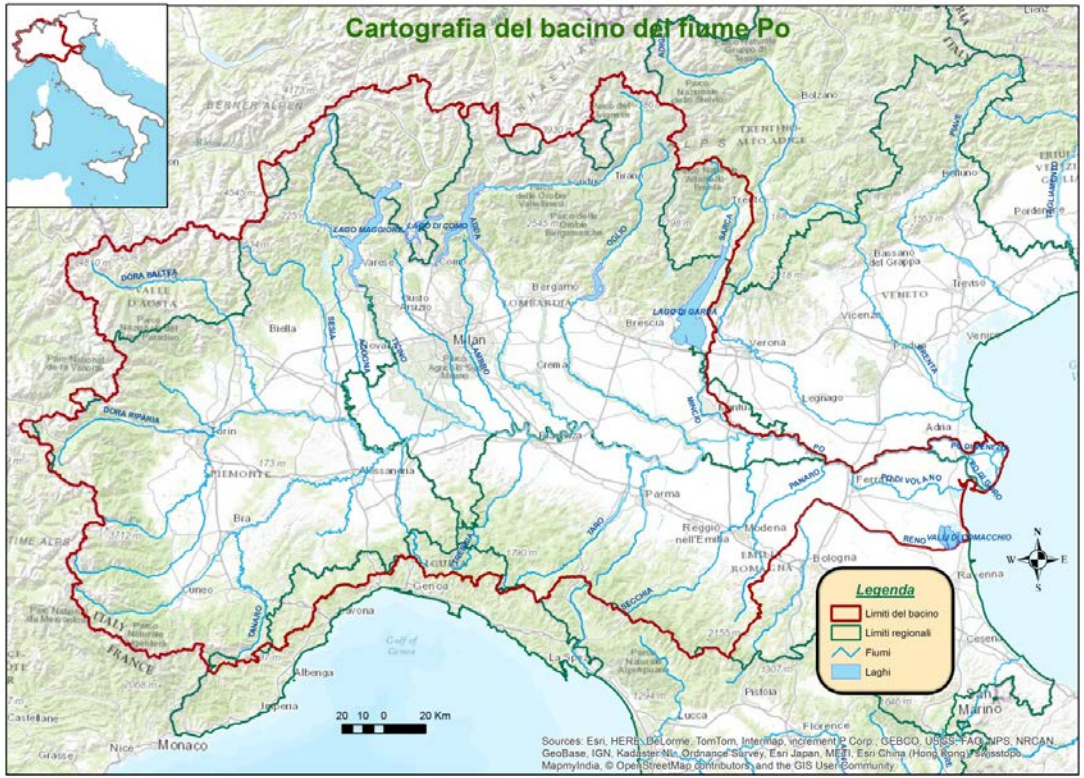
Regulatory framework

European regulation address the risk in all life cycle of pesticides:

- evaluation before the placing on the market (Reg. (EC) 107/2009)
- measures to reduce risk in the use (Dir. 2009/128/EC, on sustainable use of pesticides)
- maximum residue levels in foodstuffs (Reg. (EC) 396/2005)
- environmental quality standards (EQS) (Dir. 2000/60/CE)

Despite this, national and international monitoring show widespread environmental contamination, particularly in water…

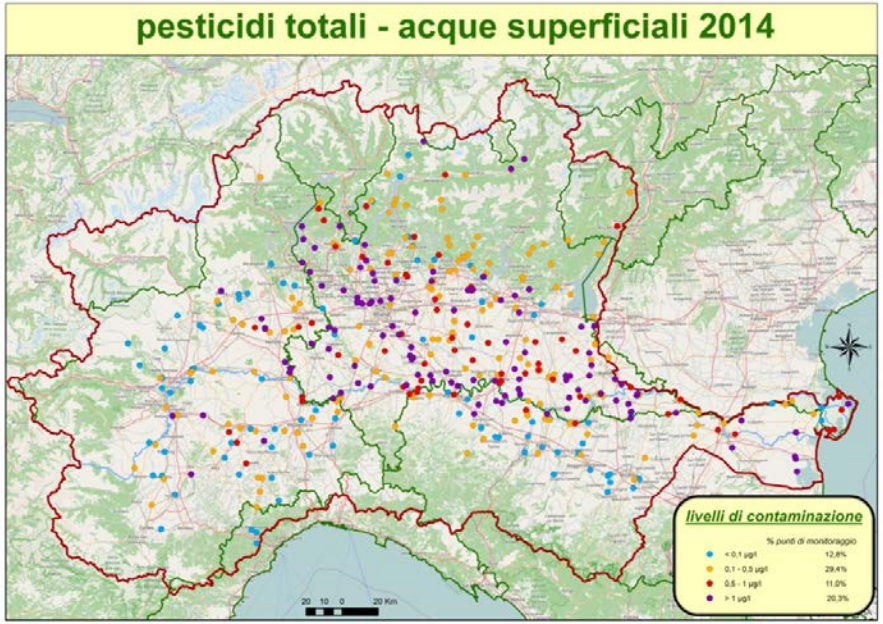
Po river basin



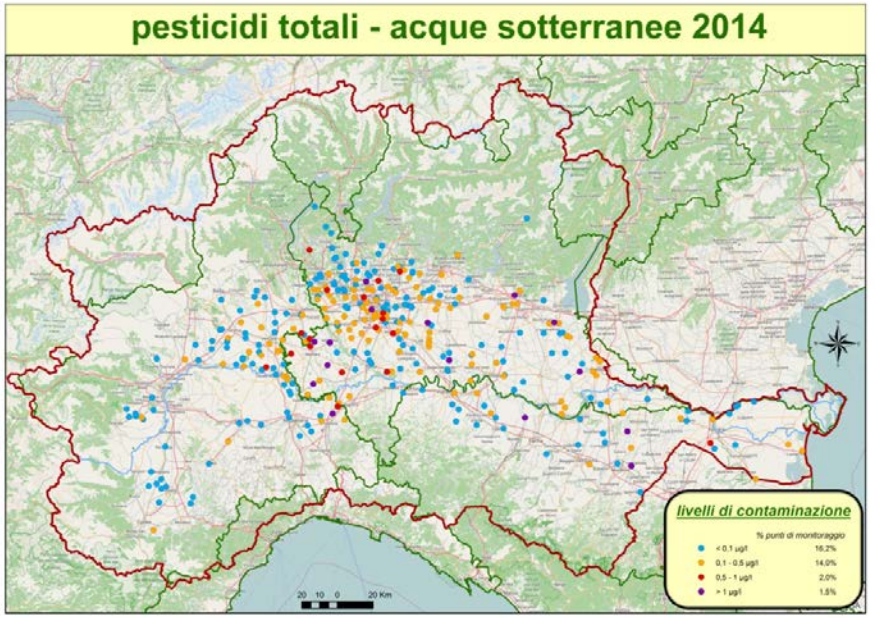
- Po river (652 km, 1,500 m3/sec – Pontelagoscuro)
- The largest basin in Italy: 74,000 Km2
- ≈ 16,000,000 inhabitants; the most important area in the Italian economy
- agriculture occupies over half of the area, high chemical inputs (fertilizers, pesticides)

Pesticide pollution

Surface water



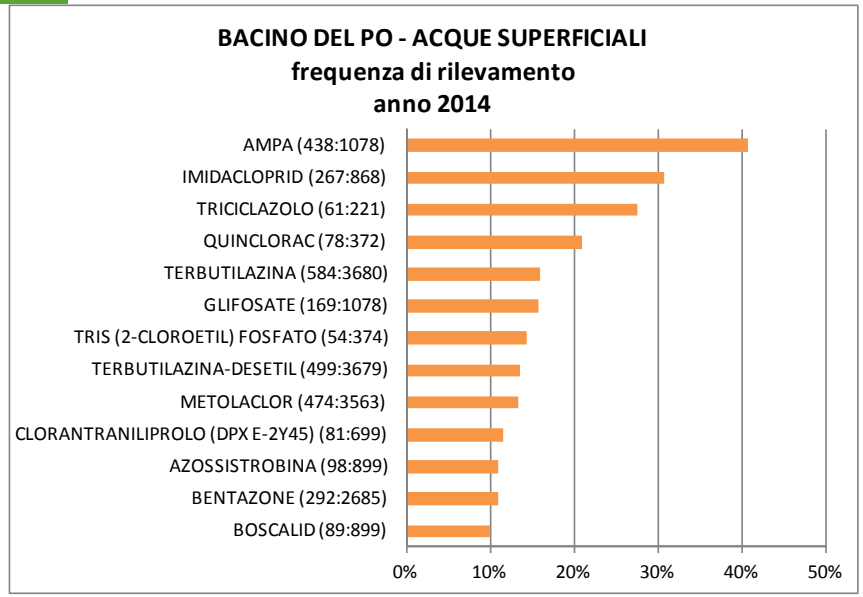
Groundwater



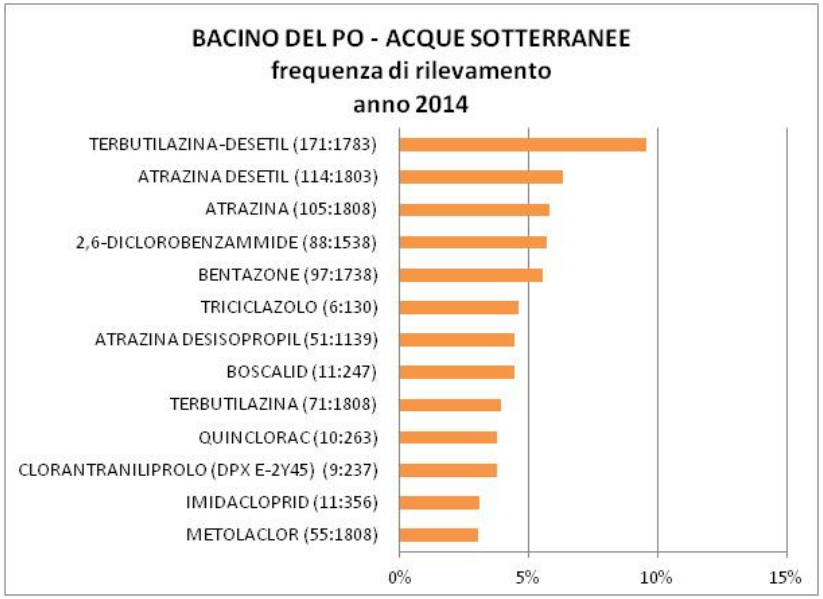
- widespread pesticide contamination of the Po valley
- monitoring network: 570 sites SW; 1,035 sites GW
- pesticides: more than 70% SW (32.6% above limit); more than 40% GW (8.7% above limit)

Detection frequency

Surface water



Groundwater

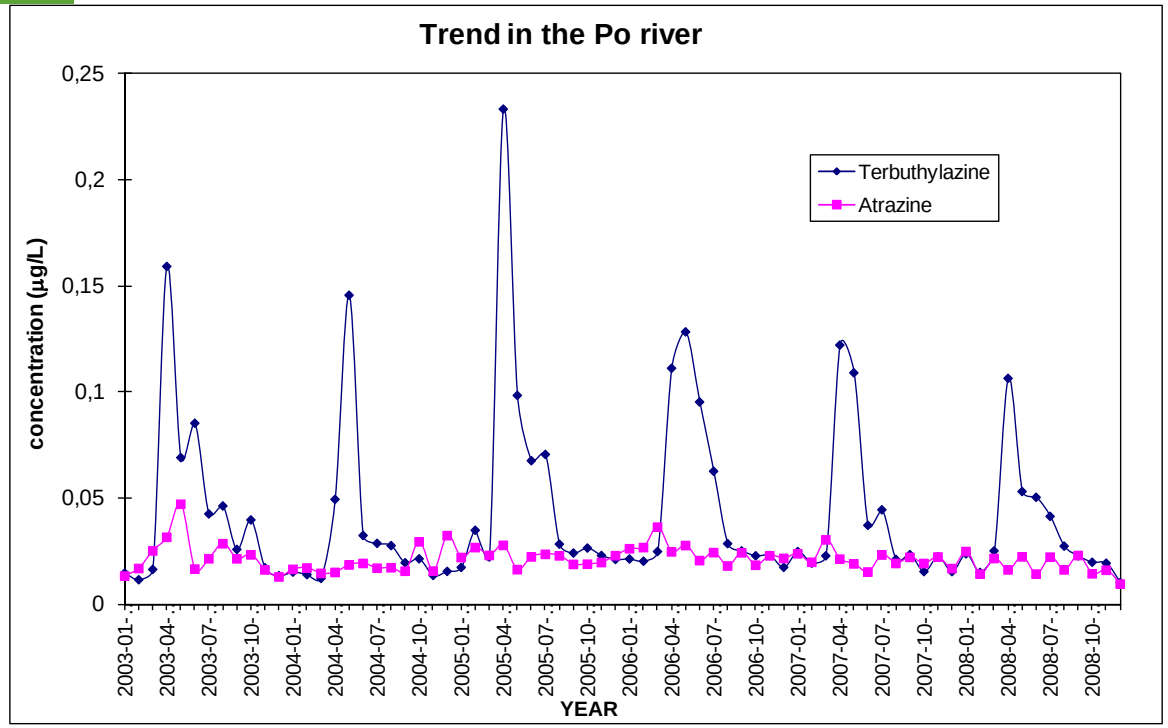


- all types of substances have been found, but especially herbicides
- mixtures of substances (up to 46 different), which can give rise to cumulative effects
  - 48.5% of SW samples: 2 or more substances
  - 15.4% of GW samples: 2 or more substances

Atrazine

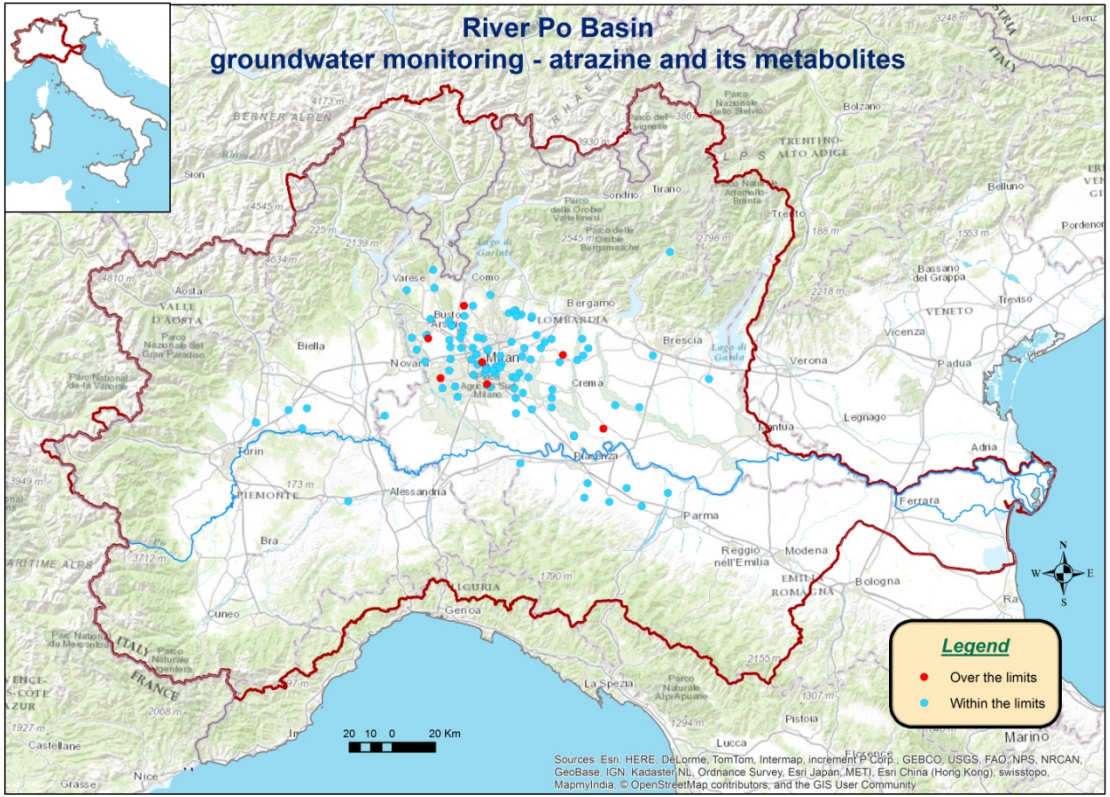
- Banned in Italy since the early ’90s, because of widespread groundwater contamination
- one on the most used herbicide: corn and sorghum, but also for urban and industrial areas
- very toxic to aquatic life, damage to organs through prolonged or repeated exposure, allergic skin reaction
- “priority substance” of EU WFD: recognised as persistent
- ED Cat. 1 (evidence in organism), EU-Strategy for Endocrine Disruptors

Why do we study atrazine?



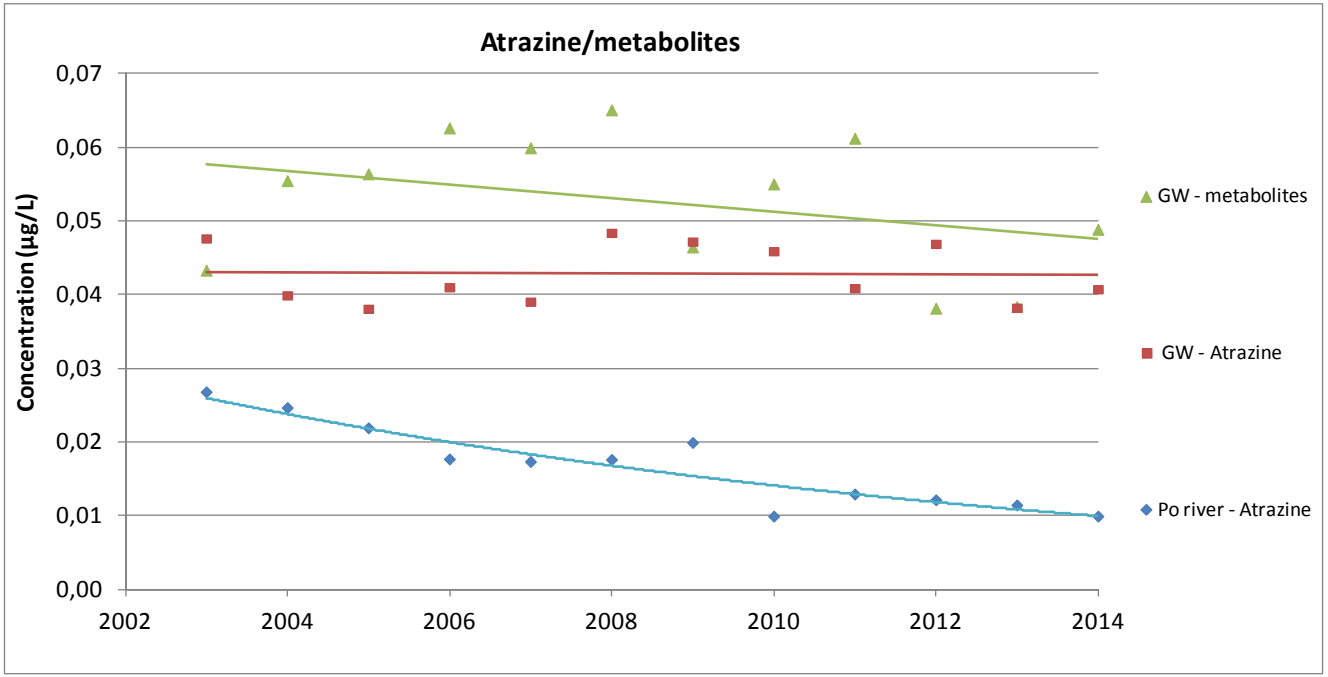
- Terbuthylazine highlights a stagional use with peaks in the spring
- Atrazine has a stable trend indicating a residual historical contamination, due to an intensive, widespread use in the past
- can provide valuable information on the fate of pesticides in water

Atrazine - 2014



- still a widespread contamination due to the past intensive use and persistence
- GW: 104 sites (10.8% of total)
- concentration generally low, but a number of non-conformity (> 0.1 µg/L)

Contamination Trend



- concentration in river decreases regularly: disappearence half-time ≈ 8 years
- GW does not indicate any trend but swings around a roughly constant value
- concentration in GW significantly higher (4 times) than in the river
- metabolites in GW at levels greater than the parental

Results

- widespread atrazine pollution (particularly in GW) in Po basin about 25 y after the ban
- very slow tendency to decrease in SW (Po river)
- GW does not indicate any trend, pollution follows the very slow dynamics of groundwater
- exposure models not fully representative of the environmental fate of chemicals, at least for a massive large scale use
- degradation processes in GW very slow due to the lack of the biotic and abiotic degradation mechanisms
- It is very difficult to make predictions about the ability of groundwater recovery

Results

- The fate of Atrazines can be useful to foresee the future critical issues of other substances, particularly for triazines
- Terbuthylazine (still in use) and its metabolite desethyl-terbuthylazine are the main contaminants of SW and GW in the Po valley
  - pollution affects about half of the SW monitoring sites and most of GW ones (also with concentrations > 0.1 µg/L)

Conclusion

- exposure models not fully representative of the environmental fate of chemicals, at least for a massive large scale use
- persistence in the environment may be much more higher than expected in the studies
- lack of realism in environmental risk assessment: high uncertainty on the actual consequences on ecosystem structure and functions [SCHER, SCENIHR, SCCS, 2013]
- authorization process should take into account a retrospective risk assessment, considering all available information, particularly monitoring data

Conclusion

- It seems not cautelative to base the authorization on the regulatory acceptable limits (e.g. drinking water, EQS)
- there is no-threshold substances (CMR, PBT, ED)
- “mixture effect” (tens of different substances in a sample) is an unsolved issue: risk assessment based on individual substances
- knowledge gaps and uncertainties in the authorization process, which should be guided by the precautionary principle

Environmental sustainability

Chemical pollution follows paths and undergoes environmental fate which makes it very difficult to predict and to reverse

sustainability of chemical pollution should take into account the capability of the environment to respond to anthropogenic stressors (resilience)

Thanks for the attention