

# NATIONAL GROUNDWATER MONITORING AS HIGHER TIER ASSESSMENT FOR PESTICIDES AND THEIR METABOLITES

## Introduction

In the framework of Plant Protection Product (PPP) risk assessment under EU Reg. 1107/2009, groundwater (GW) monitoring programs can be carried out and assessed as refined risk assessment in the tiered approach defined by the FOCUS GW group (SANCO, 2010) and EFSA (2013). However, specific indications of methodologies on how to conduct the studies and about the possible use of the monitoring results have not been proposed by the EU authorities so far. The SETAC group EMAG-Pest/groundwater, is developing scientific bases to recommend harmonised guidance for groundwater monitoring.

At the Italian level, a national provision requires that companies perform monitoring plans for toxicologically non-relevant metabolites whose PEC<sub>gw</sub> exceeds 0.75 µg/L in the Italian relevant scenarios (CCPF, 2009) calculated with standard FOCUS GW models (Min. Salute, 2012). In the last years, AEIFORIA has implemented a specific network of more than 250 wells for field leaching and groundwater monitoring (of which more than 130 new installed piezometers) distributed in relevant agricultural national areas, useful also to accomplish this requirement.

## Objectives

- To establish a robust methodology at national and EU level for the identification of sites vulnerable to leaching based on the indication of GW FOCUS modelling;
- To characterize the extent of occurrence of active substance or its metabolites in wells by retrospective monitoring.

## Materials and methods



- REPRESENTATIVE AREAS IDENTIFICATION:** identification of areas checking shallow GW, crop data, sales data, vulnerability, potential vulnerable layer, weather data and agronomical aspects.
- SITE IDENTIFICATION AND CHARACTERIZATION:** identification and characterization through direct interviews with farm owners and farmers, characterization of PPP usage, Cone penetration test and litho-stratigraphic assessment.

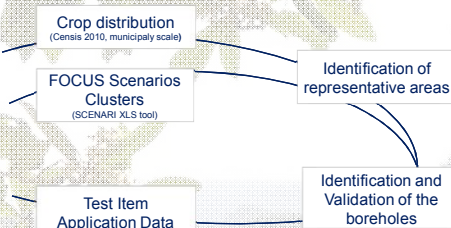


- SITE SET-UP:** selection of existing suitable wells or installation of new piezometers, also taking in consideration the preliminary indication from EMAG-Pest.



- MONITORING:** starting of sampling schedule, carried out in the best way possible in order to preserve samples from degradation, photo degradation and to avoid cross-contamination of GW.

- ANALYSIS:** samples are analyzed using the most appropriate analytical methods in terms of specificity and sensitivity. The most common analytical technique is performed by reversed-phase HPLC with triple quadrupole mass spectrometric detection (LC-MS/MS). At least two daughter ions of characteristic transitions of each analyte are monitored.



Study	Target Culture	Usage	Total sampling points	Total analyzed samples	Total planned samples	N° of metabolites researched	Parent compound detections			Metabolites detections			
							<LOQ	>LOQ <0.1 µg/L	>0.1 µg/L	<LOQ	>LOQ <0.75 µg/L	>0.75 µg/L	>10 µg/L
Study 1	Horticultural crops	Fumigant	24	24	24	1	N.A.	N.A.	N.A.	24	0	0	0
Study 2	Maize	Herbicide	30	120	120	3	N.A.	N.A.	N.A.	120	0	0	0
Study 3	Rice	Herbicide	14	28	28	0	28	0	0	N.A.	N.A.	N.A.	N.A.
Study 4	Maize	Herbicide	20	260	360	6	260	0	0	258	2	0	0
Study 5	Wheat	Herbicide	36	36	36	2	N.A.	N.A.	N.A.	30	1	4	1
Study 6	Rice	Herbicide	12	12	12	0	12	0	0	N.A.	N.A.	N.A.	N.A.
Study 7	Wheat	Herbicide	35	86	306	2	N.A.	N.A.	N.A.	78	5	3	0
Study 8	Maize	Herbicide	20	120	200	4	N.A.	N.A.	N.A.	114	6	0	0
Study 9	Rice	Herbicide	7	14	14	0	12	0	2	N.A.	N.A.	N.A.	N.A.
Study 10	Horticultural, wheat	Fungicide	20	60	180	1	59	0	1	54	1	5	0
Study 11	Horticultural, orchards	Fungicide	18	48	234	3	N.A.	N.A.	N.A.	39	9	0	0
Study 12	Orchards (apples pears)	Fungicide	8	-	72	2	N.A.	N.A.	N.A.	-	-	-	-
Study 13	Maize	Herbicide	20	60	240	4	60	0	0	60	0	0	0
Study 14	Wheat, barley	Fungicide	20	-	80	1	N.A.	N.A.	N.A.	-	-	-	-
Study 15	Rice	Herbicide	10	9	20	0	9	0	1	N.A.	N.A.	N.A.	N.A.

N.A.: Not Analysed

Table 1: The GW monitoring studies implemented in recent years.

## References

- Commissione Consultiva per i prodotti fitosanitari (CCPF), 2009: National Criteria for the environmental risk assessment: surface water and groundwater (available at: [www.minambiente.it](http://www.minambiente.it))
- EFSA, 2013: EFSA Journal 2013;11(6):3291.
- Europe Advisory Groups: Environmental Monitoring of Pesticides. <https://www.setac.org/group/SEAGPest>
- ICPS, 2007 (Azimonti G., Galimberti F., Auteri D., Triacchini G.) Scenari nazionali di esposizione ai prodotti fitosanitari per le surface water e per le acque di falda. National conference proceedings "PPPs Environmental risk management: towards a sustainable use", Milan 5-6 June 2007, 23-39, ICPS - Ministry of Environment and Protection of Land and Sea
- "SANCO, 2010. SANCO 13144/2010 (Rev. 3, 2014) Assessing Potential for Movement of Active Substances and their Metabolites to Ground Water in the EU
- Ministero della Salute, 2012, comunicazione DG SAN/7/1.5.1.z. (published in March 2013, available at [www.salute.gov.it](http://www.salute.gov.it))

## Discussion

- The identified monitoring areas mostly correspond to the sites monitored by the national Italian authority for environmental monitoring (ARPA) and to the most intensively cultivated areas;
- Results obtained until now indicate that population of concentrations exceeding the limit of 0.1 µg/L for a.i. and relevant metabolites, and the threshold of 0.75 µg/L for toxicologically non-relevant metabolites is near to 1% of the whole dataset. Values above 10 µg/L have not been observed until now.

## Conclusion

- The sampling data obtained until now indicate that the potential GW contamination does not occur in the identified vulnerable sites under realistic conditions. Thus, GW monitoring programs can constitute a valid higher tier for the pre-registration assessment of PPPs;
- Development and implementation of an official EU guidance on GW monitoring would be helpful to share common methodologies for the identification of national vulnerable scenarios. Moreover, it would facilitate the processes of PPP risk assessment and management, also in the post-authorization phase;
- Through the use of "scenari xls" tool (ICPS, 2007), already employed to evaluate the representativeness of FOCUS step 1 scenarios for the national territory, the representativeness of the sampling results could be extended to large areas in Italy. Monitoring results could be indeed considered valid for similar agro-climatic conditions, thereby reducing efforts and costs of monitoring programmes and simplifying the work both for industry and authorities.