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4. Soil health in achieving the Sustainable Development Goals 4.27 133609 - How will we monitor soils in the coming century?

FIRST GLANCE OF FRENCH SOIL CONTAMINATION BY PESTICIDE RESIDUES AND THE NEED FOR BROAD-SCALE MONITORING

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The intensive use of pesticides in modern agriculture raised concerns about their environmental fate and impacts on the ecosystems. If the monitoring of those substances in water bodies has been established in Europe since the 2000's, knowledge of soil contamination by such residues is scarce. However, the few studies addressing this issue pointed out the widespread occurrence of pesticides in soils and the risk they can pose for soil biodiversity. This study investigated 111 currently used pesticides in 47 soils sampled across France, mostly from arable lands but also from forest and grasslands theoretically exempted of pesticides applications. The sampling strategy was based on the French Soil Quality Monitoring Network to evaluate the feasibility of using an existing network for pesticides monitoring in soils. The results demonstrated the widespread contamination of almost all soils samples by residues, including untreated areas such as forests and permanent grasslands. Up to 33 different substances in one soil sample were detected, at concentrations leading to a medium to high ecotoxicological risk for earthworms in arable lands. Several frequently detected residues have never been reported in the literature so far or were found at much lower detection rates. Finally, the comparison with pesticide application records provided by the farmers revealed the unexpected presence of some substance in sites where they were not applied and a longer than expected persistence of several compounds. These findings question the fate of currently used pesticides in the environment under current agricultural practices and advocate for the monitoring of pesticides in soils at broad scales. Filling the knowledge gap of pesticide presence in soil is necessary to understand the contamination of other environmental compartments and prevent their contamination. Therefore, there is a clear need to integrate pesticide analysis in national soil monitoring programs to evaluate contamination levels, which will be conducted in France. This monitoring will include both target and non-target analyses to identify all the potential molecules in soil.

Keywords: Pesticides, Soil monitoring, Persistence, Risk assessment