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Combining methods and knowledges for monitoring environmental policies on a territorial scale: spatial disaggregation of pesticides sales through land use data, reglementary information and expert knowledges

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1. Introduction

Understanding the pesticides uses across a region is crucial for evaluating environmental policy effectiveness, guide environmental monitoring and implement targeted actions (Martin et al., 2023). However, when detailed on-the-ground data on phytosanitary practices and pollutant measurements are scarce or unavailable, the use of appropriate indicators with suitable spatial and temporal resolutions becomes imperative.

We present a method for allocating the annual sales of plant protection products on a territorial scale according to agricultural land use. This method provides a spatial and temporal estimate of the application of plant protection products, and is primarily intended for use by local authorities needing to carry out temporal and spatial diagnoses. The method draws upon a nationwide approach proposed by Martin et al. (2023) and Lungarska et al. (2024) in France, with the aim of enhancing and implementing it on a local scale.

2. Materials and methods

The method is based on the disaggregation of sales declaration information at the postal code level (BNV-d), based on the detailed land use information at the agricultural parcel scale (more than 350 different crops) provided by the Land Parcel Identification System (LPIS), and the registered uses of products (i.e., the target crops and the registered doses) from the authorisation marketing database (E-phy). This disaggregation encompasses the consideration of infrastructures in non-agricultural zones that could potentially be treated with these products, agricultural practices such as organic farming, and the evolution of legislation concerning the application of pesticides. As some pesticides have several registered uses per crop (i.e., different targets), a reference dose per pesticide and per crop is calculated with the median of all the uses.

Users can interact with the method to refine the information on phytosanitary practices within the investigated area. This enables the mobilisation of local expertise, which allows for the adjustment of the target crops and the reference doses applied per plant protection product. The objective is to more accurately reflect the actual phytosanitary practices in the studied area.

Subsequently, the refined disaggregated information is reaggregated into a comprehensive territorial-scale resolution. This resolution provides the user with relevant information, as the quantity of active ingredient, to monitor pesticides over time and land use category (e.g., by crop, by non-agricultural land uses). Furthermore, data disaggregated at the plot level within the territory can be used to trace pressures that vary from one point to another for a given substance. The data employed by this method are freely accessible, with records available from 2015 onwards, typically with a maximum lag of two years.

3. Results and Discussion

The method was implemented in a number of different territories across France, each characterised by varying land uses, geomorphological features, and phytosanitary challenges. The implementation process engaged a range of local stakeholders, including government agencies and local organisations, underlining the collaborative nature of the method.

The method is currently undergoing further developments, with a specific focus on refining the spatial units associated with the administrative postal code of pesticide sales (i.e., the parcels to which products sold in a postal area are effectively applied). Additionally, the inclusion of real data on pesticide applications obtained from farmers' notebooks is being considered. This will lead to a significant improvement in the results produced by the method.

4. References

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