One Health and agriculture: bridging data gaps to tackle environmental chemical loads

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The *One Health* approach seeks to ensure a sustainable balance between the health of people, animals, plants, and ecosystems, recognizing their deep interconnections. Whilst its definition was expanded in 2022 to explicitly include plant health, the agricultural dimension of *One Health* still remains insufficiently developed in practice. This study examines how data gaps and methodological inconsistencies hinder the assessment of the contribution of each domain (*i.e.*, plant, animal and human) to environmental chemical pollution, thereby limiting the design of specific and effective mitigation actions.
Using publicly available datasets from FAO, EUROSTAT, ESVAC, Animal Health Europe and OECD (2010–2020), we compared chemical inputs from agrochemicals, and drugs for and human applications across five EU countries (Italy, Germany, France, Spain and the Netherlands). Data were standardized to kilograms of active substance and normalized by land or residential area to ensure comparability among the plant, animal and human domains.
Results indicate that agriculture is a significant source of environmental chemical inputs, followed by human and veterinary drugs. However, major data limitations persist, particularly for non-antimicrobial veterinary drugs (*animal domain*), over-the-counter human medicines (*human domain*) and emerging (industrial) contaminants such as PFAS or endocrine disruptors. These gaps prevent accurate estimation of total environmental chemical load and the design of targeted mitigation strategies. In the absence of a robust evaluation of the specific contribution of each domain, setting *a priori* limits, such as the EU targets on pesticide or fertilizer reduction, may therefore prove ineffective in achieving the intended objectives. While these objectives are undoubtedly important, they could indeed unintentionally compromise other essential areas, including agricultural productivity (*SDG 12: Responsible Consumption and Production*) and food security (*SDG 2: Zero Hunger*).
Harmonized and transparent data collection across *One Health* domains would therefore enable more precise identification of pollution sources and support evidence-based policymaking. Integrating agricultural professionals (*i.e.*, licensed agronomists, foresters, and animal production specialists) into the *One Health* framework is also crucial to ensure that environmental policies remain compatible with food production and rural sustainability. Moreover, the parallel implementation of precision agriculture, digital monitoring and biotechnological innovation could reduce agrochemical dependence while maintaining productivity.

The work identifies three key priorities for future actions: (i) standardizing national and international data reporting on agrochemicals and medicines; (ii) strengthening cross-sectoral and international regulatory coordination to avoid pollution displacement; and (iii) fostering interdisciplinary collaboration among policymakers, scientists and practitioners. By emphasizing the pivotal role of agriculture within *One Health*, the study contributes to the development of integrated strategies that safeguard ecosystem integrity, food security and public well-being. Ultimately, this approach reinforces the scientific foundation of the EU Green Deal, the Farm-to-Fork Strategy and the UN Sustainable Development Goals, promoting sustainable chemical management and truly integrated vision across all sectors of society.

Keywords:
One Health, agriculture, environmental chemical loads, data standardization, sustainability

Original article:
Vos J, Alessandrini M, Trevisan M, Pii Y, Mazzetto F, Orzes G, Cesco S, 2025. *One Health approach: Addressing data challenges and unresolved questions in agriculture.* Science of the Total Environment, 977, art. no. 179312.
DOI: https://doi.org/10.1016/j.scitotenv.2025.179312.