Soil risk assessment: impact of new tools on the prediction of environmental concentrations

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EFSA has proposed a new methodology for soil exposure and risk assessment (EFSA, 2017) including new tools to calculate predicted environmental concentrations in soil (PEC_{soil}). The software PERSAM (VITO, 2019) supports the calculation of Tier-1 and Tier-2 on the basis of an analytical model. Tier-1 consists of a plot-scale assessment of three representative pre-selected scenario locations. Tier-2 applies the same analytical model in a spatial manner on a 1km x 1km grid across Europe. A higher tier scenario location is selected on the basis of the 95th percentile of the spatial Tier-2 calculations which are then evaluated in Tier-3A by the numerical models FOCUS PEARL and PELMO.

A comprehensive modelling exercise was conducted to compare the EFSA approach with the current accepted FOCUS assessment on the basis of 56 parent substances (plus up to two metabolites) covering a wide range of different degradation values and sorption coefficients. Relevant and agronomically representative application patterns were selected for various crops including spray and air blast applications. Risk failure rates were derived by dividing regulatory acceptable concentrations by PEC_{soil} at 5 cm soil depth for all tiers.

PEC_{soil} values calculated according to EFSA are up to ×200 higher for Tier-1, ×80 higher for Tier-2 and ×34 higher for Tier-3A in comparison to FOCUS. Key drivers were identified as changes in assessment soil bulk density and introduction of foliar wash-off. It is noted that Tier-3A scenario locations do not always represent relevant environmental conditions for intended uses. The overall failure rate is significantly higher increasing from 14% (FOCUS) to 67%, 58% and 36% at Tier-1, Tier-2 and Tier-3A, respectively.

The workflow with the new tools is still inefficient and prone to errors. Further usability features such as reporting, inclusion of a substance database and automation would be helpful to decrease the future workload for applicants and authorities. Moreover, it is noted that the 95th %ile soil scenarios proposed for assessment are considered agronomically atypical and frequently extreme. This widens inconsistency between exposure and effect assessment, thereby increasing uncertainty and hindering risk assessments.

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