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How can risk mitigation measures for surface runoff and erosion be included in the regulatory environmental risk assessment for pesticides in Germany?

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Surface runoff from agricultural fields is a major input pathway of pesticides into surface waters. The aim of this project was to i) analyze the effectiveness of various mitigation measures to reduce pesticide runoff and erosion inputs into surface waters, ii) assess the suitability of the measures found effective for use in the quantitative environmental exposure assessment for authorization of plant protection products (PPP), and iii) make recommendations how the potentially suitable measures could be applied in risk assessment of PPP in Germany.

Following a literature analysis, 16 risk mitigation measures were presented to five experts in the field. Measures finally selected for quantitative analysis belong to 3 groups: vegetative filter strips (VFS), soil conservation measures (including no-till) and microdams in row crops. VFS effectiveness was analysed with CART (Classification and Regression Trees) using the dataset compiled by Reichenberger et al. (2019). CART was performed for three target variables: i) relative reduction of total inflow by the VFS (ΔQ), ii) relative reduction of sediment load (ΔE), and relative reduction of pesticide load (ΔP). The main data sources for soil conservation measures were a plot database with annual runoff volumes and soil losses (Maetens et al., 2012), a literature review (Fawcett et al., 1994) and a field study with event-based data (Erlach, 2005), while for microdams the principal source were the data compiled by Sittig et al. (2020).

The following conclusions were drawn from the analysis:

VFS can be recommended for application in quantitative risk assessment. However, infiltration and sedimentation should be simulated with a mechanistic model such as VFSMOD.

Due to the high variability of results and limited availability of high-quality data, effectiveness of mulch-till could not be quantified sufficiently well. It can therefore not be recommended for now as a regulatory mitigation measure.

Before recommending no-till as a regulatory mitigation measure for surface runoff and erosion, the question of potentially increased pesticide loss via leaching and drainage should be clarified.

Microdams in row crops can also be recommended as a regulatory mitigation measure, since they have shown to be effective and their effect can be modelled as a reduction of the runoff Curve Number. However, elaborating a CN table for e.g. the FOCUS scenarios would require an in-depth analysis of the available data.