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## Evaluating trends and risks of aquatic pesticide pollution in the Western Cape, South Africa

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South Africa is the leading user of pesticides in Sub-Saharan Africa. Consequently, there is an urgent need to improve our understanding of which pesticides persist in the environment and how they are being transported to non-target environments. The presence of pesticides in non-target environments, such as surface water or groundwater, could be detrimental to aquatic ecosystems and human health.

Our research focuses on monitoring for pesticides in the rivers of three agricultural catchments (Grabouw, Hex River Valley, and Piketberg) within the Western Cape, South Africa. Passive samplers are being deployed from March 2022 to March 2023, adding to a pre-existing dataset of analytical and pesticide application data from 2017 to 2019. Laboratory methods are being developed and validated at Stellenbosch University (SU) to analyze for pesticides using Liquid Chromatography-Mass Spectrometry. Duplicate samples were analyzed at the Swiss Federal Institute of Aquatic Research (Eawag), as a quality control step. Limits of Quantification were lower at Eawag and measured concentrations were typically higher compared to SU. These differences are likely due to variations in the instrument used and sample extraction procedure.

Results from 2017-2019 indicate that 83% of samples contained five or more pesticides. In every year of sampling, total pesticide concentrations were typically attributable to a single/few compounds per catchment. Six pesticides exceeded Environmental Quality Standard (EQS) values in at least one of the sampling periods. Imidacloprid was highlighted as a pesticide of concern since it consistently exceeded EQS values over all sampling periods. Detection/exceedances of pesticides generally coincided with their application and rainfall events, except for imidacloprid and terbuthylazine. This suggests that alternate transport pathways, such as storage and input from groundwater, may be relevant. Recent results from 2022 sampling indicate that the concentrations of imidacloprid are decreasing; however, they are still exceeding EQS values. Lastly, expansion of the analytes in 2022 led to the detection of two new pesticides, dimethomorph and diphenylamine.

Our results suggest that establishing a long-term data set regarding aquatic pesticide pollution in the Western Cape will lead to a better understanding of the trends and risks of pesticide use. This improved knowledge will lead to the development of targeted mitigation measures for more

sustainable agricultural practices in South Africa and beyond.