



## Consequences of pesticide use in the tropics

June 27, 2023 | Andri Bryner

Topics: Drinking Water | Pollutants | Water & Development | Society

**While the use of pesticides in industrial countries is being questioned more and more critically, less is known about their consequences on human health and the environment in tropical countries. The interdisciplinary project “Pestrop” is now changing this and also shows where the necessary measures need to be taken.**

When it comes to water in the Global South, the focus is usually on microbiological quality. Small wonder, given that diseases, such as cholera or typhoid, spread through contaminated drinking water. Pesticides, on the other hand, are a little-researched topic in tropical regions. However, a team of experts from the fields of environmental chemistry, human toxicology and political science has now investigated which pesticides were used in two test regions in the period from 2017 to 2020 in Costa Rica and Uganda, and which active substances were found in streams and drinking water production. At the same time, research was conducted on how farmers handle pesticides and how well-informed they are about the risks. The team found clear evidence of long-term negative effects of pesticide use on farmers' health. The project also uncovered deficits in environmental data, inadequate advice to farmers and outdated statutory requirements on pesticide use.



Spraying equipment and pesticides in a shed in the Zarcero region of Costa Rica. (Photo: Samuel Fuhrmann, Swiss TPH)

### **Surprising insecticide findings**

The project focused on “modern”, often polar active substances, such as fungicides and insecticides. In Africa as well as in Central America, there are still hardly any regulations on these. However, it is evident that they are widely used. In individual samples from streams, the researchers found active substances in concentrations that were significantly above the threshold limits as recognised in Switzerland. And problematic concentrations were also found in boreholes and ponds from which the population draws its drinking water. In addition – and this was surprising – the team found substances in the water that are hardly ever sprayed on the fields, including the insecticide chlorpyrifos, which has since been banned in Switzerland. The researchers suspect that the agent is used to control mosquitoes and mites in stables and enters the environment with farmyard manure, for example.

The “Pestrop” project was jointly led by the aquatic research institute Eawag and the Swiss Tropical and Public Health Institute.

### **Philipp Staudacher on the use of pesticides in developing countries**

[Watch the video on Youtube.](#)

Lecture at Eawag Infoday 2023

At Eawag's Info Day "Aquatic research for sustainable development" on 14 September 2023 in Dübendorf, Christian Stamm, Deputy Director of Eawag, will take a closer look at Eawag's research on the use of pesticides in the Global South, but also in Switzerland, and present the research results. In particular, he will explain the conflict of goals between plant protection



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-correlation methods used in Particle Image Velocimetry (PIV) to reconstruct the fluid velocity field from the experimental recording. Despite the flexibility of CNNs, the accuracy and robustness of the standard image processing remains unsurpassed for general PIV data. As CNNs are non-linear and typically entail up to millions of trainable parameters, they require large and carefully designed training datasets to avoid over-fitting and to obtain results that are accurate for a wide range of flow conditions and length scales. Most training datasets consist of PIV-like data that are generated from displacement fields resulting from numerical flow simulations, which, in addition of being computationally expensive, may be able to inform the network only about relatively few classes of flow problems. To overcome this issue and improve the accuracy of the velocity reconstructed by CNNs, we propose to train the networks with synthetic PIV-like data generated from random displacement fields. The underlying idea is that the training dataset simply needs to teach the network about the kinematic relationship between position and velocity. These kinematic training datasets are computationally inexpensive and may allow a much richer variability in terms of length scales by varying the generation parameters. By training a state-of-the-art CNN, we investigate the accuracy of the reconstructed displacement and velocity with synthetic and experimental test cases, such as a sinusoidal flow and wind-tunnel data from a turbulent-boundary-layer and a cylinder-wake experiment. We demonstrat

e that kinematic training can drastically improve the accuracy of the CNN and allows the network to outperform conventional cross-correlation methods, being more robust with respect to data noise and providing reconstructed velocity fields that have considerably higher spatial resolution (at pixel level).'  
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Oltamare, C.; Weiss, F. T.; Staudacher, P.; Kibirango, O.; Atuhaire, A.; Stamm, C. (2023) Pesticides monitoring in surface water of a subsistence agricultural catchment in Uganda using passive samplers, *Environmental Science and Pollution Research*, 30(9), 10312-10328, doi:10.1007/s11356-022-22717-2, [Institutional Repository](#)

### Funding / cooperations

Eawag Swiss Tropical and Public Health Institute (Swiss TPH) University of Bern University of Basel National University of Costa Rica Makerere University, Uganda Uganda National Association of Community and Occupational Health (UNACOH)

### Related Links

Information on plant protection products in water

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