



Lateral transport of pesticides from a litchi orchard to an adjacent stream: Measurement and Simulation

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In the mountainous areas of northern Thailand, human population growth and migration from the lowlands have increased the pressure on agricultural systems. This has led to intensified agriculture, which is accompanied by the expansion of farmland into ever more vulnerable areas and increased application of agrochemicals. To investigate pesticide transport to surface water and to identify the flow components contributing to it, we installed two discharge gauges with automatic water samplers in a stream close to a 2-ha litchi orchard. In two years (between June and September) we applied methomyl, and in one year additionally chlorothalonil, to the orchard and monitored water fluxes and pesticide concentrations in the stream water. A multiple compartment model was developed to evaluate and interpret the field data and to test hypotheses based on the experiments. The model assumes that water flow and solute transport occur in two domains: a fracture domain characterized by rapid, preferential flow and a matrix domain in which processes are slow. The model was tested against discharge and pesticide data from the downstream gauging station. Our results show that the investigated soil is very susceptible to pesticide losses by surface runoff and preferential interflow. More than 10% of the pesticide mass applied reached the stream and preferential interflow contributed most to the pesticide peaks. Matrix and groundwater flow were unimportant. The model was found to be a valuable addition to the experiments because it helped to better understand the observed data. Besides, it could be used to fill data gaps in the experimental studies.