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Modelling Pesticide Fate in the Lower Mekong Delta

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Abstract

Vietnam is the second largest rice exporter in the world and the Lower Mekong Delta is the main rice growing area in the country. Besides rice, fruit and shrimp farming are important industries. Due to its significance in agriculture and aquaculture, water quality is of essential importance. However, previous research has shown that water pollution by pesticides is a considerable risk for agricultural production as well as for human health. Despite these facts, pesticide monitoring for recently used active ingredients has not yet been established on a regular basis. Similarly, no efforts have been made to predict pesticide pollution and build up different scenarios using mathematical models.

To address these gaps, pesticide use was investigated through surveys and participatory rural appraisals with farmers; pesticide residue concentrations were monitored in field outflows, connected irrigation canals and in drinking water and finally pesticide fate was modelled using different tools such as Steps1–2, RICEWQ and a coupled MIKE 11/ MIKE SHE model. This abstract focuses on a pesticide use survey and pesticide modelling in an agricultural area with two intensive paddy rice crops per year (An Long Commune, Dong Thap province). The fate of ten pesticide compounds (buprofezin, butachlor, cypermethrin, difenozonazol, fenobucarb, fipronil, hexaconazol, isoprothiolane, pretilachlor, and propiconazol) was modelled from April to July 2009.

Steps1–2 builds up the potential “worst case scenario” of pesticide concentrations in water and sediment phases via run-off and spray drift. RICEWQ predicts mainly the concentrations of pesticides and their metabolites as a result of agrochemical run-off. Finally, the fully distributed, physically-based model MIKE SHE and MIKE 11 enables to track pesticide movement in different water zones under various conditions and to evaluate the likely impacts of alternative mitigation strategies. These three approaches together allow providing a risk assessment to humans and/or aquatic organisms with regard to pesticides pollution.

Keywords: MIKESHE, pesticide, RICEWQ, STEPS12, water surface