

Risk assessment of pesticide transport with water erosion: A conceptual model

Xiaomei Yang (1), Sjoerd E.A.T.M. Van Der Zee (1,2), Lingtong Gai (1), Jan G. Wesseling (1), Coen J. Ritsema (1), and Violette Geissen (1)

(1) Wageningen University & Research, Netherlands (xiaomei.yang@wur.nl), (2) School of Chemistry, Monash University, Melbourne, Australia (sjoerd.vanderzee@wur.nl)

Pesticides are widely used in agriculture, horticulture, and forestry, and pesticide pollution has become an important issue worldwide. Entraining in runoff and being attached to eroded soil particles, posing a risk to water and soil quality and human health. In order to assess the risk of pesticide during water erosion processes, a simple integrative model of pesticide transport by runoff and erosion was developed. Taking soil hydrological and pesticide behaviour into account, such as water infiltration, erosion, runoff, and pesticide transport and degradation in soil, the conceptual framework was based on the known assumptions such as the convection-dispersion equation and lognormal distributions of soil properties associated with transport, sorption, degradation, and erosion. A sensitivity analysis was conducted and the results indicated that the total amount of pesticide related to soil eroded by water washing increased with slope gradient, rainfall intensity, and water field capacity of the soil. The mass of transported pesticide decreased as the micro-topography of the soil surface became obviously and the time from pesticide sprayed to erosion occurring associated with pesticide degradation negatively influenced the total amount of transported pesticide. The mechanisms involved in pesticide transport, such as runoff, infiltration, soil erosion, and pesticide transport and decay in the topsoil, thus can be well accounted for pesticide risk assessment especially in the region with intensive pesticide use and soil water erosion events.