ASSESSING PHOSPHORUS LOSSES FROM SOIL AND MANURE TO ENHANCE PREDICTIONS OF CRITICAL SOURCE AREAS

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Eutrophication of surface waters is still a big issue regarding water quality. While phosphorus (P) losses from point-sources could be reduced drastically, diffuse P losses from agricultural land are still a major cause for eutrophication of surface waters. Different studies indicate that most P losses originate from small regions of a catchment only. The localisation of such critical source areas (CSA) is expected to be critical for the design of efficient and cost-effective mitigation schemes.

Lazzarotto (2005) developed a semi-distributed model to predict such critical source areas in the Lake Sempach region (Switzerland). In general, the model results were promising but several questions arose regarding the respective roles of incidental P losses (IPL) and P losses from soil. To investigate those questions sprinkling experiments were carried out in summer 2008 in the catchment of Lake Baldegg in the Swiss Plateau. They were performed on two different sites with a relatively low and with high concentrations of P in the topsoil, respectively. On each site 8 runoff plots were installed and manure was applied on half of the plots, simulating band application technique. Artificial rainfall of deionized water was applied 1 day and 8 days after manure application to investigate the dependence of IPL on the time between manure application and the runoff event. With this setup it is possible to investigate and compare the influence of soil P status and manure on P losses with surface runoff. In addition, these experiments are used to improve the database for water soluble P (WSP_{soil}) in soils and the corresponding dissolved reactive P in runoff (DRP_{runoff}) for high soil P status.

The artificial rainfall experiments clearly show that high P concentrations in soil lead to high DRP concentrations in runoff, indicating a linear relationship between WSP_{soil} and DRP_{runoff} for unmanured plots. This linear relationship however, is different for different runoff types. Manure has an effect on P concentration in runoff for low and high-P soils. However, the manure P cannot override the effects of different soil P status. The effect of manure is more pronounced for soils with low P status. On these soils, compared to soils with high soil P status, manure has a higher and longer impact on the DRP concentrations in runoff. In addition, the performed experiments indicate that runoff type and manure application technique strongly influence P concentrations in surface runoff. Based on these findings we want to adapt the input functions of the model and improve some model components.