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Monitoring and Analysis of Nonpoint Source Pollution - Case study on terraced paddy fields in an agricultural watershed

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The intensive use of chemical fertilizer has negatively impacted environments in recent decades, mainly through water pollution by nitrogen (N) and phosphate (P) originating from agricultural activities. As a main crop with the largest cultivation area about 0.25 million ha per year in Taiwan, rice paddies account for a significant share of fertilizer consumption among agriculture crops. This study evaluated the fertilization of paddy fields impacting return flow water quality in an agricultural watershed located at Hsinchu County, northern Taiwan. Water quality monitoring continued for two crop-periods in 2012, around subject to different water bodies, including the irrigation water, drainage water, and shallow groundwater. The results indicated that obviously increasing of ammonium-N, nitrate-N and TP concentrations in the surface drainage water were observed immediately following three times of fertilizer applications (including basal, tillering, and panicle fertilizer application), but reduced to relatively low concentrations after 7-10 days after each fertilizer application. Groundwater quality monitoring showed that the observation wells with the more shallow water depth, the more significant variation of concentrations of ammonium-N, nitrate-N and TP could be observed, which means that the contamination potential of nutrient of groundwater is related not only to the impermeable plow sole layer but also to the length of percolation route in this area. The study also showed that the potential pollution load of nutrient could be further reduced by well drainage water control and rational fertilizer management, such as deep-water irrigation, reuse of return flow, the rational application of fertilizers, and the SRI (The System of Rice Intensification) method. The results of this study can provide as an evaluation basis to formulate effective measures for agricultural non-point source pollution control and the reuse of agricultural return flow.
Keywords:Chemical fertilizer, Nitrogen, Phosphorus, Paddy field, Non-point source pollution.