Estimating the Effects of the EU Common Agricultural Policy on Ground and Surface Water Quality: Case Study in the Neckar Basin

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The RIVERTWIN project (www.rivertwin.org) supports the goals of the EU Global Water Initiative (www.euwi.org) and the EU Water framework directive by adjusting, testing and implementing the integrated regional model MOSDEW for the strategic planning of water resources management in three river basins in Europe, Central Asia and West Africa. This paper focusses on the estimation of the effects of the new EU agricultural policy on the quality of ground and surface waters in the Neckar basin (South Germany) based on the linkage between the agricultural sector model ACRE-Neckar and the soil and land resources information system SLISYS.

The **A**gro-e**C**onomic p**R**oduction model at r**E**gional level-Neckar (ACRE-Neckar) represents the agricultural production in the Neckar river basin. The model optimizes agricultural production by maximizing the farm income using the Positive Mathematical Programming (PMP) method. ACRE-Neckar is based on the 'regional farm approach' i.e. that agricultural production is represented at regional level by one single farm. ACRE-Neckar calculates the production of food and fodder crops as well as livestock under the political scenario of the European Common Agricultural Policy reform 2003 (CAP reform 2003). CAP reform 2003 implies a new system of subsidies (which were paid decoupled from production for farming area) and regulations for environmental friendly and sustainable production (Cross Compliance). Simulation of the CAP reform scenario results in changes of land use and of nitrogen input in the Neckar river basin. Crop production tends to change to less intensive production systems, which is associated with a reduction of nitrogen input. The data of land use and nitrogen input calculated by ACRE-Neckar at regional level were delivered to SLISYS-Neckar, which distributed the data at lower scale level.

The land resources information system SLISYS-Neckar contains a spatially distributed model for the estimation of nitrate leaching and nutrient loads in surface runoff with high spatial ($< 1km^2$) and temporal (1 day) resolution. On the arable land sixteen crops are distinguished considering crop specific management with respect to operation scheduling, fertilisation and tillage. Information about the crop distribution on the arable land was obtained from the agricultural census of the Statistical Bureau for the state of Baden-Württemberg (reference year 2003) or

from the sector model ACRE (CAP scenarios). The estimation of diffuse pollutant loads from all land use types is based on simulations with the agroecosystem model EPIC (Erosion Productivity Impact Calculator, USDA 1990). The basin has been subdivided into hydrological response units (LUSAC: Land Use-Soil Association-Climate unit) which are quasi-homogenous with respect to land use, soil and climate. EPIC calculates the target variables for each LUSAC unit. The results show that the EU common agricultural policy will cause a decrease in the pollutant loads to groundwater in the range of 10%. This trend can be also observed for surface waters, through reduced loads in the baseflow and less surface runoff.