IMPACT OF AGRICULTURAL MANAGEMENT PRACTICES ASSOCIATED WITH BIOFUEL IN MIDWEST US ON WATER QUALITY: A CASE STUDY OF UPPER WHITE RIVER BASIN

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ABSTRACT

Upper White River Basin (UWRB) located in central Indiana, like many other regions in Midwest US is subjected to increased corn productions to meet the growing biofuel demand. Corn is a nutrient and pesticide intensive crop and an increase in its production has a direct impact on the receiving water bodies that get impaired by these nonpoint source pollutants. In present study, Soil and Water Assessment Tool (SWAT) was calibrated (1991-2000) and validated (2001-2006) for streamflow and water quality parameters to evaluate the effect of change in agricultural management practices such as crop-rotation from corn-soybean (CS) to corn-corn (CC) and three year corn-soybean rotations on total phosphorous (TP) and nitrate-nitrogen (NO₃-N). The effect of using varying fertilizer application rate, low (90 kg/ha), medium (157 kg/ha) and high (197 kg/ha) nitrogen on water quality was evaluated on total phosphorous (TP) and nitrate-nitrogen (NO₃-N) and the result showed CC rotation with high nitrogen application has greater nutrient loss compared to other crop-rotation and fertilizer-application scenarios. The corn stover amount on the agricultural field was varied from 0 to 9000 kg/ha in SWAT model and result showed that less than one-third of corn stover amount than baseline (8000 kg/ha; 1:1 grain: stover) on the field has severe impact on nutrient losses from the agricultural fields.

Keywords: SWAT model, corn stover, crop rotation, biofuel crop, sensitivity analysis, water quality