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Models Robustness for Simulating Drainage and NO_3-N Fluxes

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Computer models simulate and forecast appropriate agricultural practices to reduce environmental impact. The objectives of this study were to assess and compare robustness and performance of three models – LEACHM, NCSWAP, and SOIL-SOILN–for simulating drainage and NO_3-N leaching fluxes in an intense pasture system without recalibration. A 3-yr study was conducted on a Hagerstown silt loam to measure drainage and NO_3-N fluxes below 1 m depth from N-fertilized orchardgrass using intact core lysimeters. Five N-fertilizer treatments were replicated five times in a randomized complete block experimental design. The models were validated under orchardgrass using soil, water and N transformation rate parameters and C pools fractionation derived from a previous study conducted on similar soils under corn. The model efficiency (MEF) of drainage and NO_3-N fluxes were 0.53, 0.69 for LEACHM; 0.75, 0.39 for NCSWAP; and 0.94, 0.91for SOIL-SOILN. The models failed to produce reasonable simulations of drainage and NO_3-N fluxes in January, February and March due to limited water movement associated with frozen soil and snow accumulation and melt. The differences between simulated and measured NO_3-N leaching and among models' performances may also be related to soil N and C transformation processes embedded in the models These results are a monumental progression in the validation of computer models which will lead to continued diffusion across diverse stakeholders.