Equifinality in the modelling of ammonia volatilisation from a flooded rice system

ABSTRACT

Equifinality is the capability of models to produce similar model-output responses. The objective of this study is to use a numerical experimentation to investigate the equifinality of six modules for estimating ammonia (NH_3) volatilisation from the floodwater in a rice system. Except for the Chowdary's, all modules can simulate the fluctuating trends of NH_3 volatilisation rates. NFLOOD v.1 shows low equifinality to Jayaweera and Mikkelsen's and the regression equations in CERES-Rice, DSSAT-CSM and APSIM-Oryza in estimating the NH_3 volatilisation. The equation in APSIM-Oryza has high equifinality to that in CERES-Rice. Both regression equations have low equifinality to the regression equation in DSSAT-CSM. All three regression equations show low equifinality to Jayaweera and Mikkelsen's. Findings in this study are valuable to make an informed model selection, to interpret model-output responses critically and to improve an existing model by adopting an alternative module without using experimental data explicitly.

Keyword: Equifinality; Sensitivity analysis; Model evaluation; Ammonia volatilisation; Flooded rice