Parameter Estimation for CERES-Maize Model with the GLUE Method

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Abstract

Increased levels of nitrate nitrogen (NO_3-N) in groundwater within the Suwannee River basin of North Florida are of great concern. Best Management Practices (BMPs) for crop production recommended ways to reduce the nitrate leaching caused by nitrogen fertilizer application, while maintaining an acceptable crop yield. The use of computer models allows the simulation of various N and water management practices and their related effects on groundwater quality. Model parameter estimation is the first necessary step when using a crop model.

The main objective of this current study was to use the CERES-Maize of the DSSAT (Decision Support System for Agrotechnology Transfer, Version 4.0) model to develop BMPs for sweet corn (*Zea mays L.*) production in North Florida. The materials reported in this publication are just the procedures and results in parameter estimation with the generalized likelihood uncertainty estimation (GLUE) methods.

After a global sensitivity analysis of model outputs, dry matter yield (HWAH, kg/ha) and nitrogen leaching (NLCM, kg/ha), to input parameters, 9 most sensitive input parameters, including 3 genotype ones and 6 soil ones were selected for parameter estimation. Two rounds of GLUE simulations were then conducted respectively using the field experiment situations and results of 2005 and 2006 at the Plant Science Research and Education Unit, the University of Florida (Marion County, Florida, the U.S.). The uncertainties of posterior distributions of the selected parameters were significantly reduced. Especially for some soil parameters, the mean values of their posterior distributions were pretty close to the measured ones in field. Consequently, the uncertainties in model outputs, such as anthesis date, maturity date and yield, were also dramatically reduced, with mean values of outputs very close to observed ones.

These results showed the GLUE method was a powerful tool for model parameter estimation. The obtained posterior distributions of the selected parameters could be used for future research.

Keywords: *GLUE, DSSAT, parameter estimation, BMP, sweet corn*