



Artificial neural networks for corn and soybean yield prediction

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Abstract

The Maryland Water Quality Improvement Act of 1998 requires mandatory nutrient management planning on all agricultural land in Maryland. Nutrient management specialists need simple and accurate estimation techniques to relate crop yields and nutrient utilization in the planning process. The objectives of this study were to: (1) investigate if artificial neural network (ANN) models could effectively predict Maryland corn and soybean yields for typical climatic conditions; (2) compare the prediction capabilities of models at state, regional, and local levels; (3) evaluate ANN model performance relative to variations of developmental parameters; and (4) compare the effectiveness of multiple linear regression models to ANN models. Models were developed using historical yield data at multiple locations throughout Maryland. Field-specific rainfall data and the USDA-NRCS Soil Rating for Plant Growth (SRPG) values were used for each location. SRPG and weekly rainfall means were necessary for effective corn and soybean yield predictions. Adjusting ANN parameters such as learning rate and number of hidden nodes affected the accuracy of crop yield predictions. Optimal learning rates fell between 0.77 and 0.90. Smaller data sets required fewer hidden nodes and lower learning rates in model optimization. ANN models consistently produced more accurate

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