**A Nutrient Management Plan Support System for Assessing Water and Nutrient Utilization in Florida Sugarcane Production**

Ho-Young Kwon¹, Sabine Grunwald¹, Howard Beck² and Kelly Morgan¹

1. Soil and Water Science Department, University of Florida, 2. Agricultural and Biological Engineering Department, University of Florida

**NUMAPS** is a decision support system incorporating record keeping and computer simulation

**Objectives**
I. Optimize yields in an economically effective manner
II. Reduce environmental impacts (e.g. excessive fertilization)

**Procedures**
1) Develop an environment for ontology-based simulation
2) Assemble existing or new algorithms and/or model components to describe processes (e.g. infiltration, nutrient movement)
3) Represent the processes as database objects
   - Use Simulation and Equation Editors
4) Generate source code files
   - Automatically compiled and run within Simulation Editor
5) Produce simulation results
   - Tables and graphing tools are used to display the results
   - Provide accurate assessments of water and nutrient flux

**Definition**
I. A model is specified directly by creating ontology objects representing the model structure and model behavior
   - Ontology is a collection of concepts and their relationship within a particular domain

**Advantages**
I. A simplification of the model development process by eliminating the need to treat modeling as a programming process
II. Modelers can quickly develop and test different sets of equations used in model subsystems

**Structure**
I. Simulation Editor
II. Equation Editor

**Ontology-based approach to simulation**

**Processes related to soil-plant-water interactions**

**Nutrient dynamic model**
I. The processes for soil organic matter decay (adapted from the CENTURY¹)
II. Dynamics of inorganic N² and P³

**Sugarcane growth model**
I. Adapted from CANEGRO⁴
II. Developed to improve the understanding of complex soil-water-plant interactions related to cane and sucrose
III. Used for the sugarcane growth all around the world

**Hydrologic model**
Implement water table control systems
- Simulate an impermeable layer to create perched water table
- Introduce vertical and lateral drainage flux

**Simulation results**

**Future plan**
Validate model simulations on sites in Everglades Agricultural Area (EAA)

**References**
1. Parton et al., 1988
2. Jones et al., 2003
3. Sharpley et al., 1984
4. Inman-Bamber et al., 1994