Sweet Potato

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7. Title

Development of Model-Based Decision Support Tools for Optimum Storage Root Number, Enhanced Harvest Scheduling, and Consistent Economic Yield in

12. Investigator Name(s) (Last Name and Initials)

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20. Termination Date 09/30/2013

40. Period Covered (mo/da/year): 01/01/2011 TO 12/31/2011

Outputs:

A Bayesian decision network model named BxINROW/NET has been developed. This model represents relationships among in-row spacing regimes, agroclimatic variables known to influence storage root initiation, growing degree days to harvest, and yield grades for Beauregard sweet potato grown in Louisiana. This model was based on an earlier prototype model that underwent further validation during the 2010 and 2011 growing conditions in Louisiana. BxINROW/NET was used as a foundation model to construct a Bayesian decision network for sweet potato yield. This model predicts net returns based on multiple scenarios of in-row spacing, planting dates, and harvest times. The development of the decision support tool has been published in a peer-reviewed journal. The development of the model, along with its potential application as a model-based decision support tool, was presented at a professional conference. Three abstracts related to the development of the modeling database and model validation were published as proceedings.

Outcomes/Impacts:

The model-based decision support tool for in-row spacing reduces risk in sweet potato production systems. This result was accomplished by quantifying the risk of yield loss associated with alternative in-row spacing options under various planting and harvest date scenarios. The model also clarified the optimum planting density for Beauregard sweet potato. The model can be expanded to include other varieties and locations other management variables. This represents the first time that a modeling approach has been used to estimate optimum in-row spacing for sweet potato. In 2011, prolonged drought conditions created opportunities to further validate and calibrate optimum supplemental irrigation timing and amount. Proper calibration of soil moisture thresholds increased total marketable yield by 44% in irrigated field plots relative to non-irrigated controls. This integrative approach in interpreting research data helps to underscore the importance of a model-based approach in describing a complex agricultural system such as sweetpotato production.

Publications:

Villordon, A., R. Sheffield, J. Rojas, and Y. Chiu. 2011. Development of Simple Bayesian Belief and Decision Networks as Interactive Visualization Tools for Determining Optimal In-Row Spacing for Beauregard Sweet Potato. HortScience 46:1588-1597.

Villordon, A., D. LaBonte, and J. Solis. 2011. Using a Scanner-Based Minirhizotron System to Characterize Sweetpotato Adventitious Root Development During the Initial Storage Storage Root Bulking Stage. HortScience 46:1-5.

Villordon, A. 2011. A Probabilistic Framework for Validating Sensor-Based Data and Deriving Knowledge from Massive Datasets: Examples from Ongoing Research. HortScience 46:S76.

Villordon, A. R. Sheffield, J. Rojas, and Y. Chiu. 2011. Prototype Bayesian Belief Networks for Validating Soil Moisture Telemetry in Sensor-based Irrigation Management for Beauregard Sweetpotato. HortScience 46:S117.

Villordon, A., J. Solis, D. LaBonte, C. Clark, and R. Sheffield. 2011. Further Development of a Bayesian Belief Network Model for Estimating Fresh Market Yield in Beauregard Sweetpotato. HortScience 46:S160.

Villordon, A., J. Solis, D. LaBonte. 2011. Preliminary Crops Eexperience Using a Minirhizotron-Based System for Characterizing Adventitious Root Development During the Storage Root Initiation Period: Prospects and Problems. National Sweetpotato Collaborator Group Progress Report.

Villordon, A., J. Solis, D. LaBonte, C. Clark, and R. Sheffield. 2011. Further calibration and validation of a Bayesian belief network model representing the relationship between fresh market yield and agroclimatic variables known to influence storage root initiation in Beauregard sweetpotato. National Sweetpotato Collaborator Group Progress Report.

Participants:

A. Villordon (PI), C. Clark, D. Ferrin, D. LaBonte, T. Smith, K. Paudel, D. Miller, E. Burris, R. Sheffield, Y. Chiu, LSU AgCenter; A graduate student from North Carolina State University was trained in confirming storage root initiation associated with validating phenological stages in the Bayesian belief network model that predicts yield outcome.

Target Audiences:

Target audiences for this project include students, crop producers, crop consultants, and research and extension personnel.

Project Modifications:

Nothing significant to report during this reporting period.

Approved (Signature)	Title	Date