

Climate Information Analysis Toolkit

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The assessment and management of agricultural risk centers on two major sources of annual variability: weather and the cost and prices of agricultural inputs and outputs. To address and quantify these risks, we developed the Climate Information Analysis simulation tool, a fully functional GIS (Geographic Information System) linked with the CSM (Crop Simulation Model) crop models of DSSAT (Decision Support System for Agrotechnology Transfer). When integrated with historical weather databases in the southeastern United States, and coupled with a geospatial soil database, the system allows a wide range of crop management options to be simulated and analyzed. Together with a seasonal analysis tool, crop management can be optimized based on both price/cost structures and climate.

The CSM dynamic simulation model is linked into a stand-alone GIS and allows a wide array of management options to be tested, including planting, fertilization, irrigation, and cultivar selection. The tool can utilize either historical data (on a county basis) or use stochastically generated datasets, from long term means or monthly time series. Environmental modifications can be specified (within DSSAT compatible experimental files), or the output from GCM models (Hadley, ECHM4, etc.) can be used to drive the models. The seasonal analysis program Varan is now tightly coupled to analyze sequentially all polygons and create an excel file which can be merged directly into the base map. The advantage is that given a range of input parameters, the system can, based on a set of prices, identify the optimal management scenario (profitability) for agricultural systems in the Southeast, for any crop.

The flexibility of the system permits an exceptional range of management options to be tested. The system can (on a county by county basis) generate outputs across all available historical weather records and simulate all outputs for the management options considered. The experimental file generation engine generates files required to run simulations and automates the simulation/analysis process. After running simulations (on a county by county basis), all outputs are analyzed simultaneously and merged into the map. Both the raw summarized data, and the optimal crop management, are produced. Segregation of historical weather into ENSO neutral, El Niño, and La Niña years, or other climate modifications, can produce different optimal management recommendations.

The Climate Information Analysis tool is flexible tool for testing cropping system management in the southeastern United States and in other at-risk cropping areas around the world. Coupled with an extensive historical weather database and soil database, the tool permits exploratory analysis on crop management options with a variety of inputs and objectives that could ultimately lead to policy and management advisories.

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