

CLIMATE CHANGE IMPACTS ON GEORGIA AGRICULTURE AND IRRIGATION DEMAND

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Abstract. The agriculture industry plays a huge role in Georgia's economy, contributing billions of dollars annually. In addition, the state's water resources are intrinsically tied to the agricultural sector since both surface water and groundwater are used by farmers to irrigate crops with groundwater accounting for over sixty percent of agricultural water demand. Although Georgia is typically considered to be a state with plentiful water resources due to average annual rainfall exceeding that of many other parts of the United States, the competing demands placed on water resources by the municipal, industrial, agricultural, and ecological sectors make water resources management and planning a significant challenge for stakeholders and policy makers. This is complicated further by the uncertainty surrounding agricultural water use due to a lack of observed data regarding agricultural water application rates and seasonal volumes. Furthermore, climate change has the potential to decrease the availability of water resources due to probable changes in rainfall distribution and increases in potential evapotranspiration demand.

In this study, the Decision Support System for Agrotechnology Transfer (DSSAT) suite of crop models is utilized along with available daily weather data (precipitation, minimum and maximum temperature, and solar radiation) from the Georgia Environmental Monitoring Network (GAEMN), the National Climatic Data Center (NCDC), and the National Solar Radiation Database (NSRDB) to estimate historical irrigation volumes for farmers irrigating Georgia's primary field crops (peanut, cotton, and maize). Historical crop yield and acreage data from the National Agricultural Statistics Service (NASS) is used to calibrate model parameters and determine locally acceptable plant water stress as a management parameter. The plant water stress parameter is used to mimic the farmers' decision on when and how much to irrigate during the growing season. Climate change assessments are in progress using spatially and temporally downscaled weather data from selected general circulation models.

Results are presented here showing estimated seasonal water demand for peanut production in Decatur County for the 2002-2008 time period. A comparison of simulated and NASS estimated yields is also presented. The model is

able to represent historical yields well with simulated yield after calibration typically within two percent of NASS estimated yield. Irrigation volumes range from 34 to 359 mm, with the least water demand in 2008 and peak water demand in 2007. Future work will focus on developing probabilistic assessments of the relative changes in crop yield and water demand that are derived from climate change scenarios.

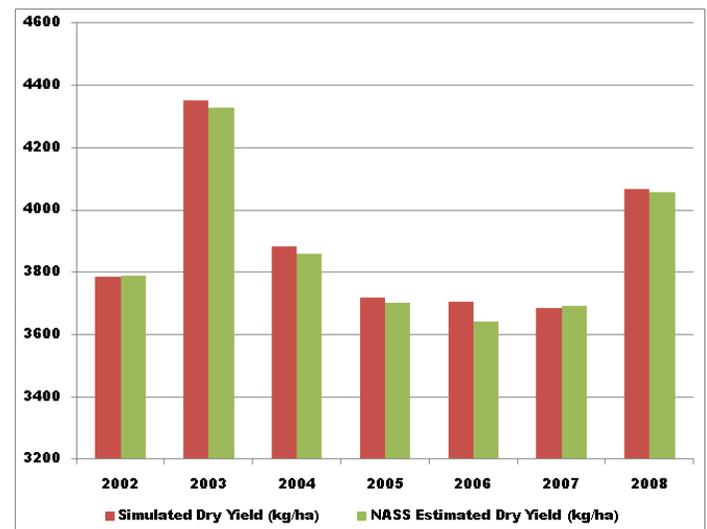


Figure 1. Simulated and NASS estimated peanut yield in Decatur County, GA.

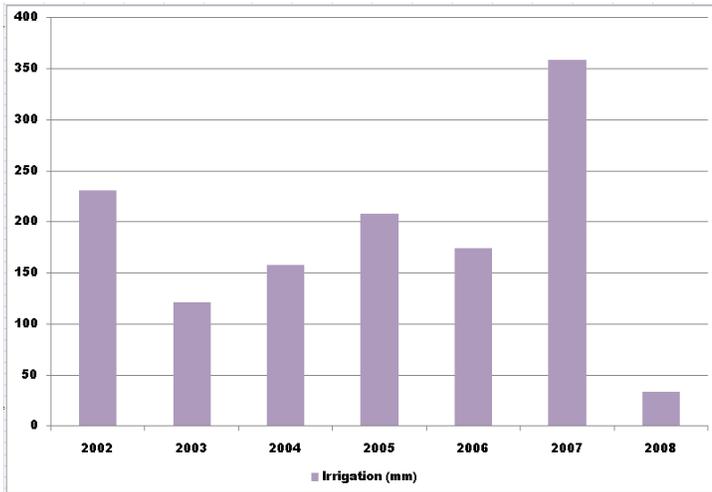


Figure 2. Simulated irrigation volumes associated with Decatur County, GA, for peanuts, assuming an irrigation efficiency of 0.75.