Interaction of Irrigation and Soil Effects on Cotton Yield

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Introduction
- Irrigated agriculture accounts for ~80% of the U.S. consumptive water use
- Soil variability reduces the effectiveness of conventional irrigation management
- Benefits of variable-rate application of agrochemicals, seeds, and nutrients masked by applying inappropriate amounts of water
- Testing dense grid of soil sampling locations expensive, but mobile apparent

Objective
The goal of this research is to develop ways to utilize variable rate irrigation to improve crop production. The specific objective of the work in this report is to better understand the impact of variable soil texture, as estimated by ECa, on the irrigation response of cotton.

Methods
- Field study at the University of Missouri Fisher Delta Research Center Marsh Farm at Portageville (36.41°N, 89.70°W) during 2016 and 2017
- Soil mapping units: Tiptonville silt loam (Oxyaquic Argiudolls), majority of the field, Reelfoot loam and sandy loam (Aquic Argiudolls) (Fig. 1).

Results
- Crop harvested with a Case IH 2155 4-row cotton spindle picker equipped with an Ag Leader Insight yield monitor system with sensors for every row
- 7-m buffer placed on each side of each plot to account for overspray from adjacent nozzles and yield in those areas was not used in analyses
- To investigate relationship between irrigation treatment response and soil, yield data points within 2.0 m of an ECa point averaged to provide an estimated yield associated with estimated clay content
- Spatial data analyses were conducted with GeoDa 1.12 using spatial error model

Conclusions
This study addressed the impact of variable soil texture on cotton response to irrigation. While a more extensive dataset will be needed to thoroughly investigate the interactions, some qualitative observations were clear:
- A strong effect of clay content on cotton yield was observed in both seasons, even without significant differences among the water management treatments
- The mobile ECa survey resulted in 5,465 data points within the study field and adjoining 5 ha field over the course of a few hours
- By strategically selecting the locations of calibration samples, accurate estimates of clay content were derived
- Manually collecting and analyzing even 1% of points would be extremely expensive and the resulting dataset would be insufficiently dense for these kinds of analyses

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