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Understanding Real-Time Irrigation Behavior to Improve Energy Efficiency in Agriculture

Abstract.

Irrigation-associated energy demand is a major component of rural energy demand and peak loads in particular. Little analysis has been done comparing energy-use and water-use efficiency at an irrigation well level. As a result, there is a knowledge gap on how best to target energy efficiency and peak load management programs in irrigated agricultural settings. Existing, preliminary analyses suggest that there is enormous variability in energy- use efficiency at a well level. Understanding the reasons for this variability, and how irrigation decisions that are made within an irrigation season are influenced by energy price and contract (as well as hydrologic, climatic, physical and policy variables) is important to identify and target opportunities for improvements. The research team proposes to combine energy and water use data from a new sensor network across Nebraska with relevant hydrological and biophysical data as well as information from participating irrigators on technology and production practices. This will allow analysis of the variability of energy-use efficiency and to improve understanding of producer responses to variations in energy contract, local soil and weather, technology, and crop choices. The research is intended to help irrigators better understand the connections between their energy and water use so that they can improve production practices through input cost savings and increased energy and water-use efficiency. Thus, the research team will engage with cooperating irrigators throughout the project to provide meaningful interpretation, contextualization and visualization of the data and analyses.