IRRIGATION DECISION-MAKING AND GROUNDWATER USE OUTCOMES IN WESTERN KANSAS

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Groundwater levels across parts of western Kansas have been declining at unsustainable rates due to pumping for agricultural irrigation despite technological advances designed to decrease total water use from the underlying aquifer (e.g., efficient irrigation, drought-resistant cultivars). Thus, water management across this agricultural landscape is more complex than targeting a simple water budget. Instead, both qualitative (e.g., management boundaries) and quantitative (e.g., crop prices) factors drive unsustainable water applications. This study uses boosted regression trees, which draw on statistical and machine-learning techniques to simultaneously analyze categorical and numerical data against annual irrigation pumping. We test approximately 40 key variables to irrigation use from 1996-2017 to characterize the relative influence of each variable on total pumping, interactions between variables, and predictive irrigation use. The results reveal relationships between total irrigation pumping and drivers such as governing policies, crop type, or soil characteristics across both space and time. By targeting the combinations of factors that statistically lead to the greatest volumes of groundwater pumping, robust management strategies can be developed to achieve conservation goals adopted in the region. This statistical approach can be replicated for other large-scale studies across the country, particularly in regions seeking to better understand irrigation use in a changing agricultural landscape.

PRESENTER BIO: Susan is a MS student in Soil and Water Sciences studying the interdisciplinary factors that impact irrigation decision-making and groundwater use of the High Plains Aquifer. She is also partnering with ECHO to develop a guide on irrigation water quality management for development practitioners.