ES SEMINAR SERIES
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Zoom

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Sustainability of Irrigated Agriculture Under Changing Climatic Conditions

Abstract: Climate models for California are predicting warmer conditions, reductions in the mountain snowpack, and more extreme heat waves, droughts, and precipitation events. These climate changes are expected to adversely impact the sustainability of agriculture because irrigation is more dependent on diminishing groundwater supplies. The USDA, ARS, SAWS unit in Davis, CA has recently been established to increase the efficiency and sustainability of irrigated agriculture in the Central Valley, CA. This presentation highlights ongoing and planned research activities within the SAWS unit. On-farm strategies to capture episodic flood water for managed aquifer recharge (MAR) is one focus area. Field studies and geophysical measurements are being conducted to characterize subsurface heterogeneity and to assess and optimize the performance and location of various MAR approaches. This information is being used in conjunction with mathematical models to better quantify infiltration, recharge, contamination fluxes, groundwater-surface water interactions, and vadose zone processes at the field and watershed scales. Treatments and MAR designs are being developed to minimize potential adverse impacts on crop production, groundwater quality, and clogging. For example, model results show that the use of a 1 m diameter by 30 m deep drywell can infiltrate as much water as a 70 m diameter infiltration basin, but the recharge occurs much more rapidly and bypasses low permeability layers. Improving irrigation efficiency is a second focus area of the unit. A combination of remote sensing, field micrometeorological and biophysical measurements, and mathematical modeling are being used to improve estimates of crop evapotranspiration (ET) for this purpose. Results show that improved irrigation efficiency can be achieved by accounting for observed spatial and temporal variability in crop ET. Economic analyses of long-term observations of MAR and irrigation efficiency are being employed to assess impacts on the food-energy-water nexus and sustainability under changing climatic conditions, water resource demands, and water allocations for irrigation.

Bio: Dr. Scott Alan Bradford is the Research Leader and a Supervisory Soil Scientist in the USDA, ARS, SAWS Unit. He is a fellow of the Soil Science Society of America, fellow of the American Society of Agronomy, recipient of the 2019 Don and Betty Kirkham Soil Physics Award, and the Editor-in-Chief for Critical Reviews in Environmental Science and Technology (2017-2020). Dr. Bradford has authored over 158 publications on a wide variety of topics in soil physics, contaminant hydrology, and environmental engineering. His research focus is currently on managed aquifer recharge.

Papers: Sasidharan, Salini, et al. (2021) "Virus transport from drywells under constant head conditions: A modeling study." Sasidharan, Salini, et al. (2021) "Comparison of recharge from drywells and infiltration basins: A modeling study."