Drought mitigation through carbon management: Improved understanding of the role of soil aggregates in agriculture

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California agriculture faces enormous challenges as climate changes and access to water is reduced and less predictable. California's recent drought cost the state $2.7 billion with a loss of more than 21,100 jobs in 2015 alone. Soil, particularly soil carbon and its microbiome, plays a critical role in crop water-use efficiency and crop response to drought. Physical, chemical, and biological interactions in soil at the micrometer scale form soil aggregates that are critical in storing carbon and contain the small pores needed to retain moisture. We have established a Consortium for Drought and Carbon Management (UC DroCaM) to examine the effects of irrigation method (i.e., furrow and drip or micro-sprinker irrigation) and management practices (e.g., carbon inputs and rotations) on size distribution of soil aggregates, formation of mineral-organic associations, microbial community shifts and extracellular polymeric substance (EPS) production, and carbon storage. Findings are integrated into a regionally-scalable predictive model (*ecosys*) to describe soil carbon dynamics and estimate the response of agricultural systems to drought. Here, we present our program's interdisciplinary approach integrating geochemical, biological, and hydrological analysis and preliminary findings on the effect of cover crops and irrigation-driven redox fluctuations on row crops and orchards, respectively.