

Long-term Research in Organic System at Russell Ranch: Results and Opportunities to Build Sustainable and Resilient Systems

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Abstract

The Century experiment was established in 1993 at Russell Ranch Sustainable Agriculture Facility (UC Davis) to measure productivity, sustainability and resource use efficiency of conventional, mixed (conventional with cover crop) and organic irrigated cropping systems. Properties such as crop yields and crop quality, carbon sequestration, water use and soil functioning have been continuously monitored, providing an essential dataset to assess the long-term impact of organic management practices on agricultural sustainability. We will summarize 15 years of interdisciplinary research and published data on corn-tomato organic system to pinpoint ecological drivers of sustainability and potential mechanisms to enhance resource use efficiency and resilience to climate change in Mediterranean climate. Over the last 5 years, tomato have yielded the same in conventional and organic system. However, the organic corn-tomato system shows increased soil carbon sequestration and soil microbial biomass as compared to the conventional and cover-cropped conventional systems, as well as increased sequestered soil potassium and phosphorus. We will also use an ecosystem services framework to discuss the implications of long-term trends in yield, soil biological and physiochemical properties, and nutrient and carbon cycling for agricultural sustainability and human nutrition. From 1994 to 2004, the concentration of flavonoids, plant secondary metabolites and anti-oxidant compounds potentially related to reduction of cardiovascular diseases and obesity, were significantly higher in organic as compared to the conventional tomatoes. Finally, we will also discuss the support provided by long-term trials for extension, outreach and education activities.

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