

2018 USAFRI Research Project Objectives

Characterizing Benefits of Alfalfa in Rotation & Communicating Value of Environmental Services to the Public **University of California - Putnam**

Project Award: \$45,833

Justification:

- This project is focused on examination of rotational benefits of alfalfa with special attention to specialty crops, and the communication of the soil/environmental benefits of alfalfa to the general public. Historically, alfalfa has been an important crop for diversification of annual grain-based and vegetable-based rotation cycles (Johnson et al. 1992; Berzsenyi et al. 2000), particularly in regions where livestock feed is in demand. However, consolidation of livestock raising operations and increased emphasis on synthetic nitrogen (N) inputs and grain production has contributed to declining alfalfa acreages in the U.S. In the past twenty years, alfalfa acreage nationwide declined from 23.55 to 17.35 million acres (USDA-NASS 2018), a trend that has drastically altered crop rotation patterns and landscape composition across the country.

Objectives:

- Specific objectives are to 1) To identify drivers of the alfalfa rotation effect on tomato fruit yields, we will characterize rotational benefits of an alfalfa-tomato rotation on yield of subsequent crop at two CA locations (Russell Ranch and one production farm); 2) Analyze the N-related and non-N related mechanisms of crop rotation by measuring crop N uptake and yield with four rates of fertilizer applied to the crop following alfalfa (tomato); 3) Take measurements to understand the mechanisms of the rotation effect: Quantify the N and Carbon impacts of alfalfa systems vs. non-alfalfa rotations related to 'soil health'. Measure nutrient levels (N, P, K, S, Ca, Mg, Fe, B, and soil organic carbon) in alfalfa vs. non-alfalfa rotations; 4) Characterize the soil microbial community in the alfalfa and corn rhizospheres by quantifying soil microbial biomass, mycorrhizal numbers in the soil, percent root colonization by mycorrhizal fungi, and fungal to bacterial ratios; and 5) Develop educational materials on the rotation.