Cal Poly Pomona Foundation, Inc.  
**Title:** Towards sustainability of lettuce production through breeding approaches to increase water and nitrogen use efficiency

**Abstract:** Lettuce is a $1.5 to 2.0 billion crop in California whose production requires substantial irrigation and supplemental nitrogen fertilizers. Water is an increasingly critical and unpredictable resource and nitrogen fertilizers are known contributors to groundwater contamination and greenhouse gases. To conserve resources, minimize environmental impact and increase the long-term sustainability of the lettuce industry, both water and nitrogen must be used more efficiently. This project aims to improve Water Use Efficiency (WUE) and Nitrogen Use Efficiency (NUE) through breeding approaches. This research will lead to the development of lettuce cultivars with improved WUE and NUE, will contribute molecular markers that can be used in other breeding programs, and will ultimately lead to understanding the biological basis for improved WUE and NUE.

California Strawberry Commission  
**Title:** Creation of a Water Quality and Nutrient Management Training Program for California Strawberry Growers

**Abstract:** The California Strawberry Commission (CSC) will create an irrigation and nutrient management training program to improve water quality management practices on California strawberry farms. This program will fill a substantive need for training on strawberry-specific irrigation and nutrient best management practices critical to improving water quality in strawberry production regions of California. The goal of the program is to equip growers and irrigators with knowledge and skills necessary to establish and operate efficient strawberry irrigation systems that conserve water, apply nutrients effectively, and enable the grower to comply with water quality regulations. The curriculum will include two classes focused on irrigation system design, and two classes on irrigation system operation. By the end of the grant, the project aims to conduct 40 training classes and engage 280 strawberry farms in the training program, reaching 70 percent of the California strawberry industry.

Rancho California Water District (RCWD)  
**Title:** Temecula Valley Winegrower Research and Demonstration Project

**Abstract:** The Project focuses on the use of technologies for implementing Regulated Deficit Irrigation (RDI) as a best management practice for enhancing water use efficiency in local winegrowing operations while improving the quality of red wine grape varieties. The Rancho California Water District (RCWD), University of California, and the Temecula Valley Winegrowers Association have partnered with a history of success on public outreach and research projects, providing the agricultural community with education and technical assistance. The research component includes: 1) Research the quantity of water required for producing high quality red wine grapes in the Temecula Valley; 2) Monitor soil salinity under varying irrigation conditions to gauge its effects on red wine grape quality; 3) Demonstrate to local growers methods employed for implementation of an effective RDI program; and 4) Transfer research knowledge gained to the local winegrowing community through a demonstration effort consisting of three workshops.
The Regents of the University of California, Davis $376,424

**Title:** Development of a Nutrient Budget Approach and Optimization of Fertilizer Management in Walnuts

**Abstract:** This project seeks to empower walnut growers to be better environmental stewards while increasing management efficiency. Growers have technology to match timing and amount of nutrients applied with the needs of the crop, but lack fundamental research on how much is needed when. This project aims to quantify the monthly nutrient needs of walnut orchards, estimate soil nutrient losses and contributions, and improve grower nutrient assessment techniques by revisiting leaf critical values, exploring optimum nutrient ratios, and revising leaf sampling for improved accuracy. The findings will be communicated to growers by a choice support mobile application to translate generalized findings to the specific site, and with publications and presentations on revised beneficial nutrient assessment practices. This will enable growers to apply only as much nutrients as needed, when needed, decreasing air and water pollution that results from over-fertilizing.

The Regents of the University of California, Davis $352,941

**Title:** Developing Soil Fumigation with Reduced Application Rate in Low Permeability Tarp Mulched Raised-Bed System

**Abstract:** With the loss of Methyl Bromide (MeBr) and increasingly strict regulations on emissions of alternative fumigants, California (CA) strawberry producers are facing challenges in pest control including critical pathogens and resident weeds that have become increasingly troublesome. Totally Impermeable Film (TIF) which can effectively retain fumigant in soil and reduce emissions may allow reduced fumigant rates to achieve optimal pest control target; however, the effective rate in TIF tarped field is unknown. It is also unclear if the higher fumigant retention in beds may result in higher emission through uncovered furrows. The aim of this project is to control soil-borne pests while reducing fumigant emissions by combining low fumigant rate and TIF in raised beds systems. Additionally, a new plastic film made from the Recycled Plastics from Fields (RPF) will be tested. The findings will benefit the economic and environmental sustainability of the $2.0 billion CA strawberry industry.

The Regents of the University of California, Davis $354,027

**Title:** Microcalorimetry for rapid assessment of specialty crop salinity tolerance

**Abstract:** Currently, there is limited information regarding salt tolerances for a wide range of specialty crops since testing for salt tolerances is resource and time intensive. Isothermal microcalorimetry can be used to examine total metabolic rates of plant tissue samples and to study effects of a wide variety of naturally occurring or artificially added factors, including salinity, on those rates. This project will use this procedure to develop a novel method to rapidly (hours or days) assess the salinity tolerance of specialty crops species. The first two years will be used to develop and validate the method. During the third year experimental field demonstrations will be established. Measureable benefits will be in pioneering a new scientific method; and by identifying and disseminating previously unreported salt tolerances for specialty crops. Expanded knowledge of salinity tolerance will improve sustainable production practices by allowing for increased use of recycled water for irrigation.
The Regents of the University of California, Oakland Cooperative Extension  

Title: Online Irrigation and Nitrogen Management Tool for Cool Season Vegetables  

Abstract: Cool season vegetables require high inputs of water and nitrogen fertilizer, which has resulted in nitrate contamination of ground water supplies on the central coast. Coastal growers are now under strict water quality regulations, and may face future restrictions on the use of nitrogen fertilizer. This project will increase capabilities of CropManage (CM), an innovative and easy-to-use web-based tool that assists growers in matching water and fertilizer rates to the needs of their crops as well as track inputs by field. This will expand CM for additional cool season vegetables by collecting field data and developing algorithms that will be integrated into the software. Immediate outcomes would be increased numbers of farmers implementing weather-based irrigation scheduling and soil testing. Potentially this project will increase efficient use of water and nitrogen fertilizer, increase grower compliance with water quality regulations, and enhance safety of drinking water supplies.

The Regents of the University of California, Santa Cruz  

Title: Improving Water Quality in California Nursery Crops using Polyacrylamide  

Abstract: Production of nursery crops impacts water quality when nutrients, pesticides, and sediment in tailwater moves off-site to surface water bodies. This project will assist the California nursery industry to mitigate water quality impacts with an easily adoptable and inexpensive method. Polyacrylamide (PAM), a sediment flocculant and erosion control polymer, is used safely in agriculture and other industries. In this project, a novel approach will be developed to use PAM as a potting soil amendment in potted plants for mitigating water pollution in nurseries. Optimal PAM rates to reduce sediment and nutrient loss from pots will be developed, and compatibility with nursery crops will be ensured. The impact on water quality will be evaluated and demonstrated in nursery field trials. This information will be transferred to nursery growers via publications and meetings.

USDA, Agricultural Research Service  

Title: Biobased matrix with encapsulated microbes as substitute for synthetic fertilizers and pesticides  

Abstract: United States Department of Agriculture (USDA) scientists in Albany, California have developed a novel matrix that can substitute for fertilizers and pesticides. This matrix improves soil health and reduces ground water contamination. The matrix is made from gypsum and starch and encapsulates metabolically active microbes. These microbes secrete enzymes and other useful compounds. These help plants fix nitrogen, produce humic acids, and solubilize sulfates, phosphates, and potassium. This results in stimulated plant growth, healthier root-systems, and improved protection from pests. The matrix is produced in granular form and preliminary green house and small-scale field trials have shown improved plant growth and yields. This project aims to further develop and optimize matrix formulations for onion, strawberry, and tomato crops. It is also in the plan for this project to increase production of the matrix formulations to pilot scale. In addition, this project will conduct large-scale field trials with the onion, strawberry, and tomato growers.

USDA, Agricultural Resource Service  

Title: Salt-Tolerant Lettuce and Spinach Varieties  

Abstract: Salinity is a major constraint to lettuce and spinach production in all major production areas in California. On the central coast, seawater has intruded into ground water supplies due to continuing overdraft conditions. In the Central Valley, salts accumulate in soil because irrigation water from the
Sacramento-San Joaquin Delta is contaminated with brackish water from the San Francisco Bay, a shallow water table, and lack of an adequate drainage outlet. In the Imperial Valley, a desert region with less than three inches of rain annually, growers rely on the salty Colorado River water for irrigation. Global warming promotes water transpiration from plants and evaporation from soil increasing salt accumulation in soil. To screen and develop salt-tolerant lettuce and spinach germplasm and cultivars to adapt to the changing environment is proposed. Successful completion will improve profitability and sustainability of lettuce and spinach specialty crops in California.