



**Total SCBGP-FB Funding:** \$16.3 Million

**Total Match Funding:** \$8.4 Million

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### **Agriculture Education/Outreach**

**Project 1 - Project Aphism (PAm)**

**\$254,400**

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**Project Title:** Best Management Practices (BMPs) for Honey Bees Pollinating California's Specialty Crops

**Project Abstract:** Improve pollination services for California's specialty crops by developing and implementing an outreach program of sustainable Best Management Practices (BMPs) for commercially-managed honey bees. This outreach program would enhance competitiveness of California's specialty crops by assuring adequate and complete pollination by a well-managed beekeeping industry. Furthermore, this outreach program would enable the primary target audience, beekeepers, to access BMPs via both traditional (print) and more modern and innovative technologies (electronic). Growers would have access to BMPs to encourage their beekeepers to adopt sustainable colony management practices.

**Project 2 – California Assoc. of Resource Conservation Districts (CARCD)**

**\$497,115**

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**Project Title:** Technology transfer campaign to increase conservation cropping systems (CCS) and winter cover crops in California specialty crops

**Project Abstract:** Despite multiple economic and environmental benefits, conservation tillage (CT) and cover cropping (CC) practices are currently used on less than 3% of vegetable crop acreage in California's Central Valley (CV). CT reduces costs and coupling CT and CC has recently been shown to increase soil carbon, reduce greenhouse gas (GHG) emissions, and reduce negative surface and ground water impacts. Low adoption rates for these conservation cropping systems reflect lack of practical knowledge on how to best implement them within a crop production system and a general unfamiliarity with the multiple benefits that may result from their use. CARCD proposes a 3-yr cooperative educational project aimed at increasing the adoption of CT and CC practices by 10% in CV vegetable systems. This initiative will 1) increase the profitability of CV vegetable crop systems, 2) reduce GHG emissions and water quality impacts, and 3) enable California vegetable farmers to more readily access trading markets.

**Project 3 – CA Agricultural Leadership Foundation (CALF)**

**\$261,100**

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**Project Title:** Building Leaders for the Future

**Project Abstract:** This project is designed to foster the long-term viability and competitiveness of the specialty crop (SC) sector by enhancing the leadership skills of its leaders and emerging leaders. Using the California Agricultural Leadership program as a foundation, this



project will focus on developing and testing three new short courses with delivery systems designed to meet the tight time constraints and unique needs and learning styles of SC sector leaders and future leaders. The deliverables at the end of this three-year initiative are as follows: a) three new short courses focused on delivering the leadership skills needed to foster the long-term viability and increase the competitiveness of the SC growers b) measurable increase in the leadership skill level of each participant completing the courses c) a sustainable delivery system for the program.

**Project 4 – Ag Innovations Network (AIN)**

**\$128,544**

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**Project Title:** California Food System Alliance Project

**Project Abstract:** This project will support the enhancement and expansion of the Food System Alliance (FSA) effort. The FSAs are county-based coalitions that educate and advocate for maintaining California specialty crop (SC) agriculture in perpetuity. The Alliances include agriculture and supply chain voices, environmentalists, hunger and health advocates, consumers and independent community leaders. FSAs have a track record of success beginning with the original Ventura County Ag Futures Alliance launched in 1999. The proposed project provides support to the existing FSAs in Yolo, San Mateo, Santa Barbara and Ventura Counties and will launch 3 new FSAs. A strengthened and expanded network of FSAs will help secure the long-term viability of SC agriculture by communicating the importance of agriculture to the broader community, crafting on-the-ground solutions to local issues, building markets, ensuring supportive local policy, and reducing the conflict at the ag/urban border.

**Project 5 - Central Coast Vineyard Team (CCVT)**

**\$275,000**

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**Project Title:** Building Sustainable Farming Systems Through Grower and Consumer Outreach

**Project Abstract:** CCVT is a non-profit group dedicated to sustainable winegrowing. Since 1994, the organization evolved from a grass roots grower group into an organization representing 60,000 acres. CCVT has documented meaningful changes in behavior among farmers in areas of soil conservation, water quality & conservation, reduced risk pest management, habitat diversity, among others. Through outreach and education, CCVT continues to share information using a grower-to-grower approach through various channels. In addition, the group reaches beyond winegrapes through the Sustainable Ag Expo. Most recently, CCVT is reaching a consumer audience through its Sustainability in Practice Certification Program (SPCP). This project builds upon CCVT's meaningful foundation to continue its sustainable agricultural outreach programs to growers and farm workers and build linkages between the sustainable ag producers and consumers.



**Project 6 - Western Growers (WG)**

**\$391,700**

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**Project Title:** California Specialty Crop Communications Plan

**Project Abstract:** The goal of this project is to foster a public policy climate more supportive of California specialty crop producers. Our first objective is to facilitate greater collaboration in communication and public outreach among California specialty crop organizations. Our second objective is to improve voting consumers' perceptions of the industry and increase their likelihood of taking action on behalf of California specialty crop producers. In order to accomplish these objectives, we will build on consumer research currently being conducted to develop and coordinate the industry-wide implementation of an inclusive, proactive, and positive communication plan. As part of this collaborative public outreach plan, we will identify the positioning strategy, message concepts, and tools (i.e. news media, community briefings, Web sites, e-communities, social networks, etc.) that will be most effective in communicating the value of the California specialty crop industry to the voting consumer.



## Environmental Concerns and Conservation

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### **Project 7 – USDA, Agricultural Research Service (ARS)**

**\$498,252**

**Project Title:** Reducing Our Footprint: Minimizing Greenhouse Gas Emissions and Nitrogen Leaching in Vineyards, and Enhancing Landscape Carbon Stocks

**Project Abstract:** Nitrogen (N) leachates have harmful impacts on water quality, and nitrous oxide (N<sub>2</sub>O) is a greenhouse gas with significant impacts on climate change. Although not yet regulated in AB 32 Global Warming Solutions Act, N<sub>2</sub>O from agriculture is a major concern for the state's agricultural industry. ARS will identify how vineyard management practices affect GHG emissions, carbon (C) stocks, and GHG footprints, and identify tradeoffs for ecosystem functions such as nitrate leaching and weed control. The study will occur in North Coast and San Joaquin Valley winegrowing regions. Deliverables include 1) 'Best management practices' to increase N retention and balance production and weed control, 2) Calculation of carbon (C) offsets potentially gained by reductions in N<sub>2</sub>O emissions and increases in soil C content, 3) A decision support system using a web-based GIS to enhance on-farm soil C stocks, 4) grower-friendly publication by partnering with National Center for Appropriate Technology.

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### **Project 8 – University of California, Davis (UCD)**

**\$275,764**

**Project Title:** Coupling conservation tillage with overhead, low-pressure precision irrigation of vegetables: A new production and irrigation paradigm for increased resource use efficiencies.

**Project Abstract:** Vegetable production in CA is conducted using irrigation on highly tilled land. Heavy tillage and surface irrigation make the soil highly subject to wind- and irrigation-induced erosion. These cropping systems lead to high costs and unacceptable losses of dust as air pollution, runoff contamination of surface waters, and excess deep percolation losses. We propose a three-year cooperative project to test and develop completely new production systems that will couple conservation tillage (CT) with low pressure overhead irrigation for vegetables. Outreach includes grower participation at all stages. This project follows the successes of CT systems for field crops that are rain-fed or grown under center pivot irrigation in various parts of the world. Grower adoption of the products of the project will help resolve current problems associated with dust and runoff, reduce costs and facilitate more efficient water application and use.

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### **Project 9 – University of California, Davis (UCD)**

**\$417,656**

**Project Title:** Soil and water management to reduce water losses, energy costs and greenhouse gas emissions in tomato rotations



**Project Abstract:** This project will evaluate how tomato growers can increase soil profile and groundwater recharge through winter cover crop management, optimize irrigation practices to reduce environmental costs and increase grower incomes. Cover crops increase water infiltration during the rainy season, and thus aid in mitigating groundwater overdraft in drought years, but under furrow irrigation, regularly cover cropped fields require greater water applications. Therefore, subsurface drip irrigation may be more appropriate, especially for winter cover cropped fields, to reduce energy costs associated with pumping extra groundwater, and to increase tomato yields. UCD will monitor water storage, soil moisture movement in the soil profile, applied water, energy use and greenhouse gas emissions in winter fallow and winter cover cropped tomato systems under furrow and subsurface drip irrigation in order to develop best management practices and to address potential for engaging in emerging carbon markets.

**Project 10** – *University of California, Merced (UCM)*

**\$185,400**

**Project Title:** Multi-Commodity Sustainability Practices Program

**Project Abstract:** Bring together specialty crop commodity groups in a collaborative effort to develop a sustainable practices program strategic plan and template that can then be customized to meet each group's specific needs. The template will include, 6-8 common practice areas, such as energy, air quality, IPM and water. The project will be stewarded by a team including the Great Valley Center, a non-profit that convenes groups around social, economic and environmental issues, Sure Harvest, a company instrumental in developing the wine industry sustainability program, and Sustainable Conservation, a non-profit that looks for economic solutions to address climate change. These entities have invested \$42,000 to date, which serves as an assurance that the project has potential. Commodity groups listed as cooperating entities have indicated their interest in the project and will be engaged at every critical phase including design and outreach, and will contribute their staff time in varying amounts.

**Project 11** – *Pear Pest Management Research Fund (PPMRF)*

**\$75,000**

**Project Title:** Developing a Sustainable Practice Benchmark Tool for California Pears

**Project Abstract:** In 2007-08, the PPMRF partnered with Sure Harvest and others to strategize on how to address sustainability for the California pear industry. The group surveyed over 1/3 of California pear farmers and assembled a diverse industry committee to decide how to proceed. The next step is an educational and benchmarking tool based on the sustainable practices identified by SYSCO. The SCBGP will help fund the following activities: 1) Compile and assess survey results. Individual results will remain confidential but will be compiled to calculate an industry-wide average for use of sustainable practices. 2) Provide reports comparing each grower's sustainability performance to the industry average including strengths and weaknesses. 3) Revise survey questions (as needed for subsequent surveys) addressing sustainability under general categories including Pest, Nutrient and Soil, Ecosystem, Water, and



Energy Management and Employer Practices. 4) Conduct industry and consumer education/outreach.

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**Project 12 - SureHarvest (SH)** **\$345,000**

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**Project Title:** Almond Sustainability Initiative: Integrated Water and Nutrient Resource Management

**Project Abstract:** An integrated water and nutrient resource management project to increase almond grower water and nutrient resource use efficiency through an industry-wide integrated environmental performance outreach, data capture, benchmarking, and continuous improvement initiative. SH and the Almond Board of California (ABC) will collaborate to: engage growers in completing an integrated water use, soil quality, and plant nutrition assessment; collecting water and nutrient use efficiency data; providing benchmark reports; working with growers to develop water and nutrient use efficiency improvement plans; and collecting year-two water and nutrient use efficiency data from growers that developed and implemented plans. The measurable outcomes of the project will include data on the total gallons of water conserved, total nutrients conserved and total acres impacted. Improvements in the capacity to measure and manage water and nutrient use efficiency will also be evaluated.

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**Project 13 – University of California, Davis (UCD)** **\$304,825**

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**Project Title:** Minimizing Water Use and Fertilizer Loss in California Container Nurseries by Precision Control

**Project Abstract:** California greenhouse/nursery/floriculture producers grow hundreds of species in a wide range of sizes, with gross cash receipts over \$4 billion in 2007. Current systems for irrigation and fertilizer application control large areas (multiple beds) in the nursery, but are inadequate to manage the plants in individual beds, thereby over-watering some beds and under-watering others. UCD proposes to develop a system for precision application of water and fertilizer in container nurseries. UCD goals are to (1) improve the efficiency of water use in container nurseries, (2) reduce fertilizer loss, and (3) demonstrate feasibility of precision irrigation and fertigation in commercial container nurseries. Wireless sensor technology developed in UCD's previous research will be used to measure container soil moisture, inject variable amounts of fertilizer, and control valves. We will collaborate directly with commercial nurseries to implement and test irrigation and fertigation control.

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**Project 14 – University of California, Davis (UCD)** **\$184,924**

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**Project Title:** Implementing the Partial Root Drying Technique to Increase Water Use Efficiency for Processing Tomatoes



**Project Abstract:** This project focuses on a new approach for using less irrigation but achieving high crop yields, thus contributing to sustainable management for California vegetables. The promising technique of partial root drying (PRD) lets half of the root system encounter areas with low soil moisture, but does not limit the photosynthetic capacity of the crop, due to water availability on the other side of the plant. California is entering a third consecutive dry year and is curtailing water rights that may affect about 1 million acres. About 80% of processing tomato fields are furrow irrigated, and irrigation is the most costly field operation before harvest. UCD proposes to focus on alternate furrow irrigation (AFI) via PRD to improve the low water use efficiency (WUE) of tomatoes, reduce runoff, nitrate leaching, greenhouse gas (GHG) emissions, energy use, and costs. Outreach will be facilitated with Geographic Information System (GIS) tools that target areas with greatest potential benefits.

**Project 15 – Ag Innovations Network (AIN)**

**\$88,683**

**Project Title:** California Roundtable on Food Supply and Water

**Project Abstract:** This project will create a three-year effort to replicate the success of the California Roundtable on Agriculture and the Environment in the arena of water use efficiency for specialty crop growers. A new California Roundtable on Food Supply and Water would be created. The new Roundtable would look first for the immediate areas of common ground. Based on the consensus recommendations developed, members would work with decision-makers, constituent groups, and the media to place its recommendations into the public debate. A longer-term set of consensus recommendations would also be created. The Roundtable would consist of up to 45 members representing a balance of specialty crop, public interest, and academic/governmental partners. Membership would be by invitation and be limited to senior leadership in the participating organization to assure that agreements and policy initiatives developed in the group would gain broad support.

**Project 16 –University of California, Davis (UCD)**

**\$ 405,903**

**Project Title:** Tree phenology models for climate change projection and improved water and nutrient management

**Project Abstract:** A new method to derive crop chilling and heat requirements will be validated and used to project crop phenology for California almond, pistachio and walnut. Phenological models will be developed from historic climate and phenology data and intensive observations in 18 orchards throughout the Central Valley. The resulting models will provide a phenology-based time scale for crop management. This time scale will be used to 1) predict the impact of climate change on the long term viability of these crops in California; 2) to enhance the efficiency of production and use of resources (water, labor, nutrients, etc) and 3) to provide direction for breeding and research programs. To anticipate California's future standing in the global marketplace, climate change effects on winter chill will be estimated on a global scale.



**Project 17 – Western Growers (WG)**

**\$122,903**

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**Project Title:** Determining the Potential Impact of Vegetable Food Safety Regulations on Wildlife and the Environment

**Project Abstract:** Commodity specific food safety guidelines for leafy greens (CSFSGLG) contain practices to address potential contamination of products from animal intrusion. Since publication of these guidelines, environmental organizations have raised concerns about the impact of these practices on wildlife habitat and water quality. Concerns raised include the effect of fencing on migration routes of wildlife, the effects of indiscriminate trapping on endangered species, and the effects of the removal of buffer strips on stream quality. This project will address these concerns by determining which practices for leafy greens pose potential problems and by providing solutions based on input from food safety and environmental resource experts. A written report will be prepared that summarizes the findings and provides recommendations for California vegetable growers to reduce or eliminate conflicts between these sometimes competing goals of environmental protection and food safety.





## Food Security

**Project 18** – *Agriculture and Land-Based Training Association (ALBA)*

**\$ 164,558**

**Project Title:** Specialty Crop Solutions for Health-Distressed Communities

**Project Abstract:** The ALBA advances economic viability, social equity and ecological land management among aspiring and beginning farmers. Monterey County operates two farms as small farm business incubators primarily assisting agricultural workers. This project will leverage ALBA’s award-winning program to generate resilient economic models that link beginning and limited-resource farmers with diverse markets serving low-income people in the Salinas Valley in order to expand consumption of fresh fruits and vegetables. This will be accomplished with public education programs, farm-direct sales whenever possible, and a focus on culturally appropriate specialty crops that can be grown locally and marketed in ways that expand demand for such crops.



## International Trade

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**Project 19 - California Grape & Tree Fruit League (CGTFL) \$75,000**

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**Project Title:** Upgrade and Expansion of the California Stone Fruit Trade and Regulatory Database

**Project Abstract:** The California Grape and Tree Fruit League will upgrade and expand its current on-line trade and regulatory database covering global trade regulations for peaches, plums, nectarines, and apricots (collectively 'stone fruit'). The final product will include important trade and regulatory information for the industry's top 25 export markets around the world. The project as proposed will also cover partial funding for hosting, maintenance, and updates to the database through the length of the grant cycle.

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**Project 20 - California Canning Peach Association (CCPA) \$75,000**

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**Project Title:** California Canned Peaches to India

**Project Abstract:** The California Canning Peach Association (CCPA) is planning to conduct market research in India to determine India's potential as a new export market for California canned peach products. Assuming favorable results, CCPA will organize a trade mission of California canning peach producers to India in April 2010 to meet with potential customers and explore export opportunities further.

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**Project 21 - Cal Poly Corporation (CPC) \$167,266**

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**Project Title:** The Impacts of Changes in Agricultural Transportation Sector on the Competitiveness of the California Specialty Crop Industry

**Project Abstract:** The basic problem to be addressed is how will changes in the agricultural transportation technology, infrastructure, and cost impact the regional and international competitiveness of California specialty crop industries? Issues to be evaluated will include current and future supply of trucking services, rising trucking costs, the current and future condition of highway congestion and infrastructure, ocean port congestion, technology, infrastructure and ocean freight rates, and air freight and railroad transportation rates.

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**Project 22 -California Pear Advisory Board (CPAB) \$100,000**

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**Project Title:** Use of 1-MCP after harvest to improve fruit quality after long-distance shipment and storage.

**Project Abstract:** Researchers at the University of California, Davis will study the effects of temperature and ethylene exposure on fresh Bartlett pears in conjunction with 1-methyl-



cyclopropane (1-MCP) to determine an appropriate balance between storage and ripening. Some Bartletts will be exposed to various temperatures prior to treatment with 1-MCP, while others will be exposed to ethylene gas at various levels and time periods and then treated with 1-MCP. Following these treatments, fruit will be either ripened immediately or placed in cold storage. Fruit color will be assessed and fruit firmness will be determined. Fruit ethylene production will also be determined during ripening as an indication of the ability of the fruit to ripen following the 1-MCP treatment. Pending the results of research in the initial year of grant funding, additional research will be devised for the second and third years to further pursue the most promising treatment options.

***Project 23 - Center for International Trade Development (CITD)***

***\$448,308***

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**Project Title:** Export Training for Specialty Crops

**Project Abstract:** The Fresno Center for International Trade Development (CITD), working together with its numerous partners, will address the following identified needs of California's specialty crop industries through customized training and counseling: 1) small business export training, counseling and assistance for specialty crop producers; 2) greater export readiness and increased trade awareness; 3) breaking down barriers facing future export markets and the high cost of developing these markets; and 4) the inability to locate buyers, distributors and importers. Utilizing its experience in training new exporters, combined with its connections throughout both California's educational system and agricultural industry, CITD will conduct a program that develops new exporters of specialty crops, while increasing the skill level of both current and new to export companies, along with activities designed to introduce these new exporters to foreign buyers through outbound and inbound trade missions.

***Project 24 - Buy California Marketing Agreement (BCMA)***

***\$324,325***

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**Project Title:** California Grown Marketing in Japan

**Project Abstract:** The BCMA is requesting SCBGP funds to carry out marketing and public relations activities in Japan to increase exports of California specialty crops to this market. Activities will focus on improving consumer perceptions of California grown products and raising the profile of these products in consumer media and at point of sale.



## Market Enhancement and Promotion

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**Project 25 - Monterey County Vintners and Growers Association (MCGA) \$199,485**

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**Project Title:** Improving Long-Term Sales and Competitiveness of Monterey Area Wine grape Growers

**Project Abstract:** MCVGA represents most Monterey County wine grape growers/vintners, promoting wines from nine unique American Viticultural Areas (AVA). The goal of this project is to increase growers' long-term sales and competitiveness by creating market awareness and promoting the unique characteristics of each AVA. Most local wine grapes go to outside commercial wineries as bulk or as juice at low margins. AVA labeled wines achieve the higher margins critical to grower sustainability. MCVGA would create print and web-based interactive electronic AVA maps and histories featuring videos, searchable databases, and photos. Our members will create limited release 'Signature Series' wines highlighting the exceptional grapes of selected AVAs. The maps, wines, and other materials would be distributed to 75 wine journalists and 150 trade professionals (e.g., distributors, restaurants). A tour/tasting event would be held for top wine media and trade professionals. The websites would be promoted to wine professionals and the public.

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**Project 26 - Wine Institute (WI) \$450,000**

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**Project Title:** California First: Spotlight on California Wine Regions

**Project Abstract:** California First: Spotlight on Statewide Wine Regions is a campaign by WI and the California Association of Wine grape Growers (CAWG) to maintain and grow market share for vintners and growers by enhancing marketing skills and consumer awareness of the state's wine regions. The campaign builds on the California First program, initiated in 2005 in response to declining U.S. market share, and is based on consumer research which recommended an umbrella campaign that utilizes the diversity of the state's wine regions as a market advantage. WI and CAWG will work with regional winery and grower organizations to increase marketing expertise, create new promotional tools geared to millennial consumers -- a growing market -- and launch a coordinated campaign that communicates the diversity of California (CA) wine regions. Cost-sharing incentives will be used to encourage statewide participation and progress will be measured by market share tracking and trade, media and consumer surveys.

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**Project 27 - Sunsweet Growers, Inc. (SG) \$ 450,000**

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**Project Title:** Improving Grower Sales and Competitiveness by Promoting Prune Juice to Younger Consumers

**Project Abstract:** Sunsweet represents 329 CA prune farmers and 70% of US prune sales. As a farmer cooperative, all income flows back directly to our grower-owners. Prune juice (PJ)



contributes 35% of growers' revenue, making it crucial to their long-term competitiveness and sustainability. PJ consumption has declined steadily; current core consumers are aged 65+, and PJ is less accepted by younger consumers moving into this age group. This project focuses on younger, health conscious women aged 35+ by raising awareness of the health benefits of this 'super fruit' juice and the improved taste appeal of newer PJ products. SG will conduct a regional TV advertising campaign, leading to future national campaigns if successful. The campaign will increase consumption by promoting newer PJ products through taste and health appeal. Our long history of successful advertising campaigns for California prunes ensures SG will execute the project with expertise. All US prune production is in California.

**Project 28 - University of California, Davis (UCD)**

**\$292,007**

**Project Title:** Measuring and Understanding the Pattern of Margins between Farm and Retail Prices for California Specialty Crops to Increase Grower Returns.

**Project Abstract:** Retail prices of specialty crops have risen rapidly over recent decades while farm prices have not kept pace. Retail prices of specialty crops have risen even faster than other foods, affecting their affordability relative to other foods. This project investigates in detail the pattern of retail, wholesale and farm price movements for California specialty crops. UCD will explore statistically complex market relationships including international imports and exports, seasonal availability, product characteristics, marketing services, concentration of marketing channels, market power of buyers and marketers and other factors affecting marketing margins. This statistical analysis leads to evaluations of why margins have increased and what opportunities may be created to improve grower returns. UCD will work with industry organizations and firms to develop hypotheses; access the most appropriate data and assure that the analysis is developed and disseminated in the most effective manner.

**Project 29 - Buy California Marketing Agreement (BCMA)**

**\$500,000**

**Project Title:** California Grown Campaign 2

**Project Abstract:** BCMA is seeking funding to conduct a 'California Grown' umbrella marketing effort that will feature growers who are the heart and soul of the California specialty crop industry. The outreach will include securing profiles of growers in a variety of industries and translating their stories to consumers through a mix of consumer marketing tactics. BCMA believes by reading, seeing and hearing the story of California agriculture straight from the grower, BCMA will help to instill pride in California grown products, while also inspiring consumers to do their part by looking for and buying locally grown products. Consumer marketing tactics employed in this campaign are radio advertisements, point of purchase promotion and a publicized economic impact study.



***Project 30 - Western Pistachio Association (WPA)***

***\$500,000***

**Project Title:** WPA Pistachio Industry Recovery and Re-building Effort

**Project Abstract:** The California pistachio community is seeking support for an industry re-building effort in light of the recent, nationwide voluntary recall of pistachios due to potential Salmonella contamination. The rebuilding plan is built on the key pillars of research, industry action, education, reassurance and recovery. The re-building effort will be a layered, multi-year, multi-target approach intended to unify the pistachio community and work collaboratively with key stakeholders and food safety experts toward the goal of restoring the public's confidence in pistachios. The re-building effort will not happen overnight, and it will not effectively happen in a vacuum 'nor without adequate funding' which, is why the WPA is requesting grant dollars to assist with the task that lies ahead.

***Project 31 - University of California, Merced (UCM)***

***\$280,624***

**Project Title:** Specialty Crop Growers Partner with City of San Francisco (SF) for Healthy People and Bottom Lines

**Project Abstract:** This project acts on a recommendation from the SF Urban Rural Roundtable's (URRT) work to conduct Ag Trade Missions such that connections/relationships are established and distribution infrastructure is developed between growers and buyers of specialty crop (SC) products. The goal is that the interaction will increase the availability of regionally grown (150 mile radius/16 county) product to SF residents. In addition, SC growers will expand their markets and increase their knowledge of product demands and marketing requirements by urban buyers. This project seeks to not only conduct these Ag trade missions, but also develop an effective food shed model that includes a refined distribution system which effectively addresses the current needs of growers and buyers. Several partners have agreed to collaborate, all bringing expertise, resources and contacts at various levels of the distribution chain and geographic areas to make this happen.



## Nutrition

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### **Project 32** - Lake County Health Services (LCHS)

**\$314,988**

**Project Title:** A Growing Movement to Seed Healthy Eating

**Project Abstract:** This project will benefit Lake County specialty crop growers (SCG) by formalizing a food distribution system focused on purchase of local crops. Impetus will center on improved nutrition/health via consumption of produce & nuts. Components include (1) a food summit, (2) marketing/ed, (3) an expanded Farm - School (F-S) and Farm-Institution (F-I) program (4) and coordination to connect these and other "eat local" efforts within a food delivery system that works in tandem to optimize consumer nutrition and grower market opportunities. The Health Leadership Network (HLN) will act as the coordinating hub. It has been at the fore of obesity prevention efforts with launch of F-S, school nutrition, and a county food assessment. Partners include a comprehensive array of public/private entities. Public Health is an HLN member and will act as fiscal recipient/manager. Funds will enable new and existing partners to rally under a shared vision to build a vibrant local food system.

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### **Project 33** – Ecology Center (EC)

**\$100,000**

**Project Title:** Ecology Center Nutrition, Food, and Farming Programs

**Project Abstract:** The Ecology Center's (EC) Nutrition, Food, and Farming Programs (NFFP) work directly with residents, farmers, and lawmakers to improve nutrition by increasing consumption of CA specialty crops (CSCs). EC's NFFP are: i) the Berkeley Farmers' Markets, increasing the consumption of CSCs by serving over 40 CSC growers and 10,000 shoppers each week for over \$3 million a year in farm-to-consumer sales; ii) the EBT Program, providing Farmers' Markets across the state with the technology and training needed to accept EBT; iii) the Berkeley Food Policy Council, a city-wide coalition of nonprofits, health service providers, schools, government agencies, and residents, connecting local agriculture with the community through replicable food policies and programs; and iv) Farm Fresh Choice, promoting the health benefits of CSCs to over 36,000 low-income youth and families with nutrition/disease-prevention education, farm stands, tastings, and culturally relevant cooking classes.

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### **Project 34** – Western Growers Foundation (WGF)

**\$135,170**

**Project Title:** Head Start Nutrition Garden Program

**Project Abstract:** WGF will provide 100 Head Start sites with the resources and funding to create a school garden. Each year, 50 sites will receive a raised garden bed, an irrigation kit, a Western Growers School Garden Program Resource Kit, the California Head Start Association's Growing, Eating, Living book, and a garden grant of \$500. Together, these resources provide an excellent platform on which to build a school garden program. Through these gardens, both children and parents are provided information about proper nutrition. Educating parents in the



principles of good nutrition is a key responsibility for the Head Start program. 5 sites will be highlighted in a Preschool Nutrition Gardening video. This video containing nutrition lessons/activities and how to deliver them to a pre-school aged audience will be made available to teachers statewide as both a training tool and model on which to base their own preschool gardening programs.

**Project 35** – *University of California, Davis (UCD)*

**\$210,376**

**Project Title:** Linking Ethnic Specialty Crop Producers and Low-Income Consumers through Marketing and Nutrition Education

**Project Abstract:** A team of University of California Cooperative Extension (UCCE) farm and nutrition advisors, and extension specialists will work together to assist smaller-scale ethnic producers with marketing fresh and culturally-appropriate produce to low-income communities in Alameda, Santa Clara, Tulare, and Riverside Counties. This three year project has three phases: 1) assessment of viable distribution systems for ethnic produce and the produce preferences of targeted consumers; 2) implementation of pilot programs in the targeted counties; and 3) project evaluation and outreach. The UCCE personnel will provide technical assistance to three groups to create successful linkages: 1) they will assist producers with their postharvest handling practices and distribution of their ethnic produce; 2) they will work with Women, Infants and Children (WIC) vendors on their produce handling practices; and 3) they will educate WIC clientele regarding proper produce handling practices and nutrition.

**Project 36** – *Trust for Conservation Innovation (TCI)*

**\$499,249**

**Project Title:** Healthy Food Access, Small Farms and Nutrition in Six California Foodsheds: A Consortium Promoting SNAP and WIC Voucher Links with Farmers Markets

**Project Abstract:** The California Healthy Food Access Consortium project would support efforts in the six foodsheds of San Diego, Los Angeles, Fresno, Monterey, Oakland and San Francisco to direct market healthy, sustainably grown local fresh fruits and vegetables to nutritionally vulnerable county citizens. The Consortium would encourage SNAP (food stamp), Seniors and WIC mothers and children clients to visit local farmers markets to use their EBT cards and exchange their WIC and Senior vouchers to purchase local fresh fruits and vegetables at farmers markets in these foodsheds. The project would additionally encourage direct sales of local fruits and vegetables to WIC stores and to school feeding programs in the six designated foodsheds. The Consortium would leverage SCBG funding with additional federal and foundation resources to provide the healthy foods grown by California farmers for direct marketing to improve the nutritional needs of vulnerable people in the designated six foodsheds.





***Project 37 - California Department of Education (CDE)***

***\$180,250***

**Project Title:** Food for Thought

**Project Abstract:** The CDE's Child and Adult Care Food Program provides the CDE a unique opportunity to influence young children's eating habits. Recognizing the importance of integrating nutrition education into preschool classrooms, CDE just published a nutrition education curriculum for preschoolers called Food for Thought (FFT). CDE will promote the use of FFT in preschool to increase preschoolers' acceptance of fresh fruits and vegetables.



## Plant Health & Pest Challenges

**Project 38** – *USDA, Agricultural Research Service (ARS)*

**\$446,447**

**Project Title:** Detection and control of Verticillium wilt on lettuce

**Project Abstract:** The long term goal of this project is to develop resources for the control of Verticillium wilt on lettuce in California, caused by the fungus *Verticillium dahliae*. Spinach, another major specialty crop in California, is not affected by Verticillium wilt in commercial production, however, spinach seeds infected with *V. dahliae* produced abroad and in Washington state and planted in the Salinas Valley increase inoculum density and introduce exotic strains that may contribute to Verticillium wilt epidemics on lettuce. The objectives of this project are to 1) develop a rapid detection assay for *V. dahliae* in spinach seed; 2) determine where the fungus is located in spinach seed to develop effective seed treatments; and 3) identify lettuce and spinach resistant to *V. dahliae* to limit spread via seed. These objectives relate to aims of ongoing work focused on control of Verticillium wilt of lettuce, and findings from this research will likely reduce the use of costly soil fumigants.

**Project 39** – *USDA, Agricultural Research Service (ARS)*

**\$471,740**

**Project Title:** Development of almond, stone fruit, and walnut rootstocks with improved resistance to soilborne pathogens

**Project Abstract:** Here we address the CA Fruit and Nut Tree industries need for superior rootstocks with resistance to soilborne pathogens. The need is critical because of; the phase out of methyl bromide; the non-sustainability of alternative fumigants; the gradual building and spread of the target pathogens; a lack of economical, effective control measures for soilborne pathogens; and the importance of maximizing productivity of CA fruit/nut orchards. We will develop rootstocks with resistance to the targeted soilborne pathogens, *Agrobacterium tumefaciens*, *Phytophthora* spp, phytoparasitic nematodes and *Armillaria* spp. This will result in reduced yield loss while maximizing yields per unit input over the life of the orchard. We will use conventional breeding, disease-screening, novel propagation techniques and gene mapping in combination with educational outreach to develop, characterize, and deploy walnut and almond/*Prunus* rootstocks with superior resistance to these critical soilborne pathogens.

**Project 40** – *University of California, Davis (UCD)*

**\$497,179**

**Project Title:** Sustainable Grape Pest Management for California Using Weather Data, Models and Cultural Controls

**Project Abstract:** This project will address sustainability of grape production through reducing inputs by using science-based decision tools. It will build on research using weather data to guide grape pest management through a statewide applied research, demonstration and implementation project for raisin, table and winegrapes. This project will demonstrate grape



powdery mildew (GublerThomas) and Botrytis bunch rot (Broome et al.) weather-driven risk models. This project will refine some of the models and combine the models with new pathogen diagnostic techniques using real time Polymerase Chain Reaction (PCR). The Western Weather Group based at Oregon State University (OSU) Integrated Plant Protection Center (IPPC) provides centralized, quality-controlled weather data from 1000s of stations and 10 disease model outputs from real time and forecasted weather. UCD will look at cultural controls that alter canopy microclimate using air blast sprayers to reduce Botrytis and test the risk model with improved weather forecasts.

**Project 41 - University of California, Riverside (UCR)**

**\$384,347**

**Project Title:** Area-wide Biological Control of Diaprepes root weevil

**Project Abstract:** The life history of the Diaprepes root weevil makes this weevil a significant threat to many different commodities and systems in southern California. Area-wide, cross-commodity pest management programs for the weevil are under development and biological control can play a significant role in these programs. Therefore, the goals of this project are to import and evaluate species of egg parasitoids for efficacy in reducing densities of Diaprepes root weevil, determine methods of storing large numbers of Diaprepes eggs for use in mass rearing of the parasitoids, and incorporate the parasitoids into management programs in citrus and urban landscapes with extension to avocados and ornamental nurseries. Using biological control will benefit citrus, avocados, and ornamental nurseries by reducing the density of weevils in a general area, thereby reducing the amount of insecticides needed to manage the weevil and the threat of re-invasion by the weevil.

**Project 42 - University of California, Riverside (UCR)**

**\$294,012**

**Project Title:** Refining chemical control of vine mealybug to manage resistance, enhance natural enemy conservation and promote integrated control

**Project Abstract:** Wine, table and raisin grapes are a \$2.3 billion crop in California grown on more than 800,000 acres. One of the critical threats facing grape production statewide is the vine mealybug (VMB), *Planococcus ficus*, a vineyard pest of exotic origin first identified in the Coachella Valley in 1994, but now infesting at least 17 counties as far north as Napa and Sonoma. An effective management program is required to suppress VMB populations and help prevent further expansion while providing sustainable control. The overall goal of this project will be to identify a suite of selective, reduced-risk insecticides that work in concert with biological control to suppress VMB populations through enhanced conservation of natural enemies. The key to a sustainable integrated program will be to optimize and diversify chemical control so that the full potential of a treatment is attained while also safeguarding against resistance through limited, but effective use of selective insecticides.



***Project 43 – California Department of Food and Agriculture (CDFA)*** ***\$277,314***

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**Project Title:** Acquisition of a Variable-Pressure Scanning Electron Microscope (VP-SEM) to enhance diagnostics of pests affecting Specialty Crops

**Project Abstract:** This project supports acquisition of a Variable-Pressure Scanning Electron Microscope (VP-SEM). With ever increasing numbers of pests attacking specialty crops, VP-SEM will allow faster identification of pest insects, pathogens, nematodes, weeds and seeds. Scanning electron microscopy is a critical tool for identifying organisms affecting specialty crops. VP-SEM is particularly useful, working under low vacuum and so requiring no sample pretreatment (dehydrating, chemical fixing, coating). Various specimen types (in fluid, live tissue, cultures, etc.) can be analyzed, and still cultured, DNA sequenced, or further examined. The large capacity chamber allows numerous and large-sized samples to be viewed. Plant diseases can be viewed in situ on plants. The current SEM is old, requires costly maintenance, and does not have VP-SEM functionality. As a result, this project will enhance diagnostic capabilities for all specialty crops. VP-SEM will allow faster identifications for pests and diseases.

***Project 44 – UC, Davis (UCD), Div of Ag and Natural Resources*** ***\$127,197***

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**Project Title:** Development of an Integrated Pest Management Program for Vole Control in Artichokes

**Project Abstract:** Each year animals cause millions of dollars of damage to agriculture. It is imperative that California develop a comprehensive integrated pest management program to identify and mitigate potential hazards quickly and efficiently. CDFA, United States Department of Agriculture (USDA), and the University of California (UC), with funding provided by the Vertebrate Pest Control Research, have been working on a control program for voles in artichokes for over 10 years. This funding will allow CDFA and its partners to assess the control methods currently available and develop a comprehensive integrated pest management program for the control of voles in artichokes.

***Project 45 – California Department of Food and Agriculture (CDFA)*** ***\$283,690***

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**Project Title:** Host Specificity Testing of Exotic Parasitoids for Biocontrol of Asian Citrus Psyllid

**Project Abstract:** This proposal will support the host specificity testing of exotic parasitoids for the biocontrol of Asian citrus psyllid (ACP) in California (CA). ACP is the most severe threat ever to face CA citrus production because of its ability to spread a bacterium that causes citrus greening, an incurable disease that is lethal to citrus. Parasitic wasps that attack the nymphs of ACP are in quarantine in Florida. These parasitoids have been collected from the home range of ACP in the Punjab region of Pakistan. Before USDA-APHIS will grant permission to release these parasitoids from quarantine for release in the environment, safety testing must be



completed to demonstrate that these natural enemies do not pose unacceptable risk to beneficial (i.e., psyllids used weed biocontrol) and rare native psyllids. It is imperative that safety testing and host specificity work is completed so regulatory requirements are satisfied and biocontrol against ACP can advance.

**Project 46** – *University of California, Davis (UCD)*

**\$227,714**

**Project Title:** Cotton Aphid Management in Pomegranate: Slowing the Spread of Citrus Tristeza Virus in the San Joaquin Valley

**Project Abstract:** Cotton aphid, *Aphis gossypii*, is a highly damaging insect pest to several specialty crops in CA, e.g., citrus, cucurbits, celery, eggplants, nursery plants, etc. This pest, with >300 reported hosts, hinders the agricultural economy by reducing crop yields via removal of crop photosynthates, contaminates commodities with excreted honeydew and insect parts, transmits serious virus diseases, and contributes to increased crop protection costs. This proposal concentrates on practices to mitigate cotton aphid populations to slow the spread of citrus tristeza virus in San Joaquin Valley citrus but the research will likely have implications to other crops. We propose to investigate and refine management plans for cotton aphid on the overwintering host, pomegranates. This phase of the life cycle may represent a 'weak point' and may offer a unique opportunity to favorably impact management of this key pest. Biorational insecticides, cultural, and biological approaches will be investigated.

**Project 47** – *University of California, Davis (UCD)*

**\$221,154**

**Project Title:** Refined Management of Arthropod Pests of Mint to Improve Sustainability and Protect Water Quality

**Project Abstract:** Mint production is located in the Northeastern counties of Shasta, Lassen, Modoc, and Siskiyou with ~4,000 acres valued at \$5 million annually. While clearly a specialty, small acreage crop, mint production is important to these local economies. Peppermint oil is used as flavoring for toothpaste, chewing gum, and other confectionery items and as insect repellent and aromatherapy; mint leaves are increasingly used as salad garnish and in mint teas. Growers' plant certified disease-free rootstock in stands that persist up to 6 years. Mint is extremely susceptible to pests which can alter the oil quality and yields. Spider mites and a recently introduced pest, mint root borer, are significant challenges and the target of pesticide use. Given the highly sensitive watersheds and environment of the Fall River Valley, the use of propargite and chlorpyrifos (both pesticides with regulatory concerns) is problematic. Alternative management methods will be investigated through this project.



## Food Safety

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### **Project 48** – *Center for Produce Safety, (CPS)*

**\$296,440**

**Project Title:** Evaluation and Optimization of Postharvest Intervention Strategies for the Reduction of Bacterial Contamination on Tomatoes

**Project Abstract:** Tomatoes are a nutritious food and an important crop for the states of California and Florida and the US economy. Yet, foodborne illness outbreaks associated with tomatoes have negatively impacted public health, consumer confidence in tomatoes, and the industry’s economic well-being. The California and Florida tomato industry has taken an active role in establishing food safety tomato-handling standards. However, due to lack of scientific data applicable to commercial handling conditions, some of the standards rely upon recommendations previously developed for tomato quality maintenance. Therefore, scientific studies to evaluate pathogen contamination and infiltration under realistic commercial handling conditions are critical for developing handling practices to effectively reduce pathogen contamination. Proposed research will focus on evaluating current tomato post-harvest handling practices on Salmonella contamination and infiltration, and providing answers to the queries raised by the industry. Goals include defining operational limits for dump tank water management, identifying cost-effective dump tank water quality monitoring parameters, and developing/optimizing an overhead spray sanitation system to minimize tomato surface contamination while reducing water and chemical use. Project outcome will provide data for developing science-based guidelines to reduce food safety risks, and avoiding setting up costly regulations that may not necessarily advance food safety.

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### **Project 49** – *Center for Produce Safety, (CPS)*

**\$62,271**

**Project Title:** Reducing tomato contamination with Salmonella through cultivar selection and maturity at harvest.

**Project Abstract:** Recent studies demonstrate that interactions of human pathogens with crops involve specific plant and bacterial genes. Our preliminary observations that *Salmonella* gene expression within tomatoes depends both on the plant’s genotype and on specific tomato volatiles that differentially accumulate in fruits as they ripen. These discoveries led to a hypothesis that it should be possible to identify crop cultivars that are less susceptible to contamination with *Salmonella*, much as breeders select for disease-resistant crops varieties. It is also expected to discover an additive effect of the genotype and maturity in affecting susceptibility of the product to contamination with *Salmonella*. This hypothesis will be tested with a suite of tomato-specific *Salmonella* gene reporters, regulation of which will be tracked in tomato fruits of different cultivars at two maturity stages. They provide more sensitive, reliable and quantitative information than the total *Salmonella* cell count. This proposed characterization of a *Salmonella*-“resistant” cultivar or a maturity stage will suggest a cost-effective solution for reducing the risk of proliferation of *Salmonella* in tomatoes. When combined with other practices



(e.g. elimination of reservoirs of pathogens from processing facilities), these efforts will help ensure microbiological safety of produce.

**Project 50** – *Center for Produce Safety, (CPS)*

**\$136,040**

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**Project Title:** Using Leafy Green Marketing Agreement Audit Data to Determine Non-Compliance Areas and Preparation of Training and Recommendations for Improvements in Future Growing Seasons

**Project Abstract:** The purpose of the Leafy Greens Marketing Agreement (LGMA) Audit Data Evaluation Proposal is to use data collected by the California Department of Food and Agriculture (CDFFA) during audits of lettuce and leafy greens producers to determine if there are more efficient and effective methods for preventing the microbial contamination of these crops. This proposal consists of four elements: the collaboration with CDFFA and the LGMA Advisory Board to obtain confidential audit data for analysis; the statistical analysis of the data for trends and compliance issues; the preparation of training tools and training sessions for growers, and; recommendations to LGMA for any changes in best practices and/or the audit document. The overall objective of the proposal is to reduce audit compliance costs for producers while making leafy greens safer (and less expensive) for the consumer.

**Project 51** – *Center for Produce Safety, (CPS)*

**\$86,563**

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**Project Title:** Differential Susceptibility of Spinach Grown under Slow- and Fast-Growth Conditions to Enteric Bacterial Contamination

**Project Abstract:** Spinach is grown in the Salinas valley during most months of the year. Early season spinach takes 40-50 days (slow growth) to reach harvest stage whereas spinach grown during the warmer summer months grows much more quickly, taking 30-35 days (fast growth) to reach harvest stage. Spinach grown under fast-growth conditions is subject to significant post-harvest breakage which may influence susceptibility to coliform bacterial colonization. The project will compare three spinach varieties grown under slow- and fast-growth conditions for physiological differences that may contribute to leaf structure and stability (waxy layer, plasmalemma and cell wall thickness, number of chloroplasts, etc.) and susceptibility to *E. coli* O157:H7 colonization. An additional stress of insect damage will be placed on the plants to see if damage combined with fast-growth conditions result in higher *E. coli* counts. The goal is to document the physical changes in spinach that accompany fast-growth conditions and identify increased risks for *E. coli* contamination of summer-grown plants. This will be the first step in systematically testing a larger number of spinach cultivars for traits that minimize breakage and contamination risks.



**Project 52** – *Center for Produce Safety, (CPS)*

**\$300,000**

**Project Title:** Wildlife survey for *E. coli* O157:H7 and *Salmonella* spp. in the central coastal counties of California

**Project Abstract:** Wildlife species will be tested for the human pathogenic strain of bacteria, *Escherichia coli* O157:H7 and *Salmonella* in Monterey, San Benito and San Luis Obispo Counties. Since 1995, this pathogen has resulted in more than 25 outbreaks from eating leafy green vegetables (LGV); approximately half of these have been associated with LGV grown on the California central coast. Wildlife has been suggested to be a source of *E. coli* contamination of LGV. Because of this uncertainty, farmers are being required to build deer- and wild pig-proof fences around their fields, and remove habitat and wildlife from their farms. To date, however, there is minimal definitive data that wildlife are an important source of contamination. The project leaders will collect colon or fresh fecal samples from wildlife collected in relevant LGV production areas to determine if they are carrying *E. coli* O157:H7. This information will help better manage and protect wildlife and provide food health safety information to farmers and to the produce industry. The future of sustainable wildlife populations in the three central coastal counties is dependent on having cumulative and accurate scientific data to properly manage wildlife and to protect human health.

**Project 53** – *Univ. of CA Cooperative Extension- Monterey County (UCCE)*

**\$112,100**

**Project Title:** Survival of *E. coli* on soil amendments and irrigation water in leafy green field environments

**Project Abstract:** Fresh market leafy green vegetables periodically are subject to contamination from foodborne human pathogens such as *E. coli*. Field aspects of such contamination are not well understood, and there is a lack of information on where and how *E. coli* comes in contact with leafy greens in the field, how *E. coli* survives there, and how production factors influence this pathogen. It is notable that few in-field projects have been conducted to address such issues as they pertain to commercial environments for leafy greens in California. This project will continue to develop field-generated information on the survival of *E. coli* under actual production environments for coastal California leafy greens. The project leaders will validate findings regarding survival of generic and non-toxicogenic O157:H7 strains of *E. coli* when introduced to irrigation water, soil, and plants of a spinach field. With this simulation of a contamination event in spinach, survival of *E. coli* under field conditions will be documented. This information will be useful in further improving metrics and regulatory measures. Also the survival of generic and non-toxicogenic O157:H7 strains when introduced as contaminants in fertilizer inputs that are subject to soil cultivation and other practices will be evaluated.





***Project 54 – University of California, Davis, Food Science and Technology (UCD) \$244,805***

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**Project Title:** Assessing Postharvest Risks for Salmonella in Pistachios

**Project Abstract:** In the past decade, outbreaks associated with consumption of raw almonds and peanut butter have been documented in the U.S. and in 2009 there was a large recall of pistachios when Salmonella was isolated from commercial products. However, with the exception of almonds, very little is known about the ecology of Salmonella in nut production and processing environments impeding the development of targeted commodity-specific intervention programs. Quantitative microbial risk assessment (QMRA) is an increasingly common tool that provides a framework for identifying critical data gaps and evaluating the overall effectiveness of risk-reduction strategies. This proposal will, through laboratory studies, identify points during post-harvest handling of pistachios where Salmonella may be reduced, controlled or amplified. Building upon a previous raw almond QMRA these laboratory data, industry data and expert opinion will be used to construct a pistachio QMRA. The overall goal of this research is to use the laboratory data and QMRA to develop scientifically-based food safety risk-reduction strategies for the pistachio industry.

***Project 55 – University of California-Davis, Dept. Plant Sciences (UCD) \$49,296***

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**Project Title:** Establishment of Critical Operating Standards for Chlorine Dioxide in Disinfection of Dump Tank and Flume Water for Fresh Tomatoes

**Project Abstract:** The establishment of sanitary standards and defined disinfection treatment doses is essential for the responsible handling and packing of fresh tomatoes. Adequate water treatment to minimize bacterial cross-contamination is a fundamental management prerequisite to providing customers with tomatoes that are safe to consume. Liquid chlorine, similar to household bleach, in forms approved for use on fresh produce has been the dominant water treatment. More recently, renewed interests in alternative sanitizers, such as chlorine dioxide, with simpler dosing requirements and lesser concerns for harmful by-products and residues has developed from within the tomato industry. There is inadequate science-based performance data to base sanitary standards and reliable audit inspection criteria for chlorine dioxide use in dump tank and flume water. The purpose of this research project is to develop a baseline of data assessing the reliability of chlorine dioxide injection into tomato packing house water systems. A total of twelve full-day surveys will be conducted under Florida and California seasons within commercial facility management operations and conditions. The research outcomes will allow the assignment of a research-based starting point for evolving national and international tomato specific standards for water quality dosing, monitoring, process controls, and corrective actions with chlorine dioxide.