

**California Department of Food and Agriculture
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CALIFORNIA GROWN PROMOTION

California's Agricultural Rock Stars

\$1,550,000

Buy California Marketing Agreement (BCMA)

In 2016, the Buy California Marketing Agreement (BCMA) refreshed its integrated paid media program, designed to highlight the diversity and uniqueness of California grown specialty crop products. Through an integrated partnership with a major media partner, the program will deliver the message through a combination of culinary and lifestyle online assets, affording the ability to expand the number of specialty crops highlighted through the effort. This strategic approach will be extended into 2017. BCMA will continue to expand and enhance the program's digital presence and align with consumers' ever-increasing reliance on digital media. The "California's Agricultural Rock Stars" campaign approach presents the specialty crops and their farmers as iconic VIPs, literally growing and fueling the aspirational California lifestyle. The campaign will grow an online community of people who support California specialty crops and provide a consistent stream of content highlighting the wide variety and seasonality of specialty crops and farmers in the state of California through multiple social media sites. It will increase awareness at point of sale and sales of California specialty crops through targeted retail promotions. It will also take a different approach to marketing through a pilot college internship program that will introduce the next generation of Californians to California specialty crops. Select event activations will be used to extend the opportunity to specialty crop stakeholders to participate in the integrated campaign, directly face a large number of consumers, or select retail partners for the campaign's targeted retail promotions.

California Sustainable Table - A Marketing Program for California Wine and Specialty Crops

\$388,288

Wine Institute

The Wine Institute seeks funds for a United States promotional campaign that expands California specialty crop market opportunities by highlighting the ideal growing conditions, stringent farming/environmental standards, and sustainable practices of California grown wines and other specialty crops that provide a compelling reason for consumers and trade to choose California Grown. Through publicity, events, social media, websites, and publication of a "coffee table" book taking readers on a culinary tour of the state's wine and specialty crops by region, the project will communicate reasons to choose California Grown to key trade, media, and consumers, and increase California wine sales and grower returns.

When You Think Figs, Think California Grown: A Campaign to Drive Awareness and Demand for California Grown Figs

\$429,899

California Fig Advisory Board

Most American consumers are not aware that 60 percent of figs sold and consumed in the United States are imported, primarily from the Middle East, Europe, Chile, and Mexico. The California Fig industry produces 100 percent of United States figs sold commercially, yet the

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California Fig industry has seen a staggering 241 percent increase in fig imports since 2007-2008, further threatening the economic viability of fig growers, processors, suppliers, employees, and the surrounding communities. The California Fig industry must act quickly to raise awareness, stimulate consumption, and drive sales of California grown figs to help ensure a sustainable economic future for all involved in the domestic fig value chain. Therefore, the California Fig industry requests funding to execute a comprehensive marketing campaign, "When You Think Figs, Think California Grown," to encourage today's fitness and on-the-go-minded consumers to seek and select California grown dried and fresh figs by highlighting the nutrition benefits of California grown figs.

*Leveraging California Grown Identity to Boost Sales of One of California's
Fastest Growing Specialty Crops: Olives for Olive Oil* \$357,521

California Olive Oil Council

California had a record 2015 olive oil harvest of four million gallons compared to 2.4 million gallons in 2014 (University of California, Davis). Recent olive plantings are reaching production age, making oil olives one of California's fastest growing specialty crops. However, imported olive oil has 96 percent of United States market share. There is a need to promote quality and value/pricing of California grown oil olives. California Olive Oil Council, representing 400-plus California oil olive growers, seeks to leverage a new California Grown partnership and execute a national retail/media/quality conscious consumer campaign to boost sales of California olive oil. Tasks include creating marketing materials with California Grown and hosting 19 events (Tree to Tables, Fancy Food Shows, growers' workshops) to promote California oil overall and train producers. The goal is to increase annual sales of California olive oil by \$14.4 million (\$48.6 million to \$63 million) by 2019 (measured by independent sales reports) directly benefitting California specialty crop producers.

*Expanding Markets, Expanding California Prune Sales: Promoting Nutritional
Benefits of California Grown Prunes to New Demographics* \$450,000

Sunsweet Growers, Inc.

The United States population is more diverse than ever. Sunsweet Growers, a California grower owned co-op (representing 70 percent of United States prune sales) seeks to promote 100 percent California grown prunes as a tasty and healthy snack choice to encourage new target consumers for California prunes. Nielsen market data show strong prune purchasing potential from new target groups and relevant messaging is needed to attract these presently untargeted consumers. Tasks include a consumer marketing campaign (messages/testing, outreach, and ads), with an outcome of increased grower returns by \$15 million by 2018. The project is supported by California Plum Board, representing all California prune growers, and California Dried Fruit Coalition. Soft demand, rising costs, and foreign competition have resulted in a 40 percent decline in California prune acreage from 2001 - 2014 (U.S. Department of Agriculture National Agricultural Statistics Service). Accordingly, higher demand is critical to industry health.

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Boosting Livermore Valley Winegrape Growers' Sales Through Promotional Campaign Leveraging California Grown Identity \$209,270

Livermore Valley Winegrowers Association

Livermore Valley's growers face mounting costs. Fruit Grower News and grower reports show labor and water costs rose 25 percent and 18 percent, respectively, in 2015, while three year regional grape prices are stagnant (National Agricultural Statistics Service). Livermore Valley Winegrowers Association seeks to counter this and bring sustainability to all Livermore Valley growers (70 percent of California District six wine region) through a marketing campaign targeting high frequency wine consumers (more than one time per week) nationwide. Project benefits growers by boosting prices for Livermore Valley grapes (\$3.3 million by 2019) by building demand for higher value winegrape uses (e.g., high-end wine versus bulk/juice) focusing on region's distinct terroir (geography/climate/soil). Tasks include a regional market assessment, creation of promotional materials for industry-wide promotion and growers/winemakers to market themselves (maps/printed collateral), media engagement and tours, and ads.

California Food for California Kids: Promoting California Grown Fruits and Vegetables in Summer Meals \$318,376

Center for Ecoliteracy

The Center for Ecoliteracy will develop, design, and conduct a multi-channel "Farm to Summer" marketing campaign to promote the quality and benefits of healthy, freshly prepared summer meals made with California grown fruits and vegetables. In coordination with regional clusters of school districts participating in the California Thursdays Network that serve summer meals, the "California Food for California Kids" campaign will target three markets (San Diego, Sacramento, and Contra Costa counties) with public relations and advertising efforts. The campaign will include four integrated components: 1) Promotional events at summer meal sites; 2) Public relations and earned media efforts; 3) Advertising in outdoor (transit), broadcast (radio), and online media; and 4) A valued spokesperson. It will be designed to increase consumption of California grown fruits and vegetables and feature specialty crop images from the California Thursdays' program to convey quality, freshness, and local source.

California Grown Taste of California Focusing on Specialty Crops \$441,006

Center for International Trade Development

This project will enhance marketability and competitiveness of California specialty crops by developing opportunities for producers to sell products in viable foreign markets, and increase foreign consumer awareness. Leveraging the California Grown identity, this project will increase export sales of specialty crops through multi-commodity promotions. Five independent, week-long reverse trade missions will include prescheduled meetings between 20 importers and 40-plus suppliers (estimate 400 - 600 meetings), using chef demonstrations with suppliers' specialty crop products to educate buyers and foreign media on health benefits and meal prep options to incorporate products in each country's diet. Foreign media will publish articles in respective countries promoting what they learned about California specialty

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crops and create consumer awareness. The project is expected to generate 10 percent export growth in target markets and specialty crop awareness, reaching five million potential foreign consumers.

Delicious California: Chardonnay and Strawberries, a Perfect Pair \$321,742

Monterey Winegrowers Council

The Monterey Winegrowers Council (also known as Monterey County Vintners and Growers Association) in partnership with the California Strawberry Commission seek to increase awareness and drive sales of California chardonnay wine (and grapes) and strawberries through innovative cross marketing activities targeting the Generation Y (Millennial) demographic. The program includes the following components: digital marketing campaign, in-store marketing programs in five cities, in-market media launch events, and buyer and media/blogger educational visits to chardonnay and strawberry growing regions. Selling the dream of the California coastal healthy lifestyle, the program will use the beauty of California's premier chardonnay and strawberry growing regions to entice buyers and provide "the cheapest travel available," offering the buyer an opportunity to bring the California lifestyle to their table through the simple purchase of California grown chardonnay and strawberries.

Increasing California Pistachios Exports to the European Trade \$244,000

American Pistachio Growers

American Pistachio Growers proposes launching a California grown advertising campaign featuring pistachio kernels from California as a healthy ingredient to foodservice professionals in European target markets. The European Union is the largest export market for California pistachios, consuming 46,352 metric tons (MT) valued at \$427,847,885 in 2015. However, pistachio kernel exports (the product most used by the foodservice industry) represented just 2,212 MT valued at \$13,600,596. Yet, this has increased 59 percent since 2012. These trends have primed the region for increased kernel pistachio imports from California. By supporting full-page advertisements in popular hotel, restaurant, and institutional trade publications highlighting the high nutritional content of pistachio kernels from California, American Pistachio Growers will leverage the already popular California Grown logo to create interest and demand among professional bakers and chefs.

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MARKET EXPANSION AND ACCESS

Student and School Food Service Specialty Crop Access and Awareness

\$364,051

CDFA, Division of Inspection Services, Office of Farm to Fork

Many Californians, especially children, lack sufficient access to specialty crops. For this project, the Office of Farm to Fork will promote consumption and usage of California specialty crops and offer assistance to schools to increase their specialty crop purchases. The Office of Farm to Fork will work with producers and schools participating in the U.S. Department of Agriculture Pilot Project for the Procurement of Unprocessed Fruits and Vegetables to increase the amount of produce schools source directly from California specialty crop farmers. They will also provide procurement and menu-planning support to school food service staff to increase the amount and variety of California specialty crops served in school meals. To improve access to specialty crops through summer meal programs in California, the Office of Farm to Fork will develop strategies to increase direct purchases of summer California fruits and vegetables and provide specialty crop marketing support to increase children's participation in summer meal programs at pilot sites in the Central Valley. The Office of Farm to Fork will also work with culinary arts students to expose them to California specialty crop farms and work with program staff to assess specialty crop representation in culinary arts curriculum. In order to further the overall reach and sustainability of the projects, the Office of Farm to Fork will coordinate with county farm bureaus, California Grown, and specialty crop marketing boards to develop a Specialty Crop School Food Access Taskforce and strategies to create long-term promotion, procurement, usage, and consumption of specialty crops.

Growing Farm-to-Institution in San Diego County: Increasing Institutions' Purchases of California-Grown Specialty Crops

\$295,178

Community Health Improvement Partners

San Diego County institutions (K-12 schools, hospitals, universities, childcare, local government, and community organizations) have greatly increased their purchasing of California grown specialty crops in recent years. However, barriers persist. This project will remove specific barriers to California grown specialty crops purchasing including: 1) Unsupportive purchasing policies; 2) A need for grower training; 3) Poor market information; 4) A lack of business relationships between growers and institutions; and 5) The need for alignment among institutions. Activities to address these barriers include technical assistance to adopt purchasing policies prioritizing California grown specialty crops, biannual grower trainings, market research on local California grown specialty crops availability, annual local foods tradeshow for California grown specialty crops producers, facilitating relationships, and convening institutions to align California grown specialty crops purchasing priorities. Removing these market barriers will support increased California grown specialty crops purchasing by institutions, with a target of \$1 million in increased purchases by the end of 2018.

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Development of Novel Antioxidant-Rich Healthy Food Products Fortified With Pomegranate Peel Powder and Extract \$307,424

USDA, Agricultural Research Service

Pomegranate processing in California generates large volumes of pomace which is either disposed of in landfills or used as animal feed. Research of aqueous extracts of the pomace showed that the peel fraction contains high levels of polyphenol antioxidants which have shown reduced undesirable obesity related metabolic characteristics. Consumers are aware of the antioxidant and anti-inflammatory properties of pomegranates; therefore, there is an opportunity to develop functional food ingredients from the pomegranate peel. These new ingredients would provide support to the specialty crop industry and offer new healthy and nutritious food products to consumers. The project aims to develop pomegranate peel powder and water-soluble extract that will be incorporated as functional ingredients for antioxidant-rich food products. The functionality of peel powder and its extract will be evaluated in solid and liquid food systems, such as baked goods, herbal tea bags, juice, and yogurt.

Zinfandel: Stories of America's Heritage Grape \$256,291

Association of Zinfandel Advocates and Producers

Although Zinfandel, which is almost exclusively grown in California, is often called "America's Heritage Grape," it has not been receiving the attention it deserves. Zinfandel: Stories of America's Heritage Grape builds on Zinfandel Advocate and Producers' 25 year history of creating meaningful experiences and building relationships between Zinfandel producers, winemakers, growers, and enthusiasts. Through compelling storytelling captured on video and popularized through social media, educational exhibits, and live events, the world of Zinfandel will captivate new audiences throughout California and beyond. As a result, the demand for Zinfandel will increase because a wider base of new and existing wine lovers will personally identify with the grape's rich history, the vibrant personalities of today's wine producers, and the dynamic community of Zinfandel consumers.

Processing Local Specialty Crops: A Farm to School Strategy for Healthier Students and Community \$241,505

Humboldt County Office of Education

The Humboldt County Office of Education will help specialty crop farmers and school districts overcome distribution and seasonality challenges of Farm to School procurement in rural Humboldt County. To do this, Humboldt County Office of Education will develop schools' capacity to purchase and process large volumes of local specialty crops at peak availability in summer and facilitate collective purchasing to aggregate demand of local specialty crops from multiple districts. These efforts will make schools a more viable market for local specialty crop farmers and increase access to local produce in schools. Success will be measured by the number of farmers selling produce to schools, the income generated by these sales, number of food service staff trained in specialty crop processing and preparation, the number of schools with expanded offerings of local specialty crops, and the number of students with greater access to specialty crops.

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Northern California Ed-Med Local Purchasing Collaboratives \$375,273

Community Alliance with Family Farmers

Demand for local specialty crops has increased among institutional buyers; however, challenges in supply and distribution continue to limit schools and hospitals from purchasing more California grown specialty crops. The goal of the project is to increase the availability of specialty crops in schools and hospitals through organizing buyer collaboratives and helping specialty crop growers overcome barriers in selling to institutions. The project helps specialty crop growers access available funds through three sales channels: direct sales, sales through distributors, and the U.S. Department of Agriculture's Unprocessed Fruit and Vegetable Pilot Project. The project is timely because there is more than \$1 million set aside in school meal programs for California grown specialty crops that is currently unused. The outcomes are to increase specialty crop sales to \$1.2 million among project partners and to increase access to specialty crops among 16 schools and hospitals.

Farm to School to Community: Riverside Fresh Produce Hub \$436,644

Riverside Unified School District

Riverside Unified School District (RUSD) proposes to pilot a food hub; the first such produce distribution arrangement ever operated by a school district. If the hub works well, countless school districts will be able to develop hubs in their communities. Building on its current school food service, which features salad bars and high levels of fresh produce, RUSD proposes to develop an expanded market for growers by developing a hub that will acquire, store, and distribute fresh produce to corner stores, WIC stores, childcare centers, and smaller school districts with limited access to fresh fruits and vegetables. RUSD and the Riverside County Department of Public Health will provide ongoing technical assistance to ensure successful storage, preparation, and marketing of produce items. The University of California's Nutrition Policy Institute will conduct an in-depth process and outcome evaluation so that other school districts will be able to replicate the pilot.

Supporting Food Hubs to Strengthen Specialty Crop Market Channels in Northern California \$81,201

The Regents of the University of California, Davis

Food hubs are an increasingly important sales channel for many small- to medium-scale specialty crop growers, offering farmers transportation efficiency and greater access to markets through aggregation. According to a national food hub survey, 98 percent of food hubs expect to see increased demand for local food products, the majority of which are fruits and vegetables. This project will enhance the market opportunities for specialty crop growers in California by creating a strong food hub network in the state, and increase specialty crop growers' capacity to supply new markets by providing targeted technical assistance to farmers through individual food hubs. The project will achieve these goals by identifying a structure, host organization, and funding strategy for a statewide food hub collaborative learning network in California and by working with food hubs to improve their farmers' understanding of food safety compliance and good agricultural practices.

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SPECIALTY CROP NUTRITION EDUCATION

*Enhanced Education and Access to Specialty Crops on the Hoopa Valley
Indian Reservation*

\$313,317

Klamath Trinity Resource Conservation District

The goal of the project is to expand access to healthy, safe, and locally produced specialty crops within the underserved Hoopa Valley Indian Reservation community in rural Northwestern California. The intended outcomes will be the enhancement of the competitiveness of specialty crops through an increased number of specialty crop local producers and several experiential and digital educational opportunities focused on crop production, preservation, preparation, and nutrition. These opportunities will target seniors, adults, and children and, in some instances, emphasize those specialty crops that are also indigenous and important to the continued native lifeways and traditional diet of the local community.

Nutrition Within Reach in the Imperial Valley

\$256,909

Imperial Valley Conservation Research Center

The Nutrition Within Reach in the Imperial Valley project will use locally grown California specialty crops to improve the nutrition of one of the most socioeconomically disadvantaged communities in the nation. Imperial County has the highest rates of diabetes and childhood obesity in the state, and low rates of fruit and vegetable consumption. This is despite the fact that the county is the nation's leading producer of winter vegetables. The project will develop a community farm cultivated in cooperation with a local Future Farmers of America chapter, and utilize the produce from that farm to help local families learn how to include specialty crops in their diet in simple, inexpensive, and culturally relevant ways. In the process, students will gain hands-on experience managing a farm, from the planning stages all the way through to marketing their crops. Students will actively participate in every aspect of production. These students will in turn educate others within the community about the specialty crop industry.

*Calaveras Farm to School - Connecting Schools and Farms Through Garden
Enhanced Nutrition Education*

\$272,487

Calaveras Unified School District

Calaveras Unified School District, in partnership with the University of California Cooperative Extension Central Sierra, will create a district-wide Garden Enhanced Nutrition Education (GENE), school-based specialty crop distribution and farm partnership model which will address knowledge about, access to, demand for, and consumption of specialty crops. Through direct lessons and training of staff and volunteers in curriculum delivery, six schools will expand garden programs to provide GENE lessons aligned with Next Generation Science and Common Core State Standards for students to learn about growing food and the long-term health benefits of eating specialty crops. GENE and cooking skills classes for families, focused on increasing specialty crop consumption, will also be taught. Farm field trips and seasonal

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specialty crop tastings through Harvest of the Month, supported by a school-based community supported agriculture distribution model, will provide easy access for families to purchase locally grown specialty crops.

Increasing Sales of Specialty Crop in Low-Income Communities Through Nutrition Education and Promotion \$60,052

Sacramento Neighborhood Housing Services Inc.

The Oak Park Farmers Market is located in Oak Park, Sacramento, California, which is a racially diverse, low-income community of 17,000 people. NeighborWorks launched the market in Oak Park in order to increase access to healthy produce in this community. The "Eating Healthy" campaign will increase access to specialty crops for low-income families in this and surrounding neighborhoods through nutrition education activities and market promotion. The Oak Park Farmers Market will provide nutrition education activities on specialty crops for families with children. The activities will include learning about the nutrition value of specialty crops and how to prepare child-friendly healthy snacks. NeighborWorks will partner with schools, city community centers, health care clinics, and other social service agencies to ensure the target population is reached. The increased customer base will also support continued efforts to attract new specialty crop vendors to the Oak Park Farmers Market.

The Journey of a Lemon and California Specialty Crop Nutrition Program \$192,971

Students for Eco-Education and Agriculture (SEEAG)

Even with California's rich specialty crop heritage, youth fail to connect the acres of farmland around them to the specialty crops on their tables and the crops' contributions to healthy eating. Students for Eco Education and Agriculture's (SEEAG) The Journey of a Lemon and California Specialty Crop Nutrition Program helps to make that connection by educating students in Los Angeles and Ventura counties about specialty crops and demonstrating their importance to lifelong healthy habits. The program, which expands on SEEAG's already proven curriculum, uses lemons and other top specialty crops to demonstrate food science and nutrition lessons. The results of this program increase direct participants' consumption, access, and preparation of specialty crops, and extend to their immediate networks to foster a regional appreciation of the specialty crop industry. Through the program, 10,200 consumers will gain knowledge about eating, accessing, and preparing more specialty crops, and 8,500 will report an intention to eat more specialty crops.

Expanding Farmer to Consumer Relationships in the Faith Communities of the San Francisco Bay Area \$294,099

Interfaith Sustainable Food Collaborative

The project will increase marketing of specialty crops by establishing producer marketing relationships with faith-based institutions. The project will benefit local specialty crop producers who need additional marketing outlets to maintain economic viability. The project goals include: 1) Increase purchasing of local produce by promoting farmers products to more than

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1,900 faith-based groups through outreach, technical assistance, training, resource materials, and conferences; 2) Develop 40 specialty crop marketing outlets including farm stands and Community Supported Agricultures' at faith-based sites; and 3) Offer 50 nutrition education workshops including cooking demonstrations integrated into sales and delivery dates to more than 850 individuals. The project builds on three years of experience in Sonoma and Marin counties by expanding into Alameda and Contra Costa counties. Partners include private farms, diverse faith-based groups, and government agencies. Independent evaluation will include surveys and focus groups.

The ART of the Specialty Crops-Pollinator Connection: Awareness, Relevance, and Training \$175,562

The Regents of the University of California, Davis

California's specialty crops depend on bee pollinators. Some require pollination, while others have higher yields and quality when bee pollination occurs. Healthy, abundant pollinator populations are thus essential to healthy foods. The project's first goal is to promote awareness and relevance of the specialty crop-pollinator connection to the public, including creating pollinator habitat in food gardens. The project will conduct onsite and virtual outreach programs to accomplish these goals. Success will be measured by visitor counts, surveys, post-tour evaluations, and online page views. The second goal is to train other educators to expand outreach. The project will train student interns, master gardeners, and K-12 educators. Success will be measured by the number of people trained and the number of programs they offer in the year after their training. Both goals will be based at the University of California, Davis Haagen-Dazs Honey Bee Haven educational garden. The garden includes 20 California specialty crops.

Abundant California: Cultivating an Appreciation of Our State's Specialty Crops

\$192,449

Center for Ecoliteracy

The Center for Ecoliteracy (CEL) will create a suite of six specialty crop lesson plans that align with California history and social science standards. Working with experts in the history of California agriculture, CEL will design innovative and developmentally appropriate learning experiences for fourth graders to complement that grade level's emphasis on California history and geography. The lessons will focus on six specialty crops: almonds, grapes, strawberries, peppers, tomatoes, and figs. The conceptual foundation of the lessons will be based on CEL's "Big Ideas: Linking Food, Culture, Health, and the Environment." Educators in three regional clusters (in Contra Costa, Sacramento, and San Diego counties) will receive professional development to implement the lessons and conduct classroom assessment. The lesson plans will be published, disseminated through the California Thursdays Network of 58 school districts, and made available for free on CEL's website.

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Sprouting Interest by Bringing the Farm to Kids

\$133,266

Capay Inc. dba Capay Organic

Kindergarten through fifth grade children will learn about specialty crops through 10 fun, engaging, child-friendly videos aligned with Common Core Curricular and Next Generation Science Standards. Building on the expertise of Farm Fresh To You and its partners in farming, health, produce, and marketing, the videos will highlight specialty crops and will bring the farm to life, showing kids where food comes from, how crops are grown and harvested, the health benefits, and will include recipe cards aligned with Harvest of the Month. The videos will be disseminated to 6,000 students in classrooms and enhance existing educational farm tours reaching 3,000 of those students. To leverage the campaign and widely disseminate these videos to families, the project will implement an integrated marketing campaign with partners on existing robust social media platforms. The project will expose nearly 20,000 children to these videos and will measure learning outcomes through surveys with children and teachers, and Google analytics.

Growing the Next Generation of Healthy California Grown

Consumers

\$213,367

Kids Growing Strong

The adoption of California specialty crop consumption in urban communities - especially among teens will be crucial to the economic future of specialty crops. Timely reinforcement from peers can influence attitudes toward nutritious specialty crops. Kids Growing Strong proposes a program leveraging successful volunteer leadership training which will invite teens to learn about specialty crops and healthy nutrition, visit farms for first-hand research, help craft authentic peer-to-peer messaging and program curricula, and take the message to the public through local outreach at public events, schools, and other venues. Teens will contribute valuable personal insight, time, and effort. The program will foster leadership, broaden skill sets, and empower them to be advocates for specialty crop consumption, nutritious diets, and the ecologically responsible California agricultural model.

Orange County Specialty Crop Educational Garden

\$193,935

Orange County Fair and Event Center

Founded in 1989 as a three-acre working farm at the Orange County Fair and Event Center, the Centennial Farm was created to educate youth about agriculture and its importance to daily life. The goal of this project is to create a garden dedicated to local specialty crops, in order to teach visitors the unique nutritional advantages of having access to and consuming local California/Orange County specialty crops. The project will utilize the Orange County Fair's experienced staff, volunteers, partners, and new intern program to develop the garden, exhibits, and related curriculum. The exhibits and lessons will be presented to the existing audiences of school children and regional visitors, through the farm school tours program, afterschool program, self-guided tours, and major events. In total, more than 1.25 million visitors will be exposed to the exhibit during the grant period, with measured increased knowledge and changed behavior in more than 125,000 youth and adult consumers.

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EQUIPPING CURRENT AND NEXT GENERATION SPECIALTY CROP FARMERS

MendoLake Food Hub: Scaling Up Wholesale Specialty Crop Production Skills to Increase Rural Market Access

\$438,699

North Coast Opportunities, Inc.

The MendoLake Food Hub completed its pilot year in December 2015 after conducting a comprehensive feasibility process. To fully participate in the MendoLake Food Hub, beginning specialty crop producers need strong business and production skills to comply with wholesale buyer requirements. North Coast Opportunities (NCO) will provide farmers with advanced training and one-on-one technical assistance in scaling up their farming businesses (production planning for local markets, labor and machinery efficiency, food safety compliance, and business accounting); carry out a specialty crop promotional campaign; conduct outreach to buyers and build buyer capacity to purchase from local specialty crop producers; and add new delivery routes and nodes to the distribution network. NCO will also explore sustainable ownership models and transition to an independent ownership structure by the end of the grant. Success will be measured by tracking the numbers of producers and buyers and the total MendoLake Food Hub sales volume.

Expanding the Capacity and Training of a New Generation of California Vegetable Producers

\$299,764

The Regents of the University of California, Davis

The project addresses the goal to train the next generation of vegetable crop workers and increase effective stewardship practices in vegetable production systems. Projections for near-future retirements of California's agricultural production, marketing, and postharvest handling sectors indicate severe re-staffing needs. To address these needs, vegetable crop production course instructors from four California universities will create a series of high-quality instructional videos on vegetable crop production systems that will be used to improve postsecondary student training and increase the number of trained graduates from California university horticulture programs with expertise in vegetable production by 20 percent as measured by objective evaluation tools that will be developed with vegetable crop industry partners. The purpose is to develop video materials for these diverse student groups that will increase their knowledge of innovative systems and motivate them to pursue professions in horticulture.

Scaling Up the Next Generation of Vegetable and Berry Farmers: A Finance and Conservation Training Program

\$350,428

California FarmLink

This training project, a partnership between California FarmLink and the Resource Conservation District of Monterey County, enables beginning and Latino farmers to expand

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and create profitable vegetable and berry operations. The two-and-a-half-year project combines a yearly seven-workshop "Winter School" series and one-on-one technical assistance to provide 130 beginning and Latino farmers with the critical conservation, agronomic, and finance training, tools, and resources needed to sustain and scale up operations. The one-on-one technical assistance is part of a continuum of services that begins with workshops and existing client relationships, empowering farmer action to address individual business needs. The Winter School workshops will cover the following topics: Finance and Conservation Introduction/Intake; Farm Planning, Soil Sampling, and Nutrient Management; Water Management and Regulations, Erosion Control; Crop Production, IPM, Food Safety; Business Accounting and Product Marketing; Securing Financing; Crop Insurance and Recordkeeping.

Development of Web-Based Decision Support Tools for Avocado

Growers

\$145,032

California Avocado Commission

The purpose of this project is to develop a website to host decision support tools for avocado growers. Avocado growers integrate many different factors into their management decisions, such as rootstock selection, irrigation frequency, fertilization timing and amount, and pruning. Environment and soil type also affect these decisions. The Avocado Commission has funded research to analyze large data sets of more than 30 avocado groves to develop predictive grove management models. These models integrate factors such as irrigation, fertilization, and yield to aid growers in their management decisions. These models must now be made into a usable tool for growers to access and utilize in their decision making process. The project will develop a website to host and maintain the decision support tools to make them available to the California avocado industry. The website and necessary training will be extended to growers through the commission's established grower outreach program.

*Identifying Value-Added Practices and Market Potential for Moringa, an
Emerging Specialty Crop for California Growers*

\$190,420

The Regents of the University of California, Davis

Moringa is a highly nutritious, drought tolerant crop with market potential for both fresh and value-added sales. Southeast Asian farmers in Fresno are growing moringa on a small scale and selling direct at farmers markets. Moringa leaves are highly perishable, needing to be sold within one day of harvest. Drying moringa extends the life of the saleable product and gives farmers entry to additional market channels for the value-added product. This project will identify (through research and replicated trials) and train farmers in best practices for drying moringa leaves. The project will also identify buyers interested in sourcing California-grown moringa, both fresh and dried, and support farmers in marketing moringa to new buyers to boost sales. Specialty crop growers across California will gain information about value-added processing of moringa, a crop with high nutritional value about which little California-focused marketing and processing information exists.

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Northern California CRAFT: Supporting Beginning Specialty Crop Farmers in Seven Northern California Counties \$146,149

The Regents of the University of California, Davis

This project establishes a Northern California Collaborative Regional Alliance for Farmer Training that will host monthly tours of successful specialty crop farms for new and aspiring farmers in Yolo, Sacramento, Solano, Sonoma, Napa, Mendocino, and Lake counties in partnership with The Farmers Guild, Grange Farm School, and Farmer Veteran Coalition. The primary objectives of the project are to increase opportunities for beginning farmers to learn directly from well-established specialty crop farmers and strengthen local peer support networks for specialty crop farmers. During each growing season, participants will visit established farms in their region, learn about a specific topic from the farmers, and network with their peers. Local specialty crop farmers will guide the tours through community planning and evaluation meetings. Collaboration with established support networks for new farmers in these regions will help ensure broad participation, impact, and sustainability.

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ENVIRONMENTAL STEWARDSHIP AND CONSERVATION

*Decision Support Tools for Processing Tomato Growers to Optimize Fruit
Quality and Yields*

\$117,130

The Regents of the University of California, Davis

This project will develop guidelines for growers of processing tomatoes on how to implement late-season deficit irrigation to increase the fruit soluble solids concentration without significant yield penalty. Low soluble solids concentration requires more energy for processing. The soluble solids concentration can be increased by some degree of deficit irrigation in the second half of the growing season. To develop indicators of when and by how much irrigation has to be cut back to obtain optimal soluble solids concentration and yields, the project will conduct replicated field trials with irrigation treatments ranging from 25 to 100 percent of evapotranspiration and will evaluate measurements of the normalized difference vegetation index, thermal imaging, soil and plant water potential, and soluble solids concentration of early ripening tomatoes. Analysis will identify the most appropriate measurements growers can use as decision support tools. The recommendations will be shared with stakeholders through online media, field days, conferences, and trade journal articles.

*Potential of Whole Orchard Recycling to Build Sustainability and Resilience of
Almond Production*

\$448,136

The Regents of the University of California, Davis

Whole-orchard recycling by incorporating old almond tree residues back to soil before replanting improves soil health and carbon sequestration without affecting yield. Although seldom implemented, whole-orchard recycling is gaining momentum due to the increasing need to sequester carbon on cropland, burning restrictions, and biomass power plant closures, resulting in excess biomass waste accumulation. Drought and high almond prices have encouraged turnover of less productive orchards. This project considers tree residues as a resource to effectively improve sustainability and resilience of the almond industry. The project will conduct trials to evaluate the short and long-term impact of whole-orchard recycling on replanted tree health and growth, soil health, carbon footprint and nitrogen dynamics, and yield resilience to deficit irrigation. Results will be presented to growers at field days and through webinars and factsheets.

*Nitrogen Requirements and Release Rates of Organic Amendments in Organic
Fresh Market Tomato Production*

\$106,918

The Regents of the University of California, Cooperative Extension

This project seeks to enable organic fresh market tomato growers to be better environmental stewards and better growers through increasing their nitrogen (N) management efficiency. Organic growers have the technology to match the timing and amount of N applied with the

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needs of their crop, but lack reliable data on temporal N uptake by plants and release from organic amendments. This project aims to quantify and provide growers with information about seasonal N uptake curves of organic fresh market tomatoes, temporal availability of N from organic amendments, and improved grower N assessment techniques by defining critical leaf N values and petiole nitrate-N concentrations. The findings will be communicated to growers with publications, a video tutorial, workshops, and farm visits. This research will enable growers to apply optimal N, when needed, thereby decreasing air and water pollution as well as cost and resource waste, resulting from improper fertilization.

Improving Salinity Management of Strawberry Cultivars in California \$252,295

The Regents of the University of California, Cooperative Extension

Strawberries are the third most valued crop in California and the most sensitive to salinity. Limited information on the salt tolerance of strawberries produced on the coastal regions of California has led to significant yield losses in recent years. Published thresholds of strawberry tolerance to soil salinity may not be directly transferable to the soils, climate, and cultivars that are typical to the coast, the main production region in California. Many growers in the Ventura/Oxnard and Watsonville areas successfully produce strawberries in soils that have electrical conductivity above the published salt tolerance threshold of 1.0 dS/m. Growers are either incurring yield losses or the published thresholds may be incorrect for modern cultivars. This project aims to determine soil salinity tolerance levels to the four most popular strawberry cultivars grown in California in order to develop accurate salinity management strategies for optimizing yields and to support the sustainability of the strawberry industry.

*Understanding and Controlling Ice Nucleating Bacteria to Prevent Frost in
Vineyards*

\$166,000

The Regents of the University of California, Cooperative Extension

Grapes are damaged when tissues freeze in spring frosts. Frost damage is triggered by certain bacteria that catalyze ice formation near 32 degrees Fahrenheit. Without those bacteria, grapes can supercool as low as 25 degrees Fahrenheit and avoid damaging ice formation. Overhead sprinklers can prevent damage to vines, but it takes considerable water, which is not always available. The use of wind machines for frost control is expensive, energy demanding, and noisy, requiring air inversions to work. Understanding the microbiology of grape vines will enable farming practices that avoid damaging ice formation without the need to warm plants by unsustainable methods, reducing water and energy demand. The project will research strategies to enable grapes to tolerate cold temperatures by reducing ice nucleating bacteria on leaves and by selecting and managing cover crops that do not support ice nucleating bacteria that migrate to grapes.

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*Developing and Applying Tools to Reduce Greenhouse Gas Emissions,
Sequester Carbon, and Improve Soil Health* \$141,535

California Land Stewardship Institute

This project will develop the tools to implement a number of climate change adaptations on specialty crop lands in Sonoma, Mendocino, and Napa counties. An element including inventory/assessment methods and beneficial management practices will be developed for vineyards and pear orchards to reduce greenhouse gas emissions, increase carbon sequestration, increase soil health, and increase water use efficiency. A stakeholder group of specialty crop growers, and winegrape and pear associations will be central to the project. Scientists will inform the group and provide a basis for the project. The element will be reviewed by the grower group and be field tested for cost effectiveness. California Land Stewardship Institute will apply the new element to 300 sites, and it will be added to the Fish Friendly Farming program, applying it to more than 870 specialty crop growers over time. Implementation will be tracked through California Land Stewardship Institute's database. The element will also be available to more growers through specialty crop associations.

*Development of a New Dry-Peeling System for Fruits and Vegetables Using
Sequential Flame and Catalytic Infrared Heating* \$305,210

The Regents of the University of California, Davis

The drought in California highlighted the water crisis and urgent need to replace the current hot lye and steam peeling methods. These methods are associated with problems of high water and energy use, environmental pollution, and high cost of wastewater treatment. An infrared dry-peeling technology has recently been developed and demonstrated in a pilot scale. Infrared radiation heating is used to lose the skin of fruits and vegetables. It eliminates the use of chemicals and water and the treatment of wastewater with high salinity. However, the continued development to improve throughput capacity of the dry-peeling technology is needed. The aim of this proposed project is to further develop the dry-peeling technology for fruits and vegetables using sequential flame and catalytic infrared heating to achieve high peeling capacity and reduced energy consumption, cost, and peeling loss, but improve product quality.

*Enhancing Sustainable Mandarin Production With Organic Matter Amendments
and Improved Cultural Practices* \$142,559

The Regents of the University of California, Cooperative Extension

This study will evaluate two foothill mandarin (*Citrus unshiu*) production practices not commonly used in other California citrus. Foothill soils are low in organic matter and key nutrients, so growers consider pruning and mulching critical to fruit quality and orchard sustainability. However, there is little data on impacts of these practices in citrus. Increased organic matter enhances soil nutrient and water-holding capacity, and it reduces nitrogen leaching. Wood chips, horse manure, and other organic materials are readily available and inexpensive. The project will assess impacts of organic mulch by measuring soil organic matter, tree growth, leaf nutrient status, fruit yields, and quality. The project will assess pruning

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impacts on scale insects, fruit yield, and quality. Research will be conducted in commercial mandarin orchards. Area citrus growers will cooperate in the research and in field meetings to share findings with other growers. This study benefits both organic and conventional growers.

Landscape Plant Performance: Water Use and Disease Resistance Assessments and New Cultivar Selections

\$309,348

The Regents of the University of California, Davis

This project will determine irrigation requirements and assess disease resistance of new and recently introduced landscape plants at two University of California facilities, one in Northern and one in Southern California. Plants will be established in year one and exposed to irrigation treatments in year two. Plants will be measured for growth, assessed for disease resistance, and evaluated for aesthetic quality. The University of California, Davis (UC Davis) site will be expanded to include a disease resistance assessment field. Three new fields will be installed at the University of California, South Coast Research and Extension Center in Irvine, CA to duplicate the UC Davis fields. There are no California academic ornamental plant breeders, so collaboration with Dr. Ryan Contreras, Oregon State University Department of Horticulture, will be established to bring his landscape plants in California. The test site design will enable the concurrent determination of the fire blight resistance and irrigation requirements of Dr. Contreras' Cotoneaster plant selections.

Minimizing Pest Risks to Orchard and Row Crops Associated With On Farm Pollinator Habitat Plantings

\$335,986

The Regents of the University of California, Davis

This project will develop best management practices to mitigate pest risk to orchard and row crops associated with forage plantings that are increasingly implemented to support honey bees and other pollinators. It contributes to a more sustainable system for specialty crop production by adding a critical component to overcome pest risk, a key barrier to adoption of habitat plantings. The project will monitor export of key pests and natural enemies from pollinator plantings and quantify pests at individual flower species currently being assessed for support of crop pollinators. Plant-species-specific data on pests will be integrated into a decision tool used to optimize pollinator seed mixes. To date, the tool has considered only beneficial aspects of plants. The resulting innovation will provide critical balance between benefits and liability of different species, allowing for crop-specific selection of plants that avoid pest risks and maximize biological control and pollination benefits.

Characterizing and Breeding Salt Tolerance in Lettuce

\$326,980

USDA, Agricultural Research Service

Climate change has led to higher sea levels and farther saltwater intrusion, and promotes water transpiration from plants and evaporation from soil, increasing salt accumulation in soil. Lettuce is particularly vulnerable to salt stress, and salinity is a major constraint in all lettuce production areas in California. Thus, there is a pressing need to adapt lettuce production to the changing environment in order to protect and even increase current production levels. The

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integrated analyses of physiological and genetic mechanisms will allow identification of critical factors in salt tolerance, which could be used to develop molecular markers to create tolerant germplasm. The purposes of this proposal are to identify physiological traits, proteins, and genes underlying salt-tolerance in lettuce and incorporate them into new cultivars. This project aims to increase salt tolerance, profitability, and sustainability of lettuce production in California.

Immobilizing Mineralized Nitrogen From Cole Crop Residues Using Organic Amendments \$252,258

The Regents of the University of California, Santa Cruz

Incorporation of nitrogen (N) rich cole crop residues in fall can release considerable amount of inorganic N in soil during winter rainy seasons on land that is bare fallowed, that is vulnerable to loss via leaching. This could worsen the nitrate pollution of groundwater that already poses health risks to 254,000 people in areas within California where cole crops are produced. Studies in the European Union and Canada showed that application of high-carbon/nitrogen ratio (C/N) organic amendments can immobilize N mineralized from cole crop residues resulting in reduction of N losses in winter and improved water holding capacity of the soil. Using locally available amendments, a team of researchers and growers will identify practical high-C/N organic amendments and in field trials examine their effects on N loss in winter after cole crop residue incorporation; soil moisture and N dynamics; and yield, costs, and net returns of subsequent lettuce and strawberry production.

Data-Driven Block-Level Yield Prediction for Seasonal Nitrogen Fertilization Strategies in California's Almond Orchards \$443,049

The Regents of the University of California, Davis

Nitrogen (N) management work plans are now required of almond growers statewide. To meet this goal, growers must first predict yield in each production unit and use that to develop an N management plan. This project will build statistical models for early-season yield projection and mid-season yield updates and capitalizes on unprecedented access to historic yield data and biophysical, climate, and remote sensed data from a large number of growers. The project's monitoring and modeling approach will capture prior-season canopy and current flower emergence using aerial imagery, and combine that with historic yield data and geospatial biophysical, climate, and remote sensed data to provide a block specific almond yield prediction. The outcome will increase the utility of the current online N Management tool and assist growers to manage N efficiently and comply with mandated requirements. The model will also be a powerful research and development tool to optimize management and hence sustainability.

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*Innovative Best Management Practice Adoption Strategies to Increase
Nitrogen Efficiency in Central Coast Specialty Crops* \$282,336

California Department of Food and Agriculture

The Central Coast provides produce to the United States and much of the world. Recent water quality data show that fertilizer nitrate enters ground and surface waters at high rates. To address the disconnect between available and adopted good nutrient management practices, the Fertilizer Research and Education Program is forming a working group of key regional stakeholders to identify barriers and guide strategies that increase best management practice adoption. This work will utilize recent social science research findings to catalyze the implementation of best management practices that are protective of water quality by integrating innovative targeted technical training, hands-on field demonstration, and outreach to growers and farm staff at all levels.

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PLANT HEALTH AND PEST MANAGEMENT

*Biological Control of Brown Marmorated Stink Bug, Halyomorpha Halys
(Pentatomidae)*

\$442,165

California Department of Food and Agriculture

This project will provide a sustainable, cost-effective management tool for control of the brown marmorated stink bug (BMSB), a new, invasive pest to California. BMSB was inadvertently introduced from Asia to the mid-Atlantic states in the mid-1990s. It is highly polyphagous and spreading throughout California. There are high populations in southern California and in urban centers from Modesto to Chico. In the Eastern and Northwest United States, urban populations of BMSB have spread into agricultural regions causing serious economic damage to fruit crops, vegetable, and field crops. BMSB's piercing, sucking mouthparts discolor fruit, which in turn makes them unmarketable. Laboratory tests will be completed to obtain a field release permit for a parasitoid found in China that specializes in feeding on BMSB. In addition, a state-wide survey will determine if this parasitoid is already in California in the event that the field release permit request is delayed. The same survey will provide data for the release permit.

*Implementing Rapid Molecular Diagnostic Tools to Detect Phytophthora
Cinnamomi in California*

\$395,839

University Corporation at Monterey Bay

Phytophthora as a genus is an enormously destructive plant pathogen on many crops in California and globally. *P. cinnamomi* has a broad host range and causes Phytophthora root rot, the most serious disease and the major constraint for avocado production in California. This disease affects 60 to 75 percent of California growers causing losses of \$40 million annually. In 2015, this pathogen was identified as an emerging pathogen on blueberries. In 2013, the California avocado and blueberry industries were worth an estimated \$435 million and \$123 million, respectively, with significant growth occurring in the blueberry industry (approximately \$93 million over the last six years). The goal of this project is to implement newly developed molecular tools to rapidly and accurately detect *P. cinnamomi* in plant material, soil, and water samples in the field. Additionally, the project aims to transfer these technologies to end users such as pest control advisors, growers, nurseries, and extension agents.

*Breeding for Improved Varroa Resistance to Support Honey Bee Health and
Crop Pollination Services*

\$320,751

Project Apis m.

Health threats to honey bees like the parasitic Varroa mite threaten crop pollination security. As the largest specialty crop producer, using most of the managed bees available nationwide, California is the single greatest beneficiary of healthy honey bees. This long-term program will breed honey bees that have been enhanced for resistance to mites and for functionality in commercial beekeeping operations. Over three breeding seasons, a consortium of bee

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breeders, commercial beekeepers, and scientists will build on existing knowledge and resistant strains to select bees with reliable traits including resistance, early season population buildup, and good honey production. Improved resistant bees that mitigate the damaging effects of Varroa mites and chemical treatments will reduce bee mortality and improve bee health, thus increasing pollination sustainability. The project will be proven successful as California pollinators and queen producers adopt the new selected Varroa-resistant stock.

Biological Control of Bagrada Bug, Bagrada Hilaris (Pentatomidae) \$375,375

California Department of Food and Agriculture

The bagrada bug is an invasive insect that has become a serious pest to cole crops throughout the Southwestern United States. This project will provide a sustainable pest management strategy for suppressing this pest in California. First reported in 2008, the bagrada bug has spread throughout agricultural areas of Imperial and Riverside counties, up through the Central Valley, and along the coast from San Diego to Monterey Bay. Currently, the only means for controlling this pest is conventional pesticides. This leaves organic producers of cole crops at risk since there are no effective organically registered control measures. A long-term, self-sustaining solution is the introduction of parasitoids specialized in feeding on this pest. This project will evaluate a novel parasitoid for host specificity, determine if any resident natural enemies are attacking bagrada bug, and submit release permits to the appropriate authorities. The ultimate goal is the release of the new parasitoid.

Updating Best Management Practices to Identify and Mitigate Polyphagous Shot Hole Borer in Avocados \$54,542

California Association of Pest Control Advisers (CAPCA)

The California Association of Pest Control Advisers (CAPCA) and the California Avocado Commission plan to bring new best practices updates on the identification and mitigation of Polyphagous Shot Hole Borer (PSHB) to Pest Control Advisers (PCAs). In light of newest quarantines and expanded infestation boundaries into Ventura County in November 2015, training PCAs on current detection, treatment, and even trapping will be key to aiding containment and protecting the industry. This educational outreach to PCAs and the real-time updates via the crop team's risk management network are designed to manage PSHB and the disease it carries to minimize economic harm to avocado growers as a California specialty crop. CAPCA's broader interest is also in developing rapid response crop teams by commodity to educate PCAs and network growers, researchers, industry, and interested parties to quickly and effectively address new pest threats in California.

Utilizing the Citrus Microbiome to Manage Citrus Huanglongbing Disease \$449,740

The Regents of the University of California, Riverside

There is compelling evidence that the health of an animal or plant is a function of the activities of its resident microbiome. The goal of this proposal is to design a beneficial citrus microbiome whose deployment can be integrated into current citriculture during the nursery propagation

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stage to provide a sustainable and an environmentally friendly management tool for citrus Huanglongbing (HLB). The project will utilize a naturally occurring phenomenon observed in Florida, where groves containing many severely symptomatic trees also contain a small number of trees that exhibit minimal HLB symptoms. These trees are referred to as survivor trees. The project will employ a novel greenhouse bioassay to identify microbes in survivor trees that inhibit *Candidatus Liberibacter asiaticus* (CLAs) titers and HLB symptoms. The project will use two complementary approaches to create CLAs-inhibiting source trees. These deliverable solutions will be extended to the citrus community through a multi-faceted outreach plan.

Biocontrol of Aflatoxin Contamination of Almond - Towards Implementation in Orchards \$208,213

State Water Resources Control Board

Due to severe drought and water stress and the high levels of navel orangeworm in the last several years, aflatoxin (AF) contamination of almond has again become an important issue in marketing and consumption of almonds. AFs are secondary metabolites produced by two fungi, *Aspergillus flavus* and *A. parasiticus*, which infect and contaminate nut crops with AFs. This has created major marketing problems in exported loads of almonds because the allowable tolerances for aflatoxins are very low (10 to 15 parts per billion). Some strains of *A. flavus* do not produce AFs (called atoxigenics). One atoxigenic strain (AF36) has been selected after 10 years of research, registered in 2012 on pistachio, and used in a very large scale commercially as a biocontrol approach to reduce AFs. The project proposes to do additional research that is needed in order to register AF36 on almond so that it is used in commercial orchard applications to reduce AF contamination and improve marketing and food safety of almond.

Development of Versatile Phytophthora-Resistant Almond and Walnut Rootstocks Using Host-Induced Gene Silencing \$277,252

USDA, Agricultural Research Service

Phytophthora root and crown rots are common destructive diseases of almond and walnut rootstocks in California. Developing resistant cultivars by traditional breeding is slow and uncertain. The U.S. Department of Agriculture, Agriculture Research Service (USDA, ARS) was first to demonstrate a Ribonucleic acid interference-based (RNAi) method referred to as host-induced gene silencing (HIGS) in walnut against crown gall (CG) disease. USDA, ARS recently extended HIGS to demonstrate resistance to root-lesion nematodes (RLN) in walnut. USDA, ARS expects that pathogen resistance based on HIGS will be more durable than that mediated by protein coding resistance genes. A strategic advantage of HIGS resistance is its versatility; that is, its adaptability to stacking with other traits (e.g., resistance to CG and RLN, environmental adaptations). This project will target rootstocks of walnut and almond to engineer HIGS-based resistance to Phytophthora. It will exploit a well-established transformation system for walnut rootstock and develop a reliable transformation system for almond rootstock.

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Controlling Fusarium Dieback - Shot Hole Borers Throughout Avocado Groves in California

\$449,301

The Regents of the University of California, Riverside

The viability of the California avocado industry is threatened by the exotic pest complex Fusarium dieback, which is formed by two shot hole borer beetle species, each associated with specific fungal species. These complexes have spread from urban-wildland forests into many commercial avocado groves. While the two beetle invasions were initially geographically isolated, the two populations recently converged in Orange County, with unknown repercussions. The project's goal is to develop an integrated pest management (IPM) strategy for these pest complexes. Because no control methods are currently available, this project will be a success when it produces and enables adoption of the following IPM building blocks: 1) Robust, rapid identification tools for fungi with the beetles; 2) Tests showing the effectiveness of several control measures in the field; and 3) A risk model based on grove and landscape traits that guides users to which control measures would be most suitable for individual groves.

Selection of Susceptible Walnut Hosts by the Walnut Twig Beetle: New Avenues for Managing Thousand Cankers Disease

\$372,547

The Regents of the University of California, Davis

Thousand cankers disease (TCD) is an emerging disease first discovered as responsible for dieback and death of black walnut in western states and now confirmed as a widespread threat to English walnut, *Juglans regia*, and its rootstocks in California orchards. TCD is caused by a fungal infection following attack by the walnut twig beetle (WTB), which aggregates and transmits the pathogen. The multiple infections result in cankers that girdle and kill branches and stems. TCD management in orchards must include the capacity to determine which host trees are likely to become infected and the ability to detect and deter the vector. The project will identify volatile organic compounds that attract or repel WTB and develop and field test an improved lure for monitoring WTB populations and a repellent for disrupting WTB aggregations. Success of the project will be evaluated by field studies to assess efficacy and surveys to estimate grower adoption of an optimized lure and/or repellent.

Sensitizing Navel Orangeworm to Radiation for Sterile Insect Technique Programs

\$237,450

USDA, Agricultural Research Service

Navel orangeworm (NOW) is a major pest of specialty crops and the top factor in infestation by *A. flavus* and subsequent aflatoxin contamination. Stakeholders have initiated a collaborative Sterile Insect Technique (SIT) program to replace the discontinued Animal and Plant Health Inspection Service Boll Weevil program. Currently, gamma sources are the only practical means for insect sterilization on the required level. Western Regional Research Center (WRRC) scientists have reported that x-ray is a suitable substitute, but cannot practically meet the throughput required. WRRC scientists have also shown that natural products can sensitize fungus and bacteria to existing treatments, reducing required doses. It is known that insects can be sensitized to radiation under certain controlled atmosphere conditions. The project will

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investigate sensitizing NOW through application of natural compounds, atmospheric conditions, and electromagnetic pre-treatments, with the goal of reducing required doses to the point that x-ray can replace radioisotopes for a large SIT program.

Extension of Shade Cloth Benefits for California Apples

\$88,648

California Apple Commission

In 2014, the California Apple Commission (CAC) received a Specialty Crop Block Grant Program award to investigate the benefits of shade cloth on apples in California. Due to unforeseen challenges, such as an extremely early apple harvest, the closing of California shipping ports, and structural design issues, the project lost almost a year of valuable data for the project. The CAC is requesting additional funding to obtain more data which will strengthen the validity of the findings. Since the shade cloth is already purchased and installed, the additional funding will pay for the cost of the extended research and personnel to implement the grant.

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FIXED AMOUNT AWARDS: FOOD SAFETY MODERNIZATION ACT

*Enhancing Agricultural Safety Year-Round: Good Agricultural Practices
(EASY GAP) for California Stone Fruit* \$149,328

California State University, Chico Research Foundation

The recently finalized Food Safety Modernization Act (FSMA) rules require specific food safety practices for produce. FSMA requirements are generalized to cover all crops. However, application of these requirements differ for specific types of crops like stone fruit. Northern California farmers grow a significant percent of stone fruit in the United States, but the Center for Healthy Communities survey results show that essentially all north state farmers do not have a food safety plan in place. Previous Center for Healthy Communities funding has enabled the development of a generalized on-farm food safety training program, Enhancing Agricultural Safety Year-Round: Good Agricultural Practices (EASY GAP). CDFR funding would allow EASY GAP for California Stone Fruit to develop materials specifically for stone fruit farmers. The training and materials would increase understanding of on-farm food safety as evaluated by pre and post quizzes and provide GAP training certificates.

*Demystifying FSMA: Explaining the Produce and Preventive Controls Rules
to Small and Minority Specialty Crop Growers in California* \$149,226

Community Alliance with Family Farmers

Community Alliance with Family Farmers will host and participate in workshops with the goal to explain Food Safety Modernization Act (FSMA) rules and good agricultural practices throughout California in collaboration with University of California Cooperative Extension and other organizations, focusing primarily on small and minority specialty crop farmers who may have a qualified exemption from FSMA and who typically cannot afford food safety consultants. Community Alliance with Family Farmers expects to directly reach 600 farmers in workshops, 50 farmers through one-on-one support, 50 growers in two webinars, and 100 growers from previous contacts. The project will develop materials appropriate to the audience in collaboration with the University of California, Davis and the National Sustainable Agriculture Coalition that will be approved by the Food and Drug Administration. The webinars will be posted online with all other materials, and Community Alliance with Family Farmers will make the information available to organizations and growers around the country. The major outcome will be that these growers will learn about and understand FSMA rules, food safety threats, and third-party audits for good agricultural practices certification.

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Facilitate FSMA Implementation Through Resource Development and Outreach for Almond Operations Covered Under Farm Definition \$150,000

Almond Board of California

The major goal of the project is to ensure growers and farm-type operations covered under the Produce Safety Rule understand the requirements and have the proper tools and training to take action before mandatory compliance periods begin. Almond Board of California will utilize internal and external expertise to assist almond farm operations understand the requirements through development of tools and resources and providing educational seminars. In addition, Almond Board of California will leverage existing communications programs and educational events to educate growers and farm operations. Outcomes of this project will be to: develop a Produce Safety Rule toolkit; develop almond grower and farm operation produce safety training curriculum; build out a training workshop schedule and initiate statewide training workshops; develop/implement Produce Safety Rule outreach campaign; and incorporate Produce Safety Rule training into the Almond Conference agenda.

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FIXED AMOUNT AWARDS: ADAPTATION TO DROUGHT

Using Soil Moisture Sensors to Reduce Water Use and Improve Irrigation Efficiency in Avocado Groves \$82,078

California Avocado Commission

Avocado is the most salt sensitive tree crop grown in California and growers must utilize leaching fractions to maintain low soil salinity levels. Most avocado growers base their irrigation scheduling and leaching fractions on experience and do not use sensors to precisely monitor their water application. Since many avocado groves are on steep slopes, runoff can be an issue if leaching and general irrigation are not carefully monitored leading to water wastage. This project will establish a demonstration block at the Avocado Commission's demonstration grove in Ventura County using several different soil moisture sensor systems to schedule irrigation and leaching fractions. Through field days, growers will be able to see the technology firsthand and learn how to install and use it to better manage their irrigation. By documenting water use, leaching fractions, and tree growth under sensor-based and conventional irrigation practices, growers will see the benefits of this technology.

California On-Farm Soil Health Network for Drought Resiliency Through Increased Adoption of Soil Health Practices \$149,989

East Stanislaus Resource Conservation District

As noted in the U.S. Department of Agriculture's Building Blocks for Climate Smart Agriculture and Forestry, soil health is a fundamental action that must take priority to address climate change conditions. Climate-smart practices designed for working production systems provide multiple economic and environmental benefits in addition to supporting resilience to extreme weather, reduced emissions, and increased carbon storage. California On-Farm Soil Health Network was established in three pilot regions through a cooperative effort to address the low adoption rate of soil health practices by producers through creation of localized and customized systems where farmers can learn from each other. Success stories, research, and demonstrations will be shared across a statewide network of partners. East Stanislaus Resource Conservation District staff will work with partners to assist in the implementation of regional hubs that require facilitation of stakeholder meetings, shared challenges, and demonstrations that promote soil health practices for drought resiliency.

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FOOD SAFETY

Listeria Monocytogenes Growth and Survival on Peaches and Nectarines as Influenced by Stone Fruit Packinghouse Operations, Storage and Transportation Conditions

\$95,735

Center for Produce Safety

The Center for Produce Safety will partner with University of Connecticut to evaluate *Listeria* survival on stone fruits as influenced by current packinghouse practices. The recent multi-state recall of stone fruit due to concern about contamination with *Listeria monocytogenes* highlights the potential for stone fruits to serve as a vehicle in *Listeria* transmission. Further, the incident also demonstrates the pathogen's ability to persist and survive on stone fruits during handling, storage, and transportation. While investigations on the persistence of *Listeria* have been performed on other produce, there is a general lack of knowledge on the behavior of pathogens associated with stone fruits. Also, each produce type has unique compositional and physical characteristics that require produce-specific management practices. Therefore, to develop stone fruit-specific risk reduction knowledge and preventive controls, this study will investigate the survival and growth of *Listeria* on peaches and nectarines under packinghouse environment, storage, and transportation conditions. The study will be performed under conditions simulating stone fruit unloading and staging, waxing and fungicide application, storage, and transportation from the packing facility. The goal of this study is to provide quantifiable data on the effect of current practices on *Listeria* survival on stone fruits. Furthermore, the identification of food safety risks associated with different steps within the packinghouse continuum will help develop comprehensive preventive controls for foodborne pathogens, including *Listeria monocytogenes*.

Characterization and Mitigation of Bacteriological Risks Associated with Packing Fresh-Market Citrus

\$171,393

Center for Produce Safety

The Center for Produce Safety will partner with University of California, Davis to provide data to the California citrus industry to validate packinghouse practices. After harvest, fresh oranges and lemons are sorted, washed, and packed in packinghouses for further distribution and sale. Because green and blue molds result in significant losses of citrus fruit during storage and shipping, fungicides are often applied during packing. Recirculating drench applications are common because they significantly increase fungicide efficacy, but they also provide an opportunity for cross contamination or movement of microorganisms throughout the facility, which can be a food safety issue if not appropriately managed. The overall goal of this project is to provide data that the California fresh citrus packinghouse industry can use to support the controls that reduce or eliminate foodborne pathogen cross contamination where citrus fruits are comingled or where recirculating materials come into contact with the fruit. A laboratory component is included for the most common fungicides to determine minimum compatible sanitizer concentrations that are effective in eliminating *Salmonella* and *Listeria*

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monocytogenes. The laboratory data will be verified in a pilot-scale citrus packing facility, and the results of these studies will be used to prepare documents the industry can use to support the efficacy of their food safety practices.

Cyclospora: Potential Reservoirs and Occurrence in Irrigation Waters \$310,980

Center for Produce Safety

The Center for Produce Safety will partner with the University of Arizona to assess the potential reservoirs of Cyclospora and occurrence in irrigation waters. Cyclospora has recently been implicated in outbreaks associated with the United States produce imported from Mexico. Cyclospora outbreaks have also been linked to drinking water. Information on the sources and occurrence of this organism are very limited. Currently, only humans, and possibly primates, are believed to be infected by this parasite. The goal of this project is to determine if produce grown in the United States is at risk of contamination from irrigation waters contaminated with human sewage (e.g., from faulty/leaky septic systems or compromised sewer pipes) and treated wastewater effluents that could potentially be discharged into surface waters used for the irrigation of food crops. Large-volume irrigation water samples and raw sewage and treated wastewater grab samples collected monthly over two years in Arizona and Texas will be concentrated by filtration and examined for the presence of Cyclospora cayetanensis. The specific objectives are: a) to determine the occurrence of C. cayetanensis in irrigation waters in Arizona and Texas, which will allow a determination of any risk from C. cayetanensis and to identify areas of potential risk; and b) to determine the occurrence of C. cayetanensis in raw sewage and treated wastewater effluents in produce-producing areas such as Yuma, AZ and El Paso, TX, which will allow for an assessment of the incidence of C. cayetanensis infection in these communities. In addition, treated wastewater effluents are sometimes released into watersheds and could potentially impact irrigation waters. This study will determine if any risks exist from Cyclospora in irrigation waters from these two regions.

Resolving Postharvest Harborage Sites of Listeria Protects Zone 1 Surfaces

\$359,523

Center for Produce Safety

The Center for Produce Safety will partner with University of California, Davis to conduct multi-site investigative environmental sampling for Listeria in California citrus packinghouses. Fresh whole citrus has not experienced an incident of recall, illness, or outbreak, and California citrus production practices and regions appear to significantly limit the environmental risk of preharvest contamination. However, recent serious incidents associated with California apples, which involved the bacterial pathogen Listeria monocytogenes (L. monocytogenes), have prompted proactive measures to more carefully assess postharvest risks and develop validated interventions for citrus system-wide. In this project, confidentially enrolled handlers will participate in a detailed survey involving facility sampling for indicator Listeria and L. monocytogenes. The data collected will provide critical baseline knowledge for the design and implementation of sanitation and an on-going environmental monitoring program (EMP), which will ultimately protect food contact (Zone 1) surfaces from the establishment of resident L. monocytogenes and minimize the potential for contamination of citrus during daily operations.

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The major outcome will be the development of a model EMP and guidance in establishing an environmental-zone Master Sanitation Schedule linked to EMP outcomes for California fresh citrus packinghouses. Other anticipated outcomes include a general overview and report card of the California citrus packing environment, and the identification of potential sources of *Listeria* related to citrus growing regions and harvest/postharvest practices. Closing this knowledge gap will result in measureable improvements in reducing *L. monocytogenes* prevalence.

Field-Collected Hydrological Data and Remotely-Sensed Landscape and Meteorological Data can Predict the Quality of Surface Water Used for Produce Production

\$358,214

Center for Produce Safety

There is a clear need for the development of improved, science-based tools to help reduce preharvest introduction of microbial produce safety risks through surface water use. The purpose of this project is to identify and prioritize spatial and temporal risk factors for microbial contamination of surface water, and to develop geospatial models that predict surface water microbial quality for individual water sources, which will be assessed by quantifying generic *Escherichia coli* (*E. coli*) and testing for key pathogens (e.g., *Salmonella*). Spatial and temporal variation in water quality will be assessed by repeatedly testing multiple water sources over two years. Publicly available remotely sensed data (e.g., predominant upstream land use) will be used to identify factors that are associated with elevated *E. coli* levels and an increased risk of pathogen detection. Data collection will be performed in two produce growing regions (Arizona and New York) to assess the robustness of the models and their translatability to other regions. These data and models will allow growers to identify times and locations where surface water sources are more likely to be microbially contaminated. This information will enable growers to better time water use, testing, and treatment to minimize produce safety risks associated with microbially contaminated surface water.

Control of Listeria Monocytogenes on Apple Through Spray Manifold–Applied Antimicrobial Intervention

\$293,883

Center for Produce Safety

The Center for Produce Safety will partner with Washington State University to provide data to the apple industry on sanitizer validation on apple packing lines. *Listeria monocytogenes* is listed by the Food and Drug Administration as a pathogen of concern and has been singled out on both ready-to-wash and ready-to-eat produce due to its nature as a true environmental species. The overall goal of the project is to comparatively assess and validate critical operating parameters for registered, commercially practical, and legally allowed sanitizers against *L. monocytogenes*, and to verify their efficacy on multiple apple packing lines. The project will validate the efficacy of selected sanitizers against *L. monocytogenes* on whole apple surfaces through laboratory testing and verify the selected sanitizer interventions in model/pilot packing line and representative commercial apple packing lines in two states. This project will provide data for apple producers about the practical efficacy of antimicrobial

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interventions under commercial packing conditions, resulting in tested and proven methods for spray bar intervention in fresh apples. This information will fill critical gaps in the knowledge, and will be crucial to reduce *L. monocytogenes* risk in fresh apples.