

Working Together for the Benefit of All Californians

2022 UC ANR Annual Report



Advancing Innovation in Agriculture and Natural Resources



In 2022, University of California Agriculture and Natural Resources (UC ANR) responded to the persistent economic, health and environmental impacts of the pandemic, as well as several climate-related natural disasters and challenges, by providing support, education and guidance to local communities and governments and California's agricultural

businesses and workforce. UC ANR continued research and engagement across its locations and programs that aim to serve all 40 million residents of California.

UC ANR continued to strengthen its commitment to diversity, equity and inclusion in all that we do. In 2022, new leadership development opportunities were launched to provide additional support to hiring managers and search committees to promote a culture of diversity and inclusion in the hiring process. All UC ANR directors, academics and supervisors are now tasked to complete new training to help build a stronger culture of respect, equality, equity and justice within our organization.

The 2021-22 California state budget included a historic increase for UC ANR, notably providing an additional \$32 million in ongoing funding that will restore our academic footprint across the state. As a result of this increase, UC ANR personnel launched a hiring blitz that continued into 2022. In March and April, we released for recruitment the last 64 of the 106 high-priority UC Cooperative Extension (UCCE) Advisor and Specialist positions that last year's state budget increase made possible. These recruitments

expanded UC ANR's footprint at several UC campuses, Research and Extension Centers (RECs), and county offices. The newly hired UCCE Advisors and Specialists have already begun conducting needs assessments to better understand how to effectively serve the communities in which we work.

In addition, UC ANR was able to expand its programmatic footprint by hiring 86 more Community Educators, who provide direct education, technical assistance and evaluation support for the successful implementation of UC ANR programs. Through new efforts in partnership with the California Department of Food and Agriculture (CDFA), UC ANR opened recruitments for 10 Climate-Smart Agriculture Community Educators and 10 Small Farms Community Educators. These positions provide technical assistance to farmers to apply for and implement CDFA programs, ensuring California's food supply and supporting small businesses during a time of economic stress.

We are very grateful for several new developments that will expand our ability to meet the needs of Californians through innovative solutions. First, President Michael Drake announced the addition of two new Agricultural Experiment Station (AES) campuses at UC Santa Cruz and UC Merced. While UC ANR already has UCCE Specialists at both campuses conducting research on agricultural and food-related issues, the new AES designation expands UC's agricultural research portfolio and can help us develop the solutions needed for many challenges facing California.

Second, we received the great news that Fresno-Merced Future of Food Innovation Coalition, or F3 for short, was awarded a \$65.1 million grant from the U.S. Department of Commerce's Build Back Better Regional Challenge. UC ANR will partner with F3 to lead the Local Farm and Food

2021-2022 Highlighted Outputs & Activity



10

novel ideas led to patents

1,210
policy engagement activities



3,020

credible, audience-driven educational materials

25,950

meetings, workshops, field days and courses held



467,950

direct contacts/educational exchanges with adults and youth

Innovation initiative with over \$20.5 million in funding. This opportunity will help us advance inclusive innovation in agriculture by ensuring technology solutions address the needs of small-scale farmers, food business owners and local communities. Lastly, the California Legislature appropriated \$2 million for UC ANR to hire Fire Advisors in 2022. These Fire Advisors will work to build fire adaptation and resilience throughout California, improving policies and practices at every level.

*Glenda Humiston,
Vice President, UC ANR*

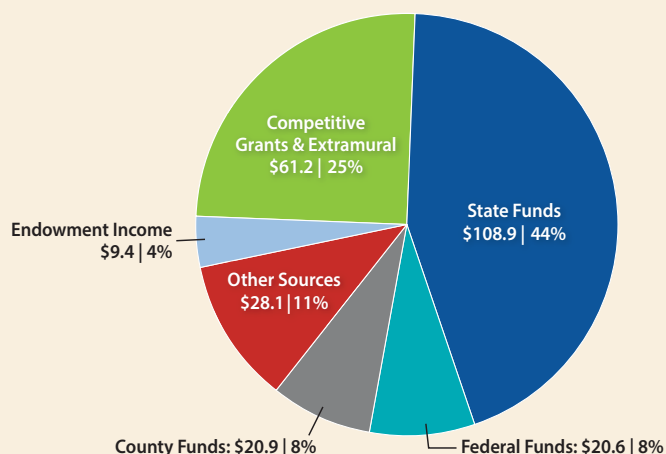
UC ANR operates a statewide network of researchers and educators dedicated to the development and application of knowledge to address local agricultural, environmental and health issues. The network of local Cooperative Extension sites and research and extension centers is often the face of the university to residents who may never set foot on a UC campus. By working and living among those we serve, UC ANR expands UC's reach to engage all people and communities in California, ensuring equal access to the UC system.

In 2022, more than 150 UCCE Advisors were conducting research, outreach and education activities, serving all 58 counties from 70+ locations throughout California. Nine research and extension centers (RECs), located in a variety of ecosystems across the state, provide places for researchers to conduct field experiments and educational opportunities for the public. Approximately 540 affiliated Agricultural Experiment Station (AES) researchers were located at three campuses, and 110 UCCE specialists were located at six campuses, RECs and county offices.

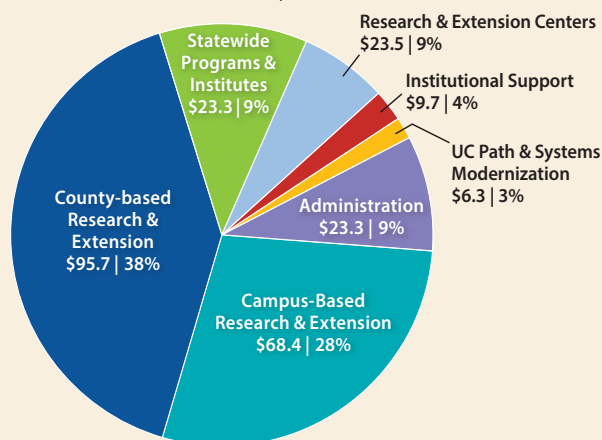
UC ANR's statewide programs and institutes continued work through and with our county offices and community partners. The statewide programs include UC California Naturalist; UC Master Gardener; 4-H Youth Development; Expanded Food and Nutrition Education; UC Master Food Preserver; Informatics and Geographic Information Systems; UC Integrated Pest Management; UC Sustainable Agriculture Research and Education; Agricultural Issues Center; and CalFresh Healthy Living, UC. The institutes are the Nutrition Policy Institute, California Institute for Water Resources, and UC Organic Agriculture Institute.



Total Fund Sources = \$249.2 M



Total Fund Uses = \$249.2 M



Promoting Economic Prosperity in California



Increased agricultural efficiency and profitability

San Diego cut flower industry saves money with new rodent management strategies

In response to reports of rodent damage to bulbs and irrigation lines among nurseries and cut flower operations in San Diego, a UCCE Advisor provided technical assistance and information about science-based pest management strategies. As a result of these efforts, growers reported a 5% increase in crop yield and up to 90% reduction in pesticide use, saving as much as \$30,000 in production costs. Additionally, one grower estimated that the information on rodent management prevented \$50,000 a year in crop loss. ([Niamh Quinn](#))

Environmentally friendly disease management can reduce vegetable crop loss

A UCCE Specialist at UC Davis works to reduce the impact of plant pathogens in crops, and improve sustainability of disease management practices. California grows 75% of the nation's lettuce, generating over \$2 billion in sales. Verticillium wilt of lettuce is caused by a fungus which has long-lived dormant resting spores and causes significant yield loss. Historically, soil-borne plant diseases of lettuce were managed with soil fumigation. The fumigant methyl bromide was phased out due to damage to the Earth's ozone layer and other fumigants are less effective for Verticillium wilt of lettuce. UCCE research documented that incorporating broccoli crop residue and crustacean meal – i.e. dried shrimp, crab and lobster shells – changed the soil bacterial community to reduce

the number of resting spores and curb incidence of the disease. This soil amendment, paired with crop rotation, can reduce crop loss, and is economically feasible, while having low environmental impact. ([Krishna Subbarao](#))

Low-risk alternative to insecticides found for sugar beet industry

A UCCE Specialist at UC Davis who conducts research to improve integrated pest management strategies received funding from the California Department of Pesticide Regulation to find alternatives to chlorpyrifos for sugar beet production. Starting in 2022, the use of chlorpyrifos was banned in the United States due to accumulating research showing neurodevelopmental toxicity in both humans and animals. To test alternatives to the banned pesticide, the UCCE Specialist partnered with growers and Pest Control Advisers. They conducted research at the UC Desert Research Extension Center as well as grower-cooperator fields in California. One of the low-risk strategies identified through the research was the use of seed treatments instead of chlorpyrifos or other insecticides. These findings were shared at the American Society of Sugar Beet Technologies' biennial meeting. Growers in the Imperial Valley have widely adopted this low-risk strategy. ([Steve Kaffka](#))

An innovative approach to amplifying crucial nitrogen fertilizer management practices

A UCCE Agronomy Advisor led a series of seven presentations to improve nitrogen use efficiency in wheat with Pest Control Advisers, Certified Crop Advisers (CCAs), soil scientists, and other crop consultants. UCCE is leveraging a developed webtool as part of a win-win



service agreement that CCAs can integrate into their nitrogen management recommendations rather than training all growers individually. In this way, improved nitrogen fertilizer use efficiency can be achieved on a broader scale, more quickly, and with less effort. The participants reported an increase in nitrogen management knowledge that can be applied to the over 41,000 acres of small grains that they manage throughout California. (Konrad Mathesius)

Improved animal management, productivity and efficiency

AES researcher's insights improve aquaculture production

An AES researcher based at UC Davis is advancing a novel perspective of evolution that emphasizes the role of stress-induced genetic mutation on the rate of evolution. The multi-state project involves identifying how tilapia and other aquaculture fish perceive, transduce and counteract key abiotic stressors, such as salinity and temperature. The findings have improved our understanding of how to minimize salinity and other environmental stress in fish, which benefits aquaculture stakeholders who can use the knowledge to improve production. (Dietmar Kueltz)

UCCE Specialist leads national effort to improve beef cattle genetics

A UCCE Specialist at UC Davis, who focuses on animal biotechnology, is working to meet the needs of beef producers and extension educators in beef genetics programming. Due to reductions in the number of beef genetics extension specialists and funding for outreach in the U.S., the UCCE Specialist collaborated with faculty from five states to develop a national extension program called eBEEF. Materials provided through eBEEF include the recently revised version of the "Beef Cattle Beef Sire Selection Manual" that was distributed to cattle producers throughout the nation. The program also contributed to the Beef Improvement Federation Guidelines for Uniform Beef Improvement Programs, which encouraged cattle breeders throughout the nation to standardize recording of the quality of their beef, and select and improve beef cattle genetics. (Alison Van Eenennaam)

Improved individual household and financial stability

Californians better prepared to face increasing food prices

As Californians were challenged this year by inflated food prices, CalFresh Healthy Living, UC equipped program participants with skills to manage household finances through Making Every Dollar Count and Plan, Shop, Save & Cook interactive lessons. A statewide survey of 742 adult participants showed that 89% of participants reported improvements in at least one food resource management skill. Sixty-one percent of respondents compare unit prices of food more frequently, and buy the option that stretches their dollars further. To ensure they only buy what they need, 62% shop with a list more frequently. (CFHL, UC, Amira Resnick)

Enhanced community economic development

UCCE supports targeted grazing businesses

A Livestock and Natural Resources Advisor from UCCE in the Sierra Foothills has developed specialized business-planning and economic-analysis tools for targeted grazing businesses. These include profit calculators and decision-support tools that cater to the unique service-based nature of grazing businesses. The tools empower producers to analyze potential costs, with a primary goal of establishing a profitable and sustainable fee structure. By using this information, potential clients

of these businesses can better understand how targeted grazing might meet their specific vegetation-management needs. As a result of these efforts, local landowners and managers used targeted grazing services to manage vegetation on more than 7,000 acres. ([Dan Macon](#))

UCCE Small Farms Team helps farmers win \$101,000 in grant funding

The UCCE Small Farms team provided outreach and technical assistance in Chinese, Hmong, Spanish and English to assist farmers in applying for economic relief grants. One such grant, from the California Department of Food and Agriculture's California Underserved and Small Producers program, provided relief for losses due to drought. As a result of the Small Farms Team's effective outreach and support, 38 farmers collectively received \$101,000 from the program. These funds will enable farmers to recover from past periods of drought and strengthen their resilience to future drought conditions. ([Xuewen Feng](#), [Aparna Gazula](#), [Paulina Hernandez](#))

Increased emerging food economies and markets

New invention using photosynthetic processes shows promise for commercialization

Developing high-value chemicals and pharmaceutical proteins can be costly, hard to scale, and carry risk of contamination. An AES researcher at UC Berkeley is working on a multistate research project that developed photosynthetic cyanobacteria cell factories using pioneering and proprietary methods to produce high-value chemicals and plant essential oils. This process creates enzymes and bio-pharmaceutical agents in greater volume and shorter periods of time than traditionally made by plants, with potential applications for oral vaccines,

antigens against livestock diseases, and cytokines and growth factors. The technology was patented by the university and has been purchased by a startup company as an option for commercialization. ([Anastasios Melis](#))

New pistachio cultivar to withstand climate change

Finding new plant cultivars that can adapt to climate change is crucial to maintaining California's agricultural industry. To respond to this need and needs of the market, UC ANR scientists tested materials from over a dozen scientifically designed pistachio trials, bred by private cooperating growers and at the UC ANR West Side Research and Extension Center. This research resulted in the release of a new pistachio cultivar, "UC West Side," from the UC ANR breeding program to the industry. This new cultivar has an enhanced potential for pollination, a trait that can help counteract the impacts of the Central Valley's increasingly warmer winters. ([Craig Kallsen](#))

UCCE and partners release new carrot varieties for organic agriculture

A UCCE Vegetable Crops Advisor collaborated with the Organic Seed Alliance and researchers from other universities on the Carrot Improvement for Organic Agriculture project. The goal is to develop and assess carrots for improved disease and nematode resistance, as well as enhanced nutrition and flavor. Through these partnerships, three new carrot varieties – two red (R6220 and R6636) and one yellow (Y1246) – have been released in the last two years. Another carrot variety named "Carnelian," developed as part of the project, is now commercially available from High Mowing Organic Seed. These variety trials enable organic growers to choose varieties that are better suited for their region, ensuring high productivity and carrot quality. ([Jaspreet Sidhu](#))



\$32 million

saved by dairies with
environmental stewardship
certification

\$450,000

in economic and drought
relief funding awarded to
small farms



\$33.58

monthly food cost
savings reported by 1,656
EFNEP families

Developing an Inclusive and Equitable Society



Improved living and working conditions for California's farmworkers

UCCE helps grape growers improve working conditions for farmworkers

A UCCE Viticulture Advisor developed a unique agriculture-specific workplace assessment tool that queries workers and provides direct feedback to employers. The Advisor collaborated with Napa Valley Farmworker Foundation to develop the tool, which has been used by 13 Napa Valley grape growers to solicit feedback from 311 farmworkers. The feedback allows employers to address issues of communication, team cohesion, supervision, safety and compensation. For instance, 50% of the participating Napa Valley grape growers adjusted compensation, and 63% of participants changed communication between workers and managers in response to feedback from farmworkers. These changes resulted in reports of higher morale, greater motivation and a 29% reduction in turnover and absenteeism. (Monica Cooper)

UCCE equips growers with knowledge to use pesticides safely

A team led by a UCCE Small Farms Advisor in Santa Clara County has been working on identifying and developing research-based information to protect farmers, farmworkers and the food system. As part of this effort, they have created two PowerPoint presentations: "How to Protect Oneself From Risks When Working in an Agricultural Operation" and "New Fieldworker Training Requirements." These presentations and educational materials have been developed in Chinese, English and Spanish and disseminated through inclusive workshops and technical assistance. Using these materials, 67 growers, for whom English is a second language, and a grower cooperative pesticide dealership can protect themselves from harmful ingredients. (Xuewen Feng, Aparna Gazula, Paulina Hernandez)

Increased diversity, inclusiveness and cultural competency in California's workplaces

Educating extension professionals about communities of color in California

UC SAREP organized a project to educate extension professionals about engaging with communities of color in California. They conducted six webinars featuring experts from various backgrounds, including farmers of color, Tribe-serving organizations, and UCCE and U.S. Department of Agriculture National Resource Conservation Service professionals. The webinars covered topics such as building relationships, respecting different knowledge systems, and addressing racial inequities in land access. Two webinars focused on sustainable agriculture from the perspectives of indigenous farmers and other farmers of color, while two others discussed racial disparities in farmland ownership and innovative approaches to land sovereignty and tenure. The webinars were well-received, with many attendees reporting increased awareness of the topics, learning new knowledge and skills. The attendees also reported changing their opinions and/or attitudes towards the topics. Respondents particularly emphasized the importance of building relationships with people of color in their work. ([Sonja Brodt](#))



48

UC SAREP webinar participants increased their awareness of strategies to engage communities of color

13

immigrant teens taught UC 4-H environmental science program to Latino children



UCCE provides resources to under-represented groups in the farming community

UCCE collaborated with underserved farmers in the Sacramento Valley region, including around 200 Hmong and Lu Mien farmers who predominantly grow conventionally managed strawberries, vegetables and flowers. Language and cultural barriers have previously prevented these farmers from integrating and receiving resources that are standard for California farmers. To address this, the UCCE Advisor worked with the Department of Pesticide Regulation to fund an integrated pest management extension program for Hmong and Lu Mien farmers in Sacramento. The funding was used to hire two staff persons, one Hmong and one Lu Mien speaker, to develop a culturally targeted outreach program. As a result, the UCCE Advisor was able to increase their reach to Hmong and Lu Mien farmers. Additionally, farmers reached by the program implemented integrated pest management strategies, composting and other practices that made their farms more sustainable. ([Margaret Lloyd](#))



Protecting California's Natural Resources



Improved management and land use

UCCE ensures gray wolf compensation programs for California ranchers

A UCCE advisor was invited by the California Department of Fish and Wildlife to join a committee tasked with developing direct compensation and pay-for-presence programs for ranchers affected by gray wolves in California. UCCE's involvement in the statewide committee played a significant role in shaping these programs. Thanks in large part to UCCE's ongoing efforts, sheep producers in Northern California are now eligible to participate in the gray wolf compensation programs. As gray wolves continue to re-establish territory in California, these programs will be crucial in enabling ranchers to sustain their livelihoods. ([Dan Macon](#))

Improved air quality

Walnut growers adopt more sustainable tree removal methods

A UCCE Advisor tested the use of whole orchard recycling in walnut orchards. In recent years, biomass power generation plants have been shut down due to air quality regulations that limit growers' ability to manage biomass by burning. A promising alternative to managing biomass, whole orchard recycling involves grinding trees during orchard removal and incorporating the chips back into the soil. Whole orchard recycling is already considered a

best practice in almond orchards. To assess the viability in walnut orchards systems, the UCCE Advisor conducted tests on approximately 30 acres of walnut orchards and, based on the research, three walnut growers in the San Joaquin Valley changed their management practices, while other growers expressed interest in adopting this practice. ([Mohamed Nouri](#))

Protection and conservation of soil quality

UCCE recommendations mitigate soilborne diseases in pistachios

A UCCE Specialist based at UC Davis has been conducting research on the identification and control of plant pathogens that affect fruit and nut crops. Collaborating with growers, the Specialist conducted research trials to develop prevention strategies for soilborne diseases in pistachios. The findings have been shared with a diverse range of stakeholders, including representatives from commodity boards, agrochemical and biocontrol companies, growers, Pest Control Advisers, field workers, and the California Department of Food and Agriculture. One of UCCE's recommendations, to use Platinum-tolerant rootstock for managing Phytophthora diseases in pistachios, has become a standard practice in the industry. Growers have reported success in mitigating soilborne diseases with this strategy. As a result, nurseries are now promoting Platinum rootstock as a superior option for soilborne disease management. ([Florent Trouillas](#))

Increased ecological sustainability of agriculture, landscapes and forestry

Maximizing benefits to waterfowl while reducing grower costs

AES research at UC Davis studies the agronomic benefits of providing habitat for waterfowl in the rice-growing region of the Sacramento Valley. The project provides necessary information to establish realistic acreage goals for wetland conservation efforts and develops new management techniques to maximize quality and productivity of existing wetland habitats. Project leaders work with state and federal wildlife managers, private sector wildlife managers, and with growers to share knowledge about new methods that maximize the benefits to waterfowl while reducing costs or constraints on growers. By working with agricultural and agency planners, project team members help develop and implement new practices that will maintain healthy wetlands while adapting to reduced water availability, changes in agriculture, expanding urban growth and environmental variability. This work helps to sustain and grow breeding and wintering populations of waterfowl and other wetland-dependent wildlife for the public to enjoy. (John Eadie)

Research balances grazing and biodiversity for rangeland management

An AES researcher at UC Riverside is addressing the challenge of balancing rangeland management practices that maximize livestock grazing resources and native biodiversity with ongoing stressors such as drought and non-native plant invasion. The project involves long-term monitoring of plant and animal dynamics in grazed and ungrazed areas to inform conservation efforts. Research findings are being shared with federal land managers, informing practices that promote sustainable grazing practices and support native plant and animal biodiversity. (Loralee Larios)

Adding tools to prevent pesticide resistance

A UCCE Advisor and Specialist continued their work on USDA-funded Interregional Research Project No. 4 (IR-4) projects, which test the efficacy and residue of pesticides. IR-4 research can help growers develop data to register safe and effective pest-management products for high-value, low-acreage specialty crops. In 2020, UCCE tested a pesticide for managing olive fruit flies. The results were promising and UCCE's research findings were used to register the olive fruit fly pesticide with the Environmental Protection Agency. The product demonstrated efficacy in UCCE's study and passed subsequent residue trials. Once approved, the pesticide, Sivanto,

will be available for growers to rotate pest management strategies, preventing pesticide resistance in olive fruit fly populations. (Cindy Kron)

UCCE provides a promising metric for restoring forest resilience

Forest restoration planning is a complex process that requires consideration of threats from drought, wildfires, insects, and disease. UCCE has developed a more comprehensive and quantified metric for defining and restoring forest resilience in restoration efforts. This resilience metric helps forest managers determine the effectiveness of forest restoration projects. UCCE's research, including the use of the resilience metric, have been shared with local clientele, the state Board of Forestry and other stakeholders, and have received recognition from the chief of the Forest Service and news agencies. This applied research has been used by National Forest managers in designing landscape-level forest restoration projects and has informed new rules and practices in the management of public and private lands in California. (Ryan Tompkins, Rob York)

UCCE builds community composting capacity in an urban area

Community composting helps reduce greenhouse gas emissions, sequesters carbon in the soil, and increases access to compost for urban residents. To increase community composting in Santa Clara County a UCCE Urban



Agriculture and Food Systems Advisor organized meetings to bring together urban agriculture organizations interested in community composting. The UCCE Compost Education Program led workshops and community workdays at a compost demonstration site to engage the public in small-scale and community-scale composting. In 2022, the compost system built by the UCCE Compost Education Program diverted 1,158 lbs. of food waste and 19 tons of manure and woodchips from the waste stream and produced 9.6 cubic yards of finished compost. Two partner organizations have secured additional funding to continue the work, launching or expanding their community composting operations. (Lucy Diekmann, Maya Shyldowski, Cole Smith, Jenel Vincze)

Improved water quality

Developing science-based approaches for groundwater recharge in agricultural settings

Managed aquifer recharge on agricultural land (Ag-MAR) is a water resources management practice, which floods farmland with surface water during the winter to recharge the underlying groundwater for later use. Using farmland for groundwater recharge and banking potentially addresses several climate change-induced water-management concerns in California such as increasing drought frequency, decreasing mountain snowpack and increasing rainfall intensity. AES research at UC Davis provides a better understanding of the factors influencing the risk of groundwater quality impairment when using agricultural fields for groundwater recharge. This project provides stakeholders, agencies and policymakers with science-based knowledge that allows them to weigh environmental costs and benefits of integrating Ag-MAR into conventional agricultural production systems to inform site-specific decision making. (Helen Dahlke)

Improved water use efficiency

Promoting the production and use of drought-tolerant crops for horticultural industries

A UCCE Specialist at UC Riverside identified drought-tolerant ornamental species that not only reduce the water requirements of urban landscapes, but also reduce the urban heat-island effect. The Specialist has discovered that some plant species used in landscapes are drought-tolerant while other species are drought-avoiders by developing extensive root systems or going dormant during drought. Plants that are drought-avoiders will reduce the heat-island effect. The study places emphasis on native plant species, given that local agencies are beginning to require the use of native plants in landscapes.

The nursery industry benefits from this research as they can improve and fine-tune the plant palette selection needed by the landscape industry, thus producing plants that are marketable. (Donald Merhaut)

Increased water supply security

Stakeholders learn about the impact of the Sustainable Groundwater Management Act

A UCCE Specialist based at UC Berkeley conducted quantitative economic analyses of the behavior, institutional constraints, and incentives of water users with the objective of addressing agricultural water management challenges in the face of water scarcity. The research evaluated the efficacy and potential of various policies for water resource management, emphasizing groundwater in California and the Sustainable Groundwater Management Act (SGMA). To study the impact of rising groundwater prices, the Specialist analyzed available data on water use and water prices from a representative irrigation district. She also tracked the implementation of SGMA to study ongoing trends in groundwater management strategies. The findings were communicated through various media and presentations. Farmers, state-level regulators, and other stakeholders who attended the UCCE presentations on SGMA improved their understanding of SGMA's impacts, as observed through follow-up conversations with UCCE. These discussions allowed the UCCE Specialist to provide further information about the consequences of SGMA and the benefits of various management actions. (Ellen Bruno)

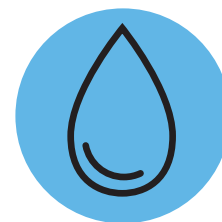


22.9 million

wasps released for
pest control since 2005,
replacing 22,808 pounds of
carbamate pesticide

1,300

acres of drip irrigation
applied to sweet corn
and lettuce fields in
Southern California



Safeguarding Abundant and Healthy Food for All Californians



Improved food safety

UCCE expertise used to update food safety guidelines

Following salmonellosis outbreaks in 2020 and 2021 that were linked to consumption of onions, a UCCE Specialist in food safety based at UC Davis collaborated with scientists from Oregon State University to develop and deliver a webinar to 100 scientists and policy experts from the Food and Drug Administration (FDA) as part of the FDA's Center for Food Safety and Applied Nutrition Regulatory Research lecture series. The webinar covered past, current, and proposed research on the survival of pathogens and pathogen surrogate organisms in curing onions and during postharvest handling through final preparation. UCCE's expertise, along with other stakeholder input, were incorporated into an updated, second edition of the Commodity Specific Food Safety Guidelines for the Dry Bulb Onion Supply Chain (July 2022). The document provides science-based recommended food safety practices for dry bulb onion production that are intended to minimize microbiological hazards. ([Linda Harris](#))

UC 4-H Cooking Academy empowers teens to teach food safety

A UCCE 4-H Youth Development Advisor in Sacramento County empowered teen teachers to deliver the UC 4-H Virtual Cooking Academy series to elementary students in 10 Expanded Learning programs. The Virtual Cooking Academy series not only teaches basic cooking skills but also imparts crucial food safety skills in children, so they

can cook and eat healthy recipes from start to finish. Program evaluation results showed that at least 57% of students learned safe food handling practices and/or used them more often. Practices included properly storing foods in the refrigerator, and washing fruits and vegetables before consumption. ([Marianne Bird](#))

Improved food security

UC ANR studies impact of improvements to WIC program

An AES researcher from UC Davis and a UCCE Specialist at the Nutrition Policy Institute collaborated on a project to investigate the impact of changes made to the WIC program during the COVID-19 pandemic. The changes included remote delivery of nutrition education services and an expansion of the monthly cash value benefit. Findings showed both participants and WIC directors had positive views on the remote work and services. Furthermore, the increased monthly cash value benefit was linked to higher purchasing of fruits and vegetables, which contributed to improved household food security and increased intake of fruits and vegetables. The findings suggest that these changes will attract and retain the most families, while providing more benefits to the health and well-being of participants. The study's results were shared with WIC program administrators and policymakers, and contributed to decision to maintain remote delivery services after the COVID-19 public health emergency declaration was ended. ([Lauren Au](#), [Lorrene Ritchie](#))

UCCE Advisors guide the formation of local emergency food systems

Several UCCE Advisors on California's North Coast have partnered with community organizations and local governments to strengthen local emergency food systems. Sonoma County has included plans for emergency food response in the county's Recovery and Resiliency Framework, which has already been utilized during the pandemic. Several counties in California's North Coast have developed a three-year plan to form a centralized food hub and have already formed the Emergency Food System Committee for Humboldt and Del Norte counties. These efforts have positioned the California North Coast to respond quickly and effectively to periods of food insecurity during emergencies. ([Dorina Espinoza](#), [Julia Van Soelen Kim](#))

Fostering a more resilient food system

Working together, an Urban Agriculture Advisor and a Nutrition Family and Consumer Sciences Advisor engaged more than 70 nonprofits, businesses, government agencies, and existing food system collaboratives to research and develop the Santa Clara County Food System Workplan. The project reviewed pandemic conditions and proposed ways to address and evaluate gaps and improve coordination within the countywide food system. To support the implementation of the workplan, UCCE Advisors facilitated the Food Security Action Plan group and conducted a needs assessment to determine levels of food insecurity among county residents. Monthly meetings brought together county and city staff and food assistance providers to prioritize strategies for addressing food needs as federal pandemic funding ended. This process resulted in a shared definition of "at-risk for food insecurity"

and improved coordination among city and county staff. The effort also informed Santa Clara County Board of Supervisors' requests for additional action to address food insecurity, and made information about finding food assistance more accessible for county residents. ([Lucy Diekmann](#), [Laura Vollmer](#))



2,000

adult and youth EFNEP participants improved food safety skills and practices



397%

increase in food assistance benefit redemption at San Luis Obispo County farmers markets since 2017



365

UC Master Gardener participants reduced garden-grown food loss



Developing a Qualified Workforce



Increased effective public leaders

UC 4-H grows public speaking skills in youth

One of the UC 4-H Youth Development Program's (UC 4-H) primary mission areas is to provide youth with leadership opportunities. To achieve this goal, UC 4-H offers a robust public speaking program to develop leadership skills. To evaluate the program's success between 2020 and 2022, UC 4-H conducted an annual Public Speaking Confidence Study that explored 4-H members' communication confidence and the role of UC 4-H in building that confidence. According to the study, over 64% of 4-H youth reported that they developed their public speaking skills at 4-H Club meetings and/or Presentation Days. The findings also showed that 4-H members reported higher levels of public speaking confidence the more years they participated in 4-H, even when controlling for age. On average, 4-H members reported 89% public speaking confidence compared to a comparable sample of college students reporting 75% confidence. ([Nicole Marshall-Wheeler](#), [Steven Worker](#))

Increased workforce retention and competency

Green Landscaper curriculum equips workers with sustainable landscape training

UCCE developed the Green Landscaper curriculum to train landscapers and workers in the landscape maintenance sector. This Spanish-language training program is specifically designed to equip landscapers and workers with the skills and knowledge necessary to maintain sustainable landscapes. As a result of the training offered in Spanish, 24 Hispanic participants completed the training and were awarded with a certificate, increasing their professional competencies in this area. ([María de la Fuente](#))

UCCE training helps workers receive qualified pesticide applicator certification

A UCCE Specialist based at the Kearney Agricultural Research and Extension Center promoted best practices for pesticide spray applications to improve the efficiency, effectiveness and environmental sustainability of critical crop protection efforts against pests and diseases in the

San Joaquin Valley. The UCCE Specialist developed two decision support tools, CitrusSprayEx, a Windows-based application, and Airblast Spray Advisor, a web app, to help growers, pesticide applicators, and sprayer operators plan and evaluate airblast spray applications. He provided webinars and training for airblast spray applications to over 250 participants, most of whom received continuing education credits for their qualified pesticide applicator certification. After the webinars, 52% of participants were likely to adopt the new Airblast Spray Advisor web app, and 39% were likely to adopt the initial CitrusSprayEx system. These decision support tools have the potential to improve spray application effectiveness, profitability and environmental stewardship. (Peter Larbi)

UCCE recruits and trains qualified natural resource management workers

A UCCE Advisor played a crucial role in the Modoc Shared Stewardship, a partnership of the Modoc County Farm Bureau, Modoc County, Modoc National Forest, and UCCE. The partnership aims to address the consistent shortage of qualified workers in natural resource management, which hinders the timely completion of projects important to Modoc clientele on federal lands. The Advisor gathered collaborative resources to complete the human resources work, job outreach and hiring, and on-the-ground training out of the UCCE Modoc office. Nearly 100 individuals were trained and hired to work on natural resources issues in Modoc County, with 15 of them becoming full-time federal employees. These employees have carried out diverse tasks such as rangeland monitoring, marking timber projects, completing archeology and wildlife surveys, treating noxious weeds and ensuring National Environmental Policy Act compliance. This program also provides employment opportunities for students, giving them valuable experience before graduation, and for recent retirees, who can share their institutional knowledge with the next generation. (Laura Snell)

Improved college readiness and access

UC 4-H prepares youth for success later in life

UCCE conducted a study of California 4-H alumni, surveying young and emerging adult alumni of the program to understand the long-term impacts of participating in UC 4-H. The study assessed career success, among other topics, and revealed that the UC 4-H program played a role in preparing students for college and career paths. Out of the 695 UC 4-H alumni who participated in the survey, 84% reported that the program contributed to their success in professional pursuits later in life. (Anne Iaccopucci, Nicole Marshall-Wheeler, Roshan Nayak, Steven Worker)



Increased civic engagement

UC California Naturalists are volunteering more

The UC California Naturalist Program offers an opportunity for Californians to discover the state's distinctive ecology, develop the skills needed to preserve it, and become environmental stewards actively working toward community and ecosystem resilience. Every year, the program collaborates with a statewide network of community-based partner organizations to train their staff to co-design and deliver either the California Naturalist or Climate Stewards certification courses. Over the 2022 federal fiscal year, program partners trained and certified 957 participants as either California Naturalists or Climate Stewards, representing a 30% increase over the prior year. For the same period, California Naturalist and Climate Stewards logged over 57 thousand volunteer hours engaging in participatory science, environmental education, conservation, community resilience and adaptation, and environmental justice activities. (Greg Ira)



1.2 million

hours of public service
delivered by 19,300
UC-trained volunteers

73

more volunteer hours
donated by UC 4-H alumni
than the general public



Building Climate-Resilient Communities and Ecosystems



Increased preparedness and resilience to extreme weather and climate change

Collaborative stewardship promotes fire-resilient communities

An AES researcher at UC Berkeley is working with several tribes to understand the specific roles that fire has for tribal people. Recently, policies have been developed to increase cultural burning by Native tribes in California. The dramatic increase in prescribed and cultural burns is recognized as a key element to restore forest functioning. Based on understanding of traditional ecological knowledge, the researcher is testing the role that fire can play in increasing acorn yields through fires that directly control pest populations. The results are profound not only because of the ecological field work, but also because they highlight how existing permitting constrains fire use and creates challenges for Indigenous communities to perform cultural burns. This study has demonstrated that permitting may need to change if the beneficial use of fire is to become significant across the landscape. ([Peter Nelson](#))

Fostering cooperation for sustainable environmental policy-making

Researchers at UC Davis are investigating factors that facilitate cooperation among California stakeholders in collaborative policy, particularly in the areas of agriculture, environment, sea-level rise and climate adaptation planning. This project aims to solve the governance and human behavior challenges associated with the policy issues faced by California agricultural and environmental stakeholders. The broader benefits of the project include improving overall environmental decision-making, overcoming governance barriers, creating new governance institutions, helping stakeholders learn and cooperate, and shifting towards more sustainable environmental behavior. ([Mark Lubell](#))

Using Artificial Intelligence for wildfire management

Managing the landscape to reduce wildfire severity is a critical need, but it is challenged by the enormous complexities of fires' spatial patterns, differing levels of tolerances for fires and treatment intensities, and variable owner/stakeholder objectives. An AES researcher at UC Berkeley is focusing on developing a foundation for using Artificial Intelligence (AI) in helping to deal with

these complexities. The research reflects the deliberately careful and stepwise process of considering AI, building a foundation of understanding to support collaborative exploration of its potential. (Carl Boettiger)

Improving the design of California's urban forests for cooling potential and equity

As summer temperatures climb due to a warming climate, urban forests will play a critical role in the mitigation of heat hazards to urban residents. While homeowners and businesses have long recognized the value that shade trees provide, it has become more important to think about how trees in cities interact with each other and with humans at community levels. An AES researcher at UC Berkeley is analyzing the benefit of urban forests during the last three decades, when heating of urban cities has grown substantially. The patterns found are being used to understand the role of urban forests and how they can be designed in the future. This project has engaged several undergraduate researchers, who are thinking about important equity questions around who benefits from urban forestry and how it can be more equitably planned. (Iryna Dronova)

Irrigation District uses UCCE study to save water and produce solar power

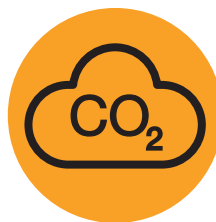
A UCCE Specialist at UC Merced collaborated with other UC researchers to study the energy and water co-benefits of covering canals with solar panels. The results of this study were shared widely, including at the Latino Leaders for Water Education panel discussion, which was attended by approximately 150 elected officials serving Latino communities. The findings were also widely disseminated through media outlets, such as Time Magazine, Los Angeles Times and Vogue Magazine. The study directly influenced the Turlock Irrigation District to construct solar panels over water canals with \$20 million in funding from the California Department of Water Resources. The study's results indicated potential water savings of 63 billion gallons annually, equivalent to the amount needed to irrigate 50,000 acres of farmland or meet the residential water needs of over 2 million people. Additionally, the 13 gigawatts of solar power generated each year by the panels would be equivalent to about one-sixth of the state's current installed capacity and roughly half of the projected new capacity needed by 2030 to achieve California's decarbonization goals. (Tapan Pathak)

UCCE informs bill to prevent loss of homes due to fire

To address the increasingly severe impact of California wildfires, a UCCE Specialist has led research and extension efforts related to land use planning in the context of



fire-related losses. The Specialist has produced guides and articles based on research, and has developed a novel framework in the Regional Wildfire Mitigation Program. He has also engaged in policy discussions with the California Department of Forestry and Fire Protection (CAL FIRE) and legislative staffers. His engagement with legislative staffers in Sacramento regarding fire and land use planning directly influenced the passage of California Assembly Bill No. 1445. Furthermore, the Governor's Office of Planning and Research has utilized information from the Specialist to create a new guidance document on fire hazard planning. (Max Moritz)



1,412

tons of estimated carbon emissions reduced per year by UC Climate Steward participants

700

climate-ready landscape trees provided free to residents of urban areas in Southern California



Promoting Healthy People and Communities



Improved community health and wellness

Increasing the usage of edible gardens for nutrition and education

CalFresh Healthy Living, UC (CFHL, UC) partners with schools and communities throughout the state to support edible gardens, which enhance nutrition education, provide nutritious food to children and families, and promote community health. In the past year, 30 participating CFHL, UC sites have utilized their gardens' produce in meals and snacks provided at the site. Additionally, 28 sites distributed gardening materials to the community for use in home gardening, while 68 sites offered opportunities for the community to work in their edible gardens. These initiatives have contributed to the overall goal of promoting health and wellness through improved access to fresh, locally grown produce. (CFHL, UC, [Amira Resnick](#))

Research informs better infant formula to boost health

Infant diet has significant impacts on metabolic health and the development of the gut microbiome. An AES research project at UC Davis aims to understand the role of microbes in health and disease by using a systems biology approach to determine how different microbes can alter host metabolism, and how the environment may be manipulated to ensure host health. One focus of the

project is infant formula, and the findings on maternal and infant health provided to formula manufacturers will lead to the production of better formulas that mimic human milk more closely. These improved formulas could significantly impact long-term health for infants. The work may also provide information necessary for policymakers to champion better parental leave benefits for breastfeeding mothers, and to make recommendations for limiting the exposure to potentially toxic chemicals during pregnancy. ([Carolyn Slupsky](#))

Improving access safe drinking water in schools

The National Drinking Water Alliance (NDWA), coordinated by a UCCE academic at the Nutrition Policy Institute, shares data-driven information and best practices to improve access to safe drinking water and reduce the consumption of sugary drinks. The UCCE academic shares NDWA resources and knowledge with policymakers at the local, state and national level. These activities have contributed to the passage of a bill in California that improves drinking water access and promotion in schools (CA AB 2638). The bill supports K-12 student access to drinking water by mandating water bottle filling stations in all new or renovated school buildings, permitting students to carry refillable water bottles, and asking schools to provide drinking water education and promotion. ([Christina Hecht](#))

Improved health for all

Research transforms food waste into nutrient-rich bioactive ingredients

An AES researcher at UC Davis is identifying biomolecules in food processing waste streams that are biologically active and health-promoting. The California dairy industry produces over 100 million pounds of cheese whey each day, but most of this organic waste stream is discarded. The research showed that waste stream products can be used to improve human health via modulation of the gut microbiome; the biomolecules can be used to create novel food products that are rich in functional ingredients such as glycans, oligosaccharides and glycoproteins. This research has potential to decrease food processing waste while simultaneously improving the nutrition of the general public. ([Daniela Barile](#))

Adults and youth adopt healthy eating practices

UC ANR offers various nutrition education programs to both adults and children across the state. For example, CalFresh Healthy Living, UC (CFHL, UC) delivers nutrition education to over 58,000 youth and adults. According to a survey of 375 adult CFHL, UC participants, many have reported making improvements in their healthy eating practices. For instance, 44% of the participants reported drinking less soda, and 71% reported eating more servings of fruits and vegetables. In another example, a UCCE Advisor in Alameda County extended the Happy Healthy Family curriculum to 1,545 children at 28 preschools in Oakland Unified School District through classroom teachers, and the results were positive. An evaluation of the curriculum showed that 52% of children increased their intake of fruits and vegetables, and 25% reduced their consumption of sugary drinks. ([CFHL, UC](#), [Mary Blackburn](#), [Amira Resnick](#))

Parents do more physical activity

UCCE academics oversee the implementation of the Expanded Food and Nutrition Education Program in California, which includes delivering the Eating Smart Being Active (ESBA) curriculum aimed at teaching healthy lifestyle practices. A UCCE Advisor working in Alameda and Contra Costa counties reported that 277 parents graduated from the ESBA series and made improvements in their healthy lifestyle practices. For example, 70% to 75% of participants in each county improved their physical activity habits, such as exercising for at least 30 minutes more frequently and doing more muscle-strengthening exercises. In addition to the inherent health benefits for the parents, higher physical activity in parents is associated with higher physical activity in children. ([Marisa Neelon](#))

Improved access to positive built and natural environment

Growing access to green spaces

The UC Master Gardener Program teaches people how to grow food and garden sustainably through public education workshops and outreach. Gardening interventions also have the potential to benefit the broader community. For example, a 2016 nationwide study found that living near greenery may help a person live longer due to less air pollution, more physical activity, more social engagement, and, most significantly, better mental health as measured by a lower prevalence of depression. In 2022, 72 participants in the UC Master Gardener volunteer-led educational programs reported in a statewide survey that they have applied sustainable gardening practices they learned from the program to over 101,705 square feet of school and community gardens, providing an important benefit to their broader communities. ([UC Master Gardener Program](#))



63%

of UC Master Gardener volunteers spent more time outside

108,000

individuals benefited from policy, systems, and environmental changes at 286 CFHL, UC sites



98%

of 1,660 adult EFNEP participants improved their diet quality



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