

Working Together for the Benefit of All Californians

2023 UC ANR Annual Report



*UC Master Gardeners tend flowers,
South Coast Research and Extension Center*

Creating Science-Based Solutions With Communities



In 2023, University of California Agriculture and Natural Resources (UC ANR) continued its focus on operations, research and engagement across California, aiming to serve all 40 million residents. The UC Cooperative Extension program footprint expanded thanks to a historic \$32 million increase in funding by the state. UC ANR has also been working closely

with UC Merced and UC Santa Cruz to integrate the two campuses into UC’s Agricultural Experiment Station (AES). We look forward to announcing new AES faculty and projects soon.

The UC ANR Statewide Conference, “Growing Our Future Together: Aligning Strengths for California’s Success,” brought together 846 participants, including 75 external guests, and launched UC ANR’s 2025-2040 strategic visioning process. The conference facilitated networking between colleagues, shared research and extension best practices, highlighted career development pathways and showcased our impact, science and partnerships.

UC ANR continued to strengthen its commitment to equity, diversity and inclusion (EDI) in all that we do. We hired our first Director of Workplace Inclusion & Belonging, responsible for developing and implementing the organization’s EDI initiatives and programs. UC ANR projects also reflected our investment in supporting communities that historically have been underserved by the land-grant system. Cooperative Extension Specialists and the California Institute for Water Resources were awarded an \$8.2 million California Climate Action Grant to develop water planning tools to advance sustainable, inclusive and equitable water distribution across California. UC

ANR statewide programs, such as the Expanded Food and Nutrition Education Program, CalFresh Healthy Living, UC and 4-H continued to deliver culturally relevant and responsive programming to increase food security and community leadership.

UC ANR led major regional economic and innovation projects. At the California Economic Summit, UC ANR community economic development Advisors and Specialists showcased how investments in working landscapes can generate jobs and grow the state’s economy. The Farms, Food, Future Initiative, or F3, also celebrated its one-year anniversary. F3 focuses on revitalizing the Central Valley’s economy through inclusive agrifood tech innovation. In collaboration with Fresno BIPOC Produce, F3 supported Black, Indigenous and people of color (BIPOC) small farmers to sell \$433,000 worth of produce, surpassing the program’s one-year goal by 44%. Additionally, UC ANR was awarded a grant to establish a USDA Southwest Regional Food Business Center that will serve California, Arizona, Nevada and Utah. The \$35 million project will focus on the Colonias communities – communities within the mainly rural U.S.-Mexico border region with marginal conditions related to housing and infrastructure — of southern Arizona and California.

Wildfires continue to affect all of California. In response, UC ANR formalized our statewide Fire Network and named a director. The network will build connections and capacity among UC ANR scientists, practitioners, land management and regulatory agencies, policymakers and communities to work toward fire resilience in California. The Fire Network played a pivotal role in rolling out California’s State-Certified Burn Boss Program, which trains professionals to manage prescribed burns.

We are grateful to the 16,000+ volunteers who work within our programs, spend time reviewing research

2022-2023 Highlighted Outputs & Activity



9

novel ideas led to patents

1,500

policy engagement activities



1,880

credible, audience-driven educational materials

29,280

meetings, workshops, field days and courses held



1,255,990

direct contacts/educational exchanges with adults and youth

proposals, participate in events and offer leadership in various advisory councils. These individuals offer their time, resources and knowledge and greatly extend our ability to deliver our mission throughout the state. A huge thanks also goes to our state agency partners for their support and collaborations. These partnerships have allowed us to expand efforts in climate-smart agriculture, sustainable pest management, food safety, the Fire Network and new opportunities for volunteers to participate in science through our Environmental Stewards program. Working together allows all of us to better serve California.

Glenda Humiston, Vice President

University of California Agriculture and Natural Resources

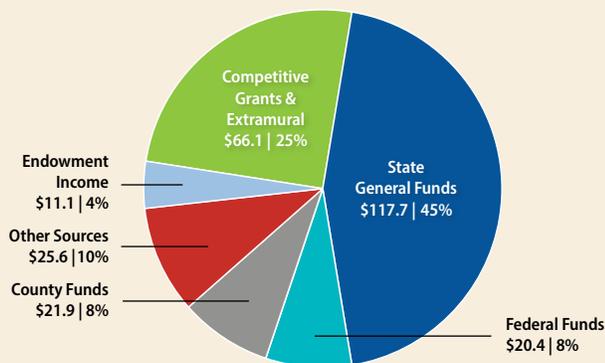
UC ANR operates a statewide network of researchers and educators dedicated to the development and application of knowledge to address local agricultural, environmental and health issues. The network of local Cooperative Extension sites and research and extension centers is often the face of the university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

In 2023, nearly 170 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 515 affiliated Agricultural Experiment Station (AES) researchers were located at three campuses and 110 UCCE specialists were located at six campuses, RECs and county offices.

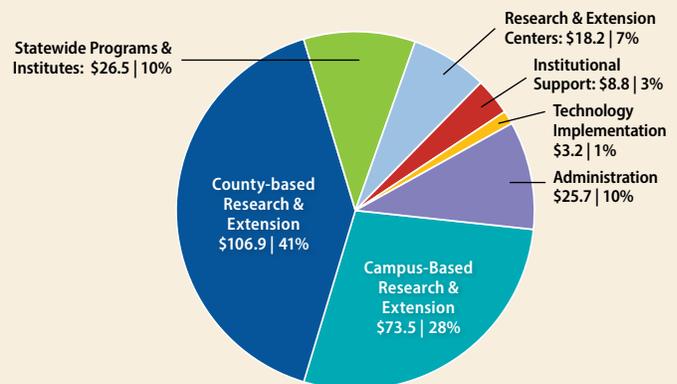
UC ANR's statewide programs and institutes continued work through and with our county offices and community partners. The statewide programs include UC Environmental Stewards; UC Master Gardeners; 4-H Youth Development; Expanded Food and Nutrition Education; UC Master Food Preservers; Informatics and 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.



2022-23 Total Fund Sources = \$262.8 M



2022-23 Total Fund Uses = \$262.8 M



Promoting Economic Prosperity in California



Photo courtesy of Mike Hsu

UC Davis students work on their robot for the Farm Robotics Challenge

Improved individual household and financial stability

Expanded Food and Nutrition Education Program helps families budget

UC Cooperative Extension (UCCE) academics provided oversight, leadership and guidance for the statewide Expanded Food and Nutrition Education Program (EFNEP). Curricula, such as Eating Smart, Being Active, are designed to help adult participants improve food buying/budgeting skills and food resource management techniques. In 2023, EFNEP graduates statewide averaged a \$63.95 savings in their monthly grocery budget, which is \$767 in savings a year per family. After completing EFNEP classes, the number of participants reporting they were unable to afford balanced meals fell from 89% to 37%. (EFNEP)

Enhanced community economic development

UCCE Small Farms Network empowers farmers to secure over \$900,000 in economic relief funding

The [UCCE Small Farms Network](#) provided outreach and technical assistance in English, Spanish, Hmong, Lao, Mandarin, Korean, Vietnamese and Iu Mien to support

small-scale farmers in applying for state and federal programs to address drought, flood and COVID relief. As a result, 14 of 20 farmers in Fresno County supported by UCCE received funding totaling over \$335,000 in economic relief funding from state and federal programs ([Ruth Dahlquist-Willard](#)). In Riverside County, 31 of 37 underserved farmers applying for grants with UCCE assistance were awarded a total of \$350,000 in funding for economic relief from COVID-19, drought and flood ([Hung Doan](#)). All 73 Central Coast farmers who applied for Coronavirus Food Assistance grants with UCCE assistance were awarded funds totaling \$232,625. ([Aparna Gazula](#))

Improved animal management, productivity and efficiency

UCCE specialist leads efforts to improve poultry welfare

A UCCE Poultry Specialist in the Department of Animal Science at UC Davis organized and presented at a virtual symposium on poultry welfare assessments with the national Poultry Extension Collaborative. There were 159 participants from 20 different countries, including the United States, United Kingdom, Canada, Mexico, Nigeria, Pakistan, Iraq, Jamaica, Germany, Turkey and Brazil. Attendees included veterinarians, poultry industry stakeholders, researchers, university faculty and staff, students,

government employees and consultants. In a post-event survey, 100% of the 63 respondents said they would use information presented in the symposium on poultry welfare, and 94% were likely to change their behavior based on the information provided. (Richard Blatchford)

AES researcher identifies antimicrobials to prevent disease in aquaculture

Rainbow trout are raised in aquaculture for human consumption or for release into water bodies for sport fishing and conservation. The bacterial disease piscine lactococcosis is an emerging and usually fatal disease to rainbow trout and related fish. An AES researcher based at the UC Davis School of Veterinary Medicine has provided the first comprehensive characterization of all three causative agents of this disease and provided direct recommendations for species-specific diagnosis and management. They included preventative measures, like vaccine development, and therapeutic measures, like the identification of two antimicrobial drugs that are effective in reducing fish death. The antimicrobial drugs are already approved for use in other aquaculture systems. The results provide aquaculturists with a tool to manage the disease and increase fish survival. (Esteban Soto Martinez)

Increased agricultural efficiency and profitability

UC cultivates knowledge of organic agriculture practices

In collaboration with other UCCE personnel, the UC Organic Agriculture Institute (OAI) facilitated multiple in-person workshops and a webinar series on diverse topics in organic production, which engaged 188 total participants. Extension topics included soil nutrient management, pest and weed control, pathogen and disease management and other best practices in organic crop production. Focal

organic crops included rice, citrus, avocado, vegetables and wine grapes. Of those participants who completed a survey following OAI events, 92% felt that the workshop greatly or somewhat improved their knowledge of key organic production practices. Respondents also reported they were interested in obtaining more resources on organic practices specifically tailored to their production region. (Rob Straser) A UCCE Specialty Crops and Horticulture Advisor working on the North Coast collaborated with OAI to share results of field trials of overwintering cauliflower, a novel crop for the region. At the field day, UCCE shared information on organic production for this crop, including fertilizer and pest considerations, with 38 participants. At the end, 92% of survey respondents indicated they had greatly improved their knowledge. (Eddie Tanner, UC Organic Agriculture Institute)

Citrus advisor sparks IPM action on lemon pitting issue

After making 20 farm calls and analyzing samples, a UC Area Citrus Integrated Pest Management (IPM) Advisor for the San Joaquin Valley first alerted the citrus industry to the emergent issue of lemon pitting. However, none of the experts the advisor consulted, including horticulturists, plant pathologists, entomologists and plant physiologists, had an answer. In response, the advisor shared her observations at the 13th Annual Citrus Meeting organized by the world's largest provider of crop inputs and services. Subsequently, the Citrus Research Board has invited the advisor to serve as a co-principal investigator of new research on the topic. A consultant reported that the advisor was "the only researcher who followed this issue and [her] presentation at the grower meeting pushed the citrus industry to fund research to understand what was causing pitting in lemons and making it unmarketable. [Her] dedication has helped us get the attention this issue deserved." (Sandipa Gautam)



\$6,000

per-acre net income increases after switching to grafted watermelons



150

students from 12 universities in Farms, Food, Future Initiative's inaugural Farm Robotics Challenge

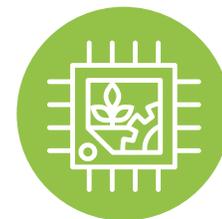
377%

more local, fresh specialty crops purchased by UC Davis Medical Center after working with UC SAREP



\$2 million

collectively saved on groceries by EFNEP graduates



UCCE safeguards vital cool-season vegetables and strawberry crops

A UCCE Advisor in plant pathology launched a research and extension education program to address growers' needs on plant disease management. The tri-county Santa Cruz, Monterey and San Benito area is the leading producer of cool-season vegetables and strawberries for the country. The production gross value of all agricultural commodities is over \$4.1 billion, with lettuce and strawberries being the top crops (County Crop and Livestock Report, 2021). However, this agricultural system continuously faces threats of emerging and reoccurring plant diseases, which cause yield and quality loss. For example, impatiens necrotic spot virus (INSV) along with Pythium wilt have caused significant loss in lettuce since 2019. In 2022, the loss caused by INSV was estimated to be over \$150 million. To address these concerns, the advisor conducted and extended research through multiple avenues, including field days on plant disease management, which had more than 100 attendees. Afterward, 75% of participants reported gaining new insights into disease management. (Yu-Chen Wang)



Photo courtesy of Evett Kilmartin

UC ANR Researcher in a potato test plot

Increased emerging food economies and markets

UC ANR pioneers field-ready technology through collaborative development

A Viticulture Advisor in the Central Valley collaborates with manufacturers and developers during the development stage so the products are ready for application in the table grape production system. Technologies are tested at the Shafter Research Station, an agricultural research facility, and grower sites to assess suitability and efficiency under different growing conditions. Five different products or equipment have been tested at six different sites over the past two years, including a yield estimation camera system from Bloomfield Robotics and four mechanical pruning devices. Bloomfield Robotics has used the 6,000 ground-truthing data points provided by UCCE to optimize the yield estimation algorithm. The camera system was commercialized in 2023 and two local growers have been beta users. This joint effort of UCCE, the California table grape industry, manufacturers and developers supports novel field-ready technologies that meet growers' needs. (Tian Tian)

New small grain varieties released

An AES researcher and collaborators at UC Davis worked to release the wheat variety UC-Central White with excellent breadmaking quality and the high yield malting barley variety UC-Alameda. They are also partnering with industry to commercialize varieties with high dietary fiber. Varieties released by this group or developed in collaboration with industry are being grown on sizeable acreage in California. (Jorge Dubcovsky)

Intermountain Research and Extension Center develops new potato varieties

California potato growers rank potato variety development as their top research priority. The Intermountain Research and Extension Center meets this need as one of only two locations in California that do variety testing, and the only summer growing site evaluating new varieties for the state's 40,000-acre potato industry. The variety and management trials helped California growers adopt new potato varieties including Classic Russet, Canela Russet and Reveille Russet, which offer higher yields, higher market value and/or improved long-term storage compared to older varieties. (Rob Wilson)

Developing an Inclusive and Equitable Society



Photo courtesy of Margaret Lloyd

Hmong farmers on an Integrated Pest Management field trip

Improved living and working conditions for California's farmworkers

UCCE promotes nutrition education in migrant farmworker families

CalFresh Healthy Living, UC in Kern County (CFHL, UCCE Kern) partnered with Community Action Partnership of San Luis Obispo (CAPSLO), which has five Head Start centers in the county. CAPSLO provides no-cost child care and preschool services to low-income family members whose primary occupation is agricultural production and harvesting. CFHL, UCCE Kern conducted youth and adult nutrition education at the centers. Over 125 preschool children participated in evidence-based lessons utilizing Coordinated Approach to Child Health and Go, Glow, Grow to introduce nutritious foods, share how foods keep them healthy and promote physical activity. After participating in multiple food tastings (36 surveys capturing 393 responses), 85% of preschoolers reported a willingness to eat the sampled nutritious foods again. This helps promote the purchase of healthy foods when perishability and waste are concerns for parents stretching their money to feed their families. (CFHL, UC, Andra Nicoli and Beatriz Rojas)

Community-engaged research addresses health equity in San Joaquin Valley

An AES researcher in social and environmental justice

at UC Davis completed a project addressing health concerns for community residents of Kettleman City, CA. Individuals living in rural communities across the San Joaquin Valley tend to be predominantly Hispanic, employed in agriculture and largely low-income. The farmworker community tends to be exposed to more environmental pollutants, including some of the poorest air quality in the country. This project used an innovative community-engaged approach, working with residents to collect data and develop research briefs, fact sheets and a mini-documentary for community members to better understand their potential risk to environmental exposures, including from a neighboring landfill. The results also inform policy recommendations on waste containment and air pollution to reduce environmental impacts on these frontline communities. (Clare Cannon)

UCCE Specialist informs policy to advance health care access for agricultural workers

A UCCE Specialist at UC Berkeley conducted research on the health of agricultural workers, with a focus on long-term health, the ability to access high-quality health care and the ability of the workforce to meet the changing demands of the industry. The Specialist shared research findings in a report to the California Department of Public Health. By sharing evidence-based research on the health of agricultural workers, UCCE contributed to a decision

by the State of California to expand Medi-Cal coverage to undocumented adults. (Christy Getz)

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

Small Farms Advisor works with underserved farmers for inclusion in state's roadmap

A UCCE Small Farms Advisor conducted research and outreach programs dedicated to ensuring the sustainability and viability of organic farms. In 2023, the advisor served on the Sustainable Pest Management workgroup for the California Department of Pesticide Regulation (DPR) and represented the needs and interests of both underserved farmers and organic growers, diversified and small-scale. As a result of the advisor's participation in the workgroup, DPR included the needs and interests of farmers who have historically received less support from state and federal agricultural agencies in a new guiding document, "Accelerating Sustainable Pest Management: A Roadmap for California." Their inclusion in the roadmap increases the resiliency and success of these farmers in the future. (Margaret Lloyd)

UCCE Specialist brings agencies together with California tribes to work on land use

A UCCE Specialist at UC Berkeley works with tribes on tribal sovereignty in land use. The Specialist held a "Strengthening Tribal-Agency Partnerships" webinar to

address challenges tribes and agencies face in land-use permitting on tribal lands, as well as concerns about the impact of cannabis grows on tribal cultural resources. Thirty-six people attended, including government agency representatives, students, tribal government representatives, tribal attorneys and UC ANR personnel. After attending the webinar, nearly all survey respondents indicated they felt more confident in their ability to engage in consultation and resource protection, and all reported they were more likely to engage in consultation and resource protection. (Jennifer Sowerwine)



100

participants at the UC ANR Statewide Conference attended a session on best practices for engagement with California tribes

53%

of surveyed farmworkers in Napa reported their employers addressed issues they raised through the Agricultural Jobs Satisfaction Survey



Head Start preschoolers hold Go, Glow, Grow Participation Certificates

Photo courtesy of CalFresh Healthy Living, UC

Protecting California's Natural Resources



Photo courtesy of Ali Montazar

Sustainable water usage in date palm production

Improved management and use of land

Community-based efforts preserve California's oaks

A UCCE Specialist's lab at UC Berkeley continued to lead community-based projects related to Sudden Oak Death (SOD), including SOD Blitzes. Annually, over 400 SOD Blitz volunteers help with detecting the disease across the state, producing detailed local maps of disease distribution and identifying areas for proactive management. In 2023, the volunteers surveyed more than 10,000 trees and sampled approximately 2,000 to be tested at UC Berkeley. Sixty-four land managers received treatment options and technical assistance from the volunteers. The volunteers reported that they were able to protect 6,678 trees over 715 acres with an average success rate of 88% and at an average cost of \$56 per tree. The combined value of oaks protected in 2022 and 2023 is estimated at over \$12 million. ([Matteo Garbelotto](#))

UCCE addresses salinity management for pistachio growers

Salinization problems occur on a high proportion of agricultural land in the San Joaquin Valley. To support pistachio growers in managing salinity issues, a UCCE Nut Crops Advisor organized a hands-on workshop for over 100 growers to learn how to calculate irrigation schedules, use soil and water reports to choose appropriate amendments and calculate application rates for

pistachios under saline conditions. After the event, 100 attendees reported that they were likely or very likely to adopt these practices in the future. ([Mae Culumber](#))

Improved air quality

UCCE transforms strawberry farming for healthier air and communities

According to the California Department of Pesticide Regulation, the average amount of fumigant active ingredients used on strawberries between 2019 and 2022 was 9,368,685 pounds/year, posing airborne risks to workers and residents. A UCCE Specialist at UC Santa Cruz and his colleagues continued to conduct on-farm research trials on organic strawberries and develop pest management alternatives to fumigants. Organic strawberry growers in the state began implementing anaerobic soil disinfestation (ASD) using rice bran at a commercial scale after research by UC Santa Cruz and UCCE scientists demonstrated that this practice could provide a comparable yield to fumigated controls' yield. ASD research has facilitated growth in organic strawberry production in California; since 2014, organic strawberries with ASD and rice bran-applied acreage increased by 702 acres. In 2023, 5,287 acres, or 13% of total strawberry acreage in the state, were devoted to organic strawberry production. This means ASD and rice bran fertilizer applications contributed to a reduction of 213,000 pounds in fumigant active ingredients, mitigating the health risks from toxic air contaminants. ([Joji Muramoto](#))

Protection and conservation of soil quality

Tomato growers implement better soil health practices

A UCCE collaboration with AES faculty at UC Davis demonstrated several soil-building techniques, including reduced tillage, cover cropping and organic matter amendments. After learning more about the practices, two California tomato processors have begun providing incentives for their growers to implement soil health practices. With these incentives, greater adoption of these practices has been observed. In addition, even growers who are not receiving the incentives have increased their rate of adoption. (Brenna Aegerter)

Increased ecological sustainability of agriculture, landscapes and forestry

UCCE biocontrol program protects California's citrus industry against serious pest

First detected in California in 2010, Asian citrus psyllid (ACP) is a serious pest of citrus that spreads a bacterium, *Candidatus Liberbacter asiaticus* (CLAs), which causes the lethal citrus disease, huanglongbing (HLB).

ACP devastated the Florida citrus industry and was expected to do the same in California. To prevent that, a UCCE Entomology Specialist at UC Riverside initiated research and extension efforts on the biological control of ACP, which are now showing significant results; ACP pest populations have declined, on average, by about 70% in California. After more than 15 years, ACP-CLAs is still largely limited to urban areas and there have not been major outbreaks of ACP-CLAs in commercial citrus production areas. Overall, the long-term viability of commercial citrus production in California is now far more likely given the highly reduced threat posed by ACP-CLAs. (Mark Hoddle)

AES researcher advances safer practices for using reclaimed wastewater and biosolids

An AES researcher at UC Riverside leads a multistate project investigating the risks of reusing reclaimed wastewater and biosolids in agriculture and how to mitigate those risks. Using reclaimed wastewater and biosolids holds many societal and economic benefits. However, these waste sources often contain trace contaminants like pharmaceuticals, veterinary medicines and industry chemicals, posing risks to crops and human health. By conducting laboratory, greenhouse, and field studies, the researchers look at how these contaminants behave in soil and crops when wastewater and biosolids are used. Additionally, the researchers explore ways to mitigate risks posed by these contaminants. For example, alternating irrigation methods and using reclaimed wastewater only during the early growth have shown promising results in reducing contaminant levels in edible plant parts. The findings of this project benefit a wide range of stakeholders including scientists, regulators, utilities, growers and the general public by providing crucial information for safer and more sustainable agricultural practices. (Jay Gan)

Multistate project promotes sustainable landscape practices

An AES researcher at UC Davis wrapped up his work on a multistate project targeting critical issues faced by the landscape industry, affecting ornamental plant producers, landscape designers and architects, and green infrastructure managers. Six standardized experimental plots were developed in five states to assess landscape plant performance to determine irrigation recommendations and to evaluate how plants will function as climate change. These recommendations also assist with compliance with California regulations on designing water-efficient urban landscapes. Workshops, field days, videos and informational materials were developed and

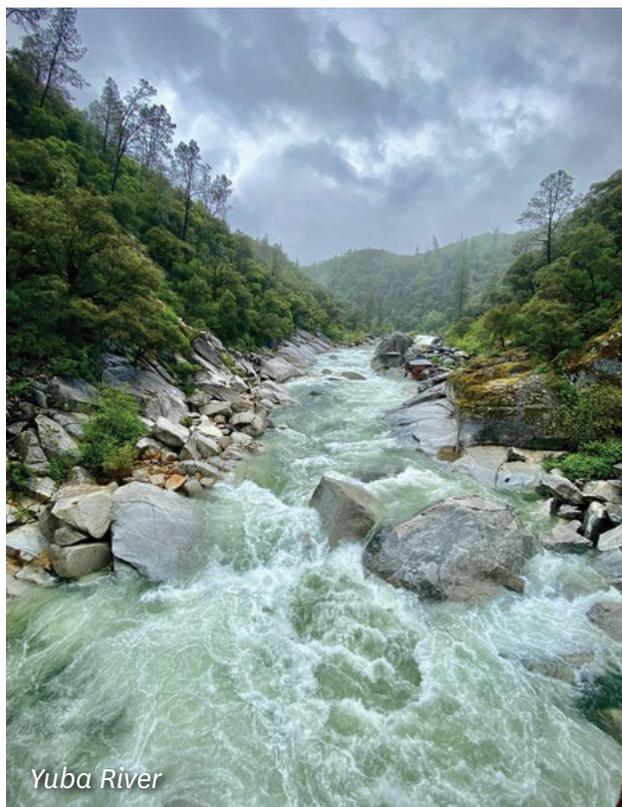


Photo courtesy of Danielle Lee

Yuba River

extended to educate growers, landscape professionals, educators and regulators on efficient water use. The broader public benefits from these efforts through water conservation and the creation of environmentally friendly landscapes, contributing to overall well-being in urban areas. (Lorence Oki)

Improved water quality

UCCE works with ranchers and water board to improve water quality in Eastern Sierra

A UCCE Advisor in the Eastern Sierra region continued to bring expertise in regional water quality planning for the impaired Bishop Creek watershed. UCCE provided technical service and led a planning process that included partner agency and local rancher input. As a result of UCCE efforts, the Lahontan Region Water Board staff adopted and began implementing the Vision Plan, which will reduce the regulatory hurdles faced by local cattle producers by implementing voluntary measures to improve water quality. If the plan is successful, Bishop Creek water quality will improve and the creek will be de-listed as impaired by the U.S. Environmental Protection Agency. (Dustin Blakey)

Improved water use efficiency

Vegetable growers adopt UCCE water-smart strategies

A UCCE Advisor at UC ANR's Desert Research and Extension Center continued water-use efficiency collaborative research alongside 15 desert vegetable growers with nearly 60,000 acres in the Imperial and Coachella valleys. As a result of adopting drip irrigation, irrigation tools

and information on best water and nitrogen management practices provided by UCCE, lettuce growers conserved an average of 0.7 acre-feet of water on a total of 1,100 acres and reduced nitrogen fertilizer application by 14%. Onion growers in the desert region who collaborated with UCCE and adopted drip irrigation conserved an average of 2.6 acre-feet per acre of water on a total of 800 acres and enhanced nitrogen-use efficiency by 53%. Spinach growers who adopted drip irrigation increased water-use efficiency by nearly 12%. As a result of applying less fertilizer and water for food safety and downy mildew control, these onion and spinach growers also reduced fertilizer costs and water treatment costs by \$160 and \$310 per acre, respectively. (Ali Montazar)

Increased water supply security

UCCE partnerships restore forests and increase water security

UCCE continued to be the research partner on the French Meadows Project, west of Lake Tahoe. Research goals are to provide adaptive management of natural resources, especially in forested watersheds, which face widespread threats from overgrowth, drought, pests and wildfires. A UCCE Specialist at UC Merced conducted ongoing, participatory research and capacity building with government agencies, non-governmental organizations, associations and natural resource management groups. As a result, 870 acres of forest were restored in the past season using thinning and mastication. It also resulted in 500 acres of prescribed burns. This restored land contributes to increased water security given forested watersheds cover one-third of the state and serves as the water tower for the environment and millions of people. (Safeeq Khan)



15%

reduction, on average, in annual water usage in date palm production by following UCCE guidelines

24,000

acres of alfalfa being produced using UCCE healthy soil guidelines as part of Delta Drought Response Pilot Program



76%

of the UC Master Gardener Program participants improved use of plants to support pollinators

Safeguarding Abundant and Healthy Food for All Californians



Photo courtesy of Cal Fresh Healthy Living, UC

Cooking Academy students show off healthy snacks they made

Improved food safety

UCCE advisor prepares Korean-speaking farmers to pass produce safety inspections

In the Inland Empire of Southern California, a UCCE Small Farms Advisor supports historically underrepresented farmers to navigate and meet Food Safety Modernization Act (FSMA) regulations. The need for culturally specific outreach emerged through a needs assessment, which showed more than 80 growers in the area were not aware of FSMA regulations. UCCE became the hotline for Korean-speaking farmers, assisting them with education, training and one-on-one food safety assessments during individual farm visits. As a result, farmers completed California Department of Food and Agriculture Produce Safety Rule inspections with no findings, meaning they were fully in compliance. ([Hung Doan](#))

Expanded Food and Nutrition Education Program improves home food-safety practices

UC ANR's Expanded Food and Nutrition Education Program (EFNEP) conducts extension activities focused on improving individual and household food safety. In a survey of more than 1,930 adult participants, 84% showed improvements in one or more food safety practices, such as using safe methods to thaw frozen foods or using a meat thermometer, as a result of participating in the program. Out of 1,815 youth EFNEP participants surveyed, 57% of youth in kindergarten through grade 12 showed improvements in food-safety skills and knowledge. (EFNEP)

Researchers expand understanding of food safety in the modern food supply chain

Food safety incidents result in economic losses across the

supply chain, the waste of edible products and negative impacts on consumer confidence. Food safety incidents are widespread and yet little is known about supply chain impacts. Two AES researchers in agricultural and resource economics at UC Davis, working with another faculty member and a fourth economist, studied the 2018 food safety incident regarding E. coli in romaine lettuce. They found the processors, shippers and grocery retailers incurred the largest losses, and that growers were largely shielded from these losses due to fixed-price provisions in their contracts with processors. The study informs policymakers and industry members about how modern produce markets work, and how contracts affect the distribution of price impacts through the supply chain. (Rachael Goodhue, Richard Sexton, Kristin Kiesel)

Improved food security

UCCE collaboration with Torres Martinez Tribe improves access to fresh produce

A Vegetable Crops Advisor in Southern California works with the Torres Martinez Tribe to improve access to healthy food, knowledge of sustainable crop production and food sovereignty. In collaboration with the tribe, a multidisciplinary UCCE team of CalFresh Healthy Living personnel and agriculture advisors implemented several backyard garden projects including raised-bed vegetable gardens for six families, citrus fruit tree planting for seven families and planting events at the Tribal Senior Community Garden. The new backyard gardens supply healthy and organically grown fruits and leafy greens and can reduce grocery spending. (Philip Waisen)



Photo courtesy of Matt Glass

UC Master Food Preservers demonstrate canning techniques



200+

growers learned about post-flood crop safety from the UC Small Farms Network

\$232,957

of CalFresh nutrition benefits spent at San Luis Obispo farmers market in 2023



1,000+

completions of UC Master Food Preserver eLearning modules

Developing a Qualified Workforce



Photo courtesy of Evett Kilmartin

Participants in 4-H day camp learn about livestock through crafts

Increased workforce retention and competency

UCCE staff helps mentor diverse communities in forestry and natural resource management

The UC Cooperative Extension collaborated with community partners to deliver the Forestry and Natural Resources Career Mentorship Program, a statewide mentoring program aimed at training new members of the forestry and natural resources workforce. The program supported 248 early- and mid-career professionals and students studying forestry and natural resources, particularly those who identify as women, nonbinary, Black, Indigenous, Latinx, Asian, Pacific Islander or LGBTQIA. At the end of the program year, student and early-career participants reported being increasingly motivated and determined to pursue a career in forestry and natural resource management. In addition, professional mentors recognized the value of the Diversity, Equity, Inclusion and Justice (DEIJ) workshops the program hosted, with one citing they “are essential for progressing forestry to a more inclusive profession.” (Katie Low)

Pre-K-12 educators graduate Forestry Institute for Teachers with new skills

A UCCE forestry youth education coordinator oversaw four week-long professional learning events for 96 pre-K to 12

educators in Humboldt, Shasta, El Dorado and Tuolumne counties. Graduates from UCCE’s Forestry Institute for Teachers received three university-accredited continuing education units. These educators also applied their skills to develop and implement a forestry curriculum project in their respective classrooms to share core forestry concepts with their students. These curriculum projects center on civic engagement, workforce development and increasing environmental literacy. (Austin Roughton)

UCCE workshop in Mandarin supports farmers to secure professional licenses

Asian farmers in the San Francisco Bay Area face significant language and cultural barriers to obtaining and maintaining their pesticide applicator permits. For the past seven years, in collaboration with the Santa Clara County Agricultural Division, UCCE has coordinated annual workshops on topics related to pesticide safety, laws and regulations, as well as integrated pest management. In 2023, UCCE offered a Bay Area Chrysanthemum Growers Association Continuing Education Workshop in Mandarin, which was attended by 60 Asian farmers. All attendees increased their knowledge about avoiding pesticide drift, farm labor contractor inspections, pesticide use and school notifications, online pesticide use reporting, the new invasive pest Oriental Fruit Fly and proposed updates to California Department of Pesticide Regulation’s private applicator certificate and fumigation

licensing, and new neonicotinoid pesticide regulations. Workshop participants received continuing education units to maintain their professional licenses. (Aparna Gazula)

Increased effective public leaders

UC 4-H fosters future leaders in disease prevention

UC ANR developed, evaluated and delivered evidence-based educational programs that provided youth with leadership skills. UCCE academics provided oversight, leadership and guidance for the statewide UC 4-H Youth Development Program (UC 4-H). After completing a UC 4-H Epidemiology Project, youth reported not only improved health behaviors for themselves, but also reported being leaders in the health of their communities. Many young participants (62.5%) reported that they can “definitely help” control the spread of diseases, and 71.9% could envision themselves getting involved in their local community to help slow the spread of disease. (Marcel Horowitz)

Improved college readiness and access

GROW program cultivates agricultural career pathways

The UC ANR South Coast Research and Extension Center (REC) collaborated with the Orange County Farm Bureau to deliver programming through GROW, Growing Ag Education through our High Schools. South Coast REC community educators expanded the program to deliver agriculture education to high school youth enrolled in culinary arts and biosciences. Through GROW’s Agriculture Career Pathways program, 303 high school students from five Orange County high schools attended field events at South Coast REC, where they learned about agricultural careers, area crops and how these crops are used in the culinary industry. Following field days, 51% of the 104

attendees stated they were likely or highly likely to consider a career in agriculture. (Darren Haver)

UC 4-H mentoring program advances student success

A UCCE 4-H Youth Development Advisor supported a three-year 4-H National Mentoring Program in Sonoma County, using the 4-H Youth Futures: College within Reach curriculum. In three program cycles spanning from 2019 to 2023, 119 teenagers were mentored by 34 college students. After participating in the program, over 90% of participants have graduated high school, with almost all enrolled in post-secondary education. Additionally, younger students who were in 8th to 10th grade are now progressing successfully through their junior and senior years, on track to graduate. Nearly 20% of the youth opted to become more involved with 4-H programs as volunteers. (Steven Worker)

Increased civic engagement

UC Environmental Stewards Program boosts volunteerism

The UC Environmental Stewards Program conducts activities and training to introduce Californians to the wonders of the state’s unique ecology and engage the public in the study and stewardship of California’s natural communities. In 2023, 69 local program partners conducted 95 courses and certified 1,373 California Naturalists and Climate Stewards. After completing their courses, 93% of participants reported improving their capacity to volunteer. Overall, the number of Environmental Stewards alumni recording volunteer hours has grown to 1,567 individuals participating in naturalist-related civic engagement. In 2023, Environmental Stewards volunteers donated a record high of over 68,387 hours across 52 counties, engaging in participatory science, land and water stewardship, environmental justice and education and interpretation activities. (Greg Ira)

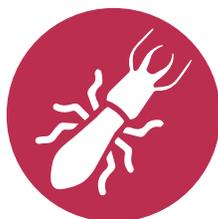


478,176

hours of public service provided by 5,876 UC Master Gardener volunteers

100%

of pest management professionals attending Urban IPM training in Bay Area demonstrated increased knowledge of new monitoring and management strategies for drywood termites



30

professionals certified as Burn Bosses, a UC ANR-supported State Certification program

Building Climate Resilient Communities and Ecosystems



Burn boss overlooking a collaborative burn with the Central Coast Prescribed Burn Association

Photo courtesy of Barb Satink Wolfson

Increased preparedness and resilience to extreme weather and climate change

UC ANR team supports farmers and ranchers to adopt climate-smart practices

In partnership with the California Department of Food and Agriculture, the UC ANR Climate Smart Agriculture educator team has assisted more than 1,785 farmers and ranchers with grant application assistance, project implementation support and education on climate-smart agriculture adoption at 146 workshops and field days. Translation services are offered in English, Spanish, Mandarin, Hmong, Cantonese, Punjabi and Lu Mien. Since 2019, clientele in 33 counties have been awarded almost \$39 million to support 430 projects funded by three state programs: Healthy Soils Program (HSP), State Water Efficiency and Enhancement Program (SWEEP) and Alternative Manure Management Program (AMMP). Clientele continue to receive support from UCCE to implement climate-smart projects. As a result of the HSP, SWEEP and AMMP grant-funded projects, farmers and ranchers applied science-based practices that reduce greenhouse gas emissions and sequester carbon while increasing on-farm resilience. (Hope Zabronsky)

AES research advances value and use of agrivoltaics

Agrioltaics is an emerging technology that addresses a wide range of public interest topics within the water-energy-food nexus, including water conservation, soil health

improvement and green energy generation alongside food production, agricultural resilience, and food and energy security. Despite the potential benefits, agrivoltaics lacks substantial presence and data in California. To bridge this gap, an AES researcher at UC Davis is working on a multistate effort to investigate innovative agrivoltaic solutions to maximize working lands' potential for securing food and energy while building resilience for growers. Researchers led extensive outreach efforts and pilot experiments in agrivoltaics, as well as launched California's inaugural agrivoltaics conference that fostered collaboration among growers, policymakers, energy experts and industry representatives. The team is working to secure funding to support pioneering growers in implementing agrivoltaic modules on their lands, thereby catalyzing visibility and accelerating its adoption. This work aims to demystify agrivoltaics for growers and provide essential information on this new technology. (Majdi Abou Najm)

Adding seaweed to dairy cattle diets reduces methane emissions

Agricultural methane emissions must be decreased by 11 to 30% of the 2010 level by 2030 and by 24 to 47% by 2050 to meet the Paris Agreement's target of limiting the global average temperature from rising more than 1.5°C above pre-industrial levels. To achieve this, sustainable practices are needed to balance productivity with ecological responsibility. An AES researcher at UC Davis has led projects to investigate the use of feed additives, including seaweed, to reduce methane emissions. The research findings suggest that supplementing seaweed

significantly reduces greenhouse gas emissions. The use of seaweed and other feed additives would significantly contribute to meeting the Paris Agreement goals by mitigating enteric methane emissions from U.S. dairy farms. (Ermias Kebreab)

Advisor helps strengthen natural disaster responsiveness in Northern California

A UCCE Livestock and Natural Resources Advisor in rural Northern California worked with colleagues and emergency service personnel on the development of 10 county livestock and Ag Disaster Pass programs across the state, which grant farmers and ranchers special access to their land during natural disasters. With an Ag Disaster Pass, farmers and ranchers can care for their livestock and agricultural assets and provide auxiliary support to emergency personnel, which mitigates damage and expedites emergency responses. As a result of UCCE's dedicated effort, there are programs in counties that have experienced catastrophic fires, including Butte, Plumas and Sierra. There is international interest in replicating the program, and the advisor has shared lessons learned and the value of the Ag Disaster Pass program in Canada, Vietnam and Australia. (Tracy Schohr)

UCCE teaches home hardening and defensible space strategies to reduce fire risk

More than 1,000 community members participated in home hardening and defensible space events led by a UCCE Fire Advisor at the South Coast Research and Extension Center. The 43 events included webinars, virtual workshops, in-person presentations and community events to engage populations with different demographics and interests. Eighty-four percent of participants who responded to post-presentation surveys indicating they will use the content again in the future. Empowering residents and communities in reducing their fire risk will help limit losses in future fires. (Luca Carmignani)

AES research illuminates how wildfire impacts soil health

An AES researcher at UC Riverside is advancing understanding of community dynamics of organisms in the soil after wildfires across ecosystem types, including chaparral and forested ecosystems. Changes in underground communities are expected, and this research applies high-precision methods to know which species reduce, stay the same or increase after a fire. Understanding what happens below-ground after wildfires will help land managers better decide when and where to conduct prescribed fires and/or selectively allow wildfires to burn. This work may also help managers with engineering microbiomes to improve ecosystem restoration after fires. (Sydney Glassman)

Researchers explore risk-cost trade-offs of efforts to bolster electrical infrastructure

Electricity infrastructure has ignited some of the largest and most destructive wildfires in recent years. Utilities are now deploying a variety of strategies and investments to reduce the likelihood that their infrastructure causes fires in the future. AES researchers at UC Berkeley are assessing the impacts of simultaneous efforts to mitigate wildfires caused by powerlines and expand the power grid. In the coming years, utilities are proposing to spend billions of dollars on these efforts, so it is important to judiciously assess the risk-cost trade-offs. As wildfire risk escalates, regulators and utilities will need to weigh risk mitigation benefits against affordability concerns and electrification efforts that rely on low retail rates and reliable electric service. This research, which explores these trade-offs using detailed data from the largest utility in the country, provides ratepayers, policymakers and other stakeholders with in-depth data to strategize policies related to climate change and wildfire mitigation. (Meredith Fowlie)

Home composting program aims to reduce waste and air pollution

UCCE Santa Clara County's Composting Education Program focuses on diverting waste and reducing truck trips to landfills, potentially reducing air pollution. The program targets residential areas by providing free workshops throughout the county to educate and promote home composting. In 2022, composting outreach reached more than 20,000 residents at 85 different events. Three months after attending a home composting workshop, attendees composted at home an estimated 73.6 tons of organic waste, which includes 8.7 tons of food waste. Thus they saved 3.17 metric tons of CO₂ from being emitted, equivalent to emissions produced while driving 7,869 miles in an average gasoline-powered car. (Sheila Barry)



~\$1.5 million

community investment in wildfire preparedness using UCCE Firewise tool

20,600+

tons of estimated carbon emissions reduced per year by the Alternative Manure Management Program



Promoting healthy people and communities



UC Master Gardener improves green space

Photo courtesy of Matt Glass

Improved health for all

Great Tomato Challenge promotes gardening and nutrition

CalFresh Healthy Living, UC Cooperative Extension in Amador, Butte, Colusa and Glenn counties, and the UC Master Gardener Program collaborated on their second annual Great Tomato Challenge, a program aimed at promoting container gardening within the Community Housing Improvement Program (CHIP) through a blend of educational workshops and a vibrant social media contest. More than 40 adults participated in 90-minute Fresh from the Garden workshops across five CHIP sites, which were advertised in English, Spanish and Hmong. They learned how to harvest, store and prepare fresh tomatoes. In a post-program survey, seven respondents who previously reported not eating more than one kind of vegetable a day committed to eating more varieties of vegetables each day. One participant reported, “This workshop helps my family to be healthier.” Gardening has a role in promoting greater vegetable intake and variety, which improves overall health. ([Veronica Van Cleave-Hunt](#), [CFHL](#), [UC](#), [UC Master Gardener Program](#))

AES research identifies dietary strategies to improve pancreatic cancer outcomes

Pancreatic cancer is one of the deadliest cancers with only a 10% five-year survival rate globally. Therefore, expanding preventive and treatment options is a pressing issue. An AES researcher at UC Davis is evaluating dietary strategies to prevent pancreatic cancer progression and reduce the risk of developing pancreatic cancer. Specifically, the researcher conducted a project to elucidate how a ketogenic diet, a diet with high amounts of fat and low content of carbohydrates, affects pancreatic cancer growth in mice. The results of this project suggest that a ketogenic diet holds promise as an supplemental therapy for pancreatic cancer and may promote maintenance of muscle mass. ([Gerardo Mackenzie](#))

Nutrition and culinary course improves food-related habits of college students

A UCCE Specialist at UC Berkeley studied the effects of a nutrition and culinary course designed for college students. Transitioning from parental care to college life, many students lack the skills to grocery shop and cook their meals, potentially leading to suboptimal dietary habits. To address

this issue, UC Berkeley developed a course aimed at improving students' dietary intake, meal preparation skills, food security and stress levels. Compared to a control group, students who completed the course reported significant changes in their food-related habits: an increase in the number of cups of fruit consumed, an increase in the frequency of cooking their own meals and a decrease in the frequency of skipping meals. (Susana Matias)

Improved community health and wellness

UC brings healthy vending guidelines to campuses

Over several years, a Nutrition Policy Institute (NPI) academic spearheaded the development of the UC Healthy Vending Guidelines along with an implementation toolkit. The effort was part of the UC Global Food Initiative and involved partnerships with UC campuses to promote and adopt healthy vending practices. As a direct outcome of these collaborative efforts, UC adopted a new section into the UC Sustainable Practices Policy, under the Health and Well-being Policy Area. The policy sets a goal for UC suppliers responsible for operating or maintaining vending machines on UC premises to ensure that 50% of beverages and 35% of snacks meet the UC Healthy Vending Guidelines. These percentages are slated to increase to 60% and 40%, respectively, by the year 2027. (Janice Kao)

Urban IPM program reduces bed bug infestations

An Urban Integrated Pest Management (IPM) Advisor researches IPM services for bed bugs, cockroaches, fleas, rodents, ants and other urban pests. Research findings have included significant decreases in pest infestations, which may bring immediate relief to those who live, work and study at demonstration sites. Bed bug demonstration sites typically include 50 to 150 residential units, each housing one to four residents, many of whom have experienced barriers



Photo courtesy of Evett Kilmartin

Cooking Academy student holds cooking utensil

to accessing safe and healthy housing due to age, ability, income or other factors. In 2023, demonstration sites showed significant decreases in bed bug incidence, with a 100% reduction in individual cases and up to 88% property-wide, as well as in infestation severity (up to 99% reduction in individual cases) directly improving living conditions for residents in over 130 units. (Andrew Sutherland)

Improved access to positive built and natural environment

UC Master Gardener Program fosters green spaces

The UC Master Gardener Program teaches people how to grow food and gardens sustainably through public 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 2023, 80 participants in the UC Master Gardener volunteer-led educational programs reported in a statewide survey that they applied sustainable gardening practices they learned from the program to over 294,233 square feet of school and community gardens, providing an important benefit to their broader communities. (UC Master Gardener Program)



98%

of 1,930 adult EFNEP participants improved their diet quality

79%

of youth participants in 4-H SNAC Clubs learned cooking skills to prepare food at home





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