

CA&ES Outlook

Our agricultural
research drives
innovation. **4**

Four students
who lead
by example. **14**

THE STRENGTH OF THE CENTRAL VALLEY

CA&ES students,
top to bottom:
Megan Reese,
Jacob Gomez,
Edward Silva,
and Michelle Vang.

CA&ES Outlook

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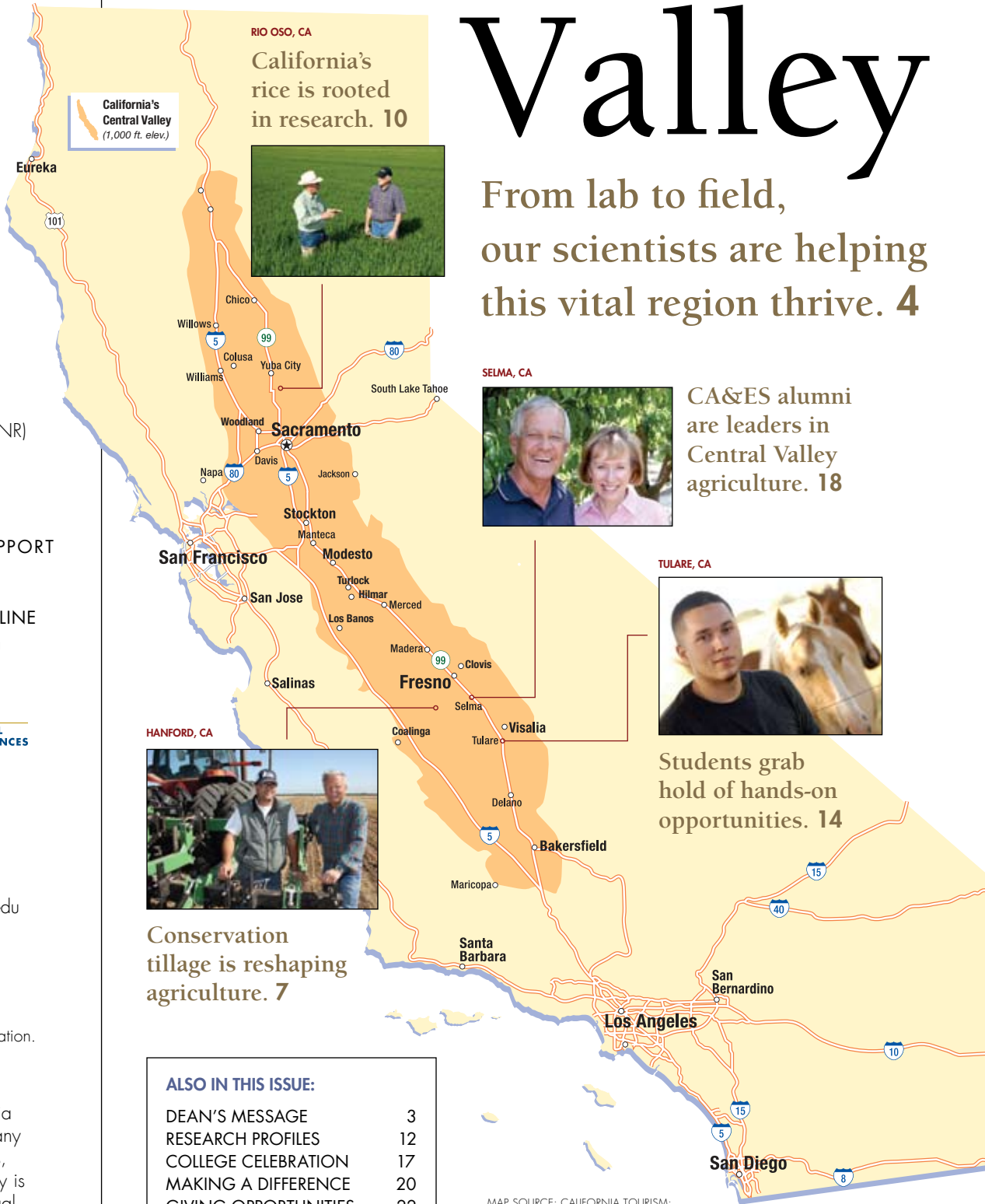
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All about the Central Valley

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MAP SOURCE: CALIFORNIA TOURISM; UC DAVIS INFORMATION CENTER FOR THE ENVIRONMENT (CENTRAL VALLEY BOUNDARY.)

VITAL TO THE VALLEY

Central Valley agriculture is a knowledge-intensive business

CALIFORNIA IS THE TOP FARM STATE IN THE nation, in large part because of the agricultural productivity of the great Central Valley. The region encompasses the Sacramento and San Joaquin valleys, and includes all or portions of 17 counties spanning more than 400 miles from Redding to Bakersfield. Vegetable, fruit, and nut production are the largest farming industries, followed by the beef and dairy industries.

Calculations by the UC Agricultural Issues Center confirm that agriculture—farming and closely related activities such as food processing—continue to be a major economic driver in the Central Valley. The direct contribution is more than 290,000 jobs and \$65.5 billion in sales (2009 figures). Ripple effects include purchases and employment in marketing, transportation, and other industries, as well as purchases and government services demanded by those employed in agriculture—schools, entertainment, and consumer transportation, for instance. Including these ripple effects, agriculture accounts for about 22 percent of Central Valley employment and almost 21 percent of the gross regional product.

The Central Valley is an economic powerhouse for many reasons. Few places in the world have the combination of fertile and abundant farmland, extensive water storage and conveyance for irrigation, and ideal climate for growing food.

In addition, higher education and research foster innovations that help drive the Central Valley's dynamic agricultural economy. Agriculture is a knowledge-intensive business that depends on university science for critical advances. California farmers work closely with UC Davis scientists on and off campus to find new ways to improve plant and animal nutrition, increase crop yields, maintain water quality, manage pests, and sustain the viability of agriculture. In measurements of research output in support of locally important commodities, no university in the U.S. exceeds the research volume and accomplishments of UC Davis.

We are also working to make the Central Valley a better place to live. Some valley residents face social and environmental challenges traced in part to the valley's economic dependence on agriculture—poverty, unemployment, water shortages, environmental degradation, and an undereducated workforce. Our



KATHY BARRANTES/UC DAVIS

Peter Arellanes ('86; left), export manager for table grape producer Sunview Marketing International in Delano, with Dean Neal Van Alfen. Arellanes is one of many UC Davis alumni who contribute to the success of agriculture in the Central Valley.

research and programs are addressing these issues to improve the quality of life for valley residents.

The Central Valley is an unparalleled region of agricultural productivity and environmental resources, but it faces important challenges. Having grown up in Modesto, I am a Central Valley native and thus care deeply about the valley's future. I am confident that this place we call home will continue to thrive and that UC Davis will continue to play a vital role in its success.

NEAL VAN ALFEN, DEAN
COLLEGE OF AGRICULTURAL AND
ENVIRONMENTAL SCIENCES

Note: This is my last issue of CA&ES Outlook magazine as dean of the college. After 13 years as dean, I am resigning and returning to my faculty position in the Department of Plant Pathology at UC Davis. The widespread support I received as dean allowed us all to work together to strengthen this extraordinary college that has impact throughout California and the world. Thank you for your ongoing commitment to the College of Agricultural and Environmental Sciences.

Story by John Stumbos, Robin DeRieux,
Jeannette Warnert, and Ann Filmer

The great Central Valley

**A long tradition of innovation
spurs growth in the nation's
most productive agricultural region.**

Ever since the First Transcontinental Railroad linked California to the eastern U.S. in 1869, the fertile Central Valley of California has supplied the nation with a succession of agricultural products such as wheat and grains, cattle and poultry, fruits and vegetables, dairy and meat, and nursery crops.

The Central Valley stretches more than 400 miles from Redding to Bakersfield, encompassing the Sacramento Valley in the north and the San Joaquin Valley in the south. Agriculture is one of the largest economic drivers in the Central Valley, with major production of dairy, grapes, nuts and tree fruits, cattle and poultry, tomatoes, and rice. Of California's \$37.5 billion annual agricultural production, 62 percent is from the Central Valley (CDFA data, 2010). More than 20 percent of U.S. food is produced in the Central Valley, making California critical to the nation's food security.

Despite the success of agriculture in the Central Valley, the region is one of the fastest-growing areas in California, which has imparted social and environmental challenges such as poverty, unemployment, low educational attainment, exposure to environmental toxins, and loss of prime agricultural land. Agriculture itself faces challenges to remain economically vital—growers and ranchers must

continue to produce high-quality food on less land and with fluctuating water supplies, urban population pressures, and global market changes.

The University of California, with its Agricultural Experiment Station and Cooperative Extension, has been pivotal in helping California become the nation's leading food-producing state.

UC Davis, the land-grant university located in the Central Valley, has had a strong partnership with agriculture for more than a century.

UC Davis research has contributed to increased agricultural yields, sustainable production practices that maintain water quality and reduce pesticide use, and new markets for the valley's agricultural commodities. UC Davis continues to work closely with agricultural producers to develop new technologies and production practices, and to address emerging issues that impact agriculture. The university is also helping to find solutions to environmental issues such as air and water quality, grazing land management, and restoration of wetlands and wildlife.

The issues that affect the people, the land, and the future of the agricultural economy of California are at the heart of UC Davis research and outreach. The stories featured herein highlight some of the work we do to support the vitality and the future of California's great Central Valley. — AF

Dryland farming near
Rio Vista on the western
edge of the Central Valley.

TERRANCE EMERSON/ISTOCKPHOTO



UC Cooperative Extension farm advisor Richard Molinar (above) has been conducting variety trials on squash, eggplants, melons, and green beans at the Kearney Agricultural Center for more than 20 years. In this trial Molinar worked with UCCE farm advisor Manuel Jimenez and UC Davis plant pathology professor Robert Gilbertson to identify the best zucchini varieties for growers to plant.

Innovation at Kearney field station

Far from the UC Davis campus, CA&ES faculty have been at work for decades at a unique research station in the heart of the San Joaquin Valley.

Established in 1962 on 330 acres of prime farmland southeast of Fresno, the UC Kearney Agricultural Research and Extension Center is internationally renowned for the development of new fruit, nut, and grape varieties, innovative cultural and irrigation practices, pest and disease management techniques, and postharvest biology. The center is managed by UC Agriculture and Natural Resources.

“Kearney has evolved over the years into a valuable research campus,” says the center’s director, Jeff Dahlberg. “We are home to dozens of resident and visiting scientists—many of them from UC Davis—

and specialized laboratories and greenhouses. We have facilities to host large and small groups. At any one time about 100 research projects are under way.”

Kearney is especially valuable for long-term research projects, such as an 11-year effort to provide pistachio growers with a tool to reduce aflatoxin contamination. Hundreds of thousands of pounds of pistachios are rejected each year because of aflatoxin.

UC Davis plant pathologist Themis Michailides and fellow researchers at Kearney discovered how to expose pistachio trees to the spores of a beneficial fungus to displace the fungi that produce aflatoxin. California pistachio growers are now applying this beneficial fungus in their orchards to reduce aflatoxin contamination.

In another project, UC Davis plant sciences agronomist Dan Putnam and colleagues are studying how to control weeds on a six-acre plot of organic alfalfa. First-year trials at Kearney revealed that late-November planting of organic alfalfa resulted in a weak stand and severe weed intrusion.

“For organic growers, paying attention to planting time is particularly important because there are so few weed control options,” Putnam said.

Looking to expand options for winegrape growers, UC Davis Cooperative Extension viticulturist Matthew Fidelibus is supervising the production at Kearney of 56 winegrape varieties from places like Spain, Greece, and Italy, where the climate is similar to the San Joaquin Valley.

“Most of the popular wine varieties—Merlot, Cabernet Sauvignon, Chardonnay—are at

their best in somewhat cooler climates,” Fidelibus said. “So we are looking for grapes that make superior fruit in warm climates.”

Dozens of additional ideas are

being nurtured at Kearney, such as growing sorghum as a potential feed and fuel crop, producing fruit on dwarf trees to facilitate harvest, and grafting blueberries on new

rootstocks for better growth.

“Kearney is positioned to support California agricultural innovation long into the future,” Dahlberg says. — JW

How conservation tillage is reshaping agriculture

A farming revolution is building momentum in California’s Central Valley.

Conservation tillage, which emerged in the Midwest after the Dust Bowl, has become a common agricultural practice throughout the world. But in California, conventional agricultural tillage practices haven’t changed much in decades—until now.

In the last 10 years a rapidly increasing number of California farmers have switched from tillage-intensive practices to alternatives such as strip-till and no-till agriculture to grow wheat, barley, triticale, tomatoes, beans, corn, and other crops.

“These systems reduce inputs, cut costs, and have benefits for the soil resource,” says Jeffrey Mitchell, a UC Davis Cooperative Extension specialist. “But they’re not without risk. You have to plan out the sequence of management operations. That’s the tricky part.”

Mitchell spends a good portion of his time at the university’s West Side Research and Extension Center in Five Points. For more than 15 years he has conducted field research on new tillage strategies and has been instrumental in coordinating a workgroup that provides a focal point for farmers, academics, and agency personnel interested in conservation tillage.

Conservation tillage is characterized by less tillage and fewer tractor passes across farm fields. In California it is evolving into a comprehensive approach that incorporates minimum soil disturbance, pres-



JOHN STUBBS/UC DAVIS

Pioneering farmer Dino Giacomazzi (left) has worked closely with Jeff Mitchell (right), a Cooperative Extension specialist, to implement conservation tillage practices.

ervation of plant residues, diverse crop rotations, use of cover crops, integrated pest management, and precision irrigation.

“We’re broadening our horizons,” Mitchell says. Earlier this year the workgroup morphed into Conservation Agriculture Systems Innovation (CASI) to reflect that shift. It has 1,800 members.

Dino Giacomazzi, a fourth-generation Hanford dairyman, is an advocate of conservation tillage. To feed his 900-head herd of Holstein cattle, he grows wheat, corn, and alfalfa. In the wheat-corn rotation, he used to make as many as 11 tractor passes over a field. Now he typically makes two.

“We’re cutting costs and we’re seeing the same or better yields,” he said. “But the reality is it requires much more of my

time because it’s much more management intensive.”

In addition to cutting fuel, labor, and equipment costs, conservation agriculture is good for the environment. Less soil tillage means less dust, an air quality concern. Research has also documented significant water savings and beneficial carbon sequestration in conservation tillage systems.

Mitchell believes that with encouragement from progressive farmers like Giacomazzi and other early adopters, these systems will inevitably become more widespread.

“These people put all the pieces together,” Mitchell said. “They’re innovative. They’re tenacious. They have the ‘curiosity coefficient’ and they have a view for improved systems.” — JS

Helping to turn dairy byproducts into a cash cow

UC Davis researchers are transforming an unusable dairy byproduct into a food supplement that may improve human health and provide additional revenue for the California dairy industry.

Concentrated in the Central Valley, the California dairy industry is the largest in the nation. Keeping it profitable, however, requires innovation.

CA&ES scientists have discovered the presence of certain components in cow's milk—complex sugars called oligosaccharides—that could be developed into food supplements of promising benefit to human health, especially for infants, the elderly, and others with compromised immune systems. Researchers have found these complex sugars to be present in whey permeate, a byproduct of cheese making. Whey processors send thousands of pounds of valuable oligosaccharides down the drain each day.

“We want to solve the problem of the accumulation of byproducts and improve the sustainability of the dairy industry,” said Daniela

“We want to solve the problem of the accumulation of byproducts and improve the sustainability of the dairy industry. At the same time, we can solve important problems relevant to human health.”

Barile, a professor of food science and technology who has identified more than 60 oligosaccharides in whey. “At the same time, we can solve important problems relevant to human health.”



Professor Daniela Barile conducts research on cow's milk that has promising implications for human health.

ROBIN DEREUX/UC DAVIS

Originally from Italy, Barile joined the UC Davis faculty in 2011. Her research builds on the findings of campus colleagues, who discovered that certain oligosaccharides present in human

populations at risk for intestinal infection remains a significant challenge.

When Barile began her investigations, it was believed that only a few oligosaccharides were present in cow's milk, and that they were different from those found in human breast milk. Not true, she discovered. Barile's research revealed the presence of significant quantities of complex oligosaccharides in whey that have the same protective qualities as those found in human milk.

A subsequent challenge was to develop technology that isolated these oligosaccharides in sufficient quantities to test their effectiveness on human health in clinical trials. Because whey is 90 percent water, the complex sugars

are quite diluted. California cheese makers such as Hilmar Cheese Company have partnered with Barile to provide pure bovine milk oligosaccharide powder isolated from whey permeate.

Barile and her network of

UC Davis researchers—including food science and technology professor Bruce German, viticulture and enology professor David Mills, nutrition professor Carolyn Slupsky, and postdoctoral researcher Jennifer Smilowitz—have begun conducting

the first clinical trial of this supplement on healthy adults.

“This work is about translating previous knowledge gained on human breast milk,” said Barile. “We can be the dairy industry’s innovation, their inspiration.” — RD

Immigrant workers fill the demand for seasonal labor

Fresh fruits and vegetables pose a unique labor problem for California agriculture.

California produces nearly half of the fresh fruits and vegetables grown in the United States. Unlike the largely mechanized crops grown by other states, fruits and vegetables are labor-intensive. To bring these commodities to market, growers in the Central Valley and other parts of California need a short-term, affordable workforce for planting, pruning, and harvesting.

“The demand for labor is seasonal,” said UC Davis Professor Phil Martin, an expert on immigration and labor. “How do growers make sure there are people available to fill the seasonal jobs? What happens to these seasonal employees when there is no work?”

For decades, the solution has been to reach across the border for unskilled, low-cost foreign labor. Since the 1940s, Mexican immigrants have filled most of the farmworker jobs in the Central Valley.

According to Martin, about 85 percent of the workers on California farms are immigrants, and more than half of them are not authorized to work in the United States. Farmworkers in California are typically able to find work 1,000 hours a year, earning about \$10,000, which places them below the U.S. poverty threshold.

“We’ve done studies that show poverty actually increases with an increase in seasonal farm jobs,” said Professor Ed Taylor of the UC



EDWIN REINBERG/USDA

“The New Rural Poverty: Agriculture and Immigration in California” by Philip Martin, Michael Fix, and J. Edward Taylor, explores the connections between California’s labor-intensive crops, seasonal farm jobs, and poverty among migrant workers.

Davis Department of Agricultural and Resource Economics. “It’s the opposite of other sectors of the economy.”

Martin and Taylor—together with co-author Michael Fix of the Migration Policy Institute in Washington, D.C.—explore these issues in their book, “The New Rural Poverty: Agriculture and Immigration in California.” They show that seasonal farmworkers leave the agriculture workforce after about a decade, and their children educated in the United States shun farm jobs. This creates an immigration treadmill, as farmers scour poorer places abroad in search of replacement labor.

According to Martin and Taylor,

the availability of cheap immigrant labor creates a disincentive for California growers to mechanize. It also makes agriculture dependent on Mexican workers.

A recent Pew Hispanic Center study shows that net migration from Mexico to the United States has fallen to zero for the first time in four decades. Without newcomers to replace the seasonal workers who eventually leave farm work, California agriculture may face labor shortages. Many Central Valley growers already experience difficulty finding enough workers.

“In the long run,” said Martin, “Americans may learn there is nothing more expensive than cheap farm labor.” — RD



Research helps rice industry thrive amidst challenges

In 1912, after years of trial and error by enterprising farmers and scientists to find a crop that would grow on heavy clay soils in the Sacramento Valley, 1,300 acres of a Japanese rice variety were grown in Butte and Colusa counties. It was California's first commercial rice crop, averaging 2,565 pounds/acre.

A century later, California rice is grown on more than 500,000 acres of laser-leveled fields, water-seeded by aircraft, precision managed to control weeds, diseases, and insect

pests, and harvested each fall with high-tech combines. With the development of new varieties and a steady stream of research advances and technological improvements, yields now regularly top 8,500 pounds/acre—the highest in the world. It's no wonder rice is the leading commodity throughout most of the Sacramento Valley. In 2009 alone, California exported \$877 million worth of rice to destinations around the globe.

Jim Hill, a UC Davis Cooperative Extension specialist and rice expert, credits much of the rice industry's success to the long history of cooperation between innovative growers and scientists from the University of California, the U.S. Department of Agriculture, and the grower-funded Rice Experiment

Station (RES) in Biggs, Calif.

"It's been a really good partnership," Hill says. He and a team of UC Cooperative Extension farm advisors have conducted on-farm field trials on experimental rice lines developed at the RES for more than 30 years.

Advances in rice production have been made possible over the years through the contributions of dozens of UC Davis scientists.

Examples include:

- In the 1920s, UC crop irrigation scientist Carroll Dunshee helped develop "continuous flood" irrigation to control weeds.
- In 1932 agricultural engineering professor Roy Bainer's research led to direct combining and bulk handling of the crop.
- In the late 1950s irrigation

Above: Yuba County farmer and industry leader Michael Rue (left; B.S. '71; J.D. '74) with rice specialist Jim Hill (Ph.D. '73). Rue says collaborative research has improved rice production efficiency and yield, and puts California "at the forefront of quality in the world."

engineers Robert Hagan and Franklin Raney designed warming basins to solve rice-growth problems associated with cold irrigation water from new dams.

- In the 1960s plant scientists Duane Mikkelsen, Marlin Brandon, and associates showed that a zinc deficiency was the cause of “alkali disease,” developed “critical nutrient concentrations” for rice varieties, and devised strategies to enhance fertilizer efficiency.

A marketing order passed by the industry in 1969 established a new funding source to significantly increase the amount of rice research conducted by UC Davis, RES, USDA, and others. This work has helped California rice farmers become more productive and address environmental concerns, as well.

Research on rice straw management in the 1980s and 1990s helped the industry cope with a

Advances in rice production have been made possible over the years through the contributions of dozens of UC Davis scientists.

legislatively mandated phasedown of open-field burning. “The university was instrumental in looking at how straw incorporation would affect fertility management and whether winter flooding could be used to break down rice straw,” Hill said. “UC research showed that the straw would break down and contribute about 30 pounds of nitrogen per acre.”

Winter flooding combined with straw incorporation proved to be a boon for migrating waterfowl and other wildlife. Today about half

Farm fresh delivered to your door

An increasing number of small farms in the Central Valley are selling directly to consumers through Community Supported Agriculture operations, known as CSAs. Consumers buy a “subscription” to the farm, which provides members with a box of fresh produce on a regular basis.

A recent study led by Ryan Galt, a UC Davis professor of human and community development, examined CSA farmers in 25 counties in the Central Valley and surrounding foothills. Galt and his colleagues found that the number of CSA farms and the number of CSA members in the study area have grown rapidly since the early 1990s.

“We found that the CSA was a crucial direct-to-consumer marketing channel for the small- and medium-scale farmers in our study,” said Galt. “On average, the farmers obtained 58 percent of gross sales from their CSA.”

The study found that innovation has been a key factor in CSA growth, with farmers varying payment and delivery systems to make regular



RYAN GALT/JUC DAVIS

Membership in Community Supported Agriculture operations in the Central Valley and surrounding foothills increased from less than 700 in 1990 to approximately 33,000 in 2010. Above: Jim Muck runs a CSA in Wheatland.

direct sales more attractive and accessible to consumers who are unfamiliar with the concept or who can't afford a large upfront cost, common realities in the Central Valley. Researchers also found that CSA farmers in the Central Valley study share a dedication to protecting the environment and providing healthy food to their communities. — RD

the rice fields are winter flooded, and conservation organizations like Ducks Unlimited and the California Waterfowl Association work with rice farmers to ensure that habitat is there to sustain waterfowl.

In the early 1980s, elevated levels of rice herbicides were detected in the Sacramento River and blamed for an off-taste in drinking water. UC Davis environmental toxicologists determined how these herbicides dissipated in rice fields.

UC Cooperative Extension research also helped the industry move to alternative irrigation systems that allowed herbicides to break down more completely.

“It's hard to predict what the next problem is going to be out there, but nature abhors a vacuum,” Hill says. “There will be a new disease or a new weed, so we can't just sit by. We need to continue our strong collaboration with the industry.” — JS



TARA ZAGORNY/UC DAVIS

CRC director Jonathan London (center) presents Land of Risk/Land of Opportunity at a press conference in Stockton. "It's gratifying to see policymakers and advocates applying our findings to improve the health and well-being of the San Joaquin Valley," he said.

CHANGE ON THE LANDSCAPE

Study on environmental and social risks influences policy changes

A STUDY BY THE UC DAVIS CENTER FOR Regional Change (CRC) on the elevated environmental and social hazards faced by many residents of the San Joaquin Valley is beginning to have an impact on policy development in the region.

The study, "Land of Risk/Land of Opportunity," found that about half the people who live and work in the San Joaquin Valley face elevated levels of air and water pollution. It identified pockets of poverty, limited education, language barriers, and racial and ethnic segregation as obstacles, and also found that residents of the region report more environmental hazards than are documented by state agencies.

Government's Regional Transportation and Sustainable Communities Plan.

The San Joaquin Valley Air Pollution Control District is considering using maps from the report to complement the district's environmental justice maps for the region.

The report was presented in a legislative briefing and has been used as a model for community-engaged research by state and federal agencies such as the U.S. Environmental Protection Agency and the Governor's Office of Planning and Research.

The study was funded by the Ford Foundation and conducted in partnership with the San Joaquin Valley

The report is available at <http://regionalchange.ucdavis.edu/projects/current/ceva-sjv>.

When the study was released in November 2011, professor and CRC director Jonathan London said, "Comprehensive action is needed by local, regional, and state policymakers to protect the health and well-being of the region's most vulnerable residents." Since that time, a number of developments have taken place, including:

Community organizations such as California Rural Legal Assistance, Fresno Metro Ministries, San Joaquin Valley Latino Environment Advancement Project, and Clinica Sierra Vista have used the report to advocate for public health in the region.

The report helped launch the Fresno Council of

Cumulative Health Impact Project, a coalition of environmental health and social justice organizations in the region. It used a new measure—the Cumulative Environmental Vulnerability Assessment—to identify locations and populations with the greatest risk.

According to that measure, 51 percent of San Joaquin Valley residents experience elevated cumulative environmental vulnerability. Communities facing the greatest levels of acute vulnerability include rural and urban areas in West Fresno, Monterey Park, Kettleman City, Matheny Tract, Earlimart, and Wasco.

— John Stumbos

NOT A CHEAP FIX

Groundwater study provides clarity on nitrate problem

A UC DAVIS STUDY OF NITRATES IN THE drinking water of the southern San Joaquin Valley and the Salinas Valley found that the people most affected live in small communities or rely on private domestic wells.

A report released in March, “Addressing Nitrate in California’s Drinking Water,” summarizes findings from the 18-month investigation. It defines the extent of the problem, suggests promising solutions, and outlines potential funding mechanisms.

“We found that there are large areas on the east side of the Tulare Lake Basin and in the Salinas Valley that have elevated levels of nitrate that exceed the drinking water limit,” said Thomas Harter, a UC Davis Cooperative Extension groundwater specialist and one of the lead authors of the study. The nitrate drinking water limit is 45 milligrams per liter. High nitrate levels are of concern because they pose health risks.

See the full “Addressing Nitrate in California’s Drinking Water” report online at groundwaternitrate.ucdavis.edu.

In Tulare County, more than 30 percent of domestic wells regularly exceed the drinking water nitrate standard, while Fresno, Kern, and Kings counties were in the range of 8 to 12 percent. In Monterey County about 13 percent of the domestic wells exceeded the standard.

Among the 2.5 million people in the study area who are on a public water system, about 10 percent have been exposed to nitrate levels exceeding the drinking water standard within the past 10 years.

“A quarter million people, mostly in small communities, are exposed to nitrate levels that exceed the drinking water limit,” Harter said. “It’s the economically disadvantaged small developments in agricultural areas that really struggle when they exceed the nitrate limit. Helping these communities is going to be a key issue.”

The study was funded by the State Water Resources Control Board in response to Senate Bill SBX2 1, legislation in 2008 that required an examination of nitrate contamination of the groundwater in the Tulare Lake Basin and the Salinas Valley.



KOBIN DEREUX/UC DAVIS

UC Davis groundwater expert Thomas Harter, a lead author in the groundwater study, says getting safe drinking water to the worst affected areas should be a top priority.

Scientists examined water quality records covering wastewater treatment plants, septic systems, parks, lawns, golf courses, and farms. They concluded that more than 90 percent of the nitrate contamination in groundwater in these areas is from agricultural sources—principally from synthetic fertilizer use, manure applications to cropland, and confined animal facilities such as dairies.

Fixing the drinking water systems in affected areas could cost \$20 million to \$35 million per year for decades. Several potential funding solutions, including a fee on nitrogen fertilizer or water use, are identified in the study.

“First and foremost, this is about getting safe drinking water to people,” Harter says. “In the intermediate and long term, it’s about fixing the source of the problem.”

— Outlook Staff and UC Davis News Service



NEIL MICHEL/AXCOM

Central Valley students represent four CA&ES majors: (from left) Michelle Vang, nutrition science, Megan Reese, plant sciences, Jacob Gomez, animal science, and Edward Silva, international agricultural development.

THE CREAM OF THE CROP

Four outstanding students from the Central Valley have taken advantage of opportunities at UC Davis and are preparing to tackle the challenges that face the Central Valley both today and tomorrow.

Michelle Vang / Stockton

Although Michelle Vang spent only two years at UC Davis, she took advantage of her time on campus to sample multiple career options through internships and club activities. A nutrition science major, the transfer student from Stockton graduated in June.

Before returning to Stockton, Vang spent two quarters, one day a week, working as a student intern at the UC Davis Medical Center to explore a career in medicine. She did medical center rotations in pediatrics and obstetrics. Vang also interned for a quarter at Grant Union High School in Sacramento, where college student volunteers help high school students learn

about gardening, cooking, health, and nutrition.

During her senior year on campus, Vang served as an officer for two Hmong student groups—the Hmong in Health Organization and the Hmong Student Union. She participated in outreach activities to educate Hmong parents about the value of higher education for their children. She also promoted health within the Hmong community, increasing awareness of diet-related illnesses.

“A lot of Hmong people don’t trust Western medicine,” said Vang, who plans to work in a nutrition research lab before she pursues graduate studies or medical school. “I can see how Hmong professionals would be able

to gain the trust of the community. I would like to educate my community and give back.”

Jacob Gomez / Tulare

Animal science major Jacob Gomez could have attended college just about anywhere he wanted. He chose UC Davis.

As a Gates Millennium Scholar, Gomez was one of 1,000 high school seniors selected nationwide to receive a full scholarship at the university of his choosing. Gomez passed up Cornell and UCLA to become an Aggie.

“UC Davis is the best fit for me,” said Gomez, a native of Tulare who intends to become a large-animal veterinarian and ultimately return to work in the San Joaquin Valley. “UC Davis is one of the best research universities in the nation, and we’re a good ag school with opportunities for hands-on learning as well. We have a really good combination here.”

Gomez spent the past three summers working as an intern at the UC Davis Veterinary Medicine Teaching and Research Center (VMTRC) in Tulare. His experiences there include both



COURTESY PHOTO

Jacob Gomez spends summers interning at the UC Davis Veterinary Medicine Teaching and Research Center in his hometown of Tulare.

laboratory and field work. The college junior also recently began an internship here on campus at the School of Veterinary Medicine, where he does pathology work for the California Animal Health and Food Safety Laboratory.

“Interning has helped me realize that I don’t want to wear a shirt and tie and work in a small, confined room all day,” said Gomez. “I like to be outside, up at 5 in the morning, getting dirty.”

Edward Silva / Hilmar

The world expanded for Edward Silva during his years at UC Davis. The son of Azorean immigrants, Silva grew up on a small farm in the Central Valley town of Hilmar. Travel abroad was too expensive with six children in the family, so Silva had never been overseas when he started college.

During his four years as an international agricultural development major, the first-generation college student found opportunities to travel each summer. He worked in Germany, studied in Switzerland, interned with the U.S. Consulate in the Azores, and did a marketing project in Zambia.

Prior to graduation, Silva was one of a dozen students nationwide who were selected to participate in an agricultural leadership program that included two weeks of travel to Vietnam, Malaysia, and Singapore. The group studied international marketing, trade, and global agriculture.

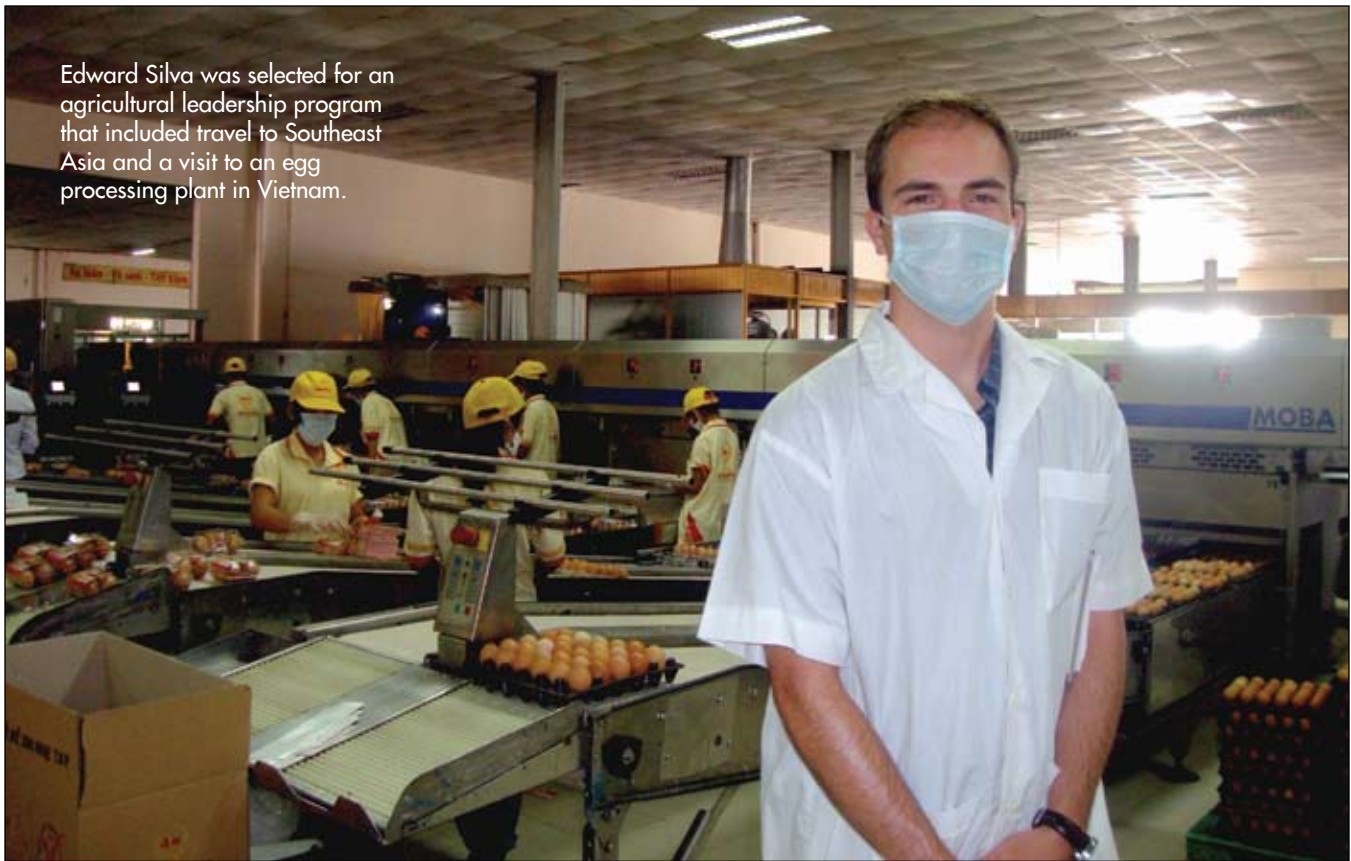
After graduation in June, Silva began a job as a brand ambassador with Ready Pac Foods, Inc., which



COURTESY PHOTO

Michelle Vang (in red) helped host a higher education conference on campus for Hmong families as part of her leadership role with a Hmong student group.

Edward Silva was selected for an agricultural leadership program that included travel to Southeast Asia and a visit to an egg processing plant in Vietnam.



produces ready-made salads and packages fresh-cut produce for consumers.

“When I was deciding where to go to college, I wasn’t sure what I wanted to study,” said Silva. “I wanted a large school that offered a lot of opportunities. I felt the size and versatility of UC Davis were just too attractive to pass up.”

Megan Reese/Clovis

Megan Reese is interested in applied science. A UC Davis senior majoring in plant sciences, Reese has done research internships in production agriculture throughout her college career.

For two summers, she participated in grape research at the USDA San Joaquin Valley Agricultural Sciences Center in Parlier. Last summer, she worked with a corn breeder at the Woodland Research Center of Dupont Pioneer.

ROBIN DERIEUX/UC DAVIS



In safety goggles and field gear, Megan Reese hand-pollinates experimental corn plants as part of her summer job at a seed company in Woodland.

“Agriculture is an underappreciated industry, and yet it is the most important, because it provides everyone in

the world with the food they need to eat,” said Reese, originally from Clovis. “To be part of that is pretty inspiring.”

Reese is an outstanding scholar, an equestrian, and a member of the UC Davis women’s club water polo team that won the national championship in 2012. UC Davis was an easy choice for her when it came time for college, since both of her parents are alumni. Her mother is a veterinarian, and her father is an agricultural consultant. Reese eventually hopes to follow in her father’s footsteps, working as an adviser to growers in crop production practices. She will complete her B.S. in June 2013 and intends to continue graduate studies in plant sciences here on campus.

“For me, the opportunities at UC Davis are amazing,” said Reese. “The professors I’m learning from are truly the world experts.”

— Robin DeRieux



Come join the fun as we honor Award of Distinction recipients and enjoy great food and beverages in our annual fall get-together.

A CELEBRATION OF BOUNTY



Above: Leland Ruth, president emeritus of the Agricultural Council of California, talks with one of last year's award recipients, Julia Tully (M.S. '85). Below: A sampling of the farmers market produce.



OUR 24TH ANNUAL COLLEGE Celebration takes place Friday, October 5, 2012 in Freeborn Hall on campus. You are invited to join us as we celebrate the accomplishments of the College of Agricultural and Environmental Sciences and honor the recipients of our Award of Distinction.

College Celebration typically draws more than 300 people—faculty, staff, students, alumni, and friends of the college—to join in the festivities. After an awards ceremony honoring this year's eight Award of Distinction recipients, attendees will gather to socialize and enjoy delicious hors d'oeuvres, as well as excellent wine, beer, and other beverages.

Guests are invited to dismantle a farmers market display and take home a bag packed full of free samples of California's freshest agricultural products—fruits, nuts, vegetables, and rice.

AWARD OF DISTINCTION

The Award of Distinction is the highest recognition presented by the College of Agricultural and Environmental Sciences to individuals whose contributions and achievements enrich the image and reputation of the college and enhance its ability to provide public service. The 2012 recipients include:

Ann Evans, *Alumni*
 Romeo Favreau, *Friend*
 Peter Moyle, *Faculty*
 Brian Pacheco, *Alumni*
 Garry Pearson, *Staff*
 Bryan Silbermann, *Friend*
 Kathleen Socolofsky, *Friend*
 Tedd Struckmeyer, *Friend*



Bill and Carol Chandler carry on the family farming tradition at their Fresno County home. The enclosed water tower was built in 1900.

SPEAKING OUT

Family farmers rally support for California agriculture

YOU WON'T FIND TWO MORE IMPASSIONED advocates for California agriculture than UC Davis alumni Bill and Carol Chandler.

On their 130-year-old family farm in the heart of Fresno County, the couple grows almonds, peaches, plums, nectarines, and grapes. They also raised two sons there, Tom and John, and have been active community volunteers. Both have been honored individually for their leadership with an "Award of Distinction" from the college.

Bill Chandler first became acquainted with the campus in the 1950s when he and his father traveled to UC Davis for the annual "Peach Day" to learn about the latest research. The experience had a lasting impact. "My goal from an early age was to be able to go to Davis to attend the university and then farm the home place," he said. "But the best thing that happened to me when I was at Davis was meeting my wife."

Carol (Robertson) Chandler grew up in the San

Francisco Bay Area and was part of a big influx of women to the small campus of 2,000 students in the early 1960s. "It was a good time to be there," she said. "You knew just about everybody. We're very proud to say we're Davis alums."

Bill studied pomology and agricultural production, earning a B.S. in agricultural economics in 1965. Carol studied physical education, earning her B.S. at UC Davis in 1966 and later a master's degree and teaching credential from California State University, Fresno.

"It behooves us to speak out and be as good advocates as possible for the ag industry because there are so few of us involved in production agriculture today."

Each has served on the UC President's Advisory Committee on Agriculture and Natural Resources. "I think wherever we are is the opportunity to talk about the importance of agricultural research," she says.

“What we look for as farmers is a better relationship with the university system so they know what we need to help us in our businesses.”

Concerned with how budget woes were affecting agricultural research and outreach in the San Joaquin Valley, Bill helped form UC Friends of Agricultural Extension. “We were concerned about getting people replaced when they retired and getting farm advisors we really needed,” he said.

The Chandler’s voice concerns shared by many San

Joaquin Valley farmers—the need for an adequate supply of labor and water, a lighter regulatory burden, and the challenges of an encroaching urban population.

“It behooves us to speak out and be as good advocates as possible for the ag industry because there are so few of us involved in production agriculture today,” Carol says. “We have to keep telling our story because agriculture is the number one economic engine in the state.”

— John Stumbos

DIVINE IDEAS

Theological grounding and a willingness to innovate have served this farmer well

ALUMNUS JOHN DIENER ('74, AGRICULTURAL economics and business management) is a San Joaquin Valley farmer well-known for his willingness to innovate and experiment with new farming practices.

Growing up in a farming family across the street from the UC West Side Research and Extension Center in Five Points, Diener was exposed to new ideas at an early age. But he also spent six years in seminary and nearly heeded a different calling. “I knew that I was either going to be a priest or a farmer,” he said.

In 1971 he transferred to UC Davis to study viticulture, entomology, engineering, and other agricultural subjects. All the Latin, philosophy, and theology at the seminary helped with critical thinking skills and influenced his perspective on agriculture. “It was part of my formation and part of my philosophical background,” he says. “Applied science is all about sustainable agriculture and what we are doing with the world that we live in.”

Through many years of working with UC farm advisors and specialists, Diener cultivated a deep appreciation for university research. He has high praise for the late UC Davis viticulture specialist Pete Christiansen, whose research on the Muscat Blanc grape led to a new clone for the industry. “Had it not been for Pete’s research at the Kearney field station, we’d still be having problems with rot in Muscat Blanc,” he said. “In conservative numbers, that’s been worth \$50 to \$100 million a year to the industry because of increased yields and reduced spraying costs.”

Diener’s approach to agriculture reflects his concern for resource stewardship and long-term sustainability.



John Diener, a CA&ES Award of Distinction past recipient, is highly regarded for his innovative approach to farming.

He has incorporated overhead pivot irrigation with conservation tillage practices to grow wheat, alfalfa, spinach, broccoli, onions, cotton, and corn—a strategy that saves fuel, water, and labor. Capital costs are also about one-third of other systems, and he manages the pivots with his iPhone.

He is currently working with UC Davis agronomist Steve Kaffka in the development of sugar beets as a potential new biofuel source. “For more than two decades, John has been one of the most engaged and innovative farmers in California trying to solve environmental concerns associated with farming practices,” Kaffka says.

Diener is also developing an integrated on-farm drainage system with UCLA and the state Department of Water Resources to clean up drainage water and extract salt compounds for commercial use, such as soda ash for glass manufacturing and calcium chloride for food processing.

“Salt harvesting has to be part of long-term sustainability,” he says. “Brackish groundwater is the largest untapped reservoir of available water that we have in California.”

— John Stumbos



YARIN HIGGINS/UC DAVIS

T.J. Rodgers' generosity vastly expands UC Davis' winemaking capabilities.

VINTAGE SUPPORT

Research fermentors are transforming winemaking

IN TWO SHORT YEARS, A HIGH-TECH wireless fermentation network made possible by the philanthropy of T.J. Rodgers and Cypress Semiconductor has vastly expanded the ability of UC Davis to conduct research on winemaking and is becoming a model for research institutes and commercial wineries throughout the world.

Rodgers—founder and CEO of Cypress Semiconductor—assembled a team in 2010 that designed and built 152 stainless-steel fermentors, 200 liters each, that are individually equipped with automated temperature control, automated pumping of juice over grape skins (red wines), and a sensor that measures fermentation progress in degrees Brix. Data is transmitted wirelessly to a nearby computer. The \$3.5 million investment of equipment and engineering is the most significant gift to the Teaching and Research Winery since its construction.

Rodgers, an electrical engineer with a doctorate from Stanford, fell in love with burgundy wine when he was a graduate student. He and his wife, Valeta Massey, operate the Clos de la Tech winery in the Santa Cruz mountains, specializing in Pinot Noir. Rodgers' contribution of research fermentors to UC Davis helps showcase how technology can transform winemaking.

"We are able to perform reproducible fermentations with precise temperature control and uniform mixing for the first time," said Roger Boulton, UC Davis professor and holder of the Stephen Sinclair Scott Endowed Chair in Enology.

Small-scale fermentations lose heat more readily than those in large commercial fermentors. This requires keeping them warm in order to replicate fermentation and extraction patterns. Since the Rodgers fermentors have both heating and cooling capabilities, they are able to make wine in a reproducible and reliable manner.

"With 150 fermentors, we can have 50 separate grape lots, each fermenting in triplicate," Boulton said. "That provides a wine research capacity that has no equal. With an eight-week experimental season each year, it's essential to be able to ferment grapes into wine without delay."

Researchers can now undertake experiments involving large numbers of vineyard sites to better understand how climate, soil, grape clone, and viticultural practices interact to influence wine composition. Students are benefitting from the new technology as they become familiar with real-time fermentation data in Web-based applications.

Rodgers' passion for innovation and winemaking continues. He and his team recently delivered third-

generation controllers that integrate several functions into one device. He also has funded two graduate students who are developing new sensors for estimating yeast populations and color chemistry.

"We are very grateful to T.J. Rodgers and the Cypress Semiconductor team," Boulton said. "These research fermentors will become an essential component of every winery."

— John Stumbos

THEIR GENEROSITY LIVES ON

Erna and Orville Thompson cared deeply about UC Davis students

THROUGHOUT THEIR LIVES AT UC DAVIS, ERNA and Orville Thompson displayed an extraordinary devotion to students. The couple doted over hundreds of young people during the decades they worked on campus—she as a staff member in the Department of Plant Pathology and he as a professor in the Department of Applied Behavioral Sciences. They also served as unofficial surrogate parents to the Alpha Gamma Rho agricultural fraternity.

Orville passed away in 2006 and Erna in 2010. Their estate has since bequeathed a \$1.4 million gift to UC Davis to establish the Orville and Erna Thompson Endowment Fund. Combined with other gifts, the \$2.4 million fund supports scholarships for graduate students in international agricultural development, plant pathology, human development, and the agriculture teacher credential program. They previously established two funds to support undergraduate and graduate students in plant pathology, human and community development, and agricultural education.

CA&ES dean Neal Van Alfen was a graduate student at UC Davis in the 1970s and knew the Thompsons well. "Erna and Orville were two of the kindest, most generous people you could imagine," he said. "Their thoughtfulness and commitment to UC Davis will live on in the hopes and dreams of our students for many years to come."

The Thompsons were originally from Montana. Orville, a veteran of World War II, utilized the GI Bill to obtain a bachelor's degree in agricultural education from Montana State University (1948), a master's in education from UC Davis (1952), and a doctorate in education, rural sociology, and educational psychology from Cornell University (1954). The Thompsons then returned to UC Davis, where Orville joined the faculty and taught courses in agricultural education and behavioral science.



Kaitlin Gregg '09, left, and her mom Carolee Gregg '84, right, flank Erna and Orville Thompson in this 2006 photo. Carolee was a student of Orville's, and Kaitlin was the recipient of the 2005 Orville and Erna Thompson CAAA Scholarship.

He also served as director of the Work-Learn Career Planning and Placement Center for 10 years before his retirement in 1988. Erna retired in 1983 as the plant pathology department's management services officer. The Thompsons were active volunteers and encouraged students to develop a practice of community involvement. One of their most gratifying honors was being selected as Picnic Day grand marshals in 1993.

The Thompsons' keen interest in the personal and professional growth of students had a lasting impact on many of them. "When Orville passed away, Erna suggested that people could make gifts to one of their CA&ES funds in his memory," said Allison Chilcott, senior director of development in Student Affairs. "I was inundated with gifts—many from former students from all over the world, and many containing heartfelt letters thanking Orville and Erna for the guidance and support they'd given."

— John Stumbos



Sustainability

Adopt an Acre

“Adopt” an acre of the Russell Ranch Sustainable Agriculture Facility—\$1,000 (one year) or \$10,000 (in perpetuity).

◀ The Student Farm

Support a student intern at The Student Farm, a student-initiated experiential learning lab—\$5,000.

International Development Capstone Course

Support an international agricultural development student with an overseas service trip that puts classroom learning into practice—\$1,000–\$2,500.

DONOR PROFILE

Sandra Gardner and Mary Lou Cockcroft

Sandra Gardner ('71, Design) and her friend, Mary Lou Cockcroft, have been loyal Dean's Circle donors since 2005. Mary Lou is an honorary lifetime member of the Food Industry Foundation/Foodsters and believes in UC Davis' advances in this area. Sandra, a world traveler, supports the college as an international leader and educator of the best students. Though Sandra is the alum, both are most certainly Aggies at heart. Thank you, Sandra and Mary Lou.

Faculty Support

Thanks to the support of our donors, 25 endowed chairs and professorships have been established in the college. These distinguished faculty positions enable the college to meet its mission of teaching, research, and public service in a broader range of fields than would be possible otherwise. Gifts of \$1 million or more endow a faculty position, creating new opportunities for faculty work in areas of critical importance to California's economic, environmental, and social well-being.

OPPORTUNITY KNOCKS

Philanthropic support allows us to recruit and retain some of the best faculty in the world, attract top students, and build cutting-edge facilities for research and teaching. Your gift, no matter the size, makes a difference. Here are some ways your gift can help.

Student Support

Scholarships and fellowships help students achieve their educational goals by reducing the financial burden of tuition and loan debt. This enables students to participate in an internship, study abroad, conduct research, or take a teaching assistant position—experiences that help them stand out when applying for graduate school or a first job. A \$1,000 gift provides immediate support to an undergraduate student. A \$5,000 gift provides immediate support to a graduate student. A gift of \$25,000 endows a named undergraduate scholarship, while a gift of \$100,000 or more will endow a named graduate student fellowship.

DONOR PROFILE Marion Hamilton

Marion Hamilton and friends established a graduate fellowship in Environmental Science and Policy in memory of her late husband, Prof. William J. Hamilton III. Not only did Marion help raise funds for the fellowship, she made the capstone gift to endow it. Thank you, Marion.

The College of Agricultural and Environmental Sciences

Annual Fund and Dean's Circle

Gifts of any amount to the college's Annual Fund help meet time-sensitive needs, such as student scholarships and leadership development opportunities. A minimum annual gift of \$1,000 enrolls you in the Dean's Circle, which brings special invitations to college events, lectures, and tours.

Plants

Improved Irrigation

The irrigation system at the Department of Plant Pathology's research farm needs an upgrade—\$120,000.

Combine Harvesters

The Department of Plant Sciences needs two combine harvesters, one for oil seed crops and another for cereal grains—\$145,000 each.

Environment and Human Ecology

Center for Regional Change

Become a friend of the Center for Regional Change—\$500 will fund a graduate student research trip; \$5,000 will sponsor a conference.

EnvironMentors

The EnvironMentors Program prepares under-represented high school students for college-level sciences—\$100 (science fair award) to \$10,000 (team travel to national competition).

Art/Science Fusion

The Art/Science Fusion program teaches students through classroom lectures and hands-on experience with art projects—\$500 to \$1500 for a hand-crafted ceramic tile at the Nature's Gallery Court in the Arboretum; \$100,000 will sponsor an artist-in-residence for a year.

DONOR PROFILE Pacific Coast Producers

Pacific Coast Producers, a large food-processing company based in Lodi, recently made a five-year pledge of \$50,000. This generous gift will be split between graduate fellowships and maintenance of the California Processing Tomato Industry Pilot Plant within the Department of Food Science and Technology. Thank you, Pacific Coast Producers.

Food and Wine

Friends of the RMI

Support the Robert Mondavi Institute for Wine and Food Science (RMI) by becoming a Friend of the RMI (\$250–\$1,000), or make a gift to the RMI Endowment and it will be matched by the college—\$5,000 or more.



Animals

◀ Practical Animal Agriculture

Help prepare our students for employment in California's animal agriculture industry. Gifts will be added to an endowment; \$300,000 fully underwrites the program.

Haagen-Dazs Honey Bee Haven

The Honey Bee Haven, a site for field research and teaching schoolchildren and the public—\$50 to \$1,000.

DONOR PROFILE Karen Medford

Karen Medford ('82, Ag. Econ.) and her husband, John, established the Barbara J. Van Zandt Endowment within the Center for Nutrition in Schools. This fund was created for teacher training in honor of Karen's late mother, Barbara Van Zandt, who worked as a registered dietitian in San Francisco and at the CSU Fullerton Health Center. The Medfords give annually to increase the fund's impact. Thank you, Karen and John.

For more information about these opportunities and other ways to partner with the college, please contact Mark Foncannon at mjfoncannon@ucdavis.edu or (530) 908-0575. Or visit us online at <http://caes.ucdavis.edu/giving>.

CA&ES Outlook

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Learn more at outlookspeaker.ucdavis.edu.

Dean's Circle

www.caes.ucdavis.edu/giving

UC DAVIS College of Agricultural and Environmental Sciences

Dear CA&ES Dean's Circle,

This card is to show my appreciation for the recent scholarship that you have granted me. Upon receiving the e-mail that I was one of the three chosen, my wife and I wept for joy. She works full time while I attend school full time. As you can imagine, money can be tight at times, and this scholarship has helped us more than you know. It has also inspired me to work even harder toward my education.

Thank you so much!

Jason and Theresa Dexter

Jason Dexter, a community college transfer student majoring in wildlife, fish and conservation biology, was awarded a \$5,000 Dean's Circle Scholarship for 2011 and 2012. Because of the generosity of donors to the CA&ES Dean's Circle, deserving students such as Jason can pursue a college degree at UC Davis.

