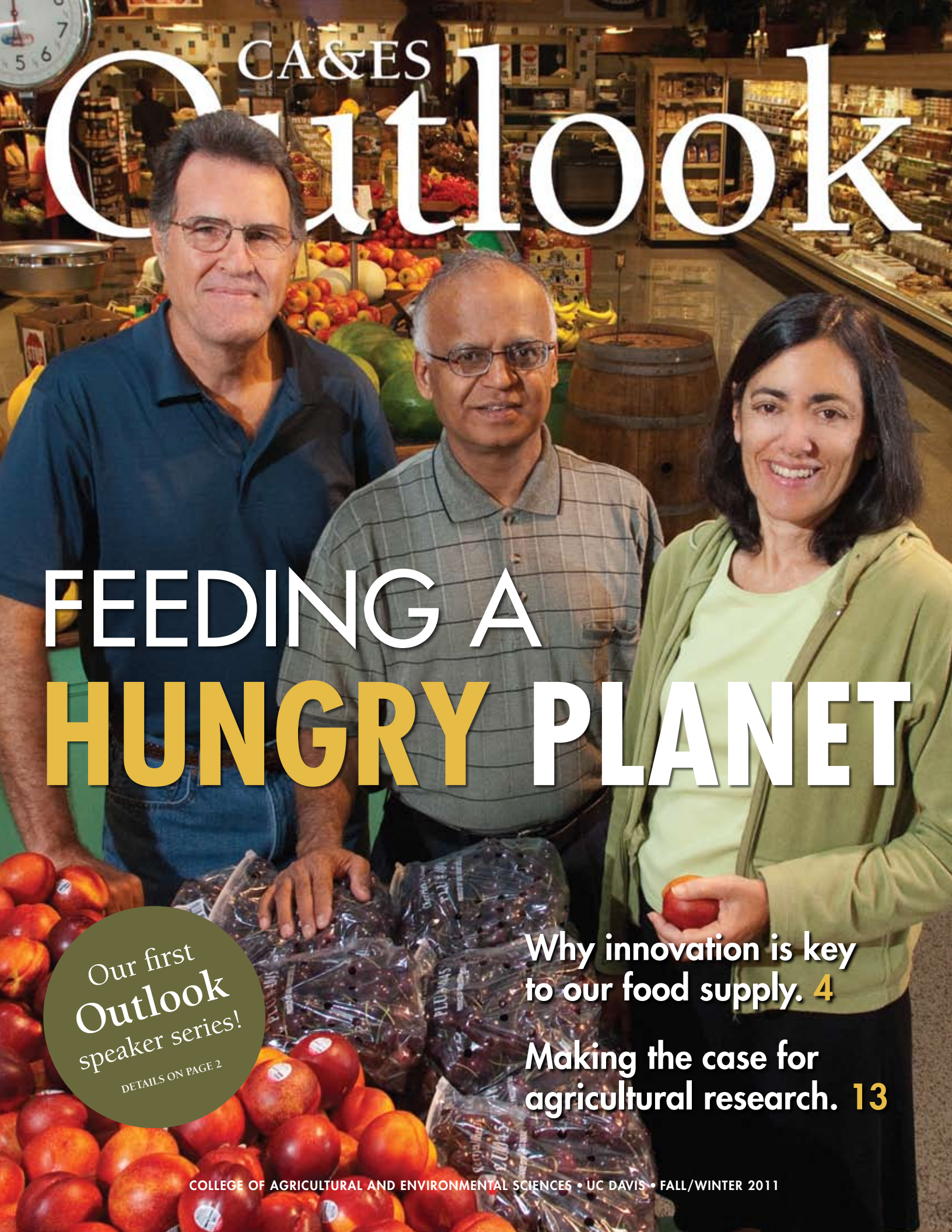

CA&ES

# Outlook

# FEEDING A HUNGRY PLANET

Our first Outlook speaker series!

DETAILS ON PAGE 2



COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES • UC DAVIS • FALL/WINTER 2011

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EXECUTIVE EDITOR
Ann Filmer

MANAGING EDITOR
John Stumbos

ASSOCIATE EDITOR
Robin DeRieux

GRAPHIC DESIGNER
Eric Rohr

CONTRIBUTING WRITERS
Jan Kingsbury
Christine Schmidt
Neal Van Alfen

ONLINE MEDIA
Trish Ang
Tyler Randles

ADMINISTRATIVE SUPPORT
Leslianne Foster
Jennifer Woo

CA&ES OUTLOOK ONLINE
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UC DAVIS COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

DEAN'S OFFICE
University of California
One Shields Avenue
Davis, CA 95616-8571
Phone (530) 752-0108
outlook@agdean.ucdavis.edu

www.caes.ucdavis.edu

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THIS ISSUE

Alumni Spotlight: San Francisco Food Bank leader Paul Ash has found new ways to bring fresh produce to those in need. Page 20



COVER PHOTO: From left, faculty members Kent Bradford, Shrinivasa Upadhyaya, and Karen Klonsky work on projects to enhance the food supply. Pictured at Nugget Market in south Davis.

Photo by Neil Michel/Axiom

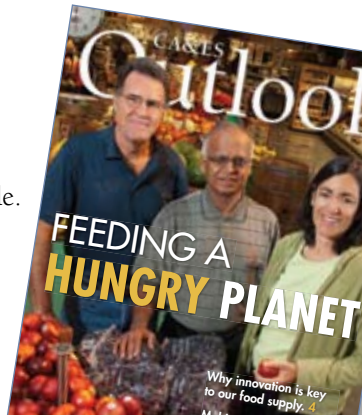
MARK YOUR CALENDAR

# NEW SPEAKER SERIES

You are invited to learn more about the challenges of feeding the planet from Dean Neal Van Alfen and three faculty experts featured in this issue of *CA&ES Outlook*, who will speak on Saturday, Nov. 5, at the UC Davis Conference Center.

| | |
|---|---|
| **8:30–9 a.m.** | Continental Breakfast |
| **9–9:30 a.m.** | Welcome: *Dean Neal Van Alfen* |
| **9:35–10:20 a.m.** | Capacity building: *Dr. Beth Mitcham* |
| **10:25–11:10 a.m.** | Sustainable agriculture: *Dr. Kate Scow* |
| **11:15–noon** | Biotechnology: *Dr. Alison Van Eenennaam* |

The $35 fee includes a $10 donation to the CA&ES Dean's Circle. For more information, visit http://outlookspeaker.ucdavis.edu or to register, visit https://registration.ucdavis.edu.



# THE CHALLENGE OF 9 BILLION

## Ample food for the future

**FIFTY YEARS AGO, RESEARCH PRODUCED** high-yielding varieties of wheat, rice, and corn that helped avert famine in parts of the developing world. Renowned scientist Norman Borlaug—the father of this "Green Revolution"—believed that increasing crop yields would limit deforestation and conversion of wild areas to agricultural use. Today we face a similar challenge.

The world's population will climb from seven billion people this year to an estimated nine billion by 2050. How will society produce the food necessary to sustain this growing population while protecting the environment? That's an issue being addressed in academia, at nonprofits, and by governments throughout the world.

We've been working on a secure food supply since the University Farm was established at Davis a century ago. We continue to innovate with new technologies and programs to address the many facets of "food security"—access to sufficient, safe, and nutritious food to meet dietary needs and food preferences for an active and healthy life.

Biotechnology enables us to make crop improvements that we couldn't through conventional plant breeding. A good example is the work of plant sciences professor Abhaya Dandekar, who has engineered rootstocks to fight crown gall in walnuts and Pierce's disease in grapes.

We continue to innovate with new technologies and programs to address the many facets of "food security"—access to sufficient, safe, and nutritious food to meet dietary needs and food preferences for an active and healthy life.

"Precision agriculture" is helping make farming more productive and efficient. Agricultural engineering professor Shrini Upadhyaya and fellow researchers are using global positioning systems, wireless networks, and innovative sensors to improve crop quality, efficiency, and resource use. Professor David Slaughter and colleagues have developed a labor-saving mechanical weeder for tomatoes.

Our Russell Ranch Sustainable Agriculture Facility tests innovative agricultural practices that may contribute to the long-term viability of our food system. For instance, pollination ecology professor Neal Williams is experimenting with wildflower mixes to enhance crop pollination from native insects.

JOHN STUMBOS/UC DAVIS

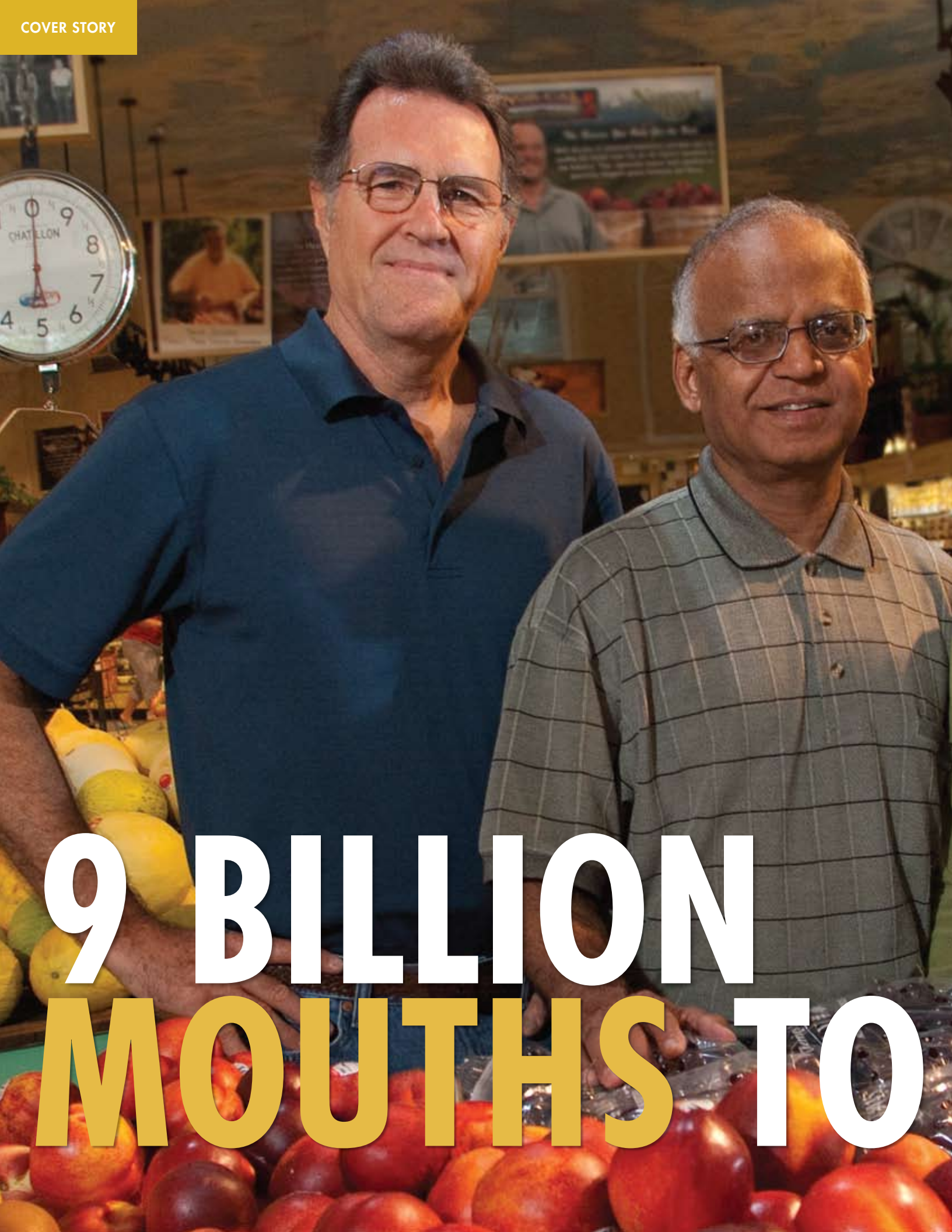
Ronald Voss (left) speaks with college dean Neal Van Alfen about the Horticulture Collaborative Research Support Program that he leads. The program, which funds projects in the developing world, is featured on page 10.

We also host two international Collaborative Research Support Programs (CRSP) working to alleviate poverty and hunger in the developing world. The Horticulture CRSP funds projects to improve farming techniques, postharvest handling, and market access in Africa, Asia, and Latin America. The Assets and Market Access CRSP focuses on risk management and improved access to finance and markets.

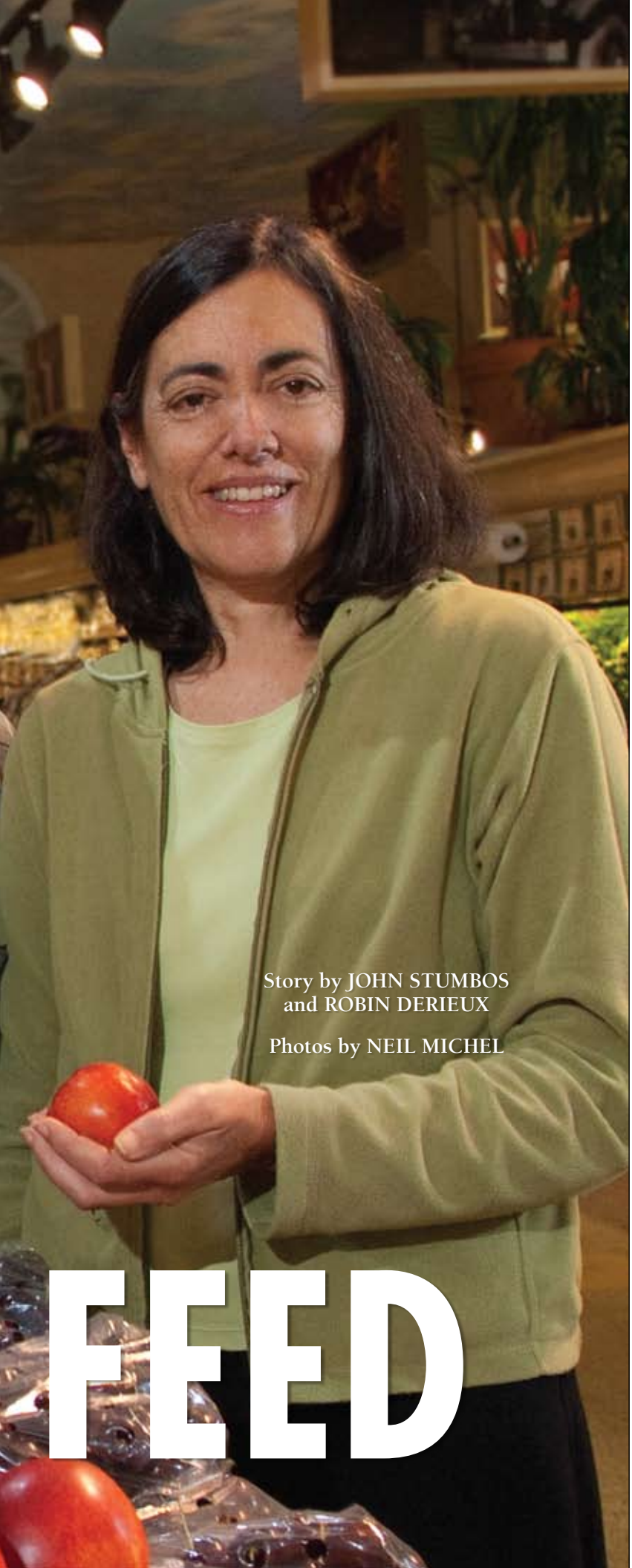
We can make the world more food-secure with renewed investments in research to keep agricultural productivity apace of resource constraints, pest and disease pressure, and the uncertainties of climate change. Without a sustained commitment, however, we risk a future with food shortages, higher food prices, loss of biodiversity, and greater threats to the environment.

I believe society will find a way to feed the world's growing population, but at what cost to the things we value besides food. That's really the challenge, and that's where a lot of our efforts are going to be in the future.

NEAL VAN ALFEN, DEAN
COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES



# 9 BILLION MOUTHS TO



# FEED

Story by JOHN STUMBOS and ROBIN DERIEUX

Photos by NEIL MICHEL

The world's population is growing fast. And everyone needs to eat. The challenge is to satisfy growing demand for food with less impact on the environment.

One billion people suffer from hunger every day. Yet the earth's population is expected to increase from seven billion in 2011 to more than nine billion people by the year 2050. The Food and Agriculture Organization of the United Nations (FAO) predicts that food production will need to increase by 70 percent over the next four decades to meet anticipated demand. Part of this increase will be driven by higher demand for animal protein, especially in developing countries with rising incomes.

Where will the food come from? The FAO projects that, globally, 90 percent of the production increases will come from increasing yield and cropping intensity on existing farmland rather than by bringing new land into agricultural production. Innovative technologies and new approaches like those currently being developed at UC Davis will play a crucial role in meeting global food demand while enhancing agricultural sustainability.

Our faculty and students are exploring new biotechnologies that hold promise to revolutionize agricultural productivity and lessen environmental impacts. Agricultural engineers are making strides in precision agriculture to help manage farms more efficiently and productively. Scientists are also studying innovative ways to grow crops at Russell Ranch, a testing ground for new sustainable agriculture practices. Horticulturists and resource economists who lead global research and development programs are working in Africa, Asia, and Latin America to reduce hunger by improving local food and agriculture techniques.

What will it take to ensure a stable and affordable food supply in the years ahead? Our economists have documented the substantial long-term benefits of agricultural research and make a strong case for reinvigorated investment in research and development to meet future food needs. Read on and learn more about our work to feed a hungry planet.

Kent Bradford, director of the UC Davis Seed Biotechnology Center, is a leader in demonstrating how biotechnology can support the goals of agricultural sustainability.

# THE PROMISE OF BIOTECHNOLOGY

"We only have two choices to feed nine billion people by 2050," said plant sciences professor Kent Bradford. "Either we increase yields on the land that is already in agricultural production, or we expand agriculture onto new land. Those are the only two options."

Director of the UC Davis Seed Biotechnology Center, Bradford believes that biotechnology should play a significant role in meeting the challenge of sustainably feeding a growing global population. Using biotechnology, scientists can create genetically engineered plants and animals with desired traits that can't be achieved through conventional breeding. Recombinant DNA technology allows scientists to genetically modify an organism to confer disease resistance, beneficial nutritional traits, reduced environmental impacts, or other characteristics. Plants and animals that have been modified by the insertion of a gene from another organism are referred to as "genetically modified," "transgenic," or "genetically engineered" (GE).

Genetically engineered crops have proven both highly productive and highly controversial since they were first commercialized in the 1990s. Concerns about potential environmental impacts or effects on human health, uncertain consumer acceptance, and fears about the risks of GE foods have led to federal regulatory hurdles and international opposition, slowing the adoption of biotechnology in agriculture.

"We're feeding six billion people now, but we still have almost a billion people who aren't getting enough to eat," said Bradford. "The population keeps increasing, and

## ON THE WEB

**Seed Biotechnology Center**
http://sbc.ucdavis.edu

**Animal Biotechnology**
http://animalscience.ucdavis.edu/animalbiotech

**Agricultural Biotechnology**
http://agribiotech.info

food demands as well. We need a quantum leap. We need new yield breakthroughs like those made during the Green Revolution of the 1960s. Given these challenges, and 15 years of production and consumption of GE crops with demonstrated environmental benefits and no safety issues, why aren't we using biotechnology every way we can?"

More than 100 agricultural crops have been genetically engineered by researchers worldwide, though less than a dozen have been deregulated and approved for commercial production. The most widely planted GE crops are herbicide-tolerant soybeans, corn, and canola, and insect-resistant cotton. According to the USDA, 90 percent of the soybeans and 88 percent of the corn grown in the United States are genetically engineered varieties. Although biotech field crops have expanded rapidly, biotech horticultural crops (fruits, vegetables, nuts, and ornamentals) are rare in the marketplace.

Since soy and corn products are often incorporated into processed foods, most Americans have been eating GE plant foods for many years. However, there have never been any GE animal food products on the market in the U.S. "Genetic engineering is one of the tools we have to get animals to target weight more efficiently with less feed input," said Alison Van Eenennaam, a UC Davis Cooperative Extension specialist in animal biotechnology. "I know that term is very controversial. Animals bring up different emotions than plants."

ROBIN DERIEUX/UC DAVIS

Alison Van Eenennaam, an expert in animal genomics and biotechnology, is involved in outreach efforts to educate the public about the full spectrum of genomic technologies.

Van Eenennaam believes that biotechnology can help meet the growing demand for meat, dairy, and eggs—particularly in developing countries—and that it will increase the efficiency and sustainability of animal production, decrease environmental impacts, and improve animal well-being. "Developing disease-resistant animals is where I see the most potential benefits of genetic engineering," she said.

In her outreach work as a biotechnology specialist, Van Eenennaam informs audiences that conventional breeding of plants and animals also holds potential risks for animal health and the environment. "The risks with genetic engineering are not different than the risks associated with selective breeding, but the perceived risk is much higher, and the regulatory burden is infinitely higher," Van Eenennaam said. — RD

## PREVENTING FRUIT AND NUT CROP DISEASES WITH BIOTECHNOLOGY

Biotechnology can help save fruit and nut crops from devastating diseases. One approach is to genetically engineer rootstocks to resist pathogens, and then graft a conventionally bred scion—the top part of the plant that produces the edible portion—to the GE rootstock.

Plant sciences professor Abhaya Dandekar created this technique to fight crown gall disease in walnuts and Pierce's disease in grapes. His lab has also begun to investigate a similar approach to combating Huanglongbing disease (HLB) in citrus.

"Theoretically, it should be easier to get plants with transgenic rootstocks through the regulatory process," said Dandekar. "The rootstocks won't be producing seeds, pollen, or fruit when grafted, so there is no concern from a gene flow standpoint."

Currently, the primary defense against Pierce's disease and HLB are chemical pesticides, which control the insects that spread the bacteria responsible for the diseases. A biotechnology solution—if approved and commercialized—could increase yields and reduce pesticide applications. — RD

JOHN STUMBOS/UC DAVIS

Abhaya Dandekar experiments with genetically engineered rootstocks to combat deadly plant diseases, such as Pierce's disease in grapes.

# PRECISION MANAGEMENT OF CROPS

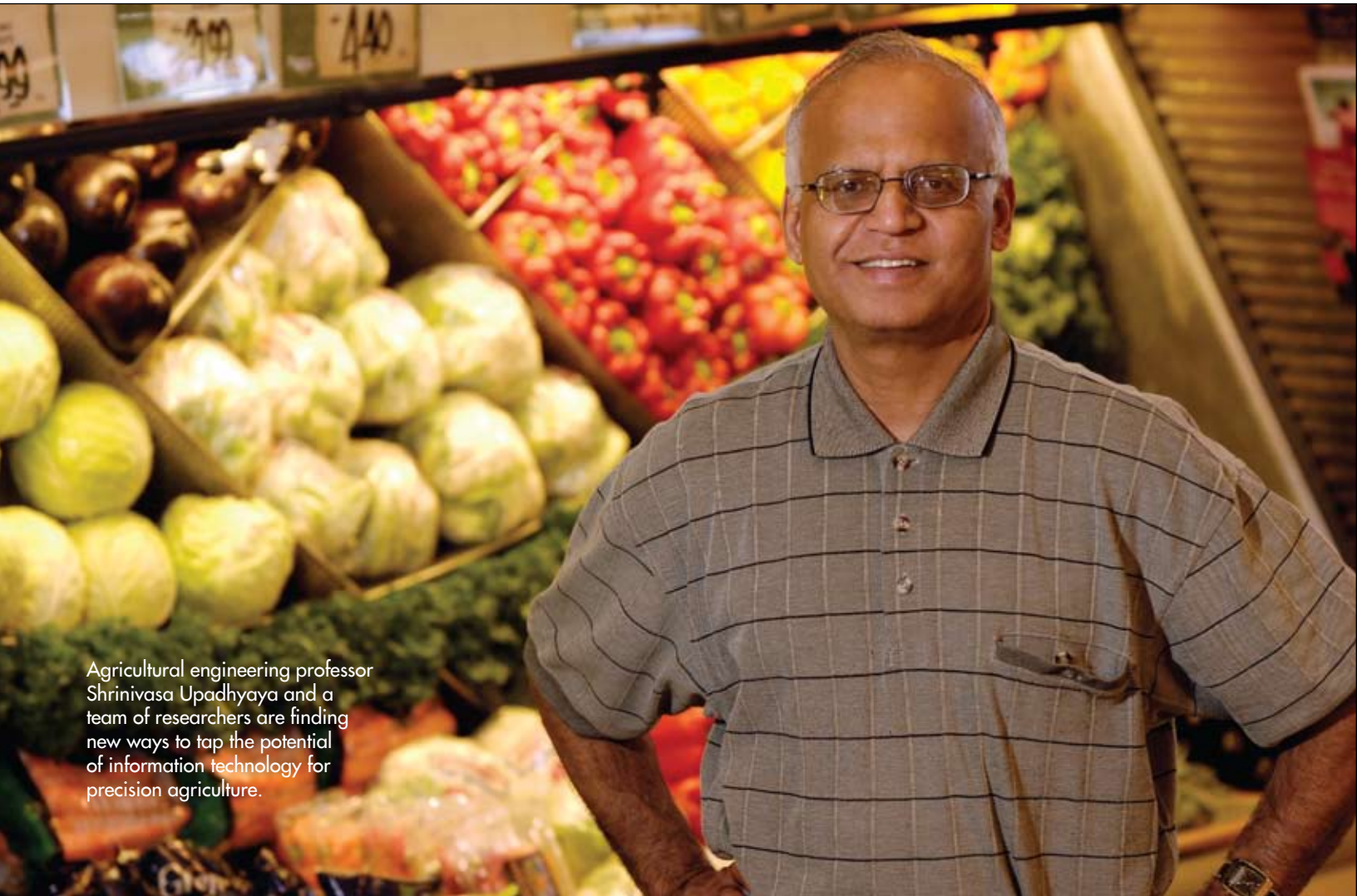
A hundred years ago a revolution took place in American agriculture as farmers switched from muscle power—their own and their animals—to the mechanical power of diesel, gasoline, and steam engines to cultivate the soil and harvest crops. Today, a new revolution is unfolding as scientists harness the power of advanced information technologies to help farmers produce higher quality, more-abundant food more efficiently to help feed an increasing population.

"With the computer technology we have, it is now becoming possible to treat each area in a farm differently," says Shrinivasa Upadhyaya, a UC Davis professor of biological and agricultural engineering. "The ultimate objective is to respond to the needs of each plant. Since not all trees in an orchard or grapevines in a vineyard yield the same, they shouldn't be treated all the same."

"The ultimate objective is to respond to the needs of each plant."

This type of site-specific management or "precision agriculture" is making huge strides by combining global positioning systems (GPS), geographic information systems (GIS), wireless networks, and innovative sensor technology. Upadhyaya and colleagues from across campus and at other western land-grant universities are in the midst of a three-year project focusing on precision irrigation and canopy management in almonds, walnuts, apples, hazelnuts, pecans, and wine grapes.

The UC Davis team includes department colleagues David Slaughter and Mike Delwiche, Bruce Lampinen and Ken Shackel from plant sciences, Mark Matthews from viticulture and enology, Karen Klonsky from agricultural and resource economics, and Greg Browne from USDA and



Agricultural engineering professor Shrinivasa Upadhyaya and a team of researchers are finding new ways to tap the potential of information technology for precision agriculture.

plant pathology. Other research partners include the University of Arizona, Oregon State University, New Mexico State University, Washington State University, Trimble Navigations Ltd., and VERIS Technologies.

"Our long-term goal is to develop a suite of sensors for a farm-based mobile platform that will assist growers in making better management decisions to improve crop quality and increase production efficiency and farm profitability while reducing the environmental footprint," Upadhyaya says.

Lampinen is working with Upadhyaya on the project to measure photosynthetically active radiation with a tractor-mounted "light bar" sensor. A separate sensor measures canopy shape. Other sensors used in this research include an infrared thermal sensor, ambient temperature and humidity sensors, and a wind-speed sensor—all helpful in determining plant water status, crucial information for irrigation management. Fine-tuning information for farm management also helps reduce the amount of fertilizers and pesticides needed for crop health.

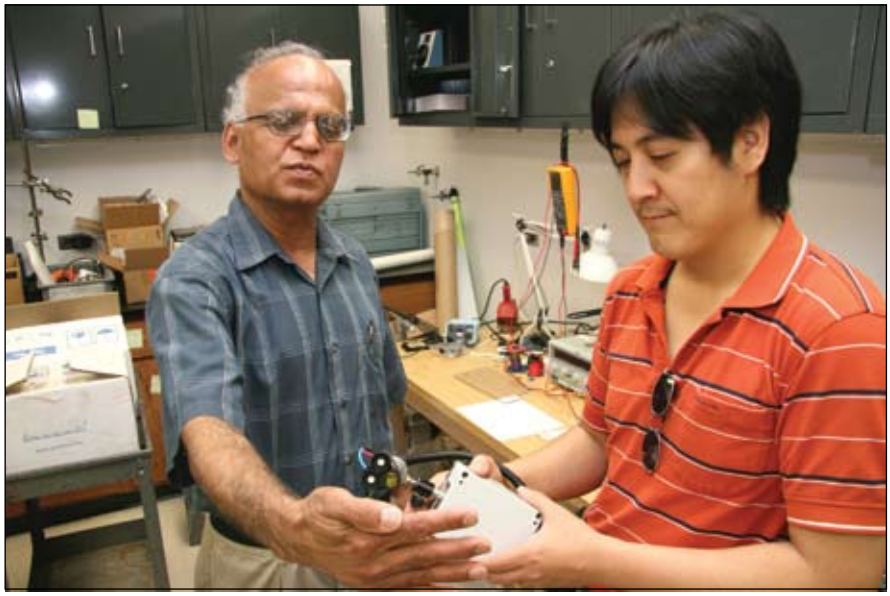
"We set out to provide growers the capabilities they will need to embark on the next wave of precision agriculture, where the value added will come from efficient information management practices at the individual tree or block of trees level," Upadhyaya says. "What matters most to growers is how this information can help make better, faster, and economically sound decisions."

Biological and agricultural engineering professor David Slaughter is also working on precision agriculture technologies. A mechanical weeder he developed in cooperation with Upadhyaya and Fadi Fathallah, another department colleague, uses GPS to safely work around tomato plants.

"We make a tomato plant map, automatically, and then knowing the latitude and longitude of every plant, we can automate weeding to approach the quality of care you would give a tomato plant when hoeing weeds in your home garden," Slaughter said.

In on-campus tests, the weeder cut labor needs by more than half. Next year the weeder will be tested in a commercial grower's field. This technology will be a boon for organic growers, whose highest cultural costs are often for weed control.

"We're using technology at various stages to assist California agriculture to be more efficient, to reduce costs, and to make it a better environment for workers," Slaughter says. "But we also want to ensure the quality is as high as possible so California can be a supplier of premium quality fruits and vegetables on the world market and, hopefully, have plenty of food to supply." — JS



JOHN STUMBOS/UC DAVIS


JOHN STUMBOS/UC DAVIS

Above, Professor Shrinivasa Upadhyaya (left) and graduate student Vasu Udompetaikul examine one of a suite of sensors for potential use on a farm-based mobile platform. Below, agricultural engineer Robert Coates checks a node on an experimental wireless network in a UC Davis nursery greenhouse. The technology collects data through sensors connected to the node for improved water management.

# BUILDING CAPACITY
# IN THE DEVELOPING WORLD

Hunger and poverty are a fact of life in many parts of the world.

"Nearly one billion people go to bed hungry every night and almost half the world—three billion people—live on less than $2.50 a day," says Ron Voss, faculty emeritus and extension vegetable specialist.

Voss is director of a relatively new program headquartered at UC Davis: the Horticulture Collaborative Research Support Program (Horticulture CRSP). Horticulture, which includes the production of both food and ornamental crops, is essential to meet human health and nutrition needs, and to provide economic opportunity.

Funded by the U.S. Agency for International Development, the Horticulture CRSP is working to improve life for people from Bangladesh to Zimbabwe through a competitive grants program that partners with U.S. land-grant universities and institutions in focus countries to undertake research, training, curriculum development, and outreach activities.

SEAN KEARNEY/UC DAVIS

Ugandan women share a meal during a farmer field school, part of a project run by Professor Kate Scow to increase the ability of smallholder farmers to produce and market vegetable crops in Uganda and the Democratic Republic of the Congo.

The World Bank estimates 2.5 billion people in the developing world earn income through agriculture. Yet many of these farmers use outdated techniques, such as plowing their fields with animal power and controlling weeds

## REDUCING RISK REDUCES HUNGER

An innovative insurance program in northern Kenya and southern Ethiopia may help prevent rural herdsmen from falling into indigence in times of catastrophic drought.

"Uninsured risk creates a poverty trap for villagers who depend on animals for income and a stable food supply," said UC Davis professor Michael Carter, an agricultural and resource economist. "Big droughts in this area wipe out 50 to 60 percent of what people have."

Carter is director of the Assets and Market Access Collaborative Research Support Program (AMA CRSP), which is helping fund a novel index-based livestock insurance program to improve food security for pastoralists. Index-based insurance protects against risks shared by the entire community. In this case, the index is the availability of forage based on satellite imagery. When the index predicts livestock mortality in excess of 15 percent, payment is triggered to all clients within the defined geographic area.

To explain how the insurance works to villagers, Carter and the research team—headed by Andrew Mude of the International Livestock Research Institute in Kenya—devised a game with poker chips representing livestock. More than 2,000 Kenyan families purchased insurance when it was initially introduced in 2010. The region is now experiencing severe drought, and pastoralists who bought policies will receive compensation in October unless forage conditions improve. — RD

by hand. Additionally, much food is wasted because of poor postharvest handling practices.

"Thirty to 40 percent of the fruits and vegetables produced in the developing world never reach the table," Voss says. "There is a pressing need to develop and implement effective and affordable technologies and innovative practices that will

"Improvements will translate into better nutrition and human health."

improve growing, handling, and marketing of horticultural products."

Horticulture CRSP projects focus on improving plant genetic material, local plant varieties, seed systems, sustainable crop production methods, and marketplace access. A special focus is on reducing postharvest losses.

In 2011 the Horticulture CRSP awarded $3.1 million to support 15 projects. Since its inception in late 2009, the program has funded 30 projects in 34 countries, including sub-Saharan Africa, southern Asia, and Latin America, with 15 U.S. universities participating. Fifty-five percent of the 2,293 trainees have been women. More than 240 technologies are under study.

"We believe these projects will improve food security by improving the quality of seed available to smallholder farmers, increasing productivity, decreasing postharvest losses, and increasing access to markets, thus increasing both the amount of food and income available," Voss said.

In addition to Voss, other key Horticulture CRSP team members at UC Davis include associate director Beth Mitcham, a Cooperative Extension postharvest specialist; Michael Reid, an emeritus professor in postharvest physiology; and Mark Bell, who leads the International Learning Center and specializes in training and communications.

To learn more about the Horticulture CRSP, visit the program's website at http://hortcrsp.ucdavis.edu.

"Improvements will translate into better nutrition and human health, as well as improved social and economic conditions," Mitcham says. "By harnessing the research, training, and outreach expertise of the land-grant universities in the U.S. to work with partners in developing countries, we can improve horticultural capabilities in much the same way that the land-grant system helped revolutionize American agriculture."— JS

# SUSTAINABILITY TAKES ROOT

Just west of Davis a few miles lies the 300-acre Russell Ranch Sustainable Agriculture Facility, a testing ground for new farming practices to ensure the long-term viability of the food production system. The facility is part of UC Davis' Agricultural Sustainability Institute (http://asi.ucdavis.edu).

"The primary objective of our projects is to better understand the relationships between inputs like fertilizers or cover crops and various indicators of sustainability—yield, profitability, water and energy use, and leaching of nitrates or pesticides," says Kate Scow, a soil science professor and ASI deputy director. "Over time we've expanded our focus to include new areas such as greenhouse gas emissions and farm edges."

JOHN S TUMBOSS/UC DAVIS

Neal Williams, a UC Davis pollination ecology professor, has been experimenting with different wildflower mixes near farm fields to enhance pollination in crops. Williams and staff researcher Kimiora Ward established three half-acre plots of mixed annuals and perennials adjacent to a watermelon field next to Russell Ranch and elsewhere in Yolo County. "What we're doing is the science of figuring out what bees do," Williams said at a recent field day. "We also recognize that if it's not something easy and that farmers have readily available, it will not be adopted."

Agricultural economist Karen Klonsky researches the economic feasibility of alternative farming practices, including those under study at the Russell Ranch Sustainable Agriculture Facility.

Russell Ranch routinely hosts a June field day for growers, scientists, and students to learn about the latest developments. A theme running through the 2011 program was increasing biodiversity on and near the farm, a strategy that helps support the capacity of the land to produce food.

Hedgerows of flowering native shrubs such as California lilac and toyon are increasingly being used in Yolo County and other areas to restore farm edges that may have no vegetation. Hedgerows not only provide habitat for birds and wildlife, they're also proving to be a valuable reservoir of beneficial insects that can aid in pest control.

"By far, you have much greater numbers of beneficial insects than pests compared to weedy areas that have more pests than beneficial insects," said Rachael Long, a UC Cooperative Extension farm advisor. "If we can show there is economic benefit to these hedgerows, then we're more likely to get growers to adopt them and to plant them on farms."

"The strategy is to keep roots in the soil, to not have fallow periods."

Soil microbes are important contributors to agricultural sustainability. They play a critical role in nutrient cycling, controlling pests, degrading toxins, and building soil structure. Priyashiela Singh, a graduate student working with Scow, examined soil microbial abundance and biodiversity in several cropping systems at Russell Ranch. An organic tomato-wheat rotation with cover crops had twice the microbial biomass as a conventionally grown system. Soil communities were more stable in organic than other systems. Future studies will investigate how these differences translate into the ability of the farming systems to withstand and recover from disturbances such as drought and heat.

"In sustainable systems, it's going to be important for us to steward the soil food web to keep those functions active," said Howard Ferris, a UC Davis nematology professor. "The strategy is to keep roots in the soil, to not have fallow periods."

"There is great potential to increase and utilize biodiversity throughout farmscapes to help increase food production while also increasing the sustainability of farming systems," Scow says. — JS

# RESEARCH IS THE SURE BET

Research into hybrid corn can be traced back to the late 1800s, but it was 1933 when the first commercial plantings were established and another 27 years until 95 percent of U.S. corn acreage was planted to the highly productive hybrids.

UC Davis agricultural economist Julian Alston uses this example to illustrate the long lag times involved in bringing research advances to development of new agricultural practices and ultimately to industry-wide adoption. While lag times vary for different innovations, the long-term payoff to society in agricultural productivity and low-cost food is worth the wait.

Alston and colleagues spent more than 15 years studying research returns in the lower 48 states during the 20th century and found that, on average, every dollar invested in agricultural research and development has provided a benefit of $21 to that state, with another $11 in spillover benefits to other states.


JOHN STUMBOS/UC DAVIS

Agricultural economist Julian Alston has shown how investments in agricultural research and development have paid off in the past. He is concerned, however, about a slowdown in the rate of agricultural productivity growth.

> "The alternatives to revitalizing research and productivity growth are not good ones."

"That's like playing roulette, which pays 35 to one if you bet on any specific number, and winning on every spin," he said. "That's a really good investment."

One way of measuring this payoff is by tracking U.S. agricultural productivity, which increased 2.5 times between 1949 and 2002. "We're producing more with less," Alston says. "The increased output is attributable to something other than increases in conventional inputs, such as fertilizer, pesticides, and farm labor. It's ultimately attributable to work done by scientists at the land-grant universities and other people who contribute to innovations that cause productivity growth."

Since 1990, however, a significant, pervasive slowdown has been taking place in the rate of agricultural productivity growth—from more than 2 percent per year in the 1970s and 1980s to less than 1 percent in the last decade. Alston believes a key factor at work in this trend is declining support for agricultural research and development. For instance, federal funding for farm productivity-enhancing research at agricultural universities dropped from a peak of about 70 percent in 1985 to about 55 percent today.

"We should do something to enhance the rates of research and investment and restore productivity growth," Alston says. "The alternatives to revitalizing research and productivity growth are not good ones for natural resource preservation, the world food equation, global security, or the international competitiveness of U.S. agriculture." — JS

### PERSISTENCE PAYS

Learn more about Alston's work in his book, *Persistence Pays*, honored in 2011 with quality of research awards by the Agricultural and Applied Economics Association, the Australian Agricultural and Resource Economics Society, and the Western Agricultural Economics Association.

ROBIN DERIEUX/UC DAVIS

"We learned that Americans are very wasteful with food and consume more calories on average than people in the rest of the world," says Hung Doan, a June 2011 graduate in biochemistry and molecular biology. "So I'm trying to be less wasteful, more energy conscious—I'm eating more veggies and less meat."

# FOOD FOR THOUGHT

## Courses help students explore connections between science, society

**HUNGRY FOR KNOWLEDGE ABOUT FOOD** systems, undergraduate student Francisco Guzman enrolled in Science and Society 2 (SAS 002), "Feeding the Planet: Influences on the Global Food Supply." Guzman is a fourth-year student who follows world news closely and wanted to learn more about possible solutions to the challenges of rising food prices and related unrest in developing countries.

"I think one of the problems with our food system today is that people just eat food and don't really ask questions about where it came from, or the process food undergoes before it reaches our plate," said Guzman, an environmental policy analysis and planning major. "Those questions only come up when problems arise."

SAS 2, offered each winter quarter, has grown to accommodate 150 students since plant pathology professors Richard Bostock and Mike Davis began teaching the course in 2006. As one of more than 20 interdepartmental Science and Society courses administered by our college, SAS 2 gives UC Davis undergraduates an opportunity to earn general education credits while learning about topical issues that impact society.

Richard Bostock

"We wanted this course to be broad in scope and to touch on controversial topics in a balanced and objective way," said Bostock. "We cover organic farming versus conventional farming, genetically modified foods, the locavore movement, energy requirements for food production, world population projections, increasing demand for meat and animal protein in developing countries, and other issues as well."

— Robin DeRieux

# THE RIGHT TOUCH

## Kelly Garbach named first winner of Bradford-Rominger Award

**UC DAVIS GRADUATE STUDENT KELLY GARBACH** received the first Eric Bradford and Charlie Rominger Agricultural Sustainability Leadership Award at a public ceremony in May.

Given by the Agricultural Sustainability Institute (ASI) at UC Davis, the award recognizes and honors individuals who exhibit the leadership, work ethic, and integrity epitomized by the late Eric Bradford, a livestock genetics professor at UC Davis for 50 years, and the late Charlie Rominger, a fifth-generation Yolo County farmer and land preservationist.

"Both Eric and Charlie were big thinkers and had the ability to realize their aspirations," said ASI director Tom Tomich. "Kelly possesses the same quiet determination and genuine modesty, while leading by example."

Garbach is an ecology doctoral candidate studying agricultural land preservation. In addition to her graduate studies, she leads the laboratory section for "Sustainability and Agroecosystem Management," a field-based course, and mentors high school students in farmland restoration as a volunteer for Audubon

"(They) were big thinkers and had the ability to realize their aspirations. Kelly possesses the same quiet determination and genuine modesty, while leading by example."

CHRIS KIM/UC DAVIS

Graduate student Kelly Garbach was honored for her leadership and dedication to sustainable agriculture.

California's Landowner Stewardship Program.

Garbach has served as a natural resource conservation consultant for both the Academy for Educational Development and the U.S. Agency for International Development. She has also worked with nonprofit organizations in Chile, Argentina, and San Francisco on natural resource management and environmental justice issues.

"I am very grateful that the Bradford and Rominger families and their friends have invited us to come to know Eric and Charlie, and be inspired to continue their legacy," Garbach said. "At UC Davis, we are surrounded by some of the brightest minds in agricultural research and management, but what makes Davis unique is that these great minds actively create space for new ideas and encourage emerging leadership."

— Agricultural Sustainability Institute

### NEW MAJOR OFFERED IN SUSTAINABLE AGRICULTURE

UC Davis undergraduates are being offered a new major: "Sustainable Agriculture and Food Systems."

"We've created a major that includes lots of learning in and out of the classroom," said Mark Van Horn, director of the Student Farm and one of the major's instructors. "This major will provide students with the knowledge and skills they need to work effectively in a wide range of positions contributing to the sustainability of food and farming."

Core classes include "Introduction to Sustainable Agriculture," "Food Systems, Sustainability, and Agroecosystem Management," "Economics of Agricultural Sustainability," and a senior capstone, "Workshop on Food System Sustainability." All students will take agricultural science coursework but will focus on one of three tracks—agriculture and ecology, food and society, or economics and policy. Internship possibilities include working with farms, food businesses, government agencies, or nonprofit organizations. — ASI

# A WATERFOWL WIN

## Dennis G. Raveling Professorship receives a big boost

**NEW PHILANTHROPIC SUPPORT IS GIVING** a big boost to an endowed professorship dedicated to helping California waterfowl.

The Dennis G. Raveling Endowed Professorship in Waterfowl Biology, created in 1994, has been held by Professor John Eadie since 1995. Eadie and his students are working to protect and improve wetland and agricultural habitats for waterfowl in California's Central Valley, which supports 3 million to 4 million migrating waterfowl—the largest single concentration of waterfowl in North America.

Eadie says the Raveling professorship helps him pursue basic research and its applications in farming, business, and public policy. "The loss of 90 to 95 percent of our wetlands has made California the emergency room of the biological sciences," Eadie said. "The Raveling endowment enables me to put graduate students into the field quickly and get vital research done."

Eadie and his students have found that even modest changes in agricultural practices and wetlands management can bring enormous benefits for the 20 percent of the nation's geese, swans, and ducks that live in, or migrate through, the state's Central Valley. The birds repay this kindness by helping farmers control weeds and mosquitoes.

These donors share an interest in promoting management of California's agricultural lands to enhance benefits to waterfowl.

The endowment was created to honor internationally recognized waterfowl teacher and researcher Dennis Raveling, who died in 1991. Original donors included individuals, foundations, and corporations, with support from three key partners—the California Waterfowl Association, the California Department of Fish and Game, and the UC Davis College of Agricultural and Environmental Sciences.

Inspired by the successful track record of Eadie and his students, Paul and Sandi Bonderson made a recent challenge to the supporters of the Raveling endowment. With a gift of $500,000, the Bondersons sought to strengthen the endowment while also encouraging additional contributions from others. Paul and Sandi are parents of a UC Davis alumnus, and Paul serves on the Dean's Advisory Council for the College of Agricultural and Environmental Sciences.

COURTESY

Professor John Eadie and his students help California waterfowl populations through research to improve wetlands and agricultural habitats.

UC Davis alumnus Peter Stent ('63, range science) and his wife Nora Stent were among the original donors to the Raveling endowment and quickly responded to the Bonderson challenge with an additional $99,000 gift to the endowment. Peter is a member of the Campaign Cabinet, a group of volunteers that is providing leadership and expertise to the Campaign for UC Davis, the campus's first comprehensive campaign.

Others are also joining the Stents in response to the Bonderson challenge, including the Dean Witter Foundation and the Herbst Foundation, both of San Francisco. All these donors and supporters share a mutual interest in promoting management of California's agricultural lands to enhance benefits to waterfowl and other water-dependent wildlife. Their partnership is built on a shared appreciation for the role of scientific research to inform management practices and policies for the betterment of waterfowl populations.

More information about endowed faculty positions is available at www.caes.ucdavis.edu/giving/endowed-chairs.

# DEVOTED TO ANIMAL SCIENCE

## Lee and Mary Ellen Baldwin remembered through gifts for students

**FRIENDS AND FAMILY OF THE LATE ANIMAL** science professor R. Lee Baldwin have established an award in his honor to support graduate students in the Department of Animal Science.

Lee Baldwin

The Lee Baldwin Family Award recognizes students whose research applies mathematics to understanding biological systems. Baldwin, who joined UC Davis in 1963, was renowned for his knowledge of ruminant biology, physiology, and nutrition. His dedication and service to the dairy and livestock industries are also among the reasons he was elected to the National Academy of Sciences in 1993 and was honored by the American Society of Dairy Science.

The Baldwin endowment was created through a $25,000 gift from Lee's wife, Mary Ellen Baldwin, prior to her passing earlier this year. The first award will be made this fall.

"Establishing this award was a tremendous honor for our family," said Lee and Mary Ellen's son, Randy Baldwin. "It is something that mom felt strongly about in order to leave a lasting legacy for my dad and we are glad to be able to support UC Davis graduate students in such a meaningful way."

The gift from the Baldwin family was matched by a $25,000 contribution from the Charlie Soderquist Matching Fund Initiative for Graduate Student Support. Gifts from family and friends in memory of Lee and Mary Ellen also contributed to funding the award.

"The Department of Animal Science is grateful for the generosity that established the endowment," said department chair Anita Oberbauer. "It enables future graduate students supported by the award to carry forward the science that Lee was so passionate about."

# UC DAVIS CAMPAIGN MAKING PROGRESS

**THE COLLEGE OF AGRICULTURAL AND** Environmental Sciences (CA&ES) is making remarkable progress in helping The Campaign for UC Davis become a success.

Through fiscal year 2010–11, more than 10,000 gifts, varying in size from $25 to more than $10 million, have been made to CA&ES toward the campaign for a total of $154,289,876. This is 73 percent of our college's campaign goal.

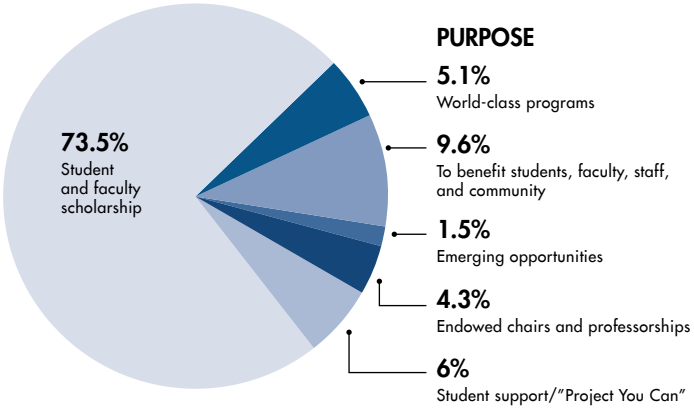
The Campaign for UC Davis is a campuswide initiative to inspire 100,000 donors to contribute $1 billion in philanthropic support to expand our ability to meet world challenges and educate future leaders. These gifts have:

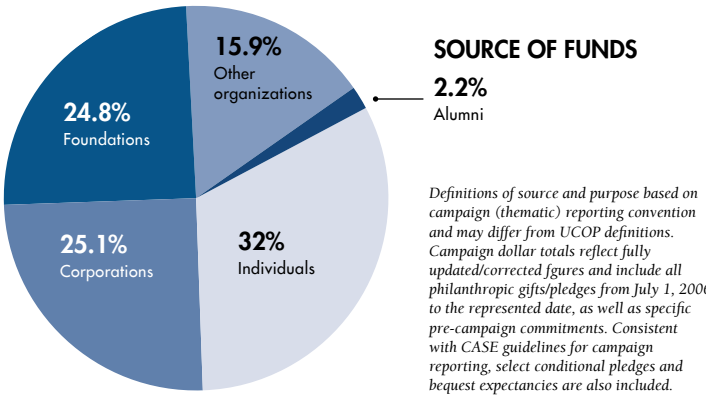
- Created research and teaching space
- Provided state-of-the-art equipment for faculty and students
- Financially supported undergraduate and graduate students
- Endowed programs to ensure long-term viability and continued innovation

With the support of the CA&ES community, we will continue to excel.

To learn more about giving to CA&ES, please visit http://caes.ucdavis.edu/giving.

— Christine Schmidt




*Definitions of source and purpose based on campaign (thematic) reporting convention and may differ from UCOP definitions. Campaign dollar totals reflect fully updated/corrected figures and include all philanthropic gifts/pledges from July 1, 2006, to the represented date, as well as specific pre-campaign commitments. Consistent with CASE guidelines for campaign reporting, select conditional pledges and bequest expectancies are also included.*

This list of donors reflects gifts of $1,000 or more that were made to the College of Agricultural and Environmental Sciences from July 1, 2010 through June 30, 2011. Pledge payments to the college and gifts made elsewhere to UC Davis are not included in this list. If your gift is not listed, please call us at (530) 754-8961.

** Chancellor's Laureates: Indviduals and corporations who have cumulatively donated $1 million or more to UC Davis.*

### $1 million and higher

American Vineyard Foundation*
Center for Food Integrity*
Barbara Banke & Jess S. Jackson*
W.K. Kellogg Foundation*
Mars, Incorporated*

### $250,000–999,999

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California Tomato Research Institute, Inc.
CIAT (International Center for Tropical Agriculture)
Cornell University
Ford Foundation*
Friends of the UC Davis Arboretum*
Gordon and Betty Moore Foundation*
International Maize and Wheat Improvement Center*
International Water Management Institute
Julianne B. Muhleman & Douglas J. Muhleman, '77, M.S. '79
Tomato Products Wellness Council
Wegman Family Charitable Foundation
William and Flora Hewlett Foundation*

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American Institute for Cancer Research
Anheuser-Busch Foundation*
California Crop Improvement Association*
Fischer Productions, LLC
Institute of Ecosystem Studies
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Mathile Institute for the Advancement of Human Nutrition
RF Tribuno Family Charitable Fund
Syngenta Crop Protection, Inc.*
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Cystic Fibrosis Research, Inc.
Darden Restaurants, Inc. Foundation
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Ellison Medical Foundation*
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Gowan Company, LLC
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International Zinc Association
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CANERS Foundation
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Florida Specialty Crop Foundation
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Haifa North America, Inc.
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Linda Pearlstein & Jack Pearlstein
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Ronald M. Yoshiyama

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Grace Bedoian & Michael S. Denison
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Evonik Degussa GmbH
Ewing Marion Kauffman Foundation
Florida Tomato Committee
Fluid Fertilizer Foundation
Mary C. Gallo
Gateway Health Alliances, Inc.
General Hydroponics
Harborchem
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International Health Nutraceuticals Incorporated
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Northern California Mint Growers Association
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Phibro Animal Health, Inc.
Produce Marketing Association, Inc.
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Rijk Zwaan Breeding BV
Sacramento Housing Alliance
Sakata Seed America, Inc.
Save the Redwoods League
Moran M. Segoli
Sierra Nevada Brewing Company, Inc.
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Stanford University
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### $5,000–9,999

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Ajinomoto Heartland, LLC
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Genencor International, Inc.
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Stuart Products, Inc.
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TIC Gums, Inc.
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Mary P. Seabury, '75 & John J. Seabury, '75, M.S. '79
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# FROM FARMS TO FAMILIES

## Alumnus Paul Ash takes a fresh approach to fight "food insecurity"

**TWENTY-TWO YEARS AGO PAUL ASH ('79,** development, resource, and consumer economics) found the perfect opportunity to combine his interest in the nonprofit world with his UC Davis bachelor of science degree in agricultural economics.

"I learned there was something called a food bank and it was a small organization that was struggling a bit," he said.

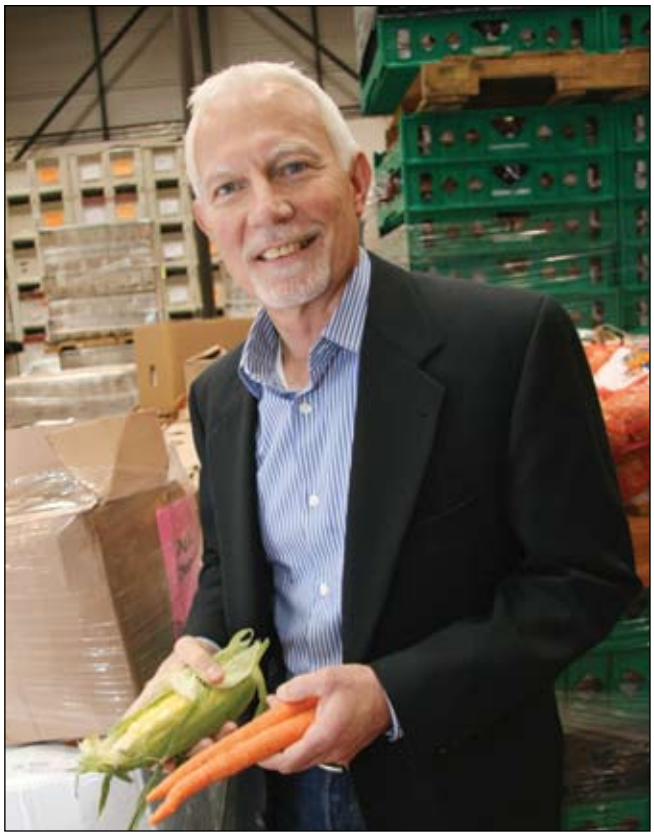
Ash was hired to become the executive director of the San Francisco Food Bank and has since overseen its remarkable growth to a model program with a $12 million annual budget, 110 employees, and an army of 20,000 volunteers who annually provide food for 200,000 hungry people. Last year 25 million pounds of fresh produce and 20 million pounds of packaged food made their way through the food bank's 60,000 square-foot warehouse to more than 200 neighborhood food pantries, soup kitchens, senior centers, homeless shelters, and youth programs in San Francisco and Marin County.

"One in four children and one in five adults in our area live at or near the poverty line," Ash says. "Even people who are above the poverty line are struggling. We see a fair number of working people, people with part-time jobs, or very low-wage jobs without benefits, at our weekly grocery pantries."

It's a growing national problem that the U.S. Department of Agriculture calls "food insecurity." According to the most recently available statistics from USDA's Economic Research Service, more than 50 million people, including 17 million children, were food insecure at some time during 2009.

> "Even people who are above the poverty line are struggling. We see a fair number of working people, people with part-time jobs, or very low-wage jobs without benefits, at our weekly grocery pantries."

Distribution through the San Francisco Food Bank has grown 33 percent in the last two years, and most of that growth has come by way of a program called "Farm to Family." The food bank collects perfectly good, fresh produce that is either excess or the wrong shape or size for conventional markets at a deeply discounted rate.



JOHN STUMBOS/UC DAVIS

Alumnus Paul Ash has seen a large increase in demand for services at the San Francisco Food Bank, where he is executive director.

"We also got one of the packers to continue picking after they got what they wanted for market," Ash said of one recent effort. "Normally, they'd just plow it under, but we paid them for the corrugated boxes they packed it in and for the extra labor. It came out to about 11 cents a pound for fresh broccoli and cauliflower—a remarkable value and it was so beautiful!"

The San Francisco Food Bank is supported by a generous community of everyday citizens who contribute time and money and by larger donors such as the Bechtel family, the Koret Foundation, and the Goldman Fund.

Ash marvels at the abundance of California agriculture and believes that with the right approach food insecurity in America can be overcome. "We can feed everybody easily," he said. "All we have to do is have the right distribution processes in place."

— John Stumbos

# GOOD THINGS ON THE HORIZON

## Partners in "Solutions from the Land" initiative visit UC Davis

**A COALITION OF RESOURCE ORGANIZATIONS** aiming to improve how agricultural, forest, and conservation lands are managed met at UC Davis in June.

The Solutions from the Land (SFL) initiative is exploring sustainable solutions to the long-term challenges of food and energy security, economic development, biodiversity conservation, and climate change. Founding sponsors include the United Nations Foundation, Conservation International, the Nature Conservancy, and the Farm Foundation. They are being joined by agriculture and forestry groups, conservation interests, businesses, nongovernmental organizations, universities (including UC Davis), land-user associations, and other organizations.

"The real potential for Solutions from the Land is bringing diverse perspectives together that all have one thing in common—they understand the critical and urgent need to feed the hungry population of today and to make sure that we have the systems in place to feed ourselves well into the future, which is truly the definition of sustainability."

Karen Ross, Secretary of the California Department of Food and Agriculture

SFL participants were in Davis for workgroups and to hear from UC Davis researchers, leaders in California agriculture, and to tour innovative agricultural projects such as the Russell Ranch Sustainable Agriculture Facility, Dixon Ridge Farms, and the Center for Land-Based Learning.

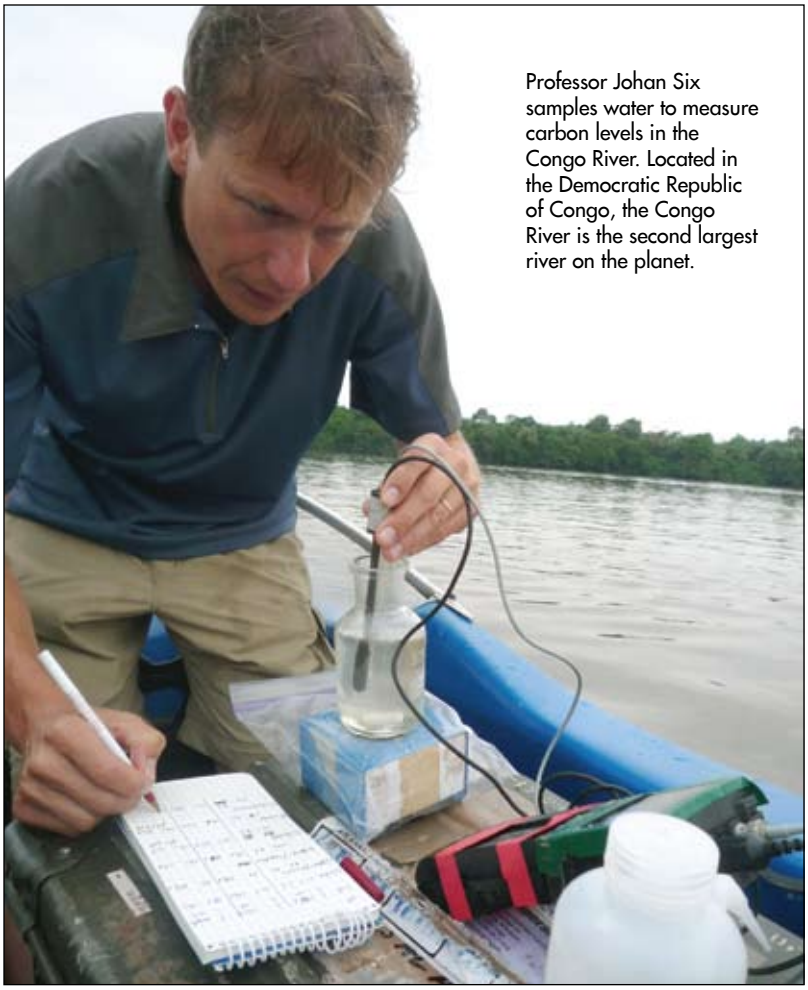
"We have set ambitious, yet attainable goals," said one of SFL's leaders, A.G. Kawamura, a California farmer and former Secretary of the California Department of Food and Agriculture. "We believe that by 2050, our resources can be managed to simultaneously satisfy domestic and global demand for safe, abundant, and affordable food, feed, and fiber, while supporting economic security and sustainable development."

Participants in the project are developing a "roadmap" detailing how the agriculture, forestry, and other land-use and conservation sectors can achieve the SFL vision for satisfying resource needs while ensuring environmental quality. Their goal is to provide a plan to increase production on working lands while offering a broad range of value-added goods and services, including ecosystem services.

The initiative will seek to effect change through policy, voluntary initiatives, consumer awareness campaigns, mitigation markets, government payments, and buyer-to-buyer arrangements. Market-based solutions that reward innovation and incentivize healthy land use will be encouraged.

For more information on the Solutions from the Land initiative visit www.SFLdialogue.net.

— John Stumbos



PIERRE-DENIS PLISNIER/MUSEUM OF TERVUREN, BELGIUM

Professor Johan Six samples water to measure carbon levels in the Congo River. Located in the Democratic Republic of Congo, the Congo River is the second largest river on the planet.

# CHANCELLOR'S FELLOW

**JOHAN SIX, A PROFESSOR IN THE DEPARTMENT OF PLANT** Sciences, was named a 2010–2011 UC Davis Chancellor's Fellow, an honor for faculty early in their careers who have already compiled outstanding records of achievement. Six and other faculty members were recognized in the spring by Chancellor Linda Katehi, each receiving a $25,000 prize and the honor of using the title "Chancellor's Fellow" for five years.

Six and members of his agroecology lab study the complex interactions among plants, soils, sediments, and all of the living organisms in a particular area, known as the biota, and the carbon and nitrogen cycles in agricultural, grassland, forest, and aquatic ecosystems. "Our general approach is to integrate field sampling, laboratory analyses, and mathematical modeling to investigate whole-system dynamics under a changing global environment," said Six.

UC Davis has recognized 63 faculty since the Chancellor's Fellow program began in 2000. Fellows from CA&ES include Andrew Waterhouse (viticulture and enology, 2000), Scott Rozelle (agricultural and resource economics, 2000), Mark Schwartz (environmental science and policy, 2003), and Rosie Woodroffe (formerly in wildlife, fish and conservation biology, 2006).

# SUPPORT FOR WHEAT RESEARCH

**WHEAT GENETICIST JORGE** Dubcovsky is one of two UC Davis plant biologists selected to be part of a new philanthropic program that boosts funding for basic plant science research. Dubcovsky, a professor in the Department of Plant Sciences, and Simon Chan in the Department of Plant Biology (College of Biological Sciences), are among 15 researchers nationwide chosen to be part of the first-ever class of HHMI-GBMF Investigators, funded jointly by the Howard Hughes Medical Institute and the Gordon and Betty Moore Foundation.

Dubcovsky and the others will share $75 million in flexible support from the two organizations over the next five years. The research funding will cover salary and laboratory equipment and allow Dubcovsky to continue developing new genetic resources to improve wheat, one of the most widely grown cereal crops on the planet. The Dubcovsky lab has identified and cloned genes involved in disease resistance, grain protein content, and flowering and frost tolerance, helping breeders develop high-yield varieties that are more nutritious and resistant to disease.

"Twenty percent of what every person around the world eats, every day, is wheat," said Dubcovsky. "Anything you do that would make that crop better has a huge impact."

Jorge Dubcovsky

STEVEN YEATER/AP

Sharon Lynch, UC Davis Athletics, shares in the good vibes with friends at last year's College Celebration.

TJ. USHING/UC DAVIS

# COME CELEBRATE THE HARVEST

**YOU ARE INVITED TO JOIN** us in Freeborn Hall on Friday, Oct. 14, as we acknowledge the accomplishments of the College of Agricultural and Environmental Sciences and honor the 10 recipients of this year's Award of Distinction.

College Celebration, a major annual event, is held each year at harvest time to reflect on the achievements of our college and our impact on California and the world. After a ceremony for the Award of Distinction recipients, faculty, staff, students, alumni, and friends of the college join in a festive gathering for delicious food, California wines, beer, and other beverages.

At the culmination of the evening, College Celebration guests are invited to dismantle a farmers market display and take home a bag full of fresh California produce, nuts, and grains.

ROBIN DERIEUX/UC DAVIS

The horse-drawn carriage will be back this year to ferry guests at College Celebration.

The cost is $15. Register at collegecelebration.ucdavis.edu.

The Award of Distinction is the highest recognition presented by the college to individuals whose contributions and achievements enrich the image and reputation of the college and enhance its ability to provide public service. The 2011 recipients include:

- Faculty: Larry N. Vanderhoef
- Friend: A.G. Kawamura
- Alumni: Margaret Lawson, Barbara Schneeman, Mahmoud El-Solh, William Sullivan, Daniel Evans, and Julia Tully
- Young Alumnus: Shawn Harrison
- Staff: Dan Flynn

CA&ES
Outlook

College of Agricultural and
Environmental Sciences #986H
University of California
One Shields Avenue
Davis, CA 95616-8571



UCDAVIS
COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

# UCDAVIS Ranked

#1

**U.S. Institutions: Most Prolific in Agricultural Sciences** (2005–2009) [1]

**Agricultural Sciences: U.S. Institution Rankings** (1998–2008) [2]

**U.S. Institutions: Most Prolific in Environment/ Ecology** (2005–2009) [1]

**Soil Sciences: High-impact U.S. Institutions** (2005–2009) [2]

**Plant and Animal Science: Most-cited Universities, International** (1997–2007) [2]

**Food Science and Technology: Most Prolific U.S. Institutions** (2005–2009) [1]

**Leading Institution for Awarding Degrees to Undergraduate Minority Students in Agricultural Sciences** [3]

*All rankings reflect current data. [1] Based on number of academic papers; Thomson Reuters / ScienceWatch; [2] Based on number of citations; Thomson Reuters / ScienceWatch; [3] Diverse Issues in Higher Education, July 2011*