

**UNIVERSITY OF CALIFORNIA**  
**DIVISION OF AGRICULTURE AND NATURAL RESOURCES**

**2010 Combined Research and Extension**  
**Federal Annual Report**

Agricultural Experiment Station  
and Cooperative Extension

Submitted April 1, 2011  
Approved May 26, 2011

**University of California**  
Agriculture and Natural Resources



# 2010 University of California Combined Research and Extension Annual Report of Accomplishments and Results

**Status: Submitted**  
**Date Submitted: 04/12/2011**

## I. Report Overview

### Executive Summary

The University of California Division of Agriculture and Natural Resources (UC ANR) is the major land grant arm of the University of California, part of the nationwide public university system "built on behalf of the people" (Abraham Lincoln). The Agricultural Experiment Station (AES) was established to develop cutting-edge research information that can be applied to solving real-world problems in agriculture and natural resources. Cooperative Extension (CE) was created as a cadre of academics housed in local communities to translate and test research findings for practical, local solutions. ANR is unique in its three way partnership with federal, state and county governments to provide these local and statewide research and extension programs that address the critical issues of California. Through its partnerships and collaborations, UC ANR is able to leverage its resources to increase its ability to address these issues.

Within UC, ANR's mission is to:

- Maintain and enhance connections that fully engage UC with the people of California
- Achieve innovation in fundamental and applied research and education that supports sustainable, safe, nutritious food production and delivery systems
- Economic success in a global economy
- A sustainable, healthy, productive environment
- Science literacy and youth development programs

Agricultural Experiment Station faculty members conduct research and teach in four colleges/school on the Davis, Berkeley and Riverside campuses. Nine research and extension centers (RECs), located in a variety of ecosystems across the state, provide a core research and extension base. Six statewide programs focus on specific issues that engage ANR academics and UC faculty from all the other campuses, allowing integrated teams to work on complex issues that need multidisciplinary approaches.

The AES has about 700 academic researchers, most of whom also have professorial appointments representing dozens of scientific disciplines. Cooperative Extension, the principal outreach arm of the Division, comprises academic appointees attached to campus departments as CE specialists or county offices as CE advisors; there are about 120 specialists and 200 advisors.

### FY 2010

California's state budget crisis continued. The Division tackled the unprecedented \$5.2 million permanent cut in state funds and \$4 million in unfunded liabilities. The budget reduction decisions aimed to reduce administrative overhead while focusing ANR programs and people on the future through our Strategic Vision. To respond to this challenge, a major effort was launched to maximize administrative efficiency, eliminate duplication, and redirect resources to

programs. The statewide administrative consolidation is in place and fully operational. The Division's priority is still to move forward with hiring new academics; current ANR staffing is well below optimal levels and postponement of new hiring would be extremely detrimental to the Division's academic mission. The resulting restructured organization will be responsive to the needs articulated in the Strategic Vision and represents a strong administrative and programmatic platform for the future. Although the 2009 cuts were severe, realistically they may not be the last, given the state's budget. ANR continues to seek alternative ways to support our programs.

After significant discussion internally and with clientele, a new Cooperative Extension model was developed. Rather than have individual county-based administrative units, new multicounty partnerships (MCPs) were proposed to achieve administrative efficiency and more effective program delivery coordination. Ground work for the pilot MCP was completed, and will be launched in FY 2011, with subsequent MCPs to follow.

During FY 2008, the Division embarked on a comprehensive and inclusive strategic planning process, culminating in the publication of ANR's Strategic Vision 2025 document. The Vision identifies the following nine multidisciplinary, integrated Strategic Initiatives that represent the best opportunities for ANR's considerable infrastructure and talent to seek new resources and new ways of partnering within and outside the University to find solutions to the issues that will be facing California in 2025:

- Improve Water Quality, Quantity, and Security
- Enhance Competitive, Sustainable Food Systems
- Increase Science Literacy in Natural Resources, Agriculture and Nutrition
- Enhance Sustainable Natural Ecosystems
- Enhance the Health of Californians and California's Agricultural Economy
- Provide for Healthy Families and Communities
- Ensure Safe and Secure Food Supplies
- Manage Endemic and Invasive Pests and Diseases
- Improve Energy Security and Green Technologies

Given limited internal resources, ANR selected certain initiatives that can have significant, documented, policy-relevant results over the next five years as the first to get under way. During FY 2009 ANR launched the following four initiatives: 1) Healthy Families and Communities; 2) Sustainable Natural Ecosystems; 3) Endemic and Invasive Pests and Diseases; and 4) Sustainable Food Systems.

During FY 2010, the Division continued to make significant progress toward its Strategic Vision. During the last year, strategic initiative leaders and panels for each of the four initiatives developed plans which identified focused areas of inquiry and needed areas of outreach. ANR members as well as the Division's stakeholders were involved in this effort. Also during FY 2010, ANR decided to additionally move forward with the Water Quality, Quantity and Security initiative. The FY 2012-2015 Plan of Work includes a full description of this new state-defined Federal Planned Program, and ANR will report on it in FY 2011. FY 2010 effort on water issues is discussed under the Sustainable Natural Ecosystems Federal Planned Program narrative.

The selection of these five strategic initiatives does not infer that the other four areas are not critically important. Rather, ANR does not currently have internal resources significant enough to be able to make additional investments in all nine at this time. Nevertheless, ANR continues

to work in all nine initiative areas in addition to the federal priority areas. For FY 2010 we are reporting on the following eight Federal Planned Programs:

1. Healthy Families and Communities
2. Childhood Obesity
3. Food Safety
4. Global Food Security and Health
5. Endemic and Invasive Pests
6. Sustainable Natural Ecosystems
7. Climate Change
8. Sustainable Energy

The following narratives describe the FY 2010 program highlights for California's Federal Planned Programs.

### **Healthy Families and Communities**

The alarming frequency of obesity, inactivity, and poor food choices in California affects all segments of our population. The future health impacts of these issues on the state will be staggering unless we can reverse this trend. In addition, it is projected that only 7 of every 10 students will graduate from high school and only 1 of 4 will be ready for college. Because a lower percentage of California's population will achieve college degrees, there will not be enough college graduates to meet the needs of the state's employers. If our society continues to lose science literacy, and the youth continue to lack community and civic engagement, California will be unable to tackle the tough challenges the future holds.

ANR campus and county-based researchers are making inroads into developing science-based strategies to prevent obesity and diabetes, and to promote wellness. ANR educators extend environmental, agricultural, natural resources, and nutrition knowledge to students and other clientele who will be the state's future scientists, leaders, educators and professionals.

Seventy Hatch and Regional Research projects were funded through Multistate Research sources at UC Riverside, Davis, and Berkeley with a focus on California's families, youth and communities. Sixteen research activities were conducted by UCCE Advisors and 298 extension projects were conducted by UCCE advisors and campus-based specialists under the state-defined Federal Planned Program: Healthy Families and Communities. Projects, lead by collaborations of faculty, specialists, advisors, county staff, industry, agencies and community-based organizations, are being conducted across the campuses and the counties that support the development of resilient communities; a few illustrative examples follow.

#### *Human Nutrition and Health*

AES research was conducted in diverse areas of nutrition and health ranging from molecular studies to evaluation of nutrition extension strategies. A few of these include: molecular physiology of fatty acid transport proteins; mammalian circadian rhythms and their impact on human health; iron metabolism; drug and disease induced element deficiencies; molecular basics of obesity and Type 2 diabetes; chemistry of lipids in foods and tissues; determinants of early lactation success and infant feeding practices; interventions to improve zinc and vitamin A consumption among low income children; nutrition literacy among adult audiences; impact of

eliminating soda machines in schools on the calorie and calcium intake of adolescents; and the use of visually enhanced communication tools to improve effectiveness of health campaigns in rural and low-income audiences.

Also considerable research was done on phytochemicals, including nutrient bioavailability and their underlying protective mechanisms, cancer fighting qualities, lifestyle modification and metabolic effects for chronic disease risk reduction, as well as the impacts on food processing on levels of phytochemicals in fruit and vegetables which has led to the development of a framework for understanding the mechanism of action of this class of bioactive compounds. Another study on biological activity of recombinant human milk proteins found that milk proteins can now be produced in rice in large quantities and that novel products may be developed that can protect infants against infections and also supply iron in an absorbable form. This may have significant health consequences in both less developed and industrialized countries. Additional study of the human milk proteins will also result in further knowledge of the benefits of breast milk.

Community level successes include delivery of highly effective nutrition education directed at high risk and low income audiences, through FSNEP and EFNEP, who reached 215,241 and 67,026 adults and youth, respectively, in 35 of California's 58 counties. These efforts are making a difference in lives of California families who report healthier food choices, increased fruit and vegetable consumption, reduced fat and increased whole grains in their diets, increased physical activity and cost savings in grocery expenditures. One statewide study found youth who participated in food tasting activities tried more foods and another reported increased hand washing by children after the nutrition lessons. The expanded use of technology (Smart Boards, "clickers", websites, videos, Twitter, and Face Book) are showing promise in nutrition education deliveries.

### *Family and Consumer Well Being*

Research by AES in this area has covered a wide range of topics from protective clothing to toddler learning. Here are a few examples of the research which is leading to new policy recommendations on several fronts: nanofibers were researched as new personal protective technologies to provide protective clothing for first responders and others facing occupational exposures to fire, heat, biological and chemical hazards; playground equipment and their use by toddlers was studied providing recommendations for playground facility development; factors in determining how children acquire information from social environments and cultural settings that shape their thinking and problem solving was studied to inform recommendations to early childhood programs on ways to enhance children's problem solving, moral reasoning, and social cognition; also researched was the degree to which economic hardships of the family of origin predicts the intergenerational impact of economic stress over time for family members. The study found that the early economic disadvantage in the family of origin has a negative impact on the emotional well being and social functioning of the next generation of children affecting their ability to become effective parents and workers once they reach adulthood. Community-based programs, such as Money Talks, are equipping consumers and youth to be empowered consumers.

### *Youth Development*

A sampling of the research conducted by AES faculty in youth development includes research on: bullying and adolescent copying strategies; a longitudinal study assessing

parenting experiences and social support during the middle childhood years that predict an individual's health, vocational identity development, job and marital satisfaction, and fulfillment; problem solving as a predictor of positive youth development and understanding of how problem solving interactions contribute to a sense of self-esteem and mastery during the years of adolescence; understating place-based elements, such as transportation, recreation, education and community pride in communities that hinder and support adolescent development; and agricultural literacy including ascertaining teaching strategies to effectively foster conversational literacy of agriculture and environmental topics and which agrifood system contexts are conducive to kindergarten-university science and social studies teaching and learning.

Over 212,000 youth were engaged in researched based programming which is improving their life trajectory and informing the field of youth development. In 2010 the Statewide 4-H YDP launched, 4-H Thrives! a cutting edge youth development framework that incorporates current research on positive youth development (PYD) identifying youth's sparks, adopting a growth mindset, setting goals, and incorporating the 6 C's of PYD: competence, confidence, connection, character, caring, and contribution. The framework is being incorporated in every county by teams of staff and volunteers and will be extensively evaluated through control groups. California Focus, a year-long program for 4-H teens to learn about California government and history, participate in legislative and judicial simulations, address current issues, and provide service learning in their communities was recognized in 2010 as a Program of Distinction. 4-H SET focused efforts on improving the capacity of staff and volunteers to deliver effective SET programming through six statewide workshops, developing new curriculum in robotics and water conservation, and conducting several collaborative research projects. Promising practices are being identified through California's participation in a multi-state project on social capital.

### *Community and Economic Development*

Research by AES faculty in community and economic development included studies on: the use of community driven development strategies for reducing rural and global poverty by improving decentralized and participatory involvement; understanding how jobs are allocated when they are scarce and how people respond in terms of economic behaviors to high unemployment; methods, data and empirical applications to explore the impacts of agriculture policy and trade reforms on agriculture production, rural income and welfare in less developed countries; planning and urban design issues related to immigrant and minority communities, public spaces and community landscapes; and effectiveness of community networks in promoting US citizenship and civic engagement .

### **Childhood Obesity**

Improving children's health is critical to the future of California. Using California's Fitnessgram data, nearly one-third of the state's school children (measured in 5th, 7th, and 9th grades) are classified as overweight/obese. Although rates of childhood obesity and overweight are increasing at alarming rates for all children, low income and ethnic minority children are at especially high risk. It is estimated by the Centers for Disease Control and Prevention that up to one-third of children born after the year 2000 will become diabetic at some time in their life if the current rate of childhood obesity is not reduced. The risk is even greater for Hispanic and African American children. California leads the nation in health care costs associated with obesity and the chronic diseases with which it is associated; the cost to the State of overweight,

obesity and physical inactivity was assessed at \$41.2 billion in 2006, predicted to rise to \$52.7 billion by 2011 by the California Center for Public Health Advocacy.

To confront this crisis, childhood obesity prevention is a major focus of ANR's Strategic Vision 2025. ANR is recognized in the country for its leadership and scholarship in addressing child nutrition. UC ANR was the first to dedicate a CE nutrition specialist to the prevention of childhood obesity. The UC Berkeley Atkins Center for Weight and Health, founded by CE childhood nutrition specialists and AES nutrition faculty, is a national leader in the obesity prevention movement. The recently established UC Davis Department of Nutrition Center for Nutrition in Schools will be a catalyst for this work, as well.

Four Hatch and Regional Research projects were funded through Multistate Research sources at UC Riverside, Davis, and Berkeley with a focus on childhood obesity. There were also 9 research activities conducted by UCCE advisors and 56 extension projects were conducted by UCCE advisors and campus based specialists under the required Federal Planned Program: Childhood Obesity. Specific examples of ANR's work to prevent pediatric obesity follow:

- The child and the family were the focus of a new program in Contra Costa County: 82 4-H school-age youth, approximately half on their own and half with an adult family member, participated in a six-week "Healthy Living" research project to evaluate the effectiveness of a family approach to preventing childhood obesity by improving nutritional and physical activity behaviors. At 2-hour meetings youth played physically active games, prepared meals using fresh fruits and vegetables, participated in interactive activities, and recorded new things they learned. Compared with the youth-only group, parents who participated in the youth-adult series were more likely to express confidence in family acceptance of recipes modified to reduce fat and sugar. Among the youth, there was significant change observed in reduced soda and sports drink consumption.
- The child in the community was the focus of Sacramento's CE program to provide seven weeks of summer day camp for about 100 low-income youth, ages 6 to 8 years old, at community centers and elementary school sites. The program included nutrition education, cooking, arts and crafts, games and fitness activities. The interactive, hands-on activities taught campers about good food habits. Eighty-four percent of the participants increased their knowledge about the importance of eating a variety of nutritious foods. Many began to make healthier snack choices.
- Hatch funds supported work to identify genetic research to reduce obesity and included specific genes that influence response to amount and type of dietary fat. Obesity and diabetes genes may be used to identify specific individual causes for obesity or diabetes. Knowledge of obesity and diabetes genes will provide a better understanding of the mechanisms by which body fat and diabetes are regulated.
- In a randomized controlled community-based educational intervention to evaluate changes in behavior and metabolic parameters related to risk of diabetes, investigators grouped Latino mothers of children aged 1-3 years into two groups: at low or high risk of childhood obesity based on birth weight and mother's history of gestational diabetes. Investigators examined differences in child feeding practices associated with accelerated weight gain among children.

- In another study, 82 youth who were recruited through the 4-H Youth Development Program, schools, community organizations, and by newspaper announcements attended six nutrition classes. Each session included a physically active game, hands-on cooking, shared mealtime, a brief nutrition activity, reflection and goal setting. Groups were randomly assigned as youth-adult and youth-only. To improve the methods of assessing dietary outcomes in youth, a validation study of a digital photographic method to complement dietary recalls was conducted. The findings of this study will have important implications for messages and interventions to be delivered through other USDA programs, including EFNEP and FSNEP. The nutrition curriculum that was developed used a hands-on learning approach.
- Programming has been developed to reduce the health consequences of obesity and prevent diabetes in overweight African American children living in low-income communities. An intervention at a summer camp was followed by monthly sessions over 2 years with nutrition education, physical activity promotion and self-esteem and self-efficacy. A cross sectional analysis of a sample of 9 to 11-year-old children with BMI greater than the 85th percentile was performed to evaluate the relationship of dietary intakes to fasting hematological and biochemical measurements and blood pressure as selected markers of cardio metabolic risk factors. Multivariate regression analysis showed that higher calories were associated with higher plasma concentrations of intermediate density lipoprotein cholesterol (IDL-C) and very low density lipoprotein cholesterol (VLDL-C). Higher intakes of carbohydrate energy (fat and protein held constant) were associated with higher IDL-C, VLDL-C triglycerides (TG) and insulin resistance (HOMA\_IR). Higher intake of fat was associated with lower HOMA-IR. These findings are valuable for better understanding impacts of nutrition programming on the individual youth at high risk for obesity.
- Survey data was collected in 31 California schools to assess student's knowledge and attitudes regarding food and activity programs and policies to prevent obesity, survey data documented youth food and activity behaviors. Data documents improved fitness levels of students who walk to school. Poorer BMI outcomes were paradoxically associated with the higher fitness levels of students walking to school pointing to the increased access to snack food vendors for youth walking to school. The same survey data also provided insight into students' competitive food preferences. This is the first study to present data on local and state food policies from the student perspective. This information has been published and will serve to inform school nutrition changes in California.
- A large scale evaluation of nutrition education in WIC was conducted to inform counseling efforts in WIC. The Atkins Center staff evaluated the effectiveness of the new WIC educational curriculum to promote healthy food choices in line with the 2010 Dietary Guidelines. The study found significant behavior change among WIC participants. Findings from this study have been published and will inform both WIC educators and others who work with low-income mothers.

## Food Safety

For many years, UC ANR research and extension personnel have been involved in food safety issues. However, because of recent outbreaks of *E. coli* O157:H7 and *Salmonella* on various food commodities, ANR activities in the food safety arena have intensified, broadened in scope, and involved more campus- and county-based academics. In addition, ANR food safety efforts are notable for continuing to cover a wide range of California commodities (processed foods, fresh-cut products, dairy cows, poultry, seafood, leafy greens, nut crops, melons and other cucurbits, strawberries and other fruits) and addressing the need for both basic and applied research.

Eleven Hatch and Regional Research projects were funded through Multistate Research sources at UC Riverside, Davis, and Berkeley with a focus on food safety. There was also one research activity conducted by a UCCE advisor and 60 extension projects were conducted by UCCE advisors and campus based specialists under the required Federal Planned Program: Food Safety.

### Projects:

- Improvement of food safety programs and the reduction of food poisoning risks depend on a deeper and more complete understanding of the human pathogens that are involved. ANR scientists therefore are investigating basic, foundational aspects of the biology, physiology, and biochemistry of key foodborne pathogens such as *E. coli*, *Salmonella*, *Listeria*, *Staphylococcus*, *Yersinia*, and other pathogens. For example, researchers are striving to understand how these bacteria detect, respond to, and survive various stresses such as acid, ethanol, temperature changes, and salts. Understanding these bacterial responses can help devise improved means of controlling the growth of these organisms. A *Listeria* project is examining how, at the biochemical level, this pathogen transports and takes up various substances. Elucidation of this transport system can lead to approaches for limiting *Listeria* reproduction. The molecular basis for how *E. coli*, *Salmonella*, and *Yersinia* pathogens produce and secrete proteins is the subject of another project that promises to add to the understanding of how these bacteria survive, infect humans and animals, and cause disease.
- Detecting and quantifying foodborne pathogens in the environment (soil and water, for example) and on food commodities are difficult and complex tasks. Projects are in place to devise faster, simpler, less expensive detection methods that remain sensitive and accurate. Industrial facilities that produce processed foods such as canned tomato products and packaged almonds, or "value added" lightly processed items such as bagged leafy greens, also rely on researchers to improve pathogen detection methods. ANR researchers are also involved in assisting these industries in improving the quality of finished products by studying the chemical, microbiological, and engineering components of these processes. Such investigations can help develop new means of improving product quality, predicting problems, detecting pathogens, decontaminating the commodity or equipment, evaluating finished product quality, and addressing food safety concerns.
- ANR research teams have conducted innovative field research in order to better understand the ecology and persistence of foodborne pathogens in agricultural fields. Campus- and county-based academics have collaborated to study how *E. coli*,

introduced into lettuce and spinach fields grown under commercial conditions, survives, is spread, and responds to growing practices. Such experiments can better inform industry and regulators on the relative risks of E. coli in the farm environment.

- Food safety issues go beyond microbial contamination of edible commodities. When the gulf oil spill contaminated seafood supplies, ANR academics quickly responded and joined in a nationwide effort to test, monitor, and otherwise work to protect consumers from consuming contaminated seafood items. This effort provides an example of the broad influence of ANR programs that extends beyond the California border.

#### Program delivery:

- The information generated by these programs has been delivered to a diverse audience of ANR clientele, including farmers, processors, regulators, public policy makers, agricultural commodity boards and organizations, consumers and the public in general. Program and information delivery took many forms, including scientific publications, technical reports, consumer information bulletins, extension short courses, website and blog postings, presentations to commodity groups, university sponsored educational events, interactions with media, and other opportunities for information transfer. A number of the ANR website information sources on food safety are particularly well done. Special outreach efforts were also made to extend food safety research and extension information to targeted, under-represented groups such as non-English speaking, limited resource farmers in California. For example, food safety knowledge sessions were completed for Hmong and Mexican strawberry growers, with presentations and printed materials translated into the appropriate languages for the respective audiences.

#### Program outcomes:

- The diverse and wide ranging ANR food safety programs are playing important roles in keeping clientele informed of issues, concerns, and progress in the food safety arena. Programs are helping producers, suppliers, and buyers of food commodities comply with new food safety regulations. Under-represented Hmong and Mexican strawberry growers in California, for example, are able to participate in new food safety auditing programs because of the training received from county-based academics. Through various efforts in the Nutrition, Family, and Consumer Science program, campus- and county-based ANR academics make it possible for consumers to participate in food safety education programs that help them improve food handling and preparation techniques. Focused efforts have successfully enabled low-income youths, adults, and families to adopt safer food handling practices, as well.

## **Global Food Security and Health**

Rapid population growth, wide spread poverty and the rapid losses of irrigated farmland create an urgency to improve our ability to produce food more efficiently and more sustainably. Food insecurity currently affects 1 in 10 Californians, and will continue to challenge millions of Californians in the future.

Only an interdisciplinary approach can effectively address the severe challenges food insecurity presents to social and environmental justice. ANR scientists have a key role to play introducing new crops and enterprises and developing new uses for existing crops and animals. Working with producers, we can improve the nutritive value of California commodities. California agriculture will benefit by the value added to its commodities and its competitive advantage in national and international markets. Agriculture's enhanced economic viability will improve the quality of life, education, and other services in rural California and will contribute to the state's overall economy as well.

Two hundred and twenty seven Hatch and Regional Research projects were funded through Multistate Research sources to investigators at UC Riverside, Davis, and Berkeley with an agricultural focus. There were also 113 research projects conducted by UCCE advisors and 556 extension projects conducted by UCCE advisors and campus based specialists under the required Federal Planned Program: Global Food Security and Health. The following projects illustrate the types of projects that are being conducted by academic and non-academic personnel located in county extension offices, the three ANR campuses, several Research and Extension Centers, and occasionally on USDA facilities in collaborative efforts:

A few years ago, a UC researcher isolated the rice genomic region that carries the submergence tolerant trait and demonstrated that one of the 13 genes in the region, called Sub1a, confers submergence tolerance. Sub1a was then precisely transferred into popular high-yielding rice varieties. Given the field performance of the new lines, many national rice improvement programs in Asia began rapid seed multiplication and dissemination efforts. For example, in 2009-2010, Swarna-Sub1 was released in India, Indonesia, and Bangladesh; BR11-Sub1 was released in Bangladesh; and IR64-Sub1 was released in the Philippines and Indonesia. Additional varieties with Sub1 are being developed by national breeding programs in several countries in Asia.

- Irrigation Research Delineates Tradeoffs in Fruit Quality and Yield:

UC Kern County farm advisors, in cooperation with a private citrus grower, developed and implemented a series of carefully monitored irrigation treatments that allowed delineation of the affects of late-season irrigation stress on fruit quality and yield. Yield and fruit quality evaluations were conducted at the experimental pack line and laboratory at the UC Lindcove Research and Extension Center. A UCCE specialist brought together a human sensory panel to determine if the laboratory-measured differences in fruit quality correlated with human sensory perception. Growers specializing in producing fruit for the early navel market now have available to them knowledge of the tradeoffs related to irrigating early navel varieties in the August-through-October time period. This research demonstrated that late season irrigation stress saved water, increased development of early fruit color, and increased the concentration of soluble solids, such as sugar, and organic acids.

- Making Avocado Crops Profitable in Ventura and Santa Barbara Counties:

Working with growers, ANR campus- and county-based personnel began testing various methods for controlling root rot. The management practices developed by ANR have made avocados economically very attractive for coastal growers where the costs of labor, land and water are so high.

- Organic Demonstration Farm Thrives at Local Community College Campus:

An organic demonstration farm was planned, designed and implemented. As the first sustainable agriculture and horticulture education and training center of its kind in Marin County, the Indian Valley Organic Farm & Garden will be instrumental in creating the next generation of green industry professionals, fostering countywide agricultural literacy and environmental sustainability, and providing graduates with the tools to find and create green jobs and businesses in horticulture, agriculture and beyond.

- Research and Education Program Keeps the California Rice Industry Competitive:

For over 10 years UCCE conducted a series of experiments to develop the best management practices to ensure high quality rice. UCCE published the Rice Quality Handbook as a standard reference for growers and dryer operators. The companion Rice Quality Workshop, attended by hundreds since its inception, is required training for employees of rice dryers throughout the Sacramento Valley. Understanding the production and processing variables affecting rice quality enables growers to harvest rice at lower moisture content, reducing drying costs, better preserving rice in storage and increasing profitability. Commercial dryers reported reducing energy use by as much as 20 percent.

- Farm Succession: Helping Families Nurture the Next Generation:

A profitable, owner-operated system of agriculture is necessary for the economic well being of our rural communities. Many farmers will retire in the next two decades and younger people are needed to carry on these farm businesses. A UCCE farm advisor offered statewide conferences and regional workshops on farm succession. In addition, she conducts individual consultations. Statistical outcomes, such as acres of farmland still in production, are hard to come by in this very dynamic and long-term arena; but, we believe that the educational outreach has affected the future of California farming and ranching in a lasting way.

- Postharvest Biology of Fruit:

Researchers have been studying the increase in susceptibility to pathogens that accompanies the ripening of fruit: for example, the interaction of the gray mold pathogen *Botrytis cinerea* with ripening tomatoes. The long-term goal is to manipulate the fruit ripening program so that increasing pathogen susceptibility is no longer linked to the ripening process.

- Integrated Approach to Enhance Efficiency of Feed Utilization in Beef Production Systems:

Results of this work suggest that selecting replacements on phenotypic weaning weight improves subsequent efficiency over selection on genetic breeding value. This information can be used to improve genetics or to determine the appropriate management system for different genotypes, or animals with varying energetic efficiencies. Beef producers should improve their understanding of how to manage

animals with inherently different genotypes and phenotypes. Also, producers will gain greater control over beef management and improve profitability.

- Genetic Variability, Selection and Inbreeding in Flower Crops:

This project applies new cut-flower breeding methods to populations of *Gerbera hybrida* to improve performance of cut-flower cultivars for California greenhouse production. These results will provide commercial flower breeders in California with a breeding strategy for the genetic improvement of flower crops and combine additive genetic variability with strong inbreeding depression. The results will also validate whether negative correlations between flower yield and flower quality can be effectively reduced allowing the production of high yielding varieties that also have high flower quality.

## Endemic and Invasive Pests

California's pests pose risks to the state's economy, trade, natural resources, health and the environment. Pests and pest management activities are very diverse and extensive given California's moderate climate coupled with the state's diverse land resources, including 27 million acres of cropland, 43 million acres of public lands, and more than 350 crops. Pests that may cause economical and health impact include arthropods, plant diseases, weeds, nematodes, and vertebrates.

Pest management efforts and activities focused on the development of basic and applied knowledge, as well as products to help develop integrated pest management strategies that are effective, economical and environmentally responsible and support public health. These activities work to understand pest biology and ecology, improve methods of pest detection and monitoring, understand pest genomics and interactions with host plants, breed for pest resistance, develop novel pest management techniques including biological control, improve application technology and delivery, and develop predictive models for pest infestation and damage.

One hundred and sixty three Hatch and Regional Research projects were funded through Multistate Research fund sources to investigators at UC Riverside, Davis, and Berkeley with pest management focus. In addition, there were 119 research projects reported by UCCE advisors and 417 extension projects were conducted by UCCE advisors and campus-based specialists under the state-defined Federal Planned Program: Endemic and Invasive Pests and Diseases.

- Pierce's Disease and its Vector Glassy-Winged Sharpshooter:

Pierce's Disease (PD) is one of the most pressing disease problems in California. PD has significantly affected wine and table grape production, especially in southern California since the introduction, spread and establishment of the glassy-winged sharpshooter (GWSS), the causative vector of PD that transmit xylem-colonizing bacterium *Xylella fastidiosa* (Xf). Research has been conducted to reduce the population of glassy-winged sharpshooters that spread the disease, map the genome for Xf, and develop new cultural and vineyard practices to help growers contain the spread of PD. To reduce Xf bacteria transmission, research was conducted to generate information on how the plant pathogenic bacterium Xf interacts with sharpshooter vectors at the

molecular level. This approach would represent a novel mechanism to limit the impact of an economically important plant pathogen. In addition, in the search for long-term solutions, work was conducted breeding grape for PD resistance. Several of these lines were tested under field conditions with promising results. As a result of PD and GWSS research, the disease control strategies have advanced to the point that planning for commercialization is in progress, including matters of regulatory approval and intellectual property freedom-to-operate.

- Management of Weedy and Invasive Plants in Wildland and Agricultural Ecosystems:

In California, there is a great concern about introducing invasive plants that may damage agriculture and ecosystem processes such as community diversity, hydrology, fire regimes, and soil chemistry. Research has shown that invasive plants have a competitive advantage because they are no longer controlled by their natural predators or pathogens, and can quickly spread out of control. In California, approximately 20% of the plant species established are non-native, with 3% considered harmful invasive plants. Although the percentage is small, these invasive plants inhabit a large proportion of the landscape. Research was conducted to study biology, invasiveness, and management of important invasive weed such as giant reed, medusahead, downy brome, artichoke thistle, *Arundo donax*, Sahara mustard, black mustard, shortpod mustard, *Salsola tragus*, and jungle grass. Researchers also have evaluated biological attributes of invasive plants and vulnerable plant communities to develop management protocols for screening plants and prioritization of their control, containment, and eradication. Results of this research have direct applications for developing ecological approaches for prevention and management of wildland invasive weeds.

- Integrated Pest Management Strategies for California Specialty Crops:

Projects were conducted to develop Integrated Pest Management strategies for key arthropods and diseases of specialty crops. Several projects evaluated mortality and sublethal effects of specific pesticides on biological control agents of pests in specialty crops, and develop new and effective tactics that can be incorporated into IPM programs for various crops including strawberry, almond, citrus, avocados, pistachio, grape, fruit trees, olive, blueberries, and vegetable crops. Several new insecticides for control of pests were evaluated and requests made to IR-4 program to register promising compounds. The relationship between timing of the spring sprays and efficacy shows that proper timing enabled reduced-risk insecticides including insect growth regulators to be used instead of organophosphates and pyrethroids to control important pests such as peach twig borer and navel orange worm. Researchers developed ecologically and economically sound methods, which reduce dependency on broad spectrum pesticides and maximize nonchemical, for controlling citrus arthropod pests such as red scale, citrus thrips, citricola scale, cottony cushion scale, citrus red mite, katydids, and the recently arrived citrus leafminer and citrus peelminer. Degree-day estimates and economic thresholds of damage were also developed. In addition, timing, rates, and methods of application of reduced-risk pesticides to improve selectivity favoring natural enemies were identified.

- Management System for Spotted Wing *Drosophila* in Caneberries and Strawberries:

UCCE in Santa Cruz County discovered a new vinegar fly pest infesting caneberries and strawberries, which was later described by the California Department of Food and Agriculture as *Drosophila suzukii*, and given the common name spotted wing drosophila. In 2009, spotted wing drosophila spread to cherries, blueberries, caneberries and strawberries in California, Oregon, Washington, British Columbia and Florida. UCCE farm advisors and specialists undertook an aggressive research program to create a program of management for this new pest. The information was extended to growers using the internet. California caneberry growers, who were among the most affected by spotted wing drosophila, quickly deployed the methods as outlined by UCCE with great success. The result was a drop in the amount of spotted wing drosophila infested fruit of at least 20 percent, resulting in savings of \$36 million to the industry.

## **Sustainable Natural Ecosystems**

The term "Natural Ecosystems" refers collectively to the less intensive land uses characteristic of forests, rangelands, and wetlands. Common themes across many of our natural resources include population growth, climate change, land use change and fragmentation, and science literacy. In addition to those four cross-cutting themes, several key areas of inquiry have been targeted by the ANR Sustainable Natural Ecosystems Strategic Initiative as having large impacts on California's natural resource ecosystems. They are briefly described below along with selected examples of high impact programs representative of ANR's work during FY 2010.

One hundred and forty seven Hatch and Regional Research projects were funded through Multistate Research sources to investigators at UC Riverside, Davis, and Berkeley with a natural resources focus. There were also 23 research projects conducted by UCCE advisors and 347 extension projects were conducted by UCCE advisors and campus-based specialists under the state-defined Federal Planned Program: Sustainable Natural Ecosystems. Projects are being conducted in several areas that are essential to sustaining California's natural resources; a few illustrative examples follow:

- **Land Change Science:**

California is characterized by a complex physical geography, tremendous natural biodiversity, and an intricate ownership pattern that juxtaposes private, municipal, state, tribal and federal land parcels across the state. Land use and human development as implemented across California's diverse ecological and social landscape can lead to increasing fragmentation which in turn threatens the ecological integrity of vital natural resources. Rapid increases in human population density and changes in climate only accentuate the need to coordinate regional planning efforts to promote conservation while also meeting the needs of all Californians. Land use and fragmentation are critical issues in sustaining natural ecosystems. Projects are underway helping clientele build and use better tool kits for quantitatively evaluating changes in the Californian landscape.

- For example, risk of wildfire is one of the critical issues facing California communities that border wildlands. Educating homeowners about fire-safe landscaping is one of the most effective ways to increase fire safety, reduce

costs associated with property destruction, and reduce the risk of erosion and debris flows after a fire. The UCCE Sustainable and Fire-Safe (SAFE) Landscapes program teaches Los Angeles and Ventura County wildland/urban interface homeowners how to create and maintain fire-safe landscaping around their homes, and take steps to protect the health of neighboring habitat. In particular, the program educates homeowners about the ecological and fire risks posed by invasive plants. UCCE also works with fire agencies, nurseries, and other organizations that provide lists of recommended plants to make sure they do not suggest the use of invasive species. In addition, recent research produced the first high-resolution map of where hot, dry Santa Ana winds consistently are most severe and which areas are more sheltered. Such models can predict where the largest wildfires in California are most likely to occur. Such quantitative analysis of extreme wind spatial variation can improve fire management effectiveness and the sustainability of urban development on fire-prone landscapes.

- Another example of a land change science project investigates how elevated nitrogen (N) inputs to wildlands adjacent to urban and urbanizing landscapes alter plant community composition; determine whether oak canopies function as hotspots of nutrient/pollutant inputs to wildlands adjacent to suburbs and agriculture; and assess how any enhanced N inputs affect plant performance and competitive relationships between native and exotic species. The project is testing whether plant and soil chemistry are altered by the enhanced nutrient input by applying an improved classification of urban land cover to the Sacramento metropolitan region. Multiple organizations including the UC Reserve System and the ANR Research and Extension System, the San Francisco Water District, the Audubon Society, CSU Fresno, and the USDA Forest Service Range are contributors.

- Biodiversity:

California is a global biodiversity hotspot given its unique and highly variable topography, geology, and climate. Increasing urbanization, global climate change, air pollution, and invasive species will impact the state's biodiversity. Conservation and restoration of diversity will be challenging, particularly due to land use changes and climate change, and will require an understanding of the distribution of ecosystem types, species, and species interactions, across space and time. These components of diversity are among the critical factors that maintain resilient systems and ecosystem services. Issues of biodiversity cross over several ANR initiatives and are not restricted to any state or region, and include a diverse clientele, requiring a high degree of cooperation and strength in research and outreach.

- Once numbering in the thousands, today coho salmon in the Russian River and its tributaries are on the verge of local extinction. To prevent this from happening, the California Department of Fish and Game (DFG), NOAA Fisheries, the Army Corp of Engineers, the Sonoma County Water Agency, Sonoma County UC Cooperative Extension and Sea Grant teamed up in 2001 to create the Russian River Coho Salmon Captive Broodstock Program. Under this program, juvenile coho were collected from coho streams within the Russian River watershed by DFG, and subsequently raised to maturity and spawned at Don Clausen Warm

Springs Hatchery at Lake Sonoma. In 2004, DFG began releasing the offspring of these captive-bred wild fish into Russian River tributaries that historically held runs of coho salmon. The goal of this program is to restore self-sustaining runs of coho salmon to multiple tributaries of the Russian River, and in doing so, create a balance where the river's water can sustain both the coho salmon and the residential and agricultural uses that rely on it.

- Crop pollination by bees affects an estimated 15-30% of the food composing the American diet. The honey bee (*Apis mellifera*) dominates crop pollination in the US; but, the number of commercially-managed colonies has been declining due primarily to parasites and diseases, and pollinator shortages have occurred in recent times (e.g. 2005) as a result. Wild bee species (4000 species in North America) provide a complementary source of pollination services, as well as an insurance policy against fluctuations in supply of the honey bee, but may also be at risk. Previous research has shown that communities of wild pollinators can provide sufficient pollination services on farms. But there are few examples of attempts to restore pollinating organisms and pollination function, particularly at a landscape scale. A UC research program investigated the factors contributing to the decline of important wild crop pollinators, and used this knowledge to develop effective restoration protocols. Based on this project, plus our previous research on native pollinators and their role in crop pollination, the California Natural Resources Conservation Service (NRCS): 1) completed development of a state technical note on native bee conservation; 2) prepared a pollinator plant list for the state; and 3) developed and implemented new cost share rates for the NRCS Environmental Quality Incentives Program, paying growers 90% of costs to implement hedgerows that include plants for pollinators. In addition, the project outreached to members of Resource Conservation Districts from several counties to do monitoring training. The work will allow implementation of new management techniques on farms to restore pollinator diversity and abundance, and monitor the results of these management innovations.
- Water Quantity, Quality, and Security:

Californians built and maintain the largest water redistribution system in the world. Moving water from sources, such as the Sierras and the Rocky Mountains, to agricultural and urban sinks, through wetlands, deserts, and wildlands consumes energy at unprecedented rates. Recent droughts and expanding urban populations place increasing pressure on California's water supplies. There is a clear need for objective research into the changing conditions, and new management strategies for water which include how land use and management regulate the water cycle.

- In residential areas outdoor water use, primarily for landscapes, comprises 50 percent or more of total water use. It is commonplace to see excess water gushing down storm drains from poorly aimed sprinklers, broken sprinkler heads, and a larger volume of water applied than the soil can absorb. The runoff water can carry pesticides, fertilizers and other waste into waterways, causing a detrimental effect on the health of the aquatic life in rivers, lakes and bays. UC researchers examined the runoff from eight neighborhoods in Sacramento and Orange counties. Water runoff samples were collected and analyzed for 11 pesticides, fertilizers, other pollutants and pathogens. In both counties, UC

Master Gardeners developed activities for homeowners to improve landscape management practices related to water, fertilizer, and pesticide use. The aim is to reduce or eliminate pollution runoff.

- Another research project analyzes and assesses the long-term sustainability of groundwater quality in aquifer systems in California on a centuries-to-millennia time scale. It will ascertain whether current information indicating declining groundwater quality in many areas is part of a long-term trend, and evaluate past analyses and hypotheses that suggest that groundwater quality may worsen for many decades or centuries to come. Target audiences include Department of Water Resources, State Water Resources Control Board, Regional Water Quality Control Boards, EPA, and USGS. Results of this research, together with ongoing water quality monitoring by state and federal agencies, indicate that groundwater quality in most California basins is on a long-term, gradual decline owing to agricultural and urban sources of contamination.
  - Another research project worked to determine how climate change will affect plant community composition in southern California, and how such changes will affect water cycling by plants. The overall objective is to predict how water resources will be affected by vegetation change, how individual species are likely to respond to climate change, and refine our knowledge of which species are more likely to be threatened by alterations in precipitation regime.
  - UC researchers worked to develop an approach to prioritizing ecosystem investments that can increase the value of investments made in improving Delta inflows and outflows. Such ecosystem investments fit into an overall plan to make the Delta a place that favors desirable species and ecosystem services. A prioritization scheme based on ecological benefits, when combined with others based on costs and additional benefits could be put in place fairly rapidly and improve decision making for ecosystem investments. Such a process is necessary to prevent extinction of listed species and find ways to work with, rather than against, the inevitable physical and biological changes that are coming to the Delta.
  - Lastly, interdisciplinary studies of the San Francisco Estuary and California water policy synthesize information on the estuary, especially the Delta, and relate it to California water policy. In 2010, the researchers' second book was published *Comparing Futures for the Sacramento-San Joaquin Delta*, and they provided analyses to assist the State Water Resources Control Board in their attempt to determine optimal flows into the Delta.
- Understanding and Valuing Working Landscapes and Ecosystem Services:

California's growing population will require an increased utilization of the natural resources. The degradation and loss of these natural resources reduces the benefits or services provided by our natural ecosystems with consequences to our society such as poorer health, less productive agricultural systems and forests, fewer jobs, higher costs to provide clean drinking water, increasing flood damage in coastal and riparian communities, less outdoor recreation, degraded natural aesthetics and the loss of genetic diversity in our flora and fauna that could harbor enormous, but yet undiscovered

benefits. Attributing a monetary value to each service enables policy makers to quantitatively understand the societal impacts of specific land use decisions that degrade our natural ecosystems, which can lead to better land use and mitigation decisions.

- Small-scale foothill farmers and ranchers are known for the quality of their products. However, excellent animal or crop production skills, hard work and dedication may not be sufficient to maintain an economically viable farm business. No matter how good their product, farmers and ranchers who lack the business and marketing skills critical to a viable small business may not be successful. UCCE farm advisors, in cooperation with farmers and a Farmers Market manager, developed a six-week farm business planning course with sessions on financial analysis tools, financial statements, weak links, operations planning, evaluating existing and alternative enterprises, analyzing markets and action plans.
- Another project uses impact assessment techniques to measure the gains from Payment for Environmental Services (PES) schemes, and uses mechanism design and the theory of contracts to assess different PES schemes. It will also help understand the willingness and ability of resource owners (individuals and communities) to contract for PES, and understand the complementarities and conflicts between PES and agricultural policy. This work has been influential in guiding the specification of a very large nationwide Mexican program of PES to prevent deforestation, with the objective of preserving hydrological services. This research will also be influential in helping design the numerous programs of avoided deforestation that are emerging following the 2009 United Nations Copenhagen climate change conference, where doing this was the major positive result.
- Lastly, another project's goals are to characterize the demand for land and water resources in California and beyond, and to identify optimal strategies for managing conflicts among competing demands. In the area of land use, the project will develop statistical estimates of the cost of land use regulation in Southern California, develop a general framework for measuring the costs of habitat conservation, and identify policies for coordinating federal, state and local land use interventions. With respect to water resources, the project will develop a conceptual framework for an optimal urban water supply portfolio, consider the role of expanded groundwater storage in an optimal portfolio (with application to the case of Southern California), refine estimates of agricultural water demands in California, and research the failure of the 2009 California Drought Water Bank and whether this episode has any broader implications for water markets in California and elsewhere.

## **Climate Change**

California is characterized by a complex physical geography, tremendous natural biodiversity, and a growing and diverse population. As the climate changes, and our urban footprint continues to grow in the next century, the interplay between climate change and urbanization will increase the challenges faced by California citizens, local and state government officials,

and planners. For example, the state's water resources are predicted to be vulnerable through changes in snow pack, timing and amount of precipitation, and increasing urban demand. More weather extremes, such as an increased frequency of heat waves are expected. Climate change is also anticipated to increase the risk of catastrophic wildfire. Invasive species are likely to increase in range and impact on natural resources, as climate change creates new habitats and niches and eliminates existing ones. In addition, the state's coastal and bay areas are at risk of flooding due to a rising sea level. These projected increases in human population density and changes in climate highlight the need to coordinate regional planning efforts to promote conservation while also meeting the needs of all Californians for reliable and clean water, healthy communities, and food.

Eleven Hatch and Regional Research projects were funded through Multistate Research sources to investigators at UC Riverside, Davis, and Berkeley under the required Federal Planned Program: Climate Change. There were also 6 extension projects were conducted by UCCE advisors under the state-defined Federal Planned Program: Climate Change. Projects are being conducted in several areas that are essential to understanding the impact of a changing climate on California's natural resources, economy and population; a few illustrative examples follow:

- Empirical and Modeling Studies of a Changing Climate:

Projects are being conducted that elucidate the nature of the complex processes which control global and regional climate and climate change, across many domains. These include modeling atmospheric dynamics in aerosol concentrations and types; detailed measurements of climatically important trace gases, such as carbon dioxide and carbonyl sulfide and carbon monoxide; and establishing a baseline of the biogeochemical, mineralogical, physical and morphological properties of soils that in turn influence carbon storage, nutrient cycling, biodiversity and regulation of quality and quantity of water supply. In one project examining atmospheric dynamics and weather, critical understanding of the development of the 2006 record-setting heat wave in California was gained through model simulations: these kinds of extreme weather events have dramatic consequences for public health, are predicted to increase. ANR academics are working closely with such agencies as the California Air Resources Board, NASA, California Sea Grant, and NOAA.

- Response of Native and Important Species:

Projects are being conducted to predict the effects of climate change on vegetation types and species in California. These projects focus on plant trait adaptability (e.g. heritable adaptation), possible range shifts that might occur with a changing climate, and novel statistical models that test the role of climatic factors in determining distributions of California plant species currently, and in the future. These plant studies are critical to understanding possible changes in habitats, and also changes to fire regimes. ANR academics are working closely with agencies such as the US Forest Service Region 5, and other non-governmental organizations, such as The Nature Conservancy.

- Economic Futures:

The potential impact of climate change on agriculture, the sector of the economy most likely to be affected, remains controversial. Projects are being conducted to predict the effects of climate change on agriculture from an agricultural economics perspective, by estimating the economic value of management actions such as reduction in greenhouse gas emissions. These projects also explicitly examine the uncertainties associated with such modeling frameworks, and explicitly incorporate adaptation in their models. The possibility of widespread biofuel adoption is also examined, and is discussed further under the following Sustainable Energy Federally Planned Program.

- **Social Dynamics:**

Projects are being conducted to look at the possible different impacts of a changing climate across social and ethnic groups throughout California. ANR academics are working closely with groups such as the Bay Area Open Space Council.

## **Sustainable Energy**

Public policies that add the production of biomass feedstocks for power and fuel to the existing objectives of agricultural production systems has affected the work of many ANR scientists and extension advisors. Both purpose grown crops and crops residues are used or will be used for these purposes. Adding new demands on agricultural systems alters demands for agricultural products, and results in new public scrutiny about the efficiency and sustainability of biomass production systems. The greenhouse gas intensity of farming in general is a new concern that originates in part with the need for biomass feedstocks for energy.

A large number of AES faculty, CE specialists and advisors are participating in research and outreach projects focused on these topics. At UC Berkeley there is the Energy Biosciences Institute (EBI), which is part of a unique partnership with three other research partners, the Lawrence Berkeley National Laboratory, the University of Illinois at Urbana-Champaign, and British Petroleum (BP); it was created in 2007 by a 10-year \$500 million grant from BP. EBI explores the application of advanced knowledge of biological processes, materials and mechanisms to the energy sector. More than 300 researchers, including AES faculty, study the complete bioenergy life cycle, beginning with the feedstocks, continuing through biomass depolymerization, and ending with finding a more effective fermentation process. At UC Davis there is the Bioenergy Research Center, which is a coalition of over one hundred campus research scientists from a wide range of disciplines, seeking to advance the development of bioenergy: heat, power, and biofuels from biomass, and the California Biomass Collaborative which is part of the statewide California Renewable Energy Collaborative, and includes more than 500 members from government, industry, academia, and environmental organizations.

Ten Hatch and Regional Research projects were funded through Multistate Research sources to investigators at UC Riverside, Davis, and Berkeley with a sustainable energy focus under the required Federal Planned Program: Sustainable Energy. There were also 6 extension projects were conducted by UCCE advisors under the state-defined Federal Planned Program: Sustainable Energy. Projects are being conducted in several areas that are essential to sustaining California's energy resources; a few illustrative examples follow:

- **Biofuel Feedstocks:**

Biofuel crops must be produced as efficiently as possible in order to not compete with food crops on prime agricultural lands. Ongoing biofuel field trials are yielding positive findings which could give California and Arizona growers the opportunity to diversify while producing renewable energy. UC research was conducted to evaluate potential biofuel feedstock crops for California, including sorghum, switchgrass, miscanthus, oilseed crops, sugarbeets, and sugar cane in the Imperial Valley. These crops were discussed at the 2010 Alfalfa, Forages, and Biofuels Field Day at the UC Desert Research and Extension Center. One research project focuses on new biofuel grasses and forage crops that can grow in California. The objectives are to discover and elucidate principles of forage and biofuel (phytomass) crop management, directed towards optimizing the yield, forage quality and economic viability of these crops, and to minimize potential deleterious environmental effects under western irrigated conditions. Western crop production is primarily limited by irrigation water. Thus, another one field based research project at the West Side Research and Extension Center specifically evaluated the response of potential cellulosic biofuel crops to water. The productivity and quality of eight potential perennial cellulosic biofuel crops were examined on marginal lands, specifically salt affected water resources and soils, and under various irrigation regimes. Cellulosic biofuels must meet the criteria of high yield, high efficiency of carbon fixation, and quality of conversion. These studies provide the basis for understanding basic agronomic production techniques for growers as well for economic, biogeochemical and life-cycle emission. This new knowledge improves stakeholders' ability to make science-based decisions on production scenarios for biofuels.

- Forest Biomass:

Research was conducted on the genetics of pines and poplars for potential use as woody biomass for power, fuel and other purposes. One research project examines the potential for poplars as a key feedstock species for cellulosic ethanol production in California, and across the nation. In contrast to herbaceous biofuels species, such as corn, switchgrass and miscanthus, poplar has advantages in market opportunities and storage. Firstly, because poplar can be grown for multiple products, including high-valued solid wood products and for pulp and paper, growers have multiple market opportunities and additional incentive to produce the crop. Secondly, because poplar is a woody perennial it can be stored "on the stump," unlike switchgrass which must be dried and stored. Additionally, poplar will grow in a wide variety of site conditions, and in some situations requires few inputs.

- Economic Potential and Policy Issues:

Research was conducted on economic and policy issues associated with bioenergy. For example, UC ANR's BioEnergy Workgroup has an ongoing cooperative project to model the economic potential for biofuel crop adoption on California farms. To this end, UCCE advisors from Kern, Sutter, Fresno, and Lassen counties, interviewed farmers and provided crop production data. Work was also being done on the development of California and national biorefinery siting models. For example, one research project assesses the overall system economic feasibility for both stand-alone and integrated biorefinery operations as influenced by resource supply distribution and facility scale. Another research project reviews methods for judging biofuels, e.g. how well they contribute to policy objectives, and compares policies that support biofuels.

## Total Actual Amount of professional FTEs/SYs for this State

Year: 2010	Extension	Research
	1862	1862
Plan	285.0	340.6
Actual	272.9	394.1

## II. Merit Review Process

### The Merit Review Process that was Employed for this year

- Internal University Panel
- Combined External and Internal University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review

### Brief Explanation

#### Scientific Peer Review

Each project funded under the Hatch Act is peer reviewed at the department level in the colleges at Berkeley, Davis, and Riverside. A peer review committee is appointed by the department chair. The committee evaluates the relevance, quality and scientific value of the proposed research. Upon completion of the peer review, the project is also reviewed at the dean's office for USDA compliance and forwarded to the Vice President's office for final review and submission to NIFA.

#### Merit Review

The Division's organizational structure emphasizes that resource allocation decisions will be driven by programmatic considerations and developed through a broad participatory process. This process will include review of the quality and relevance to program goals for all of the Division's programs.

ANR worked to realign its workgroups into 18 Program Teams, in order to provide better support to workgroups and continue ANR's commitment grass-roots planning and program implementation. The objective of this new structure is to provide a more efficient and effective means for workgroups to meet and carry out their essential leadership functions, and enhance inter-workgroup communication and collaboration. Due to budgetary constraints, it was determined that that it was not feasible to directly fund the more than 80 independent workgroup meetings that have been supported in the past. Thus, moving forward Program Team meetings will provide the opportunity for individual workgroups to come together and enable continuation of existing workgroup affiliations under the Program Team umbrella. The Program Team meetings will designate 25% of their time to large group settings with all participants considering integrated and multidisciplinary issues, with approximately 75% of the meeting time reserved for individual workgroup meetings. In this way, CE and AES personnel along with non-ANR

partners will be brought together to work on emerging and continuing issues. They will look at the Division's program priorities and determine the programs that will best address these needs.

At the statewide level, the UC ANR Program Council met almost monthly. This group is charged with coordinating statewide planning and program policies and providing statewide leadership for coordination of resource allocation. Chaired by the Associate Vice President - Academic Programs and Strategic Initiatives, it is composed of the Associate Deans for Research and Extension at the three colleges and the school of Veterinary Medicine at the Berkeley, Davis, and Riverside campuses, the Strategic Initiative Leaders, and the Assistant Director of Cooperative Extension. The Associate Vice President - Business Services and the Director of Communication Services serve as an ex officio members.

The Program Council reviewed all ANR budget proposals, program area budget proposals, and position proposals from a statewide perspective and advise on resource allocation principles and make specific recommendations on budget expenditures. These recommendations were then considered by the Vice President and his Executive Working Group for final decisions on allocations.

### **III. Stakeholder Input**

#### **Actions taken to seek stakeholder input that encouraged their participation**

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from general public

#### **Brief Explanation**

The Division used a variety of mechanisms to seek stakeholder input on the development of Division program priorities and use of its research, extension and education funds. In addition, CE advisors delivering programs in 57 California counties received input on local needs from their local clientele on a daily basis. All of the input received from stakeholders was used by ANR members in program planning and implementation at the local, regional, and statewide level.

#### *Strategic Initiatives Process*

To implement the Strategic Vision, the Strategic Initiative Leaders and the advisory panels developed 5-year action plans. Through this process, external stakeholders were consulted to identify the areas where ANR has the opportunity to make a significant, visible difference to the people of California.

### *UC ANR Coordinating Conferences and Strategic Initiatives Meetings*

The Division's Coordinating Conferences and Strategic Initiatives Meetings were the primary mechanism for accomplishing ANR's high priority research and extension goals through grassroots leadership. These meetings brought together AES and CE personnel and non-ANR partners to work on emerging and continuing priority issues in Division program areas. ANR workgroups involve external stakeholders in their program planning process and workgroup activities and projects. The involvement of external stakeholders in the workgroups ensures that real world needs are brought to the attention of the Division as programs are planned and implemented. External stakeholders on the workgroups include individual producers, representatives from local community groups, state and federal agencies, industry groups, consumer groups, and colleagues from other higher education institutions.

### *Formal advisory groups*

The President's Advisory Commission on Agriculture and Natural Resources met two times during FY 2009-2010. This group identifies informational needs for California's agricultural, natural and human resources interests and advises the President on how the University can best meet these needs through its science-based research, classroom instruction and educational outreach. The members represent 28 business, consumer, youth and government leaders from throughout California and meet twice a year to provide input. The Vice President - Agriculture and Natural Resources participates as a member of this Commission and brings the Commission's advice to the ANR Executive Council, the Division's administrative group charged with Divisionwide strategic planning.

Each of the three colleges at Berkeley, Davis and Riverside and the School of Veterinary Medicine at Davis, have external stakeholder advisory councils that met at least annually to provide feedback on their research, extension, and teaching programs. In addition, departments may have advisory boards.

Several of the Statewide Programs have external Advisory Councils that met during FY 2009-2010 to review progress and offer recommendations for future program direction.

### *Commodity Organizations/Marketing Order Boards*

Members of these organizations provided their annual input on research and extension needs for their commodities to UC ANR members through regular meetings and discussion of funding for research projects. These individual groups also come together to form the California Commodity Commission that meets with the Vice President annually to offer specific recommendations on program planning and funding issues.

### *Statewide Program Reviews*

During FY 2009-2010 the Division's began routine reviews of the statewide Master Gardener Program and the Hansen Research and Extension Center. The review committees include ANR members and external stakeholder representatives. As part of the review process, the review committees sought input from key stakeholder groups through interviews and/or surveys.

### **A brief statement of the process that was used by the recipient institution to identify**

## **individuals and groups stakeholders and to collect input from them**

### **Method to identify individuals and groups**

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

### **Brief Explanation**

Please see previous Actions to Seek discussion.

## **A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them**

### **Methods for collecting Stakeholder Input**

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

### **Brief Explanation**

Please see previous Actions to Seek discussion.

### **A statement of how the input was considered**

- In the budget process
- To identify emerging issues
- Redirect extension programs
- Redirect research programs
- In the action plans
- To set priorities

### **Brief Explanation**

Please see previous Actions to Seek discussion.

## **Brief Explanation of what you learned from your Stakeholders**

{NO DATA ENTERED}

## **IV. Expenditure Summary**

<b>1. Total Actual Formula dollars allocated (prepopulated from C-REEMS)</b>	
<b>Extension</b>	<b>Research</b>
<b>Smith-Lever 3b &amp; 3c</b>	<b>Hatch</b>
7,640,880	5,998,329

<b>2. Total Actual Dollars Planned Programs Inputs</b>		
	<b>Extension</b>	<b>Research</b>
	<b>Smith-Lever 3b &amp; 3c</b>	<b>Hatch</b>
<b>Actual Formula</b>	6,770,836	4,005,017
<b>Actual Matching</b>	6,770,836	4,005,017
<b>Actual All Other</b>	79,158,330	231,173,830
<b>Total Actual Expended</b>	92,700,002	239,183,864

<b>3. Amount of above actual formula dollars expended which comes from carryover funds from previous years</b>		
	<b>Extension</b>	<b>Research</b>
	<b>Smith-Lever 3b &amp; 3c</b>	<b>Hatch</b>
<b>Carryover</b>	806,590	1,993,312

## **V. Planned Program**

### **Program Names:**

- A. Healthy Families and Communities
- B. Childhood Obesity
- C. Food Safety
- D. Global Food Security and Hunger
- E. Sustainable Natural Ecosystems
- F. Endemic and Invasive Pests and Diseases
- G. Sustainable Energy
- H. Climate Change

### **A) Healthy Families and Communities**

## 1) Healthy Families and Communities Planned Program Knowledge Areas

### Program knowledge areas and percentages

KA Code	Knowledge Area	%1862 Extension	%1862 Research
302	Nutrient Utilization in Animals	0%	3%
304	Animal Genome	0%	5%
305	Animal Physiological Processes	0%	18%
605	Natural Resource and Environmental Economics	2%	0%
606	International Trade and Development	0%	2%
607	Consumer Economics	1%	0%
608	Community Resource Planning and Development	2%	1%
610	Domestic Policy Analysis	0%	2%
611	Foreign Policy and Programs	0%	2%
701	Nutrient Composition of Food	1%	2%
702	Requirements and Function of Nutrients and Other Food Components	1%	38%
703	Nutrition Education and Behavior	14%	12%
724	Healthy Lifestyle	8%	1%
801	Individual and Family Resource Management	5%	0%
802	Human Development and Family Well-Being	6%	5%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	2%	3%
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%	1%
805	Community Institutions, Health, and Social Services	4%	3%
806	Youth Development	48%	2%
903	Communication, Education, and Information Delivery	6%	0%
	<b>Total</b>	100%	100%

## 2) Healthy Families and Communities Planned Program Inputs

**Actual amount of professional FTE/SYs expended this program**

<b>Year: 2010</b>	<b>Extension</b>	<b>Research</b>
<b>Plan</b>	55.8	45.2
<b>Actual</b>	31.2	53.0

**Actual dollars expended in this program  
(includes carryover funds from previous years)**

<b>Extension</b>	<b>Research</b>
<b>Smith-Lever 3b &amp; 3c</b> 687,485	<b>Hatch</b> 439,122
<b>matching</b> 687,485	<b>matching</b> 439,122
<b>all other</b> 9,040,617	<b>all other</b> 31,109,403

**3) Healthy Families and Communities Planned Program Activity**

**Brief description of the Activity**

UC ANR's integrated research and extension programs conducted research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs used PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs.

**Brief description of the target audience**

- Adults, children, youth and families in general
- Children in general
- Low and moderate income adults, children, youth and families
- Adults and children at risk for nutrition related health problems, including individuals living in poverty, recent immigrants, and African American, Native American and Hispanic populations
- Nutrition and healthcare professionals
- Preschool, primary, and secondary school teachers and administrators
- Professional childcare providers
- Public agencies and private organizations concerned with food, nutrition, and health
- Patients with metabolic diseases
- Biomedical researchers
- Plant biologists
- Nutraceutical industry

**4) Healthy Families and Communities NIFA Defined Standard Output Measures**

FY 2010	Direct Contacts Adults	Direct Contacts Youth	Patents	Extension Peer Reviewed Publications	Research Peer Reviewed Publications	Total Publications
<b>Plan</b>	109,100	210,000	3	40	180	220
<b>Report</b>	236,484	393,603	0	93	124	217

## 5) Healthy Families and Communities State Defined Outputs

FY 2010	Classes/ Short Courses	Work-shops	Demonstrations/ Field Days	News-letters	Web Sites	Research projects	Videos, slide sets, other A/V or Digital Media	Manuals, other print materials
<b>Plan</b>	1920	1080	220	290	60	170	90	500
<b>Report</b>	2156	256	80	13	10	86	21	16

## 6) Healthy Families and Communities State Defined Outcomes

### a) Knowledge Outcomes

- 8549 children and youth, participating in 4-H club, community, in-school and afterschool education programs, increased level of science, agricultural and environmental literacy.

Associated Knowledge Areas: 806 Youth Development

- 12,465 low-income children and youth, participating in EFNEP or FSNEP programs, gained knowledge of nutrition.

Associated Knowledge Areas: 703 Nutrition Education and Behavior, 806 Youth Development

- 715 youth educators and child care resource specialists, participating in youth development education programs, gained knowledge of youth development practices.

Associated Knowledge Areas: 806 Youth Development

### b) Attitude Changes

- 212 youth, participating in 4-H, increased readiness to pursue careers in science, engineering and/or technology.

Associated Knowledge Areas: 806 Youth Development

- 1,109 adults and families with children, participating in EFNEP or FSNEP programs, increased readiness to adopt healthier dietary and lifestyle practices.

Associated Knowledge Areas: 703 Nutrition Education and Behavior, 724 Healthy Lifestyle, 802 Human Development and Family Well-Being

- Children and youth, participating in 4-H programs, gained interest in science through afterschool inquiry-based lessons.

*Issue (Who cares and Why)*

Nearly half of all California 8th graders test below their grade level in science abilities. 4-H has long been recognized as a national leader in non-formal, out-of-school science activities. Many classroom teachers believe these same quality, inquiry-based experiences belong inside the classroom as well. However, the current emphasis on reading and math in classroom settings is squeezing science from the school day. As a result, students have few opportunities to enjoy the discovery, wonder and learning of inquiry-based activities.

*What has been done*

The after-school setting provides the ideal environment for inquiry-based science learning. 4-H is working with the Tehama County Department of Education Safe Education & Recreation for Rural Families (SERRF) after-school program by presenting lessons and providing training and supplies for SERRF staff. Since 2004, the activities in the 4-H "Youth Experiences in Science (Y.E.S.) Project" curriculum has been offered at five sites with more than 300 elementary school students participating in six or more weeks of activities. Highlights have been snails, worms, collections, bubbles and energy.

*Results*

The initial program evaluated the impact of science inquiry-based learning on the youths' perception of scientists. Does the children's image of a scientist become more realistic after participating in the 4-H program? Pre/post artwork depicting children's perceptions of a 'scientist' revealed that boys tend to think of scientists as dangerous or mythical, but less so after the science learning. While 20 percent perceived the stereotypical scientist with a lab coat and glasses in their pre drawings, only 3 percent did so in the post drawings. In the post drawings, there was an 11 percent increase in identifying themselves as scientists. This study did show that children's participation in science experiments gives them a more realistic view of scientists and helps them to realize that they can be scientists, too.

Associated Knowledge Areas: 806 Youth Development

- Children, participating in FSNEP programs, increased readiness to eat healthy foods as a result of food tasting activities.

*Issue (Who cares and Why)*

Research has shown that children's diets tend to be high in sugar and fat and lack fruits and vegetables. Poor nutrition and lack of physical activity can put children at risk for obesity, hypertension, diabetes, heart disease and certain cancers. Nutrition education can increase their knowledge and provide new skills to promote good nutrition and exercise. It is also important for children to be offered a variety of foods to broaden their food choices.

### *What has been done*

Through collaborations with classroom- and after-school programs, the UC Food Stamp Nutrition Education Program (UC-FSNEP) trains teachers to provide instruction through hands-on activities, including food preparation and tasting. Food tasting has been a major component of the curriculum, but the impacts of the taste testing had not been evaluated. The UC-FSNEP field tested and piloted a tasting evaluation tool. In the winter and summer of 2009, teachers were instructed to survey the students in class during food tasting activities. Forty-seven classroom teachers representing 585 students in pre-kindergarten through 9th grade participated.

### *Results*

Utilizing the evaluation taste testing tool, teachers reported that 89 percent of the students tasted the food in class that day, 45 percent were tasting a food they had not tried before, and 65 percent were willing to try the food again either at home or school. The evaluation tool revealed that food tasting does have an impact on the children's attitude about new foods and their willingness to try them again.

Associated Knowledge Areas: 703 Nutrition Education and Behavior, 806 Youth Development

- Families, participating in the Making Every Dollar Count program, increased readiness to adopt money saving skills and strategies.

### *Issue (Who cares and Why)*

Families with lower educational levels and limited resources make more money management mistakes than wealthier and better-educated families. Providing money management information in formats that appeal to limited-resource families and in a learner's native language are known to increase financial literacy of less-educated families. International studies have shown that computer-based money management programs are effective in helping less-educated families improve their financial knowledge and decisions.

### *What has been done*

The Making Every Dollar Count program is an English/Spanish computer-based, audio-visual, interactive money management program designed to empower participants to independently learn the skills needed to make better financial choices for their families. It was developed at the sixth-grade reading level to meet the needs of people with diverse learning styles. The program consists of lessons on goal setting, making spending choices, stretching income, budgeting, paying bills on time, options for buying when cash is not available, saving money on food and the impact of food advertising. The online, self-paced tutorial can be used anytime and is available free at <http://makingeverydollarcoun.ucr.edu>.

### *Results*

Participants in five counties (Kern, Butte, San Joaquin, San Luis Obispo, and Santa Barbara) increased their financial skills and behavior by participating in the Making Every Dollar Count computer-based program. An

evaluation of 140 participants (39 percent Asian/Pacific Islander, 32 percent Hispanic, and 29 percent white) showed 47 percent who had classroom and computer instruction, 56 percent with classroom instruction only, and 44 percent with computer instruction only had identified community resources to help stretch their budgets. Additionally, 50 percent of the combined, 48 percent of the classroom and 40 percent of the computer only groups had used simple ways to save money on food. Nearly all the participants believed they had learned from the program and were taking actions suggested by the programmatic content.

Associated Knowledge Areas: 801 Individual and Family Resource Management

### **c) Skills Changes**

- 276 youth, participating in 4-H club, community and afterschool education programs, acquired planning, problem solving, teamwork, or other life skills.

Associated Knowledge Areas: 806 Youth Development

- 259 youth, participating in EFNEP programs, increased their ability to select low-cost, nutritious food and improved their food preparation and food safety skills.

Associated Knowledge Areas: 801 Individual and Family Resource Management, 806 Youth Development

### **d) Behavior Changes**

- Children washed hands more often, helping to prevent flu and other illness, as a result of the FSNEP teacher training.

#### *Issue (Who cares and Why)*

In the United States, on average, more than 200,000 people are hospitalized and 36,000 people die from seasonal flu complications each year. To prevent the seasonal and H1N1 flu, the Centers for Disease Control recommends getting a flu vaccine and practicing everyday preventive actions, such as frequent handwashing. Handwashing is easy and the most important step to help prevent the spread of the flu. Yet research indicates that many adults and students do not practice frequent or proper handwashing. In fact, 1 out of 5 people do not wash their hands after using the restroom (American Society of Microbiology, 2005).

#### *What has been done*

Handwashing is part of the evidence-based nutrition education curricula that UC Food Stamp Nutrition Education Program (FSNEP) educators use to train teachers. The teachers then deliver to their students the lessons on the importance of handwashing and proper steps to wash hands. The UC FSNEP evaluation workgroup developed a retrospective survey to determine if

positive changes in student and teacher health behaviors were linked to delivery of FSNEP nutrition education curriculum. The *Teacher Observation Tool* was piloted during the 2008-2009 school year. Educators sent the survey weblink to teachers in Fresno, Tulare and Santa Clara counties.

#### *Results*

Reporting for 946 students in grades 3 through 6, 34 teachers completed the confidential online survey. When asked if they agree with the statement, "Compared to the beginning of the school year, more students now wash hands more often?" 32% of teachers strongly agreed, 62% agreed, and 6% were not sure or were unable to observe. Clearly, the students were aware of the importance of handwashing and practiced this behavior more often. We expect that increased handwashing will help prevent illness, which will improve student attendance rates.

Associated Knowledge Areas: 806 Youth Development

- A new UC-FSNEP evaluation tool captured qualitative information on low-income adults, participating in the FSNEP program, adopting healthier dietary and lifestyle practices.

#### *Issue (Who cares and Why)*

Pre- and post-testing for Fresno County Food Stamp Nutrition Education Program's (FSNEP) adult training are conducted with a Food Behavior Checklist (FBC). Data analysis reveals progress in nutrition, food budgeting and food safety practices. However, the question remains: Did participants themselves recognize outcomes from attending classes?

#### *What has been done*

UC Cooperative Extension in Fresno County developed a Health Champion form to be given to participants at their last class. The purpose was to collect participants' nutrition stories in their own words. Qualitative analysis was used to determine themes. Resulting story themes were compared to FBC quantitative results.

#### *Results*

Participants' stories affirm that key food-related behavior changes are occurring. The stories also suggest that the standard checklist does not fully capture some important outcomes. Six major themes emerged from the stories.

1. Eating healthier: 33 percent said they were eating healthier foods or more balanced meals; 37 percent improvement was shown on the healthy food FBC question.
2. Parental responsibilities: 40 percent included children in their success stories: portion sizes, not forcing children to eat, decreasing sugar and fat, eating less junk food, eating breakfast. The FBC does not contain a question regarding children.
3. Plan, shop, and save: 50 percent reported success by planning meals, using the grocery list provided, comparing prices and reading

labels. FBC improvements included 51 percent read food labels, 40 percent did not run out of food by the end of the month, 37 percent used grocery lists, and 31 percent compared prices.

4. Eating more fruits and vegetables: 30 percent reported increasing fruit and vegetable consumption while the FBC showed 37 percent increased fruit variety and 40 percent increased vegetable variety.
5. Make a change: Stories included reducing fat (30 percent) by using less oil, baking meats, and changing to low-fat dairy; reducing sugar (22 percent) by consuming fewer sweets and soda; and reducing salt (21 percent). FBC improvements included 42 percent ate low-fat food items, 35 percent did not add salt to food and 32 percent reduced soda consumption.
6. Increased physical activity: 20 percent noted positive changes. The FBC didn't ask about physical activity.

Associated Knowledge Areas: 703 Nutrition Education and Behavior

- Youth, participating in the UC-FSNEP EatFit program, adopted better food choices and got more exercise.

#### *Issue (Who cares and Why)*

Almost one third of youth ages 10 to 14 living in Riverside County are either overweight, obese or are at risk of being overweight. If we focus on children living in poverty, the number increases to 42 percent, according to the 2007 California Health Interview Survey. The survey also reports that 70 percent of Riverside youth ages 10 to 14 eat less than 5 servings of fruits and vegetables daily, 47 percent said they ate fast food two or more times in the past week, 19 percent drank two or more glasses of soda or other sugary drinks the previous day, and only 22 percent are active for at least one hour every day in a typical week.

#### *What has been done*

To combat these disappointing trends, Alvord Unified School District and Alvord Educational Foundation have joined with Riverside Medical Clinic Foundation and UC-Food Stamp Nutrition Education Program (UC-FSNEP) to improve the health and well being of the middle school students and their families in a project called "Kick Off Riverside." This project was piloted at one predominantly Hispanic school. Three hundred and fifty nine students enrolled in the UC-FSNEP EatFit program, which was delivered by the PE teachers during class. With the support of the principal and the PE team, the 6th grade students and their families met at the school one night every month for a health and nutrition talk and family exercise time led by local fitness businesses. The students analyzed their diets and learned to set eating and fitness goals. The PE teachers were instrumental in delivering the nutrition and fitness messages in EatFit, and in getting the students, and through them their families, interested in healthy living.

#### *Results*

Pre/post-tests were collected from two classes with a total of 68 students. The pre/post-test results show that 85 percent of students increased in nutrition and fitness knowledge, 59 percent now make better food choices, and 51 percent are more physically active. In addition, the Kick Off Riverside participant numbers went up at the end of the school year. With the support of the Alvord School District Secondary Education Director and all partners involved in this project, Kick Off Riverside expanded to include all four middle schools during the 2009-2010 school year.

Associated Knowledge Areas: 806 Youth Development

- Hmong community members, participating in a multistate EFNEP project, adopted healthy lifestyle practices.

*Issue (Who cares and Why)*

Successful promotion of healthy eating behaviors and an active lifestyle is important for the health and well-being of everyone, including low-income families from diverse backgrounds. This is especially critical for minority communities, who are increasingly at risk for obesity, being overweight, and chronic diseases like diabetes, heart disease, and cancer due to a host of social, cultural, and environmental factors. Critical barriers to nutrition education include cultural and linguistic challenges such as the lack of culturally appropriate information and materials, diverse levels of acculturation and health literacy, and limited English proficiency. Studies show that visual materials and bilingual videos that are culturally responsive and literacy appropriate help participants acquire the knowledge, skills, attitudes, and behavior necessary for nutritional well-being.

*What has been done*

Our objectives were to develop videos and visual handouts that would enhance the effectiveness of nutrition education with diverse populations, including recent refugees and immigrants. UC-EFNEP collaborated on a multistate effort to examine the efficacy of visual handouts and short video clips to communicate nutrition education messages to Hmong communities in California, Minnesota, and Wisconsin. Focus groups and interviews with the participants demonstrated the need for tools that encourage food resource management skills like planning ahead and using store ads, and that address how to increase consumption of vegetables and calcium-rich foods. Three video clips were produced with Hmong community members and nutrition educators using storytelling, teaching presentations, and dramatic problem posing to promote dialogue around solutions. Visual handouts conveying the key messages of each video were also developed for educators working in situations without access to screening technology.

*Results*

A total of 279 participants in the EFNEP program and 8 Hmong nutrition educators viewed the materials. Evaluation data shows that the visuals and videos were positively viewed as helpful, culturally acceptable, and accessible. Among the 166 California Hmong graduates, positive behavior change was evident. Consumption of dairy products more than doubled, 44

percent of graduates improved their use of store ads or looking for sales when shopping for food, 43 percent improved their practice of planning and making a "list" of what to buy, 21 percent drank more water (rather than soda), and 37 percent increased their daily physical activity (doing 30 minutes of exercise each day). These videos and handouts not only increased access to nutrition education for traditionally underserved communities, they also helped participants build their capacity to effectively put what they learned into practice. They also provide a useful model for reaching other low-literacy communities served by the EFNEP program.

Associated Knowledge Areas: 724 Healthy Lifestyle

- Families with children, participating in the Healthy Lifestyle Fitness Camp (a UC-FSNEP collaborative project), improved their nutrition and physical activity behaviors.

*Issue (Who cares and Why)*

Physical education testing indicates more than a third of Fresno County 5th-, 7th, and 9th-graders do not meet health fitness guidelines. Nutrition and physical activity are components in preventing obesity and chronic disease. During summer vacation children should consume seasonal foods and have time for physical activity. Yet, low-income children in families that depend on school lunch often miss a healthy meal and are inactive, staying indoors while their parents work.

*What has been done*

UC Food Stamp Nutrition Education Program (UC-FSNEP) in Fresno County was one of 14 partners to collaborate with the City of Fresno's Parks and Recreation Healthy Lifestyle Fitness Camp. This six-week summer day camp was designed to educate 50 underprivileged youth ages 10 to 18 about healthy living. Most participants were overweight and all were unfit. UC Cooperative Extension's role included:

- Delivering eight nutrition education lessons to parents in English and Spanish. Each lesson included physical activity, food demonstrations and recipes
- Training Parks and Recreation staff on UC EatFit curriculum and food safety
- Collaborating with SaveMart Supermarket for nutrition education and tasting experiences
- Evaluating camp results
- Conducting parent focus groups six weeks after camp

*Results*

Evaluation of participating parents revealed 83 percent improved in reading food labels, 72 percent ate low-fat foods, 67 percent ate healthier foods, and 48.5 percent increased fruit and vegetable variety. Parent focus groups showed continued success with shopping and planning meals, reading food labels and increased physical activity. More than 70 percent of the children improved lifestyle activity behaviors, 53 percent increased lifestyle knowledge, and 47 percent improved food selection practices.

Partners' data revealed kids had a cumulative weight loss of 279 pounds, a loss of 58.5 waistline inches, and improved blood pressure. The data suggest children who had the greatest camp success were also the children whose parents attended the nutrition classes.

Associated Knowledge Areas: 724 Healthy Lifestyle

- Community benefits from the Placer Youth Commission substance use and underage drinking prevention activities.

*Issue (Who cares and Why)*

Communities nationwide suffer from unlawful substance use and underage drinking. There is a nationwide glut of unused or expired medications in homes, posing a threat to both the individuals of the community - especially youth - as well as the environment. Medications lingering in medicine cabinets increase easy access to drugs and contributes to the high and rising rates of prescription drug abuse. Medications and personal care products flushed down the toilet or leaching into our water streams poses danger to fish, animals, and ultimately to us. In addition, youth who drink alcohol say they get it from their own or a friend's home, or at a house where the parents are home, but unaware of the drinking, or some report they drink at a friend's house with the parents' permission.

*What has been done*

UC Cooperative Extension worked to establish the Placer County Youth Commission as a formal body of youth to advise elected officials and other community institutions on youth-related as well as broader community needs and issues. In 2010, the youth worked with adults to develop a comprehensive community approach to a substance use and underage drinking prevention strategy. For example, they re-established peer mentoring programs on campus, organized merchant stings, addressed changing community norms regarding youth alcohol use, educated parents on how to talk with their kids, and organized a county wide prescription drug collection event.

*Results*

Over 3,000 pounds of prescription drugs were collected. In addition, over 1000 parents took a pledge to help curtail underage drinking. They agreed to send a consistent message that alcohol use under age 21 is unlawful and unacceptable; they will assure parties or events held at their homes are properly supervised; and they will welcome parents of teens attending a party at their house to call and check on party details, times, supervision, etc. Youth and adults reported that they reevaluated perceptions of one another, with youth pleased to discover prominent community leaders caring about their experiences and dedicated to making their hopes for change a reality, and adults awestruck by the youth's passion to take action to positively change their community. Adults reported that they were going to involve young people in the decision making in various settings from school planning to develop treatment plans. This type of social and community change is important in solving the problems that affect youth by seeing young people as

resources rather than recipients of programs, services, etc. These types of experiences are also necessary in providing young people with opportunities and proper support to gain critical skills and become competent, caring, productive adults. The youth commissions provided a real world setting for youth leadership development.

Associated Knowledge Areas: 806 Youth Development

- 6,781 low-income adults, youth and families, participating in EFNEP and FSNEP programs, adopted healthier dietary practices.

Associated Knowledge Areas: 703 Nutrition Education and Behavior

- 2,870 youth, participating in 4-H clubs and other youth development programs, assume leadership roles in organizations or participate in community affairs.

Associated Knowledge Areas: 806 Youth Development

- 21,725 low-income adults, youth and families, participating in EFNEP or FSNEP programs, adopted safe food handling and preparation techniques.

Associated Knowledge Areas: 724 Healthy Lifestyle, 802 Human Development and Family Well-Being

- 6,428 low-income youth, adults, and families, participating in nutrition and consumer education programs, adopted food resource management techniques.

Associated Knowledge Areas: 801 Individual and Family Resource Management

- 2,052 children and youth, participating in EFNEP or FSNEP programs, adopted healthier dietary and lifestyle practices.

Associated Knowledge Areas: 703 Nutrition Education and Behavior, 806 Youth Development

## **7) Healthy Families and Communities Planned Program External Factors**

### **External factors which affected outcomes**

- Economy
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

### **Brief Explanation**

The unprecedented budgetary constraints coupled with the increasingly bleak economic environment significantly affected Healthy Families and Communities and how UC ANR responded to these challenges. With some of the highest home foreclosures and unemployment in the nation, demand remained high for extension programming in money management, gardening, food budgeting, nutrition education, and youth

development. Participation in FSNEP and EFNEP programs continued at high levels, though collaborations with some grass-root community partners lessen because of budgetary issues in partners' revenue streams. Obtaining sufficient cost-share in the FSNEP program was also challenging with more layoffs and closures in partnering agencies. The 4-H Youth Development Program saw a substantial increase in its enrollment in afterschool and enrichment programs, growing by over 100,000 youth. This increase is attributed to budget strapped agencies seeking low cost and high quality training and curriculum resources and several grants which provided ANR resources to focus more in this area. Restructuring the administration of the EFNEP has resulted in more resources being allocated to the counties, with expectations in 2011 to have even higher participation numbers. Significant increases in the number of retiring advisors in the Healthy Families and Communities program areas is putting our academic coverage of county advisors and specialists below a critical mass, making it difficult to meet community expectations and program oversight needs and requiring alternative programmatic and administrative structures. This is expected to continue for the next several years.

## B) Childhood Obesity

### 1) Childhood Obesity Planned Program Knowledge Areas

#### Program knowledge areas and percentages

KA Code	Knowledge Area	%1862 Extension	%1862 Research
205	Plant Management Systems	1%	0%
305	Animal Physiological Processes	0%	5%
504	Home and Commercial Food Service	5%	0%
703	Nutrition Education and Behavior	67%	32%
704	Nutrition and Hunger in the Population	3%	0%
724	Healthy Lifestyle	21%	21%
802	Human Development and Family Well-Being	0%	21%
806	Youth Development	3%	21%
	<b>Total</b>	100%	100%

### 2) Childhood Obesity Planned Program Knowledge Inputs

#### Actual amount of professional FTE/SYs expended this program

Year:	Extension	Research
<b>2010</b>		
<b>Plan</b>	{no data}	{no data}
<b>Actual</b>	6.6	4.2

#### Actual dollars expended in this program (includes carryover funds from previous years)

Extension	Research
<b>Smith-Lever 3b &amp; 3c</b>	<b>Hatch</b>
136,540	7,412
<b>matching</b>	<b>matching</b>
136,540	7,412
<b>all other</b>	<b>all other</b>
1,911,378	2,463,414

### 3) Childhood Obesity Planned Program Activity

#### Brief description of the activity

UC ANR's integrated research and extension programs conducted research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs used newsletters and collaborations with other agencies and organizations to create and deliver programs.

### Brief description of the target audience

The target audience of some programs is underserved groups but also UC ANR reaches out to the general public, especially through its efforts to change state and local policies and create environments conducive to healthy lifestyles and positive youth development. Below is a list of our target groups:

- Children, youth and families in general
- Children in general
- Low and moderate income children, youth and families
- Children at risk for nutrition related health problems, including individuals living in poverty, recent immigrants, and African American, Native American and Hispanic populations
- Nutrition and healthcare professionals
- Preschool, primary, and secondary school teachers and administrators
- Professional childcare providers
- Public agencies and private organizations concerned with food, nutrition, and health
- Patients with metabolic diseases
- Biomedical researchers
- Plant biologists
- Nutraceutical industry

#### 4) Childhood Obesity NIFA Defined Standard Output Measures

FY 2010	Direct Contacts Adults	Direct Contacts Youth	Patents	Extension Peer Reviewed Publications	Research Peer Reviewed Publications	Total Publications
<b>Plan</b>	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}
<b>Report</b>	82,137	4,825	0	13	11	24

#### 5) Childhood Obesity State Defined Outputs

FY 2010	Classes/ Short Courses	Workshops	Demonstrations/ Field Days	News-letters	Web Sites	Research projects	Videos, slide sets, other A/V or Digital Media	Manuals, other print materials
<b>Plan</b>	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}
<b>Report</b>	95	37	37	7	0	13	0	0

#### 6) Childhood Obesity State Defined Outcomes

##### a) Knowledge Changes

*None reported*

**b) Attitude Changes**

- 116 adults and families with children, participating in the childhood obesity prevention education programs, increased readiness to adopt healthier dietary and lifestyle practices.

Associated Knowledge Areas: 703 Nutrition Education and Behavior, 802 Human Development and Family Well-Being, 806 Youth Development

**c) Skill Changes**

*None reported*

**d) Behavior Changes**

- 1,199 low-income families with children, participating in nutrition education programs, adopted healthier dietary practices.

Associated Knowledge Areas: 703 Nutrition Education and Behavior, 802 Human Development and Family Well-Being, 806 Youth Development

- 1,728 children and youth, participating in nutrition and youth development education programs, adopted healthier dietary and lifestyle practices.

Associated Knowledge Areas: 703 Nutrition Education and Behavior, 806 Youth Development

- Youth and their families, participating in 4-H programs, adopted healthier dietary and lifestyle practices.

*Issue (Who cares and Why)*

Obesity among 6- to 11-year-old youth has tripled over the past 30 years. Many youth and adults lack basic meal planning and food preparation skills. In a typical week in 2007, the number of dinners that were cooked and eaten at home was 4.8, but only 57 percent were prepared from scratch (Food Technology, 2008). Empowering youth and their families to adopt healthy food habits - such as planning, preparing and sharing meals at home - will improve the well-being of the entire household.

*What has been done*

4-H school-age youth and parents participated in a six-week "Healthy Living" research project to evaluate the effectiveness of a family approach to preventing childhood obesity. The goals of the research project were to improve the nutrition behaviors of youth and their families and to encourage physical activity. Each two-hour meeting began with a fun physical activity, followed by preparation of lunch or dinner using a variety of fresh fruits and vegetables. After sharing a family-style meal, the youth participated in an interactive nutrition activity and then concluded the class by recording five new things they learned. The UC Cooperative Extension Health Promotion Workgroup conducted the pilot project

in Contra Costa, Yolo and Amador counties and produced a food and physical activity curriculum called "Healthalicious Cooking."

#### *Results*

Forty-four youth completed the youth-only series and 38 youth completed the same series along with an adult member of their families. Participation in project influenced nutrition and physical activity knowledge, attitudes and behaviors. Compared with the youth-only group, parents who participated in the youth-adult series were more likely to express confidence in modifying recipes to reduce fat and sugar, while still maintaining acceptability with their families. Among the youth, there was an overall trend towards nutrition behavior change, with significant change observed in reduced soda and sports drink consumption. In addition, youth were better able to identify whole grains.

Associated Knowledge Areas: 703 Nutrition Education and Behavior, 806 Youth Development

- Youth, participating in a summer day camp, adopted healthy eating habits

#### *Issue (Who cares and Why)*

There is a national epidemic of childhood obesity. Experts estimate one in five children between the ages of 6 and 17 are overweight. Millions of these children face a higher risk of developing obesity-related disorders such as diabetes and heart disease during early adulthood. An effective approach to address the complex issue of childhood overweight is to create environments that promote healthy eating and physically active lifestyles.

#### *What has been done*

UC Cooperative Extension provided seven weeks of summer day camp experiences for low-income youth, ages 6 to 8 years old. The sessions were held at community centers and elementary school sites. The camp program included nutrition education, cooking, arts and crafts, games and fitness activities. The interactive, hands-on activities taught children about good food habits. The youth prepared snacks, exercised to music, and participated in crafts, kitchen science and gardening activities related to good health and nutrition.

#### *Results*

About 100 elementary school-aged youth participate in the nutrition camp program each year. Pre- and post-assessments indicated that 84 percent of the participants increased their knowledge about the importance of eating a variety of nutritious foods. Many began to make healthier snack choices, and practiced hand washing food safety.

Associated Knowledge Areas: 703 Nutrition Education and Behavior, 806 Youth Development

- Latino families, participating in the Eat Well Dine Well health awareness and prevention program, adopted healthier lifestyle practices.

*Issue (Who cares and Why)*

Poor diet and physical inactivity can contribute to obesity, cancer, cardiovascular disease and diabetes. Latinos have 21 percent greater obesity prevalence than whites, according to researchers from the U.S. Centers for Disease Control and Prevention. More than 10 percent of Latinos have been diagnosed with diabetes, while 7 percent of whites and 8 percent of Asians suffer from the disease, according to the American Diabetes Association. Chronic diseases can result in disability and decrease the quality of life for family members.

*What has been done*

UC Cooperative Extension in Sacramento County provides "Eat Well Dine Well," a health awareness and prevention program designed to empower individuals to make behavior changes that reduce the risk of chronic health-related illnesses. The program provides participants opportunities to:

- Increase understanding about healthy versions of familiar foods that are easy and quick to prepare, inexpensive, and tasty
- Practice cooking techniques that substitute low-fat, low-sugar and low-sodium ingredients to make recipes healthier
- Engage in physical activity as a component of healthy living

The weekly three-part workshop series are held at various community-based agency sites that provide services to low-income Latino families.

*Results*

The average yearly clientele participation is approximately 167 low-income adults; 93 percent of the participants are Latino. Evaluations completed by the participants before and after participating indicated:

- 88 percent increase in participants making changes in recipes to make them lower in fat, sodium or sugar.
- 76 percent increase in participants engaging in moderate physical activity on a daily basis.
- 94 percent increase in knowledge of the importance of consumption of adequate amounts of fruits and vegetables, and the practice of portion size control strategies to improve diet.

Associated Knowledge Areas: 724 Healthy Lifestyle

**e) Social/Health Condition Changes**

*None reported*

**f) Environmental Condition Changes**

*None reported*

**g) Economic Condition Changes**

*None reported*

**7) Childhood Obesity Planned Program External Factors**

**External factors which affected outcomes**

- Economy
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

## C) Food Safety

### 1) Food Safety Planned Program Knowledge Areas

#### Program knowledge areas and percentages

KA Code	Knowledge Area	%1862 Extension	%1862 Research
104	Protect Soil from Harmful Effects of Natural Elements	3%	0%
136	Conservation of Biological Diversity	0%	1%
212	Pathogens and Nematodes Affecting Plants	0%	15%
302	Nutrient Utilization in Animals	0%	7%
303	Genetic Improvement of Animals	0%	7%
307	Animal Management Systems	1%	0%
308	Improved Animal Products (Before Harvest)	5%	2%
311	Animal Diseases	7%	7%
315	Animal Welfare/Well-Being and Protection	1%	2%
501	New and Improved Food Processing Technologies	18%	10%
502	New and Improved Food Products	5%	1%
503	Quality Maintenance in Storing and Marketing Food Products	5%	3%
606	International Trade and Development	0%	3%
702	Requirements and Function of Nutrients and Other Food Components	0%	2%
703	Nutrition Education and Behavior	1%	0%
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	15%	6%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	34%	28%
722	Zoonotic Diseases and Parasites Affecting Humans	4%	0%
723	Hazards to Human Health and Safety	0%	6%
903	Communication, Education, and Information Delivery	1%	0%
	<b>Total</b>	100%	100%

## 2) Food Safety Planned Program Inputs

Actual amount of professional FTE/SYs expended this program

Year: 2010	Extension	Research
<b>Plan</b>	{no data}	{no data}
<b>Actual</b>	9.4	7.1

Actual dollars expended in this program  
(includes carryover funds from previous years)

Extension	Research
<b>Smith-Lever 3b &amp; 3c</b>	<b>Hatch</b>
254,094	297,100
<b>matching</b>	<b>matching</b>
254,094	297,100
<b>all other</b>	<b>all other</b>
2,711,895	4,146,747

## 3) Food Safety Planned Program Activity

### Brief description of the activity

UC ANR's integrated research and extension programs conducted research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs used collaborations with other agencies and organizations to create and deliver programs.

### Brief description of the target audience

- Food producers (e.g. farmers/ranchers and rangeland owners/operators/managers, including conventional, organic, small and large producers)
- Agricultural advising professionals
- Allied industry companies
- Food processors, handlers, retailers and suppliers
- Public regulatory agencies and private non-profit advocacy groups
- Food consumers, members of the general public

## 4) Food Safety NIFA Defined Standard Output Measures

FY 2010	Direct Contacts Adults	Direct Contacts Youth	Patents	Extension Peer Reviewed Publications	Research Peer Reviewed Publications	Total Publications
<b>Plan</b>	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}
<b>Report</b>	88,576	0	0	5	11	16

## 5) Food Safety State Defined Outputs

FY 2010	Classes/ Short Courses	Work- shops	Demonstrations/ Field Days	News- letters	Web Sites	Research projects	Videos, slide sets, other A/V or Digital Media	Manuals, other print materials
<b>Plan</b>	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}
<b>Report</b>	17	36	15	0	0	12	0	0

## 6) Food Safety State Defined Outcomes

### h) Knowledge Changes

- 505 adults, participating in food safety education programs, gained knowledge of safe food handling and preparation techniques.

Associated Knowledge Areas: 712 Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

- Small-scale strawberry growers, participating in food safety workshops, gained food safety knowledge.

#### *Issue (Who cares and Why)*

Food safety scares have cost agricultural producers millions of dollars in lost sales. They also cause consumers to have less faith in the safety of the country's food system. Even though food from California is among the safest and most regulated in the world, we still need to increase our vigilance in the field, in the packing house and in the distribution system. Since strawberries can be sold directly to the public or to processors, food safety efforts need to begin in the field.

#### *What has been done*

The Merced and Fresno County UC Cooperative Extension offices, working with the California Strawberry Commission, held intensive food safety workshops for small-scale strawberry growers, including hands-on training about proper handling of the fruit, and even personal hygiene. A Hmong interpreter translated the lessons in Hmong for non-English-speaking participants. The farmers were given training materials in Spanish and English that they could use to teach the workers they hired about reducing any chances of the fruit becoming contaminated. Forty-one growers in the Fresno region and 27 in the Merced region participated. These are small growers so while the acres involved are small, the number of participants is significant.

#### *Results*

Almost all of the small strawberry growers in each county have been trained and understand how to prevent food contamination in the field. Some of the growers also produce vegetables and can apply their food safety knowledge to those crops. The participants now have up-to-date food safety education materials to use when training new employees. A few growers are participating in

a food safety auditing program this year to have a documented Food Safety Plan. With an increasing focus on food safety, many produce buyers, suppliers, and consumers want to know that good agricultural practices are being used on the farm. The program helps to document and verify that farms are producing fruits and vegetables in the safest manner possible and that the farmer is aware of potential problems and taking steps to correct them.

Associated Knowledge Areas: 711 Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources

**i) Attitude Changes**

*None reported*

**j) Skill Changes**

*None reported*

**k) Behavior Changes**

- 462 low-income adults, youth and families, participating in food safety education programs, adopted safe food handling and preparation techniques.

Associated Knowledge Areas: 712 Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

**l) Social/Health Condition Changes**

*None reported*

**m) Environmental Condition Changes**

*None reported*

**n) Economic Condition Changes**

*None reported*

## 7) Food Safety Planned Program External Factors

### External factors which affected outcomes

- Economy
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

### Brief explanation

ANR food safety programs and activities were primarily affected by external factors having to do with the overall economy and government. The slow economy influenced all university research and extension programs, of course. ANR food safety research and extension teams were likewise subject to limited research funds and perhaps reduced ability to hire research staff and students. Given the recent increased public concern over food safety, changes are being considered in regards to public policy, government standards and regulations for food safety, and industry adoption of changes, improvements, and new standards. All of these policy/governmental discussions affect ANR food safety programs by creating opportunities for ANR involvement, dictating direction of future research, and increasing the scope of discussion and debate among stakeholders (legislators, regulators, producers and suppliers, marketers, consumers, researchers).

## D) Global Food Security and Hunger

### 1) Global Food Security and Hunger Planned Program Knowledge Areas

#### Program knowledge areas and percentages

KA Code	Knowledge Area	%1862 Extension	%1862 Research
102	Soil, Plant, Water, Nutrient Relationships	10%	2%
111	Conservation and Efficient Use of Water	2%	2%
201	Plant Genome, Genetics, and Genetic Mechanisms	12%	21%
202	Plant Genetic Resources	5%	8%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	6%	9%
204	Plant Product Quality and Utility (Preharvest)	6%	5%
205	Plant Management Systems	17%	4%
206	Basic Plant Biology	8%	17%
211	Insects, Mites, and Other Arthropods Affecting Plants	3%	3%
212	Pathogens and Nematodes Affecting Plants	3%	3%
301	Reproductive Performance of Animals	2%	4%
302	Nutrient Utilization in Animals	3%	2%
304	Animal Genome	1%	3%
307	Animal Management Systems	5%	0%
501	New and Improved Food Processing Technologies	1%	3%
502	New and Improved Food Products	3%	4%
601	Economics of Agricultural Production and Farm Management	6%	3%
603	Market Economics	2%	2%
604	Marketing and Distribution Practices	2%	1%
723	Hazards to Human Health and Safety	3%	4%
	<b>Total</b>	100%	100%

### 2) Global Food Security and Hunger Planned Program Inputs

#### Actual amount of professional FTE/Sys expended this program

Year:	Extension	Research
<b>2010</b>		
<b>Plan</b>	100.0	145.0
<b>Actual</b>	101.5	131.9

**Actual dollars expended in this program  
(includes carryover funds from previous years)**

<b>Extension</b>	<b>Research</b>
<b>Smith-Lever 3b &amp; 3c</b> 2,145,669	<b>Hatch</b> 1,184,591
<b>matching</b> 2,145,669	<b>matching</b> 1,184,591
<b>all other</b> 29,436,388	<b>all other</b> 77,374,668

**3) Global Food Security and Hunger Planned Program Activity**

**Brief description of the activity**

UC ANR's integrated research and extension programs conducted research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs used PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs.

**Brief description of the target audience**

- Farmers/ranchers and rangeland owners/operators/managers
- Allied agricultural industries professionals
- Landscaping professionals
- Organic farmers
- Consumers
- Food suppliers
- Food processors
- Food retailers

**4) Global Food Security and Hunger NIFA Defined Standard Output Measures**

<b>FY 2010</b>	<b>Direct Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Patents</b>	<b>Extension Peer Reviewed Publications</b>	<b>Research Peer Reviewed Publications</b>	<b>Total Publications</b>
<b>Plan</b>	69,000	9,000	10	90	580	670
<b>Report</b>	253,304	10,818	9	133	469	602

**Patents Listed:**

- Asparagus - M256
- VX211, a new clonal rootstock for walnuts
- Identification of archaeal single-stranded DNA binding proteins
- Development of an assay for an informative SNP which can be used to identify carriers of the herda disease allele
- RX1, a new juglans microcarpa x j. regia clonal rootstock for walnuts
- Method and compositions for preparing and delivering rumen-protected lipids, other nutrients and medicaments
- Development of a sensor for rapid determination of soil nitrate content based on mid-ir spectroscopy

- Overexpression of leafy cotyledon2 gene delays senescence of vegetative and reproductive structures in plants
- Engineering phytochromes: biliproteins that switch and glow

## 5) Global Food Security and Hunger State Defined Outputs

FY 2010	Classes/ Short Courses	Work- shops	Demonstrations/ Field Days	News- letters	Web Sites	Research projects	Videos, slide sets, other A/V or Digital Media	Manuals, other print materials
<b>Plan</b>	210	210	170	280	120	580	20	90
<b>Report</b>	328	117	62	37	26	340	4	19

## 6) Global Food Security and Hunger State Defined Outcomes

### a) Knowledge Changes

- 2,767 farm and ranch owner/operators and managers, and allied industry professionals, participating in agriculture education programs, gained knowledge of cultural practices or aspects of comprehensive management systems for plant and animal production.

Associated Knowledge Areas: 203 Plant Biological Efficiency and Abiotic Stresses Affecting Plants, 204 Plant Product Quality and Utility (Preharvest), 205 Plant Management Systems

- 242 farm owner/operators and managers, and allied industry professionals, participating in agriculture education programs, gained knowledge of irrigation and water management practices.

Associated Knowledge Areas: 111 Conservation and Efficient Use of Water

- 677 farm owner/operators and managers and allied industry professionals, participating in agriculture education programs, gained knowledge of pest and disease management for plant production.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants

- 611 farm owner/operators and allied industry professionals, participating in agriculture education programs, gained knowledge of business management practices, economics, and marketing techniques.

Associated Knowledge Areas: 604 Marketing and Distribution Practices

- 1,444 farm owner/operators and allied industry professionals, participating in agriculture education programs, gained knowledge of crop and varietal selection factors for plant production.

Associated Knowledge Areas: 202 Plant Genetic Resources, 204 Plant Product Quality and Utility (Preharvest)

- 126 members of the public, participating in Master Gardener Programs, gained knowledge of sustainable home gardening techniques, including varietal selection, composting, water conservation and proper use of pest control, to extend to members of the public.

Associated Knowledge Areas: 111 Conservation and Efficient Use of Water, 202 Plant Genetic Resources, 205 Plant Management Systems, 206 Basic Plant Biology

- Farming families learned to plan for farm succession.

*Issue (Who cares and Why)*

A profitable, owner-operated system of agriculture is necessary for the economic well being of our rural communities. Many farmers will retire in the next two decades and younger people are needed to carry on these farm businesses. Young people have little opportunity to enter farming, and even those whose parents have a farm may lose the opportunity because of poor succession and estate planning. Several surveys have found that as many as 64 percent of landowners do not have estate plans. Careful planning is needed for families to provide retirement for the senior members and farming opportunities for the next generation.

*What has been done*

A UC Cooperative Extension farm advisor offered statewide conferences and regional workshops on farm succession by partnering with California Farmlink, a statewide non-profit organization. In addition, she conducts individual consultations with farmers and ranchers in Humboldt County. The conferences and workshops included speakers from UC Davis, Northern California Farm Credit, California FarmLink, and many other consultants, lawyers, land trust directors and accountants. Motivating producers to act on succession planning is the main objective. The Western Region Risk Management Agency provided grant funds to offer the conferences at a lower cost in order to reach wider audiences.

*Results*

Getting family members across the generations together to learn techniques and work seriously on this topic has had positive effects. About 70 families (200 people) have attended these events. Each family is unique and the outcomes are individual and personal. Statistical outcomes, such as acres of farmland still in production, are hard to come by in this very dynamic and long-term arena, but we believe that the educational outreach has affected the future of California farming and ranching in a lasting way. Overall, we heard positive stories from individuals such as: "I slowed down and realized I was pressuring my 25-year-old." "Grandpa listened to us and realizes he needs better estate planning tools." "My off-farm heir respects her on-farm sister more." "We understand sweat equity now, and issues of fairness." "We met with a land trust about a conservation

easement." "We shared the financials with our son while home on spring break and we signed up for more workshops!"

Associated Knowledge Areas: 601 Economics of Agricultural Production and Farm Management

- Research quantifying the impacts of late irrigation stress delineated tradeoffs in fruit quality and yield.

*Issue (Who cares and Why)*

Production of navel oranges for the early market is big business in the southern San Joaquin Valley of California. Minimum harvest standards exist for juice sweetness and fruit color within the industry. The first harvested fruit of the season that meet these minimum requirements often receive a large price premium in the marketplace. Concern exists within the industry that standards for sweetness and some other fruit quality parameters are not sufficient to meet consumer acceptability and that disappointed consumers are unlikely to return to buy navel orange fruit later in the season when the fruit is sweeter and juicier. Growers of early-maturing orange varieties approached late-season irrigation strategies differently and little scientific research existed to guide these decisions. Some growers irrigated fully until harvest, while others reduced irrigation as harvest approached. In drought years, irrigation decisions are not only made as they affect fruit quality and yield, but also with respect to water availability and cost.

*What has been done*

UC Cooperative Extension farm advisors, working with a private citrus grower, developed and implemented a series of carefully monitored irrigation treatments that allowed delineation of the affects of late-season irrigation stress on fruit quality and yield. Yield and fruit quality evaluations of the fruit harvested from this trial were conducted. To determine if laboratory-measured differences in fruit quality parameters correlated with human sensory perception, fruit from the irrigation treatments was evaluated by a human sensory panel through a program developed by a UC Extension Specialist. Results from this project were presented at ANR-sponsored grower meetings in Kern County in 2007, 2008 and 2009 and appeared in a statewide newsletter, "Topics in Subtropics." A final report of the project appeared in the 2008 annual report of the Citrus Research Board, which is the statewide citrus commodity group in California.

*Results*

Growers specializing in producing fruit for the early navel market now have available to them knowledge of the tradeoffs related to irrigating early navel varieties in the August-through-October time period. This research demonstrated, on the positive side, that late season irrigation stress saved water, increased development of early fruit color and increased the concentration of soluble solids, such as sugar, and organic acids. On the negative side, water stress, generally, reduced fruit size and yield.

Associated Knowledge Areas: 102 Soil, Plant, Water, Nutrient Relationships

## **b) Attitude Changes**

- 218 farm and ranch owners /operators and managers and allied industry professionals, participating in agriculture education programs, were more likely to try out or adopt recommended cultural practices, pest and disease management, or other aspects of comprehensive management systems for plant and animal production.

Associated Knowledge Areas: 203 Plant Biological Efficiency and Abiotic Stresses Affecting Plants, 204 Plant Product Quality and Utility (Preharvest), 205 Plant Management Systems, 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants, 307 Animal Management Systems

- 300 farm owners/operators, including small scale specialty crop growers and family farmers participating in agriculture education programs, are interested in adopting superior varieties of crops or new commercial crops to improve economic viability.

Associated Knowledge Areas: 601 Economics of Agricultural Production and Farm Management

- 374 members of the public, participating in agritourism programs and events, felt more connected to local farms and were more likely to buy local agricultural products.

Associated Knowledge Areas: 604 Marketing and Distribution Practices

## **c) Skill Changes**

- 94 farm and ranch owners/operators, participating in agriculture education programs, gained business management skills.

Associated Knowledge Areas: 601 Economics of Agricultural Production and Farm Management, 604 Marketing and Distribution Practices

- 1,373 farm and ranch owner/operators and managers, and allied industry professionals, participating in agriculture education programs, gained skills in recommended pest management practices.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants

## **d) Behavior Changes**

- 206 farm owner/operators and managers, and allied industry professionals, participating in agriculture education programs, adopted recommended cultural practices or other aspects of comprehensive management systems for plant and animal production.

Associated Knowledge Areas: 203 Plant Biological Efficiency and Abiotic Stresses Affecting Plants, 204 Plant Product Quality and Utility (Preharvest), 205 Plant Management Systems

- 71 farm, ranch and nursery owner/operator and managers, and allied industry professionals, participating in agriculture education programs, adopted recommended irrigation or other water and soil management practices.

Associated Knowledge Areas: 102 Soil, Plant, Water, Nutrient Relationships, 111 Conservation and Efficient Use of Water

- 145 tree fruit and nut producers, and backyard orchard owners, participating in agriculture education programs, adopted recommended pruning techniques or other orchard management practices.

Associated Knowledge Areas: 205 Plant Management Systems

- 150 farm owner/operators and managers, and allied industry professionals, participating in agriculture education programs, adopted superior varieties of crops for plant production.

Associated Knowledge Areas: 202 Plant Genetic Resources, 204 Plant Product Quality and Utility (Preharvest)

#### **e) Social/Health Condition Changes**

- 2 new access points offering fresh produce were established in low-income communities to increase the availability of affordable, healthy foods.

Associated Knowledge Areas: 604 Marketing and Distribution Practices

#### **f) Environmental Changes**

- 958 UC Extension trained citrus crop producers, Master Gardeners, and industry people from commodity groups such as the California Avocado Commission and Society and the Citrus Research Board, monitored the pest Asian citrus phyllid and its related economically devastating disease citrus greening, which contributed to the resulting quarantine, helping to protect over 300,000 acres of citrus.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants

#### **g) Economic Changes**

- 100 small farmers successfully grew off season blueberries as an alternative profitable new crop, gaining on average \$10,000 in average net income.

Associated Knowledge Areas: 601 Economics of Agricultural Production and Farm Management

- Avocado crop problems were biologically controlled, making them more profitable.

*Issue (Who cares and Why)*

Since 1882, when Mexican avocado seedlings were planted in Ventura County, the industry has been slowly expanding. Today there are 17,000 acres of avocados in Ventura and Santa Barbara counties. Initially there were few problems in the crop, other than searching for the ideal variety. For many years, avocados were one of the few crops in California that was unsprayed. Over time, a number of new pests have arrived. In the late 1940s, growers started seeing "avocado decline," a slow dying of the roots and canopies of the trees. ANR began the long-term study of what turned out to be a fungal disease that was renamed "avocado root rot." In the meantime, other problems began showing up in the \$80 million avocado crop (2008) - diseases, pests and management issues, such as pruning, irrigating and fertilizing.

*What has been done*

Working with growers, UC ANR campus- and county- based personnel tested various methods for controlling root rot. This involved field studies to finally come up with a package of strategies to control the disease. Disease-control strategies include clonal rootstocks (disease-resistant), mounding, mulching, gypsum and some chemical treatments. Selection for more tolerant rootstocks continues, but now the rootstocks are also being selected for salt tolerance and resistance to other diseases. For the various waves of pests that have come through these orchards, biological control and management techniques, such as pruning and fertilizing to control these problems, were devised.

*Results*

In general, the avocado crop in Ventura and Santa Barbara counties is in good biological control, requiring few pesticides. The management practices developed by UC ANR have made avocados economically very attractive for coastal growers where the costs of labor, land and water are so high.

Associated Knowledge Areas: 601 Economics of Agricultural Production and Farm Management

- UC contributed to the development of rice harvest and storage practices, helping to keep the California rice industry competitive.

*Issue (Who cares and Why)*

California enjoys a reputation of producing high quality rice. Rice, unlike most other cereals, is consumed as a whole grain. Therefore physical properties such as size, shape, uniformity and general appearance are of utmost importance. Efforts to improve quality in other regions and countries challenge California growers to seek improved production and postharvest strategies to maintain the state's competitive edge in the global marketplace. To capitalize on new markets, retain market share, and remain competitive, it is essential to understand the production factors under the control of the grower that ultimately influence grain quality.

### *What has been done*

For over 10 years UC Extension conducted a series of experiments to develop the best management practices to ensure high quality rice. A comprehensive approach to identify key points in the production and postharvest management continuum was developed as a result of several years of on-farm and laboratory research specifically applicable to the unique California rice production system.

### *Results*

UC Extension published the Rice Quality Handbook as a standard reference for growers and dryer operators. The companion Rice Quality Workshop, attended by hundreds since its inception, is required training for employees of rice dryers throughout the Sacramento Valley. Understanding the production and processing variables affecting rice quality enables growers to harvest rice at lower moisture content, reduce drying costs, better preserve rice in storage and increase profitability. In addition, commercial dryers reported reducing energy use by as much as 20 percent.

Associated Knowledge Areas: 601 Economics of Agricultural Production and Farm Management

## **7) Global Food Security and Hunger Planned Program External Factors**

### **External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

### **Brief explanation**

Some of the regional issues that will influence food security issues are as follows: competition and distribution of water in the arid West, loss of irrigated farmland to urbanization and other uses, parcelization of farmland, increased energy costs and concurrent increases in fertilizer costs, low cost imports that threaten the long-term viability of certain agricultural sectors, and invasive and imported pests.

## E) Sustainable Natural Ecosystems

### 1) Sustainable Natural Ecosystems Planned Program Knowledge Areas

#### Program knowledge areas and percentages

KA Code	Knowledge Area	%1862 Extension	%1862 Research
101	Appraisal of Soil Resources	4%	7%
102	Soil, Plant, Water, Nutrient Relationships	9%	15%
103	Management of Saline and Sodic Soils and Salinity	4%	5%
104	Protect Soil from Harmful Effects of Natural Elements	1%	2%
111	Conservation and Efficient Use of Water	12%	5%
112	Watershed Protection and Management	9%	2%
121	Management of Range Resources	6%	3%
122	Management and Control of Forest and Range Fires	1%	2%
123	Management and Sustainability of Forest Resources	6%	2%
131	Alternative Uses of Land	2%	2%
132	Weather and Climate	3%	3%
133	Pollution Prevention and Mitigation	11%	8%
135	Aquatic and Terrestrial Wildlife	9%	9%
136	Conservation of Biological Diversity	6%	8%
141	Air Resource Protection and Management	4%	3%
206	Basic Plant Biology	4%	8%
305	Animal Physiological Processes	1%	2%
605	Natural Resource and Environmental Economics	5%	8%
610	Domestic Policy Analysis	2%	4%
702	Requirements and Function of Nutrients and Other Food Components	1%	2%
	<b>Total</b>	100%	100%

### 2) Sustainable Natural Ecosystems Planned Program Inputs

#### Actual amount of professional FTE/SYs expended this program

Year:	Extension	Research
<b>2010</b>		
<b>Plan</b>	63.6	84.6
<b>Actual</b>	56.4	86.0

**Actual dollars expended in this program  
(includes carryover funds from previous years)**

<b>Extension</b>	<b>Research</b>
<b>Smith-Lever 3b &amp; 3c</b> 1,673,767	<b>Hatch</b> 733,986
<b>matching</b> 1,673,767	<b>matching</b> 733,986
<b>all other</b> 16,361,283	<b>all other</b> 50,423,743

**3) Sustainable Natural Ecosystems Planned Program Activity**

**Brief description of the activity**

UC ANR's integrated research and extension programs conducted research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs used PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs.

**Brief description of the target audience**

- Farmers
- Ranchers
- Governmental agencies
- Agricultural and fishing organizations
- Owners/managers of private and public rangeland, forest and wildlands
- Community organizations
- Resource managers

**4) Sustainable Natural Ecosystems NIFA Defined Standard Output Measures**

<b>FY 2010</b>	<b>Direct Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Patents</b>	<b>Extension Peer Reviewed Publications</b>	<b>Research Peer Reviewed Publications</b>	<b>Total Publications</b>
Plan	30,700	0	0	40	340	380
Report	70,821	192	0	44	338	382

**5) Sustainable Natural Ecosystems State Defined Outputs**

<b>FY 2010</b>	<b>Classes/ Short Courses</b>	<b>Work-shops</b>	<b>Demonstrations/ Field Days</b>	<b>News-letters</b>	<b>Web Sites</b>	<b>Research projects</b>	<b>Videos, slide sets, other A/V or Digital Media</b>	<b>Manuals, other print materials</b>
Plan	100	140	120	70	40	240	20	90
Report	52	40	19	5	9	170	0	14

## 6) Sustainable Natural Ecosystems State Defined Outcomes

### a) Knowledge Changes

- 1,280 farm, ranch, and rangeland owner/operators and managers, allied industry professionals, public agency representatives, and members of the public, participating in water quality education programs, gained knowledge of best management practices for preserving water quality.

Associated Knowledge Areas: 112 Watershed Protection and Management, 133 Pollution Prevention and Mitigation

- 60 resource managers and other stakeholders in watershed management issues, participating in sustainable use of fisheries education programs, gained knowledge of strategies and techniques for sustainable use of inland fishery resources.

Associated Knowledge Areas: 135 Aquatic and Terrestrial Life

- 245 owners/managers of private and public rangeland, forest and wildlands, participating in sustainable use of natural resources education programs, gained knowledge of strategies and techniques for sustainable use of range, forest and wildland resources.

Associated Knowledge Areas: 121 Management of Range Resources, 123 Management and Sustainability of Forest Resources, 135 Aquatic and Terrestrial Wildlife, 136 Conservation of Biological Diversity

- 76 farm owner/operators, allied industry and natural resource professionals, and members of the public, participating in water conservation education programs, gained knowledge of water use and conservation practices.

Associated Knowledge Areas: 111 Conservation and Efficient Use of Water, 112 Watershed Protection and Management

- 151 fire protection and land management agencies, land and home owners, community organizations, and landscape professionals, participating in wildland fire education programs, gained knowledge on how to increase the fire resistance of homes and landscaping.

Associated Knowledge Areas: 122 Management and Control of Forest and Range Fires

- UC research improved aviculture.

#### *Issue (Who cares and Why)*

In the 1970s and 1980s, the popularity of parrots as pets increased markedly in the U.S. During that time, production of parrots in captivity was limited due to a lack of information about their nutrition and reproduction. Birds, mostly parrots, became the third most popular pet after cats and dogs. Most of the parrots sold as pets, except for budgerigars and cockatiels, were caught from the wild. Capture from the wild was so extreme that it led to the endangerment of many

parrot species. As a result, the Wild Bird Conservation Act was enacted in 1992 to reduce capture from the wild by stopping importation of birds into the U.S., a major market for such birds. The act has been highly effective. Since 1992, the demand for pet parrots has been met by increased domestic production. To meet domestic demand, the conduct of aviculture has improved dramatically.

#### *What has been done*

In the early 1980s, captive parrots were often mismanaged, particularly in the areas of nutrition, reproduction, and rearing methods. Until recently, pet bird diets were based on folklore and tradition. Recent studies on parrot nutrition have led to the development and widespread adoption of formulated diets. UC ANR faculty in the UC Davis College of Agricultural and Environmental Sciences developed molecular genetic approaches for sexing birds, a dramatic advance over surgical methods of sexing birds. Photographic guides showing embryonic development have educated aviculturists on artificial incubation. Recent studies have shown how human handling of chicks better adapts them to captive environments and how cage enrichments, i.e., cage toys, help the psychological well-being of parrots, reducing the number of birds handed over to shelters and sanctuaries.

#### *Results*

Collectively, these studies have had a major positive impact on the conduct of aviculture. Importation of wild-captured birds to the U.S. has largely been halted. Domestically produced parrots are now meeting the demand for pet birds. Pet bird nutrition has been greatly improved by nutritionally balanced pelleted diets. Genetic sexing and environmental control of reproduction have improved the reproductive efficiency of parrots. Methods of rearing and cage enrichments are addressing the psychological well-being of birds. These new practices, along with advances in pet bird medicine, have radically transformed aviculture from what it was 30 years ago.

Associated Knowledge Areas: 305 Animal Physiological Processes

- UC research on urban runoff develops improved landscape management practices related to water.

#### *Issue (Who cares and Why)*

Recent droughts and expanding urban populations place increasing pressure on California's water supplies. In residential areas, outdoor water use, primarily for landscapes, comprises 50 percent or more of total water use. It is commonplace to see excess water gushing down storm drains from poorly aimed sprinklers, broken sprinkler heads, and a larger volume of water applied than the soil can absorb. The runoff water can carry pesticides, fertilizers and other waste into waterways, causing a detrimental effect on the health of the aquatic life in rivers, lakes and bays.

#### *What has been done*

UC researchers, in cooperation with CALFED and the State Water Resources Control Board, examined the runoff from eight neighborhoods in Sacramento and Orange counties. Water runoff samples were collected regularly

during the irrigation season and during the first rains of each storm season. The samples were analyzed for 11 pesticides, fertilizers, other pollutants and pathogens. In both counties, UC master gardeners developed activities for homeowners to improve landscape management practices related to water, fertilizer, and pesticide use. The aim was to reduce or eliminate pollution runoff.

#### *Results*

The research found runoff flow in both counties showed consistent water waste from normal landscape irrigation. In Northern California, irrigation runoff was nearly five times higher than storm runoff, indicating poor outdoor water management in the dry season. In general, pesticides and pathogen indicators were found in all samples. This data helped water agencies develop customer programs on managing landscapes. Master Gardener outreach improved the landscape practices of homeowners. The flow data also is being used by a team of UC researchers to develop a model for urban planners and developers to reduce water runoff and runoff pollutants in new and existing urban landscapes.

Associated Knowledge Areas: 111 Conservation and Efficient Use of Water, 133 Pollution Prevention and Mitigation

- UC research on the negative impacts of nitrogen deposition on native plants is now available to regulators to consider ecosystem as well as human health.

#### *Issue (Who cares and Why)*

Research documented the harmful effects of air pollution, specifically nitrogen deposition, on coastal sage scrub and desert native vegetation. Nitrogen deposited on the soil promotes the growth of non-native invasive grasses that can quickly replace and out-compete native plants. The loss of native plant communities can displace native wildlife that relies on the native species for nutrition, shelter, or nesting. The spread of invasive grasses has also been linked to increases in the frequency and severity of wildfires.

#### *What has been done*

A UC Specialist has been working with a multi-agency (EPA, National Park Service, Forest Service) working group to determine critical loads of nitrogen deposition that will cause harmful ecosystem impacts to southern California shrublands. Relatively low amounts of nitrogen deposition will cause increases in invasive grass biomass that fuel fires, and will cause losses in diversity of native wildflower species.

#### *Results*

The results of this research will be presented to regulators to inform air quality standards to avoid major ecosystem impacts. Air quality standards are set based on human health standards. However, in some cases, even lower amounts of atmospheric NO<sub>x</sub> pollution than affect human health will have negative impacts on native California ecosystems. These negative impacts of nitrogen deposition on native ecosystems have previously been unknown, and now for the first time critical load values are available to regulators to consider ecosystem as well as human health.

Associated Knowledge Areas: 136 Conservation of Biological Diversity, 141 Air Resource Protection and Management

**b) Attitude Changes**

- 52 farm, nursery, ranch and rangeland owner/operators and managers, allied industry professionals, public agency representatives, and members of the public, participating in water quality education programs, intended to use best management practices for preserving water quality.

Associated Knowledge Areas: 112 Watershed Protection and Management, 133 Pollution Prevention and Mitigation

**c) Skill Changes**

*None Reported*

**d) Behavior Changes**

- Cattle ranchers adopted new grazing practices that improve water use efficiency.

*Issue (Who cares and Why)*

Most ranchers in the intermountain area of Northern California rely on irrigated pastures or public land grazing allotments for grazing during the growing season. Because of harsh winter conditions, there is insufficient good-quality forage on the range or in irrigated pastures from October to mid April or later. That makes winter feeding one of the most costly inputs in cow/calf cattle operations as ranchers feed hay, low-quality crop aftermath, or supplements. There are other incentives for cattle producers to find alternative grazing systems. Growers are facing continued and more aggressive reductions in public lands grazing. This will intensify the need for improved efficiency and increased forage supplies, especially in the fall. Water use for forage production is also falling under increased scrutiny. A forage system that decreases winter hay feeding, reduces the dependency on public lands grazing, and improves water use efficiency would be highly desirable.

*What has been done*

UC Cooperative Extension advisors conducted a series of field trials in Siskiyou County to develop a grazing system using winter annual grasses. Trials were conducted with growers and at the UC Intermountain Research and Extension Center. Yield and forage quality were evaluated for several different grass species under actual grazing conditions. Grazing management practices were also studied by cutting to simulate grazing. The results indicated that annual grasses such as triticale could lengthen the forage production season by allowing late fall grazing, early spring grazing and still allow for a hay crop to be produced from the regrowth after grazing. Much of the growing season for winter annual grasses occurs at times of the year when temperatures are cool and rain frequent. Since the amount of water needed per unit of forage is less with this

annual grass system than it is with perennial grasses, this system has improved water use efficiency.

#### *Results*

The new forage management system, primarily with a new crop called triticale, is a terrific improvement. Triticale doesn't replace an old crop; it complements the traditional cattle grazing systems. Triticale provides grazable forage of high quality when previously that wasn't available. Growth occurs during the year when natural rainfall is more plentiful making better use of water. It's advantages are so great many cattle ranchers are readily adopting the new practices.

Associated Knowledge Areas: 121 Management of Range Resources

- Members of the public in Los Angeles and Ventura counties adopted fire-safe landscape practices.

#### *Issue (Who cares and Why)*

Risk of wildfire is one of the critical issues facing California communities that border wildlands. As we were reminded during 2009s catastrophic Station Fire, wildfires devastate families and communities and damage precious natural areas. Educating homeowners about fire-safe landscaping is one of the most effective ways to increase fire safety, reduce costs associated with property destruction, and reduce the risk of erosion and debris flows after a fire. In addition, wildlands close to communities can suffer if exotic plant species escape from backyards and invade habitat areas. Invasive plants harm habitat and increase the risk of wildfire.

#### *What has been done*

The UC Cooperative Extension Sustainable and Fire-Safe (SAFE) Landscapes program teaches Los Angeles and Ventura county wildland/urban interface homeowners how to create and maintain fire-safe landscaping around their homes, and take steps to protect the health of neighboring habitat. In particular, the program educates homeowners about the ecological and fire risks posed by invasive plants. UCCE also works with fire agencies, nurseries, and other organizations that provide lists of recommended plants to make sure they do not suggest the use of invasive species.

#### *Results*

SAFE Landscapes calendars were distributed to 49,000 residents in the wildland/urban interface areas of Los Angeles and Ventura counties through direct mail and at events and workshops. Mail-in surveys were included. Of 241 survey respondents, 76 percent reported being more concerned about invasive plants after reading the calendar, 81 percent said they have avoided buying invasive plants, 55 percent said they would change their landscape because of the calendar, and 51 percent specifically said they were removing these species from their landscapes.

Associated Knowledge Areas: 122 Management and Control of Forest and Range Fires

**e) Social/Health Condition Changes**

*None Reported*

**f) Environmental Condition Changes**

- UC helped to complete 15 Agricultural Conservation Easements and to protect 2,745 acres of working farm and ranch land in the northern San Joaquin Valley through the development of the Central Valley Farmland Trust.

*Issue (Who cares and Why)*

Prime farmland is disappearing at an alarming rate all across the nation and the problem is especially acute in the San Joaquin Valley. Farmers and local governments need more effective tools for preserving prime farmland. Agricultural Conservation Easements (ACE) allow land owners to preserve working farms and also accomplish long-term estate-planning objectives. A farmland trust is needed to facilitate these projects and to hold the resulting easements.

*What has been done*

UC Cooperative Extension in Merced County has worked with interested agriculturalists to establish and grow the Central Valley Farmland Trust (CVFT). A UC farm advisor provided technical assistance in policy development, capacity building and building organizational strength. He also lectures to groups in other agricultural areas of the state who are interested in developing farmland trusts to serve their regions. He provides technical assistance to groups and agencies on and use issues and impacts on production agriculture.

*Results*

As of June 2010 the CVFT has completed 15 ACE and has protected 2,745 acres of working farm and ranch land in the northern San Joaquin Valley. Projects are pending that will protect additional high-value lands. All of the existing farms are in production today and monitored regularly by volunteers and staff members to assure the objectives of the ACE are being met. The large number of inquiries and applications is indicative of the big demand by property owners for the opportunity to complete ACE. Funding for them has been difficult to obtain, so the waiting list is long. The CVFT is working with other jurisdictions to help them develop similar programs.

Associated Knowledge Areas: 605 Natural Resource and Environmental Economics

**g) Economic Changes**

*None Reported*

## 7) Sustainable Natural Ecosystems Planned Program External Factors

### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

### Brief Explanation

The continuing effects of global environmental change are being felt, with more extreme weather events, warming climate, and displacement of natural organisms. Superimposed on the above are a rapidly growing and urbanizing population with an increased gap between rich and poor. California's economy, which used to be ranked 8th in the world, has slipped to 12th, limiting available appropriations for issues related to sustainable natural ecosystems.

## F) Endemic and Invasive Pests and Diseases

### 1) Endemic and Invasive Pests and Diseases Planned Program Knowledge Areas

#### Program knowledge areas and percentages

KA Code	Knowledge Area	%1862 Extension	%1862 Research
135	Aquatic and Terrestrial Wildlife	1%	5%
136	Conservation of Biological Diversity	1%	2%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	3%
202	Plant Genetic Resources	0%	1%
206	Basic Plant Biology	1%	1%
211	Insects, Mites, and Other Arthropods Affecting Plants	15%	14%
212	Pathogens and Nematodes Affecting Plants	21%	32%
213	Weeds Affecting Plants	14%	3%
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	1%	0%
215	Biological Control of Pests Affecting Plants	4%	12%
216	Integrated Pest Management Systems	35%	7%
304	Animal Genome	0%	1%
305	Animal Physiological Processes	0%	2%
311	Animal Diseases	1%	2%
312	External Parasites and Pests of Animals	1%	2%
601	Economics of Agricultural Production and Farm Management	1%	1%
721	Insects and Other Pests Affecting Humans	2%	8%
722	Zoonotic Diseases and Parasites Affecting Humans	0%	1%
723	Hazards to Human Health and Safety	0%	3%
903	Communication, Education, and Information Delivery	2%	0%
	<b>Total</b>	100%	100%

### 2) Endemic and Invasive Pests and Diseases Planned Program Inputs

#### Actual amount of professional FTE/SYs expended this program

Year:	Extension	Research
<b>2010</b>		
<b>Plan</b>	65.5	65.7
<b>Actual</b>	67.9	96.0

**Actual dollars expended in this program  
(includes carryover funds from previous years)**

<b>Extension</b>	<b>Research</b>
<b>Smith-Lever 3b &amp; 3c</b> 1,873,281	<b>Hatch</b> 1,125,337
<b>matching</b> 1,873,281	<b>matching</b> 1,125,337
<b>all other</b> 19,696,769	<b>all other</b> 56,289,015

**3) Endemic and Invasive Pests and Diseases Planned Program Activity**

**Brief description of the activity**

UC ANR's integrated research and extension programs will conduct research projects, workshops, education classes and demonstrations as well as one-on-one interventions. In addition, the programs will use PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs.

**Brief description of the target audience**

- Farmers
- Ranchers
- Rangeland owners/managers
- Landscaping professionals
- Owners/operators of allied agricultural industries
- General public
- Crop and pest consultants

**4) Endemic and Invasive Pests and Diseases NIFA Defined Standard Output Measures**

FY 2010	Direct Contacts Adults	Direct Contacts Youth	Patents	Extension Peer Reviewed Publications	Research Peer Reviewed Publications	Total Publications
Plan	25,100	0	0	130	280	410
Report	84,894	0	3	187	385	572

**Patents Listed:**

- Cloning and characterization of a novel inhibitor of apoptosis protein
- Improved inhibitors for the soluble epoxide hydrolase
- Attractants for the navel orangeworm, amyelois transitella and attractants and behavioral antagonist (inhibitor) for the meal moth

## 5) Endemic and Invasive Pests and Diseases State Defined Outputs

FY 2010	Classes/ Short Courses	Work-shops	Demonstrations/ Field Days	News-letters	Web Sites	Research projects	Videos, slide sets, other A/V or Digital Media	Manuals, other print materials
Plan	130	60	110	170	60	490	20	70
Report	104	36	37	29	11	282	11	20

## 6) Endemic and Invasive Pests and Diseases State Defined Outcomes

### a) Knowledge Changes

- 2,229 farm, ranch, range and landscaping owner/operators and managers, and Pest Control Advisors and other allied industry professionals, participating in pest management education programs, gained knowledge of Integrated Pest Management strategies and techniques.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants, 213 Weeds Affecting Plants, 216 Integrated Pest Management Systems

- 1,147 farm owner/operators and managers, and Pest Control Advisors and other allied industry professionals, participating in pest management education programs, gained knowledge of pesticide and pharmaceutical efficacy and optimal use.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants, 213 Weeds Affecting Plants

- 951 farm, forest, range, and boat owner/operators, and Pest Control Advisors and allied industry professionals, participating in invasive species programs, gained knowledge of prevention, detection and treatment practices for invasive species.

Associated Knowledge Areas: 135 Aquatic and Terrestrial Wildlife, 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants, 213 Weeds Affecting Plants, 216 Integrated Pest Management Systems

- UC research informs the development of a management strategy for cucurbit disease.

#### *Issue (Who cares and Why)*

The whitefly-transmitted cucurbit yellow stunting disorder virus (CYSDV) infects cucurbits such as melons in several parts of the world. Infection can reduce crop yields. In 2006, CYSDV hurt cucurbit production in the low desert regions of California's Imperial, Coachella and Palo Verde valleys, Arizona's Yuma Valley and in nearby Sonora, Mexico. CYSDV infections were immediate and widespread among fall melon crops in 2006 and 2007 following heavy populations of the vector silverleaf whitefly. A cucurbit host-free period during the summer provided limited success in managing CYSDV, attributed mostly to fewer

whiteflies in the Yuma Valley and central Arizona during July. Nearly all fall melon producers in Imperial County have chosen not to plant since 2007. Previous studies had shown that CYSDV was restricted to members of the Cucurbitaceae and lettuce as an experimental host, but we suspected other hosts were affecting the success of the cucurbit host-free period.

#### *What has been done*

A UC Cooperative Extension entomology advisor in Imperial County worked with the USDA Agricultural Research Service in Salinas to study potential hosts in the desert melon production regions of California, Arizona and northern Mexico. This study revealed a broader host range than originally believed for CYSDV, including the identification of non-cucurbit hosts that can serve as source plants for whitefly to transmit CYSDV back to melon and other cucurbits.

#### *Results*

There were CYSDV hosts represented in seven new distinct non-cucurbit families. The demonstration that CYSDV can be acquired by whitefly vectors from non-cucurbit hosts and efficiently transmit the virus back to cucurbits illustrates the potential niche these plants may fill during seasons when melon and other cucurbits are not widely prevalent. The new information on additional non-cucurbit host families is now being used to develop CYSDV management strategies.

Associated Knowledge Areas: 216 Integrated Pest Management Systems

### **b) Attitude Changes**

- 405 farm, ranch, and boat owner/operators and managers, and Pest Control Advisers and other allied industry professionals, participating in pest management education programs, were more likely to try out or adopt recommended strategies and techniques for invasive species and pest management.

Associated Knowledge Areas: 135 Aquatic and Terrestrial Wildlife, 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants, 213 Weeds Affecting Plants

### **c) Skills Changes**

- 705 farm owners/operators and managers, and Pest Control Advisers and other allied industry professionals, participating in pest management education programs, gained skills to detect, monitor, and treat pests.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants, 213 Weeds Affecting Plants, 215 Biological Control of Pests Affecting Plants, 216 Integrated Pest Management Systems

#### **d) Behavior Changes**

- 592 nursery growers and retail nursery staff, participating in pest management education programs, adopted pesticide and pharmaceutical efficacy and optimal use practices.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants

- 808 farm owner/operators and managers, and Pest Control Advisers and other allied industry professionals, participating in pest management education programs, adopted recommended integrated pest management practices.

Associated Knowledge Areas: 216 Integrated Pest Management Systems

- 102 farm and nursery owner/operators, participating in pest management education programs, used recommended pest and disease management practices, which resulted in reduced crop losses and thus more economic gain.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants, 216 Integrated Pest Management Systems, 601 Economics of Agricultural Production and Farm Management

- Improved pistachio quality, lower costs and reduced environmental impact resulted from growers adopting a UC recommended pistachio pest control program.

#### *Issue (Who cares and Why)*

Since the 1990s Gill's mealybug has been an issue for pistachios statewide. The pest damages pistachios by feeding on carbohydrates that would otherwise be used for nut development. This results in fewer of the highly prized split, in-shell nuts in exchange for smaller kernels in closed shells. Growers with infested fields applied multiple pesticide applications on a yearly basis to try to prevent significant crop losses. In 2004, the California Pistachio Commission approached UC for assistance in finding a solution.

#### *What has been done*

A team of UC researchers, worked closely with members of the pistachio industry, to develop a management program for this pest. Research was conducted on pest biology, the impact of mealybugs on the yield and quality of nuts, and on biological and chemical control strategies. The results were used to develop an effective and economically acceptable management program for Gill's mealybug. The program is based on the use of a single application of a highly effective insect growth regulator, buprofezin, at a time of year when the mealybugs are in their most susceptible "crawler" growth stage. If done properly, this management program can provide two years of effective control.

#### *Results*

Nearly 100 percent of the pistachio growers across the state who are battling Gill's mealybug have now used this program with great success. Most have been able to achieve two years of excellent control for less than half the cost

previously required annually for moderate control. Additionally, the transition away from broad-spectrum insecticides has had environmental benefits related to the preservation of biological control organisms and increased worker safety. This project has allowed growers to produce better quality pistachios while cutting costs and, at the same time, promoting human health and safety, and protecting the environment.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants

- Caneberry growers avoided massive losses to spotted wing drosophila by adopting the UC recommended management system.

*Issue (Who cares and Why)*

In September of 2008, UC Cooperative Extension farm advisor in Santa Cruz County discovered a new vinegar fly pest infesting caneberries and strawberries, which was later described by the California Department of Food and Agriculture as *Drosophila suzukii* and given the common name spotted wing drosophila. In 2009, spotted wing drosophila spread to cherries, blueberries, caneberries and strawberries in California, Oregon, Washington, British Columbia and Florida.

*What has been done*

In collaboration with a private industry researcher, the farm advisor undertook an aggressive research program which sought to create a program of management for this new pest. Trapping media for monitoring were tested, pesticide controls both for conventional and organic systems were screened and the removal of cull fruit from the field to limit spotted wing drosophila population growth was put into practice. The scientists established a program to share the information with growers, culminating with a standing-room-only event held at the Santa Cruz County UC Cooperative Extension office in early August 2009. The use of the Internet was critical in extending information on spotted wing drosophila. Growers and other professionals in Southern California, Oregon, Washington and British Columbia were immediately able to access updates posted on a blog about this pest.

*Results*

California caneberry growers, who were among the most affected by spotted wing drosophila, quickly deployed the methods as outlined by UC Cooperative Extension and private industry partners. Yeast sugar water traps were placed in fields to monitor the magnitude of infestation. Effective pesticide sprays were made and many growers removed cull fruit from the field. The result was a drop in the amount of spotted wing drosophila infested fruit of at least 20 percent, resulting in a probable savings of \$36 million to the industry.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants

- Pest control advisers adopted integrated pest management practices which minimize environmental impacts on nut crop acreage.

[Note: in the actual Annual Report this outcome was mistakenly coded as a knowledge change]

*Issue (Who cares and Why)*

Due to the economics involved in agriculture, the southern San Joaquin Valley has seen significant expansions in the acreage of almonds and pistachios. As of the late 2000s, the value of these two crops in Kern, Kings and Tulare counties approaches \$1 billion annually. Along with the increase in acreage has come the need for additional pest control advisers to make decisions regarding the management of insects, diseases and weeds. It is imperative that this new generation of advisers be versed in integrated pest management practices that are safe, effective, affordable and respectful of the environment.

*What has been done*

UC Cooperative extension farm advisors held five field meetings related to the management of three key nut crop pests: spider mites, navel orangeworm and Gill's mealybug. The trainings provided almond and pistachio pest control advisers with a chance to participate while integrated pest management practices were demonstrated in the field. Practices included methods for maximizing biological control, proper pest sampling techniques, alternative control strategies to those involving pesticides, and how to use pesticides judiciously when they are required. The goal was to improve participants' familiarity with these practices such that they could incorporate them into their daily practices, allowing them to manage pests effectively while minimizing negative impacts to the environment.

*Results*

To measure their success, at the end of the growing season the researchers sent surveys to the participants of the field meetings. The 40 percent of the attendees who responded to the anonymous survey stated that information from the meetings was routinely considered when making pest management decisions by individuals that influence 161,750 acres of tree nut crops. The same respondents reported that information was routinely used to improve the practices of pest control advisers that influence 83,750 acres of nut crops. This constitutes an improvement in the use of safe and effective pest management practices that minimize environmental impacts on nut crop acreage that produces approximately \$500 million in agricultural products annually.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants

## e) Social/Health Condition Changes

- Pesticide drift exposure in Kern County declines as a result of pesticide safety training.

[Note: in the actual Annual Report this outcome was mistakenly coded as a knowledge change]

### *Issue (Who cares and Why)*

Kern County has historically had some of the highest occurrences of pesticide exposure incidents in California. This trend peaked during 2002 and 2003 when a series of seven pesticide drift incidents affected more than 550 people. Each incident had significant negative impacts on human health.

### *What has been done*

A UC Cooperative Extension entomology farm advisor and staff of the Kern County Agricultural Commissioner's office conducted 31 training sessions on safe and effective use of pesticides and worker safety. Twenty of these sessions focused on the responsibilities of private applicators to provide a safe working environment and covered how to effectively manage information flow to pest control advisors, pesticide applicators and farm labor contractors. The other sessions were "train-the-trainer" meetings that provided hands-on experience in English and Spanish on how to effectively educate fieldworkers about pesticide safety. Through the latter, 319 farm labor contractors were trained, who have in turn trained tens of thousands of fieldworkers. UC Cooperative Extension plans to continue providing "train-the-trainer" programs to help farm labor contractors and farm workers protect themselves from exposure to pesticides. Meanwhile, additional programs, such as the Kern County industry-based "Spray Safe" program will help growers provide a safe working environment.

### *Results*

Since the project began in 2004, safety trainings have contributed to a steady decline in pesticide drift incidents in Kern County. Incidents from 2004 to 2006 decreased from 4 to 1 per year, with the number of people affected decreasing from 125 to 18. These reductions continued in 2007 and 2008 such that the goal of no drift incidents was attained in 2008. Reductions of pesticide drift incidents constitute a direct improvement to public health. Less drift means a safer working environment for fieldworkers and a better living environment in urban areas adjacent to agricultural fields.

Associated Knowledge Areas: 216 Integrated Pest Management Systems

## f) Environmental Changes

- 96,900 acres of vineyards under quarantine for European Grapevine Moth in Napa, Sonoma, and Mendocino Counties achieved a 1000 fold reduction of European Grapevine Moth population levels without causing disruption of secondary pest or reducing natural enemies populations because growers applied the recommended, well time control measures.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants

- The spread of vine mealybug through grape nursery stock has been eliminated as a result of the nurseries adopting the UC recommended hot-water treatments program.

[Note: in the actual Annual Report this outcome was mistakenly coded as a knowledge change]

*Issue (Who cares and Why)*

Vine mealybug is a serious pest of wine, raisin and table grapes in California. Mealybug feeding reduces grapevine vitality, transmits grape viruses, and produces tremendous amounts of sticky honeydew, promoting sooty mold that renders the grapes unmarketable. Until 2002, there was only one localized infestation of vine mealybug recognized outside of Riverside, Kern and Fresno counties. By the end of 2003, infestations had been documented in 16 counties, representing all grape-growing regions of the state. Subsequent investigations identified infested nursery stock as the cause for the rapid, widespread dissemination of this new exotic pest.

*What has been done*

UC Statewide Integrated Pest Management entomologists worked closely with the grape nursery industry to attack the problem at its source. They performed a series of hot-water treatment experiments on dormant grape cuttings and evaluated a wide range of immersion times and water temperatures for their effects on mealybug mortality. The results led to the development of a treatment program that was more than 99 percent effective at killing mealybugs on dormant nursery stock. Less than one mealybug per every 1,000 survived a five-minute treatment at 127 degrees F.

*Results*

California grape nurseries that produce more than 90 percent of the grape nursery stock sold statewide have now adopted hot-water treatment programs to ensure that their nursery products are free of vine mealybug. Since these protocols have been in place, spread of vine mealybug through nursery stock has been eliminated. Hot-water treatment programs continue to protect new vineyards from becoming infested, allowing them to get a healthy start toward contributing to California's \$3 billion grape industry.

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants

**g) Economic Changes**

- Growers are now successfully managing citrus thrips in blueberries as a result of a UC ANR developed management program.

*Issue (Who cares and Why)*

Blueberries are one of the newest crops grown in California, and are now planted on more than 5,000 acres statewide. Recently, however, blueberry fields

have been under attack by a longtime California pest called citrus thrips. Feeding by thrips causes distortion, discoloration, stunting of new shoot growth, and damage to the development of fruiting wood that supports the next year's crop. Due to the severity of the damage, one of the largest blueberry growers in the state reported that he was spraying pesticides more than 10 times per year to minimize crop losses.

#### *What has been done*

UC researchers and cooperators developed a program for citrus thrip management in blueberries. The team discovered the pest's seasonal biology, developed monitoring programs, and evaluated differences in varietal susceptibility to damage and chemical controls. The group also evaluated nonchemical controls such as the use of high-pressure water and fungi that can act as parasites of insects and kill or seriously disable them. These latter techniques were investigated as a way to delay resistance to the relatively few pesticides registered for blueberries that are being used repeatedly on some fields to combat citrus thrips.

#### *Results*

As a result of UC research, blueberry producers have the basic tools they need to prevent thrips damage and crop losses, and they have begun to adopt those practices. An agronomist with the largest blueberry farm in the San Joaquin Valley, stated that this project has resulted in "an improvement in sustainable blueberry production for California." He estimated that, on their ranches alone, results of this project have conservatively increased the crop revenue of their company by more than \$2.5 million each season.

Associated Knowledge Areas: Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants

## **7) Endemic and Invasive Pests and Diseases Planned Program External Factors**

### **External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Populations changes (immigration, new cultural groupings, etc.)
- Other ( )

### **Brief Explanation**

The weather in California during 2010 was mild, which resulted in a longer growing season, delaying the harvest of most crops and increasing pest damage. In addition, optimum weather conditions resulted in increased widespread weed pressure, especially invasive weedy plants in wildland areas. Also, a new invasive pest, the red palm weevil, appeared for the first time in southern California. Lack of resources, including funding, and expertise to address the new threat is a concern.

## G) Sustainable Energy

### 1) Sustainable Energy Planned Program Knowledge Areas

#### Program knowledge areas and percentages

KA Code	Knowledge Area	%1862 Extension	%1862 Research
104	Protect Soil from Harmful Effects of Natural Elements	0%	1%
111	Conservation and Efficient Use of Water	0%	2%
123	Management and Sustainability of Forest Resources	0%	1%
131	Alternative Uses of Land	0%	1%
133	Pollution Prevention and Mitigation	0%	4%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	38%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	3%
204	Plant Product Quality and Utility (Preharvest)	0%	2%
205	Plant Management Systems	0%	3%
206	Basic Plant Biology	0%	6%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	2%
212	Pathogens and Nematodes Affecting Plants	0%	3%
302	Nutrient Utilization in Animals	0%	1%
305	Animal Physiological Processes	0%	3%
402	Engineering Systems and Equipment	0%	3%
403	Waste Disposal, Recycling, and Reuse	0%	1%
404	Instrumentation and Control Systems	0%	1%
503	Quality Maintenance in Storing and Marketing Food Products	0%	1%
511	New and Improved Non-Food Products and Processes	0%	20%
605	Natural Resource and Environmental Economics	0%	4%
	<b>Total</b>	0%	100%

## 2) Sustainable Energy Planned Program Inputs

Actual amount of professional FTE/SYs expended this program

Year: 2010	Extension	Research
Plan	{no data}	{no data}
Actual	0.0	8.0

Actual dollars expended in this program  
(includes carryover funds from previous years)

Extension	Research
Smith-Lever 3b & 3c 0	Hatch 85,455
1862 matching 0	1862 matching 85,455
1862 all other 0	1862 all other 4,674,622

## 3) Sustainable Energy Planned Program Activity

### Brief description of the activity

UC ANR's integrated research and extension programs conducted research projects and workshops, as well as one-on-one interventions. In addition, the programs used collaborations with other agencies and organizations to create and deliver programs.

### Brief description of the target audience

- Relevant agency and private-sector partners
- Lawmakers working on issues related to energy
- Members of the public in general
- Agricultural producers of crops for use as biofuels

## 4) Sustainable Energy Defined Standard Output Measures

FY 2010	Direct Contacts Adults	Direct Contacts Youth	Patents	Extension Peer Reviewed Publications	Research Peer Reviewed Publications	Total Publications
Plan	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}
Report	0	0	3	0	24	24

### Patents Listed:

- Application of the T1a1 Gene in Optimizing Absorption and Utilization of Sunlight and Improving Photosynthetic Productivity in Plants
- Simplified daylighting controls
- Dual photo-sensor dimming daylight controls

**5) Sustainable Energy State Defined Outputs**

FY 2010	Classes/ Short Courses	Work-shops	Demonstrations/ Field Days	News-letters	Web Sites	Research projects	Videos, slide sets, other A/V or Digital Media	Manuals, other print materials
Plan	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}
Report	0	8	0	0	0	10	0	0

**6) Sustainable Energy State Defined Outcomes**

*None Reported*

**7) Sustainable Energy Planned Program External Factors**

**External factors which affected outcomes**

- Public Policy changes
- Government Regulations

**Brief Explanation**

Public policy and regulations relating to biomass use for power and fuels are constantly changing. Other policies affect the amount of power from renewable sources used in the state and nation and its price, its distribution, etc. California's Low Carbon Fuel Standard affects the use of Biofuels in the state and the federal standard (very different regulations) also applies. Important policies affecting Biofuels will continue to evolve. For example, there are groups in the state working to try to forbid irrigating crops in California that might be used as a biofuel feedstock.

## H) Climate Change

### 1) Climate Change Planned Program Knowledge Areas

#### Program knowledge areas and percentages

KA Code	Knowledge Area	%1862 Extension	%1862 Research
101	Appraisal of Soil Resources	0%	2%
102	Soil, Plant, Water, Nutrient Relationships	0%	8%
122	Management and Control of Forest and Range Fires	0%	3%
131	Alternative Uses of Land	0%	1%
132	Weather and Climate	0%	30%
133	Pollution Prevention and Mitigation	0%	1%
135	Aquatic and Terrestrial Wildlife	0%	1%
136	Conservation of Biological Diversity	0%	7%
141	Air Resource Protection and Management	0%	2%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	1%
211	Insects, Mites, and Other Arthropods Affecting Plants	0%	1%
213	Weeds Affecting Plants	0%	2%
215	Biological Control of Pests Affecting Plants	0%	1%
216	Integrated Pest Management Systems	0%	1%
304	Animal Genome	0%	1%
605	Natural Resource and Environmental Economics	0%	18%
609	Economic Theory and Methods	0%	6%
610	Domestic Policy Analysis	0%	2%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%	12%
	<b>Total</b>	0%	100%

### 2) Climate Change Planned Program Inputs

#### Actual amount of professional FTE/SYs expended this program

Year:	Extension	Research
<b>2010</b>		
<b>Plan</b>	{ no data}	{no data}
<b>Actual</b>	0.0	8.0

**Actual dollars expended in this program  
(includes carryover funds from previous years)**

<b>Extension</b>	<b>Research</b>
<b>Smith-Lever 3b &amp; 3c</b>	<b>Hatch</b>
0	132,014
<b>matching</b>	<b>matching</b>
0	132,014
<b>all other</b>	<b>all other</b>
0	4,692,218

**3) Climate Change Planned Program Activity**

**Brief description of the activity**

UC ANR's integrated research and extension programs conducted research projects and demonstrations/field days, as well as one-on-one interventions. In addition, the programs used collaborations with other agencies and organizations to create and deliver programs.

**Brief description of the target audience**

- Members of the public in general
- Lawmakers working on issues relating to climate change
- Agricultural producers
- Natural resource managers
- Relevant agency and private-sector partners (including city-county and regional planners, nonprofits, government, and business people)
- Interdisciplinary teams of scientists and technologists

**4) Climate Change NIFA Defined Standard Output Measures**

<b>FY 2010</b>	<b>Direct Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Patents</b>	<b>Extension Peer Reviewed Publications</b>	<b>Research Peer Reviewed Publications</b>	<b>Total Publications</b>
<b>Plan</b>	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}
<b>Report</b>	0	0	0	2	16	18

**5) Climate Change State Defined Outputs**

<b>FY 2010</b>	<b>Classes/ Short Courses</b>	<b>Workshops</b>	<b>Demonstrations/ Field Days</b>	<b>Newsletters</b>	<b>Web Sites</b>	<b>Research projects</b>	<b>Videos, slide sets, other AV or Digital Media</b>	<b>Manuals, other print materials</b>
<b>Plan</b>	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}	{no data}
<b>Report</b>	0	0	1	0	0	11	0	0

**6) Climate Change State Defined Outcomes**

*None Reported*

**7) Climate Change Planned Program External Factors**

**External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Availability of graduate students/others)