

UNIVERSITY OF CALIFORNIA
DIVISION OF AGRICULTURE AND NATURAL RESOURCES

2008 Combined Research and Extension
Federal Annual Report

Agricultural Experiment Station
and Cooperative Extension



2008 University of California Combined Research and Extension Federal Annual Report

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 a nationwide public university system "built on behalf of the people" (Abraham Lincoln's words) with Experiment Stations established to develop "useful and practical information...and to promote scientific investigations and experiments," and Cooperative Extension programs to "aid in diffusing...useful and practical information. "UC ANR's mission, "... is to serve California through the creation, development and application of knowledge in agricultural, natural and human resources.

UC ANR members are based on the Berkeley, Davis and Riverside campuses, and in more than 50 regional and county offices throughout the state. The Division is composed of the UC Agricultural Experiment Station (AES) and UC Cooperative Extension (CE), supplemented by 20 Statewide Programs and projects, and supported by nine Research and Extension Centers.

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 235 advisors.

The following narratives describe program highlights of FY 2008 by the California Federal Planned Programs.

California Families, Youth and Community Development

There are 98 Hatch and Regional Research projects funded through Multistate Research sources at UC Riverside, Davis, and Berkeley with a focus on California families, youth and communities. There are also 25 research activities conducted by UCCE Advisors and 362 extension projects conducted by UCCE advisors and campus based specialists under the Federal Planned Program: Sustaining California Families, Youth and Community Development. Projects are being conducted in several areas; a few illustrative examples follow.

Human Nutrition and Health:

AES research has identified health promoting components of legumes, other plants, and human milk. New bioassays have been developed to detect dioxin and other contaminants; spoilage microorganisms; and pathogens in food and agricultural samples. Obesity research has examined diets for improving weight and metabolic status, genes involved in fat cell regulation, and factors related to excessive weight gain in high risk African American youth. Other AES studies have identified polymorphisms in genes related to folate and B12 metabolism; trace element deficiencies; genetic influences on renal disease; and mechanisms in the gut involved in inflammatory bowel and Crohn's disease. Coordination across nutrition, 4H, and Master Gardeners has enabled advisors to teach low income students about plants and nutrition, as well as improve food choices and food safety skills. The Lunch Box program reached 3600 families and improved the nutritional quality of children's packed lunches. The nutritional needs of older Americans were addressed through several training programs reaching more than 230 caregivers in 10 counties and resulting in improved knowledge of food safety practices. A workgroup, in collaboration with external stakeholders, completed an assessment of food security among Central Valley farmworkers.

Youth Development:

Marin, Sonoma and Imperial Counties have begun data collection in the multistate Tufts Study that will compare developmental outcomes among youth who were or were not 4H members between the ages of 13-17 years. A longitudinal study is underway to examine the factors that influence choices of

Mexican American youth to engage in high risk behaviors. Teachers and after-school providers received professional training on delivery of experiential science and engineering programs. Five counties began youth curriculum development related to water and environmental quality. Other popular science and college preparation programs included embryology; veterinary science; pre-harvest food safety and biological risk management; nutrition; and sustainable food systems. Leadership development reached inner city minority youth in Los Angeles by engaging youth in service learning projects (planting a community garden and leading a diabetes awareness walk).

Families and Consumer Well-being:

A workgroup, with collaboration between UCCE and CSU Cal Poly academics, developed the Creating Healthy Families curriculum and DVDs to enable parents to use positive, effective parenting practices in feeding young children. Evaluation of the Money Talks Program found that teens completing the program gain knowledge and skills related to money management. San Diego Saves, a multi-agency effort, provided direct education to more than 2100 residents and reached more than 620,000 radio listeners with messages related to financial literacy.

Community Development

The California Communities Program (CCP) studied the impact of the Workforce Investment Act and made recommendations to public officials on ways to maintain program quality, including how to help minority youth find pathways to higher education and employment. CCP also conducted an evaluation of the Sierra Health Foundation Community Action coalitions.

Approaches

Caregivers (of young children and seniors) are reached through informal educational programs. In 2008, EFNEP reached low income families with children in 16 counties; FSNEP (now SNAP ed) reached food stamp eligible youth and/or adults in 35 counties.

School-age programs (including 4H clubs, classroom enrichment, summer camps, and after school activities) reach both the children at risk, as well as the general child population. Extension programs in the schools have tied nutrition education activities to the California content standards. An evaluation of the EatFit among low income students found that this approach not only improves eating and physical activity habits but also math and language arts performance.

Paid staff and volunteers from private and public entities receive in-service training on safe food handling to reduce food-borne illness in the general population.

In-service training and web-based newsletters and fact sheets in other topic areas (nutrition, health, youth development, parenting, etc) reach a wide audience, including health professionals, school administrators and teachers, paraprofessional staff from public health programs (such as WIC).

A new money management online program, Making Every Dollar Count, was tested among limited literacy audiences. Over 85% felt they learned as much by computer as they would have in a classroom setting.

California Pest Management

The scope of activities in pest management in California is extensive and very diverse. There are 132 Hatch and Regional Research projects funded through Multistate Research fund sources to investigators at UC Riverside, Davis, and Berkeley that have a pest management focus. In addition there are 123 research projects reported by UCCE Advisors and 349 extension projects conducted by UCCE advisors and campus based Specialists under the Federal Planned Program, California Pest Management.

California's moderate environment allows tremendous specialty crop and animal diversity, but it also provides niches for various pest organisms, including weeds, insects, plant diseases, nematodes, mites, and vertebrate pests that can affect the cost of production and the loss of yield. The management of key pests in California's diverse agricultural, natural, and urban ecosystems continues as on going efforts to reduce the impact of both native and exotic pests and diseases.

For example, for several decades pistachios were considered one of the most pest free crops grown in California. However, this all changed in the late 1990s when an invasive species of mealybug, Gill's mealybug, was found in a Tulare County orchard. As of 2002 it infested about 20 acres of pistachios in Tulare County; by 2007 it had been found in over 5,000 acres of pistachios statewide. A team of researchers at the University of California 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 a highly effective and economically acceptable management program for Gill's mealybug. It 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. Nearly 100% of the pistachio growers across the state that are battling Gill's mealybug have now utilized this program with great success. Most have been able to achieve two years of excellent control for less than half of the cost previously required for moderate control on an annual basis. Additionally, there have been environmental benefits due to the transition from broad spectrum insecticides to the more reduced risk insect growth regulator being used. This project has allowed pistachios to be grown with greater quality at less expense, while at the same time providing improvements to human health and safety as well as the environment.

Rice farmers need herbicides to manage weeds in their fields, but the outflow of these chemicals from flooded rice fields polluted downstream waters including the Sacramento River, causing off tastes in public drinking water and threatening downstream fisheries. In the mid 1980s through the 1990s, UC scientists cooperating with many agencies and with the rice industry conducted research and education programs to help farmers change irrigation management methods from continuous flow through to in field water holding systems. A number of research and demonstration projects showed that yields could be just as good, water use was reduced and most of all, that herbicides in water outflows were greatly reduced by water holding systems. The payoff was a 98.5% reduction in the mass flow of rice herbicides in the Sacramento River from 1984 to 1996 and farmers were still able to use these important tools to control weeds. This program serves as a model program for the benefit of other groups that need to address water quality issues.

The costs attributed to termites, their management, damage, and repairs annually exceed \$500 million in California. The most damaging termites belong to an ecological group called subterranean. They live and forage in the soil. Another ecology group, called drywood termites do not require soil contact and can occur in boards in the attic far removed from soil. Both are also common in the State. Traditionally, chemicals fumigants and liquids were the dominated method of termite control. However, today the public is demanding alternative methods of control that include baits, non-chemical and least toxic alternatives that minimize exposure of toxicants to people, their pets, and the environment. Over the last 7 years, ANR scientists in collaboration with USDA Forest Service and pest control industry have tested at least 10 alternative methods of termite management. They include chemical, baits, non-chemical methods and detection devices. Much of the pioneering work conduct on subterranean termite foraging in the State was first conduct by ANR scientists. Many of the non-chemical methods of management of drywood termite were first tested by ANR scientists. As a result, a least 10 percent of the termite management methods now used in the state are least toxic or non-chemical.

Vine mealybug is a serious new pest of \$3 billion wine, raisin and table grape industry 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 a total of 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. University of California 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 that 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 proved over 99% effective at killing any mealybugs that might be hitchhiking on dormant nursery stock; less than one per every thousand survived a 5 minute treatment at 127 degrees F. Hot water treatment programs have now been adopted throughout California

by grape nurseries that produce over 90% of the grape nursery stock sold statewide. Since these protocols have been in place, spread of vine mealybug through nursery stock has virtually disappeared.

Grape powdery mildew, ever present on grapes world wide, is the number one grape disease in California. Powdery mildew can seriously impair quality, develop rot on raisin grapes, cause wine grapes to be diverted to the distillery, and make table grapes unfit for the market unless substantial hand labor is employed to clip out infected berries during harvest. Development of the UC Davis mildew index model made it possible to monitor the rate of development of powdery mildew and to predict when control materials are needed. With proper use of the model and new pesticides it is possible, in some years, to actually reduce the amount of chemicals applied over a season while obtaining equal or better control than a standard spray program. In recent tests, two complete sprays were omitted without any significant changes in control of powdery mildew, saving the industry significant amounts of money. As more growers become comfortable with the UC model it will be adapted more widely. Reduced pesticide use pays off for the growers, consumers and the environment.

Sustainability and Viability of California Agriculture

There are 309 Hatch and Regional Research projects funded through Multi state Research sources to investigators at UC Riverside, Davis, and Berkeley with an agricultural focus. There are also 133 research projects conducted by UCCE Advisors and 349 extension projects conducted by UCCE advisors and campus based specialists under the Federal Planned Program: Sustainability and Viability of California Agriculture. The following projects illustrate the types of projects are being conducted in the area of sustainability and viability of California's agriculture.

Economic Innovation and Viability of Agriculture:

A critical component of the research and extension projects in the Ag and Natural Resources division is addressing economic viability for farmers, ranchers and the greater public. There are many projects being conducted by UC, large and small which address basic production and economic viability issues, both for enhanced product value, and cost savings. For example, defoliation is an important production practice that cotton growers can do to impact yield and lint quality. UC Farm Advisor Steve Wright has conducted field trials in California's Central Valley with over 30 different chemical combinations to evaluate the most effective and least expensive defoliant for different environmental conditions and . UC Farm Advisor Richard Smith and Specialist Steve Fenimore have conducted weed control studies on broccoli, including cultural techniques and non chemical options. This information provides valuable information to farmers who have severe price and profitability pressures for specialty crops. A simple, inexpensive (\$5) refractometer was developed by UC Farm advisors Steve Velasquez and Shannon Mueller to measure grape sugars to judge ripeness for harvest management. This is a key economic management tool for grape growers. Information on goat husbandry and economics were developed by UC Farm Advisor Deborah Giraud for small producers in Humboldt County. She also facilitated the start of a commercial goat producer's association for marketing for family farms. A new 24 chapter manual 'Irrigated Alfalfa Production for Mediterranean and Desert Zones' was published and circulated to more than 700 alfalfa growers and industry member to better inform growers about irrigation, profitability, and pest management. More than 1,000 Southeast Asian refugee farmers, and other farmers in Fresno County and throughout the state, are better informed about labor law compliance due to a UCCE Small Farm program to inform them about labor and other regulations. These small ethnic farmers are now aware of the risks and potential fines for being out of compliance, and are able to operate profitably as a result. Work by UC Farm Advisors John Edstrom has moved orchard production to marginal soils on the east side of the Sacramento Valley. The soils of western Colusa County present major challenges to profitable tree crop production. Soils here are considered marginal due to limitations in one or more character i.e. depth, texture, stratification, slope, drainage, salt content or ph, much of this area was dry land pasture or field and row crops. The Nickels Soil Lab represents the largest almond research facility in the world, with a 29 year tradition of developing and demonstrating reliable and effective horticultural innovations for nut growers. Field and laboratory work on fungal symiont by Luis Espino which may confer salt tolerance to rice was conducted – with potential impacts on plant biomass and seed yields. Other research involving seeding methods (wet seeding, and innovative no till seeding methods) will enable reduced cost methodologies to be adapted by growers. N fertilization studies on corn by UCCE Farm Advisor Carol Frate measures impacts on emissions, crop response, and N use efficiency. Research on organic fertilizer methods by Santa Barbara County farm Advisor Mark Gaskell enables successful adaptation of

these methods by coastal vegetable and fruit producers. Introduction of new and novel crops has resulted in new economic opportunities. Blueberries are an excellent example of a new crop that has been developed in California over the past 9 years, and now total over 5000 acres. Introduction of new opportunities for farmers by introduction of new crops provides a significant benefit to farmers.

Water Use Efficiency and Water Quality:

Water use and water quality efforts are key components of UC Cooperative Extension and ARS research. Drought conditions were prevalent throughout most parts of California in 2008, and had a large influence on farmers. Tomato, cotton and alfalfa fields were abandoned. Drought response website was developed by UC Irrigation Specialists with key information on how to produce crops under reduced water availability situations. This was widely used by farmers. The Landscape Professionals Workshop Series was held to conduct outreach to bring environmental awareness and best management practice education to the horticulture industry. The Workshop series will become a part of the program for qualification of a "Delta Responsible Landscaper" for both professionals and homeowners. Statewide deficit irrigation trial with alfalfa conducted by Blaine Hanson, Dan Putnam, and Farm Advisors over 4 years demonstrated the viability of late summer dry down for the state's number one water using crop. This establishes the possibility of transferring water voluntarily to meet critical water needs. Deficit irrigation trials were conducted in grapes and orchard crops in coastal areas of California by Mark Brittany and field days and educational programs were held. Economic evaluation of the impacts of the drought by UC Davis economists, and analysis of economics of water transfers have informed policy makers and others who need to make critical decisions about these important issues.

Food Safety:

Food safety is a critical issue for California growers and the nation's food supply. It affects both consumers and producers through sudden market shifts. UC Davis researchers have been studying food borne pathogens on crops for a number of years. However, because of the heightened concern about E. coli O157:H7 contamination of leafy vegetables, Monterey County farm advisors recently have partnered with food safety specialists Trevor Suslow and Linda Harris of UC Davis to conduct field experiments designed to investigate the ability of E. coli to survive and spread in a production environment. Using various nonpathogenic E. coli isolates as surrogate organisms, they are evaluating how variations in soil moisture and environmental conditions may impact survival in soil, water and on plant surfaces. Food safety educational efforts were conducted with ethic farmers to improve food safety for farmer's markets.

Crop Improvement and Genetic Engineering:

Considerable work throughout the UC systems evaluates the value and mapping of genes on the basic level, understanding enzymatic functions, using tools of genomics, proteomics, marker assisted selection, biotechnology, and traditional plant breeding. Variety testing, release, disease evaluation, and adaptation are also key components. Genetic work to evaluate the resistance levels of grape rootstocks have brought tremendous value to California viticulture industry with work conducted at the Research and Extension Centers, UC Davis, and by Farm Advisors. Citrus genetic research on disease and insect resistance by UC Riverside for California Citrus industry has brought tremendous value to citrus growers in Southern California. Varieties of several specialty crops including strawberries, grain legumes (cowpeas, beans), wheat, alfalfa have been released and/or adapted and evaluated during this period. The wheat testing program has had to continually test improved varieties for new strains of rust which has been devastating in recent years recently released varieties contain much better disease resistance characteristics. These are done by the plant breeders, UC Wheat specialist Lee Jackson, and UC Farm Advisors throughout the state. Comprehensive state wide testing of improved lines of wheat and alfalfa, cotton, and biofuels have provided critical independent data that enable wise choices by farmers. Variety testing for safflower by UC Farm Advisor Kent Brittan, has enable farmers to make better cropping decisions and cope a low water input. Likewise, field corn testing has enabled farmers to choose disease resistant lines. Alfalfa varieties are adapted to specific regions in a comprehensive state wide program. Performance of cotton varieties enables farmers to choose profitable lines for production and quality. Work on gene flow and genetic engineering policy by the Seed Biotechnology Center informs the public about the broader issue of genetic engineering and the safety of non GE crops.

Food Systems, Small Farms, Sustainable Agriculture and Public Education about Food Production:

A critical area of importance is outreach and education for gardeners, small farmers, and the general public. Included in this is the concept of 'science literacy in food systems and agriculture'. Examples of

this include a program in Sonoma County, working with the Sherriff's department to provide horticultural skills to jail inmates from the UC Master Gardener program. Inmates learned landscape design skills, plant science principles, and water conservation methods, and sell plants from the prison – some have found jobs after release. The master gardener program in other counties have used their own gardens as instructional models and designed tours to illustrate recycling, reduced landfill and drought tolerant native species. This program has involved tens of thousands of volunteers who are active in their community, training others in gardening and environmental stewardship. The UC – SAREP program in food systems have developed innovative farm to school programs that benefits small farmers by providing opportunities, and benefit consumers through education about the benefits of fresh fruits and vegetables. Children are trained from an early age to choose healthy vitamin-rich foods which prevent obesity and other health problems. This program has the potential of benefiting many different communities in California. The UC Small Farms Program provides in-depth assistance to small farmers, many of them from ethnic minorities, who wish to developed specialty markets, including locally-grown, organic, grass-fed livestock, farmers markets, Community-Supported Agriculture and other market opportunities.

Sustaining California's Natural Resources

California's environment is extremely diverse and wide ranging, from urban areas to wildlands to coastal areas to deserts to mountains, involving aquatic, terrestrial and atmospheric ecosystems. There are 174 Hatch and Regional Research projects funded through Multi state Research sources to investigators at UC Riverside, Davis, and Berkeley with a natural resources focus. There are also 42 research projects conducted by UCCE Advisors and 483 extension projects conducted by UCCE advisors and campus based specialists under the Federal Planned Program: Sustaining California's Natural Resources. Projects are being conducted in several areas that are essential to sustaining California's natural resources; a few illustrative examples follow.

Water Quality:

Projects to reduce the loading of pesticides, nutrients, pathogens, sediments, and salts from agriculture, rangeland, oak woodlands, and urban runoff into surface and ground waters are being conducted.

Air Quality:

Projects on: greenhouse gas emissions and climate change used in the development of CA's greenhouse gas legislation; data used to predict formation of ozone and secondary particles; improved models for prediction of greenhouse gas emissions from agricultural soils; reducing dust emissions using native plants, impacts on native and invasive species and developing BMPs for feedlots.

Land Use:

Developing regional models to make more reliable estimates of impacts of land use changes and anthropogenic activities (e.g., greenhouse gas emissions, aerosol formation) on climate. Developing planned growth strategies to address population growth, loss of agricultural land, poor air and water quality, and urban encroachment on wildlands.

Sustainable Use:

Providing data to agencies on: impacts of agricultural and environmental contaminants on wildlife, waterfowl, and aquatic organisms; developing strategies for management and restoration of the Bay-Delta; and implementing CA's Marine Life Protection Act. Conducting projects to examine the effects of invasive species and environmental stresses (natural and anthropogenic) on biodiversity; developing a rangeland health indicators systems to allow landowners to assess ecological and economic health of their lands.

Water Supply and Allocation:

Developed economic models allowing policy makers to calculate agricultural costs vs. environmental benefits of agricultural/urban water trades and land fallowing schemes in Salton Sea region; developing user-friendly model for growers to assess impacts of irrigation with reclaimed wastewater.

Wildland Fire:

Developed interactive website to assist residents to prepare for wildfire and deal with the aftermath. Conducting projects on: forest management practices to reduce wildfire risk and enhance long-term forest productivity, elevated soil nitrogen effects on fuel load that supports increased fire frequency, impact of prescribed burns and wildfires on the erosion potential of soils.

The 2006 nationwide outbreak caused by consumption of California grown spinach contaminated with E. coli O157:H7 has led to a number of actions to try to prevent a recurrence of food borne outbreaks. The link between water quality and food safety is receiving increased attention. There is an increased awareness of the proximity of animal operations to water that is used as a source of irrigation. Proposals to use treated municipal wastewater to irrigate food crops and land apply biosolids as a fertilizer are more carefully scrutinized, as there is the potential for these materials to contain disease causing microorganisms. An activity directly related to this issue was the organization of a session entitled "Coordinated Management of Water Quality Protection and Food Safety Practices in Cool Season Vegetable Production" that was presented at the 2008 USDA CSREES National Water Conference by a team of UC academics and external stakeholders.

A team of ANR academics that has been working in the area of water quality on the Farm Water Quality Planning Project was named as a recipient of the Western Extension Directors' Award of Excellence for 2008. Project leader Mary Bianchi, horticulture advisor for San Luis Obispo County and northern Santa Barbara County, along with Advisors from the Central Coast counties and campus based CE academics have collaborated with the USDA Natural Resource Conservation Service to provide water quality education to growers. For 7 years, the project collaborators have been offering Farm Water Quality Courses and associated tailgates and workshops to producers of irrigated agricultural crops in Santa Barbara, San Luis Obispo, Monterey, Santa Cruz, San Benito, Santa Clara, and San Mateo Counties. Orchards, vineyards, strawberries, vegetables, floriculture and nurseries have been the focus.

The California Dairy Quality Assurance Program (CDQAP) received California's highest and most prestigious environmental honor, the Governor's 2007 Environmental and Economic Leadership Award for "Environmental and Economic Partnerships," having demonstrated exceptional leadership in building public private collaborations to conserve California's resources and protect and enhance the environment. The CDQAP comprises 17 regulatory agencies, dairy organizations, environmental advocacy groups and UC. The partnership offers classroom and on farm assistance in meeting regional, state and federal environmental regulations. With new air and water regulations being promulgated or modified, the CDQAP has responded by offering a variety of courses, some statewide in scope and some specific to particular regions. Since the program's formation in 1997 some 2,400 producers or dairy advisers have attended one or more CDQAP classes for a total of more than 8,400 classroom contacts, according to Michael Payne, CDQAP director.

The UCCE Groundwater Hydrology Program received the 2007 Kevin J. Neese Award from the Groundwater Research Association. This award recognizes significant accomplishment that fosters the understanding, development, protection and management of groundwater. The program, led by UCCE specialist Thomas Harter, was chosen for its efforts to engage scientists, regulators, farm advisors, dairy industry representatives and dairy farmers to better understand the effects of dairy operations on water quality.

Total Actual Amount of professional FTEs/SYs for this State

| Year: 2008 | Extension | Research |
|-------------------|------------------|-----------------|
| | 1862 | 1862 |
| Plan | 278.1 | 360.6 |
| Actual | 286.3 | 340.8 |

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 was peer reviewed at the department level in the colleges and School of Veterinary Medicine at Berkeley, Davis, and Riverside. A peer review committee is appointed by the department chair. The committee evaluated the relevance, quality and scientific value of the proposed research. Upon completion of the peer review, the project was reviewed at the dean's office for USDA compliance and forwarded to the Vice President's office for final review and submission.

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.

Workgroups are the focal point and primary mechanism for accomplishing ANR's high priority research and extension goals. They provided grass-roots leadership for program development and evaluation at the statewide level. Structured to bring together CE and AES personnel with non-ANR partners to work on emerging and continuing issues, they looked at the Division's program priorities and determine the programs that will best address these needs. The workgroups also evaluate and report the program results of their efforts.

At the statewide level, the UC ANR Program Council is charged with coordinating statewide planning and program policies and providing statewide leadership for coordination of resource allocation. Chaired by the Asst Vice President Programs, 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, 3 CE Regional Directors, and 4 Program Leaders. The Associate Vice President and Assistant Vice President-Administrative Services serve as ex officio members.

The Program Council reviewed all ANR budget proposals, program area budget proposals, and position proposals from a statewide perspective and develop recommendations for a comprehensive ANR program budget. These recommendations were then considered by the Associate Vice President and Vice President for final decisions on allocations.

The Program Council is also charged with providing leadership for 5 year program reviews of statewide programs. Each of the Division's 20 statewide programs undergoes a program review initiated by the appropriate Program Leader every five years. A review panel of ANR members and external stakeholder representatives is appointed and conducts the review. The review results are presented and discussed by Program Council members who make recommendations to the Associate Vice President for possible actions. During FY 2008, the Sustainable Agriculture Research and Education Program, the Sea Grant Extension Program, the Gene Resources Conservation Program, the Agricultural Issues Center and the Expanded Food and Nutrition Education Program were reviewed by panels composed of ANR members, academics from other institutions and appropriate agency representatives. The review reports were presented at a Program Council meeting and the Program Council made recommendations to the Associate Vice President and Vice President on potential actions.

Academic Reviews

Two reviews were conducted in conjunction with the ANR strategic planning initiative. The UC Provost's review of ANR was undertaken in consultation with the University of California Academic Senate to arrive at a contemporary and pragmatic vision of ANR structure and mission, and how it might best serve the agricultural, environmental and natural resource interests of the state. A review team was appointed in late summer of 2008 and the site visit for the review occurred in February 2009.

The USDA Cooperative State Research Extension and Education Service review of Cooperative Extension was undertaken in the context of metrics for measuring excellence regarding response to critical issues, collaboration, engagement and partnership with clientele, and impact to the state. The committee was appointed in early fall 2008 and the review site visit was in January 2009.

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 University of California, Division of Agriculture and Natural Resources (UC ANR) continued to use a variety of mechanisms to seek stakeholder input on the development of Division program priorities and use of its research, extension and education funds. CE advisors delivering programs in 57 California counties receive input on local needs from their local clientele on a daily basis. All of the input received from stakeholders is used by ANR members in program planning and implementation at the local, regional, and statewide level.

In addition, the Division program workgroups and coordinating conferences are primary mechanisms for accomplishing ANR's high priority research and extension goals through grassroots leadership. They brought together AES and CE personnel and non ANR partners to work on emerging and continuing priority issues in Division program areas. There were 74 Divisionwide workgroups and 11 Coordinating Conferences with a total membership of over 2,200 individuals. Non ANR participants were identified by the scientists, advisors and specialists working in the specific program area and invited to participate in workgroup activities, including needs assessment and issue identification and evaluation and reporting of program results.

ANR Strategic Planning Initiative

In the summer of 2008, the Division began work on a strategic planning initiative to anticipate the research and extension priorities of California in 20 years and analyze ANR's current capacity to address them and to focus on the future demand for services. Five teams were recruited and charged to identify general themes and issues anticipated for California in the year 2025 and ANR's capacity to address future trends and issues. The Vice President charged five working groups with answering this question: How do we position ANR to respond to the needs of the state in keeping California competitive globally in providing safe, nutritious and healthy food and conserving natural and human resources? The five working groups included both internal and external stakeholders. The groups consulted with their colleagues and contacted external stakeholders to solicit their input through interviews, surveys and meetings. As the draft strategic vision statement is finalized in FY 2009, additional consultation and feedback will be sought from a wide variety of external stakeholders through meetings, presentations, town halls, and survey instruments.

Formal Advisory Groups

The President of the University chairs the President's Advisory Commission on Agriculture and Natural Resources to identify the education needs of California's agricultural, natural and human resources interests and advise him 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 met twice last year to provide input. The Vice President Agriculture and Natural Resources participated as a member of this Commission and brought 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 meet at least annually to provide feedback on their research, extension, and teaching programs. Members of these councils represent the spectrum of clientele who use the Division's programs and who have expressed interest in providing input to the college/school planning efforts.

Several of the Statewide Special Projects and Programs have external Advisory Councils that meet at least annually to review progress and offer recommendations for future program direction.

Commodity Organizations/Marketing Order Boards

Members of these organizations provide 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 on an annual basis to form the California Commodity Commission. This Commission met with the Vice President and offers specific recommendations on program planning and funding issues

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

External stakeholders are identified through a variety of mechanisms including the activities mentioned in Section 1. At the local county level, all Cooperative Extension advisors and county directors receive feedback on external stakeholders and groups as they conduct their programs. In the ANR workgroups and coordinating conferences, non ANR participants were identified by the scientists, advisors and specialists working in the specific program area and invited to participate in workgroup activities, including needs assessment and issue identification and evaluation and reporting of program results.

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

The groups described above gave their input on ANR programs and future program needs at the various meetings with ANR members. Regular 5-year program reviews are conducted of the ANR statewide programs.

During the past year, review committees included external stakeholders or gathered feedback from external stakeholders in surveys or interviews. In addition, as described above, the Division solicited input from external stakeholders through surveys, personal interviews and meetings as part of the strategic planning process that started in 2008.

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

At the individual level, the input received from stakeholders in local county and regional programs by CE advisors was used to aid in further program planning and implementation of programs at the local, regional, and statewide level. ANR workgroups and coordinating conferences identified and/or gave feedback on priority academic positions to be filled and this information was communicated to ANR administration through the four statewide Program Leaders and the ANR annual budget process. Feedback from external stakeholders compiled during the 5 year program reviews of statewide programs was considered and included in the review committees' reports to ANR administration.

Feedback from external stakeholders on trends and priorities for California in 2025 was considered during the strategic planning process started in 2008, resulting in the draft ANR Strategic Vision 2025 in February 2009.

IV. Expenditure Summary

| 1. Total Actual Formula dollars allocated (prepopulated from C-REEMS) | |
|--|-----------------|
| Extension | Research |
| Smith-Lever 3b & 3c | Hatch |
| 6,847,618 | 5,471,244 |

| 2. Total Actual Dollars Planned Programs Inputs | | |
|--|--------------------------------|-----------------|
| | Extension | Research |
| | Smith-Lever 3b & 3c | Hatch |
| Actual Formula | 6,306,557 | 2,516,340 |
| Actual Matching | 6,306,557 | 2,516,340 |
| Actual All other | 71,467,887 | 192,259,308 |
| Total Actual expanded | 84,081,001 | 197,291,988 |

| 3. Amount of above actual formula dollars expended which comes from carryover funds from previous years | | |
|--|------------------|-----------------|
| | Extension | Research |
| Carryover | 2,938,516 | 0 |

V. Planned Program

Program Names:

- A. California Families, Youth and Community Development (HR)
- B. California Pest Management (Pest)
- C. Sustainability and Viability of California Agriculture (Ag)
- D. Sustaining California's Natural Resources (NR)

A) California Families, Youth and Community Development (HR)

1) **HR Planned Program Knowledge Areas**

Program knowledge areas and percentages

| KA Code | Knowledge Area | %1862 Extension | %1862 Research |
|----------------|---|------------------------|-----------------------|
| 305 | Animal Physiological Processes | 1% | 8% |
| 311 | Animal Diseases | 2% | 3% |
| 501 | New and improved food processing technologies | 1% | 5% |
| 502 | New and improved food products | 0% | 3% |
| 608 | Community resource planning and development | 2% | 4% |
| 701 | Nutrient composition of food | 0% | 3% |
| 702 | Requirements and function of nutrients and other food | 0% | 32% |
| 703 | Nutrition education and behavior | 23% | 20% |
| 704 | Nutrition and hunger in the population | 2% | 0% |
| 711 | Ensure food products free of harmful chemicals, including residues from agricultural and other sources | 2% | 1% |
| 712 | Protect food from contamination by pathogenic microorganisms, parasites, and naturally occurring toxins | 5% | 2% |
| 723 | Hazards to human health and safety | 1% | 1% |
| 724 | Healthy lifestyle | 5% | 2% |
| 801 | Individual and family resource management | 4% | 0% |
| 802 | Human development and family well-being | 6% | 6% |
| 803 | Sociological and tech change affecting individuals, families, and communities | 1% | 4% |
| 805 | Community institutions, health, and social science | 2% | 3% |
| 806 | Youth development | 40% | 1% |
| 901 | Program and project design and statistics | 1% | 1% |
| 903 | Communication, education, and information delivery | 2% | 1% |
| | Total | 100% | 100% |

2) **HR Planned Program Inputs**

Actual amount of professional FTE/SYs expended this program

| Year: | Extension | Research |
|---------------|------------------|-----------------|
| 2008 | | |
| | 1862 | 1862 |
| Plan | 51.1 | 45.1 |
| Actual | 52.8 | 45.3 |

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

| Extension | Research |
|---|-------------------------------------|
| Smith-Lever 3b & 3c 1,163,288 | Hatch 589,887 |
| 1862 matching 1,163,288 | 1862 matching 589,887 |
| 1862 all other 13,182,742 | 1862 all other 25,544,312 |

3) HR Planned Program Activity

Brief description of the activity

UC ANR's integrated research and extension activities conducted research projects, workshops, education 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

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:

- 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
- Private organizations
- Public agencies and private organizations concerned with food, nutrition, and health
- Patients with metabolic diseases
- Biomedical researchers
- Plant biologists
- Nutraceutical industry
- Pharmaceutical industry
- Agronomists
- Plant breeders
- Food scientists

4) HR CSREES Defined Standard Output Measures

| FY 2008 | Direct Contacts Adults | Direct Contacts Youth | Patents | Extension Peer Reviewed Publications | Research Peer Reviewed Publications | Total Publications |
|----------------|-------------------------------|------------------------------|----------------|---|--|---------------------------|
| Plan | 194,000 | 240,000 | 5 | 0 | 210 | |
| Report | 164,137 | 227,052 | 3 | 43 | 180 | 223 |

Patents Listed:

- Measurement of protein synthesis rates in humans and experimental systems by use of 2h2o or 3h20 incorporation into stable c-h bonds.
- Method for measuring rates of reverse cholesterol transport in vivo, as an index of anti-atherogenesis.
- Aquatag: a process for measuring multiple classes of molecular fluxes (molecular kinetics) concurrently, for pharmaceutical drug discovery.

5) **HR State Defined Outputs**

| FY 2008 | 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 | 1100 | 1300 | 130 | 300 | 60 | 150 | 80 | 360 |
| Report | 2303 | 247 | 195 | 21 | 23 | 122 | 17 | 30 |

6) **HR State Defined Outcomes**

a) Knowledge Outcomes

- 1,413 children and youth, participating in 4-H club, community, in-school and after-school education programs, increased their level of science, agricultural and environmental literacy.

Associated Knowledge Areas: 806 Youth Development

- 1,589 low-income children and youth, participating in nutrition education programs, gained knowledge of nutrition.

Associated Knowledge Areas: 703 Nutrition Education and Behavior

- 1,589 low-income adults, participating in the nutrition education programs, gained knowledge of nutrition.

Associated Knowledge Areas: 703 Nutrition Education and Behavior

- 2,224 youth and adults in the general population, participating in nutrition education programs, gained knowledge of nutrition.

Associated Knowledge Areas: 703 Nutrition Education and Behavior

- 816 youth, adults, and families, participating in healthy lifestyle education programs, gained knowledge of healthy lifestyle practices.

Associated Knowledge Areas: 724 Healthy Lifestyle

- 443 trained extenders, 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

- 859 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

- 30 parents, participating in parent education programs, gained knowledge of parenting techniques to promote child development and learning.

Associated Knowledge Areas: 802 Human Development and Family Well-Being

- 516 teens, participating in financial management education programs, gained knowledge on wisely using banking and credit services.

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

- 298 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

- 336 adults and families with children, participating in childhood obesity prevention education 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

- 147 in-home care givers and child care providers, participating in childhood obesity prevention programs, intended to use the recommended nutrition education and life skills activities with their clientele.

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

c) Skills Changes

- 220 youth participating in 4-H club, community and after-school education programs acquired leadership or civic skills.

Associated Knowledge Areas: 806 Youth Development

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

Associated Knowledge Areas: 806 Youth Development, 712 Protect Food from Contamination by Pathogenic Microorganisms, parasites, and Naturally Occurring Toxins, 801 Individual and Family Resource Management, 703 Nutrition Education and Behavior

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

Associated Knowledge Areas: 806 Youth Development

d) Behavior Changes

- 4,820 low-income adults and families, participating in nutrition education programs, adopted healthier dietary practices.

Associated Knowledge Areas: 703 Nutrition Education and Behavior

- 2,502 youth, adults, 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

- 302 trained extenders, 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

- 3,115 low-moderate 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

- 3,612 youth and adults, participating in resource management education programs, adopted financial management techniques.

Associated Knowledge Areas: 801 Individual and Family Resource Management

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

Associated Knowledge Areas: 703 Nutrition Education and Behavior, 724 Healthy Lifestyle

- 300 youth, participating in 4-H clubs, assumed leadership roles in organizations or participate in community affairs.

Associated Knowledge Areas: 806 Youth Development

e) Condition Changes

- 1 farmers' market was established to increase access to fresh fruits and vegetables for low-income residents and families in Tulare County.

Associated Knowledge Areas: 704 Nutrition and Hunger in the Population

- 60 schools had teachers and youth leaders, participating in nutrition education programs, who contributed to changing their schools' culture and environment to be healthier.

Associated Knowledge Areas: 703 Nutrition Education and Behavior

- Low-to-moderate income individuals and families in San Diego County increased their financial literacy and benefited from removed financial barriers.

Additional qualitative outcome description:

Issue (Who cares and Why)

There is broad national and local concern about the combined effects of high consumer debt and very low or negative household savings rates, which leave many low-to-moderate income households financially vulnerable, and unprepared for the future, particularly for retirement. This problem is acute in San Diego County which has one of the highest costs-of-living in the country. In 2006, the mayor, a city councilman, and a county supervisor introduced a goal for San Diego to be the most financially literate city/county in the U.S.

What has been done

UC Cooperative Extension provided leadership and educational presentations for San Diego Saves Week 2008. They conducted workshops to increase financial literacy. They collaborated with credit unions and banks to create financial incentive for clientele to save.

Results

UC Cooperative Extension contributed to the creation of new savings products for the low-to-moderate income market, with very low opening and minimum balance requirements and no fees for a year. For example, 782 people opened new savings certificates with a guaranteed 10% APY (interest rate). Account required minimum initial deposits of \$100, and commitment to add at least \$100 per month for the next 12 months with no withdrawals during the 12 month period. Collectively the new account holders pledged additional savings of \$1.5 million over the next 12 months. A collaborator, Pacific Marine Credit Union, created the "Military Saver Certificate," a new savings product offered only to military personnel and dependents. By offering low-cost alternatives, these products removed institutional barriers to positive financial behaviors (saving) among first-time savers, low-to-moderate income households (with small amounts to save), and the unbanked.

Associated Knowledge Areas: 801 Individual and Family resource Management, 805 Community Institutions, Health, and Social Services

7) **HR Planned Program External Factors**

External factors which affected outcomes

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

Brief explanation

As the economic situation worsened in 2008, demand has increased for certain kinds of extension activities and programs, including money management skills, gardening, food preservation, and food budgeting. UC ANR is also responding by extending knowledge related to food assistance programs and strengthening community food security. Roll out of the Science, Engineering and Technology Initiative stimulated an increase in activities that promote science and environmental literacy in youth. Re structuring of the FSNEP program has increased administrative burden on county advisors, possibly limiting their engagement in some other non FSNEP, county level activities over the past year.

8) **HR Planned Program Evaluation Studies and Data Collection**

Evaluation studies planned

- After only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Case study
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention.

B) California Pest Management (Pest)1) **Pest Program Knowledge Areas****Program knowledge areas and percentages**

| KA Code | Knowledge Area | %1862 Extension | %1862 Research |
|----------------|---|------------------------|-----------------------|
| 102 | Soil, plant, water, nutrient relationships | 1% | 1% |
| 123 | Management and sustainability of forest resources | 1% | 2% |
| 133 | Pollution prevention and mitigation | 0% | 1% |
| 135 | Aquatic and terrestrial wildlife | 0% | 2% |
| 136 | Conservation of biological diversity | 1% | 0% |
| 201 | Plant genome, genetics, and genetic mechanisms | 0% | 2% |
| 202 | Plant genetic resources | 0% | 1% |
| 206 | Basic plant biology | 0% | 2% |
| 211 | Insects, mites, and other arthropods affecting plants | 18% | 17% |
| 212 | Pathogens and nematodes affecting plants | 20% | 28% |
| 213 | Weeds affecting plants | 18% | 0% |
| 215 | Biological control of pests affecting plants | 4% | 11% |
| 216 | Integrated pest management systems | 33% | 13% |
| 305 | Animal physiological processes | 0% | 2% |
| 311 | Animal diseases | 1% | 1% |
| 312 | External parasites and pests of animals | 1% | 2% |
| 603 | Market economics | 0% | 2% |
| 721 | Insects and other pests affecting humans | 2% | 9% |
| 722 | Zoonotic diseases and parasites affecting humans | 0% | 2% |
| 723 | Hazards to human health and safety | 0% | 2% |
| | Total | 100% | 100% |

2) **Pest Planned Program Inputs****Actual amount of professional FTE/SYs expended this program**

| Year: | Extension | Research |
|---------------|------------------|-----------------|
| 2008 | | |
| | 1862 | 1862 |
| Plan | 63.5 | 77.2 |
| Actual | 67.4 | 65.7 |

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

| Extension | Research |
|---|-------------------------------------|
| Smith-Lever 3b & 3c 1,485,114 | Hatch 365,771 |
| 1862 matching 1,485,114 | 1862 matching 365,771 |
| 1862 all other 16,829,776 | 1862 all other 37,075,357 |

3) Pest Planned Program Activity

Brief description of the activity

UC ANR's integrated research and extension activities 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
- Rangeland owners/managers
- Landscaping professionals
- Owners/operators of allied agricultural industries
- General public
- Crop and pest consultants

California has the most diverse agricultural production and among the most diverse range of production units, ranging from large industrial agriculture to small specialized family operated urban agriculture. The nature of the diverse production and producers fundamentally influences the types and scales of management approaches that are appropriate. Similarly, there is a large urban audience as part of the general public that has similar needs for information. Research and delivery of information to this audience must take approaches that are different from those take to commodity based clientele. The challenges are to provide the appropriate information and training to the appropriate target audience. This presents a particular challenge when invasive species are found in the urban, wildlands, and agricultural environments and move across the interfaces among those environments. Pest populations may be controlled in one of those environments, but not in others. Similarly, specific control strategies may not be appropriate in all environments. The approaches for research and education must account for the needs and the capacities of the audiences.

4) Pest CSREES Defined Standard Output Measures

| FY 2008 | Direct Contacts Adults | Direct Contacts Youth | Patents | Extension Peer Reviewed Publications | Research Peer Reviewed Publications | Total Publications |
|----------------|-------------------------------|------------------------------|----------------|---|--|---------------------------|
| Plan | 53,000 | 0 | 3 | 0 | 220 | |
| Report | 68,791 | 0 | 0 | 129 | 280 | 409 |

5) **Pest State Defined Outputs**

| FY 2008 | 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 | 90 | 50 | 110 | 200 | 45 | 480 | 10 | 70 |
| Report | 65 | 24 | 41 | 14 | 14 | 257 | 9 | 4 |

6) **Pest State Defined Outcomes**

a) **Knowledge Changes**

- 1,076 farm, ranch, range, and landscaping owner/operators and managers and Pest Control Advisors and other allied industry professionals, participating in the pest management education programs, gained knowledge of Integrated Pest Management strategies and techniques.

Associated Knowledge Areas: 216 Integrated Pest Management Systems, 312 External parasites and Pests of Animals, 213 Weeds Affecting Plants, 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants, 311 Animal Diseases

- 281 farm owner/operators and managers and Pest Control Advisors and other allied industry professionals, participating in pest management education programs, gained knowledge on how to recognize and identify pests and diseases.

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

- 225 farm owner/operators and managers, 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: 213 Weeds Affecting Plants, 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants

- 803 boat owner/operators and allied industry professionals, participating in invasive species management programs, gained knowledge of prevention, detection and treatment practices for aquatic invasive species.

Associated Knowledge Areas: 216 Integrated Pest Management Systems, 133 Pollution Prevention and Mitigation, 135 Aquatic and Terrestrial Wildlife, 213 Weeds Affecting Plants, 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants

b) **Attitude Changes**

- 269 farm, ranch, and boat owner/operators and managers, Pest Control Advisors, and other allied industry professionals, participating in pest management 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, 212 Pathogens and Nematodes Affecting Plants, 216 Integrated Pest Management Systems, 213 Weeds Affecting Plants, 211 Insects, Mites, and Other Arthropods Affecting Plants, 312 External parasites and Pests of Animals, 133 Pollution Prevention and Mitigation

c) Skills Changes

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

Associated Knowledge Areas: 216 Integrated Pest management Systems, 215 Biological Control of Pests Affecting Plants, 213 Weeds Affecting Plants, 312 External Parasites and Pests of Animals, 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants

- 115 representatives of boat owner organizations, boating businesses, governmental agencies, and allied industry professionals, in other states and other countries, participating in invasive species programs, acquired boat inspection skills to identify invasive species to reduce risks of transporting invasive species on boat hulls.

Associated Knowledge Areas: 133 Pollution Prevention and Mitigation, 135 Aquatic and Terrestrial Wildlife

d) Behavior Changes

- 172 farm owner/operators and managers, Pest Control Advisors and other allied industry professionals, 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, 213 Weeds Affecting Plants, 212 Pathogens and Nematodes Affecting Plants

- 307 farm owner/operators and managers, Pest Control Advisors and other allied professionals, participating in pest management education programs, adopted recommended Integrated Pest Management practices.

Associated Knowledge Areas: 216 Integrated Pest Management Systems

e) Condition Changes

- Walnut growers adopted pheromone-based Integrated Pest Management strategies.

Additional qualitative outcome description:

Issue (Who cares and Why)

Pheromone based IPM systems are needed to help growers meet environmental regulations and maintain high quality crops. These strategies are integrated into the pest management plan, and require grower decision making systems to determine if they are working and when to supplement them with insecticides.

What has been done

Information on the benefits of and how to use pheromone based IPM in walnuts was extended.

Results

The 2008 growing season saw a big increase in the use of mating disruption in walnuts. In 2007 there were about 600 acres; in 2008 there were 5000 acres of growers using mating disruption. With the increased cost of spray application from the increase in diesel, we expect to see a greater increase in 2009. The use of mating disruption has shown a potential decrease by 75% of broad spectrum insecticides use.

Associated Knowledge Areas: 216 Integrated Pest Management Systems

- Growers adopted new IPM strategies that incorporate new miticides to control the pacific spider mite.

Additional qualitative outcome description:

Issue (Who cares and Why)

Pacific spider mite is one of the most important summer pests of grapes, stone fruits, and almonds in Kern County. Recently, many new miticides have become available that have the potential to allow for fairly major modifications to IPM programs. There is a need to understand the strengths and reliability of these products, in order to know how we can modify treatment thresholds, resistance management programs, etc., to better manage mites in a more economical and environmentally friendly manner.

What has been done

Several miticide trials (large and small scale) were conducted to learn how these new miticides perform under Kern County conditions. Information was extended on how to best incorporate the new products into as close to an optimal IPM plan as possible.

Results

Pest Control Advisors gained a better understanding of mite biology, and an understanding of the roles of new miticides in providing opportunities for improved IPM programs. The research developed in this project has affected spider mite management on over half of the almond acreage in Kern County (50,000 acres).

Associated Knowledge Areas: 211 Insects, Mites, and Other Arthropods Affecting Plants, 216 Integrated Pest Management Systems

- San Joaquin Valley growers have shifted to plant the recommended, resistant Pima cotton varieties.

Additional qualitative outcome description:

Issue (Who cares and Why)

Fusarium oxysporum f.sp.*Vasinfectedum* (FOV) is a widely spread soil-borne fungus that attacks cotton and other plants, causing general wilt. A new race of FOV, Race 4, has been identified in California. Race 4 is different because it can more broadly affect infect cotton plants. Generally, Pima cotton varieties are more susceptible than other varieties to FOV Race 4.

What has been done

A collaboration of researchers developed methods for early identification and best management practices. They evaluated hundreds of varieties and breeding lines for resistance to FOV Race 4. They also conducted field evaluations on the most promising varieties to further verify resistance. Lastly, they are categorizing the genes that convey resistance and are identifying the molecular markers for those genes.

Results

San Joaquin Valley growers have shifted to plant more high quality Pima cotton, which commands a premium price. The identification of resistant Pima varieties has enabled the continued success of the industry. Based upon the research findings, California cotton growers are able to continue growing resistant Pima cotton varieties in areas where FOV Race 4 is present. Planting resistant cotton varieties is one of the best management practices to reduce the spread of FOV. More than 95 percent of the 2007 Pima cotton crop - 832,000 bales - was purchased by overseas mills, contributing more than \$550 million to the state economy and improving the U.S. trade balance.

Associated Knowledge Areas: 212 Pathogens and Nematodes Affecting Plants, 603 Market Economics, 201 Plant Genome, Genetics, and Genetic Mechanisms, 202 Plant Genetic Resources

7) 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 (Avail. of grad students/others)

Brief Explanation

The past year was one of the warmest on record in many parts of California. In addition, many areas in the state suffered from moderate drought conditions. The combination of factors may have had significant detrimental impacts on plants and animals, making them more susceptible to pests. Reduced moisture availability may also have significant negative impacts on biological control efforts. The drought, combined with high winds and low relative humidities, facilitated large wildfires; the largest 10 fires averaged more than 32,000 acres in size, devastating forest, rangeland, and urban environments. Recovery of the plant communities will be hampered by invasive pests, particularly weed species that flourish in disturbed environments. In addition, water deliveries for irrigation in agriculture were curtailed and will be eliminated in some districts next year. The combinations of drought and increasing temperatures will create significant economic challenges, but will also provide important opportunities to understand how pest species and environmental conditions interact to affect community level processes. There continues to be an accelerated introduction of exotic pest species into the state (e.g., light brown apple moth and Asian citrus psyllid). The consequence of limited resources available to contain or eradicate the invasions results in decisions to abandon efforts directed against one introduction before the project has been completed to focus on the most recent discovery. The new pest species will continue to create challenges in urban, natural, and agricultural environments.

8) Planned Program Evaluation Studies and Data Collection

Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Case Study
- Comparisons between program participants (individuals, group, organizations) and non-participants

- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

C) Sustainability and Viability of California Agriculture (Ag)

1) **Ag Program Knowledge areas**

Program knowledge areas and percentages

| KA Code | Knowledge Area | %1862 Extension | %1862 Research |
|----------------|---|------------------------|-----------------------|
| 102 | Soil, plant, water, nutrient relationships | 14% | 3% |
| 111 | Conservation and efficient use of water | 2% | 2% |
| 201 | Plant genome, genetics, and genetic mechanisms | 2% | 18% |
| 202 | Plant genetic resources | 5% | 8% |
| 203 | Plant biological efficiency and abiotic stresses affecting plants | 3% | 6% |
| 204 | Plant product quality and utility (preharvest) | 7% | 4% |
| 205 | Plant management systems | 33% | 5% |
| 206 | Basic plant biology | 1% | 17% |
| 211 | Insects, mites, and other arthropods affecting plants | 1% | 4% |
| 212 | Pathogens and Nematodes Affecting Plants | 1% | 16% |
| 213 | Weeds affecting plants | 1% | 3% |
| 301 | Reproductive performance of animals | 1% | 2% |
| 302 | Nutrient utilization in animals | 3% | 1% |
| 307 | Animal management systems | 9% | 0% |
| 501 | New and improved food processing technologies | 0% | 3% |
| 503 | Quality maintenance in storing and marketing food products | 1% | 2% |
| 601 | Economics of agricultural production and farm management | 8% | 1% |
| 603 | Market economics | 2% | 2% |
| 604 | Marketing and distribution practices | 4% | 1% |
| 723 | Hazards to human health and safety | 2% | 2% |
| | Total | 100% | 100% |

2) **Ag Planned Program Inputs**

Actual amount of professional FTE/SYs expended this program

| Year: 2008 | Extension | Research |
|-------------------|------------------|-----------------|
| | 1862 | 1862 |
| Plan | 100.0 | 156.0 |
| Actual | 101.8 | 145.1 |

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

| Extension | Research |
|---|-------------------------------------|
| Smith-Lever 3b & 3c 2,241,328 | Hatch 925,223 |
| 1862 matching 2,241,328 | 1862 matching 925,223 |
| 1862 all other 25,399,433 | 1862 all other 81,845,600 |

3) Ag Planned Program Activity

Brief description of the activity

UC ANR's integrated research and extension activities 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 and rangeland owners/operators/managers
- Allied agricultural industries professionals
- Landscaping professionals
- Organic farmers
- Consumers
- Food suppliers
- Food processors
- Food retailers

4) Ag CSREES Defined Standard Output Measures

| FY 2008 | Direct Contacts Adults | Direct Contacts Youth | Patents | Extension Peer Reviewed Publications | Research Peer Reviewed Publications | Total Publications |
|----------------|-------------------------------|------------------------------|----------------|---|--|---------------------------|
| Plan | 107,000 | 9,100 | 17 | 0 | 630 | |
| 2008 | 140,055 | 0 | 7 | 89 | 579 | 668 |

Patents Listed:

- Calcineuric b like protein 1 as a stress tolerance protein
- Bogsl alk, a key gene for glucosinolate biosynthesis in cruciferous crops
- Equine epsilon immunoglobulin chain derived peptides for induction of anti ige antibodies
- Changing the fatty acid composition of animals by genetic engineering
- Randy male pistachio
- Real time, electronic spray deposition sensor
- Mango mandarin

5) **Ag State Defined Outputs**

| FY 2008 | 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 | 280 | 210 | 150 | 270 | 90 | 540 | 15 | 80 |
| Report | 181 | 137 | 94 | 43 | 35 | 446 | 2 | 4 |

6) **Ag State Defined Outcomes**a) **Knowledge Changes**

- 1,102 farm and ranch owner/operators and managers and allied industry professionals, participating in agriculture education programs, gained knowledge of aspects of comprehensive management systems for plant and animal production.

Associated Knowledge Areas: 307 Animal Management Systems, 204 Plant Product Quality and Utility (Preharvest), 205 Plant Management Systems, 203 Plant Biological Efficiency and Abiotic Stresses Affecting Plants

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

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

- 40 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: 203 Plant Biological Efficiency and Abiotic Stresses Affecting Plants, 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants, 213 Weeds Affecting Plants

- 428 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)

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

Associated Knowledge Areas: 604 Marketing and Distribution Practices

- 4,784 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.

Associated Knowledge Areas: 102 Soil, Plant, Water, Nutrient Relationships, 211 Insects, Mites, and Other Arthropods Affecting Plants, 213 Weeds Affecting Plants, 111 Conservation and Efficient Use of Water, 202 Plant Genetic Resources, 206 Basic Plant Biology, 205 Plant Management Systems

b) Attitude Changes

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

Associated Knowledge Areas: 307 Animal Management Systems, 213 Weeds Affecting Plants, 212 Pathogens and Nematodes Affecting Plants, 205 Plant Management Systems, 203 Plant Biological Efficiency and Abiotic Stresses Affecting Plants, 204 Plant Product Quality and Utility (Preharvest), 211 Insects, Mites, and Other Arthropods Affecting Plants, 212 Pathogens and Nematodes Affecting Plants

- 547 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) Skills Changes

- 32 farm and ranch owners/operators, participating in agriculture education programs, acquired skills in business management skills, specifically for agritourism.

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

- 1,107 farm owner/operator and managers, participating in agriculture education programs, irrigation and water and soil management skills.

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

d) Behavior Changes

- 125 farm and ranch 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: 205 Plant Management Systems, 307 Animal Management Systems, 203 Plant Biological Efficiency and Abiotic Stresses Affecting Plants, 204 Plant Product Quality and Utility (Preharvest)

- 2,516 farm, ranch, and nursery owner/operators, 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

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

Associated Knowledge Areas: 205 Plant Management Systems

- 2,255 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)

- 65 small farm and ranch owner/operator and managers, participating in agriculture education programs, utilized alternative marketing of their crops to local consumers, including farmers markets, schools, restaurants, community supported agriculture boxes.

Associated Knowledge Areas: 604 Marketing and Distribution Practices

- 342 farm and ranch owner/operators and managers, including those from under-served and under-represented populations, participating in agriculture education programs, adopted farm management practices to be in compliance with regulations.

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

e) Conditions Changes

- Adoption of pedestrian stone fruit orchard practices to save on labor costs.

Additional qualitative outcome description:

Issue (Who cares and Why)

Growers and producers of stone fruit face decreased returns, and in turn have been forced to cut costs. These economic pressures are forcing growers to reevaluate all farming practices. For production practices, labor costs dominate all others. Over the past few years much has been learned about the relationship between tree height, production potential, and labor cost savings. Both dwarfing and standard rootstocks have been studied, but never within a comparison as part of an overall system. Furthermore, while we have demonstrated that tree height can be significantly and successfully reduced, we still do not know if a true pedestrian orchard, i.e. one in which no ladders are at all necessary, is feasible. While these goals are important, it is also important to develop systems that are not so inherently expensive that growers cannot afford to plant them.

What has been done

Developed several orchard system/rootstock combinations in a side by side setting where they could be viewed and evaluated in a uniform setting, with the idea of testing the concept of a true pedestrian orchard. Extended knowledge to growers/producers as to whether a viable pedestrian orchard is possible under the high vigor conditions of the southern San Joaquin Valley.

Results

At least 1500 acres of orchards have been topped to reduce height and subsequent associated labor costs. Our research has been pivotal in this. Labor cost savings of 30-60% have been realized.

Associated Knowledge Areas: 102 Soil, Plant, Water, Nutrient Relationships, 601 Economics of Agricultural Production and Farm Management

- Study contributes to a policy change that will compensate rice growers for losses caused by dam operation.

Additional qualitative outcome description:

Issue (Who cares and Why)

Water temperature has increasingly become a matter of concern for California rice growers due to a need for public water agencies to improve habitat for fish. There have been few systematic efforts to measure at the field level the effect of low water temperature on rice yield. Neither have there been systematic efforts to measure the spatial distribution of water temperature in a check.

What has been done

Research was conducted to determine the spatial variability in water temperature in two California rice fields, to quantify water temperature (Tw) effects on yield, and to determine whether water temperature can be estimated from thermal infrared images. Overall, the study showed that the deleterious effects of cold water on rice productivity occur well beyond the visually impacted area immediately adjacent to the water intake. Spatial variability in water temperature is discernible using remotely sensed thermal infrared images, which were well correlated to ground based measurements.

Results

Due to the implementation of a GIS-based study, this project directly impacted 95% of the land area planted to rice in Butte County. Local irrigation districts signed a binding agreement with the Department of Water Resources (DWR) that states that the DWR will compensate rice farmers for the yearly yield losses associated low water temperatures resulting from the operation of the Oroville Dam.

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

- Innovative direct marketing strategies expand the market potential of limited resource growers.

Additional qualitative outcome description:

Issue (Who cares and Why)

In California's Central Valley, there are many Southeast Asian refugee farmers (Mien and Hmong) growing unique varieties of Southeast Asian vegetables and strawberries. They continue to struggle in achieving viable agricultural livelihoods. Their key challenges are: language barriers; high cost of transportation; competition with organic produce (for niche and boutique markets); centralized purchasing of many wholesalers, chain grocery stores and restaurants; and sophisticated food safety documentation and labeling requirements by larger customers.

What has been done

Researchers interviewed growers and farmers' market managers throughout Sacramento County to learn the barriers and opportunities of marketing at local farmers' markets. Other direct market opportunities were investigated, such as local schools, hospitals, restaurants, wholesalers, and the Grower's Collaborative. Research findings and logistical support were provided to over 100 Southeast Asian growers through workshops. An online map that locates all certified farmers' markets and urban farm stands in Sacramento County was created.

Results

As a result of this project, two growers began selling at a certified farmers' market and WIC farm stand, two growers began selling to a flea market, and two growers were linked with a grocery store. The researchers also helped the Sacramento Farm Bureau locate strawberry growers on a Sacramento County map that was distributed at the county fair.

Associated Knowledge Areas: 604 Marketing and Distribution Practices

- Increased orchard production on marginal soils.

Additional qualitative outcome description:

Issue (Who cares and Why)

The soils of California's western Colusa County present major challenges to profitable tree crop production. The soils are considered marginal due to limitations in one or more character i.e. depth, texture, stratification, slope, drainage, salt content or ph. Urban expansion has accelerated the displacement of orchards in the Central Valley corridor, while wildlife conservation projects are displacing orchards along the river system.

What has been done

A collaborative research program developed management systems, based on drip irrigation/fertigation, high density spacing, and minimum pruning, with the goal of increasing the profitability of almond and walnut production on vast new areas in the west side of the Sacramento Valley and east side of the San Joaquin Valley. Counties most benefiting include, Colusa, Glenn, Sutter, Tehama and Yolo, but also Stanislaus, San Joaquin and Merced.

Results

Soils previously unplanted to orchards are now increasingly developed for nut crops. Approximately 3000 new acres were added, which will produce 6,000,000 additional pounds of nuts, valued to contribute \$10,000,000 to the local economy.

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

- Specialty crop market development for small farmers, especially those along the coast.

Additional qualitative outcome description:

Issue (Who cares and Why)

There is a need for specialty crop development for small farmers, especially for those along the coast. Coastal agriculture is a high cost environment that requires high returns. Coastal blueberries grow at a period when they can not be grown anywhere else in the US. Fruit that is shipped in from the Southern hemisphere is of poor quality. There is a need to know what varieties do best along the coast, how to grow them, what are the economics are, and how to market the crop.

What has been done

A number of different research and education strategies have been implemented in several counties. Research has been done to determine best production practices for blueberries, to minimize grower risks in conducting large-scale on-farm experiments. In addition, cost and return studies have been done and extended to small scale growers.

Results

Knowledge of production practices and economics has resulted in expansion of blueberry production in the Coastal region of California and in Tulare county. Statewide 5000 acres have been planted with blueberries. Small farmers have been producing blueberries profitably.

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

- A county-based meat buying club was developed, strengthening the economic viability of local livestock production, as well as reducing the club members' carbon footprint.

Additional qualitative outcome description:

Issue (Who cares and Why)

New food trends are emerging: consumers want to know food sources, its safety, health attributes, and for animal products, that the livestock is raised humanely. Consumers are also conscious of reducing their carbon footprints. By purchasing local food, they can reduce transportation costs while supporting local agriculture.

What has been done

Working in collaboration with other local agencies and the U.S. Department of Agriculture, UC Cooperative Extension started a Sonoma county-based meat buying club to enhance local market opportunities for the county's livestock producers and income streams that can help keep ranching operations viable. The club gives county residents access to meat raised on the county's family farms, which follow environmental and humane practices, at an affordable price.

Results

The Sonoma County Meat Buying Club supplies local beef, lamb, pork, duck and goat to 120 members, who purchase 7, 15 or 25 pounds on a monthly basis. Each month the club has been purchasing 700 pounds of beef, 300 pounds of pork and 150 pounds of lamb from local family farmers. Members are directly strengthening the economic viability of livestock production in Sonoma County. They have become educated on the difference between grass-fed beef and corn-finished beef in terms of texture, cooking practices, and farming practices. In addition, the club members are shrinking their carbon footprint by purchasing locally raised meat.

Associated Knowledge Areas: 604 Marketing and Distribution Practices

7) Ag Planned Program External Factors

External factors which affected outcomes

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

8) Ag Planned Program Evaluation Studies and Data Collection

Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Case Study
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

D) Sustaining California's Natural Resources (NR)

1) NR Program Knowledge Areas

Program knowledge areas and percentages

| KA Code | Knowledge Area | %1862 Extension | %1862 Research |
|---------|---|-----------------|----------------|
| 101 | Appraisal of soil resources | 1% | 11% |
| 102 | Soil, plant, water, nutrient relationships | 4% | 15% |
| 103 | Management of saline and sodic soils and salinity | 2% | 1% |
| 111 | Conservation and efficient use of water | 14% | 1% |
| 112 | Watershed protection and management | 17% | 5% |
| 121 | Management of range resources | 8% | 2% |
| 122 | Management and control of forest and range fires | 5% | 0% |
| 123 | Management and sustainability of forest resources | 6% | 1% |
| 131 | Alternative uses of land | 2% | 1% |
| 132 | Weather and climate | 2% | 7% |
| 133 | Pollution prevention and mitigation | 15% | 10% |
| 135 | Aquatic and terrestrial wildlife | 14% | 12% |
| 136 | Conservation of biological diversity | 4% | 1% |
| 141 | Air resource protection and management | 3% | 1% |
| 206 | Basic plant biology | 0% | 6% |
| 212 | Pathogens and nematodes affecting plants | 0% | 6% |
| 305 | Animal physiological processes | 0% | 5% |
| 311 | Animal diseases | 0% | 3% |
| 604 | Marketing and distribution practices | 0% | 4% |
| 605 | Natural resource and environmental economics | 3% | 8% |
| | Total | 100% | 100% |

2) NR Planned Program Inputs

Actual amount of professional FTE/SYs expended this program

| Year: | Extension | Research |
|--------|-----------|----------|
| 2008 | | |
| | 1862 | 1862 |
| Plan | 63.5 | 82.3 |
| Actual | 64.3 | 64.7 |

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

| Extension | Research |
|---|-------------------------------------|
| Smith-Lever 3b & 3c 1,416,827 | Hatch 635,459 |
| 1862 matching 1,416,827 | 1862 matching 635,459 |
| 1862 all other 16,055,936 | 1862 all other 47,794,039 |

3) NR Planned Program Activity

Brief description of the activity

UC ANR's integrated research and extension activities 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
- Marine industry owners/operators
- Governmental agencies
- Agricultural and fishing organizations
- Owners/managers of private and public rangeland, forest and wildlands
- Community organizations
- Resource managers

Because of the extreme diversity of California's natural resources, the clientele is necessarily diverse. In many cases, the issues at hand are somewhat contentious, with a wide range of viewpoints represented by the various interest groups. It is essential that information that is presented has a sound scientific basis, and that it is presented in a clear, understandable manner, at a level that is appropriate for the target audience. Recognition of the clientele's position on a specific topic is also important.

4) NR CSREES Defined Standard Output Measures

| FY 2008 | Direct Contacts Adults | Direct Contacts Youth | Patents | Extension Peer Reviewed Publications | Research Peer Reviewed Publications | Total Publications |
|----------------|-------------------------------|------------------------------|----------------|---|--|---------------------------|
| Plan | 69,000 | 0 | 3 | 0 | 430 | |
| 2008 | 77,547 | 0 | 0 | 35 | 344 | 379 |

5) NR State Defined Outputs

| FY 2008 | Classes/ Short Courses | Workshops | Demonstrations/ Field Days | Newsletters | Web Sites | Research projects | Videos, slide sets, other A/V or Digital Media | Manuals, other print materials |
|----------------|-------------------------------|------------------|-----------------------------------|--------------------|------------------|--------------------------|---|---------------------------------------|
| Plan | 110 | 130 | 120 | 100 | 25 | 250 | 35 | 80 |
| Report | 179 | 65 | 77 | 11 | 12 | 227 | 1 | 5 |

6) NR State Defined Outcomes

a) Knowledge Changes

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

Associated Knowledge Areas: 135 Aquatic and Terrestrial Wildlife

- 16 governmental agencies, community organizations and other stakeholders in land use policy issues, participating in sustainable use of natural resources education programs, increased their understanding of land use planning strategies, methodologies and data.

Associated Knowledge Areas: 131 Alternative Uses of Land

- 2,162 farm, ranch, rangeland and marine industry owner/operators and managers, allied industry professionals, 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

- 103 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: 123 Management and Sustainability of forest Resources, 135 Aquatic and Terrestrial Wildlife, 136 conservation of Biological Diversity, 121 Management of Range Resources

- 2,970 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

- 1,008 farm and dairy owners/operators and allied industry professionals, participating in soil quality education programs, gained an understanding of soil salinity conditions and soil-plant-water nutrient relationships, and the relevant management practices.

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

- 72 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

b) Attitude Changes

- 300 farm, ranch and rangeland, and marine industry owner/operators and managers, participating in water quality education programs, intended to use best management practices for preserving water quality.

Associated Knowledge Areas: 111 Conservation and efficient Use of Water, 112 Watershed Protection and Management, 133 Pollution Prevention and Mitigation

- 24 wildland/urban interface homeowners, landscape professionals, land managers, and fire agency personnel, participating in wildland fire education programs, intended to improve fire-safety practices to help protect property from wildfire damage.

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

- 50 fishery and marine resource managers and allied industry professionals, participating in fishery and fishing community sustainability education programs, gained appreciation for the importance of considering social, cultural and economic impacts of management actions for sustainable fisheries.

Associated Knowledge Areas: 135 Aquatic and Terrestrial Wildlife, 605 Natural Resource and Environmental Economics

c) Skills Changes

- 152 farm, nursery, and marine industry owner/operators and managers and allied industry professionals, participating in water management education programs, gained water management skills, for example, water quality skills to reduce run-off and water pollution or water quantity skills to maximize water use efficiency.

Associated Knowledge Areas: 111 Conservation and Efficient Use of Water

d) Behavior Changes

- 247 farm, ranch, rangeland, and landscape owner/operators and managers and allied industry professionals, participating in sustainable use of water education programs, adopted best management practices for water conservation and preserving water quality.

Associated Knowledge Areas: 111 Conservation and Efficient Use of Water, 112 Watershed Protection and Management, 133 Pollution Prevention and Mitigation

- 5 farm and ranch owner/operators and managers, allied industry professionals, and members of the public, participating in soil quality education programs, adopted practices to improve soil quality.

Associated Knowledge Areas: 102 Soil, Plant, Water, Nutrient Relationships, 103 Management of Saline and Sodic Soils and Salinity

- 20 farm, ranch, rangeland owner operators and managers and allied industry professionals, participating in sustainable use of natural resources education programs, adopted recommended grazing and rangeland management practices.

Associated Knowledge Areas: 121 Management of Range Resources

- 904 peach and almond growers, participating in air quality education programs, used fumigants other than methyl bromide and fewer inactive alternative materials, thereby reducing water and air contamination, as well as reducing ozone depletion.

Associated Knowledge Areas: 141 Air Resource Protection and Management

e) Condition Changes

- Expanded pistachio production as a profitable salt tolerant crop to help California 'find' new available water to meet increasing urban demand.

Additional qualitative outcome description:

Issue (Who cares and Why)

One stated goal of California's current water plan is to "find" new water available for increasing urban demand through conservation/efficiency improvements in the irrigated ag sector. One way to "find" more water is to grow salt tolerant crops with some of the "saline sink" water. Pistachios offer a more profitable alternative to cotton, which has long been known as a salt tolerant crop. Pistachios may be as salt tolerant as cotton, but there is only one small-scale nine year field study on the salt tolerance of pistachios on the Westside of the San Joaquin Valley. It is essential to verify that large-scale commercial plantings of pistachio can be successfully brought into profitable production using these marginal water supplies.

What has been done

Research began in 2004 on 240 acres of a total pistachio development, using 3 different levels of irrigation salinity. The project will be extended, depending on results after trees are 4 years old, until the trees come into bearing. Several educational presentations were conducted statewide, including at the Irrigation Association's 28th International Irrigation Show and the 2008 Annual Statewide Pistachio Day.

Results

Our work in this project area of pistachio salt tolerance has given growers confidence to develop new orchards in salt affected areas in 2008. There are now at least 3000 acres of new pistachio orchards, of the 150,000 acres total in California.

Associated Knowledge Areas: 111 Conservation and Efficient Use of Water, 103 Management of Saline and Sodic Soils and Salinity

- Growers adopted new irrigation technologies and practices that improve yields and water use efficiency.

Additional qualitative outcome description:

Issue (Who cares and Why)

Growers face decreased water supplies and increased costs. Kern County irrigated acreage is about 850,000 acres. About half this acreage is in permanent crops, which are better suited to various soil moisture/plant water status monitoring than field crops. This acreage increases by 10,000 to 20,000 acres/year.

What has been done

Research on field irrigation was conducted. A total of 136 fields covering 12,400 acres belonging to 31 different growers in 14 different crops, 11 soil textures and 9 different irrigation system types were set up by the end of 2007. Information on better soil and plant moisture monitoring methods was extended through a newsletter, demonstrations and workshops, as well as through on-going collaborations with USDA Natural Resources Conservation Service, Kern County Water Agency, and Kern Resource Conservation District.

Results

Growers gained a better understanding and increased their utilization of these technologies by about 25,000 acres. These adopted technologies and practices for monitoring soil moisture/crop water use improve yields and water use efficiency.

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

- The market for selling rice straw to dairies expanded, which benefited both dairies and the rice growers, as well as contributing to improved air quality.

Additional qualitative outcome description:

Issue (Who cares and Why)

California dairy operations are outgrowing available forage resources. Rice operations are interested in marketing more rice straw, as they can only dispose of 25% of the acreage by burning. The air quality regulations and time constraints require that the straw be provided in a manner that allows it to be directly added to the Total Mix Ration mixer/feeder.

What has been done

Information on how to produce rice straw for the dairy feeding market was extended through meetings and a newsletter.

Results

UC Cooperative Extension research and extension has contributed to rice growers now changing their practices of producing rice straw. In addition, the utilization of rice straw in dairy heifer rations has increased and the market is expanding.

Associated Knowledge Areas: 141 Air Resource Protection and Management, 133 Pollution Prevention and Mitigation

- Areas in the Santa Barbara Channel Halibut Trawl Grounds were left open to commercial halibut trawlers because research showed sustainable use of marine and coastal resources.

Additional qualitative outcome description:

Issue (Who cares and Why)

The integrity and sustainability of marine and coastal resources and the communities that depend on them are important issues in California, particularly in Ventura and Santa Barbara counties. While these resources are valued by many in these counties, there are conflicts among consumptive and non-consumptive users. In this case, commercial Halibut Trawlers faced economic losses due to potential closing of the Santa Barbara Channel Halibut Trawl Grounds.

What has been done

A collaborative research project was developed to evaluate the impact of trawling in the California halibut trawl grounds, in response to SB 1459 -- a bill that requires the trawl grounds to be closed unless data illustrates that trawling operations 1) Minimize bycatch 2) are not likely damaging seafloor habitat, 3) are not adversely affecting ecosystem health, and 4) are not impeding reasonable restoration of kelp, coral, or other biogenic habitats. UC Cooperative extension contributed to the research design and data collection, as well as, to the writing and presenting of the report to the Fish and Game Commission.

Results

Three of four trawl ground areas Santa Barbara Channel Halibut Trawl Grounds were left open to Commercial Halibut Trawlers. These areas would have been closed without the results of the project.

Associated Knowledge Areas: 605 Natural Resource and Environmental Economics, 135 Natural Resource and Environmental Economics

- San Diego Bay boat owners began to adopt nontoxic methods to control hull-borne aquatic invasive species, which will save them money while protecting water quality.

Additional qualitative outcome description:

Issue (Who cares and Why)

California has lost millions of dollars from aquatic invasive species (AIS). State water quality and pesticide regulatory agencies have found impaired water quality in boat basins statewide. Research shows that hull-borne AIS are more tolerant of copper than are native species, giving the introduced species a competitive edge. In addition, boat owners must reduce copper emissions from antifouling paints by 75% in the next 15 years. Thus, technically feasible and cost-effective methods are needed for managing hull-borne invasive species using nontoxic hull coatings.

What has been done

Economic analysis was conducted to evaluate the costs of strategies to control hull-borne invasive species on California boats while protecting water quality. This was based on a field demonstration, an economic study, and with continuing follow-up contacts with 4 boat owners. The analysis assumes that 1500 boat owners will switch to nontoxic hull coatings, that these hull coatings will last at least 8 years vs. 2.5 years for copper paints, and that the nontoxic coatings must be cleaned twice as often as copper paints. Information on switching to nontoxic hull coatings was extended through, articles, publications, radio interviews, educational presentation and workshops.

Results

The data were extrapolated to 2000 boat owners in Shelter Island Yacht Basin of San Diego Bay to indicate that individual boat owners were estimated to save \$1,840 over 8 years by avoiding 3 paint replacements, but with twice as frequent hull cleaning. The total estimated savings to 1500 boat owners over 8 years is \$2.76 million.

Associated Knowledge Areas: 133 Pollution Prevention and Mitigation, 135 Natural Resource and Environmental Economics

7) NR 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.)

Brief Explanation

FY08 continued the trend experienced in the previous several years as having below average rainfall amounts, resulting in several significant impacts across the state. There is increasing competition for our scarce water resources among the agricultural, urban, and environmental sectors. In conjunction with a number of recent decisions regarding allocations of water from the Colorado River and the Bay Delta, the drought exacerbated that competition. The inextricable link between water quantity and water quality has come into sharper focus as a result of water scarcity. There is an increased focus on finding appropriate, safe uses for reclaimed municipal wastewater for agricultural, urban, and environmental uses. Increased attention is being paid to protecting groundwater sources of potable water from surface contamination. In some areas of the state, agricultural lands are being fallowed as water previously used for irrigation is being sold for urban use. Water scarcity is also resulting in closer scrutiny regarding the water needs of new developments proposed in some urban areas. The below average rainfalls also contributed to the numerous severe wildfires across the state. Some of the impacts were immediate, including the destruction of thousands of acres of forests, wildlands, and urban

areas; air quality impacts on human health, wildlife, etc., as well as the significant economic impacts. Other impacts will take longer to occur. These include the potential for erosion during heavy rainfall events in the burn areas, which will cause increased sediment loads to surface water bodies, which can impact the aquatic ecosystem; recovery of plant and animal species in the burn areas, and economic recovery.

8) **NR Planned Program Evaluation Studies and Data Collection**

Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Case Study
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparison between locales where the program operates and sites without program intervention