

**University of California
Division of Agriculture and Natural Resources
Agricultural Experiment Station and Cooperative Extension**

**ANNUAL REPORT OF
ACCOMPLISHMENTS AND RESULTS**

FY 2000

Submitted to USDA-CSREES

March 2001

SECTION A. PLANNED PROGRAMS

The University of California Division of Agriculture and Natural Resources (UC-DANR) is the major land-grant arm of the University of California, part of a nationwide public university system "built on behalf of the people" (Lincoln's words) with Experiment Stations established to develop "useful and practical information...and to promote scientific investigations and experiments", and a Cooperative Extension program to "aid in diffusing...useful and practical information."

UC-DANR is 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 23 statewide special programs and projects, and supported by 10 Research and Extension Centers and 33 sites of the Natural Reserve System.

The AES has about 650 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 142 specialists and 267 advisors.

UC-DANR's mission, "... is to serve California through the creation, development and application of knowledge in agricultural, natural and human resources."

The following reports on California's planned programs for the five National Goals represent a sample of the research and extension efforts conducted by our faculty, advisors and specialists. We have recently implemented a systemwide web based program reporting system to be used by all AES faculty and CE specialists and advisors. Due to the timing of its deployment, we have not been able to capture complete information from all our academics for this fiscal year.

Thus the following descriptions do not present the complete picture of the research and extension programs for California. We anticipate that we will have more complete information in succeeding Annual Reports that will fully document the breadth of California's agricultural, human, and natural resources programs.

University of California
 FY 2000 Annual Report of Accomplishments and Results

NATIONAL GOAL 1

Through research and education, empower the agricultural system with knowledge that will improve competitiveness in domestic production, processing and marketing.

California produces more than 350 crop or animal commodities. University of California Division of Agriculture and Natural Resources (DANR) researchers and extension specialists and advisors continued to develop and extend research-based knowledge to address the agricultural issues facing California producers. Changes in demographics, the emerging markets, global income growth, new production areas, losses in agricultural production, loss of wildlife habitat, and regulatory issues cause a continuing requirement for increased and more efficient production and for development of new cultivars or breeds in plant and animal agriculture.

DANR academics have contributed to the development of plant cultivars and animal breeds for increased production efficiency and enhanced resistance to pests and diseases as the example of the DANR walnut program illustrates. They also explored opportunities for conservation tillage in California cropping systems, resulting in increased use of cover crops and minimum tillage in horticultural crops. This will aid in increasing soil organic matter, reducing production costs, and improving air quality in many production regions of California.

Research and extension professionals have mobilized and made major contributions in the pest and disease management area, particularly on invasive species threatening California's crops. A dramatic example of this is the reoccurrence of Pierce's Disease. This new infestation, spread by the glassy-winged sharpshooter, was discovered in southern California where it has killed more than 300 acres of vineyards. DANR academics with their counterparts in other institutions and agencies have worked together to coordinate research to limit the spread of both the sharpshooter and Pierce's Disease in the state.

Over 200 local extension programs were delivered in this area. In addition, 50 statewide collaborative workgroups composed of both AES and CE academics planned and conducted research and extension projects. California academics published over 600 peer reviewed articles and over 250 extension publications to address Goal 1 and, last year 22 patents were issued.

FY 1999-2000 Allocated Resources

Extension Federal Funds (Smith Lever 3 b&c)	Extension State Match	Research Federal Funds (Hatch)	Research State Match
\$3,153,052	\$21,761,763 [170.5 FTE]	\$2,822,815	\$55,492,848 (261.9 FTE)

UC-DANR's Agricultural Resources Programs Covering:

- ▶ **Agricultural Productivity and Efficiency**
- ▶ **Handling, Storage and Processing Agricultural Products**
- ▶ **Pest and Disease Management**

AGRICULTURAL PRODUCTIVITY AND EFFICIENCY

DANR focused its research and extension resources on increasing the economic and cultural efficiency, productivity, and product quality of animal and plant agriculture while using more ecologically sound practices. Programs were delivered by individuals and collaborative groups including 37 statewide workgroups composed of both AES and CE academics. To accomplish this:

- 131 Extension programs were delivered
- 204 Extension and outreach publications were published
- 305 Peer reviewed research papers were published
- 17 Patents were issued

Research and Extension Performance Goals:

- Enhanced management methods in agriculture by: developing management systems that integrate resistant cultivars and breeds; developing plant or animal germplasm with resistance to pests; developing monitoring systems and teams to detect and manage pest outbreaks; developing improved comprehensive management systems and methods for extending information on plant and animal health.
- Improved soil quality by developing improved agricultural systems based on long-term multidisciplinary studies of rotational or other management effects.

CASE STUDY: WALNUT PROGRAM

Key Theme: Agricultural Productivity

Background / Problem Statement

Walnuts are grown on about 250,000 acres throughout the Central Valley and in the surrounding foothills. The diverse climatic and soil conditions among these areas affect all aspects of walnut culture, and while some aspects of walnut culture are common to all regions, others are not. The successful development and transfer of information and technology applicable to all regions requires inclusion of many disciplines, coordination of projects, and cooperation among participants.

The purpose of the DANR Walnut program has been to foster the development of reliable and useful information and its application and extension to California walnut growers. To that end, our activities included: promoting communication and cooperation among CE Farm Advisors, Specialists, AES faculty, USDA, California State University scientists and industry; the identification and prioritization of problems and their solutions; and the development of extension and teaching programs and publications.

University of California
FY 2000 Annual Report of Accomplishments and Results

During the past decade, the DANR program in walnuts has:

- developed and evaluated a range of new cultivars, some of which are now in commercial evaluation.
- tested new cultural practices, particularly high-density plantings, for earlier production and increased productivity.
- developed integrated pest management programs to reduce losses from pests and diseases while reducing pesticide use in walnut production.

Activities

Over the years the DANR Walnut program has proven to be very successful in coordinating research and outreach activities directed towards increasing sustainability and profitability of walnut production. These included:

- an aggressive cultivar improvement program (supported by the walnut industry through an endowed program)
 - a study of the genetic diversity of walnut rootstocks to which horticulturists, plant pathologists, and nematologists contribute
 - a multi-faceted approach to codling moth control including introduction of parasitoids
 - a coordinated group of projects on walnut blight disease that include development of predictive and monitoring systems to improve control
 - research on replacements for methyl bromide for both orchard management and post harvest pest control.

A broad array of farm advisor field trials and site specific adaptive research projects have been supported annually through industry research grants, including:

- Production, Clonal Propagation and Nursery Production of Hybrid Walnut Rootstocks
- Walnut Orchard Management: Pilot Projects, Field Testing, Adaptive Research and Problem Solving
- Boron Deficiency and Toxicity in Walnuts
- Trichogramma Augmentation as a Component of the Management of Codling Moths in Walnuts
- Development of New Lures for Walnut Husk Fly Based on Host Plant Volatiles
- Importing Parasitoids for Area-wide Management of the Codling Moth in Walnuts
- Pheromone-based Monitoring and Mating Disruption of Naval Orangeworm
- Ecology of a Group of Generalist Predators, the Green Lacewings, and Their Contribution to Biological Control in Walnuts
- Epidemiological Approaches to the Control of Walnut Blight
- Management of Walnut Blackline
- Use of Polymerase Chain Reaction System(BIO-PER) for Detection of *Erwinia Rubrifaciens* (Deep Bark Canker) in Symptomless Tissues of Walnut Trees
- Crown Gall of Walnuts
- Strategies for Control of *Phytophthora* Root and Crown Rots of Walnuts
- Walnut Blight Control Investigation
- Alternatives and Improvements to Soil Fumigation with Methyl Bromide

University of California
FY 2000 Annual Report of Accomplishments and Results

- Generation of Walnuts Engineered with Rice Bacterial Blight Resistance
- Development of Vectors for Introduction of Novel Genes into Walnut Rootstocks
- Walnut Improvement Program (Breeding and selection of new cultivars)
- Paradox Rootstock Diversity Study
- Development of Alternatives to the Presently Utilized Fumigant, Propylene Oxide, to Reduce Microbe Counts on Walnut Nut Meats
- Equilibrium Moisture of Walnut Cultivars
- Reduction of Walnut Rancidity with Edible Oxygen-Barrier Coatings

The program also coordinated a Walnut Pest Management Alliance Program, a broad-based implementation project designed to develop, demonstrate, and encourage adoption of reduced-risk pest management in walnuts statewide. This multi-year project, under the direction of the UC-Integrated Pest Management Farm Advisors and involving pomology farm advisors, AES scientists, CAFF-BIOS, Pest Control Advisors, and growers is currently supported through funding in excess of \$100,000 per year from industry, the UC IPM Smith-Lever Project, and the Department of Pesticide Regulation.

Examples of extension activities that originated and were mediated through the walnut program are the walnut short course, videos on husk fly and crown gall management, and the walnut orchard management manual. Annual outreach activities included:

- Walnut Research Conference: 3 days during the 3rd or 4th week of January
- Walnut Tour: 2-3 days usually in conjunction with the almond tour, May/June
- Annual Northern San Joaquin Tri-County Walnut Grower's Institute -- Modesto (March)
- Annual county walnut meetings (February-March): San Benito, Sutter/Yuba, Butte, Tehama/Shasta, Colusa, Glenn, Yolo
- Pomology short course on walnut production (approximately 5 year intervals, last held November 1995)

Fifteen outreach publications have been produced including the Walnut Production Manual, 1997, Integrated Pest Management for Walnuts, 1993, and Walnut Harvesting and Handling in California. In addition, newsletters are published in most walnut producing counties, e.g.

Orchard Notes Newsletter (Sutter/Yuba) and In -A- Nutshell (Tulare County).

Twenty-four peer-reviewed publications included have been published by DANR faculty, CE specialists and advisors.

Impact

Walnuts are one of California's major horticultural crops with production on 220,000 acres valued (1999) at \$230 million. The UC Walnut program has developed the cultivars as well as much of the production, harvesting and pest management technology that is the basis for the industry's success.

Source of Federal Funds: Smith Lever 3b & c and Hatch.

Scope of Impact: Largely within California

CASE STUDY: CONSERVATION TILLAGE

Key Theme: Agricultural Productivity

Background / Problem Statement

The conservation tillage program is a collaborative effort of faculty and extension professionals to explore the opportunities for conservation tillage in California cropping systems. Despite a 300% increase in conservation tillage (CT) production in the Midwest during the past decade, less than 0.3% of crop land acreage in California is currently farmed using CT practices.

Pre plant tillage operations typically account for 18 - 24% of overall production costs in common annual cropping systems in California. On average, between 9 and 11 separate tillage-related operations, each involving heavy equipment, are conducted during the fall - spring period to prepare the soil for summer cropping. These operations represent not only considerable energy, equipment and labor costs, but reduce soil organic matter (SOM) and may be the source of considerable respirable dust. Because SOM is an important attribute of good soil quality and long-term productivity, interest is growing in developing alternative production systems that reduce costs and improve the soil resource through greater sequestration of carbon. Furthermore, no data currently exist on potential benefits of reduced tillage production systems in mitigating airborne respirable dusts that result from heavily tilled agricultural production systems.

Conservation tillage systems may serve to increase SOM levels, reduce production costs and improve air quality throughout many production regions of California. Very little work has been done, however, to evaluate CT systems in California.

The purposes of the DANR Conservation Tillage program are:

- 1) to develop knowledge and exchange information on CT production systems,
- 2) to coordinate related research and extension programs in conservation tillage
- 3) to respond to needs for information on reduced tillage production alternatives, and
- 4) to plan and conduct statewide and regional conferences, workshops and training demonstrations as well as produce publications and internet materials that summarize research findings from the program.

Activities

- During the last year, a series of farmer - DANR scientist focus group meetings were held to identify new and emerging areas of interest and information needs in relation to conservation tillage. From these meetings the goals of integrating year-round soil cover and reducing tillage surfaced as priority research and information development needs.

University of California
FY 2000 Annual Report of Accomplishments and Results

- With support from private industry and the Division, the Conservation tillage program acquired a range of state-of-the-art tillage equipment for demonstration and applied research purposes.
- “CT2000,” a conservation tillage outreach meeting including seven speakers from out of state and four California presenters was held at two sites and attracted 280 participants
- Ongoing research evaluated a range of possible cover crop species or mixtures and minimum tillage practices (rolling, mowing) at five study locations to evaluate cover crop biomass and nitrogen, and effects of the cover crops and tillage on crop yield.

Impact

Many California farmers have had an opportunity to discuss the possibilities of conservation tillage practices, and there is increasing actual use of cover crops and minimum tillage in horticultural crops.

Source of Federal Funds: Smith Lever 3b&c and Hatch.

Scope of Impact: State specific

HANDLING, STORAGE AND PROCESSING AGRICULTURAL PRODUCTS

DANR focused its research and extension resources on improving access to new markets and opportunities for agricultural products through post-harvest technologies that will enhance the value of these products. Programs were delivered by individuals and collaborative groups including 2 statewide workgroups composed of both AES and CE academics. To accomplish this:

- 23 Extension and outreach publications were published
- 85 Peer reviewed research papers were published
- 1 Patent was issued

Research and Extension Performance Goals:

- Develop new technologies for storage, shipping, and distribution, including sanitation and disinfestation methods, to ensure that California products can be marketed nationally and internationally.
- Develop new methods for measuring and improving product quality characteristics and shelf life.
- Develop technologies and practices to lengthen shelf-life of agricultural products and to improve storage and shipping characteristics.

CASE STUDY: UC DANR POSTHARVEST BIOLOGY AND TECHNOLOGY

Research and outreach program

The faculty, extension specialists and advisors involved in the DANR program in postharvest technology provided relevant information to California growers, shippers, marketers, carriers, distributors, retailers, processors, and consumers of fresh horticultural crops intended to:

- Improve the quality and value of horticultural crops available to the consumer.
- Reduce post-harvest losses and improve marketing efficiency.
- Focus on solving specific problems in handling fruits, vegetables and ornamentals.

Research Activities

The basic and applied research programs conducted by DANR academics addressed a wide range of factors affecting the quality and marketability of perishable products including studies on:

- Ripening biology
- The mode of action of ethylene and techniques to control its effects
- The mechanism of action of Controlled Atmosphere storage systems
- Molecular changes during flower and leaf senescence
- Heat treatments to prevent post harvest disorders
- Economics of the national and international market in fresh fruits and vegetables
- Biochemical and molecular bases for texture in fruits and vegetables
- Optimal techniques for handling 'lightly processed' commodities

University of California
FY 2000 Annual Report of Accomplishments and Results

- Microbial safety of fruits and vegetables
- Pre harvest factors affecting post harvest performance
- Leaf senescence

Outreach Activities

The outreach of the DANR postharvest program included the 'Postharvest Research and Information Center' which is a web-based source of post harvest information and served as an important outreach vehicle for the program. In addition, a number of outreach activities were scheduled, including:

- A two-week short course on post harvest technology of horticultural commodities was presented during late June. It included lectures, discussions, demonstrations, and a 5-day field trip to major production areas of California.
- Workshops of 1 to 3 days held in various locations throughout the state. Topics include management of fruit ripening, maintaining quality and safety of fresh cut products, and post harvest handling of fruits, nuts, vegetables, and ornamentals.
- Members presented research results and post harvest information at meetings of various industry organizations.
- Local meetings were in cooperation with farm advisors and home economists to disseminate information about post harvest handling procedures.

Extension Publications

DANR's 23 extension publications on post harvest biology and technology have an international reputation, particularly the regular extension publication, "Perishables Handling," which is published quarterly and reports research in progress, recent publications, and brief reviews of various aspects of post harvest technology of horticultural crops. The 300 page Syllabus for the annual short course, 'Post harvest Technology of Horticultural Crops' is being revised for the third time, and is considered the 'bible' for this subject matter throughout the world.

In addition, DANR faculty, CE specialists and advisors have published over 50 peer-reviewed publications.

Impact

A large proportion of the nation's fresh fruits and vegetables come from California farms. The post harvest program has been an essential component of the reduction in losses and improvement of quality of these products at the consumer level, through improved handling systems, reduced losses due to post harvest diseases, and measures to overcome the effects of ethylene.

Source of Federal Funds: Smith Lever 3b&c and Hatch.

Scope of Impact: The post harvest program has international impacts, both in terms of the impact of its research and outreach and in terms of the effects of post harvest technologies developed in California on losses of perishables throughout the world.

CASE STUDY: POST HARVEST TECHNOLOGIES FOR CUT FLOWERS

Research and Outreach Activities

Cut flowers are an important part of California's horticultural industry, and post harvest losses are high, due to their delicacy and perishability. The post harvest program for cut flowers is focused on reducing these losses by understanding factors causing those losses, and developing technologies to overcome them. In the past year, the program has:

- Demonstrated a highly linear relationship between storage temperature and vase life for cut flowers that are transported across the country.
- Determined that low but non-freezing temperatures are satisfactory for several cut flowers that had been suggested to be chilling sensitive.
- Demonstrated that proper temperature management is more important than hydration during storage of cut flowers.
- Developed a simple pre-cooling system adapted to new 'Procona' packages being adopted by the industry.
- Demonstrated the use of specially-formulated enzyme-based time-temperature indicators as tools for post harvest quality control of cut flowers.
- Demonstrated the efficacy of 1-methylcyclopropene as a tool for inhibiting the deleterious effects of ethylene in many cut flowers.
- Developed treatment protocols for the use of 1-MCP with cut flowers.

The results of the basic and applied research have been published in peer-reviewed and industry journals, and presented orally at University and Industry meetings. The results of this and other research have been summarized in the 'Flower and Plant Care Manual' for the Society of American Florists

Impact

1-MCP has been adopted by many producers and shippers in California and Florida as a convenient tool for overcoming the effects of ethylene. Shippers are increasingly aware of the importance of proper temperature management, and some major wholesalers have started to use the time-temperature indicators to ensure proper transportation temperatures for their products.

Source of Federal Funds: Smith Lever 3b&c and Hatch.

Scope of Impact: The research and outreach program is conducted collaboratively with researchers at the University of Florida, and the impact is national in scope.

PEST AND DISEASE MANAGEMENT

DANR focused its research and extension resources on promoting pest and disease management strategies that are safe, environmentally sound, and economically viable. Programs were delivered by individuals and collaborative groups including 6 statewide workgroups composed of both AES and CE academics. To accomplish this:

- 89 Extension programs were delivered
- 40 Extension and outreach publications were published
- 316 Peer reviewed research papers were published
- 4 Patents were issued

Research and Extension Performance Goals:

- Provide cost-effective approaches for prevention and management of pests and diseases of plant and animals by developing and implementing: new vaccines; new pest-resistant and tolerant genotypes; new pesticide and disease management tactics; new biological control agents; economical threshold levels of pests and diseases in various production systems; new plant and animal breeding/management tactics; and cultural effects on plant production systems.
- Develop and introduce cost-effective detection and monitoring systems to: detect the presence and abundance of pest and disease organisms; facilitate efficient management of pest and disease organisms in integrated management systems; determine economic-threshold levels of pests and diseases to provide more efficient timing for management practices.
- Develop and support pest and disease outbreak teams to anticipate and respond to pest and disease outbreaks by working with appropriate governmental and local agencies.
- Disseminate information by effective technology dealing with: recognition and identification of pests and diseases; economic thresholds for pests and diseases; and comprehensive and integrated management strategies for pests and diseases.

CASE STUDY: AVOCADO ARTHROPOD PEST MANAGEMENT

Key Theme: Invasive Species

Background / Problem Statement

Based on 1998 statistics, avocados are California's #18 agricultural commodity with a crop value of \$263 million (California Department of Food and Agriculture, Agricultural Statistics, http://www.cdfa.ca.gov/agfacts/1998_top_20_farm_products.html). Historically, avocado growers in California had relatively few problems with insects and mites and endemic biological control maintained pest species below economic thresholds. Few pesticides were registered or used for arthropod pest management on avocados in California. This picture changed

University of California
FY 2000 Annual Report of Accomplishments and Results

dramatically with the introduction of two exotic pests from Mexico – the perseia mite in 1990 and avocado thrips in 1996.

Persea mite, *Oligonychus perseae*, was first described in 1975 from specimens collected from avocado foliage that were intercepted from Mexico at an El Paso, Texas quarantine facility. At the time of discovery in Texas, this tetranychid was a species new to science. Persea mite is native to Mexico and damages avocados in arid regions, but it is not a major pest in the state of Michoacan where Hass avocado production is greatest. Persea mite has also been recorded from Costa Rica where it is a serious exotic pest.

Persea mite was first discovered attacking avocados in San Diego County in 1990, and was originally misidentified as *Oligonychus peruvianus*. By the summer of 1993, the pest had spread north to Ventura County. Santa Barbara had its first record in spring 1994, and in 1996 perseia mite had established in San Luis Obispo County. Contaminated fruit bins, harvesting equipment, and clothing probably assisted in the dispersal of perseia mite throughout California. High mite densities (100-500 per leaf) and subsequent feeding can cause partial or total defoliation of trees. Mite-induced defoliation opens the tree canopy, increasing the risk of sunburn to young fruit and exposed tree trunks. Premature fruit drop can occur.

Avocado thrips, *Scirtothrips perseae*, was also a pest new to science when it was discovered in California in July of 1996, and it spread rapidly from two initial sites of discovery near Port Hueneme in Ventura County and at the Irvine Ranch in Orange County. Avocado thrips larvae and adults can build to such high densities over the fall through spring period on young leaves on top-worked trees that leaves damaged from feeding can drop. The main source of economic loss attributable to avocado thrips, however, is scarring of immature fruit in spring by feeding thrips.

Economic losses attributable to avocado thrips have been calculated using pack-out records. Economic data for 22 anonymous growers were combined with costs of thrips control incurred by either using biological control agents, Veratran-D (sabadilla), or Agri-Mek (abamectin). An economic model was developed by an agricultural economist at UC Davis to estimate the effects to growers and consumers of rising production costs, retail prices, and decreases in quality. The model indicated an annual short-run loss to avocado growers of between \$7.6 and \$13.4 million in 1998 from the combined effects of losses in quality and increased production costs associated with avocado thrips management. Economic losses to avocado thrips continue to accrue annually, but the magnitude of decreased revenue will vary yearly depending on the severity of thrips infestations, costs of control (biological or chemical), percentage of crop damaged, severity of damage, and market value for harvested fruit.

Activities

Responding to the crises generated by perseia mite and avocado thrips, a team of California Experiment Station researchers and Cooperative Extension specialists/advisors teamed with key avocado Pest Control Advisors and representatives of the California Avocado Commission and formed a workgroup that prioritized, planned, and implemented research and extension efforts

University of California
FY 2000 Annual Report of Accomplishments and Results

needed to deal with these new pest species. Funding for research and extension efforts has been provided from a wide variety of sources including Hatch, Smith-Lever, UC's Statewide IPM Project, DANR Competitive Grant Funds, and the California Avocado Commission. What is striking about this example is how quickly industry and UC research and extension personnel mobilized to address these new problems and developed practical solutions for grower use. For example, avocado thrips was first discovered in July 1996, was taxonomically described in June 1997, its home range was rapidly delimited as being limited to Central America based on foreign exploration by two researchers, and selective pesticides were rapidly made available for grower use (sabadilla was made available in 1998 through an emergency special local needs permit, abamectin in 1999 and 2000 through a Section 18 emergency exemption, and spinosad was rapidly registered in 2000). A key to rapidly addressing this problem was the input of two outstanding thrips systematists at the USDA Beltsville Systematic Laboratory (rapid taxonomic description of avocado thrips and identification of specimens collected in Mexico, Costa Rica, Trinidad, and the Dominican Republic) and an Australian colleague of CSIRO (March 1997 tour of avocado thrips damaged field sites and based on examination of specimens, hypothesized that its native home was probably central America).

Number of new vaccines and biological control agents tested and released/status:

- Biological control agents tested / released – details:
- *Chrysoperla carnea* – commercially reared predaceous lacewing tested against avocado thrips in both laboratory and then field trials
- *Chrysoperla rufilabris* – commercially predaceous lacewing tested against avocado thrips in both laboratory and then field trials
- *Franklinothrips orizabensis* – endemic predaceous thrips collected from field populations, insectary rearing method developed, laboratory colony established, laboratory tests conducted, and field tests in progress
- *Galendromus helveolus* – commercially reared predaceous mite tested against perseas mite in both laboratory and then field trials
- *Galendromus annectans* – commercially reared predaceous mite tested against perseas mite in both laboratory and then field trials
- *Goetheana incerta* – eulophid thrips parasitoid imported from South Africa through UC Riverside's quarantine facility under USDA/CDFA Permit #32923, biology studied, rearing method developed, and preliminary host specificity studies conducted
- *Neoseiulus californicus* -- commercially reared biological control predaceous mite tested against perseas mite in both laboratory and then field trials

Impact

Prior to their introduction into California in 1990 and 1996, perseas mite and avocado thrips, respectively, were species new to science and thus, almost nothing was known about their biology, ecology, phenology, or economic impact. These subjects have now been thoroughly researched and information disseminated to growers and pest control advisors through meetings, publications, and web sites (see e.g., <http://www.biocontrol.ucr.edu/mite1.html> and <http://www.biocontrol.ucr.edu/avocadonthrips.html>, respectively). Management methods have

University of California
FY 2000 Annual Report of Accomplishments and Results

been developed for both species which integrate the use of insectary reared natural enemies with use of selective pesticides (materials relatively innocuous to natural enemies: oil or abamectin for perseas mite; abamectin, sabadilla, or spinosad for avocado thrips) when their use is justified based on economic thresholds evaluated using defined monitoring methods.

Over the period 1999-2000, UC research and extension personnel were extremely active informing avocado growers and pest control advisors regarding the basic biology, ecology, population dynamics and damage potential of perseas mite and avocado thrips (see Output Indicators listed below). Weather patterns the last three years have been quite different resulting in variable populations of these two pest species. Perseas mite levels appear to have declined in southern production regions (San Diego Co.) but have been more severe in the north (Riverside, Ventura, and San Luis Obispo Co.). Avocado thrips was extremely severe in 1998, less so in 1999, and even lighter in 2000. Thus, it is important that growers and pest control advisors monitor mite and thrips populations and use economic thresholds to make decisions regarding natural enemy releases or pesticide applications.

CASE STUDY: MANAGEMENT OF PIERCE'S DISEASE AND OTHER DISEASES CAUSED BY *XYLELLA FASTIDIOSA* AS VECTORED BY VARIOUS SHARPSHOOTERS INCLUDING THE GLASSY-WINGED SHARPSHOOTER

Key Theme: Invasive Species

Background

Pierce's disease was first recorded in Orange County of California in the 1880s when it killed more than 40,000 acres of young grapevines in less than five years. Known then as "California vine disease," Pierce's Disease put a quick end to the expansion of wine grape production in the southern part of the state. Over the next century, Pierce's Disease reappeared occasionally. Several cyclical outbreaks of Pierce's Disease occurred prior to the last decade, the most significant occurring in the 1940s, cost growers more than \$10 million. While its symptoms were known, the cause of Pierce's disease remained a mystery.

About 25 years ago, scientists at UC Davis linked Pierce's Disease to an unidentified bacterium. Their colleagues at UC Berkeley were able to culture the bacterium, *Xylella fastidiosa*, and Davis researchers found that it damaged grape vines by entering the plant's water-conducting tissues (xylem), multiplying rapidly, and eventually clogging its critical water and nutrient transport system. UC researchers also discovered that the disease is spread by sharpshooters, insects related to the common leafhopper. Sharpshooters feed by piercing the xylem of plants and sucking the sap. If the plant already carries *X. fastidiosa*, a sharpshooter can transmit the bacterium from diseased to healthy plants. Unlike phylloxera which causes a long, slow decline in production, a vine infected by *X. fastidiosa* and left untreated, typically dies within a year or two. During this period, the vine produces no fruit. Pierce's disease has reemerged recently as a vineyard problem in both Northern and Southern California wine grape growing regions. An outbreak of this lethal disease of grapes began in Napa and Sonoma counties in the 1990s and

University of California
FY 2000 Annual Report of Accomplishments and Results

Pierce's Disease has since been found in Mendocino and Lake counties. The disease has cost North Coast growers an estimated \$33 million and required the removal and replanting of more than 1,000 acres of vines.

The most dramatic outbreak of Pierce's disease in recent memory was triggered by the appearance of the glassy-winged sharpshooter (GWSS), an exotic pest accidentally introduced into California over a decade ago. GWSS probably entered Southern California as egg masses on plants brought in from the southeastern United States. First collected near Irvine in 1989, it was mistaken for the native smoke tree sharpshooter (*Homalodisca lacerta*) until positively identified in 1994.

GWSS is a serious threat to California vineyards because it travels longer distances than other sharpshooters and its larger mouthparts allow it to feed on older wood. This ability to feed on wood at the base of canes and on older stems appears to increase the rate of spread of *X. fastidiosa* from vine to vine. It also promotes systemic infection by placing the bacterium in closer proximity to the xylem. Traditionally, most summer infections of vines are made by vectors feeding on new growth near the tips of canes. The summer infections can usually be removed in the course of normal winter pruning in the vineyard, thereby minimizing vine-to-vine spread of the bacterium.

GWSS has been found in high numbers in citrus and avocado groves and on woody ornamentals. It has been recorded feeding on over 70 species of plants in 35 different plant families and is active throughout the year. GWSS probably can feed and reproduce on many other plant species that it has not yet encountered or where it has simply not been observed.

In the past three growing seasons, Pierce's disease has killed more than 300 acres of vineyards in the Temecula Valley and threatens the survival of Riverside County's viticulture and wine industries. To put this rapid spread into perspective, the outbreak of Pierce's Disease in Temecula was first detected in 1997. The following year the symptoms of the disease were visible in only a few localized areas. However, UC Riverside scientists sampling for the disease, found a Pierce's Disease incidence ranging from 25% to 97% in vineyards. By summer 1999 hundreds of acres of vines were dead and significant new acreage is expected to succumb to Pierce's Disease this growing season.

Based on current knowledge of the biology of GWSS, there is reason to believe that this insect pest may disperse northward into the major wine, table and raisin grape producing areas of the state. While the presence of GWSS would represent a serious threat to California viticulture, this disease vector also poses serious consequences for other commercial crops and nursery ornamentals. GWSS is already thought to be responsible for much of the spread of oleander leaf scorch (OLS) in Southern California. This disease has killed a large number of the oleanders planted as ornamental shrubs in parks, commercial and residential landscapes and in freeway medians. OLS is caused by a strain of *X. fastidiosa* distinctive from that affecting grapes and

University of California
FY 2000 Annual Report of Accomplishments and Results

almonds, but it may yet prove capable of causing disease in other ornamental and commercial crops.

In addition, GWSS may spread diseases to localities where they are not yet a problem, as well as increasing the incidence of *X. fastidiosa*-caused diseases where they already occur. Some strains of the bacterium not yet in California may now spread rapidly if they are introduced into the state. This includes citrus variegated chlorosis (CVC), a serious disease of citrus that has killed more than 60 million orange trees in Brazil. Other strains of the *X. fastidiosa* bacterium are known to infect peaches, plums and forest trees in the southeastern United States. GWSS may cause increased incidence and severity of Pierce's Disease in California.

UC scientists believe the glassy-winged sharpshooter has the potential to increase both the incidence and severity of Pierce's disease in California because it can: substantially increase the population of insect vectors transmitting *X. fastidiosa* to susceptible crops (numbers); cover longer distances in a shorter time than other sharpshooters (range and speed); utilize more breeding habitats and plant hosts than native Pierce's Disease vectors (opportunistic behavior); and transmit disease from vine-to-vine, resulting in an exponential, rather than linear, increase in Pierce's Disease incidence in vineyards (exponential spread).

In addition to Pierce's disease on grapes and oleander leaf scorch, GWSS has the potential to increase the incidence of almond leaf scorch and alfalfa dwarf in California. In addition, phony peach disease, citrus variegated chlorosis, elm leaf scorch, oak leaf scorch, and several other diseases are caused by strains of *X. fastidiosa* not known to be present in California at present but if they were introduced, it is likely that GWSS would rapidly transmit these strains to susceptible crops resulting in disease epidemics.

Activities

The output indicators listed below clearly demonstrate UC's response to the Pierce's disease problem in California over 1999-2000. Some of the highlights are noted below.

- Ten web sites have posted information on the glassy-winged sharpshooter/Pierce's Disease. Dr. Alexander Purcell's Pierce's Disease web site (UC Berkeley) received 146,037 successful web hits in calendar year 2000 (an average of 399 per day)
- There were 37 extension/outreach publications on the glassy-winged sharpshooter/Pierce's Disease. Over 350,000 copies (100,000 translated to Spanish) of ANR's brochure on "Glassy-winged sharpshooter: a serious threat to California agriculture" were distributed in 1999-2000.
- Eight peer-reviewed research papers were published on Pierce's Disease/the glassy-winged sharpshooter.
- UC's workgroup on Pierce's Disease / Glassy-winged sharpshooter met in both 1999 and 2000 and brought together over 100 researchers and action agency officials to discuss and coordinate research on sharpshooters and Pierce's disease.
- A publication by Redak et al. (2000) provided the framework used by CDFA and County regulators in California for inspecting for GWSS in nurseries so as to limit the spread of this pest throughout the state

University of California
FY 2000 Annual Report of Accomplishments and Results

- Fifteen meetings/symposia were held on this topic. These included an international symposium held Dec. 12-14, 2000 in Davis, CA attracted more than 200 scientists / industry / action agency officials from the U.S. and around the world to develop a list of innovative research topics which might address the Pierce's Disease problem in California
- Over 262 oral presentations were given by UC personnel in 1999-2000 dealing with *Xylella*-induced diseases / sharpshooters (all output indicator data are for 37 of 61 [61%] of the personnel dealing with this problem who responded to our survey)
- Six new biological control agents were tested and released:
 - *Gonatocerus ashmeadi* – endemic egg parasitoid collected from field populations, laboratory rearing method developed, laboratory colony established, laboratory tests conducted, field populations monitored, mass rearing methodology under development for planned augmentative spring release studies
 - *Gonatocerus faciastus* – endemic egg parasitoid surveyed in field studies
 - *Gonatocerus morrilli* – endemic egg parasitoid surveyed in field studies
 - *Gonatocerus triguttatus* – egg parasitoid imported through UC Riverside's quarantine facility, reared in quarantine, biology studies conducted, obtained permit allowing field release, field recovery studies in progress
 - *Ufens spiritus* – endemic egg parasitoid surveyed in field studies
 - *Ufens americanus* – endemic egg parasitoid surveyed in field studies

CASE STUDY: UC STATEWIDE INTEGRATED PEST MANAGEMENT PROGRAM

Key Theme: Integrated Pest Management

Background / Problem Statement

The year 2000 marked the 20th anniversary of the UC Statewide Integrated Pest Management (IPM) Program, which has been dedicated to furthering development and practice of IPM in California by facilitating UC research and extension activities. The UC Statewide IPM Project has helped growers reduce the pesticide load in the environment; enhance the predictability and effectiveness of pest control techniques; develop pest-control programs that are economically, environmentally and socially acceptable; and increase use of natural pest controls.

Research Activities

Research funded by the IPM Project is primarily conducted by scientists on UC's Berkeley, Davis and Riverside campuses, but also by UC farm advisors and the seven IPM advisors located around the state. Below are a few examples of their recent achievements:

- Replacement of organophosphates with the biologically based products *Bacillus thuringiensis* and spinosad for peach twig borer management in stone fruits
- Development of soil solarization as an alternative to use of methyl bromide
- Development of mass releases of *Trichogramma* wasps to manage codling moth in walnuts and pome fruit orchards

University of California
FY 2000 Annual Report of Accomplishments and Results

- Importation and release of parasites for control of two newly introduced pests of eucalyptus: red gum lerp psyllid and eucalyptus tortoise beetle
- Development of alternative weed-control methods for yellow starthistle management
- Studies on the basic biology of cotton aphid to help explain its emergence as a major pest of San Joaquin Valley cotton, including development of economic thresholds and biocontrol strategies
- Development of interplanting grasses into alfalfa shown to reduce weeds and alfalfa weevil populations in alfalfa hay.

Over the ten year period 1989-1999, a total of 194 research grants were funded by UC-IPM . Entomology was the discipline most often included in the research projects (45%) followed by plant pathology (21%). Most (70%) were managed by two or more investigators and 25% involved principal investigators from different institutions (more than one UC campus or Cooperative Extension office). While 30% of the projects resulted in nonchemical pest-control procedures, less than 10% developed synthetic chemical pest-control procedures, reflecting the general goal of UC-IPM to develop strategies and tactics that permit pest managers and growers to move away from the use of synthetic pesticides towards biorational materials and other risk-reducing materials.

Education/Outreach Activities

Publications

The IPM Education and Publications group has published 13 manuals covering California's top crops. A 14th book, Integrated Pest Management for Floriculture and Nursery Crops, will be released in spring 2001. More than 76,000 copies of the manuals have been sold. These manuals and the frequently updated UC IPM Pest Management Guidelines covering 42 crops, helped pest control advisors (PCAs) and growers identify pests and natural enemies, recognize the environmental and ecological factors that have brought on pest problems, adopt or adapt reliable monitoring practices, and rely on multiple management alternatives.

Although developing IPM information for major agricultural crops was the first priority of the UC IPM Project, as time went on, the project recognized the needs of urban audiences. There was an increased realization that pesticides are used and misused in urban areas, particularly by homeowners. The misuse of pesticides in urban areas can contribute to environmental problems that affect all of California's population, and result in further restrictions on uses of certain products. UC's IPM information also can have an environmental impact by lessening reliance on broadly toxic pesticides.

The Project has sold nearly 40,000 copies of Pests of the Garden and Small Farm and Pests of Landscape Trees and Shrubs. The books provide comprehensive IPM programs for home gardeners and professional landscapers. A CD-ROM, "The UC Guide to Solving Garden and Landscape Problems" was released in 2000 and is used in every UC Master Gardener office to diagnose and suggest management methods for garden and landscape pests. It is also for

University of California
FY 2000 Annual Report of Accomplishments and Results

sale to the general public and has been extremely popular -- the Los Angeles Times (Sept. 28, 2000) described it as "the best single reference on plant problems for Californians."

The *Pest Note* series, featuring more than 80 home and landscape pests as diverse as bermudagrass, cockroaches, powdery mildew, head lice and house mice, is also an important part of IPM urban outreach.

Web Site Expanded Access

Since 1980, UC IPM has supported development of computerized tools for on-farm decision-making. Databases and utilities were created to assist research and extension efforts, and the systems allowed researchers to develop, test and distribute other pest management-related resources. The rapid increase of personal computer use and the implementation of the databases and materials on the Web has made access to UC's IPM information possible for literally millions of users.

The information systems group has been involved in implementing a wide variety of tools used on personal computers such as expert systems in cotton and rice, utilities such as degree-day calculators and trap data spreadsheets, and databases such as the State Department of Pesticide Regulation Pesticide Use Reports.

These resources are accessible via the Internet, along with a catalog of publications, educational programs and software. The Web site includes UC's official guidelines for managing pests in major crops and in the home and landscape. Thousands of color photographs help users accurately identify pest problems. Temperatures, rainfall and other weather data arrive daily from about 200 stations throughout California.

Use of the Web site has grown exponentially, from 7,000 page accesses per month in 1995-96, the first year of the site, to an average of 342,000 per month in 2000.

IPM Updating of PCA Licensing Exams

Growers have historically relied on Pest Control Advisors (PCAs) for information about applying pesticides, but in recent years PCAs have become increasingly important in the adoption of biologically intensive IPM programs, geared toward reducing agrochemical use.

The California Department of Pesticide Regulation (DPR) currently licenses more than 4,000 PCAs who serve at least 40,000 growers and public agencies. At the urging of the California Agricultural Production Consultants Association (CAPCA), DPR and an ad hoc committee, the UC IPM was tapped to update the study materials and exams used to prepare and test PCAs. The materials had not been significantly revised in nearly 20 years, particularly with regard to IPM. The tests needed revision to accurately reflect current trends, practices and technology, rather than testing outdated practices. Also, the state licensing PCA exam did not have questions that adequately tested a person's knowledge of the ecological basis for pest problems and solutions.

University of California
FY 2000 Annual Report of Accomplishments and Results

Over the past four years, the UC Statewide IPM Project coordinated a major updating of the licensing exams for PCAs with the explicit goal of incorporating integrated pest management concepts.

The backbone of the project was the development of Knowledge Expectations, which define exactly what newly minted PCAs need to know for the licensing category tests. The process, which took more than 3 years and thousands of hours, involved expert committees comprised of hundreds of pest management professionals from the industry, academia and regulatory agencies.

PCAs are licensed in one or more of seven categories: insects, mites and invertebrates; plant pathology; nematodes; vertebrate pests; weed control; defoliation and other harvest-aid practices; and plant growth regulators. With broad agreement that PCAs in every category need to be well versed in the concepts of integrated pest management, the committees established Knowledge Expectations that crossed every discipline. For the first time, PCAs preparing for the exam had a clear idea of what they need to study and instructors know exactly what needs to be taught.

In addition to Knowledge Expectations, the project included the following components:

Study guides. Each expert committee reviewed and recommended study materials, and many exam guides are being updated as a result.

Exam questions. Members of the expert committees developed a large pool of exam questions for each licensing area. DPR expects to implement the new exams in 2003.

IPM textbook: Using the new criteria, the first textbook for PCAs was developed by the UC DANR IPM group: *IPM in Practice*. The 280-page guide will be available early next year.

The expert committees will continue to periodically review the Knowledge Expectations, providing a coordinated process for tracking the relevancy and currency of exams and study materials. This model is now being considered for the development of licensing programs for other professionals, such as pesticide applicators.

Training

Training helps reduce pesticide risks. Communicating pesticide safety information to California's 800,000 agricultural workers is a daunting task. California production agriculture applies about 202 million pounds of pesticide active ingredients each year, over a vast geographic area and on hundreds of different crops, livestock and nursery products.

University of California
FY 2000 Annual Report of Accomplishments and Results

California uses a greater variety of pesticides and a greater array of application methods and timing, than regions such as the Midwest, where growers produce a few major crops within well-defined seasons. Furthermore, the state's agricultural workers are drawn from a large and constantly changing pool, primarily migrant and seasonal workers from Mexico, as well as Southeast Asian and Punjabi immigrants and other non-English-speaking persons.

Since 1988, the UC IPM Project has been responsible for mandated training of California's pesticide applicators. With a staff of just three educators, a half-time writer, and one and one-half support positions, its Pesticide Education Program (PEP) devised innovative methods for managing a Herculean task.

Hands-on workshops: The program's initial efforts involved conducting 8-hour seminars for as many as 400 participants. These large seminars were not particularly engaging for participants nor were they effective in influencing pesticide-handling behavior.

Learning from this experience, PEP developed hands-on workshops and revised its delivery mode, acknowledging that people feel more comfortable asking questions in small groups. The workshops are conducted outside in facilities such as fairgrounds or large parks, and accommodate as many as 420 participants divided into small groups of 15 people or less. The groups rotate through seven stations, covering topics such as personal protective equipment, mixing and loading, application equipment, leaks and spills, environmental protection, first aid, and cleanup and disposal methods. Some sessions are conducted in Spanish, Punjabi or other languages.

Lacking the resources to conduct these workshops themselves, PEP staff offered 175 train-the-trainer workshops between 1993 and 2000, with 4,410 individuals receiving certification. In turn, these individuals trained more than 810,000 pesticide handlers and agricultural field workers. In addition, some PEP workshops have targeted the health-care workers, to improve reporting of pesticide illnesses and injuries.

Pesticide label comprehension: In 2000, PEP conducted a feasibility study among Hispanic farmers in Monterey County and Hmong farmers in Fresno County to determine if non-English-speaking individuals could acquire sufficient English skills to understand pesticide labels. In consultation with English as a Second Language (ESL) experts, program staff developed a 60-hour course. In a recent evaluation, individuals were asked 75 questions about a pesticide label before and after taking the course. The post-course data showed that the number of correct answers increased by an average of 81.7%.

Impacts/Outreach success

PEP's train-the-trainer programs illustrate that it is possible to leverage the efforts of a few staff in order to reach large numbers of people. In 1999, 247 participants were surveyed to assess the effectiveness of the train-the-trainer workshops; on average, each instructor trained 219 fieldworkers (SD = 670) and 35 pesticide handlers (SD = 8).

University of California
FY 2000 Annual Report of Accomplishments and Results

The state's Pesticide Illness Surveillance Program reports that pesticide handlers and agricultural field workers may be changing their behaviors. From 1989 through 1998, the state program, which relies on health care worker reports, found that topical illnesses definitely or probably caused by pesticide exposure dropped by 61% in agricultural workers and 57% in nonagricultural workers.

University of California
 FY 2000 Annual Report of Accomplishments and Results

NATIONAL GOAL 2

A safe and secure food and fiber system. To ensure an adequate food and fiber supply and food safety through improved science based detection, surveillance, prevention, and education.

The potential risks resulting from both the production and consumption of agricultural products are of increasing concern for California residents. As many as one million cases of food borne disease from consumption of foods containing pathogenic microorganisms such as *Escherichia coli* 157:H, *Salmonella*, and *Listeria* may occur annually in California. Such pathogens disproportionately affect sensitive population groups such as the young, the elderly, and the immuno-compromised.

FY 1999-2000 Allocated Resources

Extension Federal Funds	Extension State Match	Research Federal Funds	Research State Match
\$13,671	\$2,360,927 [13.1 FTE]	\$179,472	\$3,528,187 [23.1 FTE]

UC-DANR's Human Resources Programs Covering:

- **Human Health and Nutrition - Food Borne Diseases**

UC-DANR focused its research and extension resources on improving the health of California consumers by decreasing the incidence of food borne diseases and reducing the risks posed from the chemical contaminants in food. Programs were delivered by individuals and collaborative groups including 4 statewide workgroups composed of both AES and CE academics. To accomplish this:

- 5 Extension programs were delivered
- 7 Extension and outreach publications were published
- 16 Peer reviewed research papers were published

Research and Extension Performance Goals

- Develop effective research and educational programs directed toward food producers, processors, retailers, restaurants, regulators and consumers to reduce the incidence of food borne disease.
 - Develop effective research and educational programs directed toward food producers, processors, regulators and consumers to minimize the risks associated with chemical contaminants in food.
 - Develop effective training programs addressing food safety and sanitation issues using bi-lingual educational materials.

University of California
FY 2000 Annual Report of Accomplishments and Results

The **FoodSafe Program** supported a web page (<http://foodsafe.ucdavis.edu/>) that provides information on food safety “hot topics” and links to other databases with food safety information. It also provided a Food Safety Directory containing the names of 110 university faculty, campus specialists and county-based advisors working with food safety issues who have consented to be listed in the Directory. There is specific information directed to the consumer on Food Safety during Emergency Conditions, Food Preservation, and Food borne Illnesses: How to Identify Populations at Risk.” The **FoodSafe Program** maintains a national database on its website of pesticide publications, a collection of articles on pesticide residues in food and related topics. In the last 15 months, the web page has totaled over 17,000 page views.

"Don't give kids a tummy ache," a Spanish and English CD is directed towards parents and other care givers of young children. CE advisors and specialists adapted this program from the Penn State curriculum "Safe Foods--It's Up to You." The curriculum is on a CD and includes English/Spanish lesson plans, pre/post quizzes, handouts, and 19 full color visuals. The visuals can be used as a PowerPoint presentation or printed out to be used as a flipchart or as overhead transparencies. The program is an interactive way to teach food safety to those who care for young children. and has been piloted tested for effectiveness.

The protozoal parasite, *Cryptosporidium parvum*, is capable of waterborne transmission from livestock to humans. The fecal-oral parasite is readily mobilized with agricultural runoff during rainfall conditions where it can become a waterborne hazard if discharged in streams or lakes. California researchers are working to minimize this transmission by developing practical guidelines regarding buffer widths and percent vegetative cover necessary for effective removal of *Cryptosporidium parvum* in animal agricultural runoff. The effect of percent vegetative cover on a buffer's filtration efficiency is being calculated for agricultural soils of differing properties (infiltration rate, organic matter, bulk density), differing slopes, and differing rainstorm intensities (1.5 and 4.0 ml/hr/cm² over 4 hours). This project should result in cost-effective management strategies for reducing the risk of point and non-point source microbial contamination of water from animal agriculture.

A CE Specialist has developed a program to increase consumer knowledge of irradiation. The program will be delivered to health professionals and directly to consumers in the community. This will decrease food borne illness by increasing consumer knowledge and acceptance of foods processed by irradiation. Viewing a video tape and discussions with community leaders will take place in communities where irradiated foods will be offered. Economists will conduct an economic analysis of the market response to irradiated foods in those communities where the educational program is presented.

Research studies indicate good nutritional and food safety practices as major contributors to human health. Yet, consumers indicate confusion regarding correct information and often do not practice good health behaviors regarding nutrition and food safety. CE county programs often combine food safety training with their nutrition programs. An advisor worked with consumers to identify consumer handling practices for eggs and fresh fruits and vegetables. She recruited

University of California
FY 2000 Annual Report of Accomplishments and Results

and scheduled focus groups to determine ways to improve the safety in handling fresh produce and eggs. Egg handling practices that improved were: refrigeration, thorough cooking of eggs, reduced consumption of raw egg products, and washing hands after cracking eggs. Another CE advisor worked on determining the nutrition and food safety status of brown bag lunches packed by parents for their preschool children and the most effective methods to educate and motivate parents to improve the nutritional and food safety quality of these lunches. Nutrition and food safety programs were delivered to Food Stamp recipients and health and family service professionals. A total of 327 low-income adults were trained. Additionally 79 teachers were trained and three professional seminars were attended by 150 health professionals. The results of the training indicate that 80% of low-income participants of nutrition/food safety training indicated they gained useful information and 50% of teachers trained have incorporated nutrition/food safety training in their teaching curriculum.

University of California
 FY 2000 Annual Report of Accomplishments and Results

NATIONAL GOAL 3

A healthy, well-nourished population. Through research and education on nutrition and development of more nutritious foods, enable people to make health promoting choices.

A plethora of human epidemiological data indicates that improved nutritional and lifestyle practices will significantly reduce potential risks from chronic diseases including, but not limited to, many types of cancer, heart disease, non-insulin dependent diabetes, and osteoporosis. Better nutritional and lifestyle practices will also provide significant prenatal and postnatal benefits. Groups most at risk of nutrient deficiencies are children, women of childbearing years, substance abusers, and the elderly. Also, a disproportionate share of diet-related disease is borne by minority subgroups of the population. Twenty-five percent of California's children live below poverty level, putting them at risk of food deprivation and making them vulnerable to under nutrition and other nutrition problems.

California research and extension professionals on the campuses and in the counties worked together to address health and nutrition issues affecting the complete spectrum of the state's citizens. Obesity, anemia prevention, and nutrition curriculum for school age children using gardening as the focus are a few of the areas being worked on that will impact the health and nutritional status of Californians.

The Body Weight and Health Workgroup has initiated a study to determine the relationship between body weight and food insecurity in the low income Latino population. The results of the study will contribute to planning interventions aimed at improving the health status of the Latino population as well as contributing to the knowledge base of the factors influencing childhood obesity.

Low income residents, by the very nature of their limited resources, are more vulnerable to current and long term affects of poor food choices and practices. CE advisors, specialists, and faculty collaborated on a pilot project to identify the specific lifestyle practices which lead to iron-deficiency anemia in very young children. They worked with the county anemia task force and other agencies and developed a training video. In addition, training sessions throughout the state (32 counties) on strategies to reduce iron deficiency anemia; later follow up indicated that 28 of these counties had active groups engaged in localized versions of the strategies presented

FY 1999-2000 Allocated Resources

Extension Federal Funds	Extension State Match	Research Federal Funds	Research State Match
\$501,266	\$2,810,394 [23.9 FTE]	\$284,773	\$5,598,261 [28.9 FTE]

UC-DANR's Human Resources Programs Covering:

• **Human Health and Nutrition**

UC-DANR focused its research and extension resources on optimizing the health and dietary well-being of California consumers. Programs were delivered by individuals and collaborative groups including 3 statewide workgroups composed of both AES and CE academics. To accomplish this:

- 28 Extension programs were delivered
- 7 Extension and outreach publications were published
- 21 Peer reviewed research papers were published

Research and Extension Performance Goals:

- Identify interactions between nutritional status and health.
- Identify the nutrition, health and lifestyle practices of California consumers who are at risk for nutrition-related health problems.
- Identify unique food related behavior that put specific cultural groups at risk.

CASE STUDY: BODY WEIGHT AND HEALTH

Key Themes: Human Nutrition, Human Health

Background/Problem Statement

Obesity continues to be a national epidemic, despite efforts to educate the public about the benefits of a healthy lifestyle and the risks associated with obesity. In California, the largest increases in obesity prevalence have occurred in the low-income Latino population. To design effective interventions, it is critical to understand which factors contribute to the disproportionately high risk of obesity among this specific population.

Although extreme food shortages have long been known to impair growth and weight gain, mild to moderate food insecurity may paradoxically contribute to the high prevalence of obesity among the poor. It has been hypothesized that cyclical food shortages (e.g., when food stamps run out before the end of the month) may increase reliance on high fat or empty calorie foods. High fat and empty calories foods can be inexpensive and satiating, providing poor households a means of stretching their constrained food dollar. In addition to influencing choices based on economic considerations, hunger may increase the desire for high fat foods and result in hyperphagia and weight gain once food is again available. It is of major concern as the prevalence of obesity, especially among low-income populations, is rising rapidly.

While several studies have demonstrated a positive association between mild to moderate household food insecurity and obesity among adults, it is not known whether an analogous effect of food insecurity exists among children. Current research documents greater risk of overweight among low-income children and among food insecure children, however, no published studies to date have actually examined the relationship between early childhood obesity and food

University of California
FY 2000 Annual Report of Accomplishments and Results

insecurity. Unpublished data from a survey of 239 central California low-income Latino families suggests a high prevalence of childhood overweight in families reporting food insecurity. Further research is needed to compare the rates of child obesity between food insecure families and food secure families in a low-income Latino population.

The Body Weight and Health Workgroup planned a study to determine the relationship between body weight and food insecurity in a cross-sectional sample of low-income Latino children in California. The results of this study can be used to assist policy makers in better understanding the relationship between food insecurity and childhood obesity in a population at high risk for early onset obesity.

Activities

- The relationship between food security and childhood obesity will be investigated via a cross-sectional survey of 600 low-income Latino families with children between the ages of 3 and 6 years. The survey will take place in 6 California counties and bilingual staff from the counties have been trained on interviewing techniques and collecting standardized anthropometric measurements. Recruiting and surveying of the families will begin in February 2001.
- The UC Cooperative Extension conference was co-sponsored by the Workgroup. Featured speakers included Dr. Marilyn Townsend who spoke on food insecurity and obesity in adults.

Future Activities

Childhood Obesity Conference will be co-sponsored by the UC Berkeley Center for Weight and Health and California Department of Health Services (DHS) in Spring 2001. The conference is designed for persons interested in programs in research, prevention, education and treatment of obesity in children. Highlights of the conference include: Intervention program options

- Parenting guidelines and resources
- Funding sources and new initiatives
- Community networking and action

Publications and Workshops. Data analysis will take place between summer and fall, 2001. Two presentations of study findings are proposed: statewide, at the California Dietetic Association and nationally, at the Society for Nutrition Education meeting. By 2002, one scientific publication will be drafted.

Impacts

- The results of this study will contribute to a better understanding of the etiology of childhood obesity and a greater awareness of the issue among California health professionals. The knowledge will be an integral part of planning interventions aimed at improving the health status of the Latino population.

University of California
FY 2000 Annual Report of Accomplishments and Results

- The survey and investigation of the relationship between food insecurity and obesity in Latino children is essential for further understanding factors that contribute to obesity in this population. With this information, health professionals can develop effective interventions and determine resources needed to help prevent and treat obesity in this population. The findings from the investigation may also be instrumental in evaluating the effects of food assistance and poverty programs and informing state and national organizations of changes needed in the programs to better assist California's Latino population.
- The conferences will increase knowledge and awareness of various factors influencing childhood obesity and will provide an opportunity for health professionals to learn from the experience of others and to discuss relevant issues and concerns. The impact of the conferences will be seen in improved interventions and services for low-income populations, especially Latinos.

CASE STUDY: ANEMIA PREVENTION

Key Theme: Human Nutrition

Background

Low income residents, by the very nature of their limited resources, are more vulnerable to current and long term affects of poor food choices and practices. CE advisors, specialists, and faculty collaborated on a pilot project to identify the specific lifestyle practices which lead to iron-deficiency anemia in very young children. The DANR workgroup, Anemia Prevention Among High Risk Groups in California, has assessed the iron status in a representative sample of children from low-income families, ages 12-36 months, who attended selected WIC clinics and examined the risk factors potentially associated with iron status in this population. The outcome of this research is to develop a more focused education intervention program that is based on the problems and lifestyles of the clientele. The ultimate goal of this research is to use these results as baseline data to develop and assess the effectiveness of a nutrition education intervention program on reducing the prevalence of iron deficiency and iron deficiency anemia.

Activities

A questionnaire was developed to collect demographic information, data on acute illness at the time of study or in the previous 2 weeks, maternal iron status, and dietary information including infant feeding history and timing of introduction of foods affecting iron nutriture and lifestyle. The interview instrument was developed and reviewed for content validity by nutrition and public health professionals. It was field tested (N=22) at the County of Sacramento, Department of Health and Human Services, and a WIC clinic. Revisions were made to clarify any questions that were confusing to the subjects. The instrument has been translated into Spanish to allow its use in either language, according to the subject's personal choice.

Data collection began at the Richmond Health Center on August 1, 2000. The questionnaire was administered at the clinic through an in-person interview by a trained bilingual interviewer. The process has been successful to date. Currently, one bi-lingual interviewer (Spanish and English) recruits potential subjects from the Richmond WIC clinic. Eligibility for the study is determined

University of California
FY 2000 Annual Report of Accomplishments and Results

and a 30-minute interview is conducted. After the interview is completed, a blood draw is taken by the phlebotomist at the Richmond Health Center lab. The child's mother receives a subject compensation of \$20 once the blood is drawn and the child receives an age-appropriate book or toy.

Results to date show twenty-four children with hemoglobin values at or below the CDC cutoff of 11.0g/dL for 1 to 2 year olds, and 11.1 g/dL for 2 to 5 year olds in Contra Costa County. Based on a power calculation, a sample size of 400 subjects is needed to determine significant association of risk factors with iron deficiency. Of the two-hundred interviews conducted at Contra Costa County, a total of 183 blood draws were taken; thus the apparent prevalence of anemia in the sample is 13.1%. Subject recruitment continues in Tulare County for interviews and blood draws of eligible children. Analysis of the samples from children recruited from Tulare County will occur when all samples are received.

Several presentations have been made concerning the issues addressed in this project. Over ten seminars on iron deficiency anemia have been presented throughout California over the past year. In addition, seminars have been presented on this issue at more than 15 conferences. Each of these seminars included health professionals who planned on using the information with their clientele. Representatives from 32 counties participated in the regional training sessions to promote anemia prevention task force formation. At some of the trainings all members of the potential task force were there to initiate their local efforts; at others health care providers from county medical teams came to learn more about iron deficiency anemia; at some trainings representatives from upper level health department administration joined us. Follow up interviews indicated that 28 counties had active groups engaged in localized versions of the strategies we presented. In one county, \$20,000 in grant funds was received to further their anemia task force activities.

Impact

The careful examination of associations between iron deficiency/iron deficiency anemia and dietary intake and habits will be important in setting pediatric nutrition guidelines and educational efforts aimed at children at risk of anemia. Data from the proposed study are critical in the design of effective nutrition education programs which incorporate current nutrition recommendations for young children which will ultimately lead to reducing the incidence of iron deficiency anemia.

Source of Federal Funds: Smith Lever 3 b&c, Hatch

Scope of Impact: State specific

CASE STUDY: NUTRITION TO GROW ON

Key Theme: Human Nutrition

Background

A Nutrition to Grow On curriculum was developed DANR researchers and extension advisors and specialists to determine the effectiveness of a long-term garden-based nutrition education

University of California
FY 2000 Annual Report of Accomplishments and Results

program on the knowledge, food preferences and behavior of young children in the 4th grade. A pilot study was conducted to evaluate the initial feasibility of implementing and evaluating a garden-enhanced nutrition education program within a school setting. This study was conducted with first graders from both a control and intervention site. The results showed a significant improvement in the intervention site students' willingness to taste vegetables. It was concluded that is possible to implement and evaluate such a program within school-year constraints. Once the feasibility was determined, the objective of the subsequent study was to develop a more comprehensive nutrition education curriculum designed to improve the nutrition knowledge and vegetable preferences of all elementary school-age children.

A curriculum was developed around the Social Cognitive Theory and consisted of nine nutrition lessons with complementary gardening activities. Following each lesson, students were sent home with a family newsletter so as to encourage parental involvement and discussion. The curriculum was designed with standards for the core subject areas in mind. The Nutrition to Grow On lessons were repeatedly field-tested in several fourth and fifth grade classrooms and revised until no further changes were necessary. A nutrition knowledge questionnaire and a vegetable preference survey were also developed at this time. This garden-enhanced nutrition education curriculum has been shown to be an effective tool for improving the nutrition knowledge and vegetable preferences of elementary school-aged children. The Nutrition to Grow On curriculum has been published by and will be distributed by the California Department of Education.

Activities

There are currently several training sessions on the use of the Nutrition to Grow On curriculum in progress throughout the states of California and Arizona and seven journal articles have been published on this research

The Nutrition to Grow On evaluation project reached 215 fourth grade students. The published curriculum will be made available to all public elementary schools in California through the California Department of Education. The Food Stamp Nutrition Education Program (FSNEP) will be using this curriculum as part of their program.

Impact

The ultimate impact of the use of the Nutrition to Grow on curriculum will be an increase in the nutrition knowledge of school age children and an improvement in their vegetable preferences.

Source of Federal Funds: Smith Lever 3 b&c

Scope of Impact: California and potentially other western states

NATIONAL GOAL 4

Greater harmony between agriculture and the environment. Enhance the quality of the environment through better understanding of and building on agriculture's and forestry's complex links with soil, water, air, and biotic resources.

University of California
 FY 2000 Annual Report of Accomplishments and Results

There is a need to protect and improve natural resources, including soil, air and water, plants and animals, and environmental quality by developing reduced-risk agricultural production and maintenance systems for food, fiber, and ornamentals. California researchers and extension advisors and specialists worked in the critical area of watershed management, developing a comprehensive water quality planning course that has been extended to California rangeland owners. As a result, over 1 million acres of rangeland are now covered by ranch water quality plans, resulting in significant reductions in sediment and pathogen loads in water bodies across California.

Starting in 1995, thousands of California live oaks, black oaks, and tanoaks have been reported dying in large numbers in localized areas of Marin County, the Santa Cruz Mountains, and Big Sur. This epidemic, referred to as Sudden Oak Death (SOD), causes the rapid death of the affected trees with foliage turning from apparently a healthy green to brown within a few weeks. The disease is expected to occur in the oak woodlands of the coast ranges from Mendocino to Santa Barbara county. A collaborative effort of AES faculty, CE specialists and advisors and state and federal agency personnel developed a comprehensive research and education program to combat this disease. The cause has been identified as a Phtophthora species and interim guidelines have been developed and disseminated on controlling the spread of the organism. Future work will seek to understand more about the fungus' biology and the role of insects and other fungi play.

Another example of the collaborative effort of faculty and extension professionals is the Urban-Wildland Fire Hazard Mitigation Program. A broad array of projects addressed this issue resulting in increased acreage scheduled for fuel management treatment due to increased understanding of the role and consequences of wildfire.

Over 150 local extension programs were delivered in this area. In addition, 26 statewide collaborative workgroups composed of both AES and CE academics planned and conducted research and extension projects. California academics published 95 peer reviewed articles and 21 extension publications to address Goal 4.

FY 1999-2000 Allocated Resources

Extension Federal Funds	Extension State Match	Research Federal Funds	Research State Match
\$1,274,217	\$11,942,208 [85.6 FTE]	\$1,511,023	\$29,704,741 [110.6FTE]

UC-DANR's Natural Resources Programs Covering:

- **Wildfire Science and Management**
- **Water Quality, Water Quantity, Water Allocation and Watershed Management**

WILDFIRE SCIENCE AND MANAGEMENT

DANR focused its research and extension resources on reducing the risk and intensity of wildfire and to improve public understanding of the role of wildfire in the functioning of an ecosystem. Programs were delivered by individuals and collaborative groups including a statewide workgroup composed of both AES and CE academics. To accomplish this:

- 6 Extension programs were delivered
- 32 Peer reviewed research papers were published

Research and Extension Performance Goals:

- Evaluate alternative systems of vegetation management comparing the benefits and costs from both an environmental and an economic viewpoint.
 - Coordinate educational efforts directed toward those in positions of managing wildfire and fuel loads, and those affected by wildfire.
 - Inform policy makers and others who influence policy decisions on wildfire management.
 - Determine current fuel loads in various vegetation types.
 - Identify costs and environmental consequences associated with different fuel modification strategies.
 - Employ interdisciplinary teams to evaluate consequences of wildland and prescribed fires on various ecological processes.
 - Conduct research and technology transfer to address role of wildfire management on ecosystem sustainability.

CASE STUDY: WILDFIRE SCIENCE

Key Theme: Wildfire Science and Management

The Urban-Wildland Fire Hazard Mitigation Program is a collaborative effort of faculty and extension professionals to address the fire danger to life, property and resources. The program, coordinated by the UC Forest Products Laboratory, is comprised of a wide array of projects including:

Fire Safe Vegetation: Through laboratory testing of vegetation fire resistance, developed a publication listing fire resistant vegetation, and developed a classification of vegetation fire resistance.

Fire Safe Structures or Ignition Resistance: Developed protocols for determining ignition resistance and testing building components, validation of results and development of a structural ignition guide, name DEFENS.

University of California
FY 2000 Annual Report of Accomplishments and Results

Biomass Utilization: Assessed the potential for expanding biomass utilization, described biomass utilization techniques, developed case studies and identified challenges to application.

Revision of the California Vegetation Management Program EIR: The EIR was revised with the goal to provide vegetation managers with an expanded number of techniques to reduce or eliminate wildland fuels in efforts to mitigate potential fire hazards. The state's Chaparral Management Program Environmental Impact Report was updated to reflect the changing conditions including and complying with the latest California Environmental Quality Act changes.

Fire Hazard Assessment Project: This project evaluated statewide code enforcement activities at state and local levels of government, then developed a publication regarding the variety of hazard assessment systems in use in California and make recommendations regarding systems.

Fire Safe Inspector (IFCI Code Training): Training program was developed and conducted to provide code enforcement officials with the intent and application of the IFCI UWI Code through the review and inspection of fire safe plans, and to develop and deliver train the trainer classes.

Professional Inspector Training Course: Courses developed to provide a standardized methodology to evaluate fire safe characteristics of individual homes, subdivisions, and communities to prescribe measures to mitigate losses from wildland fires. A course was developed to train individuals as fire hazard inspectors in classes delivered in Southern California and Northern California.

Fire Safe Guide Update: Information and data was collected, analyzed, and disseminated regarding fires and fire defense improvements. This information is being used to direct research, implement management plans, and meet goals established in the California Fire Plan. Analysis reports, plans and guidelines were posted on the Internet for equal access by all resource and fire service between CFIRS and NFIRS into one system. A system was developed for prioritizing and capturing the costs associated with Fire Safe projects.

Strategic Resource Planning Guide (the I Zone Series): This publication compiled a description and summary of Hazard Mitigation Grant Programs so that information from these programs can be widely applied to reduce the hazards of wildfire. A series of in-depth manuals, both in print and on-line, was developed covering the results of all the current FEMA funded projects.

Impact

University of California
FY 2000 Annual Report of Accomplishments and Results

Californians have an increased understanding about the role and consequences of wildfire. The acreage scheduled for fuel management treatment in the I Zone has increased due to the understanding of these consequences. Completion of these projects will reduce the number of people and the value of property and natural resources at risk due to catastrophic fires occurring in both wildlands and wildland/urban interfaces.

Source of Federal Funds: Smith Lever 3b&c and Hatch.

Scope of Impact: State specific

WATER QUALITY, WATER QUANTITY, WATER ALLOCATION AND WATERSHED MANAGEMENT

DANR focused its research and extension resources on the following goals: improve the integration of all water quality factors when determining the beneficial uses of water; improve the decision-making process when reallocating existing developed surface water; ensure water resources are valued and priced using appropriate means; maximize the utilization of reclaimed water under appropriate conditions; improve public understanding and knowledge of all water rights and their consequences when making policy decisions regarding water management; improve the standardization, coordination and dissemination of water information when dealing with quality, quantity and interagency transfer efforts; improve watersheds while sustaining local, natural resource-based economies; and improve the integration of sound, ecologically-objective information for the benefit of all watershed components. Programs were delivered by individuals and collaborative groups including 2 statewide workgroups composed of both AES and CE academics. To accomplish this:

- 59 Extension programs were delivered
- 47 Extension and outreach publications were published
- 67 Peer reviewed research papers were published
- 2 Web sites were implemented
- 1 Computer software program was developed

Research and Extension Goals:

- Facilitate interdisciplinary research on water quality issues.
- Disseminate research-based information on the effects of various activities on water quality to public policy decision-makers and other stakeholders.
- Facilitate discussion of water issues in a collaborative manner at the state, regional, and local levels by determining the relationship between state and regional water management plans and local, site-specific implementation of projects consistent with those higher level plans and objectives.
- Disseminate research-based information to public policy decision-makers and stakeholders regarding regulation, allocation and end uses, costs, and water quality assessment and technology.
- Conduct research and outreach programs related to development of new technologies that are usable in the laboratory or in the field for measuring and monitoring water quality.
- Conduct research and outreach programs related to estimating yields, water runoff, drainage, and benefits and costs of various management activities. Downstream effects including those on coastal and estuarine environments, as well as those within the watershed, should be assessed.
- Improve coordination among watershed planning groups, agencies, etc.
- Demonstrate to stakeholder audiences effective watershed management practices.

University of California
FY 2000 Annual Report of Accomplishments and Results

- Facilitate the exchange of information on watershed concepts and the effects of various management options among stakeholders in watershed planning efforts.
- Assist agencies, landowners, and watershed groups in designing and interpreting long-term monitoring programs assessing new management practices and restoration efforts.

CASE STUDY: DANR WATER QUALITY EDUCATION PROGRAM

Key Theme: Water Quality

Over the past eight years, a comprehensive DANR Water Quality Planning Course has been developed. The course has:

- Delivered educational programs that teach private landowners about watersheds, water quality regulations, rangelands, grazing, and environmental assessment and monitoring.
- Conducted training for Cooperative Extension Advisors, USDA Natural Resource Conservation Service personnel, and other agency personnel in the area of rangeland watershed management.
- Provided information to public policy makers.
- Developed effective methods for monitoring California rangelands and associated water bodies.
- Characterized the hydrology, ecology and water quality of rangeland watersheds, riparian areas and associated stream systems.
- Developed and improved “best management practices” and test their effectiveness.
- Determined the influence of livestock on grazed watersheds.

Activities

A primary delivery method of the education program has been the development and implementation of the Ranch Water Quality Planning Short course by UC Cooperative Extension Specialists and Advisors. This Short course is designed to enable rangeland owners to complete comprehensive non-point source pollution management plans. These courses have been headed up by UC Cooperative Extension specialists and advisors, often in collaboration with the Natural Resource Conservation Service and the California Cattlemen’s Association. The Ranch Water Quality Planning Short course is based upon research conducted by AES faculty and CE Specialists and Advisors. A parallel outreach effort has resulted in the production of over 40 watershed and water quality fact sheets, which have been distributed to land owners, decision makers, and the general public, among others.

Impact

Over 1,000,000 acres of rangeland are now covered by ranch water quality plans. These plans have resulted in significant reductions in sediment and pathogen loads in water bodies across California. These non-point source pollution reductions have resulted from improvements to grazing management, ranch road construction and maintenance, and re vegetation projects. The

University of California
FY 2000 Annual Report of Accomplishments and Results

final resulted is improved water quality for a variety of beneficial uses downstream from livestock grazing operations.

Source of Federal Funds: Smith Lever 3b&c and Hatch.

Scope of Impact: State specific.

CASE STUDY: SUDDEN OAK DEATH

Key Theme: Natural Resources Management

Throughout many of California's coastal counties tanoaks (*Lithocarpus densiflorus*), coast live oaks (*Quercus agrifolia*) and black oaks (*Quercus kelloggii*) are dying in large numbers. The unprecedented level of dieback of tanoak, coast live oak, black oak poses several immediate and future environmental threats:

- Dead and dying oaks have worsened the already severe fire hazard conditions in both wildland and developed hillside areas.
- Many wildlife species depend on these major acorn-bearing trees for habitat.
- Oaks are highly valued trees in an urban setting, providing beauty, shade and property value to homes. The loss of these trees is both aesthetically and financially costly.
- Reduction in tree cover is resulting in significant risks for increased sediment production and impaired beneficial uses of water.

A collaborative effort of AES faculty, CE specialists and advisors and collaborating agency personnel (state, federal and California State University) developed a comprehensive research and education program on sudden oak death.

Activities/Outputs

- Six extension publications on sudden oak death
- Fourteen extension education programs where stakeholders received sudden oak death information
- One comprehensive, interdisciplinary research project initiated

Impacts

The causative agent of sudden oak death has been identified as a *Phytophthora* species. Based upon morphology, the isolates examined in detail do not match any *Phytophthora* species currently known from California. The identification of this causative agent provides the first opportunity to develop a strategy for reducing the spread of sudden oak death and eventually solving this serious problem. Researchers must now search to understand the fungus' biology, its role in Sudden Oak Death, and what role, if any, bark beetles and other fungi consistently associated with the dying trees play.

The public and resource professionals are better informed about sudden oak death and the preliminary findings of the research program have been developed into interim guidelines for controlling the spread of the organism.

Source of Federal Funds: Smith Lever 3 b&c; Hatch

Scope of Impact: State specific

CASE STUDY: RANGELAND WATER QUALITY PROGRAM

Key Theme: Water Quality

The Rangeland Water Quality Program links faculty, specialists and advisors with rangeland owners and managers to provide educational programs focused on best management practices that will lead to improved water quality within local watersheds. The program and its comprehensive curricula (short courses, facts sheets, etc) have been endorsed by state agencies as an excellent way to reach private landowners with a voluntary approach to meeting water quality requirements.

Activities/Outputs

- 600 individual landowners/operators attended ranch water quality shortcourses
- 165 people submitted water quality management plans
- 23 ranch water quality short courses were conducted
- 8 peer review research papers involving multidisciplinary work on rangeland water quality issues

Impact

Ranch water quality plans were developed which cover over 400,000 acres of California rangelands. These plans, and their associated “best management practices” significantly reduced non-point source pollution resulting from rangeland livestock operations, improving the quality of water for a wide variety of beneficial uses.

Source of Federal Funds: Smith Lever 3 b&c; Hatch

Scope of Impact: State specific

University of California
 FY 2000 Annual Report of Accomplishments and Results

NATIONAL GOAL 5

Enhanced economic opportunity and quality of life for Americans. Empower people and communities, through research-based information and education, to address economic and social challenges facing our youth, families, and communities.

The human resource issues in California cross demographic and socioeconomic lines, affecting all ages, from children to the elderly, and diverse cultural groups. Demographic changes along with other environmental changes such as family structure, technological advances, and political environment, contribute to unique challenges for California's youth and families.

Economic pressures within California and the nation continue to impact the ability of families and individuals to maintain self-sufficiency. Many California communities are experiencing real and pressing need for research-based information on how to remain viable and provide the necessary services for their residents.

The Division is uniquely positioned to strengthen the linkages between research and practice to address issues of California's youth, families and communities and has provided targeted applied research, education, and outreach to develop and strengthen California's youth, family and community resources. Examples of the collaborative efforts of AES and CE professionals include the community economic development project on the identification of outcomes for community projects. Working in one county, there were immediate community impacts, ranging from better communication among local groups leading to coalition building efforts to individual impacts of increased clarity on project development and decision making. The longer term impact is the replicable knowledge about best practices in community economic development that can be disseminated and used by other communities.

Another major effort of DANR academics has been the assistance to those making the transition from welfare to work. The Gateway to a Better Life curriculum was created through the collaboration of faculty, advisors and specialists. The curriculum is currently being used in eight counties with a variety of audiences. The goal is that those completing the course will enter the workforce and be able to remain employed.

FY 1999-2000 Allocated Resources

Extension Federal Funds	Extension State Match	Research Federal Funds	Research State Match
\$1,130,582	\$5,402,708 [48.4 FTE]	\$148,889	\$2,926,964 [14.3 FTE]

UC-DANR's Human Resources Programs Covering:

- **Human and Community Development**
- **Economically Viable Families and Communities**

HUMAN AND COMMUNITY DEVELOPMENT

UC-DANR focused its research and extension resources on the need to create supportive environments in which culturally diverse youth and adults can reach their fullest potential and to strengthen the capacities of families and individuals for self-sufficiency and well-being by improving life skills. Programs were delivered by individuals and collaborative groups including 9 statewide workgroups composed of both AES and CE academics. To accomplish this:

- 68 Extension programs were delivered
- 6 Extension and outreach publications were published
- 13 Peer reviewed research papers were published

Research and Extension Performance Goals

- Improve the capacity of targeted communities to provide integrated approaches to support healthy youth development that involve youth, families, and community members, and provide training and technical assistance to family, youth, and community professionals.
 - Develop and implement programs that teach and demonstrate collaboration building.
 - Improve understanding of multicultural and diversity issues by providing youth and family service agencies with training and technical assistance in issues of diversity and promoting tolerance. Research the parenting practices of California's minority populations to develop and disseminate more culturally appropriate parent education materials.
 - Prepare youth for an employable future by developing and extending to youth service agencies curricula on youth career decision making, workforce preparation and entrepreneurship experience of youth. Generate new knowledge about workforce preparation strategies by conducting comparative studies.

CASE STUDY: YOUTH DEVELOPMENT - ADOLESCENTS

Key Theme: Youth Development/4-H

The DANR Adolescents Workgroup initiated a "toolbox" that will include (1) science-based information about the development of leadership, (2) curriculum tools for leadership education, and (3) a tool for the assessment of youth leadership development. Twenty-five community collaborators were surveyed to determine the content and structure of the toolbox, the first draft of which will be available in late 2001.

An Extension specialist provided statewide and national leadership for Extension research and outreach on adolescent pregnancy, parenting, and sexuality. At the national level, one national conference was held, and six conference workshops were conducted on this topic for over 300 Extension professionals. At the state level, the Adolescents Workgroup conducted research on

University of California
FY 2000 Annual Report of Accomplishments and Results

effective community-based prevention programming, resulting in an article published in the *Journal of Extension*. Over 500 community members and professionals have requested the UC publication “Best Practices in Pregnancy Prevention.”

Source of Federal Funds: Smith-Lever 3b&c
Scope of Impact: State Specific and Multi-State

CASE STUDY: MONEY 2000 + FOR TEENS
Key Theme: Consumer Management

Background/Problem Statement

Although several money management curriculums for teens exist, it appears that these curriculums were developed based on what adults believed to be important to teens, rather than teens indicating their needs and interests. Teens have access to and spend a great deal of money each year—money they have earned as well as money given to them by their family. Additionally, they spend money for the family buying food and other items to be used by the entire family. Research indicates that the financial literacy of teens is low and efforts should be made to increase this literacy.

Activities

In 1998, with regional funding, a group of Nutrition, Family, and Consumer Sciences advisors and Youth Advisors conducted a study to identify the money management topics that teens wanted to know about, to find out how they wanted to receive the information, and to determine if there were differences in what teens wanted to be taught and the adults’ perception of what they thought teens should be taught. It was important to identify the teenagers’ interests so that a program could be developed that would have “teenage appeal.” The results of the study revealed that teens were most interested in learning how to buy a car, how to make their money go farther, and easy ways to save. They preferred to learn about money during school. The survey results showed what teens want to be taught and how. Those topics of interest were used as the focus for educational lessons, which will have a significant impact on their financial future.

The Money 2000 + for Teens workgroup took the information derived from the survey conducted and developed a money management program with teenagers as the target audience. A series of four newsletters, with corresponding leader’s guides have already been developed. A web site is in the development stage. The workgroup is in the process of implementing the program. After implementation, an evaluation will be conducted to determine behavior and attitudinal changes relating to teens’ financial practices.

Focus group interviews were conducted last fall with teens throughout the state to get their feedback on the newsletters as well as the survey. Their recommendations were addressed in the leader’s guides and their suggestions will be considered in future revisions of the newsletters.

University of California
FY 2000 Annual Report of Accomplishments and Results

Currently, workgroup members and other interested advisors are implementing the program and conducting the evaluation at the county level at 10 sites with groups of 10 to 25 teens. By the end of March 2001, this phase of the program will be completed.

Future Activities

The next phase of this project will be the final follow-up survey. The workgroup consulted with a colleague at Cal State Fullerton's Social Science Research Center in designing the pilot evaluation. The teen survey will be administered three times:

- prior to the initiation of the educational component (pre-test),
- at the completion of the educational program (post-test), and
- 3-6 months after completion of the program (follow-up survey).

Program leaders will also be asked to complete a survey related to their experiences in teaching the program and in their use of the leader's guides.

After the program evaluation is complete the workgroup will conduct a review and revision of the program materials as well as develop additional newsletters. All materials are being developed in Spanish to reach the high Latino/Mexican population in Southern California. The newsletters and leader's guides will be distributed by November of this year.

The project was recently awarded a \$50,000 grant from the Chase Manhattan Foundation Financial Literacy Program. These monies will go towards the continued development of the interactive web site. The web site will be in both English and Spanish.

Publications and Workshops

In addition to the actual publication of program materials, the article *Preparing Teens to Make Financial Decisions Now and as Adults* has been accepted for publication in the Journal of Family and Consumer Sciences. Included in the *Proceedings of the Association for Financial Counseling and Planning Education* was a presentation, *Teens and Adults Perceptions Regarding Money Management Education and Delivery Systems*. The workgroup has also presented posters at two UC conferences.

Impacts

The preliminary study determined what teens want to know about financial management and how they want to receive the information. The results of the pilot study will determine whether teens experienced a gain in knowledge and/or a change in behavior when provided information on the financial management topics they requested in their preferred format, a newsletter.

Source of Federal Funds: Smith Lever 3 b&c

Scope of Impact: State specific

ECONOMICALLY VIABLE FAMILIES AND COMMUNITIES

UC-DANR focused its research and extension resources on the need to improve the capacity of consumers to efficiently use economic and personal resources and strengthen the capacity of communities, families and individuals to create and maintain sustainable economic growth. Programs were delivered by individuals and collaborative groups including 6 statewide workgroups composed of both AES and CE academics. To accomplish this:

- 9 Extension programs were delivered
- 4 Extension and outreach publications were published
- 21 Peer reviewed research papers were published

Research and Extension Performance Goals

- Develop, test and institute effective educational programs on topics related to economic health: consumer choices, personal and family resources management, employment readiness and training, transition from welfare to work, etc.
 - Develop, test, and institute effective economic education outreach models for building community coalitions with emphasis on economic self-sufficiency of individuals and economic development for communities.
 - Conduct community level research on the effects of economic changes and decisions on communities and households.
 - Perform evaluation research on economic programs that demonstrate effective results for potential creation of economic development models. Develop a "best practices" approach for replication of models that work.

CASE STUDY: GATEWAY TO A BETTER LIFE

Key Theme: Workforce Preparation

Background

The development of the Gateway to a Better Life curriculum was a collaborative effort among AES faculty, CE Specialists, and county advisors to create a resource for those transitioning from welfare to work. The ultimate goal of the curriculum is to provide information that will empower the clients to enter the workforce, and maintain balance in their lives so they can stay employed. Two teams of advisors are currently involved in evaluation activities. One team is conducting focus groups with clients to determine if the curriculum is meeting their needs and the other team is surveying trainers and agency staff to find out what they have used with clients, as well as what they have not used and why they haven't.

Activities

The Gateway curriculum is currently being used in eight California counties in a number of different settings and with different audiences, including: women's crisis centers, family services

University of California
FY 2000 Annual Report of Accomplishments and Results

programs, food pantries, Healthy Start, Head Start, emancipating youth programs, Social Services departments, teen parents programs, ROP, and high schools.

Four issues of a quarterly newsletter, LifeSkills, have been distributed, both electronically and in hard copy, to California county offices. County offices are creating electronic mailing lists for distribution to local social service agencies and legislators. A national electronic mailing list has also been established through the consumer economics office.

The materials are being used in a number of counties to leverage funding from other community agencies. Examples of this include a special project in Sacramento County with the County of Sacramento and another such project in Contra Costa County where the materials are being used to expand the outreach of the Food Stamp Nutrition Education Program.

Three statewide Gateway trainings have been completed and numerous county level training sessions have been held. In Solano County, for example, weekly life skills classes are conducted with a community coalition at the county's largest food pantry. Kern County has trained extenders from several social service agencies to use the materials.

The complete Gateway curriculum has been purchased on CD by Cooperative Extension offices in six states. Many of these states adapted the materials for use in their state. Training and evaluation are currently being conducted in many of these locations.

In addition to the CD, several hundred copies of the curriculum have sold in California as well as to several other states. Arizona and Louisiana bought copies for all counties in their states and are implementing the program statewide. DANR Publications continued to sell the materials.

The American Express Foundation has recognized one section of the curriculum, "Making Every Dollar Count," as eligible for other grantors to use to implement the curriculum in limited resource areas. As a result, organizations throughout the United States are now using this curriculum.

Source of Federal Funds: Smith Lever 3 b&c

Scope of Impact: California and nationwide

**CASE STUDY: BEST PRACTICES FOR OUTCOMES ASSESSMENT IN
COMMUNITY ECONOMIC DEVELOPMENT**

Key Theme: Community Development

Background/Problem Statement

In today's results-oriented environment project developers face demands from both private and government funders for more rigorous assessments of project outcomes—not just how money is spent, but what public value is achieved. Common sense suggests that project developers and

University of California
FY 2000 Annual Report of Accomplishments and Results

other leaders should be clear about what they hope to achieve, and have ways of knowing the degree to which their intentions are realized. On the other hand, the work of implementing outcomes assessment places taxing new demands on local leaders and project developers and consumes vital resources that might otherwise be directed toward substantive goals. The existing studies that examine the implementation of “results accountability” by community based organizations raise serious questions about the practical utility of outcomes assessment, and the degree to which both grantors and grantees take it seriously as a means of disciplining programmatic decisions.

To examine the limits of outcomes assessment, and the conditions under which it might become useful to community economic development, California researchers and extension academics engaged in a research and extension project conducted between Fall 1998 and Spring 2000 on California’s north coast—an area moving from timber dependency toward more diversified economic development. The project, funded by a competitive grant (\$51,122) from the University of California Division of Agriculture and Natural Resources, involved AES researchers and CE Specialists at UC Davis working collaboratively with the Humboldt County UC Cooperative Extension office, and the Center for Environmental Economic Development in Arcata. A local steering committee made up of project developers spent many hours with the research team sharing their project ideas, trying out different assessment approaches, and providing honest feedback on what worked and what didn’t.

Methods and Activities

Three primary methods were used. First, the group worked closely with a diverse set of project developers (e.g. agriculture, forestry, textiles, tourism) as they prepared project descriptions based on a “program logic model” that specifies outcomes and indicators. The group wanted to learn what outcomes the project developers thought their projects were trying to achieve, and what kinds of indicators they believed would let them know how they were doing. Second, a search was conducted on community indicators literature and related websites and a list of 51 community economic development indicators currently in use was developed. The group then surveyed a group of north coast funders and decision makers, asking them to rate the indicators according to their importance and understandability. Third, a focus group of community decision-makers and project funders was convened to get their feedback on different modes of presenting project information in written form, their explanations for the way indicators on the survey were rated, and their thoughts about the link between project-level indicators and community-wide indicators.

A fundamental paradox with far-reaching implications was discovered. Few nonprofit projects are of sufficient scope that they can reasonably be held accountable for changing community-wide indicators. On the other hand, the project-level outcomes for which they can be held accountable are typically so narrow that the public has no compelling accountability interest. Thus, a great chasm exists between the project-level indicators funders are asking project developers to produce and the community-wide indicators that the public cares about.

University of California
FY 2000 Annual Report of Accomplishments and Results

Through one-on-one technical assistance, community meetings, a survey and focus group, the project:

- developed and tested an education model for building community coalitions focused on community economic development
- evaluated existing outcomes assessment methods in community economic development and identified “good practices”

Publications

- A working paper, *The Promise and Limits of Outcomes Assessment in Community Economic Development* (Campbell, Giraud, Ihara, Wright; May 2000);
- An academic paper, *Outcomes Assessment and the Paradox of Nonprofit Accountability* (Campbell; September 2000; presented at the meeting of the Association for Research on Nonprofit Organizations and Voluntary Action, November 16-18, 2000; submitted to *Nonprofit Management and Leadership*).

Workshops

- A Community Economic Development workshop held November 12, 1999 in Arcata attended by over 20 community leaders.
- An outcomes assessment workshop, “The Role of County Directors as Mentor in Collaborative Efforts: Results Accountability,” held at the County and Statewide Programs Leadership Conference, San Diego, April 11, 2000.
- A poster presentation, “The Promise and Limits of Outcomes Assessment in Community Economic Development,” at the Second National Extension Natural Resources Conference, South Lake Tahoe, May 16-18, 2000. A workshop on outcomes assessment conducted for the Personnel and Organizational Development Committee of ECOP on January 17, 2000.

Impacts

- a stronger and more effective community economic development coalition was established in the north coast region
- replicable knowledge about best practices in community economic development was created and disseminated

Community Impacts

Community participants reported a number of immediately useful outcomes including:

- Newly shared terminology which aids communication and collaboration among local participants, fortifying coalition-building efforts in the region.
- The Humboldt Economic Development Forum has drawn on this project to translate their already identified economic principles into measurable outcomes
- A Forest Service representative charged with the task of introducing outcomes assessment in the Humboldt region reported that her job has been made easier by this project

University of California
FY 2000 Annual Report of Accomplishments and Results

- One participant has used the United Way distinction between outputs and outcomes to improve her grant writing class for local residents.
- Project developers noted that the thought process required to identify outcomes is helping their decision-making: “Now when I am determining whether to take on a new project I find myself asking whether the activity will bring a meaningful result.”
- Agreement that the real issue is the need for accountability strategies and processes that connect the project and community level in ways that promote incremental achievements, ongoing learning, and clarity about future choices. While these strategies can and should draw on rigorously specified indicators of outcomes, their primary challenge is to improve the exercise of public judgment within complex organizational networks.

SECTION B. STAKEHOLDER INPUT PROCESS

The University of California Division of Agriculture and Natural Resources (UC DANR) 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.

Program Planning Advisory Committees (PPACs)

These committees are comprised of forty-five Division members representative of the diversity of UC DANR disciplines and program areas, from all Division-affiliated campuses and from county offices throughout the state. The specific charge of the PPACs is to identify and prioritize statewide programmatic issues annually, to develop three-to-five year Division-wide research and extension goals that address high priority issues, and to recommend approaches and methods for attaining those goals. Fifteen individuals serve on each of three subject area committees, Agricultural Resources, Human Resources and Natural Resources, that are charged with recommending Division-wide program priorities within their respective subject areas. The PPAC members consult with their UC DANR colleagues as they review and revise the Division's program priorities and make recommendations on actions and approaches to achieve the goals. In addition, the members seek the input of external stakeholders, both formally through circulation of the PPAC's issues statements and informally through meetings, consultations, and other activities. The input from both internal and external stakeholders is then considered as the PPAC members determine the program priorities for the Division.

Formal advisory groups

The President of the University recently initiated and 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 meet twice a year to provide input. The Vice President - Agriculture and Natural Resources participates as a member of this Commission and brings the Commission's advice to the 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.

University of California
FY 2000 Annual Report of Accomplishments and Results

Commodity Organizations/Marketing Order Boards

Members of these organizations provide annual input on research and extension needs for their commodities to UC DANR 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 meets with the Vice President and offers specific recommendations on program planning and funding issues.

UC DANR Workgroups

Program workgroups provide grassroots leadership for statewide program development by bringing together AES scientists, CE advisors, CE specialists, and non-DANR partners, cooperators and clientele to work on emerging and continuing issues in Division program areas. Non-DANR participants are 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. The involvement of external stakeholders in the workgroups ensures that real world needs are brought to the attention of University scientists and extension specialists and advisors as programs are planned and implemented. There were 59 Divisionwide workgroups involving over 400 external stakeholders in their program planning process and workgroup activities and projects.

University of California
FY 2000 Annual Report of Accomplishments and Results

SECTION C. PROGRAM REVIEW PROCESS

There has been no significant changes to the California program review processes since our Plan of Work Update, submitted in July 2000.

SECTION D. EVALUATION OF SUCCESS OF MULTI AND JOINT ACTIVITIES

California's research and extension professionals planned and delivered programs that addressed the critical issues facing the state in the areas of agriculture, natural resources and human resources by pooling the expertise of California AES and CE academics, by collaborating with colleagues in other institutions, agencies, and states, and by consulting with the external stakeholders. Critical issues such as the invasive pests threatening the food supply, the implementation of Welfare Reform and its effect on families and communities, water quality and water quantity issues have been addressed by teams of AES faculty, advisors and specialists across disciplines and subject matter expertise.

The planned programs achieved many of the performance goals as described in Section A by the case study examples. In addition, the needs of under-served or under-represented groups were considered and addressed. The anemia study that will provide strategies to lower the occurrence of iron deficiency anemia in the low income Latino population is one example. Due to the late implementation of the new program reporting system, there is not complete information to document all of the outcomes and impacts of California's planned programs. However, it is anticipated that more complete information in succeeding annual reports will fully document California programs that address the needs of California's diverse population.

The collaborative teams addressing the Pierce's Disease/Glassy-winged sharpshooter threat is an example of improved program effectiveness/efficiency as statewide teams were formed, drawing on the research and extension expertise available throughout the state and the nation to work together on this problem. The DANR workgroups are another example of improved program effectiveness as workgroups are formed around statewide issues and the membership is composed of research and extension professionals from the three campuses and 50 county offices as well as the affected stakeholders. This prevents duplication of effort and ensures that the most complete body of knowledge and expertise is available to address the issues by including all those with expertise in relevant areas.

The multistate extension activities described in the following section are a small sample of the multistate work of California extension advisors and specialists. Collaborating on topics that cross state boundaries such as invasive pests, youth development issues, and varietal development draws together a wider spectrum of expertise and allows for a greater number of stakeholders to be served.

SECTION E. MULTISTATE EXTENSION ACTIVITIES

California Cooperative Extension advisors and specialists collaborated with colleagues in other states on the following activities.

AGRICULTURAL RESOURCES

- **Beltwide Root Health Study:** California Extension advisors worked with their colleagues at Mississippi State University, Louisiana State University, and Texas A&M to quantify and demonstrate the impact of a healthy root system on yield, earliness and fiber quality; and to develop cost-effective recommendations for healthy stand establishment that will enhance grow-off and performance of a cotton crop. Updates on the study were published in the Beltwide Cotton Production Proceedings.
- **Uniform Harvest Aid Performance and Fiber Quality Evaluation, Cotton Defoliation Work Group:** California Extension advisors worked with their colleagues to develop effective, contemporary harvest aid recommendations that contribute to harvest efficiency and high quality fiber and to evaluate performance of harvest aid treatments to biotic and environmental factors. The cooperating institutions are: Mississippi State University, University of Oklahoma, Texas A&M University, Auburn University, Alabama, University of Tennessee, and the University of North Carolina. The recommendations are published in the publication, Cotton Harvest Management: Use and Influence of Harvest Aids. No. 5, The Cotton Foundation Reference Book Series. (In Press), Extension Newsletter, and Beltwide Cotton Production Conference Proceedings.
- **Cotton Insect Loss Committee:** The committee is part of the Insect Control and Research Conference of the Beltwide Conferences. The committee documents the crop losses caused by insects. These reports have been made since 1979 and provide a valuable tool for following shifts in pest importance over the years. California advisors provide the estimate of California losses, developed in collaboration with the California State Cotton Workgroup, at its annual planning meeting. The cooperating institutions are: Auburn University, University Arkansas , Arizona State University, University of Florida, University of Georgia , Louisiana State University, Mississippi State University, University of Missouri, New Mexico State University, North Carolina State University, Clemson University, University of Tennessee, Texas A&M University ,Virginia Polytechnic Institute. The information is published in the Annual Report of the Proceedings of the Beltwide Conference.
- **Sweet Potato Variety Testing:** Since California does not have a sweet potato breeder, advisors collaborated with states that do have breeders, Louisiana, North Carolina, Virginia, Texas, Alabama, Arkansas, Mississippi, South Carolina, and Florida, and test their varieties in California.
- **World Sweetpotato Virus Decline Study:** Advisors worked with Louisiana State University in Baton Rouge researchers as well as researchers at the International Potato Institute in

University of California
FY 2000 Annual Report of Accomplishments and Results

Lima, Peru, to test six cultivars selected from various countries for their resistance to viruses. Six cultivars are planted in six different locations in California's sweetpotato growing region. The objective is to find some genetic material that is resistant to viruses that attack the California sweet potato crops.

- **Spinach Downy Mildew:** A California advisor collaborated with his counterpart at the University of Arkansas to identify new strains of the spinach downy mildew in California. Results of the project were shared with the California spinach industry at two meetings. An abstract of the project was published in *Phytopathology* and a plant disease paper is being prepared.
- **California/Oregon Cattle College, pilot project:** In 1999, a California advisor organized a very successful Cattle College short course. The course consisted of six three-hour long sessions and used the multi-state produced *Cow/calf Management Guide* and *Cattle Producer's Library* three-ringed binder as a text. This was a pilot course that used only Advisors from the North Coast of California and Oregon. Thirty ranchers from Mendocino and Lake Counties attended. It was a good test case for cross-state programing. The course was repeated in Coos County Oregon in April and May of 2000. The collaborating institution was Oregon State University. Given that this was the first attempt at this type of cross-state collaboration and it was viewed as a successful effort, the participants are talking about future collaboration on both research and joint publications for the North Coast Region of California and Oregon.
- **Oregon Grazing Conference:** This conference was organized by the Coos/Curry County Livestock Agent from Oregon State University. A California advisor presented a talk for this program on the Economics of High Density Short Duration Grazing. The proceedings of the Conference, Oregon Grazing Conference II, include the California advisor's presentation.
- **California, Oregon, Idaho, and Nevada (C.O.I.N.) :** California, Oregon, Idaho and Nevada Email Listserver was developed several years ago to foster communication between Livestock Advisors, County Agents and Extension Specialists. Service call questions are posted to this server and all on the list can reply. This has provided a powerful resource for agents/advisors to coordinate joint projects, problem solve, and share research data. It is an outstanding example of cross-state collaboration and continues to be a useful forum. In addition, each year a COIN sponsored in-service training meeting, usually two to three days in length is hosted on a rotating basis by one of the participating states. Advisors, County Agents and Specialists from the collaborating states share results of research and extension programs during this meeting, combining classroom and field activities. Joint research and educational activities are planned at these meetings.

Last year the group published 10,000 copies of the "COIN Beef Book - Sustainable Beef Production in the West". It is a reference of frequently used information in beef production. Specialists and Advisors/Agents from all four states comprised a committee that collected

University of California
FY 2000 Annual Report of Accomplishments and Results

and edited the data. The previous year, the group published and distributed 7,000 copies of a rancher's handbooks in all four states.

- **Low Desert Collaborative Projects:** A California Advisor is working with his colleagues at the University of Arizona on three projects concerning low desert agriculture.

Optimization of Water and N application efficiency for Surface Irrigated

Production Systems: This collaborative research project is aimed at conducting field experiments to develop a data base for the calibration and validation of surface hydraulics and chemical transport models. Such models can be used to develop improved management guidelines for nitrogen-fertigation systems in the low desert of Southwestern United States.

Evaluation of Methodology for Estimating Irrigation Time as Influenced by Soil

Texture and Spatial and Temporal Variability: This project is largely associated with furrow irrigation on fine to medium textured alluvial soils used for vegetable production in the low desert and aimed evaluation of the utility of generalized irrigation design and management criteria at different sites and across time.

Efficient Irrigation for Reduced Non-point Source Pollution from Low Desert

Vegetables: This research project aimed at developing irrigation scheduling technologies for drip and furrow irrigated melons and lettuce. Findings were presented and published in the CDFA-FREP Conference proceedings, 1999.

- **UC Guide to Solving Garden and Landscape Problems :** The CD-ROM was developed for Master Gardeners, horticultural advisors, landscape professionals and home gardeners to use to help diagnose and manage pest problems in the landscape. The emphasis is on least toxic pest management methods. California Advisors worked with Extension agents at Oregon State University and Washington State University to develop this CD with a grant from the Western Region IPM Grants through USDA. The CD-ROM was just about completed by the beginning of 2000 and released for sale in April 2000. It is now being used in all University of California Master Gardener offices as a resource.
- **Improving the Effectiveness of Livestock Distribution Practices in Grazed Watersheds:** California Advisors and Specialists worked with their Oregon State Extension colleagues on this study is to improve the ability to attract livestock away from riparian zones and other critical areas by more precisely defining how cattle use range landscapes and then modifying their behavior by manipulating the location of landscape attractants. This study involves the interactions of the animal and range forage production system, water quality and habitat values. The field study was conducted at the San Joaquin Experimental Range in Madera County. Landscape analysis is being conducted in the GIS laboratory in the Rangeland Resource Department at Oregon State University. Research and extension education publications will be the product of this research. A new study collaborating with this same

University of California
FY 2000 Annual Report of Accomplishments and Results

group is under development in Lassen County, California. Poster and Oral presentations at Society for Range Management Meetings.

- **Distribution of manure in a grazed watershed:** The objective of this study is to estimate the distribution of manure in a grazed watershed. California Advisors and Specialists worked with Oregon State University Extension personnel on this project. One research paper has been accepted by the Journal of Range Management. Several extension presentations have been presented in California, Oregon and Nevada.

HUMAN RESOURCES

- **Rural Low Income Families: Tracking Their Well Being and Function in the Context of Welfare Reform plan (Multistate Project NC-223):** A California Nutrition, Family and Consumer Sciences Advisor is working with colleagues in Colorado, Idaho, Indiana, Kentucky, Louisiana, Minnesota, Missouri, Massachusetts, Michigan, Nebraska, New Hampshire, Ohio, Oregon, Utah, and Wyoming on this Regional Research project documenting welfare reform impacts from the perspective of rural family members to provide insights to agencies and policy makers as they adjust welfare reform to enhance and change rural family functioning within their rural communities.
- **Multicultural Workshops:** A California Nutrition, Family and Consumer Sciences Advisor presented workshops on Nutrition for Latinos, Assessing Your Cultural Knowledge, and Developing a Program for Culturally Diverse Populations at Kansas State University.

NATURAL RESOURCES

- **Living on the Land– Stewardship for Small Acreages:** Land stewardship issues and the implication of this clientele group's management practices are of growing importance to natural resources as more people are settling on small acreage properties bordering urban areas. A California Advisor worked with her University of Nevada colleague on a two year multi-state project to develop curriculum for “Living on the Land: Stewardship for Small Acreages.” The workshop curriculum targets agriculture and natural resource educators and provides guidance and materials that will enable the participants to successfully develop and deliver a program to the clientele in their local areas. The first conference will be held in October 2-3, 2001.

SECTION F. INTEGRATED RESEARCH AND EXTENSION ACTIVITIES

Cooperative Extension (CE) and the Agricultural Experiment Station (AES) in California are administered by a single authority, the Vice President for Agriculture and Natural Resources, University of California. In his dual role as CE Director and AES Director, the Vice President ensured integration of *all* research and extension activities, including all activities supported by Hatch and Smith-Lever 3(b)(1) and (c) funds.

California AES and CE programs were planned and conducted so as to form a seamless continuum from creation and development of new knowledge to the dissemination and application of that new knowledge. Research and extension programs were coordinated at a statewide level by four Program Leaders - Agricultural Policy and Pest Management, Agricultural Productivity, Human Resources, and Natural Resources - who promoted the integration of research and extension goals and activities across and within AES and CE.

The Program Leaders had oversight of a network of “workgroups,” each of which brought together AES and CE personnel collaboratively as they planned and coordinated research and extension programs in a particular high priority program area. Workgroups also included clientele and other external stakeholders as appropriate. Through the workgroups, research goals were developed that addressed practical information needs and mesh with outreach and educational capabilities. Likewise, extension goals were defined in keeping with the available and anticipated stream of research findings.

In addition, many campus-based faculty held joint appointments in CE and AES, thus fully integrating the research and extension functions. The growing number of these appointments ensures that the research generated on campuses has the natural conduit to the CE counterparts in the counties and most importantly, to the end user clientele.

Thus, California AES and CE were fully integrated administratively and programmatically, thereby ensuring that all major programs included both a research and extension component, planned and delivered as a unified whole.