

UNIVERSITY OF CALIFORNIA
Sustainable Agriculture
Research and Education Program

www.sarep.ucdavis.edu

Ensuring the Long-Term Viability of California Agriculture through Research and Education

UC SAREP

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California farmers and ranchers face a tremendous challenge as stewards of the state's land resource. As producers of a wide array of high-quality agricultural commodities, valued at \$28 billion in 1998, California farmers are expected to sustain high productivity with minimal environmental impact. However, observers of the environmental and social conditions of agriculture and food systems in California are concerned with the sustainability of these systems. High urban growth rates have led to increased competition for the land, water and air resources necessary for production agriculture. Consumers are increasingly concerned about food security issues and are demanding roles in shaping sustainable food and agricultural systems. Farmers face increasing restrictions and prohibition of farming practices considered commonplace even five years ago. At the same time, production costs are rising and many commodity prices continue to be at low levels.

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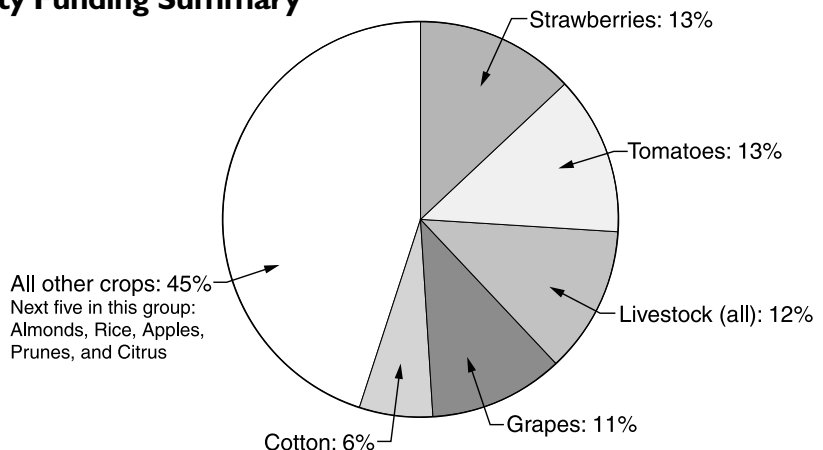
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One of SAREP's major goals is to help the state's farmers and ranchers manage their land and businesses in ways that are profitable and protect the environment. The program does that through two means: 1) funding research and education projects that address critical needs and problems in our agricultural systems, and 2) developing and extending information on sustainable farming and ranching practices.

COMPETITIVE GRANTS PROGRAM

SAREP has held closely to its mandate to support research and extension efforts relevant to the state's farmers and ranchers. From 1987 to 1999, SAREP funded 100 projects related to crop or livestock production, for a total of \$6 million (Research and Education/Crop/Livestock, BIFS, Methyl Bromide). These projects address issues, problems, and opportunities in a variety of production systems across the state. The top five commodities addressed through our grants from 1987 to 1999 are shown in the following chart.

SAREP Ag Production Grants Commodity Funding Summary 1987-1999



With SAREP's emphasis on sustainability and environmental quality, many of the projects supported look specifically at the dynamics of organic production systems. An analysis of all agricultural production and community development and public policy grants funded from 1987 to 1999 shows that 20 percent of the funds went to projects with direct relevance to organic farming and food systems. Another 62 percent was awarded to projects dealing with materials and practices that could be applicable to or adapted to organic systems.

Projects for the current reporting period (1997-1999) include both basic research as well as projects geared toward the application of new techniques (see SAREP Funded Projects below). Major project categories include soil management, pest management, livestock and dairy production, and cropping systems. The Biologically Integrated Cropping Systems (BIFS) grants program is covered in a separate brochure.

In 1999, SAREP launched a special grants program targeting alternatives to methyl bromide. Methyl bromide has been identified as an ozone-depleting substance, and the U.S. Environmental Protection Agency has prohibited the production and importation of methyl bromide starting January 1, 2005. Although several potential chemical and non-chemical alternatives to methyl bromide have been identified, none have been adequately evaluated for their effectiveness within California farming systems. SAREP is supporting six new biologically based projects aimed at filling that information gap and helping producers prepare for the changes ahead.

Grants for Graduate Students and Educational Events

In addition to grants for production-oriented research, SAREP also provides grants for graduate student research and for educational events.

Sustainable Agriculture Graduate Awards

The Sustainable Agriculture Graduate Awards (SAGA) complement existing graduate support funds within the university and help graduate students address critical issues facing agricultural producers and society. In FY 1997/98 and 1998/99, nine graduate students were awarded a total of \$17,925 for sustainable agriculture projects. A list of the SAGA grants funded in this reporting period appears later in this publication.

Educational Events

In FY 1997/98 and 1998/99, SAREP supported 56 educational events by providing a total of \$35,591 in grants to Cooperative Extension personnel and non-profit educational organizations. Grants of \$1,000 maximum per event support workshops, field days, conferences and other educational activities addressing sustainable farming and ranching and community economic development. Final reports from 1998 show that more than 1,000 individuals participated in the events funded that year. A list of the educational events funded in FY 1997/98 and 1998/99 appears in this publication.

SAREP FUNDED PROJECTS

Projects funded in 1999 are summarized below. Individual fact sheets for projects funded in previous years are available at the SAREP Web site at www.sarep.ucdavis.edu.

1999

Alternatives to Methyl Bromide

■ **Cultural Control and Etiology of Replant Disorder of *Prunus* spp.**, Greg Browne, \$150,638 (3 years)

Pre-plant applications of methyl bromide (MeBr) are used extensively for control of replant problems on *Prunus* spp. in California. This project will directly concern orchard replacement strategies for almonds, nectarines, peaches, plums, and prunes. The research will attempt to reduce dependence on MeBr by determining possible contributions of pre-plant fallow periods and cover crops to replant disorder (RD) control, by determining the level of specificity of RD between two types of crops that may follow each other on large acreages—*Prunus* spp. and *Vitis* spp.—and by elucidating underlying causes of RD.

■ **Microbiological Improvement of Root Health, Growth, and Yield of Strawberry**, John Duniway, \$118,780 (3 years)

The objective of this research is to find and effectively deploy microorganisms to improve root health, growth, and yield of strawberry plants without soil fumigation or with less than optimum soil fumigation treatments. This project's approach is to use microorganisms growing in fumigated soils in California which promote growth of strawberry plants in the greenhouse, to inoculate transplants and plants grown for berry production in the field. Methods of field application will be researched and resulting growth and yield responses of strawberry measured relative to those obtained by conventional farming practices with and without fumigation.

■ **Development of Grape Rootstocks with Multiple Nematode Resistance**, Howard Ferris, \$100,744 (3 years)

The phase-out of methyl bromide will present California grape growers with a critical problem: lack of suitable rootstocks with nematode resistance. This problem will be particularly severe where new vineyards are replanted over a previous vineyard. This research will accelerate the development of grape rootstocks with resistance to a broad range of nematode species and aggressive strains. The project will also provide the grape rootstock breeding program with data on nematode resistance to help produce better crosses.

■ **Containerized Strawberry Transplants as a Replacement for Methyl Bromide Soil Fumigation in California Strawberry Nurseries**, Kirk Larson, \$107,969 (3 years)

Strawberry nurseries currently fumigate with mixtures of methyl bromide (MeBr) and chloropicrin (CP) to ensure the production of pathogen- and nematode-free transplants. The impending ban on MeBr requires that alternative technologies be developed for continued production of quality strawberry transplants. The use of containerized transplants produced in disease-free, soil-less media would eliminate the need for nursery soil fumigation. This research will determine suitable methods for propagating and conditioning containerized strawberry plants (plugs) and determine plug performance in California's strawberry production regions.

■ **Alternatives to Methyl Bromide for Control of Soil Borne Fungi, Bacteria and Weeds in Coastal Ornamental Crops**, James MacDonald, \$76,228 (3 years)

Non-chemical alternatives to methyl bromide for field-grown ornamentals (cut flowers, bulbs and greens) grown in the coastal regions of California will be researched. Solarization will be combined with the addition of organic amendments to stimulate the phenomenon of biofumigation. The project will focus on the soil-borne fungus *Fusarium oxysporum*, the soil-borne bacterium *Erwinia carotovora* and several weed species as representative of the pathogens and pests that need to be controlled.

■ **Acetaldehyde and Carbon Dioxide Fumigation for Postharvest Control of Insects on Strawberry Fruit**, Elizabeth Mitcham, \$75,986 (2 years)

This project will explore fumigation with acetaldehyde and carbon dioxide as an alternative to methyl bromide for postharvest insect and mite control in strawberries. Two-spotted spider mites and western flower thrips will be exposed to 0.5 to 2.5 percent acetaldehyde alone and with 20 to 50 percent carbon dioxide in the laboratory. Mortality of insects and fruit quality will be monitored.

Production Agriculture Research and Education

■ **Quantifying Pest and Beneficial Insects Associated with Insectary Hedgerow Plantings**, Rachael Long, \$7,000 (1 year)

California farmers are planting hedgerows of insectary plants around their farms to attract beneficial insects for better biocontrol of pests in adjacent crops. Little information exists, however, on the types of insects attracted to hedgerow plants, including both pest and beneficial insects and whether hedgerows serve as an overwintering site for pests such as stinkbugs. This project aims to quantify the diversity, abundance, and distribution of pest and beneficial insects in hedgerow plantings.

■ **Conservation Tillage Systems for the San Joaquin Valley's West Side**, Jeff Mitchell, \$38,322 (3 years)

Currently, preplant tillage operations account for about 18 to 24 percent of overall production costs for annual crops grown in the West Side of the San Joaquin Valley (SJV). This research and extension project will compare conservation tillage and conventional tillage practices in crop rotations common to the SJV West Side in terms of productivity, key soil properties, pest and crop management requirements, and production costs. Information related to the background, goals and outcomes of this study will be widely disseminated.

1998

■ **Impact of Dairy Waste and Crop Nutrient Management of Shallow Groundwater Quality**, Thomas Harter, \$44,000 (3 years)

■ **Effects of Cover Crops on a Vineyard Ecosystem in the Northern San Joaquin Valley**, Chuck Ingels, \$18,272 (3 years)

■ **Use of Dairy Lagoon Water in Production of Forage Crops**, Marsha Campbell Mathews, \$46,210 (3 years)

■ **Native Grass Species for Use as Perennial Cover Crops in Central Valley Vineyards**, Michael Costello, \$15,000 (1 year)

■ **Defining Changes in Soil Organic Matter Quality During the Transition from Conventional to Low Input Organic Systems to Identify Sustainable Farming Practices**, William Horwath, \$46,722 (2 years)

■ **A Grower-Managed Biorational Management Program for Artichokes on the Northern Central California Coast**, Mohamed Bari, \$43,057 (2 years)

1996

- **Alternate Side Irrigation to Control Root Rot in Avocados**, Gary Bender, \$10,000 (1 year)
- **Development of a N-Fertilizer Recommendation Model to Improve N-Use Efficiency and to Alleviate Nitrate Pollution to Ground Water from Almond Orchards**, Patrick Brown, \$30,000 (3 years)
- **The Impact of a Sustainable Agricultural Practice with Grapes on Pesticide Use in California**, Lynn Epstein, \$8,573 (1 year)
- **History of Grazing on the Shasta-Trinity National Forest: Implications for the Future**, Larry Forero, \$5,919 (1 year)
- **The Contribution of Ranch Roads, Cattle Trails and Bed Load to the Sediment Budget for a Grazed Watershed in the Central Sierra Foothills**, Melvin George, \$23,508 (3 years)
- **Do Soils Suppressive of Phylloxera Exist?**, Jeffrey Granett, \$8,287 (1 year)
- **Role of the Soil Microbial Community in Suppression of Rhizoctonia Stem Rot Disease of Cauliflower**, Joseph Hancock, \$18,400 (2 years)
- **Farming, Agriculture and Resource Management for Sustainability (FARMS)**, Rich Engel, \$15,000 (1 year)
- **Environmental Fate and Characterization of Selenium Supplemented to Intensively Grazed Beef Cattle**, John Maas, \$27,100 (2 years)
- **Use of Cover Crop Mulches in Processing Tomato Production Systems**, Jeff Mitchell, \$8,800 (2 years)

1995

- **Controlled Grazing on Foothill Rangelands**, Roger Ingram, \$48,400 (3 years)
- **Assessing the Environmental Risk from Rangeland Cattle Shedding *Cryptosporidium parvum* in Their Feces**, Rob Atwill, \$7,946 (2 years)
- **Ecology of a Group of Generalist Predators, The Green Lacewings, and their Contribution to Biological Control in Almonds and Walnuts**, Jay Rosenheim, \$24,000 (3 years)
- **Alternative Postharvest Treatments for Decay and Insect Control**, Marita Cantwell, \$48,405 (3 years)
- **Fostering the Transition Toward Balanced Predator/Prey Mite Populations in Vineyards Using Narrow Range Summer Oil**, Michael Costello, \$16,250 (2 years)

1994

- **Suppression of Plant-Parasitic Nematodes in Conventional and Organic Farming Systems**, Bruce Jaffee, \$19,155 (3 years)

1988

- **Evaluating the Transition from Conventional to More Sustainable and Organic Farming Systems in the Sacramento Valley**, Steven Temple, \$455,626 (10 years)

COLLABORATIVE RESEARCH AND EXTENSION ACTIVITIES

SAREP works with a variety of organizations and groups within and outside the University of California to educate producers, extension professionals, public policy makers and others about sustainable farming and ranching practices. SAREP staff have put a high priority on working collaboratively with colleagues in the UC Division of Agriculture and Natural Resources as well as farmers, community organizations, and government agencies, to address issues of the sustainability of California's agriculture. These outreach efforts complement and extend SAREP-funded research projects. Activities during the last two years include the following:

Central Coast Farming Systems Research and Extension Program

In cooperation with the University of California, Santa Cruz Center for Agroecology and Sustainable Food Systems, SAREP staff are actively involved in research and extension activities in the Central Coast region. These projects are designed to 1) provide successful reduced-risk and organic farming principles to organic, transitional and conventional farmers considering conversion to sustainable practices and/or production for certified organic markets, and 2) demonstrate the on-going agronomic and economic feasibility of these new production technologies in an on-farm, whole-systems research approach. Practices promoted by the program include: release of insectary-reared natural enemies, conservation of native natural enemies, "farmscaping" for the support of biological control agents, and intensive monitoring and threshold-based decision-making to reduce pesticide applications. Staff-led research includes farm-level conversion from conventional to organic production systems (apples and cotton), biological control and non-crop farm-scape vegetation for pesticide use reduction (cotton and strawberries), codling moth mating disruption (apples), bio-intensive and organic production (strawberries), and a grower-managed reduced-risk key pest control program (artichokes).

Weather-Driven Plant Disease Risk Models

SAREP works with California PestCast, a project of the University of California Statewide Integrated Pest Management Project. PestCast is a regional weather network to support the development, validation and implementation of plant disease models. SAREP is working with PestCast support on the validation of several plant disease risk models. In addition, SAREP is leading the development of PestCast's disease model database on the World Wide Web. This database serves as a clearinghouse of information about models developed for economically important crop and turf diseases in California. A model is included in the database if it uses weather, host and/or pathogen data to predict risk of plant disease outbreak. Available at: http://www.ipm.ucdavis.edu/DISEASE/california_pestcast.html

California Environmental Regulations and Vineyard Development

With support from the California Association of Winegrape Growers, SAREP is developing a guide for California winegrape growers, describing important federal, state, and county regulations for vineyard development. The guide will identify necessary steps for complying with existing regulations and provide information on educational resources for growers, including publications and organizational contacts. General environmental issues to be addressed include erosion, hillside development, oak woodlands conservation, vernal pools and wetlands, riparian areas, water quality, air quality, habitat conservation, and endangered species.

Collaboration with Western Region USDA SARE Program

SAREP has maintained a strong connection over the past decade with its national counterpart, the U.S. Department of Agriculture's Sustainable Agriculture Research and Education (SARE) program, which is managed for the western states by the Western Region SARE program located at Utah State University. In December 1997, former SAREP Associate Director Jill Shore Auburn was selected to head the national SARE program in Washington D.C. SAREP Director Sean L. Swezey is chair of the USDA-SARE Western Coordinating Committee and program co-chair of the SARE 2000 conference to be held in Portland, Oregon in March 2000.

SAREP also houses Western SARE Communications Specialist Kristen Kelleher, who provides public information and outreach for the entire Western SARE program of research and education grants, Agriculture in Concert with the Environment grants (a partnership between USDA and U.S. Environmental Protection Agency), and the SARE Farmer/Rancher Research Grants.

Professional Development Program

With funding from the Western Region USDA-SARE Professional Development Program, SAREP has produced educational resources that advisors and Natural Resources Conservation Service (NRCS) field staff can use in working with their clientele around the state. Initial projects have focused on developing educational materials on cover cropping and soil quality (see Selected Resources and Publications at the end of this brochure). A new project funded in 1999 is aimed at providing educational opportunities for pest control advisors interested in learning more about sustainable agriculture and ecological pest management. SAREP is also providing small grants to support professional development activities that take place through UC workgroups and continuing conferences, and through NRCS channels. Grants funded in FY 1997/98 and 1998/99 included in-service educational activities and workgroups on a range of topics from pest management, cover crops, conservation tillage and soil management, biointensive mini-gardening, floriculture and nursery management, to livestock.

Sustainable Agriculture Educators

SAREP also recognizes the unique contributions of the many other teachers, instructors, and program managers involved in education related to sustainable agriculture. SAREP maintains a list of sustainable agriculture education programs in California (soon to be available on the Web) and works with many of them through grants and collaborative projects. For the last three years SAREP has hosted an annual sustainable agriculture educators meeting for faculty from the California State University System, community colleges, and the University of California. This group has about 30 members who teach a variety of courses related to sustainable agriculture or agricultural ecology. Members benefit through sharing of educational resources and curricula, and discussion of strategies for successful teaching and instruction.

GRANTS AWARDED FOR EDUCATIONAL EVENTS · FY 1998/99

- ◆ Sierra Cantor, Sotoyome Resource Conservation District, Sonoma/Marin counties, **FARMS (Farming, Agriculture and Resource Management for Sustainability)**, \$1,000
- ◆ Deborah Giraud, UCCE Humboldt County, **Community Food Security...Access for All**, \$900
- ◆ William Huber, Hyampom Valley Growers Association, **Marketing Your Agricultural Product**, \$947
- ◆ Chuck Ingels, UCCE Sacramento County, **Cover Cropping in Vineyards: Experimental Results and Species Demonstration**, \$500
- ◆ Roger Ingram, UCCE Placer/Nevada counties, **The California Grazing Academy**, \$1,000
- ◆ Stephanie Larson, UCCE Sonoma/Marin counties, **Balancing Agricultural Viability with State and Federal Water and Habitat Regulations**, \$1,000
- ◆ Richard Molinar, UCCE Fresno County, **Annual Strawberry Growers Meeting**, \$920
- ◆ Katy Pye, Yolo County Resource Conservation District, **"Bring Farm Edges Back to Life!" Field Day**, \$1000
- ◆ Judith Redmond, Community Alliance with Family Farmers, **Food Safety Issues and Their Importance to Small Farms; The Economics of Alternative Production Practices**, \$2,000
- ◆ Steve Schwartz, California FarmLink, **Maintaining Sustainable Communities Through Effective Use of Easements and Estate Planning**, \$1,000
- ◆ Lisa Woo Shanks, Foundation for the Advancement of Environmental Education, **Horses and Water Quality Protection: Outreach to the San Francisco Bay Horse Community**, \$1,000
- ◆ Rodney Tripp, California Section of the Society of Range Management, **California Range and Natural Resources Camp**, \$1000
- ◆ Sabrina Walker, Project YE'ES—Youth Economic Educational Sustainability, **"Digging Towards the Future": Youth Urban Agriculture Conference**, \$1,000
- ◆ Lynn Young, Committee for Sustainable Agriculture, **Five Sustainable Agriculture Conferences and Farm Tours: Best Management Practices for Strawberries, Cool-Season Vegetables, Field Crops, and Livestock and Dairy (2)**, \$2,500

GRANTS AWARDED FOR EDUCATIONAL EVENTS · FY 1997/98

- ◆ Andrea Sexton, Glenn County, **Glenn County Workshop Series** (8 events), \$4,000
- ◆ Bob Roan, Placer County, **PlacerGROWN Farm Conference**, \$1,000
- ◆ Chuck Ingels, UCCE Sacramento County, **Codling Moth Biology and Ecological Control**, \$1,000
- ◆ Dave Daley and Glenn Nader, CSU Chico, UCCE Sutter/Yuba counties, **Beef Day**, \$1,000
- ◆ Desmond Jolly, UCD Small Farm Center, **Agriculture and Ethics Symposium**, \$1,000
- ◆ Ernest White, Tehama County Resource Conservation District, **Introduction to Watershed Functions**, \$914
- ◆ Chuck Ingels, Bennie Fouche, UCCE Sacramento County, **Strawberry IPM for Southeast Asian Growers** (3 events), \$2,000
- ◆ Jean Saffell, Fresno Resource Conservation District, **Fresno County RCD Day**, \$1,000
- ◆ Lynn Young, Watsonville Committee for Sustainable Agriculture (CSA), **CSA Soil Fertility Conference** (6 events), \$3,000
- ◆ Mel George, UC Davis, **Annual Grassland Ecosystem Shortcourse**, \$1,000
- ◆ Pat Delwiche, CSU Chico, **Integrating Agriculture with Wildlife (I)**, \$960
- ◆ Paul Wills, Shasta/Trinity Counties, **Turning Dirt into Soil**, \$950
- ◆ Roger Ingram, UCCE Placer/Nevada counties, **California Grazing Academy**, \$1,000
- ◆ William Oswald, UC Berkeley, **Integrated Wastewater Ponding for Kehoe Dairy** (2 events), \$2,000

GRANTS AWARDED FOR SAGA · FY 1998/99

- ◆ Chris G. Campbell, UC Berkeley Environmental Science, Policy and Management, **Characterizing Solute Transport in Sloping Soils Using In Situ Measurements and Transfer Functions Modeling**, \$2,000
- ◆ Alison J. Eagle, UC Davis International Agricultural Development, **Nutrient Supply Power of Rice Soils Under Alternative Rice Straw Management Practices**, \$2,000
- ◆ Julie Guthman, UC Berkeley Geography, **Organic Regulation: Codifying Meaning, Structuring Opportunity**, \$2,000
- ◆ Donald W. Lotter, UC Davis Entomology, **Tests of Induced Resistance in Grapevine**, \$1,035
- ◆ Benjamin N. Shouse, UC Davis Ecology/Nematology, **The Place of Microbial Grazers in Reduced-Input Agriculture**, \$2,000

GRANTS AWARDED FOR SAGA · FY 1997/98

- ◆ Valerie Eviner, UC Berkeley Integrative Biology, **Understanding the Influence of Plant Species on Soil Nutrient Dynamics and Soil Properties in California Annual Grasslands**, \$2,000
- ◆ Cecilia Jones, UC Davis Plant Pathology, **Effect of Decomposition of Organic Amendments on the Rhizosphere Bacterial Communities and Suppression of Root Pathogens on Cotton**, \$2,000
- ◆ Andreas Westphal, UC Riverside Nematology, **Field Survey for Suppressiveness Against *Heterodera Schachtii***, \$2,000
- ◆ Annette Wszelaki, UC Davis Pomology, **Heat Treatments, Biological Controls and Controlled Atmospheres as Alternatives to Pesticides in Control of *Botrytis cinerea* in Postharvest Handling of Strawberries and Apples**, \$2,000

SELECTED RESOURCES AND PUBLICATIONS

How to Order

SAREP Publications

A complete list of all SAREP publications is available on the Web at www.sarep.ucdavis.edu.

Sustainable Agriculture. Three-times per year newsletter from SAREP. **Free** in U.S.; foreign subscribers are asked to make a donation of \$10.00 or more annually to cover postage. Available in print and on the SAREP Web site.

Exploring Eco Labeling for California Winegrapes: Conference Proceedings. Edited by Janet C. Broome, Clifford Ohmart, Angela Moskow, and Jennifer Waddel. 1999. Available on the SAREP Web site. Price: **Free**.

Soil Quality Topics: A Selection of Resources for Education and Extension. Edited by David Chaney and Ann Mayse. 1999. Price: **\$30.00**.

Cover Crops: Resources for Education and Extension. Edited by David Chaney and Ann Mayse. 1998. Price: **\$20.00**.

Sustainable Farming Systems: A Guide to the Transition. By Ann Mayse. 1997. Price: **\$6.50**.

DANR Publications

DANR publications can be ordered by phone, Fax, mail, or Internet directly from UC DANR Communication Services.

Organic Apple Production Manual. Edited by Sean L. Swezey, Paul Vossen, Janet Caprile, and Walt Bentley. Available March 2000. Publication 3403.

Cover Cropping in Vineyards: A Grower's Handbook. Edited by Chuck Ingels, Robert L. Bugg, Glenn McGourty, and Peter Christensen. 1998. Publication 3338. Price: **\$20.00**.

How to Find Agricultural Information on the Internet. By Mark Campidonica, edited by Jill Shore Auburn. 1997. Publication 3387. Price: **\$12.00**.

Related Publications

Enhancing Biological Control: Habitat Management to Promote Natural Enemies of Agricultural Pests. Edited by Charles H. Pickett and Robert L. Bugg. 1998. Price: **\$50.00**. Available from UC Press. Phone: (800) 777-4726; World Wide Web: <http://www.ucpress.edu>.

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