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From the Director

A Decade of Work, Communication

Welcome to the ninth volume of Sustainable Agriculture. Last September we celebrated the tenth anniversary of our program, which was established by the University of California in 1986 at the request of the California Legislature through Senator Nicholas Petris' Sustainable Agriculture Research and Education Act. Petris authored the Act in response to farmer, consumer and researcher concerns that California farming practices be more ecologically sound, economically profitable and socially responsible. When UC SAREP was established, we immediately set up the public and technical advisory committees identified in our founding legislation. One of their first requests was to begin a newsletter (on recycled paper!). In the fall of 1988 the first issue of Sustainable Agriculture News, a quarterly about the activities and projects funded by SAREP, was published. In 1990 we added a sister publication, Components, to provide more technical reviews and information. Two years later we merged the publications into Sustainable Agriculture, which we have published faithfully four times a year. We have received much positive feedback on the newsletter from the California agriculture community, and from readers throughout the country and the world. Our newsletter has chronicled the work of SAREP-in the last ten years we've awarded more than \$3.2 million to approximately 230 basic and applied research projects, community development and public policy projects, seminars and field demonstrations and graduate student awards. SAREP provided the seed money for the first long-term irrigated farmland study in a Mediterranean climate anywhere in the world. SAREP administers a second grant program (Biologically Integrated Farming Systems) to help farmers reduce their use of pesticides and synthetic fertilizer. This program is funded by the California Environmental Protection Agency's Department of Pesticide Regulation and the U.S. Environmental Protection Agency. Sustainable Agriculture was the first publication SAREP produced. Since that time we've published books and pamphlets, produced videos, created databases, and established our award-winning Web site which allows users to view information on SAREP-funded research and education projects, databases, and articles from the last eight years of quarterly newsletters. Because of the success of our other publications and of our Web site, we have decided to reduce the number of newsletters we produce. Our veteran quarterly becomes a three-times-a-year publication with this issue. We hope you enjoy the news and information inside, which includes summaries of the newest 31 grants SAREP has funded. You will notice that the Technical Reviews section has been reformatted. Additionally, we are including in this issue a four-page UC Cooperative Extension South Central Region/SAREP insert (following page 6) highlighting some of the sustainable agriculture work taking place in the South Central Region. We appreciate the collaboration with colleagues throughout the state. We've enjoyed being a

part of the greatest agricultural community in the world and look forward to the next ten years.-*Bill Liebhardt, director, University of California Sustainable Agriculture Research and Education Program.*

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SAREP Funds New Projects

by *Claudette Cervinka, guest writer*

Thirty-one research and education projects have been granted a total of \$267,535 by UC SAREP in the 1996-97 funding cycle, according to Bill Liebhardt, SAREP director. New projects were chosen in four areas: production, community development and public policy, educational events, and graduate student awards. Additionally nine continuing projects received \$81,539, bringing SAREP's total grant funding for 1996-97 to \$349,074. Brief descriptions of the new projects, principal investigators and amounts awarded for the first year follow.

Production Projects (12 projects; \$150,767)

Steven Temple, Extension Agronomist, Agronomy and Range Science, UC Davis, "The Transition from Conventional to Low-Input or Organic Farming Systems: Soil Biology, Soil Chemistry, Soil Physics, Energy Utilization, Economics and Risk": \$45,661 for first year in another four-year cycle. The Sustainable Agriculture Farming Systems (SAFS) project at UC Davis compares four farming systems with varying levels of dependence on external resources over a 12-year period. Changes in soil biology and fertility are becoming apparent. Steady-state conditions have not been reached in all systems, and soil fertility and other problems will require remedial management. Shifts have occurred in pest populations in the different farming systems, particularly in weed and soil pathogen communities. An eight-acre companion site for novel farming practices tests the reduction of non-renewable resource inputs. Outreach through field days and workshops and grower adoption of emerging technologies continue as primary objectives.

Richard Engel, Project Coordinator, California Foundation for Agriculture in the Classroom, "Farming, Agriculture and Resource Management for Sustainability (FARMS)": \$15,000. This project combines hands-on science, agriculture and education to provide a base for informed decision-making on agricultural issues for high school students. It will enhance their understanding of the role of agriculture, its social and economic significance and its relation to human health and the environment. Included will be student-teacher-farmer informational programs, workshops and farm stays as well as campus information on agriculture and environmental science careers. A partnership between private orchards, UC Davis, the California Foundation for Agriculture in the Classroom and the Yolo County Resource Conservation District, this project will be a model for developing outreach programs.

John Maas, Extension Veterinarian, Veterinary Medicine Extension, UC Davis, "Environmental Fate and Characterization of Selenium Supplemented to Intensively Grazed Beef Cattle": \$14,800 for first year. Selenium supplementation is necessary and widespread in livestock production, but there is also concern about the potential for environmental selenium

accumulation. There is a critical need for data charting the environmental fate of selenium supplemented to cattle. This project will quantify selenium concentrations in soils, plants and water in treated and control pastures.

Stephen Welter, Associate Professor and Entomologist, Insect Biology Division, Environmental Science, Policy and Management, UC Berkeley, "Impact of Border Companion Plants on Natural Enemy Performance in an Augmentative Biological Control Program in California Strawberries": \$13,187 for first year. The \$600 million California strawberry accounts for 75 percent of fresh strawberries consumed in the U.S. Two-thirds of the crop is grown on the Central Coast and in Santa Maria, where its primary pest is the native tarnished plant bug, *Lygus hesperus*. Current control strategies involve multiple applications of insecticides, including pyrethroids, which are disruptive to natural enemies of other strawberry pests. An alternative, more selective control strategy for the tarnished plant bug may include the use of its natural enemy *Anaphes iole*, a native egg parasitoid. Preliminary studies show a need to increase the effectiveness of the insects after release by studying their performance and biological constraints. The effectiveness of strawberry flowers and border companion plants as nectar sources will be examined as factors that enhance the establishment of resident insect populations of *Anaphes iole*. Researchers will conduct field trials in collaboration with conventional growers in the area. Comparisons will be made on the tarnished plant bug densities, fruit damage, parasitism levels and predator populations with and without bordering comparison plants. If successful, this program may help strawberry growers reduce the use of insecticides.

Gary Bender, San Diego County Farm Advisor, "Alternate Side Irrigation to Control Root Rot in Avocados": \$10,000. Phytophthora root rot has devastated thousands of acres of avocado trees in California. Chemical treatments are being withdrawn or are too expensive. This project will test the efficacy of using alternate side irrigation with and without mulch applications as part of an integrated pest management program to control root rot. Rather than watering the same part of the tree's root zone during each irrigation, irrigation water will be applied on alternating sides of each tree row. Alternating dry/wet cycles are expected to diminish the infection while allowing for feeder root development. The use of a series of control practices is expected to provide better disease control for longer time.

Patrick Brown, Associate Professor, Pomology, UC Davis, "Development of a N-Fertilizer Recommendation Model to Improve N-Use Efficiency and to Alleviate Nitrate Pollution to Ground Water from Almond Orchards": \$10,000 for first year. Fertilizer management advice for California orchard crops like almonds has depended on generalized recommendations. This may contribute to high nitrate levels in some California groundwater. A reliable tool for measuring tree N status will aid growers in using nitrogen efficiently. The goal of this study is to develop and test better tools for precision nitrogen measurement in the field (leaf nitrate analysis), determine seasonal as well as total nitrogen demands, and prepare a user-friendly computer program for growers so they can enter local variables and receive best management recommendations for N fertilization.

Joseph Hancock, Professor and Plant Pathologist, Environmental Science, Policy and Management, UC Berkeley, "Role of the Soil Microbial

Community in Suppression of Rhizoctonia Stem Rot Disease of Cauliflower": \$9,200 for first year. Fungicides are applied in the greenhouse plant production industries (ornamental and vegetable) to control soil borne plant pathogens. The intense cultural and management practices in these industries also lend themselves to integrated pest management programs that include the use of biologicals. This project should provide an improved means of selecting microbial biological control agents. Researchers will build on information from preliminary studies with Rhizoctonia solani suppressive soils identified in a field at the UC West Side Research and Extension Center. Microbes will be tested for their ability to suppress stem rot in a range of amended soils. Depending upon the results of this work, it may be possible to extend this method to other disease suppressive soils. A simple method of forecasting soil suppressiveness (and lack of it) to certain diseases could have very wide application in crop planning.

Jeffrey Granett, Professor, Entomology, UC Davis, "Do Soils Suppressive of Phylloxera Exist?": \$8,287. Grape phylloxera is one of the most serious pests of California vineyards, feeding on roots and allowing entry of secondary fungal rot organisms. No work has been done on the community ecology/natural enemy complex of the insect. This study will conclude whether there is potential for biological control of phylloxera by finding out if there are vineyard soils or management methods that suppress the pest.

Lynn Epstein, Associate Professor, Environmental Science, Policy and Management, UC Berkeley, "The Impact of a Sustainable Agricultural Practice with Grapes on Pesticide Use in California": \$8,573. Since the late 1980s, canopy leaf removal has been a sustainable, non-pesticidal means to control Botrytis bunch rot, an economically important grape fungal disease. By using the California Department of Pesticide Regulations' Pesticide Use Report database, the study will document changes in fungicide use on grapes between 1990 and 1995. This is the first time the impact of a sustainable alternative has been determined using actual pesticide use data. It will also estimate the extent to which leaf removal has become a standard practice, analyze comparative costs of leaf pruning versus fungicide application, and assess the reasons for success or impediments to further use of this sustainable practice.

Larry Forero, Shasta-Trinity Counties Livestock and Natural Resources Advisor, "History of Grazing on the Shasta-Trinity National Forest: Implications for the Future": \$5,919. This project was funded by SAREP in 1995-96 to reconstruct the history of grazing in the Shasta Trinity National Forest and determine the causes for the reduction of grazing in the area since the 1930s. Additional funding will complete the project with data from the National Archives. Allotment maps will be digitized and an interview instrument will be developed. This project will provide insight into how changes in access to federal forage areas translate to private sector land use and management decisions.

Melvin George, Extension Agronomist, Agronomy and Range Science, UC Davis, "The Contribution of Ranch Roads, Cattle Trails and Bed Load to the Sediment Budget for a Grazed Watershed in the Central Sierra Foothills": \$5,700 for first year. The sustainability of rangeland ecosystems depends upon owners' knowledge about their lands and the impacts of their livestock. Water quality is a high priority rangeland and livestock production issue;

livestock producers must assess nonpoint pollution sources on their ranches to show that voluntary compliance is a viable alternative to regulation. Current national and state watershed studies in a grazed watershed in Madera County have not measured sediment from dirt roads and cattle trails or bed load sediments in the stream channel. This project will measure those sediment budget components that are not currently being measured; existing funding will continue measurements begun two years ago of hill slope and streambank erosion, suspended sediment, flow and precipitation. The results of this project will be communicated to community and clientele groups by the Rangeland Watershed Program, which focuses on managing the rangeland forage crop and livestock in ways that support economic returns while reducing impacts on the resource base.

Jeff Mitchell, Extension Vegetable Crops Specialist, Kearney Agricultural Center, "Use of Cover Crop Mulches in Processing Tomato Production Systems": \$4,440 for first year. In recent years there has been a shift in land use on the West Side of the Central San Joaquin Valley. Thirty years ago more than 60 percent of the land was planted to wheat, barley and safflower. By 1994, however, this percentage had slipped to less than seven percent. Higher value crops, including many vegetables and cotton, are now common in West Side rotations. The increase in these high-value crops has led to fewer additions of organic matter to the soil, more aggressive tillage operations and a reported decline in soil quality. Preserving soil health and improving nutrient use efficiencies are compelling reasons for renewed interest among a number of farmers in more biologically based soil-building alternatives. This project will evaluate the effectiveness of surface organic mulches in no-till processing tomatoes for suppressing weeds without herbicides and providing nutrients, maintaining optimal soil temperatures, and increasing crop water use efficiencies. Companion cover crop trials for no-till techniques will also be included.

Community Development and Public Policy Projects (7 projects; \$99,303)

Adina Merenlender, Extension Specialist, Environmental Sciences, Policy and Management, UC Berkeley, "A Spatially Explicit Vineyard Model: Addressing Crop Production, Public Policy and Environmental Concerns": \$22,000 for first year. A team of UC research and extension personnel and members of the Sonoma County Grape Growers Association will develop a model to predict where new vineyards are likely to expand in the Russian River and Alexander valleys, and will evaluate their potential impact on oak woodlands and watersheds. Available digital information will be integrated to predict and test this model with recently established vineyards. First-year data collection on grape growing in the area will include grower interviews and a literature search.

Glenn Nader, Lassen County Livestock and Natural Resources Advisor, "Natural Beef: Consumer Acceptability, Market Development and Economics": \$14,948. A team of ranchers, California State University, Chico and UC Cooperative Extension researchers is developing more sustainable marketing alternatives for Northern California beef producers by evaluating

consumer acceptability of grass-fed natural beef, identifying the demographics of this potential market, determining its economic feasibility, and developing marketing plans for producers.

Carol Shennan, Associate Professor, Vegetable Crops, UC Davis, "Socio-Economic Analysis of Rotational Management of Wetlands and Cropland in the Tulelake Basin": \$14,440. This project is examining the merits and costs of managing agricultural lands and wetland reserves in the Tulelake Basin. It has previously received federal grants to study the impacts of wetland/cropland rotations on water use and quality, seasonal patterns of nutrient release, crop productivity, pest populations, and quality of wildlife habitat. SAREP funds will support interviews with farmers, farm advisors, hunters, environmentalists, agencies and local businesses, and the organization of information gathered into a better decision-making framework.

Yolanda Huang, Coordinator, Willard Greening Project, "Urban Food Project": \$18,225. The Willard Greening Project in the Berkeley Unified School District is joining forces with the Urban Gardening Project to expand inner city agriculture and make fresh, organic food available to low-income urban people using vacant and public lands. Homeless people will be trained in intensive farming methods and efficient market delivery systems will be developed. The food produced is for school use, the local farmers' market or for community lunch programs.

Andrew Fisher, Coordinator, Community Food Security Coalition, "Evaluating Farmers' Markets in Low Income Communities": \$9,540. Factors contributing to successful farmers' markets in low-income areas will be evaluated and case studies of inner city markets from across the country will be developed. Researchers will also examine existing information on failed or successful California markets and will identify public policies that affect the success of farmers' markets. Those involved with farmers' markets will be educated about the steps needed to make them successful.

Sibella Kraus, Center for Urban Education about Sustainable Agriculture, "Market Cooking for Kids: In-Season Cooking and Science for School Children": \$10,000. This project extends for a second year the successful hands-on cooking and science program developed for children at Oakland and San Francisco elementary schools. The focus is to help urban children understand the relationships between healthy, fresh food and regional sustainable agriculture. It involves collaboration among teachers, science educators, chefs, produce wholesalers and farmers. A primary goal is the production of A Young People's Reference Guide to Fresh, Local Foods, so other children may benefit from the work developed in this program.

Laura Lawson, Berkeley Youth Alternatives, "Rethinking Direct Marketing Approaches Appropriate to Low Income Communities and Urban Market Gardens": \$10,150 for first year. To better integrate urban market gardening into low-income neighborhood food consumption patterns, surveys will be conducted with Berkeley farmers' market consumers, West Berkeley residents and families affiliated with the Berkeley Youth Alternatives organization. Data will be used to develop a direct marketing pilot project designed to serve low-income urban communities.

Graduate Student Awards (1 project; \$2,000)

Jo Ann Baumgartner, "Bird and Arthropod Predation of Codling Moth in Sustainable Apple Orchards," \$2,000. Codling moth is a worldwide pest of apples. Broad spectrum organophosphate pesticides are routinely applied to control this moth in conventional orchards; there are few sustainable options that reduce the overwintering populations of codling moths. Birds and some insect species are known to attack the dormant stage of the codling moth. Many orchardists do not realize the volume of insects many birds are capable of consuming, or that the codling moth is eaten by 36 different bird species. A preliminary survey by this researcher showed approximately 40 percent of overwintering codling moths appear to have been attacked by birds. This research will continue the work with replicated, statistically valid studies of the interactions among the dormant codling moth, California bird species and insect predators.

Grants for Educational Events (11 projects; \$15,465)

Educational grants are awarded to individuals and organizations to conduct workshops, field days, and other educational events related to sustainable agriculture. Eleven grants were awarded to support 17 different programs around the state. For more information about a particular event, call the telephone number shown. To learn more about SAREP's educational grants program, call **David Chaney** at (916) 754-8551.

William Brooks, Central Coast Resource Conservation and Development Council. \$1,000. Baled Straw as an Energy Efficient Alternative Material for Low-Cost Construction in Rural Communities. Date: November 26, 1996. Location: Salinas. (408) 758-1469.

Linda Chase, Emergency Food Bank, Jubilee Farm Project. \$1,000 for two events. Composting and Biological Control Workshops. Dates: TBA. Location: Stockton. (209) 464-7369.

Jan Dietrick, Dietrick Institute for Applied Insect Ecology. \$1,530 for two events. Fighting New Pests of Avocados Biologically. Dates: March or April 1997. Location: TBA. (805) 643-2325

Roger Ingram and **David Pratt**, UC Cooperative Extension. \$1,000. The California Grazing Academy. Date: April 25-27, 1997. Location: Sierra Foothill Research and Extension Center, Browns Valley. (916) 889-7385.

Jill Klein, Community Alliance with Family Farmers Foundation Lighthouse Farm Network. \$5,000 for five events. Lighthouse Farm Network Educational Events. (916) 756-8518.

- Doing Research on Your Farm. December 17, 1996. Woodland.
- Options for Biological Control of Lygus, Two-spotted Spider Mites and Soil-borne Diseases in Strawberries on the Central Coast. January 7, 1997. Aptos Berry Farm and Sweet Briar Development Insectary, Watsonville.
- Beneficial Insect Identification and Worker Safety Training (in

Spanish). March 1997. Madison.

- Integrating Livestock on the Farm/Direct Marketing Options/ Livestock Handling. March 12-13, 1997. Santa Cruz.
- Building Soil Fertility with Cover Crops and Compost. November 6, 1996. France Ranch, Porterville.

Stephanie Larson, UC Cooperative Extension. \$1,000. Producing Wool to Meet Organic Standards for the Sustainability of the Sheep Industry. Date: TBA. Location: Sonoma/Marin County. (707) 527-2621.

Brenda Ouwerkerk, San Luis Obispo County Agricultural Commissioner's Office. \$1,000. Yellow Star Thistle Forum II. Date: December 5, 1996. Location: San Luis Obispo. (805) 781-5910.

Milt McGiffen, UC Riverside Department of Botany and Plant Sciences. \$935. Integrated Nutsedge Management. Date: March 25, 1997. Location: UC Riverside. (909) 787-2430.

William Oswald, UC Environmental Engineering and Health Sciences Lab. \$1,000. Commissioning of an Advanced Integrated Wastewater Ponding for the Treatment and Reclamation of Dairy Waste at Kehoe Dairy, Point Reyes National Seashore. Date: April 1997. Location: Kehoe Dairy, Point Reyes National Seashore Headquarters. (510) 231-5682.

Bob Roan, PlacerGROWN. \$1,000. PlacerGROWN Farm Conference. Date: January 18, 1997. Location: Lincoln. (916) 889-7398.

Kristen Schroeder, San Mateo Resource Conservation District. \$1,000. Cover Cropping on the Central Coast: Problems and Solutions for Coastal San Mateo County. Date: January 15, 1997. Location: San Mateo County. (415) 726-4660.

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Rominger Announces USDA's Support of Sustainable Agriculture

Deputy Secretary of Agriculture **Richard Rominger**, a Yolo County, California farmer announced at the end of 1996 a policy directive expressing USDA's commitment to sustainable development which includes sustainable agriculture, forestry, and rural communities. "In a Secretary's Memorandum on Sustainable Development, Agriculture Secretary Dan Glickman articulated the need to balance the goals of production and profitability, stewardship of the natural resource base and ecological systems, and viability of rural communities," Rominger said. Through this Memorandum, Glickman will establish a USDA Council on Sustainable Development for the coordination and integration of policies, programs, activities, and education on this issue throughout the Department. Rominger commissioned a 50-member interagency Sustainable Agriculture Working Group in 1995 to examine barriers to adopting more sustainable farming methods. The working group identified 33 ways for USDA to overcome such barriers. The recommendations evolved after a series of workshops and field tours during which members listened to farmers, extension agents, and academic experts describe the need for more support for sustainable agriculture.

USDA is committed to working toward the economic, environmental, and social sustainability of diverse food, fiber, agriculture, forest, and range systems. USDA will balance the goals of production and profitability, stewardship of the natural resource base and ecological systems, and viability of rural communities. USDA will integrate these goals into its policies and programs, particularly through interagency collaboration, partnerships, and outreach. -Dan Glickman, US Secretary of Agriculture.

Winter, 1997 (v9n1)

SAREP Publications Coordinator

Barbara Wetzel, SAREP publications coordinator for the last nine years, has moved to Seattle with her family. Wetzel has been responsible for many of the design decisions for SAREP publications, including the newsletter, the program's progress reports, proceedings, books and pamphlets. Known for her eye for detail, editing skills and incredible program memory, Wetzel will be sorely missed. She investigated dozens of newsgroups and "listservs" on the Internet that might be useful to staff, and our email in-baskets frequently included FYI notes from her saying "Thought you might be interested," or "Would this be useful for our....?" In addition to her commitment to the program and the concepts of sustainability, Wetzel will be missed for her dry wit (useful in Seattle) and delicious baking skills. We wish her and the entire Wetzel-Litts family well!

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Monitoring populations of soil microorganisms during a conversion from a conventional to an organic system of vegetable growing.

A. Sivapalan, Wendy C. Morgan and P.R. Franz

Biological Agriculture and Horticulture 10(1):9-27.

1993 This research project examined the effect of past cropping history, rate of compost application, and current farming practices on changes in soil populations of fungi, total bacteria, fluorescent pseudomonads, gram negative bacteria and actinomycetes. The experiment was carried out on two field sites, about 1.5 km apart, and of similar soil type and climatic conditions. The organic area was composed of four blocks, with each block divided into two plots according to whether they had been cropped for ten years previously with either pasture or a vegetable crop. Each plot consisted of five raised beds each 1.5 meters wide and 42 meters long and was divided into four subplots. These experiments started in the third year of the organic conversion.

Data were also collected from a conventionally cultivated area, cropped previously for ten years with vegetables using regular synthetic fertilizer and pesticide treatments. This site consisted of one block (42 x 15 meters) subdivided into eight subplots.

During these experiments the same crop was sown on the same day at both sites. Soil samples were taken six times between June 1991 and March 1992 under three crops and, using the dilution-plate method, assessed for the number and type of microorganisms. The major findings from this investigation agree with other studies that have been conducted along similar lines. Specifically:

- Plots previously cultivated as pasture (for ten years in this case) supported higher microbial populations than those previously cropped with vegetables. This effect lasted two to three years after the pasture was incorporated into the soil, and after numerous cultivations in vegetable and green manure crops.
- High compost rates (120 tons per hectare) increased the total microbial populations and the number of species of fungi compared to the lower compost rate (80 tons per hectare).
- Microbial populations were generally higher in plots that were undergoing a conversion to organic production, a result the researchers say is most likely due to the higher additions of organic matter.

In addition to the above, this project makes a significant contribution to our understanding of the soil system by reporting significant detail about changes in microbial populations over time and the widely varied and rich fungal flora

that may be involved in promoting plant growth and development in farming systems dependent upon organic matter management.

Acremonium butyri, *Chaetomium globosum*, *Gliocladium roseum*, *Trichoderma hamatum*, and *Zygorrhynchus moelleri* in particular were all found in greater frequencies in the area being converted to organic vegetable production than in plots managed conventionally. These species have all been found to possess antagonistic activity against certain pathogens such as *Sclerotinia sclerotiorum*, and two (*Trichoderma* and *Zygorrhynchus*) have been found to have some plant growth enhancement properties.

For more information: A. Sivapalan, Dept. of Agriculture, Institute for Horticultural Development, 621 Burwood Highway, Knoxfield, Victoria 3176, Australia.

(DEC. 543)

Contributed by David Chaney

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Effect of inoculating fungi into compost on growth of tomato and compost microflora.

A. Sivapalan, W.C. Morgan and P.R. Franz

Australian Journal of Experimental Agriculture 34:541-548. 1994

This study examined whether or not the beneficial fungi *Acremonium butyri*, *Chaetomium globosum*, *Gliocladium roseum*, *Trichoderma hamatum*, and *Zygorrhynchus moelleri* can be managed or manipulated on farms to increase crop production. Each of the five species was tested separately for its ability to promote growth of tomato plants. Isolates of the fungi were used to inoculate soilless mature compost. Four-week-old tomato seedlings were transplanted into the compost three days after inoculation and arranged in a randomized complete block design consisting of seven replicates with seven treatments [each of the five fungi indicated above, uninoculated compost, and uninoculated compost plus NPK (5:8:4 at 1 ton per hectare)]. Growth of plants, as well as microbial populations, were monitored weekly. Microbial populations were also measured in pots without tomato plants to assess the affect of plant roots on the soil system.

Researchers found that *T. hamatum* and *Z. moelleri* increased growth of tomato plants in soilless compost over and above growth that could be attributed to fertilizer additions by nearly 10 percent, and that the populations of these fungi remained constant over the course of the experiment. The study showed that *A. butyri*, *C. globosum* and *G. roseum* also enhanced growth of tomato plants, but their numbers declined over time. The investigators also looked at the effect of fungal inoculation on the populations of other fungi that were naturally present. *Aspergillus fumigatus* was the dominant uninoculated fungal species in all treatments at the beginning of the experiment, but its numbers were reduced significantly by *T. hamatum*, *G. roseum* (with plants), and *Z. moelleri* (without plants). The inoculated fungi reduced populations of other fungi as well, including species of *Fusarium*, *Mucor*, and *Penicillium*. There was no inhibition observed on populations of bacteria or actinomycetes. Higher numbers of microorganisms in pots with plants as compared to pots without plants supports the general observation that substances released to the soil by plant roots stimulate growth of microorganisms. The researchers noted that *T. hamatum* and *Z. moelleri* have certain characteristics that make them adaptable to a wide range of environmental conditions. Such qualities, in this reviewer's opinion, suggest possible uses by farmers and ranchers as a means to reduce certain diseases or to promote plant growth. Further investigation along these lines is clearly warranted.

For more information: A. Sivapalan, Dept. of Agriculture, Institute for Horticultural Development, 621 Burwood Highway, Knoxfield, Victoria 3176, Australia.

(DEC.544)

Contributed by David Chaney

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Understanding the human element in agricultural resource conservation.

Soil and Water Conservation Society, Socioeconomic Research Agenda
Project Task Force

Soil and Water Conservation Society. Ankeny, Iowa. 1993

Reviewer's Note: The research strategies described in this brief report suggest a more collective model of research in contrast to the individually oriented and more narrowly focused efforts that currently dominate many fields. The recommendations could be applied in a variety of disciplines in the social and natural sciences to foster more meaningful and effective research over the long-term.

Although important strides have been made in monitoring and testing production practices that conserve natural resources more effectively, researchers and practitioners have been less successful in understanding the roles played by farm owners and operators. A critical element of sound resource management strategy is to understand why farmers behave as they do and to suggest how they will respond to various efforts to adopt resource-conserving production techniques.

This ten-page report presents the findings of a task force whose purpose was to examine this dilemma. The group, comprised of leading social scientists and conservation practitioners and headed by William Lockeretz (Tufts University) and Peter Nowak (University of Wisconsin), looked specifically at social science research methods and approaches and suggested strategies and institutional arrangements that represent a qualitative change in the study of resource conservation behavior. The report's recommendations focus on the need for a cumulative, systematic body of knowledge about resource conservation behavior. Recognizing that the adoption of resource-conserving techniques is a complex process, the task force recommends that individual research projects:

- Incorporate clusters of questions that address multiple issues (vs. studying single components) about the meaning and motivation of conservation behavior,
- Include more longitudinal studies (those that track data at intervals over several years),
- Broaden the range of variables used to explain farmers' and ranchers' conservation behavior, particularly the effect of exposure to wrong information or deliberate misinformation,
- Give more attention to comparing and interpreting results obtained under different circumstances.

Such characteristics would present greater opportunities for cooperative

research efforts and aggregation of data, in contrast to individually oriented efforts. In order to promote this model widely, the task force suggests two steps for future action:

1. Form a working group of active researchers that meets one or two times a year to exchange ideas, to reach agreement on research methods and to facilitate coordinated planning of multi-site, multi-team projects.
2. Organize periodic meetings with people who are involved with conservation issues in the field, to exchange ideas and to ensure that researchers' perspectives extend beyond their immediate colleagues and topics of interest.

In the long-term, the task force envisions a more ambitious goal: a coordinated national study of regionally oriented experiments using agreed-upon protocols. This study would allow researchers and practitioners to employ their collective wisdom and to generate comparable research results in a way that has never before been possible.

The task force acknowledges that incorporating these new research approaches will be a challenge; however, the approaches also offer the opportunity to contribute significantly to the protection and conservation of essential agricultural and environmental resources.

For more information: Soil and Water Conservation Society. 7515 Northeast Ankeny Road, Ankeny, Iowa 50021-9764.

(GWF.1296)

Contributed by Gail Feenstra

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Publications from SAREP-Funded Projects

UC SAREP-funded projects frequently produce articles for peer-reviewed academic journals, professional publications, and commodity or trade publications. Recent journal articles include:

- Koike, Steven T., Richard R. Smith, Louise E. Jackson, Lisa J. Wyland, John I. Inman and William E. Chaney. 1996. Phacelia, lana woollypod vetch, and Austrian winter pea: Three new cover crop hosts of *Sclerotinia minor* in California. *Plant Disease* 80(12):1409-1412.
- van Bruggen, Ariena H.C. 1995. Plant disease severity in high-input compared to reduced-input and organic farming systems. *Plant Disease* 79(10):976-984.

Resources

Sustainable Ag Education Resource List

Educational and Training Opportunities in Sustainable Agriculture: 9th edition, December 1996, compiled by **Jane Potter Gates**, Alternative Farming Systems Information Center, Information Centers Branch, National Agricultural Library, Agricultural Research Service, USDA. A current list of information products on sustainable farming systems educational and training opportunities is available from the National Agricultural Library (NAL). The publications on the list may be ordered in either hardcopy or electronic format. Orders for publications may be made via email: afsic@nal.usda.gov; Tel: (301) 504-6559; Fax: (301) 504-6409 or by surface mail: Alternative Farming Systems Information Center, National Ag Library, Room 304, 10301 Baltimore Ave., Beltsville, MD 20705-2351. To find the information on the World Wide Web, go to:

<http://www.inform.umd.edu/EdRes/Topic/AgrEnv/AltFarm/>

Sustainable Vegetable Production

Sustainable Practices for Vegetable Production in the South, 174 pages, 1996, by **Mary Peet**, Focus Publications. Also available on the World Wide Web at <http://www2.ncsu.edu/sustainable/> At the Web site, download files or print out sections. The site received the American Society of Horticulture 1996 Extension Materials award for the Commercial Fruit, Vegetable and Herb Production category. The material covers botany, production practices (integrated pest management, soil management, etc.), crop profiles, harvest and post-harvest, appendices with maps of soil regions and climate zones, and other Web resources. To purchase the book, contact Focus, PO Box 369, Newburyport MA; Tel: (800) 848-7236, email: pullins@pullins.com

Videos

Risky Business, 1996, 24 minutes, **Melissa Young/Mark Dworkin**, directors; Melissa Young, producer; Moving Images Video Project. Genetic engineering is transforming science and agriculture. This video explores questions about how this new technology will be used, who will benefit from it, how it will affect farmers, the food supply, and the environment. It features interviews with scientists and researchers (including SAREP director **Bill Liebhardt**) about genetically altered foods, herbicide-tolerant crops and more. The cost is \$195 plus \$5 for shipping and handling; \$45 rental plus \$5 shipping (can be applied toward purchase); discounts are available. For ordering information contact Bullfrog Films, PO Box 149, Oley, PA 19547; Tel: 800-543-3764; Fax: (610) 370-1978; email: bullfrog@igc.org; www: <http://www.bullfrogfilms.com>

The Greening of Cuba, 1996, 38 minutes, **Jaime Kibben**, director; produced by Food First's Institute for Food and Development Policy. When trade relations with the socialist bloc collapsed in 1990, Cuba lost 80 percent of its pesticide and fertilizer imports and half of its petroleum. Challenged with growing food for 11 million people, Cuba embarked on the largest conversion to organic farming ever attempted. The video profiles Cuban farmers and scientists working to reinvent a sustainable agriculture based on ecological principles and local knowledge using traditional methods and biotechnology. In Spanish with English subtitles. The cost is \$29.95. To order, telephone (800) 274-7826, or contact Food First at 398 60th St., Oakland, CA 94616; Tel: (510) 654-4400; Fax: (510) 654-4551; email: foodfirst@ipc.apc.org

Fueling the Future: A 4 Part Series, produced by KBDI-TV, Denver, 58 minutes each. Produced for national PBS broadcast and hosted by **Hodding Carter**, this award-winning series on U.S. energy practices covers transportation, farming, housing, and disposable products. Each of the four videos traces the history of the topic, and asks how a more secure energy future can be obtained. They include *Running on Empty*, which traces how the automobile became the mainstay of U.S. transportation and examines the viability of alternative fuels and revitalizing public transportation. *Hot-Wiring American Farms* shows how heavy use of fossil fuels has enabled American farmers to become highly productive in the short-term; questions about the future of agriculture are raised. It examines the impact of energy-intensive farming and explores more efficient alternatives, including many sustainable ag practices. The video features several California growers and spokespeople. *No Deposit, No Return* investigates wastefulness in the U.S., the energy cost of "throw-aways," and possible solutions. *No Place Like Home* examines how communities evolved in an era of cheap energy, and highlights how some planners are working to develop a more energy-efficient approach. Institutions may purchase each video for \$79 (\$279 for the series) or rent

each for \$45. Individuals and low-income groups pay \$39.95 per video (\$139 for the series) and \$25 for rentals. Contact The Video Project, 200 Estates Dr., Ben Lomond, CA 95005; Tel: (800) 4-PLANET; Fax: (408) 336-2168; email: videoproject@videoproject.org; www: <http://www.videoproject.org/videoproject>

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Sources of Funding

Biologically Integrated Farming Systems Grants,

Farmers, commodity groups and academic researchers are encouraged to apply for a second round of grants administered by SAREP to improve soil fertility and crop protection with cultural practices and biological pest control that reduce reliance on agricultural chemicals. Awards ranging from \$80,000 to \$100,000 per year for one or more projects will be available through the Biologically Integrated Farming Systems (BIFS) pilot projects, the result of 1994 state legislation. The first round of BIFS grants - funded by the California Environmental Protection Agency's Department of Pesticide Regulation and the U.S. Environmental Protection Agency - supports ongoing projects in winegrapes and field crops. New funding from the federal EPA and the University of California Division of Agriculture and Natural Resources permits SAREP to fund one or more additional projects. The core of BIFS projects is a team approach to farm management, using farmers, consultants, UC farm advisors and researchers, and independent pest-control advisers to farmers.

"An increasing number of California farmers representing many commodities and counties have been able to maintain yields and quality while greatly reducing their reliance on agrichemicals, including pesticides and synthetic fertilizers," says SAREP Director **Bill Liebhardt**. The elements these farmers integrate into their production systems include biological and cultural control of pests; on-farm habitats for beneficial insects, mites and spiders; a strong emphasis on soil-building practices, often including biological nitrogen fixation to supply all or part of the nitrogen needed by crop plants; and reduced reliance on agricultural chemicals.

Applicants for BIFS funds may employ additional techniques, such as field monitoring for pest and beneficial organisms; collection of weather data; reliance on research-based action thresholds; use of selective biorational pesticides; and soil, water and plant-tissue testing. "BIFS grants are not necessarily limited to organic farming systems," Liebhardt adds. "Under this kind of management, agrichemical programs are crafted carefully to integrate all these elements."

New proposals for BIFS funding to study these farmers' production systems are encouraged. Formal Request for Proposals were mailed the first week of January 1997. Proposals must be received by UC SAREP no later than **April 9, 1997**. California institutions and individuals are invited to apply for funding. Principal investigators on BIFS projects may be private individuals, for-profit and non-profit corporations, including commodity boards, Resource Conservation Districts, Natural Resources Conservation Service Districts or soil conservationists, University of California Cooperative Extension farm advisors, Cooperative Extension specialists, Area IPM Advisors, and faculty of any accredited California institution of higher learning. For more

information, contact SAREP at (916) 752-7556 or visit its Web site at www.sarep.ucdavis.edu

Fund for Rural America

The Federal Agriculture Improvement and Reform Act of 1996 (the Farm Bill) has authorized money for the U.S. Department of Agriculture's "Fund For Rural America" to expand economic opportunities for rural Americans; \$100 million per year for three years will be split equally among three areas: rural development, research, and an amount to be used at the discretion of the Agriculture Secretary for research or rural development. Rural Development funding may be used for a range of rural development activities, including rural business enterprise grants, direct loans, loan guarantees, grants to water and waste water projects, distance learning and telemedicine loans and grants, self-help housing, and rural housing preservation. Research funding is for a competitive research grant program for "...research, extension, and education to increase international competitiveness, efficiency, and farm profitability; reduce economic and health risks; conserve and enhance natural resources; develop new crops, new crop uses, and new agricultural applications of biotechnology; enhance animal agricultural resources; preserve plant and animal germplasm; increase economic opportunities in farming and rural communities; and expand locally-owned value-added processing." A request for proposals for the competitive research grant program is in the current Federal Register. For additional information, contact **Colien Hefferan** at (202) 720-7441 or **Jim Newby** at (202) 720-9365 or access their Web site at:

<http://www.rurdev.usda.gov/agency/rbcds/html/funrlam.htm>

Organic Research Grants

The Organic Farming Research Foundation is offering funds for research on organic farming methods, dissemination of research results to organic farmers and growers interested in making the transition to organic production, and consumer education on organic farming issues. Projects should involve farmers in design and execution, and take place on working farms when possible. Proposals of \$3,000-\$5,000 are encouraged. Matching funds and/or in-kind contributions are recommended. Proposals are considered twice a year; the next round of proposals must be received by **July 15, 1997**. To receive copies of grant application procedures and the OFRF Research and Education Priorities describing target areas, write Grants Program, Organic Farming Research Foundation, PO Box 440, Santa Cruz, CA 95061; Tel: (408) 426-6606.

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World Wide Web Sites

SAREP WEB Information:

<http://www.sarep.ucdavis.edu> In addition to its print publications, UC SAREP offers access to SAREP-funded research and education projects, its quarterly newsletter, its Progress Report 1993-1995, and information databases through its World Wide Web server.

SAREP Covercrops Database:

<http://www.sarep.ucdavis.edu/ccrop> SAREP has developed an on-line resource for cover crop information which features a searchable database, several articles, and references to other sources of information on cover crops. The database contains hundreds of pages of useful information and color pictures of more than 40 cover crops used on farms in California. The resource page will be periodically updated as new information is developed.

SAREP Calendar:

http://www.sarep.ucdavis.edu/cgi-bin/SAREPcal.exe/list_events SAREP offers a regularly updated sustainable agriculture calendar on our World Wide Web site. You may add your own sustainable agriculture events on the SAREP Web site calendar.

Other Related Sites...

Visit the website of the Kearney Foundation of Soil Science located at: <http://www.cnr.berkeley.edu/~gsposito/Kearney> The site features soil quality topics and summaries of Kearney Foundation-funded research projects, and information about a March 25 symposium, "California Soil Quality: From Critical Research to Sustainable Management" at UC Berkeley.