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In This Issue:

[From the Director:](#)

[Sustainability: A Tradition of Grassroots Participation](#)

[Novel Approaches to Soil Management Highlighted at Conferences](#)

[Unique Niches: Agritourism Grows in West Marin](#)

[Searching for Common Ground: Toward Sustainable Agriculture in Japan & California](#)

[New PAC/TAC Members Join SAREP](#)

Technical Reviews:

[Return to Resistance: Breeding Crops to Reduce Pesticide Dependence](#)

[Nematode-trapping Fungi in Organic and Conventional Cropping Systems](#)

[A Total System Approach to Sustainable Pest Management](#)

Other:

[Sources of Funding](#)

[Resources](#)

[Calendar](#)

From the Director

Sustainability: A Tradition of Grassroots Participation

*(Editor's Note: After 11 years, **Bill Liebhardt** steps down as director of SAREP on June 30 to return to Extension work in the Department of Agronomy and Range Science at UC Davis.)*

Eleven years ago I started these conversations with those of you who read our newsletter; this will be my last one. I have always tried to be straight and honest in my conversations, even when it was controversial, and I will try to keep to that standard here. In 1986 California legislation was passed (**Petris SB872**) which gave birth to this program. When I came here from the Rodale Research Center in Pennsylvania to direct SAREP, I read the legislation many times; I have continued to use it as the guiding principle for our actions here. The legislation was crafted by the people of California who were especially concerned about the sustainability of this state's agriculture: family farmers and ranchers, organic growers, environmentalists and consumers who had a different vision for the state. They wanted a change in the status quo for research and education efforts in the UC system. Their actions, were, in a large sense, a call by the citizens of California to those of us in the land grant system to get back to the business of the people. It made many inside and outside the system unhappy because it questioned the track we were on; those tensions remain today.

Many of the farmers and ranchers who helped create SAREP are around today helping us develop research and information. They have let me know when they think we're off base. Some of these farmers are advisers on major experiments on the UC Davis campus, including the Long Term Research on Agricultural Systems project and the Sustainable Agriculture Farming Systems project. They are involved in the Biologically Integrated Orchard Systems (BIOS) or Biologically Integrated Farming Systems (BIFS) programs and others that stress biological and soil-building approaches in farming systems, and which include diverse management teams of farmers, researchers, Cooperative Extension personnel, and pest control advisers.

There is still much work to be done; SAREP's grants budget is strained yet there is a huge need for research on crop and animal farming systems that are more biologically based and that improve the sustainability of our rural and urban communities. I am personally troubled by the gap between the richest and poorest sections of our society; the inequities show up clearly in the rural farming communities where many are hungry and lack decent housing. I wonder at times if the message of sustainability can be translated into reality for all of us.

I was heartened recently, however, by the fight over the proposed USDA organic standards. Why would a fight raise my spirits about sustainability? In its initial draft of the rule, the USDA essentially ignored seven years of study and input from farmers, environmentalists, retailers, scientists, consumers and the experience of state certifying agencies, and would have included genetically engineered crops, irradiated foods, and the use of municipal sludge in its new organic criteria. On the face of it, it looked like corporate special interests were once again going to win out over the wishes of the grassroots farming community. The organic share of the food market basket is still small, although its revenues now are more than \$4 billion a year, and most of the farmers who supply this alternative to consumers are small-scale.

Yet there was a huge outcry during the USDA's extended 120-day public comment period on the proposed standards. More than **200,000** public criticisms were received—the largest community reaction in USDA history.

No matter how the proposed regulations are finally worded, this tremendous response on the part of thousands of individuals concerned for the land, their farms and families and for the food they produce, shows that they won't be silenced and give up their participation and power in the legislative process. For me, this is incredibly hopeful—and a good case for sustainability.

Those of us within the university are also struggling with the influence of corporate sponsorship and influence: We are encouraged to be entrepreneurial—seek out funds and work with the private sector. It is a trend here at the UC and across the country. Universities are doing this because there is a lack of money from public sources. "Privatizing" is the battle cry in our country today. I fear that in our rush to obtain short-term funding and resources, we will sell out the basic reasons that universities exist. We learned the corrupting influence of the military-industrial complex, but I think the university-industrial-governmental complex is more dangerous to our society, as everything will be driven by the corporate agenda. The business of universities is becoming the business of the corporate agenda. Is that what we want?

As always, there is still much to do regarding the organic standards and the many other issues that face us in our quest for agricultural sustainability here in California and beyond. I hope the power of individuals across the country can inspire thousands of people right here in California to demand and get the best sustainable research and information that is available. Good luck to us all. —*Bill Liebhardt, director, University of California Sustainable Agriculture Research and Education Program.*

[[Back](#) | [Search](#) | [Feedback](#)]

SAREP Participates in Fund For Rural America Grants

The U.S. Department of Agriculture has awarded two Fund for Rural America grants totaling \$725,000 to projects involving a UC SAREP researcher. A grant for \$400,000 will be conducted in California with investigators from SAREP, the UC Davis Department of Agriculture and Resource Economics, and the Community Alliance with Family Farmers, while the second grant, for \$325,000, will be conducted with investigators at Cornell University and Iowa State University.

The Federal Agriculture Improvement and Reform Act of 1996 (the Farm Bill) authorized money for the Fund For Rural America to expand economic opportunities for rural Americans; \$80 million per year is being divided between two areas: rural development and research. Less than 7 percent of the Fund for Rural America applicants were funded during the first year of the granting program. The grants involving SAREP were awarded in the research category.

"We are very excited to be participating in two large-scale projects that link sustainable agriculture with rural community development," says **Bill Liebhardt**, SAREP director.

Gail Feenstra, SAREP food systems coordinator, is leading the California component of the project "Retail Farmers' Markets and Rural Development: Entrepreneurship, Incubation, and Job Creation," conducted with researchers from the Cornell Farming Alternatives Program and Iowa State University Department of Sociology (\$325,000). The project will demonstrate and promote the economic development potential of farmers' markets as rural enterprise incubators.

Feenstra will also be a collaborator on the grant "Increasing Adoption of Sustainable Agriculture and Positive Community Impacts," which received \$400,000. This project brings together the expertise of UC researchers, the Community Alliance with Family Farmers and the Lodi-Woodbridge Winegrape Commission to increase adoption of sustainable agriculture practices and build farmer leadership skills to strengthen connections in local communities. Former SAREP associate director **Jill Shore Auburn** and Feenstra helped write the grant request for the project, which will now be headed by **Karen Klonsky** from the UC Davis Department of Agriculture and Resource Economics.

Unique Niches: Agritourism Grows in West Marin

Because of its natural scenic beauty, the single largest tourist draw in West Marin is Point Reyes National Seashore and the 35,000 acres of pristine farmland along the east side of Tomales Bay. Two and one half million people visit the Point Reyes area annually. North Bay and West Marin farmers and ranchers looking for alternative approaches to maintaining profitable agricultural enterprises are exploring agriculture and nature-based tourism activities.



(photo by Ellie Rilla)

When asked why **Sharon Doughty**, a third generation West Marin dairy operator, decided to open her on-farm Point Reyes Vineyard Inn Bed and Breakfast (B&B) last summer she replied, “I have four adult children who want make a living on this property so we need to diversify to do that.”

Sleeping in the Straw

Called “Agriturismo” in Italy, “Farm Stay” in New Zealand, and “Sleeping in the Straw” in Switzerland, agricultural tourism or agritourism is defined as “a business conducted by a farm operator for the enjoyment and education of the public, to promote the products of the farm, and thereby generate additional farm income.”

At the Marin Agriculture Summit, a gathering of local agencies, farmers, agricultural land owners and community members in February 1997, participants indicated that one of the highest priorities for action included a regional marketing strategy that promotes Marin County farms and products.

Following up on these ideas, UC Cooperative Extension farm advisor/director **Ellie Rilla** took a sabbatical leave to study the farm B&B system in England and farm tourism operations in Vermont, New York and Connecticut. She visited and interviewed 100 farm entrepreneurs about their successes in agritourism.

Experienced Words

In one interview, **Beth Kennett** of Liberty Hill Farm, a Vermont dairy farm destination for families, offered words of wisdom to other farms thinking about this type of endeavor.

“Work with what you have to suit your needs, strengths and abilities,” Kennett said. “This is not for everyone. A service venture will never take the place of farming or ranching but it has helped us supplement our primary farm income and has allowed us to continue our farm lifestyle.”

Rilla is currently presenting her research results in a series of slide presentations to audiences in Marin and Sonoma counties.

“Response to my slide presentation on agritourism has been very positive,” she said. “There are people out there who are either already doing some type of agritourism venture or thinking about it. I hope a more coordinated effort will evolve out of the interest so that farms and ranches, tourism bureaus, and park agencies, local food purveyors and growers will all coordinate to share resources, promote one another and expand the agritourism effort in the North Bay and beyond.”

When asked about her outlook for the future, West Marin dairy owner Doughty replied, “It’s only limited by your imagination and willingness to work. You need to be willing to experiment by trial and error and be willing to make mistakes. We have a wonderful piece of property on this 800 acres. Don’t sit around and look at what you can’t do, but look at what you can do.”

Interest in agritourism as a possible venue for some farmers exists in more than Coastal Marin. In Mendocino, the county Economic Development office, Cooperative Extension (CE) and others have just completed a Tourism and Economic Development plan that incorporates agritourism. In San Diego, CE advisors are working with the community as interest is growing in creating agritourism venues in the Carlsbad area as well as ecotourism opportunities along the waterfront. The UC Small Farm Center, based at UC Davis, received a \$200,000 grant from the USDA’s Fund for Rural America for an agritourism project in California. Contact the Small Farm Center to become part of anew Agritourism Workgroup (530-752-8136; sfcenter@ucdavis.edu)

For a copy of Rilla’s sabbatical report, please call the UC Cooperative Extension office in Novato at (415) 899-8620.

Searching for Common Ground: Toward Sustainable Agriculture in Japan & California



U.S. delegation members in Masanobu Fukuoka's rice paddy with winter wheat crop. (photo by Joji Muramoto)

by Jenny Broome, SAREP, Miguel Altieri, UC Berkeley, and Hidaka Kazumasa, Ehime University, Japan

Scientists from the University of California, the University of Minnesota, and several nonprofit organizations together with more than 30 Japanese professors, researchers, students and farmers participated in a Japan/U.S. agroecology workshop at Ehime University, Hojo City, Ehime, Japan in March 1998.

Japanese and American agriculture differ considerably, in terms of scale of operation, farming methods, the natural environment, history and culture. The most obvious difference is that of scale. Japanese farms are small-scale yet farmed intensively, while U.S. agriculture is large-scale and intensive. Both regions, however, share some common challenges to their agricultural systems such as a decrease in the number of people working in agriculture and the environmental and human health impacts associated with their intensive agricultural production methods. In addition, due to the internationalization of the world economy there are very real concerns about competition in agricultural products that may negatively impact the viability of the small farm sector in both countries. In the wake of the "orange wars" of the past decade when there was concern in Japan over the importation of less expensive California oranges, relations between the two regions are growing increasingly strained over the possibility of a "rice war," related to the cheaper price of imported California rice. Additionally, as we enter the 21st century, there is growing concern in both regions about further population increase, food shortages, and the impacts of the extraordinary weather that appears to be accompanying global warming.

The Ehime University workshop initiated a critical dialogue to deepen understanding about how the agriculture of the two regions, and the

agriculture, farmers and other people of the world, can continue to coexist. Through comparative analysis of the agricultural ecosystems of the two representative regions of California and Ehime, participants addressed the questions that must be faced in the 21st century if agriculture is to be sustainable in the long-term. These factors include social and cultural dimensions, the economic challenges of agricultural production in rural communities, as well as environmental problems associated with intensive agriculture.

Topics addressed during the workshop ranged from the common challenges to long-term sustainability of farming in each country, exciting new approaches to address these issues, new partnerships for technical information development and exchange between researchers and farmers, the impact of globalization on agriculture in each region, and the role of education in supporting sustainable agriculture in each country.

Specific topics included:

- Increasing agroecosystem biodiversity as a critical component of integrated farming systems;
- Economic liberalization and globalization and its impacts on agricultural sustainability;
- Agroecological comparisons of conventional and organic farming systems (citrus, vegetables and rice);
- Agricultural chemical reduction in Japanese vegetable cultivation;
- Case study of California broccoli production;
- Chemical-free cultivation with recycled paper mulch in rice;
- Pesticide use reduction by small farmers in Japan using the educational insect observation plate ‘mushi-mi-ban’;
- Farmers’ requests for collaborative research with universities;
- Biologically integrated farming systems in California wine grapes, almonds, walnuts and vegetable/cotton production systems;
- Japanese village society that supports agriculture and the natural environment;
- Community Supported Agriculture in California; and
- The Japanese certification system for organic food.

The workshop also included a visit to an experimental forest project on slash-and-burn agriculture near Ehime as well as a visit to the rice paddy of the world-renowned Japanese writer and promoter of sustainable agriculture **Masanobu Fukuoka**. He is the author of *The One Straw Revolution*, which shows the critical role of locally based agroecological knowledge in developing sustainable farming systems. In addition, the group toured a large-scale (for Japanese standards) organic farming operation, the J-Wing Farm in Shigenobu Town.

The exchange was made possible with financial assistance from the Japan Foundation. The U.S. delegation leader was **Miguel A. Altieri**, associate professor of agroecology, Department of Environmental Science, Policy and Management, UC Berkeley. The Japan delegation leader was **Hidaka Kazumasa**, associate professor, College Research Farm (insect ecology/agroecology), College of Agriculture, Ehime University.

U.S. participants included **David A. Andow**, associate professor, Department

of Entomology (insect ecology), University of Minnesota; **Stephen R. Gliessman**, professor, Department of Environmental Studies (agroecology), University of California, Santa Cruz; **Joji Muramoto**, research scientist, UC Santa Cruz, Soil and Fertilizer Science (agroecology); **Patrick Madden**, former executive director, World Sustainable Agriculture Association (agroecology/agricultural policy); **Peter M. Rosiest**, executive director, Institute for Food Development and Policy (agroecology); **Janet (Jenny) C. Broome**, research associate, UC SAREP (agroecology/plant pathology); **Clara I.**, graduate student, Department of Entomology, UC Davis (agroecology/biological control); and **Keiko Okano**, graduate student, UC Berkeley (agroecology/entomology).

[[Back](#) | [Search](#) | [Feedback](#)]

New PAC/TAC Members Join SAREP

UC SAREP was created almost 12 years ago, the product of legislation carried by State Senator **Nicholas Petris** of Oakland in response to farmer, consumer and researcher concerns that California farming practices be more ecologically sound, economically profitable and socially responsible. Senate Bill 872, the *Sustainable Agriculture Research and Education Act of 1986*, that requested the Regents of the University of California establish the Sustainable Agriculture Research and Education Program (SAREP). The legislation charged SAREP with administering a competitive research grants program for sustainable agricultural practices and public policies, developing and disseminating information on sustainable practices, and coordinating long-term farmland research.

The program found a home at UC Davis and the first public and technical advisory committees were selected. After a national search, **Bill Liebhardt** was selected SAREP director; soon after his arrival the first grants were awarded to eight projects.

"We have always used the enacting legislation as our blueprint," said Liebhardt. "In the last 12 years, SAREP has awarded more than \$3.5 million to approximately 260 basic and applied research projects, economic and public policy projects, seminar and field demonstrations and graduate student awards.

Since 1995, SAREP has administered a second funding program to help farmers reduce their use of pesticides and synthetic fertilizers, called the Biologically Integrated Farming Systems (BIFS) program. A separate, 13-member BIFS advisory committee makes recommendations about BIFS grants.

SAREP's enabling legislation requires it to have both public and technical advisory committees to advise the university on program goals and make recommendations on the award of competitive grants. The Public Advisory Committee (PAC) includes individuals actively involved in agricultural production, as well as representatives from government, public organizations, and institutions of higher education. The Technical Advisory Committee (TAC) is made up of UC and California State University and makes recommendations about the scientific merit of grant applications. PAC and TAC members generally serve three year terms. New members in 1998 are:

Public Advisory Committee

- **RON ALVES** is an instructor in the Agriculture and Environmental Science Division at Modesto Junior College, where he has taught biology, soil science, environmental conservation, food processing, ag business and worked with the lab technician program since 1974.

Previously he taught high school in Yuba City and Japan. Raised on a family farm in Stanislaus County, he and his wife and three children operate a small farm in Modesto where they raise sheep, swine and walnuts. Alves is interested in land use planning and sustainable food systems, and is particularly concerned about educating the urban population about rural issues and problems. To that end, he and other instructors at Modesto Junior College are involved in educational programs at local elementary schools.

- **ROBERT BORNT** is the owner of Bob's Organics, an organic food production and distribution company in San Diego. The company produces hot sauces and cooking sauces and markets family grown, fresh organic vegetables. He is also the director of Farm Hands, a non-profit organization dedicated to farm gleaning and low-cost fresh food production for distribution into low-income communities. He is particularly interested in sustainable, healthy lifestyles - sustained with the availability of fresh, healthy food and consumer education- especially for low-income/ no-income families.
- **FRANK DAWLEY** and his wife Vicky have been managing her family's cattle ranch in the foothills of western Tehama County since 1975. Practicing Holistic Management since 1984, they have been working toward their goal of a prosperous cow-calf operation on an ecologically improving landscape producing high-quality beef for consumers to enjoy. Dawley is particularly interested in livestock production, watershed stability, direct marketing, and wildlife. He served on SAREP's Public Advisory Committee in 1993-95.
- **DEBRA DENTON** is an environmental scientist for the US Environmental Protection Agency Region 9 (San Francisco) in the Water Management Division. She assists with permitting guidance, enforcement actions, data interpretation and test methodology issues related to effluent toxicity testing. She has worked on national Whole Effluent Toxicity (WET) issues for EPA's Office of Water, and was on special assignment to the EPA's Office of Research and Development laboratory to develop the echinoderm sperm cell fertilization test method. She has also worked for the State Water Resources Control Board providing technical support to testing laboratories on quality assurance and statistical analysis and for the Department of Food and Agriculture performing pesticide monitoring studies in air, sediment, groundwater and surface water throughout California. She recently served as the chair of the City of Davis Pesticide Taskforce Committee. She is currently working on a Ph.D. in hydrobiology at UC Davis, where she is looking at the effects of pyrethroid insecticides used in Delta orchards on larval fish.
- **JEFF DLOTT** is currently the Executive Director of Collaborative Research and Designs for Agriculture. His work focuses on collaborating with farmers, farm managers, agricultural consultants, researchers and others in the design, execution, and evaluation of environmentally sound and economically feasible farming practices. In California, Dlott is working with the raisin, winegrape, lettuce and celery industries. He also has worked as a consultant to the Pew Charitable Trusts and the C. S. Mott Foundation in project and program

evaluation. He recently accepted a position as Senior Program Officer in the Agricultural Initiative at US Environmental Protection Agency Region 9 (San Francisco). In this new position, he will be working with the agricultural industry on developing alternative pest management strategies in response to the implementation of the Food Quality Protection Act.

- **AN PEISCHEL** is a partner in Goats Unlimited in Butte County. The meat goats are grazed in organic olive orchards, and are also used in three counties for fuel load reduction in ponderosa pine plantations, firebreaking in forests and land cleaning. The range-fed goats are marketed to San Francisco restaurants. She also teaches an holistic range livestock management class at CSU, Chico. Goats Unlimited has been grazing meat goats in Hawaii and California for 13 years.
- **TIM O'NEILL** is the ranch manager for the family operation O'Neill Farming Enterprises in Five Points, Fresno County, which includes some certified organic row crop fields. He is also a vineyard owner, and an advocate for sustainable and organic farming systems.
- **JIM RIDER** is a partner with his brother Dick in Bruce Rider & Sons, which grows, packs and ships organic apples near Watsonville, Santa Cruz County. They have been growing organically for eight years, and their whole operation has been organic for the past three years. He also is a partner with his wife Barbara in Rider Flowers, a farming operation which grows and ships 150 varieties of field-grown specialty cut flowers.
- **BETH VON GUNTEN** is the Ventura County- based field representative for the Community Alliance with Family Farmers (CAFF) and is responsible for the Ventura County Lighthouse Farm Meetings, for any growers interested in reducing chemical use and developing more biologically based methods of farming. She has a strong interest in the economic viability of sustainable production, especially in areas under pressure from urban development; the impact of various production and processing methods on the nutritional value of crops; and issues raised by the introduction of biotechnology into agricultural production systems. The recipient of the 1997 CAFF Beacon of Light Award, she is also an organic farm and processing inspector.

Technical Advisory Committee

- **ERNST L. BIBERSTEIN** is a professor emeritus from the UC Davis School of Veterinary Medicine. His specialty is veterinary microbiology, particularly bacterial and fungal diseases of animals.
- **HOLLY BROWN-WILLIAMS** is associate director of the California Policy Seminar (CPS), a University of California program that applies UC research expertise to the analysis, development, and implementation of state policy. Based in Berkeley, CPS represents all nine UC campuses and affiliated units. Her academic background is in business administration and industrial relations. She is particularly interested in the role of public policy in enhancing environmentally

sustainable and economically viable agricultural approaches.

- **RACHEL MABIE** is the UC Cooperative Extension director in Los Angeles County. Before accepting that assignment, she was the urban horticulture advisor in Los Angeles, and directed the Los Angeles Urban Garden Program, known locally as Common Ground. A former Peace Corps volunteer with a background in agronomy, she is fluent in Spanish. Her specialty is urban horticulture, including community, school and market gardens. She is particularly interested in small-scale and intensive agriculture, the urban/agriculture interface, and backyard horticulture. She has worked with Cooperative Extension since 1988.
- **PAUL SIRI** is the associate director of the Bodega Marine Laboratory in Bodega Bay, Marin County and has been a UC researcher and administrator for 21 years. His specialty is water quality treatment and reuse for intensive culture of marine, freshwater and anadromous fishes; fish behavior, population biology and ecology of endangered salmon; and environmental effects of cultured fishes. He is also a consultant to the Food and Agriculture Organization of the United Nations on the environmental effects of intensive fish culture.
- **DOREEN STABINSKY** is an assistant professor of environmental studies at California State University at Sacramento. She was trained as a molecular geneticist, and now works in the field of biotechnology policy. Her present research is focused on the environmental effects of the release of genetically engineered organisms into the environment, as well as the social, political and economic consequences of the use of genetic engineering in agriculture.
- **CAROLYN STULL** is the UC Cooperative Extension animal welfare specialist in Veterinary Medicine Extension at UC Davis. Her specialties are animal welfare issues including veal calf welfare, dairy calf housing, horse starvation, transport, and appropriate care practices for beef, sheep, dairy and poultry. She is particularly interested in the integration of environment, animal welfare and food safety; alternative production systems; and stress reduction in agricultural animals. She responds to public issues concerning agricultural animal welfare through research projects providing scientific data.
- **JO ANN C. WHEATLEY** is a professor of crop science at California Polytechnic State University in San Luis Obispo. An entomologist by training, her specialty is the biological control of arthropods, and Integrated Pest Management in coastal wine grapes. She is particularly interested in evaluation techniques for examining stream, creek and river health, aquatic insect complexes, and mealybug and leafhopper management in wine grapes. She is active in fly fishing organizations and is a registered pest control adviser.

Continuing PAC/TAC

Public Advisory Committee: Cynthia Cory, Leonard Diggs, James Liebman, Michael Straus and Brock Taylor.

Technical Advisory Committee: Edith Allen, Steve Blank, Caroline

Bledsoe, Robert Gottlieb, Blaine Hanson, Tim Hartz, Donald Klingborg, Craig Kolodge, Janet Savage, Rob Thayer and Joan Wright. [Note: Edith Allen is serving a second three-year term.]

Biographies of continuing PAC/TAC members appeared in the Summer 1997 (Vol. 9, No. 2), Summer 1996 (Vol. 8, No. 3), and the Summer 1995 (Vol. 7, No. 3) issues of *Sustainable Agriculture*.

Retiring PAC/TAC

The following advisory committee members rotated off the PAC or TAC in 1997. PAC: Catherine Brandel, David Costa, Marion Kalb, Ron Mansfield, Andrew Rubin, Bryte Stewart, Don Villarejo, Angus Wright. TAC: Tom Shultz and Lucia Varela. UC SAREP is very appreciative of the work that advisory committee members do for the program.

[[Back](#) | [Search](#) | [Feedback](#)]

Technical Review

Return to Resistance: Breeding Crops to Reduce Pesticide Dependence

Raoul Robinson

agAccess, Davis, Calif. 1996

Raoul Robinson, Ph.D. spoke at the University of California, Davis campus in March 1998 on "New Approaches to the Control of Crop Parasites." Robinson is a Canadian/British plant scientist with 40-years experience working in crop improvement. He is the author of numerous books including *Plant Pathosystems* (Collier-MacMillan, 1987) and *Host Management in Plant Pathosystems* (Springer-Verlag, 1976). His latest book, *Return to Resistance: Breeding Crops to Reduce Pesticide Dependence*, is written for a wider, less technical audience.

His UC Davis talk addressed the main topic of this recent book, the use of durable, horizontal host-plant resistance to manage parasites. He includes diseases, mites, insects, and nematodes in this category but excludes weeds as they are competitors and not parasites. In his talk and his book, he contrasts most current resistance breeding programs that are based on single gene, or vertical resistance, to programs that are based on a quantitative multi-gene horizontal resistance.

Vertical resistance is based on the "gene-for-gene" model of host parasite interactions, where every pathogen has a gene for parasitic ability and every host has a resistance gene. Robinson used a "lock-and-key metaphor" to describe vertical resistance, where the parasite gene is the key and the host gene is the lock. Either the key fits and the parasite gains entry to the host, or the lock holds and the parasite is excluded. Obviously the selection pressure in the parasite to overcome this kind of host resistance is intense. Indeed, others have described this kind of resistance breeding as "an arms race"--no sooner are new genes for resistance discovered and integrated into a plant, then the pathogen overcomes the resistance. Horizontal resistance, on the other hand, is quantitative; traits are results of mixtures of multiple gene products, therefore one observes a range of inheritance and genetic expression in the crop from a minimum to a maximum. This kind of resistance is more location specific, selected for over time and in the presence of local races of all pathogens, and is delimited by the crop's own range of cultivation.

Robinson and other breeders have shown that horizontal resistance can be developed and is durable in potatoes, coffee, corn, and beans. Importantly, not only is this kind of resistance long-lasting, but it greatly reduces or eliminates the need for pesticides. He cites examples of potato cultivars such as "Alpha," a Dutch cultivar grown in the Toluca Valley of Mexico, originally bred in

Europe with vertical resistance to late blight (*Phytophthora infestans*). It now typically receives 20 to 25 fungicide applications a year, while cultivars with horizontal resistance such as "Tollocan" and "Rosita" are sprayed only one to two times a year. Much of this potato resistance breeding work in Toluca was done by John Niederhauser with support from the Rockefeller Foundation.

In addition to discussing late blight on potatoes in Mexico and a more general history of late blight during the great Irish Potato Famine, Robinson described various other case studies of the challenges and successes in breeding for horizontal resistance. He discussed resistance breeding against the tropical corn rust (*Puccinia polysora*) in Kenya and coffee berry disease (*Colletotrichum coffeanum*) in Ethiopia.

Robinson also addressed possible new directions and solutions to some of the current shortcomings in the reliance on vertical resistance in crop protection. He suggested that plant breeders, farmers, amateur breeders and environmentalists should seriously consider making use of horizontal resistance through what he calls "plant breeding clubs." People form these clubs out of concern about the quality of commercially available cultivars, or to contribute practically to developing cultivars less reliant on pesticides. A club might be linked to a university interested in teaching students with "hands-on learning," or club members might simply be interested in the possible patent royalties.

For more information on how to breed for horizontal resistance, why and how to form plant breeding clubs, and for a general overview of the history of breeding for host-plant resistance to parasites, see Robinson's new book. *Return to Resistance: Breeding Crops to Reduce Pesticide Dependence* can be ordered for \$29.95 by calling Fertile Ground (agAccess) at (530) 756-7177.

For more information: R. Robinson, 445 Provost Lane, Fergus, Ontario, Canada, N1M 2N3.

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Contributed by Jenny Broome

Technical Review

Nematode-trapping Fungi in Organic and Conventional Cropping Systems

B.A. Jaffee, H. Ferris, and K.M. Scow

Phytopathology 88:344-350. 1998

Abstract reprinted with permission.

Nematode-trapping fungi, nematodes, and microbial biomass were quantified in conventionally and organically managed field plots in the Sustainable Agriculture Farming Systems Project at the University of California at Davis. There were four replicate plots (0.135 ha per plot) for each management system, and plots were sampled three times each year for two years. The hypothesis that nematode-trapping fungi would be more abundant in organically managed plots was partially supported: The number of species of nematode-trapping fungi was slightly but significantly greater in organic than in conventional plots, two species (*Arthrobotrys dactyloides* and *Nematoctonus leiosporus*) were detected more frequently in organic plots, and the population densities of *A. dactyloides* and *N. leiosporus* were greater in organic than in conventional plots. Two other species (*A. haptotyla* and *A. thaumasia*), however, tended to be more numerous in conventional than in organic plots, and the total density of nematode-trapping fungi was similar in organic and conventional plots. Bacterivorous nematodes were more abundant and microbial biomass (substrate-induced respiration) was greater in organic than in conventional plots. Suppression of the root-knot nematode *Meloidogyne javanica*, as measured in a bioassay, was not related to management system or population density of nematode-trapping fungi, but was positively related to microbial biomass.

For more information: B. Jaffee, Department of Nematology, University of California, One Shields Ave. Davis, CA 95616. bjaffee@ucdavis.edu

DEC.553

Contributed by Dave Chaney

Technical Review

A Total System Approach To Sustainable Pest Management

W.J. Lewis, J.C. van Lenteren, Sharad C. Phatak, and J.H. Tumlinson, III

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A fundamental shift to a total system approach for crop protection is urgently needed to resolve escalating economic and environmental consequences of combating agricultural pests. Pest management strategies have long been dominated by quests for "silver bullet" products to control pest outbreaks. However, managing undesired variables in ecosystems is similar to that for other systems, including the human body and social orders. Experience in these fields substantiates the fact that therapeutic interventions into any system are effective only for short-term relief because these externalities are soon "neutralized" by countermoves within the system. Long-term resolutions can be achieved only by restructuring and managing these systems in ways that maximize the array of "built-in" preventive strengths, with therapeutic tactics serving strictly as backups to these natural regulators. To date, we have failed to incorporate this basic principle into the mainstream of pest management science and continue to regress into a foot race with nature. This article establishes why a total system approach is essential as the guiding premise of pest management and provides arguments as to how earlier attempts for change and current mainstream initiatives generally fail to follow this principle. It draws on emerging knowledge about multitrophic level interactions and other specific findings about management of ecosystems to propose a pivotal redirection of pest management strategies that would honor this principle and, thus, be sustainable. Finally, it addresses the potential immense benefits of such a central shift in pest management philosophy.

For more information contact: W.J. Lewis, Insect Biology Research Lab, Agricultural Research Service, USDA, PO Box 748, Tifton, GA 31793.

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Contributed by Dave Chaney

Sources of Funding

SAREP Requests for Proposals - *CHANGES*

Look for changes in the Requests for Proposals (RFPs) SAREP is releasing later this summer, most notably in the timeline. RFPs will be sent to all California residents on the SAREP mailing list by Sept. 1, 1998, with proposals due later in the fall. SAREP will continue to offer research and education grants (with typical awards of \$3,000 - \$15,000 per year), and smaller grants for graduate student support (\$2,000 per individual) and educational events (up to \$1,000 per event). Other changes will be in the stated funding priorities as SAREP continues to clarify projects that will most effectively advance its mission and goals. Also new this year: Grants for agroforestry projects will be supported from a special fund established through a grant from the International Tree Crops Institute USA Inc. The RFPs will be posted on SAREP's Web site (<http://www.sarep.ucdavis.edu>) as soon as they are released. For more information, please contact SAREP grants manager, **Bev Ransom**, at (530) 754-8546 or baransom@ucdavis.edu

Food Projects

The USDA's Community Food Projects Grants Request for Proposals were released in May. These grants support the development of community food projects designed to meet the needs of low-income people, increase the self-reliance of communities re. their own food needs, and promote comprehensive responses to local food, farm and nutrition issues. Call (202) 401-5048 for a copy of the RFP; for questions, contact **Liz Tuckermanty**, at (202) 205-0241. Brief descriptions of 1996 awardees, as well as the annual *Project Planning Guide: A Guide to Preparing Winning Proposals for the USDA/ CSREES Community Food Projects Competitive Grants Program*, is available from The Community Food Security Coalition. Check its Web site at <http://www.foodsecurity.org/cfpp.htm>

Youth Gardens

The National Gardening Association will award its 16th Annual Youth Garden grants to 300 schools, neighborhood groups, community centers, and treatment facilities across the nation. Eligible organizations must plan to garden in 1999 with at least 15 children between the ages of 3 and 18 years (either food or beautification gardens). For an application contact: Youth Garden Grants, National Gardening Association, 180 Flynn Avenue, Burlington, VT 05401, Web site: <http://www2.garden.org/nga/EDU/NGA-EDU6.HTM> Applications are due **November 15, 1998**.

USDA's Fund for Rural America

The 1998 release of the Request for Proposals for the Fund for Rural America was expected by SAREP's newsletter publication date. Proposals will have a 42-day turn-around deadline. For more information, see

<http://www.reeusda.gov/fra> or call: (202) 401-2363. Fund for Rural America grants support research, education, and extension activities.

UC Policy Grants

The UC California Policy Seminar (CPS) has issued its 1999 Call for Proposals to UC faculty and senior research staff to conduct research on significant policy issues facing California. CPS will award approximately \$200,000 through this competition; normally four to six grants receive funding. CPS welcomes proposals on all topics that examine current and anticipated state policies, develop policy approaches, and/or evaluate policy implications. Prior to the formal applications process, faculty interested in applying should submit a two-page letter of intent by **August 3, 1998**. Contact CPS at (510) 642-5514; E-mail: CA.PolSem@ucop.edu Guidelines are also available on the internet at <http://www.ucop.edu/cps>

Organic Research Grants

The Organic Farming Research Foundation is offering funds for organic farming research, 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. The next round of proposals must be received by **July 15, 1998**. 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; E-mail: research@ofrf.org

Pest Management Funds

The California Department of Pesticide Regulation (DPR) is planning to release requests for proposals for pest management grants in late July or early August. Proposals for reduced-risk pest management projects would be due in October. For information, contact **Bob Elliott** at (916) 324-4156; E-mail: belliot@cdpr.ca.gov

[[Back](#) | [Search](#) | [Feedback](#)]

Resources

Print Publications

Federal Resources Guide

Guide to USDA and Other Federal Resources for Sustainable Agriculture and Forestry Enterprises, 160 pages, USDA SARE program, Michael Fields Agricultural Institute, Forest Service and USDA's Resource Conservation and Development program. The Guide gives basic information about more than 70 federal programs helpful to farmers, small entrepreneurs, non-profit organizations, rural communities and others in sustainable agriculture. For free copies, contact Appropriate Technology Transfer for Rural Areas (ATTRA), at (800) 346-9140.

Organic Directory

1998 National Organic Directory, produced by Community Alliance with Family Farmers (CAFF), \$44.95. Includes farmers of organic commodities nationwide, U.S. and international food wholesalers, farm suppliers, updated federal and state organic laws, businesses serving the organic industry, certification groups, cross-referenced organic commodities (buyers/sellers). Contact: CAFF, PO Box 363, Davis, CA 95617; (800) 852-3832 or (530) 756-8518 ext. 17. Add \$6 shipping/handling (CA residents add \$3.48 tax).

Organic Cotton

Organic Cotton Directory, published by the Organic Trade Association (OTA), \$15. Features 200 businesses and extensive market data. A collaborative project of the Pesticide Action Network and OTA's Organic Fiber Council. Contact: OTA's Organic Fiber Council, Nathan Boone, (530) 750-2265; Fax: (530) 756-3122; e-mail: ofc@igc.org or Linda Lutz, (413) 774-7511; Fax: (413) 774-6432.

Web Sites

Agricultural Databases (AgDB) & Conferences

- <http://www.agnic.org/agdb/> (databases)
- <http://www.agnic.org/mtg/> (calendar)

The Agriculture Network Information Center (AgNIC), a virtual information center established by the National Agricultural Library in collaboration with various universities, offers a database resource (AgDB) and a calendar devoted to conferences. An experts directory is expected to be available soon. AgDB is a searchable database of agriculture-related databases, datasets, and information systems that describes and links to more than 800 information resources, including those related to forestry, insects, and weed control. Content ranges from "technical" to "practical."

Also available through AgNIC is a calendar maintained by the National Agricultural Library, which includes information about and links to more than 1,200 major national and international agricultural conferences.

Environmental Education

- <http://www.2nature.org>

This site is maintained by Second Nature, a nonprofit organization that helps education professionals link the interdisciplinary principles of environmental sustainability to their teaching and campus operations, through online resources. Resources include syllabi, reading lists, teaching techniques, bibliographic references, and a calendar of events.

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 newsletter, its latest Biennial Report, an interactive calendar, and information databases through its World Wide Web server.

New items

Cover Crop Slide Shows

- <http://www.sarep.ucdavis.edu/ccrop>
Cover cropping in orchards and vineyards
Cover cropping in row and field crop systems

Biennial Report

- <http://www.sarep.ucdavis.edu/pubs /progress/95-97>

Learning from the BIOS Approach

- <http://www.sarep.ucdavis.edu/bios /index.htm>

New Organic Cost Studies (raisin grapes, lemons, oranges)

- <http://www.sarep.ucdavis.edu/pubs /Costs.htm>

Calendar

SAREP Web Calendar

SAREP offers a regularly updated sustainable agriculture calendar on our World Wide Web site at: <http://www.sarep.ucdavis.edu/> (click on "Courses, Workshops, Events"). Please feel free to use our add-on form to announce your own related events.

National/International Calendar

The National Agricultural Library maintains a calendar as part of AgNIC at <http://www.agnic.org> It links to more than 1,200 major national and international agricultural conferences.

Monthly Meetings

Lighthouse Farm Network The Community Alliance with Family Farmers Foundation sponsors informal monthly meetings for growers to discuss issues related to pesticide use reduction. Contact: **Reggie Knox**, CAFF, (408) 457-1007.

July

5-9 Balancing Resources Issues, Soil & Water Conservation Society Annual Conference, San Diego, CA. For more information contact SWCS, e-mail: swcs@swcs.org, Web: <http://www.swcs.org>

October

TBA Improving Water Quality Through Sustainable Agricultural Practices--A Workshop Series for Dairy Producers, Orchardists & Rowcrop Farmers. Glenn County Resource Conservation District, UC Cooperative Extension, UC SAREP. Various locations in Glenn County. Contact: **Barbara Reed/Bill Krueger**, UCCE (530) 865-1107; **Andrea Sexton**, CD, (530) 934-5713.

November

5-7 Food: Nature & Culture conference, The New School, New York, NY. Forum on hunger, diet, food security for scholars, scientists, policy makers organized by **Arien Mack**, editor of Social Research. Contact: (212) 229-2488, e-mail: socres@newschool.edu, Web: <http://www.newschool.edu/centers/socres/food>