CASFS
The CENTER for AGROECOLOGY & SUSTAINABLE FOOD SYSTEMS

the Cultivar

The CENTER for AGROECOLOGY & SUSTAINABLE FOOD SYSTEMS

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in this issue:

Community Supported Agriculture on the Central Coast

CSA project manager Nancy Vail packs boxes for shareholders in the Center's Farm & Garden CSA program.

Across the U.S., a growing number of consumers are getting much of their weekly produce by picking up a box of fruits and vegetables harvested that same day on a farm in their community. "Pick-up days" continue through the growing season for members of community supported agriculture farms, often referred to as CSAs.

The basic concept behind CSA is simple—a farmer commits to growing food for a group of people (often called "members" or "shareholders") and the people support the farmer by paying for their shares of produce ahead of time, often at the beginning of the season. CSA members thus ideally share both the risks and the bounty of farming.

Community Supported Agriculture farms have been operating in the U.S. since the mid 1980s. The number of CSA farms has grown significantly—currently, there are between 800 and 1,000 CSAs in the United States. As CSAs have been created across the country, many sustainable agriculture advocates have professed a number of ideals and dreams for this approach to farming and marketing. Many see the CSA as a vehicle for increasing small farm viability and for encouraging the use of ecologically sound farming practices. CSAs have also been promoted as a way to build personal relationships between farmers and consumers, to educate people about the food system and its issues, and to enhance community development.

The nature of, and possibilities for, CSA on California's central coast have been the focus of a study conducted by the social issues staff of the Center for Agroecology and Sustainable Food Systems (the Center). This study aims to: 1) describe how the CSA model has been implemented on the central coast, 2) determine the extent to which central coast CSAs are manifesting the hopes that people hold for them, and 3) identify constraints and opportunities to reaching these ideals. This research will contribute to the small number of studies focusing on CSAs in the U.S. and California and will provide information to people interested in understanding, supporting, or furthering CSAs. Center staff involved in the study include social issues specialist Patricia Allen, post-doctoral researcher James Murrell, and post-graduate researcher Jan Perez.

> *continues on page 2*

SEVENTY-NINE PERCENT [OF CSA MEMBERS] NOTED THAT **THEY EAT MORE VEGETABLES,** OR EAT A GREATER VARIETY OF VEGETABLES

Social issues research on CSAs is part of the Center's Central Coast Research Project, an effort funded by the USDA. Its purpose is to explore ways of improving the sustainability of the food and agricultural system on the California central coast (which includes Monterey, San Benito, Santa Cruz, Santa Clara, and San Mateo Counties).[1] Part of the social science component of the study looks more broadly at alternative and traditional marketing strategies and their relationship to encouraging more ecologically healthy farming practices. Since CSAs have been put in the forefront of alternative marketing options, and since CSAs appear to be something quite different from the conventional food system, they were chosen as the focus of a more in-depth study.

RESEARCH APPROACH

Developing an understanding of CSAs requires learning from both farmers and members. The research team used three strategies for collecting this information—interviews, written questionnaires, and focus groups. After identifying 14 CSAs in the central coast, center social issues staff conducted 1 1/2- to 3-hour interviews with growers from 13 CSAs. These growers also completed a questionnaire covering information such as farm size, growing practices, and demographic data.

CSA members provided information through a written questionnaire and by participating in focus groups. A 4-page survey was distributed to members of 8 farms through the mail or in the CSA box. We received 272 responses of the 638 surveys delivered to members for a response rate of 43%.

On a form delivered with the questionnaire, members were asked to indicate if they would be interested in participating in a focus group on CSA. Ultimately, 16 members from 5 different farms were able to participate in one of three focus group sessions in Ben Lomond, Watsonville, and Santa Cruz. This article reports some preliminary results and observations from the farmer interviews, focus groups, and written questionnaires.

PROFILES OF CSA FARMS AND MEMBERS

The survey and interview process has provided us with a picture of central coast CSAs and their members. Of the 13 CSAs that participated in the study, a little over half (7 out of 13) were traditional family or individual farms. Five CSAs were run by non-profits and one other by a cooperative. The number of shares ranged from 5 to 235, with the average being around 80. Most members received primarily vegetables and fruit. Some farms had flower shares as well (the smallest CSA had *just* flower shares in 2001) and one farm has started offering a bread share this year. Most CSA farms are small, ranging from 1/2 to 23 acres. Only one farm was significantly larger than the rest, at 650 acres.

The member survey results show that the CSA shareholders on the central coast are very similar to those nationwide—they tend to be European-American (90%), highly educated (81% have 16 years of education—roughly a college degree), and middle to upper income (66% have a household income of $60,000 or more). This member profile is not necessarily representative of the population on the central coast. For example, in the 5 county area, only 51% of the people are European-American.

The most frequently reported "important reasons" members expressed for joining CSAs were to purchase organic (62%), fresh (34%) produce. The members also wanted to buy local produce or support "local" farms (40%). Additionally, 48% of members mentioned that they wanted to *support* a farm, a farmer, or sustainable/organic agriculture in general.

EFFECTS ON SHAREHOLDERS

One topic of interest in this study was to see what people learned from their experiences with the CSA farm, and how their lives changed. To address this question, we asked them if their eating habits had changed since becoming a member. Eighty-one percent (221 individuals) responded that they had some type of change. Seventy-nine percent of the 221 noted that they eat more vegetables or eat a greater

Martha Brown

Members of the UCSC Farm & Garden CSA project pick up their weekly shares at an historic barn on the UCSC Farm.

[1] Also included in the Central Coast study is research on water quality and ways of decreasing nonpoint source pollution from the region's farms (see *The Cultivar,* 19 #2, Fall/Winter 2000).

CSA GROWERS TEND TO **FARM IN WAYS** THAT ARE **ENVIRONMENTALLY FRIENDLY. THIS ENVIRONMENTAL RESPONSIBILITY** IS SUPPORTED BY THE CSA MEMBERS

variety of vegetables. This finding is encouraging considering that eating more fruits and vegetables, including a wider variety, has been suggested as sound nutrition advice for preventing health problems. Other common shareholder responses included that they are eating healthier (17%), they are eating at home more and out less (12%), and they are eating better quality food (10%).

We also asked people if there have been any other changes (besides eating habit changes) in their own or their household's life since participating in CSAs. Forty-nine percent (133 people) mentioned something that could be categorized as a change. The most frequent responses were that people cook differently (27% of the 133 responses). This category includes people who say they now plan their meals around the vegetables, cook more creatively, enjoy cooking more, and use different recipes/try new things. As one woman said, "I usually plan a week's menu in advance of going shopping. With CSA I planned the menu around the CSA produce, e.g., ate more stuffed chard and cabbage, fruit desserts, etc."

Pete Lowy

All of the CSA farms surveyed use organic methods and many are certified by an organic certification agency, such as California Certified Organic Farmers (CCOF).

CSAS AND ECOLOGICAL SOUNDNESS

One goal of this study is to determine the extent to which CSAs use ecological farming practices. From the farmer surveys, we found that all these farms use organic methods, and almost 70% are certified by an organic certification agency. Also, we found that CSA growers used many practices considered necessary for sustainable farming.

Regarding pesticide use, 8 out of 12 use organic pesticides,[2] which might be considered the minimum activities one could do with organic practices. However, the overwhelming majority (11 out of 12) use 3 or more different types of practices to control pests, such as providing habitat to encourage beneficial insects (10 out of 12), crop rotation (11 out of 12), and cultural controls such as tillage, water management, etc. (10 out of 12). Similarly, weeds are controlled through a multitude of practices (11 out of 12 farms used 4 or more different activities). The primary activities used to control weeds were crop rotation (all), tillage (11 out of 12), pre-irrigation (9 out of 12), and flame weeding (7 out of 10). This evidence appears to confirm beliefs that CSA growers tend to farm in ways that are environmentally friendly.

This environmental responsibility is supported, and thus partially sustained, by the CSA members. When asked about their main reasons for joining a CSA, 79% of the members wrote in reasons related to environmental soundness. These included: wanting organic produce, wanting to support organic farming or sustainable agriculture, not using pesticides, and other environmental reasons. The attitudes of the members combined with the farmers use of ecologically sound farming practices support the hope of CSAs as being a more environmentally benign food production system.

MARKET SECURITY FOR SMALL-SCALE GROWERS?

Another hope for CSAs is that they will provide a stable marketing channel for small farms, since farmers know who their customers will be for the year, and the farms are not subjected to the vagaries of market demand and price fluctuations. A small turnover of members from year to year, therefore, would improve the security of CSA as a marketing option.

To explore this topic, members were asked if they planned to purchase a share from this farm again next year. Encouragingly, 78% said they would return. However, this may be optimistic, since farmers reported that the average return rate for the previous year was around 65%. Some farmers stated that they have to do a lot of work every year to replace the members who left.

Therefore, an important question to look at regarding market security is "Why are people leaving?" Of the 20% (57 households) who did not intend to renew their CSA membership or who were unsure about returning, 44% gave reasons for leaving that related to product mix. These people

[2]Growing practice data are missing for one of the farms interviewed.

> *continues on page 18*

from the
director

This twentieth volume of *The Cultivar* represents a milestone for the Center—for two decades now, we've been using the newsletter to bring you information on our research, education, and outreach work.

The articles in this issue reflect how much our thinking about agroecosystems, alternative marketing, and resource protection has developed since we first produced *The Cultivar* in the winter of 1983.

Twenty years ago Community Supported Agriculture (CSA) had barely gained a toehold in the U.S.—today the concept is at the forefront of efforts to develop alternative marketing strategies for small- and medium-scale growers (*see cover story*). For the past twenty years, conservationists and farmers have often squared off over environmental issues—today they're working together to benefit both farmers and wildlife (*page 8*).

Other changes reflect growing public and policy interest in farming practices that protect soil and water, and support the people that grow our food. The market for organic products continues to expand at a rate of 20% per year. New books like *Fatal Harvest* and *The Farm as Natural Habitat* (*page 17*) chronicle conventional agriculture's impacts on natural resources and communities, and point to sustainable alternatives to chemical-based practices. Organic farming research received $15 million dollars in the recently passed federal farm bill, which also includes new funds to promote stewardship practices on farms and ranches.

As the sustainable agriculture movement has grown, the Center's efforts have also evolved. Research into social issues in agriculture, water quality protection, and farm nutrient budgets now complement the program's original work on topics such as polyculture, intercropping, and allelopathy. This year we celebrate the 35th season of training apprentices in organic farming and gardening techniques, an effort whose "ripple effect" has spread around the world. UC Santa Cruz students enjoy new opportunities through the Center's classes and grants program (*page 13*). And the new Life Lab Garden Classroom at the Center's farm adds another dimension to our outreach programs (*page 16*).

It's amazing to see how far we've come since our first newsletter, when we introduced the ideas of "agroecology" and "agroecosystem" to readers. These terms have become standard in many current discussions of agriculture, thanks in part to the efforts of Center faculty affiliates and staff. Furthermore, I recently returned from an international conference on "Healthy Ecosystems, Healthy People" in Washington D.C. The conference highlighted the need to better understand links among ecosystem processes, biodiversity, and human health in both urban and rural areas. The Center's work on agricultural landscapes, urban agriculture, and food systems addresses critical elements in understanding these links and helps create healthy ecosystems for the future. Our hope is that in twenty years we can look back on another quantum leap in progress toward developing food systems that are environmentally sound, socially just, and sustainable for future generations.

- Dr. Carol Shennan

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Achieving a Nutrient Balance on the Farm

Managing soil nutrients is a little like balancing a complex set of scales. On one side of the balance point are soil amendments in the form of fertilizers, compost, cover crops, or other inputs, along with the nutrients already present in the soil; on the other are the nutrients crops use as they develop. Ideally, crops will convert most or all of the added nutrients to fruit, flowers, and vegetables, and the scales will balance at the end of the cropping season.

In reality, achieving a nutrient balance—particularly in an organically managed system—can be tricky. Organic inputs such as cover crops and composts differ from soluble chemical fertilizers in that their composition can't be easily altered and manipulated. And while too few nutrients can limit crop yields, overapplication of compost or the accumulation of nutrients in the soil—even from an organic source, such as cover crops—can put natural resources at risk. Rain or irrigation water may leach unused nutrients into sensitive waterways and groundwater, triggering pollution problems. These unused nutrients also represent a loss of income for the farmer.

Growers can help balance nutrients in their cropping systems by developing a nutrient budget for their farm. Using a nutrient budget, a grower calculates "credits" in the form of inputs, and balances them against the nutrient requirements the crop needs to achieve a desired yield. These are not real-time calculations, but are based on past performance for the climate and soil condition, ideally from local sites or the grower's own farm.

Antonio Abboud, a visiting researcher from the Universidade Federal Rural do Rio de Janeiro, Brazil, conducted a nutrient balance study on the Center for Agroecology and Sustainable Food System's farm at UC Santa Cruz during the 2001-2002 cropping season. His visit was sponsored by CAPES, an agency of the Brazilian Ministry of Education.

Abboud's study addressed two basic questions: Are current soil management practices maintaining soil fertility? And how can a nutrient budget help improve management practices?

Pete Lowy

A wide variety of crops were sampled during the nutrient balance study on the UCSC Farm. Flags mark study plots in the row crops fields.

SOIL MANAGEMENT PRACTICES

The UCSC Farm has been managed organically since 1974, and according to farm manager Jim Leap the 12 acres of fields and 2 acres of orchards have been generously amended with compost, lime, gypsum, phosphate, and manure teas in the past.

As part of current soil management practices, farm fields and orchards are cover cropped in the winter to protect them against erosion and to generate biomass and nitrogen. "Our typical cover crop consists of bell beans (*Vicia faba*) and vetch (*Vicia* sp.), each sown at a rate of approximately 50 pounds of seeds per acre, combined with oats (*Avena sativa*), at a rate of less than 5 pounds per acre," says Leap. Summer cover crops such as annual buckwheat (*Fagopyrum esculentum*), sudan, vetch, and soybeans (*Gly-*

> *continues on next page*

cine max) are used in the annual production systems when feasible.

In the spring, cover crops are mowed with a flail mower and incorporated with a mechanical spader to a depth of 35 centimeters (approximately 14 inches). "Cover crops in the orchards are also mowed in the spring, but are left on the surface until fall, when we disc the orchard floor and plant it to winter cover crops. That reduces our tillage to two passes with a disc in the fall," says Leap.

Following incorporation and breakdown of cover crops, farm staff amends the fields and orchards with farm-produced compost. "Currently we produce approximately 60 tons of finished compost each year for use on the row crop fields and orchards," says Leap. In the last two years, the compost has consisted of one part horse manure with bedding material, and some of the previous year's compost as an inoculum source, combined with one part grape pomice and stems. Leap's goal is to limit compost applications to a rate of 5 tons per acre or less to minimize nutrient buildup and leaching.

Leap uses an eight-year crop rotation based on different crop species, rooting depths, moisture and fertility requirements, disease cycles, and weed control. The rotation consists of –

1st year – perennial cover crop (Linn perennial rye, and crimson, rose, and burr clovers)

2nd year – perennial rye mowed, compost applied, overwintering onions and garlic planted

3rd year – garlic and onions harvested

4th year – mix of greens, carrots, broccoli, cabbage, and salad mix

5th year – peppers, potatoes, or tomatoes

6th year – sweet corn and bush beans

7th year – cucurbits: pumpkins, winter squashes, cucumbers

8th year – miscellaneous crops, e.g., summer squash, cucumbers, peppers, eggplant

CALCULATING NUTRIENT INPUTS AND CROP EXPORTS

Abboud sampled the farm's compost prior to its application in the spring to determine levels of nitrogen (N), phosphorous (P), and potassium (K). These were measured at 0.93% N, 0.45% P, and 0.79% K. The percentages were multiplied by the tons of compost applied per acre to calculate nutrient inputs. For example, a 5 ton per acre application adds approximately 100 pounds of nitrogen, 45 pounds of phosphorous, and 79 pounds of potassium per acre.

As part of the study, Abboud also collected soil samples from selected field and orchard sites in the spring, taking samples from 6-inch depths on a grid. Three composite samples were taken from 10 subsamples and analyzed for pH and soil available P. Results will be incorporated into a soil fertility map to include in the farm's Geographic Information System (GIS). In addition, he examined historical nutrient level trends for the fields using results from previous tests for soil organic matter (SOM), pH, and available N, P, and K.

To calculate nutrient exports, Abboud sampled crop yields during the spring, summer, and fall. Samples consisted of more than two dozen vegetable crops grown in

Calculating Nitrogen Inputs from Cover Crops

Cover crops are a cornerstone of fertility management strategies for organic farmers, yet it is a little tricky to work out how to account for them when constructing a nutrient budget. For all nutrients except nitrogen (N), cover crops may increase available nutrient levels in the upper part of the soil profile, but this does not count as a true "input" into the field. What cover crops are actually doing is "recycling" nutrients that they have absorbed from the soil, and returning them to the topsoil when their residue is incorporated or left on the surface to decompose. In this way crops can experience higher available nutrient levels based on how good the previous cover crops were at scavenging nutrients from the soil. For example, some cover crops are deeper rooted and/or more efficient at scavenging nitrogen and phosphorous from the soil than many cash crops. However, if legumes are used as a cover crop, they have the capacity to fix nitrogen, which is a true input.

The trick here is to know how much of the nitrogen contained in the cover crop residue was produced by biological N fixation, and how much was taken up from the soil (i.e.,recycled). Working this out is not straightforward, and the proportion that is fixed N can vary enormously depending on how well the legume nodulates, whether soil P is adequate, or how high available N in the soil is already. To fix nitrogen from the atmosphere requires much more energy than absorbing N from the soil, so even legumes will take up soil N if it is available rather than invest in producing root nodules and fixing N. When legumes are planted in a mixture with a non-legume (e.g., a cereal or grass), they will typically fix more N than when planted alone because the non-legume lowers the available N in the soil as it grows.

At CASFS we are using a variety of techniques to quantify how much N is fixed by our legume cover crops so that we can get a more accurate picture of whether the farm has a good balance of N inputs to match what is removed in crop harvests. To optimize N fixation by a legume: 1) innoculate with the appropriate rhizobium species at planting unless you have built up a healthy population in your field from previous years (check for good root nodulation), 2) plant in mixture with a non-legume in soils that have good N fertility already, and 3) ensure that other nutrients such as P are adequate.

single rows or intercropped. For each crop row, two to four plots 1 meter in length were sampled for fresh and dry biomass and N, P, and K content. Abboud also analyzed any crop residues and weeds left in the fields in the fall, prior to their being turned under.

Abboud found a large variation in crop yields when compared to the averages for California as reported by the California Agricultural Statistical Services (USDA web site www.nass.usda.gov). He believes that much of this variation stemmed from harvesting immature vegetables and comparing their nutrient content to results from analysis of mature vegetables. This points up the need to harvest vegetables at a mature stage and use local yields for calculating nutrient budgets rather than relying on yields from other years or sites. Leap explains that the high diversity of crops grown at the UCSC Farm for the Community Supported Agriculture (CSA) operation also complicated Abboud's analysis of nutrient exports.

Looking at a single crop provides a clearer example of the nutrient balance process. On a portion of the fields where compost was applied prior to planting an onion crop, Abboud calculated a partial field nutrient balance. This balance, which did not include the cover crop's N contribution, suggests a deficit of -77.1 kg N/ha (-69 pounds N/acre), an amount likely to be supplied by biological nitrogen fixation (BNF) from the cover crop (Leap estimates that cover crops contribute approximately 60–80 pounds of nitrogen per acre annually—see sidebar). A small deficit in P (-6.9 kg P/ha, -6 lb P/acre) suggests P is basically in balance, but a much larger K deficit of -114 kg K/ha (100 lb K/acre) indicates that K is being depleted in the system.

Abboud also simulated a nutrient budget based on the full 8-year crop rotation used in the row crop fields. The simulation indicates trends similar to the partial field analysis described above: an N deficit of -53 kg N/ha (-47 lb N/acre) that would be provided by BNF from the cover crop; a slightly negative P balance, indicating that P is not a short-term concern; and a highly negative K balance of –336.9 kg K/ha (-300 lb K/acre) over 8 years.

In his conclusions, Abboud notes that one reason K may appear to be declining in the system is a change in soil amendments. Leap explains that in the past they had applied composted chicken manure high in K to the UCSC farm fields, which likely led to an accumulation of K in the soil. Although K now appears to be declining in the system, Leap believes that past K levels were abnormally high. However, Abboud also notes that similar K deficits were observed in a Canadian farm under long-term organic management (Abboud 1992).

PHOSPHOROUS LEVELS COMPARED

Using a soil analysis technique that measures labile P (the portion of P available to plants) and non-labile P, in organic and inorganic forms, Abboud compared P levels in farmed soils with those from non-cultivated soils outside the UCSC farm boundary. He found that total P levels are higher on farm soils compared to unfarmed areas. The fraction responsible for this increase is mostly the labile inorganic one, although most of the fertilization occurs as organic amendments.

Although this result apparently contradicts the slightly negative P balance found in the nutrient budget analysis, Abboud explains that plants could either be mobilizing P from deeper layers via root uptake and residue deposition or previous amendments of bone meal and rock phosphate used many years ago on the row crop fields may be the cause for this increase in soil P.

IMPROVING SOIL MANAGEMENT

Asked whether he sees nutrient budgets as a tool to improve soil management practices, Jim Leap replies, "Absolutely, especially when it comes to managing nitrogen and phosphorous. These are the nutrients showing up in waterways downstream from farms, so it's clear that these nutrients are being lost from fields. This is in part because growers often fail to take leaching into account. When soluble nutrients such as phosphorous and nitrates accumulate, they're vulnerable to leaching."

Growers can help minimize such losses by testing their soil to determine levels of N, P, and K, then adding appropriate amounts of amendments to address crop needs. This approach contrasts with practices currently used by the many growers who operate on a fixed protocol, applying the same type and amounts of amendments year after year without taking into account the true needs of the soil and crops. According to Leap, such an approach may stem in part from the need to improve soil conditions. For instance, growers working on heavy soils may need to add large quantities of compost to improve soil tilth, and in the process add more nutrients than the crops can use.

The cost of developing a nutrient budget may be a deterrent for some growers. Expenses include tests for soil, compost, and crop nutrient levels. And although there are organic soil amendments high in N, P, or K available that would help growers fine tune their nutrient management practices, these amendments can add considerable cost to an operation when compared with compost or cover crops.

Researchers from the Center for Agroecology and Sustainable Food Systems are currently developing a nutrient budget worksheet for organic vegetable growers. According to Center director Carol Shennan, the worksheet will be based in part of Abboud's nutrient budget analysis and will help growers plan their fertility management strategies to maximize production while minimizing nitrogen and phosphorous runoff. A detailed worksheet will appear in the Fall/Winter 2002 issue of *The Cultivar.*

– Martha Brown

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Farming with the Wild: Reconnecting Food Systems with Ecosystems

Despite a shared love for the land and a common commitment to protecting it from development, wildlands advocates and the sustainable farming community tend to overlook one another as natural and necessary allies. Indeed, conservationists are prone to repudiate agriculture as a leading cause of the biodiversity crisis, and to blithely disregard and undervalue the sources of their food and fiber. Meanwhile, farmers too often view conservation as yet another threat to their livelihood. Ideologies aside, however, self-preservation in the context of ecological preservation demands that we embrace both wildlands and stewardship farming as essential elements to protecting the larger landscape. Thus, the Wild Farm Alliance was founded in 2000 as a network of farmers, conservationists, and consumers who promote agriculture that helps protect and restore wild Nature.

THE MANDATE FOR CHANGE

Agriculture has been identified as the primary cause of habitat loss—the principal foe to biodiversity (Wilcove et al. 1998). Habitat destruction and fragmentation, the displacement of native species and the introduction of exotic species, pollution of terrestrial and aquatic ecosystems, soil erosion, the persecution of predators, the release of genetically modified organisms, and the overexploitation of nonrenewable resources for food production and distribution are among the many ecologically devastating consequences of modern agricultural practices. These impacts are best understood from the perspective of agriculture's dominance on the landscape. In the United States excluding Alaska, approximately half of the private land base is managed as cropland, pastureland, or rangeland (Heard et al. 2000). Coupled with grazing on public lands, a total of 65 to 75% of the US land area (in the Lower 48) is directly affected by agriculture (Wuerthner 2000). Given this magnitude of scale, it is not surprising that agriculture has contributed to the plight of at least 42% of the species listed under the Endangered Species Act (USDA 1997), with livestock grazing culpable for one-third of imperiled plant species (Wilcove et al. 1998).

Of course, the ecological footprint of agriculture extends well beyond its immediate geographical footprint, as is dramatically exemplified by water development. In the last two centuries, land under irrigation has increased thirtyfold (Leslie 2000), with 40% of the world's food currently produced from irrigated land (Brown et al. 1999). Globally, more than 35% of accessible freshwater is used in agriculture (Vitousek et al. 1997). In addition to the profound ecological repercussions of such intensive water use (e.g., myriad damming effects, pollution, aquifer depletion, climate change), the resulting scarcity of water is predicted to become the most important factor limiting agricultural production in the future (Leslie 2000).

In essence, industrial agriculture has become an affront to Nature's complexity and integrity, as monopolistic control increasingly results in input-dependent food and fiber systems. According to agroecologist Miguel Altieri (1999): "Modern agriculture implies the simplification of the structure of the environment over vast areas, replacing nature's diversity with a small number of cultivated plants and domesticated animals." Altieri notes that no more than 70 plant species are grown on roughly 1.5 billion hectares of cropland worldwide. By comparison, consider the 40,000 species of flora that occur on just 2% of the world's land surface encompassed by Colombia, Ecuador, and Peru (Wilson 1992).

The ubiquity of animal-based agriculture adds insult to injury. More than 800 million acres of American pastureland, rangeland, and forest are grazed for livestock production (Wuerthner 2000). An additional 200 million acres of cropland are annually dedicated to growing grains, alfalfa, and grass for livestock, which consume more than 70% of the grain grown in the United States (Rifkin 1992). Circling back to water development, the production of one ton of beef requires from 15,000 to 70,000 tons of water (Leslie 2000). Clearly, our current level of meat consumption is taking a major toll on the land and its resources.

In the United States and abroad, small-scale farmers who strive to manage farmland responsibly are under extreme pressure to maximize production in order to compensate for deflated prices. Trends in globalization have exacerbated this crisis, as farmers are forced to compete in an export-driven economy (the United States alone supplies roughly half of the world's grain exports; Brown et al. 1999). Farmers are increasingly compelled to specialize in whichever commodity they can produce most cheaply and to offer their products on global markets—a system that favors large, monocultural farms employing heavy and costly machinery (Gorelick 2000). Small, community-based farms are driven under, while foods consumed locally are brought in from elsewhere.

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Farmland surrounds Elkhorn Slough's critical wildlife habitats on California's central coast.

The few winners in this scenario—including the five agribusinesses that account for nearly two-thirds of the global pesticide market, almost one-quarter of the global seed market, and virtually the entire transgenic seed market* (Gorelick 2000)—are profoundly outnumbered by its human and non-human losers. Indian scholar and activist Vandana Shiva cautions that "Industrial agriculture has not produced more food. It has destroyed diverse sources of food, and it has stolen food from other species to bring larger quantities of specific commodities to the market, using huge quantities of fossil fuels and water and toxic chemicals in the process" (Shiva 2000).

BRIDGING THE GAP BETWEEN WILDLANDS AND AGRICULTURE

In recent years, forward-thinking conservation activists and biologists have set forth a bold vision of large-scale wilderness recovery based on restoring interconnected functional ecosystems across North America. A growing body of scientific literature supports the need for large protected areas to reverse the dramatic trends in biodiversity loss (Frankel and Soulé 1981, Noss and Cooperrider 1994, Soulé and Noss 1998). But if landscape-level conservation planning is to be effective, the capacity of agricultural lands to help maintain biodiversity and ecological processes must be increased. Reciprocally, sustainable food systems depend upon the ecosystem services provided by biodiversity, such as the recycling of nutrients, the regulation of local hydrological processes, and the detoxification of noxious chemicals (Altieri 1999).

There are perhaps no better ambassadors for farming with the wild than pollinators. This diverse assemblage of insects, birds, bats, and a few other mammals are critical to the effective pollination of both cultivated and wild plants, yet, alarmingly, more than 200 species of wild vertebrate pollinators and innumerable invertebrates are on the verge of extinction (Allen-Wardell et al. 1998). In addition to the obvious implications for crop yield, the ecological ramifications are palpable:

It now appears that the majority of plants studied to date show evidence of natural pollinator limitation. That is to say, under natural conditions, 62 percent of some 258 kinds of plants studied in detail suffer limited fruit set from too few visits by effective pollinators. If this condition is the norm in the natural world, to what extent is the regeneration of plants jeopardized by human disruption of the interactions between plants and their pollinators? (Buchmann and Nabhan 1996)

Organic farmers have done pioneering work in managing the farm as a natural system by demonstrating that superior and healthy crops can be grown without chemical inputs. The marketing of organics has also dramatically heightened public awareness about the link between food and the environment. But organic production alone cannot and does not address the landscape-level threats agriculture poses to biodiversity. North Dakota wheat farmer Frederick Kirschenmann and co-author David Gould (2000)

> continues on next page

*These five agribusinesses are AstraZeneca, DuPont, Monsanto, Novartis, and Aventis.

Wild Farm Alliance

"Marrying the two concepts of sustainable agriculture and wildlife habitat protection—that's what people are so excited about," says Jo Ann Baumgartner, project director for the Wild Farm Alliance. This new, national organization serves as a leading source of information and resources on agricultural practices that promote wildlands protection and biodiversity.

Headquartered in Watsonville on California's central coast, the alliance is involved in other activities including creating a platform for individuals and organizations to sign in an effort to create a network of connections. Wild Farm Alliance staff and steering committee members write about the project for newsletters and national magazines such as *Sierra* and *Orion Afield,* make conference presentations, and develop fact sheets for farmers, conservationists, and consumers. Staff also offer periodic tours of farms that incorporate habitat conservation efforts, and workshops for growers on farming-compatible techniques to maintain and restore wildlife habitat.

For more information, contact Jo Ann Baumgartner at Wild Farm Alliance, 406 Main St., Ste. 213, Watsonville, CA 95076, 831.761-8408, 761-8103 (fax), wildfarms@earthlink.net.

conclude that "we cannot have healthy 'organic' farms inside degraded landscapes. Quite apart from the problem of 'drift'—whether chemical or genetic—there is the fact that the biodiversity necessary to produce the ecosystem services on which our organic farms depend can only be restored and maintained at the ecosystem level."

Accordingly, we need to raise the bar for organic production such that sustainable agriculture is equated with true *ecological* sustainability, and cannot be co-opted by industrial agriculture. To achieve this goal, we must rethink organic agriculture at the landscape level and reform food and fiber systems from the ground up.

CULTIVATING A FUTURE FOR BIODIVERSITY

Fortunately, humankind does not have the capacity to confront the apparent paradox evoked by modern agriculture: "that we depend upon what we are endangered by (Berry 1987). As stated in the Vancouver Statement on the Globalization and Industrialization of Agriculture (1998):

We know that there are non-toxic and non-destructive alternatives to global industrial agriculture, and we know that these alternatives can provide more food. Farmers around the world are farming in ways that respect their unique ecological and cultural communities. Building on their wisdom, all farms of the twenty-first century can be ecologically regenerative, community sustaining, biologically and culturally diverse, as well as energy conserving. We must not only build upon the existing knowledge and vision of farmers, but we must expand partnerships and create coalitions that serve to re-empower them.

Stewardship practices such as establishing riparian buffers, diversifying land use, minimizing disturbance of soil biota and structure, timing farming activities to avoid disturbance of nesting birds, eliminating synthetic herbicides and pesticides, rotational grazing, and maintaining wildlife refugia on the farm have already shown ecological promise. In order for such practices to succeed in the long run, however, they must make economic sense for the farmer. Strategies for enhancing the market value of good stewardship are beginning to emerge. A growing number of certification and ecolabeling programs, for example, are attempting to create market-based incentives to address species-specific and regional conservation issues. Through such third-party verification programs, consumers can identify and directly support farmers who help protect biodiversity.

In the last two decades, several federal cost-share programs have also been initiated under the Farm Bill to encourage stewardship on private agricultural lands. For instance, the Wildlife Habitat Incentives Program (WHIP) was created in 1996 to help landowners plan and pay for wildlife habitat restoration and management activities. In 1998 and 1999, $50 million in WHIP funds supported more than 8,000 projects affecting well over one million acres of land (Hackett 2000). While farmer and rancher demand for such incentive programs continues to increase dramatically, most requests for federal assistance are rejected due to inadequate funding. Last year, Congress designated $32 billion in federal farm spending, less than 10% of which was dedicated to conservation programs (Faber 2001). In fact, public financial commitment to conservation on private lands is well below the level of 60 years ago (USDA 1997). Current government subsidies for destructive agricultural practices should be eliminated, and associated funds redirected into programs that reward farmers and ranchers who implement practices aimed at protecting natural habitat, water quality, and wildlife.

Ultimately, the viability of farming with the wild will depend upon a societal commitment to supporting ecologically sustainable agriculture. Many billions of dollars are exchanged annually for food and fiber; consumers can exercise their spending power to keep stewardship farmers and biodiversity in business. Every farm, every rural landscape, should help provide connectivity—through clear and free-flowing streams, through woodlots, grasslands, and wetlands—to self-willed lands beyond the hands of human control. Only together can farmers, conservationists, and consumers cultivate a future in which farms and ranches are seamlessly integrated into landscapes that support a full range of native species, from butterflies and bats to wolverines and wolves.

–Paula MacKay

Paula MacKay is on the steering committee of the Wild Farm Alliance and is The Wildlands Project's communications coordinator. The Wild Farm Alliance (406 Main St., Suite 213, Watsonville, CA 95076; 831-761-8408; fax 831-761-8103; wildfarms@earthlink.net) is a project of the Tides Center.

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Research

Updates

USDA Grant Funds Lygus Study

The Center received a grant this spring to expand its research on alternative controls for *Lygus hesperus* (lygus bug), a major pest of strawberries on California's central coast. The grant from the US Department of Agriculture's Sustainable Agriculture Research and Education program (USDA–SARE) will provide $33,000 to fund expansion of a pilot study that examined the effectiveness of using "bug vacs" to control lygus in trap crops planted adjacent to organic strawberry fields.

As reported in the Fall/Winter 2001 issue of *The Cultivar,* Center researchers have been testing the impact of tractor-mounted vacuum units on lygus in trap crops planted on Monterey and Santa Cruz County farms. Trap crops are planted in long rows adjacent to the strawberry fields to attract lygus and other pests away from strawberry plants and "trap" them in the non-crop vegetation. The trap crops consist of a relay of winter-planted radish and wild mustard, followed by a spring planting of alfalfa and sweet alyssum that blooms throughout the summer.

But what do you do with the lygus you've trapped? "We've learned through earlier experiments that there's no easy, natural way to keep lygus from migrating from the trap crops back into the strawberry fields," says Sean Swezey, the Center's Farm Extension specialist who will direct the bug vac study. Last season, Center researchers experimented with vacuuming the trap crops and found that the tractor-mounted vacuum units successfully reduced lygus numbers. And although the data are still being analyzed, "We also saw almost no lygus damage in strawberries adjacent to the vacuumed trap crops," says Swezey.

Ohri Yamada

A strawberry ranch employee uses a tractor-mounted "bug vac" to vacuum trap crops adjacent to strawberry fields on a Monterey County ranch.

According to Swezey, vacuuming stands of trap crops rather than the strawberry plants themselves saves time and energy, as well as conserving beneficial insects in the fields. "This vacuuming approach uses technology that many organic growers already rely on, but instead of using bug vacs on the strawberry plants we're using them on trap crops where the lygus congregate," he says.

The USDA-funded study will take place on Pacific Gold Strawberry's organic fields in Prunedale beginning next season. Center researchers will monitor the effects of a weekly vacuuming program to see if it controls lygus populations both in the trap crops and the strawberry crops, and will monitor lygus damage in strawberries adjacent to the trap crops as well as those farther from the field edge. "If this approach is successful, we're hoping that more growers will incorporate trap crops throughout their fields," says Swezey.

New Study Examines Effects of Organic Fertilizers and Irrigation Management on Organic Broccoli Production

Organic growers face the challenge of providing sufficient nutrients to their crops to maximize production while protecting groundwater from pollution as a result of excess fertilization. This is particularly true for shallow-rooted crops such as broccoli and lettuce, where overapplication of organic fertilizers can lead to nitrogen and other nutrients leaching from the soil into groundwater. Overuse of fertilizers also represents an economic loss to the grower.

Sajeemas Pasakdee, a graduate student in UC Santa Cruz's Environmental Studies Department, is comparing the effects of different organic fertilizers and water applications on an organic broccoli crop at the Center's on-campus farm. In a randomized complete block design experiment, Pasakdee is examining the impact of different irrigation rates and three different organic nitrogen sources on several factors: the depth to which nitrogen occurs be-

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Jon Kersey

Sajeemas Pasakdee (foreground) and Jamie Hernandez collect broccoli leaves for nitrogen analysis.

low the root zone, the amount of nitrogen leached from the cropping system, nitrogen levels in the crop, and crop yield and quality.

One major goal of this work is to determine whether these broccoli production practices use water and organic sources of nitrogen effectively, or whether nitrogen is being lost from the system. "Broccoli has a shallow root system, leading to a limited ability to take up water and nutrients from the deep soil profile," explains Pasakdee. "Because of broccoli's high requirement for N, growers might overapply N and water to achieve desirable yields without realizing that an excess amount of nitrogen might leach out from the root zone."

In conducting her three-year study, Pasakdee is working closely with Larry Chrisco, a Central Valley organic grower at Harris Farms in Fivepoint; Center farm manager Jim Leap; Gary Banuelos, plant and soil scientist at the U.S. Department of Agriculture–Agricultural Research Service in Parlier, California; and Center director Carol Shennan. The study design duplicates typical soil amendment practices used by commercial organic farmers. A similar three-year study is also being conducted for fall plantings of broccoli at Harris Farms.

Pasakdee's study is taking place on a 0.3 acre plot that was planted to perennial rye during the fall and winter season, then tilled and amended with a ton of compost in the spring. This pre-plant application rate of 3.3 ton per acre represents approximately 100 lbs N/acre. The three fertility treatments are–

- Pre-plant compost + 50 lbs N/acre fish powder for side dress #1 and 50 lbs N/acre fish powder for side dress #2
- Pre-plant compost + 50 lbs N/acre phytamin for side dress #1 and 50 lbs N/acre phytamin for side dress #2
- Pre-plant compost + 70 lbs N/acre phytamin for side dress #1 and 30 lbs N/acre $NaNO_3^-$ for side dress #2

Each of the above treatments totals 200 lbs N/acre. A fourth treatment using only the pre-plant compost serves as a control.

Nutrient content of the fertilizers used in the study are–

- Compost: 1.69N-0.66P-0.92K
- Fish powder: 12-0.25-1
- Phytamin (feathermeal and bloodmeal mix): 7-0-0
- $NaN0_3^-$ (Chilean nitrate): 16-0-0

The three irrigation treatments are 80%, 100%, and 150% of daily evapotranspiration (Et0) rates.

Pasakdee will measure how these different types of organic fertilizers and water application rates affect broccoli growth and development, and how these treatments contribute to nitrate leaching in the soil profile. The study will continue for the next two cropping seasons.

Effects of Annual and Perennial Cover Crops Compared

Center director Carol Shennan, and Center faculty affiliates Weixin Cheng, Michael Loik, and post-doctoral researcher Marc Los Huertos are examining the impact of a perennial rye cover crop treatment on microbial activity, soil organic matter, yield, and other soil fertility factors. The study is taking place at the Center's on-campus farm, where the perennial rye treatment was planted in the spring and left in place for a year.

A perennial rye cover crop left in place for a full season is a regular part of the farm's 8-year crop rotation (see p. 6), based on soil improvements observed by farm manager Jim Leap. The researchers are evaluating this practice for its impact on soil quality and crop performance, and to see if it could be a viable strategy for transitioning land to organic management and more rapidly improving poor soils.

The perennial rye treatment is being compared with adjacent plots on which a winter cover crop of bell beans, oat grass, and vetch was planted following a lettuce crop. One of the study's goals is to determine whether the year-long perennial rye cover crop can improve soil organic matter levels more quickly than a standard winter cover crop.

Both the perennial rye and the standard winter cover crop were incorporated this spring. The plots were then split, with half of each treatment (a total of 8 replicates of each) planted with potatoes and half with broccoli.

The researchers will measure the effects of each treatment on root development, root and above-ground biomass, and soil respiration (an indicator of microbial activity), as well as on soil organic matter levels. Other factors to be addressed include the possible allelopathic (growth suppressing) effect of the perennial rye cover on the crops, and the effect of the potato crop on populations of symphylans. Farm manager Jim Leap has observed that potatoes appear to suppress populations of this destructive soil pest; he will examine the impact of the potato crop versus that of the broccoli crop on symphylan populations in this controlled study.

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from the
Field

Center Grants Support UCSC Graduate Students

Each year the Center for Agroecology & Sustainable Food Systems awards funds to UC Santa Cruz undergraduate and graduate students through a competitive grant process. Two graduate students in Environmental Studies, Dorothy Overpeck and Rob Sirrine, have used their awards to help fund field studies that will form the basis for their dissertations. Here they report on the progress of their fieldwork.

ANALYSING AGROFORESTRY SYSTEMS IN SOUTHERN MALAWI: IMPLICATIONS FOR SUSTAINABILITY

Greetings from southern Malawi! I am currently finishing up ten months of intensive fieldwork here in East Africa, the first phase of a project that will continue through May of 2004. I've been evaluating the sustainability of three agroforestry technologies that are being heavily promoted by government officials, donors, non-governmental organizations, and research scientists as the most feasible option to address declining soil quality and alarming food insecurity.

Malawi's poor soil quality has been mostly attributed to decades of continuous maize (corn) cropping, an agricultural system that has evolved in conjunction with rapid population growth. With very small landholding sizes in southern Malawi, massive food insecurity, a policy setting that emphasizes maize-based systems, and a strong cultural preference for maize, few farmers rotate their maize crop with systems that demand less nitrogen (N) or that fix N. While farmers do intercrop N-fixing legumes within their maize systems, scientists have recognized that the low population densities and poor N-fixing abilities of these legume varieties prevent adequate N return. Ironically, the food security crisis in southern Malawi is attributed to the small landholdings and poor soil quality. And there are few other employment opportunities; in fact, 80% of the population contributes to the smallholder agriculture sector.

My research, supported in part by a Fulbright Fellowship, is in collaboration with an on-farm participatory project started by University of Malawi, Bunda College of Agriculture in 1994. With Rockefeller Foundation funding, researchers from the university began investigating the potential for three agroforestry technologies to address the food security problem. The technologies involve intercropping fast-growing nitrogen-fixing tree species with maize, but cutting and replanting the trees yearly to minimize their ability to compete for nutrients and water.

The leguminous agroforestry species *Sesbania sesban*, *Tephrosia vogelli*, and *Cajanus cajan* (pigeon pea) have been chosen for their initial slow growth (which also minimizes competition when maize is young) and corresponding ability to mature during the dry season, following the maize harvest. The nitrogen provided by the legumes is meant to replace at least the first fertilization done by farmers, as the cost of fertilizer has quadrupled recently and is now out of the reach of most smallholders.

My contribution to the collaborative project is to compare the overall sustainability of the three agroforestry

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Dorothy Overpeck collects data on a maize intercropping system in southern Malawi. Growing maize on small landholdings is the region's main form of employment.

systems. I strongly believe that sustainability must include more than the ability to improve soil quality— it must also make socio-economic sense and be culturally acceptable to the smallholder farmers. Without such an interdisciplinary investigation, what seem like promising alternative cropping systems may not be adopted for very rational socio-economic reasons. For example, it may take five to ten years for farmers using the agroforestry technologies to notice substantial differences in soil quality. However, these farmers are not in the position to think long-term; they are most concerned with having food today and tomorrow. Thus most smallholders will not adopt a technology that potentially replaces a food crop or requires substantial labor.

After my first full field season I have found that farmers feel there are clear differences between the three systems. Not surprisingly, most farmers prefer *Cajanus cajan* (pigeon pea) technology to the other two tree species because it provides a food crop. Interestingly, my initial results show that female farmers prefer this legume, as they are typically the ones responsible for feeding their families. Ironically, *C. cajan* is expected to contribute most slowly to improved soil quality (my own soil quality data analysis won't be complete until 2004). Also interesting is that *C. cajan* was already widely adopted by farmers in southern Malawi, and was included in this study mainly as a control.

These results confirm the importance of investigating the socio-economic consequences of promoting new cropping systems. If the government and researchers want farmers to adopt the other two varieties, *Tephrosia vogelli* or *Sesbania sesban*, which would theoretically speed up soil quality improvement, there is a clear need to provide farmers with short-term incentives, and address seed availability and education.

– Dorothy Overpeck

PRESERVING THE VIABILITY AND CULTURAL INTEGRITY OF A NORTHERN MICHIGAN FARMING COMMUNITY

Hot summer days, lemonade, a cool dip in the bay and cherry pie—these are luxuries that many northern Michigan residents take for granted. While a refreshing swim in the cool waters of Grand Traverse Bay can be guaranteed, with the region's tart cherry farm numbers dwindling the future of the family cherry farm is in question.

Michigan accounts for 75% of U.S. tart cherry (*Prunus cerasus* L.) growers and production. The industry is an important component of the state's economy, with an annual value surpassing $100 million. However, northern Michigan tart cherry farmers currently face pressures from multiple sources: weakening economic status, new claims for rural space, natural constraints to production, and environmental concerns regarding their production practices. The result has been loss of farmland, loss of intergenerational farm transfer, need for off-farm income, and widespread use of environmentally degrading technologies to overcome a cost-price squeeze. The overarching objective of my research is to increase the sustainability of the northern Michigan tart cherry farm by addressing the environmental, economic, political and social forces that intersect and interact at the farm level. Nothing less than the future of the family cherry farm is at stake.

While past research in the area has focused solely on ecological interactions, I am suggesting that a more comprehensive framework is needed to address farm-scale sustainability. The specific objectives of this research are two-fold: to evaluate the benefits of cover cropping in northern Michigan tart cherry orchards, and to investigate the complex of sociopolitical and socioeconomic pressures farmers face and evaluate how these pressures prohibit or encourage the adoption of agroecological practices.

My agroecological investigation is a continuation of three years of previous on-farm research where I have increased the functional diversity of the tart cherry orchard floor through cover cropping. Cover-cropping has been shown to increase beneficial insect diversity and abundance, improve soil quality, reduce erosion, reduce weeds, fix nitrogen, and increase yield in numerous systems. The four cover crop treatments in this study include various mixtures of black mustard, *Brassica nigra*, red clover, *Trifolium pratense*, white clover, *Trifolium repens*, annual rye, *Secale cereal*, and hairy vetch, *Vicia villosa*.

Over the past two years I collected and evaluated biophysical data, namely soil quality, insect pest suppression, weed suppression, yields, and economic data in the form of cost-benefit analyses, on the four cover crop treatments. Though the initial biophysical data suggest it is feasible to use cover crops to reduce or eliminate chemical application without decreasing yield, transition costs may prohibit the adoption of cover cropping practices in northern Michigan.

Because social impediments and political constraints can be the main obstacles to adoption of agroecological practices, a more comprehensive framework is needed to discern the entire complex of pressures facing northern Michigan tart cherry growers. To determine this complex of pressures, I will use a commodity systems analysis as the basis for interviewing key stakeholders in 2002. This type of analysis follows a commodity from production to consumption, investigating the many factors that are involved along the way. Such an analysis look at such factors as farming practices, labor, regulations, the impacts of research, and marketing and distribution. I will also examine the relationship between farm-level characteristics and use of agroecological techniques. These socio-economic analyses will demonstrate how and why pressures affect the adoption of sustainable farming practices. I will be using surveys, questionnaires, and participatory observation to gather information from fifty farmers, as well as community and industry-wide stakeholders.

The goal of this cover cropping work is to increase farmer knowledge of the technique's benefits and methods, and improve its adoption rate and social acceptability. I also

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Center
Notes

Center Takes Part in Sustainable Cuisine Event

The Center took part in the inaugural *Cooking for Solutions* event held this spring at the Monterey Bay Aquarium in Monterey, California. This celebration of sustainable cuisine featured Alice Waters, Deborah Madison, and other celebrity chefs who emphasize organic and sustainable ingredients in their cooking. The Center distributed information on sustainable farming and gardening practices as part of the event's Sustainable Food Practices information fair. Forrest Cook, a graduate of the Center's Apprenticeship in Ecological Horticulture course, was one of the chefs taking part in the evening extravaganza, where more than two dozen restaurants offered tastes of gourmet dishes prepared with sustainable ingredients. For more information on the aquarium's efforts to promote sustainable cuisine through its Seafood Watch program, see www.mbayaq.org.

Benefit Chef Walk Planned for Fall Equinox

On Saturday, September 21, Earthbound Farms will sponsor a "benefit chef walk" with Ben Ford, owner and head chef of Chadwick in Los Angeles, with proceeds supporting Center public education and apprentice training programs. Held at Earthbound's organic farm and Farm Stand in the Carmel Valley, the walk features a tour of the organic farm fields, followed by a cooking demonstration at the Farm Stand using freshly harvested vegetables. As part of the tour, participants pick their choices of organic produce to bring home. The suggested donation for the benefit tour, produce, and cooking demonstration is $30. Earthbound's Farm Stand is located at 7250 Carmel Valley Road, 3-1/2 miles east of Highway 1. For more information, call 831.625-6219, email farmstand@ebfarm.com, or see www.ebfarm.com.

Festival Raises Funds for Low-Income CSA Shares

Fresh organic strawberries piled high on homemade shortcake and smothered in whipped cream took center stage at May's Strawberry Shortcake Festival. The annual festival, held at the Center's on-campus farm, drew shortcake lovers of all ages to an afternoon of food, music, and a silent auction. Organized by Lydiah Gatere and Lisa Mosca, who are second-year apprentices in the Center's Apprenticeship in Ecological Horticulture program, the event raised more than $2,000. Proceeds will fund shares for low-income members of the Center's Farm & Garden Community Supported Agriculture (CSA) program. For more information on the Center's CSA program, or to get on the mailing list for next year's CSA shareholder drive, call 831.459-4661.

Martha Brown

Trish and Lee Hildinger enjoy organic strawberry shortcake at the Spring Shortcake Festival on the UCSC Farm.

Grants Support Apprenticeship Training Program

Over the past six months, the Center's Apprenticeship in Ecological Horticulture course, which trains students in the fundamental skills of organic farming and gardening (see below), has received a number of grants in support of its efforts –

- This spring, the Richard & Rhoda Goldman Fund granted $50,000 to fund the completion of the Apprenticeship's instructional manual, *The Training Manual for Intensive Organic Production in the Garden and Small Farm*.
- Newman's Own Organics has offered a fifth year of support for the Apprenticeship Program, with a $25,000 grant for second-year apprentices salaries.

This grant from Nell Newman's foundation complements $10,000 gifted earlier this year by Paul Newman's foundation, Newman's Own.

- For the second year in a row, the Chez Panisse Foundation is making it possible for apprentices to be trained in cooking the food they are growing. The outcome of this year's $7,500 grant will include a short instructional guide on teaching seasonal cooking from the gardens and fields.
- The Wallace Genetic Foundation has granted $40,000 in general support for the Apprenticeship's six-month organic training program. This grant will pay the salaries and benefits of Apprenticeship instructional staff and second-year apprentices.
- The Foundation for Sustainability and Innovation's $5,000 seed grant will help the Apprenticeship staff initiate an instructional guide for teaching Community Supported Agriculture (CSA) and other innovative marketing strategies for small farm viability.

Many thanks to these funders for their support of the Center's training program.

"Garden Classroom" Celebrates Grand Opening

Kids sang "Dirt Made My Lunch," played "Worm Bingo," and visited Beelandia, Veggitopia, and Chickenville as the Life Lab Science Program celebrated its new Garden Classroom on June 1. The festive day of live music, crafts, creative science, and great food marked the official grand opening of the garden, located on the Center's 25-acre Farm at UC Santa Cruz.

The first phase of the Garden Classroom offers a one-acre model for school garden projects. Through classroom programs, summer camps, and self-guided tours, young visitors can explore garden-based topics such as soil science, pollination, plant adaptations, and solar power. During their visits, kids can cook at an outdoor kitchen funded by a grant from Chez Panisse restaurant in Berkeley, study recycling in the "Rot Zone" featuring 10 different composting systems, take data at a weather station, and explore a pollination garden, a water garden, and the "Sensual Spiral" that highlights plants with different textures, smells, and colors.

The Garden Classroom isn't just for kids—it also hosts teacher workshops on a variety of professional development topics, including starting a school garden, science inquiry, and implementing a hands-on science curriculum. UCSC undergraduate and graduate students also use the garden for internships, thesis projects, and classes.

For more information on the Life Lab Garden Classroom, or to register for class tours and summer camp sessions, call 831.459-2001 or see www.lifelab.org.

Center Announces 2003 Apprenticeship Application Dates

The Center's six-month *Apprenticeship in Ecological Horticulture* course provides training in the concepts and practices of organic gardening and small-scale farming. This full-time program is held annually at the 25-acre Farm and 2-acre Alan Chadwick Garden on the UCSC campus. The Apprenticeship course carries 20 units of UC Extension credit for the approximately 300 hours of formal instruction and 700 hours of in-field training and hands-on experience in the greenhouses, gardens, orchards, and fields.

Each year 35 to 40 apprentices come from all regions of the U.S. and abroad for the six-month course. Most apprentices choose to live on the Farm in their own tents, sharing cooking and other community responsibilities in a common kitchen/dining facility. Tuition is $3,250 and there are several scholarships available for people of color and/or low-income.

The next Apprenticeship course will run from April 14 to October 17, 2003. Application deadlines for the 2003 program are September 1, 2002 for international applicants and November 1, 2002 for U.S. and Canadian citizens.

For more information and an application, contact:

Apprenticeship Information
CASFS, UCSC
1156 High Street
Santa Cruz, CA 95064
(831) 459-3240
email, apprenticeship@cats.ucsc.edu

Information and application materials are also available on the Web: www.ucsc.edu/casfs/training/index.html

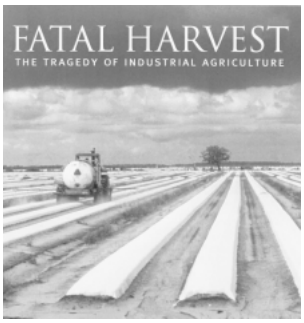
Pete Lowy

Apprentice course members Lydiah Gatere (top) and Jennifer Hashley work in the plant propagation area at the UCSC Farm. Propagation skills are an important part of the apprenticeship curriculum.

Recommended

Reading

▸ ***The Farm as Natural Habitat: Reconnecting Food Systems with Ecosystems,*** edited by Dana L. Jackson and Laura L. Jackson. Rejecting the idea that "ecological sacrifice zones" are a necessary part of feeding a hungry world, *The Farm as Natural Habitat* offers compelling examples of an alternative agriculture that can produce not only healthful food, but fully functioning ecosystems and abundant populations of native species. Contributors offer insights and practices from the fields of conservation biology, sustainable agriculture, and environmental restoration to link agriculture and biodiversity in celebrating a unique alternative to conventional agriculture. Grounded in real examples, this 250-page volume offers a viable approach to addressing the challenges of protecting and restoring biodiversity on private agricultural land. Center for Agroecology and Sustainable Food Systems director Carol Shennan contributed a chapter detailing her work at Tule Lake National Wildlife Refuge, where she coordinated a program to rotate croplands with wetlands in an effort to improve wildlife habitat as well as farming conditions. *The Farm as Natural Habitat* is available for $50.00 (hardcover) or $25.00 (paperback) from Island Press, 1.800.828-1302, fax 707.983-6414. You can order online at www.islandpress.org, or by email to orders@islandpress.org.



▸ ***Fatal Harvest: The Tragedy of Industrial Agriculture,*** edited by Andrew Kimbrell. This volume gathers together more than forty essays by leading ecological thinkers including Wendell Berry, Wes Jackson, Helena Norberg-Hodge, Vandana Shiva, and Gary Nabhan. Combined with more than 250 photos (including several taken at the Center for Agroecology and Sustainable Food Systems), the essays expose the ecological and social impacts of industrial agriculture while detailing a new ecological and humane vision for agriculture. *Fatal Harvest* shows how millions of people are engaged in the new politics of food as they work to develop a better alternative to current conventional agricultural practices. Daniela Goff-Sklan, who graduated from the Center's Apprenticeship in Ecological Horticulture course, was the art director for this striking work. *Fatal Harvest* is available for $75 (hardcover, 396 pages) or $16.95 for the *Fatal Harvest Reader* (which includes all the essays in a paperback edition), from Island Press, 1.800.828-1302, fax 707.983-6414. You can order online at www.islandpress.org, or by email to orders@islandpress.org.

Farming with the Wild

continued from page 10

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continued from page 3

made comments like, "I really prefer to select my own mix of vegetables" and "[I/we] did not like some of items which we consistently got—kale/ chard/ beets." Other frequently cited reasons for leaving include the 37% who said they had problems with quantity (got too much food, threw away too much, have a hard time finding people to split the share with, etc.). A fourth of those who weren't returning cited issues unrelated to their CSA experience (e.g., loss of income in the household, moving away from the area, or planning to have their own garden).

In addition to exploring why members may leave, we also looked at factors that are related to returning. We found that people were more likely to re-join when they were satisfied with the quality, quantity, and product mix of the produce; when picking up the box was convenient; and when people felt the share price was fair. Also, members were more likely to return the next year if the payment schedule did not pose a financial hardship, and they were not throwing away or composting more produce than before they joined the CSA.

One interesting finding is that those who said they or their household experienced a change as a result of participating in a CSA (in eating habits or in some other area of their lives), were also more likely to rejoin. For example, 82% of households that experienced a change in eating habits signed on again, whereas 65% of those without such a change rejoined. Some of these types of changes include eating more vegetables, more of different kinds of vegetables, eating at home more, cooking differently, developing a connection to the farm or farmer, etc. It appears that learning to live with the new way of eating and cooking would help increase the likelihood of staying with the CSA, as well as encouraging some changes that one would value.

What does this data about retention reveal? First, it appears that listening and responding to CSA members, as well as helping them learn to work with the food and CSA process (as well as providing new experiences) is a good strategy for preventing turnover. From the interviews with farmers, it appears that most CSAs do these activities in some manner already. However, even with these practices, there are still difficult issues to address. For example, responding to member comments about product mix is challenging since some people just want the option to choose their own vegetables. Additionally, some people want more kale and some don't want any, leaving farmers in a position where they can't please everyone.

DO SHAREHOLDERS REALLY SHARE FARMING'S RISKS?

Yet another way to look at the viability of CSAs is by exploring the concept of "risk sharing." Originally, CSAs were attempting to relieve the farmer of the total burden of risk associated with farming. For example, if heavy rains come at the wrong time and crops are lost, a farmer could have nothing or little to sell and thus no (or reduced) income. With the CSA, members generally pay up front, and thus share the burden of not having the quality, quantity, or variety that they might expect. Similarly, they ideally benefit in bountiful times.

However, from speaking with farmers, it appears that about half of them do not think that risk is shared. For example, close to half of the farmers interviewed have purchased produce from other farms when there was a shortfall of crops. Some farmers are concerned that their members just won't tolerate not receiving enough in their box. One farmer mentioned that they tried the "sharing the risk" concept and it just didn't work. As a CSA farmer in northern California pointed out, due to the abundance of organic produce in California, people can get it easily, so CSA farmers don't want to push the risk-sharing concept too much.[3]

However, some farmers did feel that risk was being shared. One of these farmers insisted on doing his best to implement the risk-sharing concept. Although he did purchase vegetables a few times, he focused more on communicating regularly with members about events affecting the size and diversity of shares. When seedlings were damaged, he'd put that information in the newsletter, adding that this would be an issue later on—that members will receive few or none of these crops in the future. This approach seemed to work well with his members. He stated that, "so long as you communicated that stuff to people, people felt like, wow, they're part of the process . . . " Even though this strategy may not work for everyone, it appears that there may be some possibility for increased risk-sharing with members.

Still, there appears to be a trade off for farms whether it is worth spending the time communicating with members about share deficits (and hoping they won't run away) or simply purchasing the needed amount to keep members satisfied. Farmers could make this decision depending on

[3] Henderson, E., and R. Van En. 1999. Sharing the Harvest: A Guide to Community Supported Agriculture. White River Junction, Vermont: Chelsea Green Publishing Company.

the goals of their CSA. For those who want to educate their members about agriculture as part of their mission, it could potentially be worth the extra effort to see if sharing more of the risk is possible with their community.

This article has offered a brief overview of the data collected from the Center's CSA study. We will soon be preparing and publishing more findings from this study, which will discuss the results in greater depth. We hope that ultimately this research will help growers, consumers, and supporters of the CSA model as they seek to expand this unique approach to farming and marketing.

– Jan Perez

RESOURCES

To find a CSA in your area –

Local Harvest – their web site can help you identify CSAs anywhere in the U.S., as well as locate other direct marketing options. *www.localharvest.org/*

Biodynamic Farming and Gardening Association – their web site also allows you to locate CSAs in the U.S. *www.biodynamics.com/csa.html*

Community Alliance with Family Farmers (CAFF) – their web site can help you locate CSAs and farmers markets anywhere in California. *caff.oceangroup.com/farms/final/csas.html*

To learn more about the CSA concept or about starting a CSA farm –

Groh, T., and S. McFadden. 1997. Farms of Tomorrow Revisited: Community Supported Farms—Farm Supported Communities. Kimberton, PA: Biodynamic Farming and Gardening Association.

Henderson, E., and R. Van En. 1999. Sharing the Harvest: A Guide to Community Supported Agriculture. White River Junction, Vermont: Chelsea Green Publishing Company.

If you are interested reading more about CSAs, an annotated bibliography can be found at www.nal.usda.gov/afsic/AFSIC_pubs/at93-02.htm. If you are interested in other research studies regarding CSAs, please see our website at www.ucsc.edu/casfs.

Center Supports Graduate Student Research

continued from page 14

hope to make farmer constraints to and incentives for adopting ecological practices increasingly transparent, thus providing the foundation for action-oriented research, community-based activism, and policy changes to alleviate such constraints. When combined, these two outcomes will have synergistic and positive impacts on farm-level sustainability of tart cherry production in northern Michigan and the cultural integrity of the community.

–Rob Sirrine

Events

continued from back page

California

▸ **Urban Agriculture: Growing Food and Jobs on a Small Piece of Land within Your Neighborhood or Community,** Friday, August 30 to Sunday, September 1, at the Center for Urban Agriculture at Fairview Gardens in Goleta, California. Farmer and author Michael Ableman, along with special guests, will offer tools and techniques for people who want to develop a viable business growing and selling food in their community.

The workshop will provide techniques for space-intensive production and examples of effective marketing methods and strategies. It will also address the challenges o f accessing land, and working with and engaging local communities to get involved with their own food security. Sponsored by the Bioneers in collaboration with The Center for Urban Agriculture. For more information and registration details, contact 877.246-6337, extension 111, or visit www.bioneers.org.

▸ **23rd Annual Ecological Farming Conference,** Wednesday, January 22 to Saturday, January 25, 2003, at the Asilomar Conference Center in Pacific Grove, California. The theme for the 2003 EcoFarm conference is "Planting Local Values in a Global Environment," and from the bus tours to the organic wine tasting to more than 50 workshops, this conference offers something for everyone. For more information, contact the Ecological Farming Association, 406 Main St., Ste. 313, Watsonville, CA, 95076; 831.763-2111 (phone), 763-2112 (fax); www.eco-farm.org.

International

▸ **14th IFOAM Organic World Congress,** August 21–24, Victoria Conference Centre, Victoria, British Columbia, Canada. Sponsored by the International Federation of Organic Agriculture Movements and the Canadian Organic Growers. For information on events, registration fees, guidelines for exhibitors, and accommodation information, see the IFOAM web site, www.cog.ca/ifoam2002, call 1.250.655-5652, email ifoam2002@cog.ca, or write IFOAM 2002, c/o Building 20, 8801 East Saanich Road, Sidney BC v8L 1H3, Canada.

Santa Cruz area

events

▸ **Grow Your Own Salad Greens,** Saturday, July 27, 10 am–1 pm at the UCSC Farm. Garden manager Orin Martin will discuss the wide variety of salad and Asian greens you can grow to make your own salad mix. This free talk will cover bed preparation, timing of plantings, growing and harvesting, and variety selection. We'll finish off with a tasting of greens from the garden. Call 831.459-3240 for more information or directions, or see www.ucsc.edu/casfs.

▸ **Preparing the Winter Garden,** Sunday, September 8, 12 noon–3 pm at the UCSC Farm. Fall marks the beginning of the Central Coast's "second" gardening season. Come and learn how to prepare your garden beds for the winter and get the most out of your fall-planted crops. Learn about cover cropping, best-perforating vegetable varieties, and more. Want to bring the kids? Check out the Cooking Fun event, below. $5 for Friends' members; $10 for non-members, payable the day of the workshop. Call 831.459-3240 for more information or directions, or see www.ucsc.edu/casfs.

▸ **Cooking Fun in the Garden,** Sunday, September 8, 12 noon–3 pm, Life Lab Children's Garden, UCSC Farm. Kids ages 7–11 are invited to make the "farm-to-fork connection" while learning about and eating the six plant parts. $5 per child. Please RSVP to the Life Lab Science Program, 831.459-2001.

▸ **Fall Plant Sale,** Friday, September 13, 12 noon–6 pm, and Saturday, September 14, 10 am–2 pm, Barn Theater Parking Lot (corner of Bay and High Streets), UC Santa Cruz. The region's best-suited varieties of organically grown winter vegetables and landscape plants will be available. Proceeds support the Apprenticeship in Ecological Horticulture program. Call 831.459-3240 for more information or directions, or see www.ucsc.edu/casfs.

▸ **Benefit Chef Walk,** Saturday, September 21, 10 am–12 noon, The Farm Stand at Earthbound Farm, Carmel Valley. Join chef Ben Ford, owner of Chadwick restaurant in Beverly Hills, for this tour and cooking demonstration at Earthbound's organic farm. Minimum suggested donation is $30. Participants bring home the produce they harvest. Proceeds benefit the outreach and training work of the Center for Agroecology and Sustainable Food System's Farm & Garden. The Farm Stand at Earthbound Farm is located at 7250 Carmel Valley Road, 3.5 miles east of Highway 1. For more information, call 831.625-6219 or email farmstand@ebfarm.com.

▸ **Traditional Grains and Tubers,** Saturday, October 5, 10 am–12 noon, UCSC Farm. Join garden manager Christof Bernau for a talk and garden walk focusing on a selection of traditional grain and tuber crops from the Americas, Africa, and Asia. Learn how to grow and prepare grain and tuber corps that feed many of the world's people, such as yacon, oca, mashau, quinoa, teft, amaranth, and millet. $5 for Friends' members; $10 for non-members, payable the day of the workshop. Call 831.459-3240 for more information or directions, or see www.ucsc.edu/casfs.

▸ **Harvest Festival,** Saturday, October 12, 11 am–4 pm, UCSC Farm. Circle the date! You don't want to miss our annual Farm celebration. Music, food, apple tasting, apple pie contest, talks, hay rides, kids' events, and lots more are in the works. Free for members of the Friends of the UCSC Farm & Garden and kids under 12; $5 for non-members. Call 831.459-3240 for more information or directions, or see www.ucsc.edu/casfs.

▸ **Benefit Dinner,** Tuesday, November 12 , 7 pm, Blacks Beach Cafe, 15th Ave and East Cliff Dr., Santa Cruz. Start the holiday season off right with a gourmet meal by Blacks Beach Cafe owner Robert Morris and guest chefs. All proceeds from the dinner support the Friends' community education and scholarship projects. $70, includes wine. For more information or to reserve a seat, call 831.475-2233.

> *continues on page 19*

266

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