THE CENTER FOR AGROECOLOGY & SUSTAINABLE FOOD SYSTEMS

The Cultivar

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Organic Agriculture and the Promise of Green Consumerism

The rapid takeoff of the market for organic food is one of the most remarkable trends in the history of food and agriculture. Organic products have become one of the fastest growing segments of the food industry, expanding at a pace that exceeds the expectations of even those within the movement. No longer confined to natural foods stores, organic foods are increasingly available at supermarkets, convenience stores, and high-end restaurants. From 1990 to 1997 the sales of organic products increased from $1 to $4 billion.[1] To meet this demand, farm numbers and acreage are growing in the organic sector, even though the opposite is true in the rest of the farm sector.[2] There were 76 percent more organic farms in 1995 than in 1991; the number of acres farmed organically nearly doubled over this same four-year period.[3]

If these growth trends continue, they could eventually lead to major changes in the characteristics of food production and consumption in the United States. In this article, we discuss the potential for the organic market to lead to changes in the American agrifood system.

Green and Beyond

For proponents of organic agriculture, its primary benefit lies in the premise that organic methods are usually better for the environment than conventional methods. In its ideal form, organic agriculture pursues this end by working with, rather than against, the existing agroecosystem. According to the Organic Trade Association, "The principal guidelines for organic production are to use materials and practices that enhance the ecological balance of natural systems and that integrate the parts of the farming system into an ecological whole."[4] A national study of organic vegetable growers documents that most growers manage pests through practices that are consistent with this ideal, such as crop rotation, selecting pest-resistant varieties, and adjusting planting dates.[5]

In studies that compare conventional and organic agriculture, organic farming has been found to reduce erosion and to improve the soil – physically, chemically, and biologically (see, for example, references 6,7). Organic farming methods could also reduce the ecological problems caused by reliance on synthetic pesticides. If the demand for organic food continues to grow, and a significant percentage of farm acreage is converted to organic production, then we are likely to reap substantial ecological benefits, as long as these new organic farms stay close to the organic ideal.

In addition to this potential for environmental improvement, the organic agriculture market also has the potential to incite equally profound social changes. The movement for organic agriculture is changing not only the way we farm, but the way we understand food, science, and politics. This social potential may be less obvious, but it is important that it not be overlooked.

Increasing the Transparency of Production Practices

Most of us have little understanding of how the products we use every day came to be. Who produced them, how, and under what conditions? What were its source materials and waste products, and what effect do these have on the environment? We are generally given scant information about such questions, with the result that we are alienated from the very ecological and social practices that sustain us.

This form of alienation has been the focus of the economic theory and social

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movement called "green consumerism." The central tenet of green consumerism is that consumers, by becoming more informed and shopping more responsibly, can transform the way that goods are produced, such that they cause less harm to people, wildlife, and the environment.

According to this theory, the primary barrier that prevents green consumers from shopping responsibly is the lack of sufficient information about the processes used to make the products they might buy. There is a growing demand for information on green consumerism.* The more consumers know about production processes, the more likely they are to buy green products. With this in mind, green consumerists look for ways to provide this kind of information. A primary method is through labeling schemes.

The interest in making production processes clear extends beyond the activist community. Progressive producers themselves have an interest in openly describing their own production practices and comparing them to the production practices of their competitors. For example, organic producers compare their methods to those of "conventional" producers.

This type of disclosure is at the heart of organic agriculture, which is defined more by processes than by products. Organics marketers explicitly direct the attention of consumers away from the commodities themselves and toward the processes that bring those commodities into being. In a web page called "Frequently Asked Questions," the primary trade association for the organic products industry in the U.S., the Organic Trade Association (OTA), puts the question of production processes front and center. The first question on the page is, "What are organic products?", and the first sentence of the answer is, "Organic refers not to the food itself, but to *how* it is produced."[9] Similarly, in the OTA's "top 5 reasons to buy organic," the first reason is not a claim about health or environmental benefits but rather a claim about production processes:

> Organic products meet stringent standards. Organic certification is the public's assurance that products have been grown and handled according to strict procedures without persistent toxic chemicals.[10]

Several of the OTA's "frequently asked questions" are questions about the commodities themselves, but in answering these questions, the OTA steers the reader's attention away from the product and towards the process. "What is clear is that buying organic products supports a system of agriculture that contributes to a healthy environment, and a healthy environment is better for everyone."[11] Thus, the organics industry is taking action to make production processes more transparent.

Organic food and agriculture present an important case of green consumerism since the organic label is one of the earliest and the most successful eco-labels, and one which other groups use as an exemplar.** As early as the 1970s California and Oregon passed laws regulating organic labeling. Since that time, the success of the organic label has led independent groups, such as the Food Alliance, to use the organic label as a model for their own eco-labels.[13] One of the primary barriers to green consumerism is the absence of "nationally accepted standards or coding systems for determining what products are environmentally sound."[14] The organics industry is notable because it has, to a great extent, overcome this barrier.

Organic food is one of the largest and most significant green consumption trends, and possibly the beginning of something profound. By shedding light on production methods, organic agriculture can reduce or eliminate the alienation between consumption and production, not only in terms of environmental issues, but also in terms of social issues. The organic label could eventually be paired, for example, with a fair labor practices label. This practice of making production processes more transparent gives organic agriculture a broad range of possibilities for transforming agricultural production practices.

The CCOF logo guarantees consumers that they are purchasing products grown according to legally defined organic standards.

Increasing the Accountability of Science and Government

While the organic-products market is like many other green markets which promote the transparency of production processes, the organics industry takes this issue of transparency a step further to include science and government. In agriculture, our knowledge of the effects of food production is mediated by scientific experts. For example, the environmental consequences of synthetic fertilizers are not readily apparent; in order to see them, we need the lenses provided by scientists. Therefore, the argument that organic food is better than non-organic food entails a critique of the scientific institutions that tell us otherwise. Because of this situation, the transparency of commodities found in the organics industry often reaches beyond the on-farm production of organic food. It extends into the realm of regulatory science – the scientific and governmental institutions that assure consumers that conventionally grown food is safe for people and the environment.

From its inception, organic agriculture has been rooted in a critique of political and scientific institutions. In his germinal work on organic agriculture, *The Soil and Health*, published in 1947, Sir Albert Howard argued that conventional agricultural science reduced the "vast biological complex" of agriculture into an array of different components, leading to an agricultural science that was not sensitive to ecological consequences.[15] Contemporary proponents of organic agriculture continue to be critical of scientific and government institutions. John Wargo, the author of *Our Children's Toxic Legacy*, is a good example. In the conclusion to this book, Wargo recom-

*A book called The Green Consumer Guide reached the top of the non-fiction best-seller list shortly after its publication.[8]

**A key incentive for developing organic standards was the numerous reports in the press about farmers and retailers labeling conventional food as organic; most damaging was a state lab examination which found that 30 percent of the 55 organically labeled prodcuts tested had detectable pesticides.[12]

mends that parents feed their children organic foods. The rationale behind this recommendation is summed up by the subtitle of the book: "How science and law fail to protect us from pesticides." Wargo's conclusion – the result of a detailed analysis of the science and policy of pesticides – is that "government has neither the capacity to predict exposures with accuracy nor to protect children from significant risks."[16]

A similar argument is made by Andrew Weil, an M.D., a best-selling author of many books on natural health, and another proponent of organic foods. Like Wargo, Weil bases his advice on a claim that we cannot trust the current scientific and government institutions. Weil says, "I cannot emphasize too strongly that residues of toxic chemicals in foods we eat are major health hazards, affecting us in ways that current medical science and governmental policy often fail to recognize."[17]

While the organics industry does not seem as willing as some independent authors to directly challenge the government and regulatory science, it has taken some steps – though relatively cautious ones – to turn a critical spotlight on the scientific and regulatory institutions that have supported conventional agriculture in the past and continue to do so in the present. For example, trust in regulatory agencies is questioned in the OTA's "Top 5 reasons to buy organic," which says, "Organic production reduces health risks. Many EPA-approved pesticides were registered long before extensive research linked these chemicals to cancer and other diseases."[18]

This critical voice became loudest during the struggle between the organics industry and the USDA over the National Organic Standards. Soon after the proposed organic rules appeared in the *Federal Register* in December 1997, the industry magazine *Delicious!* ran an article[19] that was critical of the way the federal government ignored the recommendations of the National Organic Standards Board (NOSB) and weakened the Rules. Since *Delicious!* is a free magazine widely distributed at natural foods stores, this viewpoint could become widespread, subverting public trust in the USDA as a scientific regulatory organization. The organics industry has made this kind of critical thinking an everyday experience for many shoppers. And the effect could spill over, beyond the USDA, to other scientific and political institutions.

Increasing Participation in Politics and Policies

The organic industry's critique of conventional scientific and government institutions has gone hand-in-hand with a program of political action. In many ways, recent political action focused on organic agriculture has been remarkably effective. Under pressure from the organic food industry, the U.S. Department of Agriculture has moved away from its refusal to recognize organic food, and toward developing a set of federal rules for labeling organic food. The debate over the organic standards generated more public

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From the Director

This fall has been an important time for the Center. In November we underwent our "External Review," a process which brings peer evaluators from outside UC Santa Cruz to examine the Center's work and impact, assess advances since the last review, pinpoint areas where improvements can be made, and make recommendations for future efforts. All University of California programs and departments undergo such reviews every five years. Comprising the Center's review team was a highly respected trio of agricultural experts – Dr. Fred Buttel of the University of Wisconsin, Dr. Craig Kolodge of UC Cooperative Extension, and Dr. Louis Swanson of Colorado State University.

After reviewing a self-evaluation and set of program priorities prepared by the Center, and meeting with Center staff, Environmental Studies Department faculty and students, Social Sciences Division administrators, and local farmers, staff of local non-governmental organizations, and other Center collaborators, the review team drafted its evaluation. The team recognized that, "The Center is a unique resource in the University of California system . . . [it] was the first sustainable agriculture program in the State, and remains the UC system's most accomplished sustainable agriculture program in terms of instruction, research and outreach." They also noted the contributions of the Center's hands-on, experiential training program, the Apprenticeship in Ecological Horticulture; the unique degree to which natural and social science dimensions of agricultural sustainability are integrated in the Center's work; and the services the Center provides to small- and medium-sized family farms in California. The team also acknowledged the expertise and commitment of Center staff and were impressed with the level of accomplishments, given the Center's resource constraints.

This show of support was heartening. We recognize that this is a crucial time both in our development as a program and the development of sustainable agriculture and food systems as a whole. The review team confirmed the Center's importance to the movement and offered insights into ways that we can become even more effective.

This issue of *The Cultivar* reflects the breadth of activities the Center pursues, from social and economic analysis, to agronomic research aimed at solving production problems, to organic gardening methods that maximize quality and production on intensively managed sites. Our goal is to continue to provide high quality research, teaching, and outreach efforts to a broad audience.

The review team made a number of recommendations for steering the Center's future development. Their recommendations are being evaluated by the division and the Center, and we look forward to implementing many of them as we strengthen the Center's contribution to the campus, the local community, and the state in the coming years.

– Dr. Carol Shennan

For the Farmer

Researchers Seek Organic Solution to Symphylan Problem

For the past 10 years, Farm Manager Jim Leap has been working to improve the soil in the row crop fields at the Center for Agroecology and Sustainable Food System's 25-acre organic farm: he's added compost, grown and incorporated cover crops, and recently, minimized or eliminated tillage to preserve earthworm habitat, conserve organic matter, and improve soil tilth. In the process, Leap has created ideal growing conditions for a wide mix of vegetable crops. Unfortunately, these are the same conditions that the garden symphylan (*Scutigerella immaculata*), sometimes called the garden centipede, appears to relish.

These tiny, fragile, milk-white arthropods are no longer than an eyelash, but they can decimate entire fields. They crawl through the soil in the trails of other soil-dwellers, such as earthworms, too delicate to burrow their own tunnels. Symphylans feed on the roots of germinating seeds and young transplants, interfering with the plants' ability to take up water and nutrients. The pests can also cause indirect damage by pitting roots, opening them to secondary infections by other soil pathogens. With their diverse diet and long lifespans, symphylans pose a formidable challenge to organic growers. So far, no consistently effective organic control measures for symphylans have been identified.

Symphylans caused approximately $10,000 worth of damage to the UCSC Farm last year. They stunted a range of crops, from onions and strawberries to broccoli and tomatoes. "Each spring for the past 3 years we've been hammered," says Leap, noting that about 50 percent of the dry farm tomato crop was destroyed by symphylans in 1999.

Leap isn't alone in his struggles with this persistent pest. Organic farmers and gardeners around the nation report problems with symphylans, especially in systems with high organic matter levels that have been organically farmed or gardened for a number of years.

In a joint effort, a research group from the Center, UC Cooperative Extension, and UC Davis has been working to monitor and control symphylans since 1998. The group, which includes Leap, Mario Ambrosino of the UC Cooperative Extension in Salinas, and Mark Van Horn, manager of the Student Experimental Farm at UC Davis, recently received a grant from the Organic Farming Research Foundation to expand its efforts. Their goal is to study the symphylans, both in the field and in the lab, and develop monitoring and suppression techniques for the pest.

The research team is taking a two-pronged approach: studying symphylan control techniques in the field by experimentation and observation, and developing a method for rearing symphylans in the lab where they can test various biocontrol techniques.

Potential In-Field Controls

Some potential field control techniques include flooding, tillage, and suppressive cover crops. Flooding, which can hamper symphylan populations, is not always practical. Unless the flooding penetrates deep into the soil, the symphylans can wait safely below the water level, returning as the soil becomes habitable. Van Horn has flooded severely infested fields at the UC Davis Student Experimental Farm for several weeks, and feels that this control option is worth additional study. On fields such as those at the Center's Farm on the UCSC campus, where the ground isn't level, water is expensive and infiltration is rapid, flooding is not a viable tactic.

While a lot of water over an extended period of time might not be practical, a little extra water could go a long way. According to Leap, if the crop can safely establish its primary root, it can usually survive the pests' later attacks. "The critical stage is that establishment phase," he says. Early irrigation of crops that are typically direct sown to moisture, such as squash, corn, and beans, can help the plants establish roots and minimize crop stress, buying the plant enough time to grow past severe symphylan pressure. Unlike flooding, this technique requires only about an extra inch of water over a two-week period. "It's the earliness, not so much the quantity," says Leap. He has also had success using squash transplants as an alternative to direct seeding this crop.

Tillage is another known counterattack against symphylans. The researchers are testing different depths of tillage, which includes spading and rototilling, and doing less tillage on some of the beds. They will then compare the symphylan populations from each bed. But most growers don't favor tillage as a control technique. According to Leap, tillage decreases the soil's organic matter content and a great deal of carbon escapes into the air in the form of CO_2 (see "California Growers and Researchers Consider Tillage Options," *The Cultivar*, Summer/Fall 1998, Vol. 16, No. 2). Tilling also breaks down soil aggregates, and over time can negatively affect soil tilth; it is unsuitable for long-term pest management. "Tillage is sort of antithetical to what organic farmers are trying to achieve," says Ambrosino.

One technique that the researchers are hoping will decrease symphylan pressure is planting suppressive cover crops. The team is experimenting with mica barley, which has reduced symphylan populations elsewhere, although no one knows the specific suppression mechanism involved. This fall, fields with known symphylan problems were planted with either mica barley or a vetch-oats-bell beans mix. While the vetch mix is better for horticultural purposes, says

Ambrosino, it may also be favored by symphylans, which seem to prefer legumes to cereals.

Sampling Options

Sampling for symphylans to determine the effect of field experiments poses its own challenges. According to Ambrosino, although symphylans may be at the soil surface in the spring, they exhibit a "vertical migration," crawling deep below the surface by mid summer. Symphylans are easily damaged during collection, and once this migration takes place it becomes extremely difficult to monitor them. To collect a sample, a hollow cylinder is pushed into the ground; when it is pulled up, it's full of soil. The soil is compacted during the process, though, and symphylans can't take the pressure. "They're very dainty," says Ambrosino. "They get torn up."

To monitor the symphylans effectively, studies must be timed to coincide with periods when symphylans are near the surface, where baiting techniques can determine their presence and distribution. The symphylans are baited with beet slices placed on the surface of the soil. This technique isn't fool-proof: if there is a dry zone near the surface, it will prevent the pests from reaching the bait. "They can't cross that threshold of dryness," says Ambrosino.

Another sampling problem is the seeming randomness of symphylan infestation. According to Leap, the sporadic pattern of symphylan appearance makes it difficult to know whether a test bed will even have symphylans to study. Also, since the symphylans can migrate vertically through the soil to find optimal moisture conditions, a low count from samples collected at or near the surface doesn't guarantee a pest-free crop. The researchers chose test beds based on a history of severe infestation, hoping that this will guarantee countable numbers. "We have to do this where there's tons of symphylans," says Ambrosino. "You're getting a lot of zeroes in these samples because it's so hard to get them."

Because these pests are so difficult to predict and collect, a key component of the project will be to monitor the symphylan population in a large number of crop beds and correlate the size of the population with the history of the bed. For instance, if there is a correlation between a particular cover crop being planted year after year and a decrease in symphylan activity, that could raise a flag. The researchers will use this data to identify practices that seem to suppress the pests. "Our ability to monitor and document symphylan populations in our production systems will be one of the most important tools in beginning to develop control strategies," says Leap.

Laboratory Studies Examine Biocontrol Options

In lab studies, the team is working to develop methods for raising the symphylans in a controlled setting. The pests live in plastic tubs filled with various media, and the researchers are watching to see which types of media promote reproduction. Unfortunately, symphylans have a very slow life cycle. "In order to see ecological effects," says Ambrosino, "you basically need to wait in units of 6 months."

Establishing a symphylan population in the lab will allow the researchers to test potential biological control agents against the pests. The best candidates right now include a species of mite that eats the symphylans and a fungus that feeds on their exoskeletons. Tests must be conducted, however, to make sure that broad-spectrum biocontrol agents, such as fungi, won't kill beneficial insects. "Soil arthropod predators [like the mites] don't go sweeping through killing insects," says Ambrosino, but a fungus could, considering that insects, like symphylans, have chitin-containing exoskeletons.

Along these lines, one suggested weapon against the symphylans is shrimp shell. The premise, Ambrosino says, is that the chitin in the shrimp shell will support the growth of chitin-eating fungi, which will then feed on the symphylans. Shrimp shell is also used as fertilizer, and the anti-symphylan activity claimed by the vendor has not been systematically proven.

Basic Information Still Needed

The researchers acknowledge that they may not find a 'magic bullet' to control symphylans. Instead, long-term management may require a combination of techniques, including flooding, tillage, and timing plantings to avoid the periods when symphylan populations are at their peak in the root zone; paying attention to crop and cover crop sequences; enhancing habitat for natural enemies; and, once they've been identified, applying biological control agents.

In the spring and summer of 2000, the researchers plan to expand the field trials to compare replicates of some or all of the following treatments: compost, shrimp shell/Farewell (in combination or alone), an incorporated grass cover crop (e.g., barley), flooding (continuous for 6-8 weeks prior to planting the crop), thorough tillage (e.g., spading followed by rototilling), and a biological control agent, if warranted by laboratory studies (see above). Details of the treatments will be worked out this winter, based in part on input from farmers and other researchers. Because symphylans are near the soil surface in the spring, treatments will be applied in the early spring and monitoring of the treatment effects will occur in mid through late spring.

One reason this research is so important is that very little is known about symphylans. Because they are so difficult to work with and their life cycle is so slow, many professionals have bypassed symphylans in favor of more productive research. "You don't get much professional enhancement per unit trial," says Ambrosino, who is participating in the symphylan studies as a volunteer. Therefore, he says one of the most important goals of the research is to collect as much anecdotal information as possible from growers who are battling symphylans on their own farms.

While one perfect solution may not be in sight, Ambrosino says, it's important just to let people know that someone is studying these pests and to act as a hub for existing symphylan information. In the coming year, the research team hopes to develop new information that will help growers cope with this vexing pest while maintaining optimal conditions for crop production.

– Caroline Seydel
Graduate Student,
Science Communication Program

Growers and researchers with information on symphylans are encouraged to contact Jim Leap (831/459-3375, jimleap@cats.ucsc.edu), Mario Ambrosino (831/759-7350, mdambrosino@ucdavis.edu) or Mark VanHorn (530/752.7645, mxvanhorn@ucdavis.edu).

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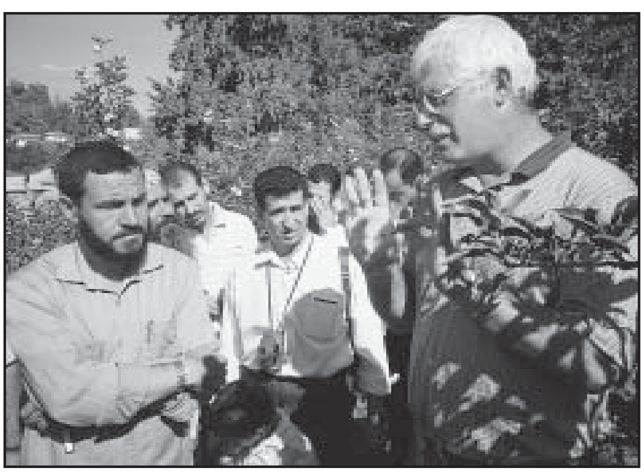
Center Notes

In August , Center Farm manager Jim Leap and post-graduate researcher Marc Los Huertos traveled to the Al-Arroub vocational agricultural school, located in the West Bank area near Hebron, to teach a workshop on organic farming techniques for Palestinian farm advisors. American Near East Refugee Aid (ANERA), a non-governmental organization, invited them to share their knowledge of organic farming and help establish a demonstration organic plot at the Al-Arroub site.

Also serving as a trainer was Magi Dabbour, a Palestinian resident of Gaza who took part in the Center's Apprenticeship in Ecological Horticulture course in 1997, thanks to support from ANERA. Dabbour works for the Palestinian Agricultural Relief Committee as an extension advisor. "Magdi confided to me that prior to his apprenticeship at the Center, he was very skeptical about growing food without synthetic inputs," says Leap. Dabbour is now seen as a leader in the organic agriculture movement and maintains a demonstration garden where he teaches the importance of crop diversity, crop rotation, cover cropping, and composting.

Leading a tour of Israeli organic farms for the Palestinian trainees was Eaton Green, who was also an apprentice course member in 1997. Green farms over 100 acres of fruit trees and vines on a Kibbutz just outside of Jerusalem, and is regarded as a driving force in Israel's organic movement.



© Jim Leap

Eaton Green leads a tour of an organic orchard in Israel.

August also brought international visitors to UC Santa Cruz, as 35 participants attended the first International Short Course on Agroecology, cosponsored through UCSC's Department of Environmental Studies and organized by Center faculty affiliate Steve Gliessman, post-graduate researcher Erle Ellis, and entomologist Miguel Altieri of UC Berkeley. Designed for extensionists, farm advisers, trainers, researchers, and other agricultural professionals, the two-week course offered lectures, demonstrations, and field applications of agroecology.

© Erle Ellis

Participants in the international short course take part in a field exercise sampling the soil profile for nitrate levels.

"Agroecology is an ecological approach to agricultural management that emphasizes the long-term sustainability of agroecosystems," says Ellis. "It is of intense interest now because of the failures of modern agricultural technology, especially for small farmers. Agroecology deals especially well with farming systems at the scale used on traditional small farms and in developing countries."

The course attracted participants from throughout Central and South America, as well as Morocco, Nigeria, Japan, Cuba, Italy, Nepal, American Samoa, and the U.S. Participants conducted hands-on lab and field activities at the Center's on-campus farm, made field trips to local farms, took part in group discussions on assigned readings, heard talks from a variety of specialists, and prepared case studies demonstrating principles of agroecology and sustainability, based on agroecosystems in the participant's home area.

A second international short course will take place August 7-18, 2000 at UC Santa Cruz. For details and application instructions, visit the web site: http://www.agroecology.org/shortcourse/2000/announce.htm, or contact Erle Ellis at 831/459-2506 or 459-2799 (fax). Mail can be directed to CASFS, 1156 High St., Santa Cruz, CA 95064, USA, attn: Erle Ellis.

This fall, the Center awarded grants totaling $57,000 to support research on topics that advance the Center's mission and encourage collaboration among Center staff, UCSC faculty and graduate students, and researchers from other institutions. The following projects received funding –

- Roots of Change - Social Innovation and Alternative Food Initiatives
  Patricia Allen, Margaret FitzSimmons, David Goodman, Ann Lindsey, Michael Goodman, Andrew Marshall, Shelly Errington, and Robert Gottlieb
- Soil Health Indicators in an Organic Strawberry-Vegetable Rotation: An Integrated Alternative to Methyl Bromide Fumigation
  Steve Gliessman, Joji Muramoto, and Erle Ellis
- Integrative Practices for Soil and Plant Health through Cover Crop Management in Central Coast Vegetable Production
  Deborah Letourneau, Weixin Cheng, Erle Ellis, Greg Gilbert, Jim Leap, Michael Loik and Jeffrey Mitchell

- Organic Farms as Laboratories: Implications for Policy
  E. Melanie DuPuis and Lisa Bunin

This fall the Center received a $20,000 grant from the Smith Horticultural Trust for general support of the Apprenticeship in Ecological Horticulture course in 2000. We thank the Smith Horticultural Trust for their generous donation to the Center's six-month training program in organic farming and gardening.

A chapter on "Contemporary Food and Farm Policy in the United States," written by the Center's senior agricultural issues analyst Patricia Allen, appears in the new book ***For Hunger-proof Cities: Sustainable Urban Food Systems.*** Edited by Mustafa Koc, Rod MacRae, Luc J.A. Mougeot, and Jennifer Welsh, this is the first book to fully examine food security from an urban perspective.

The 240-page volume examines existing local food systems and ways to improve the availability and accessibility of food for city dwellers, as well as discussing methods to improve community-supported agriculture and cooperation between urban and rural populations. It explores what existing marketing and distribution structures can do to improve accessibility, what the emerging forms of food-distribution systems are, and how they can contribute to alleviating hunger in the cities. Finally, the book discusses the underlying structures that create poverty and inequality and examines the role of emergency food systems, such as food banks.

For Hunger Proof Cities is published by IDRC, ISBN 0-88936-882-1, $35 Canadian. For ordering information, see the web site –
http://www.idrc.ca/books/882.html.

An article by Allen also appears in the most recent issue of *Agriculture and Human Values* (16:117-129, 1999). "Reweaving the food security safety net: Mediating entitlement and entrepreneurship," describes the approach of community food security and raises questions about how the movement can meet its goals of simultaneously meeting the food needs of low-income people and developing local food systems.

Research Updates

Several factors have combined to prompt interest in alternative strawberry growing methods: the impending ban on methyl bromide (a soil fumigant used extensively by Central Coast strawberry growers), coupled with concern over the impacts of strawberry pesticides and soil erosion on human health and the environment. In reaction to this interest, a multifaceted study called BASIS (Biological Agriculture Systems in Strawberries) was initiated in the fall of 1998 on nine strawberry farms in Santa Cruz and Monterey counties. The study's goal is to evaluate alternative pest, weed, and disease control techniques, as well as erosion control measures, and compare their effects to conventional strawberry production methods. BASIS researchers include Center members Sean Swezey, Polly Goldman, John Bailey, Janet Bryer, Amanda Lewis, Steve Gliessman, and Joji Muramoto, as well as members of the US Department of Agriculture/Agricultural Research Service, UC Cooperative Extension, the Community Alliance with Family Farmers, the Natural Resources Conservation Service, and the California Strawberry Commission. Three growers help make up the BASIS team.

The BASIS group established 3 field plots with biologically based systems for control of soil borne diseases and weeds, and 6 field plots for insect control. For the "below ground" portion of the research, Carolee Bull and Steve Fennimore compared biologically integrated systems to soils fumigated with methyl bromide and to non-fumigated controls. The biologically integrated systems used the following inputs: microbial inoculants, thought to stimulate plant growth and control soilborne diseases; organic acids, thought to stimulate root growth; amended compost, which may provide nutrients for the microorganisms; corn gluten, which has been shown to act as an herbicide; and plant extracts and enzymes, thought to help break down compost for use by microbes.

Microbial inoculants and organic acids were injected monthly at the test sites; all the other amendments were added to the soils before or at the time of planting. To evaluate some of the system's individual components, the following treatments were tested: the whole biologically integrated system without the microbial components; the whole system without the corn gluten meal; the microbial components alone; and the corn gluten meal alone. On the study's organic farm, only microbial inoculants were tested.

Through the initial part of the season, there were no significant differences in plant growth, yield, or weed growth amongst any of the treatments. Data from the latter part of the cropping season are now being evaluated and will be reported in the next issue of *The Cultivar.*

For the "above ground" studies on pest control measures, the Center's research group established in-field strips and field borders of non-native annual flowering plants and native perennial plant borders at five strawberry farms. Plants were chosen based on their potential to attract lygus bugs (*Lygus hesperus*, a significant pest of strawberries), and beneficial insects. The team modified an annual "good bug blend" of semi- and non-dormant alfalfa, daikon radish, culinary radish, and sweet alyssum to maximize its use as a trap crop for lygus. This blend was planted in the winter, irrigated with a drip system, and weeded throughout the spring and summer. For the native borders, the group emphasized two perennials, yarrow *(Achillea millefolium)* and coast buckwheat *(Eriogonum latifolifium),* which in earlier studies have been the most effective in establishing quickly and attracting natural enemies. Perennials were planted in the spring adjacent to the strawberry beds and maintained with mulch, drip irrigation, flaming, and hand weeding.

Total lygus were more abundant in the annual trap crop than in the control through the early part of the season (February-June), and more abundant in the trap crop than the strawberries, with both lygus nymphs and adults following this trend. Lygus were more abundant in the perennial hedgerows than in the control on some sampling dates. In general, lygus numbers within

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the farmscaped fields were low through the early part of the season, and slightly higher in the control fields than the farmscaped fields.

Although the number of generalist predators (mostly minute pirate bugs, bigeyed bugs, lacewings, damsel bugs, and lady beetles) was higher in the trap crop and perennial borders of the BASIS treatments than in the control plots, this did not translate to higher numbers of predators in the BASIS strawberry fields themselves. In fact, control fields exhibited slightly higher numbers of predators than BASIS fields. The same holds true for parasitic wasps; although abundant in the trap crop, they did not move out into the surrounding strawberries in the BASIS plots. The control plots exhibited higher numbers of two-spotted spider mites (another strawberry pest) and aphids than the BASIS plots, with correspondingly higher numbers of mite predators. Data on pest and predators from the end of the 1999 cropping season will be reported in the next issue of *The Cultivar.*

One way to decrease the need for synthetic chemical inputs is to grow crop varieties that have some natural resistance to pests and diseases. To identify strawberry varieties that perform well in organic systems, Carolee Bull and Joel Stryker of the USDA/ARS in Salinas are working with Center staff to test ten strawberry varieties adapted and bred for the Central Coast climate. These include both older varieties and more recent introductions, as well as short-day and day-neutral varieties.

In October, Stryker and farm manager Jim Leap planted the varieties in a section of the Center's farm row crop fields. Each planting includes strawberries treated with a commercial mycorrhizal inoculant (a mixture of fungal isolates designed to promote plant growth), and an untreated control. The researchers will measure yield from each treatment, as well as other factors such as mycorrhizal colonization and disease susceptibility.

The Center's biorational pest management program for artichokes (BIORAPP) continued its efforts to implement alternative controls for artichoke plume moth (APM, *Platyptilia carduidactyla*) on the northern Santa


© Jon Kersey

Research assistant Janet Bryer sorts insects collected as part of the BASIS project's "above-ground" studies.

Cruz and southern San Mateo county coast during the 1999 season. This project combines several techniques to control APM: release of a native APM egg parasite, *Trichogramma thalense*; pheromone applications; cultural controls, including yearly cut back of plants coupled with an application of *Bacillus thuringiensis* (Bt) to suppress APM; and intensive monitoring for APM abundance and artichoke damage. Heading this effort is Center research assistant Amanda Lewis, working in conjunction with Center entomologist Sean Swezey, Mohammad Bari of the Artichoke Research Association, and Reggie Knox of the Community Alliance with Family Farmers.

BIORAPP techniques were applied to three 5-acre production fields, and the effects compared to control fields treated with synthetic insecticides. Four flights of APM took place during the season; these were monitored using the Artichoke Plume Moth Day Degree Utility, based on information from the San Gregorio (San Mateo County) CIMIS weather station and the UC Statewide Integrated Pest Management pest forecasting routine. These degree-day based predictions were used to help time mass releases of the parasitic wasp *T. thalense* to maximize APM egg parasitization.

Researchers found a low rate of APM eggs parasitized by *T. thalense,* reflecting in part the low number of APM eggs deposited on artichoke plants. There were no significant differences between BIORAPP and control fields in number of APM eggs or APM larvae. Bud infestation in both the BIORAPP and control fields averaged below 4%, considered below the economic threshold for this pest, and bud damage did not exceed 10%, a level considerably lower than has been seen in previous years on the north coast. Overall, the BIORAPP production systems suggest that parasitoid release, pheromone control, and cultural practices can keep APM damage at or below an acceptable level for North Coast artichoke growers.

Center researchers plan to continue the above efforts in both organic and conventional artichoke fields. Potential future activities include collecting new *T. thalense* from the wild in order to revitalize the captive-reared colony, with plans to eventually contract with a commercial company to mass rear the parasite. The research team would also like to begin experiments with trap crops or alternate hosts for APM. Trap crops would serve two functions: they would draw APM away from artichokes, and provide release sites for APM parasitoids. This work is contingent on additional funding, which is now being sought.

Results of the Center's research on organic and conventional cotton systems, conducted as part of the Biological Agriculture Systems in Cotton (BASIC) project, are reported in the July-August 1999 edition of *California Agriculture* (Volume 53, Number 4). The article, "Preliminary studies show yield and quality potential of organic cotton," by Center staff Sean Swezey and Polly Goldman, Ralph Jurgens of New Era Farm Service in Tulare, and Ron Vargas, County Director and Farm Advisor, UC Cooperative Extension Madera County, summarizes the 1993-1995 results of research on yield, quality, plant development, weed and disease levels, pest and beneficial arthropod populations, and economic factors. Call 510/987-0044 to order *California Agriculture.*

For the Gardener

A Garlic Primer

Allium sativum, the modern garlic, is thought to have evolved from a wild species, *A. longicuspis.* It is native to south-central Asia in the steep ravines and mountains of the Tien Shan Plateau of northwestern China into southern Uzbekistan. But in fact, a broad area referred to as the "garlic crescent" runs from the Tien Shan Plateau across northern Afghanistan, Iran, the Southern Caucasus Mountains to the Turkish shores of the Black Sea, and is said to be the primary center of distribution for modern garlic. Garlic was spread across this region and beyond by both nomadic cultures and early trade routes in times before written history.

The Major Garlic Types

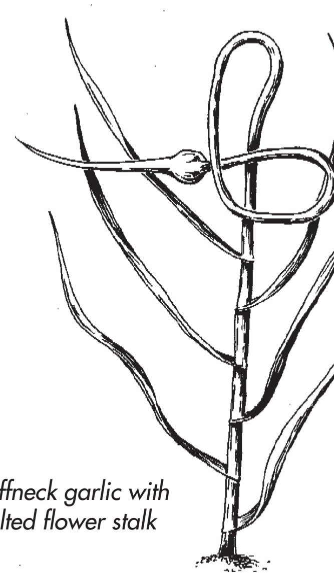
Human distribution coupled with climatic effects fostered the evolution of two groups or subspecies of garlic: *Allium sativum ophioscorodon* – the stiffneck garlic of northern (harsh winters) continental Europe, and *Allium sativum sativum* – the softneck garlic of milder Mediterranean climates.

Within the *A. sativum sativum* group several distinctive garlics developed in the milder regions of China, Korea, and Japan. These are referred to as Turban and Asiatic types, and offer growers some of the earliest maturing of all garlics. They posses characteristics of both softneck and stiffneck and are highly recommended to kitchen gardeners and niche marketers alike (see varietal descriptions, pages 11-13).

Allium sativum ophioscorodon – Stiffneck or Ophio Garlic

This group or subspecies has a host of common names: stiffneck, topsetting, ophio, serpent, rocambole, etc. Stiffneck or ophio garlics are wilder than their softneck counterparts and are probably quite similar to any number of the 150 species of wild garlic. While there are records of this type of garlic being in cultivation for 3,000-6,000 years, there is very little evidence that it has ever produced viable flowers and seed. Stiffneck garlics have a distinct set of characteristics that distinguish them from their more highly domesticated softneck relatives:

- produce a solid stiff false flower stalk, with a coiling seed stalk (see below)



Stiffneck garlic with bolted flower stalk

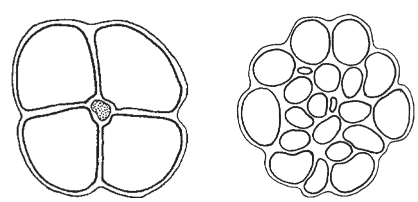
- smaller bulbs, with greater clove size to bulb size ratio and a single layer of cloves
- more uniform clove size and a low number of cloves per bulb; commonly 6-10 per bulb, but sometimes as low as 3-5 large cloves
- shorter storage life (4-8 months)
- elongated, tall symmetrical bulb shape with a delicate paper tail at the top of the clove
- require more exacting cultural inputs
- less productive per area
- most importantly, a wider range of distinctive, aromatic, highly flavored varieties

Allium sativum sativum – Softneck Garlic

Sativum means domesticated or cultivated in Latin. Thus, this subspecies of garlic commonly referred to as softneck or artichoke garlic is highly domesticated (*sativum sativum*). Indeed, softnecks are thought to have evolved under cultivation from their wilder progenitors, the ophio or stiffneck garlics. As such the softnecks are more responsive to inputs of water and nutrients, and yield both bigger bulbs and greater yields per area than stiffnecks. Characteristics that differentiate softneck from stiffneck garlics include:

- larger leaves and an overall bigger plant with no false seed stalk
- larger, heavier bulbs and a soft (braidable) neck; bulbs lumpy and not as highly colored or attractive as stiffnecks
- higher clove count per bulb, ranging from the high teens to forty
- difficult-to-peel cloves compared to stiffnecks
- greater yields and longer storage life – up to 6-10 months; therefore, almost the only garlic used in commerce
- little varietal taste differences

It is assumed that softnecks are for mild winter areas and stiffnecks for cold winter areas. But as a class, softneck garlics are better at adapting to cold weather than stiffnecks are at "crossing over" to mild winters.



Cross sections of stiffneck (left) and softneck garlics showing the clove arrangements. © Emma Skurnick

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Allium ampeloprasum (formerly _porrum_) – Elephant Garlic

Elephant garlic or great-headed garlic, as it was once called, is botanically a leek. Big is the operative word when referring to this plant: the plant itself is large, with a bulb exceeding 6 inches in diameter and weighing close to a pound each, containing 4-6 cloves which can reach 4″ tall by 1″ across.

While the plant's characteristics are strong, the taste of elephant garlic is mild. It can be used in quick stir fry dishes, salad dressings (raw), and roasted whole. When roasted, it produces a large amount of a smooth-textured paste with very little garlic "zing." Compared to the more robust *Allium sativum,* elephant garlic is a bit like the taste of light beer.

Elephant garlic was first introduced into commerce by Nichols Garden Nursery in Albany, Oregon, after purchasing stock from local Eastern European immigrant gardeners. Unlike stiff and softneck garlic, there is only one variety.

Elephant garlic should be spaced farther apart than true garlic, with 8″-10″ between planted cloves to achieve optimal bulb size. It is much easier to grow than true garlic and is much more responsive to fertility inputs. Production of a seed stalk indicates that the plant received an adequate winter chill (<50ºF, >32ºF) for 6-8 weeks, and thus will produce a segmented bulb.

Cultivation, Harvest, and Storage

Garlic's Growing Cycle

In mild Mediterranean climates like that of Central California, garlic can be thought of as the "holiday plant." You plant it just prior to Thanksgiving, top dress, foliar feed, or otherwise add supplemental nutrients on Valentine's Day and St. Patrick's Day, start to taper off watering on Memorial Day, and harvest around the Fourth of July. This catchy way of looking at the garlic cycle is not literally true all around the U.S. Stiffnecks are planted a month earlier than softnecks, and in the north the goal is to establish root but not shoot growth before frost and snow, while fertilizing and harvest take place later in the cycle in areas with more severe winters. Still, the holiday reference can be a helpful guide in thinking about garlic's needs and its long, slow growth pattern.

Soil Preparation

Like most Allium species, garlic has a fibrous, but non-branching, root system. It is both superficial (4″-8″ deep by 4″-8″ wide) and inefficient at marshaling water and nutrients from the soil. This inefficiency, combined with garlic's extended growth cycle, means that growers must provide high fertility levels and supplemental feeding throughout all but the last part of its growth period. Because garlic often grows in the wettest part of the year, good drainage is essential. A well-dressed raised bed with a shallow incorporation of nutrients is requisite for good results.

The garlic bulb is a modified leaf, thus it has a high nitrogen requirement. Phosphorous promotes early root development and helps establish the plant early in its growth cycle. Potassium is important for bulb development and food storage. A mixed compost made from horse manure with straw bedding (high potassium) and chicken manure (high nitrogen and phosphorous) is one fertility option. The goal is to establish a large plant prior to bulb initiation – the bigger the plant, the bigger the resultant bulb at harvest.

Planting – September-November

Bulb cracking and clove popping are laborious but important processes. Sizing and sorting in the post-harvest phase will expedite this stage. Gardeners often have three grades for sorting: the biggest bulbs for replant stock; the remainder of 1st grade and the next size down for sales; the smallest size for processing and generic kitchen use.

It is important not to pop garlic cloves from the bulb until just prior to planting (one week at the most). An increase in oxygen at the basal plate (where roots emerge) causes early root growth and can lead to rot if cloves are not in the ground. To the degree possible, the protective bulb and clove wrappers should be left intact. These wrappers have evolved to protect the cloves from the environment both in storage and in the ground. Any soft, injured, or diseased cloves should be discarded. The biggest bulbs (assuming good care) will result from planting the biggest-sized cloves from the biggest bulbs, and then big cloves from any size bulb. The purpose of the clove is to feed carbohydrates into the emerging shoot tip and root growth, getting the new plant off to a vigorous start irrespective of growing conditions.

Garlic cloves should be planted pointed tip up, basal plate down, with the top of the bulb 1″-2″ below the soil level in mild climates and 2″-4″ deep in cold weather areas. Garlic is a narrow-leafed monocot, and never really establishes enough leaf cover to protect the soil from the harsh influences of wind, rain, sun, freeze and thaw cycles. A light leaf litter or straw mulch can remedy this situation. Using a partially aged mulch of straw bedding from horse stalls also has the benefit of serving as a manure tea as the rains wash nutrients into the root zone. Within rows, cloves can be spaced 4″-6″ apart (stiffneck types), 6″-8″ apart (softneck types), or 8″-10″ apart (elephant garlic). Leave a minimum of 10″-12″ between rows. In a 4′ wide x 50′ long raised bed, 5 rows x 6″ will net 500 plants. Higher fertility levels allow for closer spacing without sacrificing bulb size at harvest.

Irrigation

After planting, soil moisture should be brought up to field capacity (a measure of how much water a soil can hold when saturated; field capacity occurs 2-3 days after a heavy rain or irrigation). Allow a good dry down to 50%-60% of field capacity before irrigating again. Prior to emergence, garlic cloves are prone to rot with overly wet soils. Once emergence has occurred (10 days - 3 weeks in mild climates, 3 - 6 months in cold climates), soil moisture should be checked once or twice a week and plants should be watered when the soil is dry 4″-8″ deep.

Weeds

You can have garlic or you can have weeds, but not both. As a narrow-leafed, inefficient, restricted-rooted plant, garlic is a poor competitor with aggressive, broad-leaved weeds. Weeding is most effective before the seedlings get established, both above and below ground. It is important to control weeds all the way through harvest.

Bolting/Flowering

Stiffneck garlics will send up a false flower stalk in late spring. This stalk should be cut just above the foliage. If left on the plant, it will significantly reduce bulb size at harvest (remember, stiffnecks already produce smaller bulbs than softnecks).

Pre-Harvest Care

Late fertilization of garlic is virtually useless and can lead to poor storage qualities, as high nitrogen and water content make bulbs prone to rot. During the last month of growth, the water needs of garlic decrease. It is important to have available moisture in the root zone, but care should be taken to avoid constant moisture near the bulb. The final irrigation is usually 2-3 weeks prior to harvest. In the latter stage of growth the plant will translocate nutrients from the foliage into the rapidly expanding bulb. As this starts to happen, the lower leaves will begin to yellow and eventually senesce. Bulbs should be approaching harvest size, with visible clove segmentation when approximately 25% of the foliage has senesced.

Harvest and Curing

Most softneck garlics are harvested when 4-5 green leaves remain on the plant. Note that some early stiffneck types and the Asiatic and Turban type softnecks (described below) reach full bulb maturation even though all plant leaves are green or when one or two lower leaves start to brown. Stiffneck types are generally harvested when 5-6 green leaves remain (a mature plant will have 12-15 leaves). If left in the ground past this stage the bulb wrappers will decay, the bulbs will split open and be prone to rot in the ground or early in storage.

Each green leaf on the plant represents an intact bulb wrapper at harvest and in storage. Inevitably, two to three wrappers will be destroyed in the harvest or during posthavest handling. Garlic stores best with a minimum of two intact bulb wrappers; with fewer than two wrappers, cloves can split apart, turn green from sunburn, and suffer the effects of dehydration, or rot from too much moisture. Harvesting garlic at the *slightly* green or immature stage is safer than waiting until it's overmature. Good drying and curing conditions can compensate for a slight degree of immaturity.

When ready for harvest, garlic bulbs should be pulled by hand or dug from the soil, depending on soil moisture and structure. In areas with little or no summer precipitation, garlic can be field cured. As the whole plants are pulled, they can be "shingled," that is, 6-10 plants can be laid out, with the foliage of the next bunch covering the bulbs of preceding group. This technique protects the bulbs from sunburn. Garlic stores longer and better if cured or dried with the whole plant intact. In areas with summer precipitation, garlic is best cured in an unused greenhouse or well-ventilated shed on wire screens. In humid areas, forced air is a good aid to dry down. This curing process can take as little as 5-10 days or as long as 3-4 weeks, depending on the maturation of the plants/bulbs at harvest and subsequent environmental conditions.

Cleaning and Storage

Once the garlic bulbs have cured and lost sufficient moisture, the tops can be clipped to 1/2"-1" It is critical to get good dry down in the neck. Remember, the purpose of a stem on any fruit or vegetable is to act as a buffer between the potential for rot from the environment and the items being stored. Note that overly long stems of stiffneck garlic cut at an angle can puncture surrounding bulbs in storage. Roots should be trimmed to 1/4"-1/2". Next, any soil should be gently brushed from the bulb wrapper and roots. Using either a toothbrush or a small fingernail scrub brush, exert a gentle but quick stroke from top to bottom on the bulb. Try to keep as many bulb wrappers in place as possible, but peel off any that are broken. The aim is minimal bulb wrapper damage, while netting an undamaged, vibrantly clean bulb with an unbroken outer wrapper. This usually entails removing no more than one or two wrapper layers. Culling for damaged or misshapen bulbs and size grading occurs at this stage of postharvest handling.

Fully cured, graded garlic can be stored in burlap or synthetic net onion bags. The synthetic material breathes better and is less subject to harboring molds and fungi that can rot the contents. Garlic should be stored at low light levels, at temperatures above freezing and below 40ºF or at 50º-60ºF with a relative humidity of less than 75 percent. Good air circulation between bulbs adds to storage longevity. Remember, 6 months is considered long-term storage for stiffnecks, and 9-10 months for softnecks, so eat and sell your stiffnecks first.

Green Garlic

Green garlic is a marvelously broad concept. Basically, it entails harvesting, selling and best of all, consuming whole immature garlic plants. The plants can be planted at 2" spacing and harvested at the bunching onion stage all the way through mature (but still green) plants with full-size, segmented bulbs. The flavor is basically garlic (varietal characteristics express themselves during the curing stage), but because of the high water content, it is succulent and delicate – sweet and mild. This concept affords growers cash flow ($4-$7 per pound) early in the season. It is also appreciated in the kitchen by cooks clamoring for garlic after the winter stock has dwindled away or gone soft.

Garlic Varieties

Subgroups of Stiffneck Garlics

There are several distinctive sub groupings of stiffneck garlics based on the color, sheen, and shape of bulbs and cloves.

Rocamboles

Rocamboles perform best at latitudes greater than 40 degrees North. In wet, mild winters they often bulb poorly if at all or fail to form cloves. These are arguably the highest flavored of all garlics, peel most easily, and thus are preferred by cooks in the know. The plants are short and squat with broad, spreading leaves. The flower stalks make 1-3 tight coils (360 degrees) and then resume their vertical growth. Other varieties form coils that shoot off at random angles. The bulb wrappers are a light streaked purple. The cloves are rounded and plump with high soluble solids (dense) and number 6-11. The clove color is usually brown, often a rich mahogany with a purple splash. Rocamboles mature midseason to late and have the shortest storage life of all stiffnecks (2-4 months). Varieties of note –

Russian Red – large, thick, nearly round bulbs with a copper hue and purple blotches. 8-12 cloves per bulb. The taste is fiery but quickly turns sweet and buttery.

Spanish Roja – the standard when

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judging true garlic flavor. Cloves vary from teak to brown in color; bulb wrappers are purple streaked. Rich, spicy flavored bulbs mature in midseason and store 4-6 months. May produce poorly in mild wet winter areas.

German Red – produces large bulbs with deep red color and 8-12 cloves. Fiery, spicy rich garlic flavor. Does best in cold winter climates. Midseason maturity.

Kilarney Red – high yields, late maturation, one of the better Rocamboles for mild, wet winter areas. Similar in appearance to German Red and Spanish Roja. Sustained heat, rich garlicky-butter aftertaste.

Porcelain Group

This is an eye-catching group of stiffnecks. Porcelains have almost pure white bulb wrappers with a reflective sheen and feature tall, symmetrical bulbs with 5-8 cloves. The cloves are a plump, crescent shape with an elongated paper tail at the top. The clove skins are usually light brown to pink with some rose or red streaking. Clove size sometimes rivals Elephant garlic. The cloves are easily separated from the bulb and peel with great facility. The vigorous plants can reach 4-5 feet in height with the seed stalk extending up another 2-3 feet. These are the longest storing of all stiffneck types (5-8 months). Varieties of note –

Music – indeed it is music to the garlic lover's eyes and mouth. White skinned with a touch of pink blush. 5-6 large cloves per bulb. Highest yielding variety with a long storage life (7-9 months). A medium heat index that sticks around in the back of the mouth.

Georgian Crystal – native to the Republic of Georgia. Large pure white, satin bulb wrappers cover light brown, red-streaked tall cloves that peel easily. 5-6 cloves per bulb. Mild, almost sweet flavor, even raw.

Georgian Fire – very similar to Georgian Crystal except it has an arousing strong kick that shows off well in salsa.

Purple Striped and Marbled Group

These two very similar groups of ophio garlics indeed have purple stripes on the bulb wrappers and a smooth satin sheen. The slender bulbs are not as tall as Porcelain types and contain 5-6 cloves with a distinctive paper tail. The taste of the purple stripes is moderately fiery initially but mellows quickly. This group roasts well. Varieties of note –

Chesnok Red – large bulbs, 6-10 easy-to-peel cloves. One of the best roasting and cooking garlics as it holds its shape and flavor. White bulb wrappers with purple streaks. Stores 4-6 months. Performs best in northern climes.

Red Rezan – bulb color is a glazed purple with a hint of gold or copper and a satiny finish. Moderate storage (4-5 months). High flavor but not overwhelming.

Purple Glazer – similar to Red Rezan but with fatter cloves. Originally from the Republic of Georgia.

Brown Tempest – satiny bulb wrappers with faint, fine purple stripes. Light brown, rose-tinged cloves are short and plump. 6-9 cloves per bulb. 5-6 month storage. Fiery with a buttery aftertaste.

Siberian – perhaps the most outstanding of the purple stripe group. Large, white, purple-striped bulbs. 7-8 cloves are wrapped by light pink blush-red bulb wrappers.

Korean Red – extremely large, tall bulb with intense red to almost black-red coloring. 4-8 cloves. Longest storage of stiffnecks (up to 9 months). Hot, lingering taste.

Subgroups of Softneck Garlic

Artichoke Type

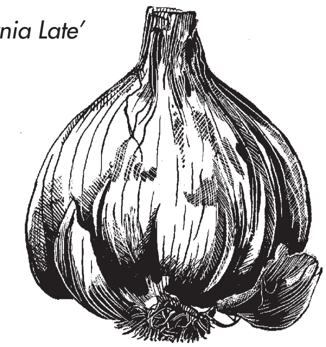
These have a lumpy, spreading bulb that vaguely resembles an artichoke flower. Varieties of note –

Inchellium Red – the best for roasting. 9-20 uniform cloves, bulbs often greater than 3" in diameter. High soluble solids give this variety a denser, heavier feel and more edible portion than other garlics. Stores 6-9 months. Mild but lingering buttery taste.

California Early and California Late – the garlic of Gilroy and the California garlic industry. Very large, vigorous, and productive. Lumpy off-white bulbs with pink-tinged cloves. Tight bulb wrappers beget long (7-10 month) storage. Mild flavored, slightly sweet, tame taste. Many small unusable cloves in center of bulb.

Machashi – good-sized flat, uniform bulbs. Cloves often occur in a single layer and are thus user friendly. Silky buttery aftertaste follows initial tongue-tingling fire.

'California Late' variety



© Emma Skurnick

Simoneti – a large, uniform bulb with a rosy patina on bulb wrappers, with pink cloves. Very productive, with a mellow taste.

Polish White or New York Polish – a monstrously big, uniform-shaped bulb; often the largest softneck type. Extremely cold hardy and does well in mild winter areas. Only 10-13 large cloves. Initially hot, but tones down quickly with a "sticks around" buttery sensation on the lips.

Creole Types

Genetically, these are softnecks that bolt early and appear stiffneck-like in their bulb and clove arrangement. They perform best in mild southern climates. Bulb wrappers are white, with distinctive red and purple clove skins. Harsh tasting when raw, these types are mild and sweet when cooked. Varieties of note –

Ajo Rojo – from Spain

Burgundy – deep, solid burgundy, with 8-12 uniform cloves per bulb

Creole Red – best tasting of its class

Spanish Morado – intense purple clove color

Silverskin Types

These softneck garlics are more demanding (á la stiffnecks) about climate conditions and soil fertility. Because of their silver-white exteriors, clean appearance and long, thin necks, they are excellent for braiding. Varieties of note –

Nichol's Silverskin – the whitest of all silver skin types.

Silver White – highly productive in both coastal and hot interior climates, with a large bulb.

Nootka Rose – from the San Juan Islands off Washington State's Olympic Peninsula; 5 clove layers with up to 35 cloves, streaked red. Large bulbs with strong flavor.

Asiatic Types

While genetically softnecks, these unique garlics combine large bulbs with the single layer clove arrangement, false flower stalk, purple or marbled color, and plump cloves of stiffnecks. They generally mature early (a month before all but the turban types, May 15 - June 1 in Central California). Asiatics need to be harvested as soon as *any* leaves show browning, or the bulbs will split apart. Varieties of note –

Asian Tempest – from South Korea. Large, finely striped with a purple blush. 5-7 big cloves. Produces well in wet, mild areas as well as cold ones. Rich, long-lasting flavor. Moderate keeper (4-6 months).

Pyongvang – from North Korea. 6-8 cloves per bulb, with a rose-purple blush to the cloves, which have an elongated paper tail. Very early harvest, poor keeper (3-5 months).

Russian Red Streak – Big bulbs, firm and plump, with a very sharp initial taste and a heat that sticks around. Long storing (7 months).

Japanese – 5-7 large cloves, similar in size and shape to elephant garlic. Tan/yellow cloves.

Turban Types

Another cross-over type – technically a soft neck, but exhibiting stiffneck characteristics: poor storage (3-4 months), bolting flower stalk, high aromatic flavor, red and purple striping, and easy-to-peel cloves. As with the Asiatics, Turbans must be checked almost daily as they approach maturation and harvested at the first sign of any leaf senescence. These are the earliest-maturing of all garlics (May 1-15 in Central California). Varieties of note –

Dushambe – 8-11 cloves with a bronze/mahogany color. Easily separated and peeled cloves. Rich, buttery taste.

Tzan – from China's Shandong Province. Often grown and marketed from Mexico as Mexican Red. Striped bulbs with purple blush. 8-10 cloves in a single layer, stiffneck style.

Xian – similar to Tzan but even earlier maturation.

Chinese Purple – early maturation (June 1). 7-10 brownish cloves with a purple splash. Pure white bulb wrapper. Mid size, tight bulb, with a fiery hot taste. Stores well (7-9 months).

Softneck varieties, with their higher soluble solids content, are the garlics for roasting. When roasting garlic, remember that distinctive varietal taste characteristics tend to be obscured. Roasted garlic (be it stiff or soft) is at its pinnacle from just after harvest to about the time it would normally be planted in the fall. At this time it starts to lose some of its sweetness and succulence and develop a green shoot in the center. While usable thereafter, it doesn't have its premier qualities as winter progresses.

- Orin Martin

Garlic "Seed" Sources

Peaceful Valley Farm Supply
PO Box 2209
Grass Valley, CA 95945
(530) 272-4769, (888) 784-1722
www.groworganic.com
10-15 varieties

Johnny's Selected Seeds
Foss Hill Rd.
Albion, ME 04910-9731
(207) 437-4301
www.johnnyseeds.com
German X-tra Hardy, NY (Polish) White

Filaree Farms
182 Concully Highway
Okanagan, WA 98840
(509) 422-6940
wide array of both softneck and stiffneck varieties

Irish Eyes with a Hint of Garlic
(formerly Ronnigers)
PO Box 307
Ellensburg, WA 98926
good selection of softnecks, stiffnecks, and novelty alliums

Territorial Seed Company
PO Box 157
Cottage Grove, OR 97424
20+ varieties

Nichol's Garden Nursery
1190 N. Pacific Highway
Albany, OR 97321-4598
(503) 928-9280
high quality elephant garlic and the softneck variety Nichol's Silverskin

'Tzan' 'Georgian Fire' 'Dushambe' 'Creole Red' 'Asian Tempest'

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Green Consumerism *(from page 3)*

response than any other rule ever proposed by the USDA.[20] In the comment period between December 1997 and April 1998, the USDA received 275,603 comments on the proposed rule.[21] The federal Agricultural Research, Extension and Education Reauthorization Act of 1997 contains a new Organic Agricultural Research and Extension Initiative, authorizing an organic agriculture research program for the first time in history. These political changes represent a major departure from the dismissal of organic agriculture by the agricultural establishment in the not-so-distant past. For example, the USDA's study of organic farming in the U.S.[22] was met with intense opposition from the agricultural scientific, policy, and industry communities, even though the report did not completely rule out the use of synthetic chemicals.[23]

The political activities of the organics industry have overlapped substantially with the activities of nongovernmental organizations (NGOs), politicians, and individuals committed to environmental and social change. These groups constitute a movement which has grown markedly in size and influence. For example, the International Federation of Organic Agriculture Movements (IFOAM), the worldwide umbrella organization of the organic agriculture movement, has grown markedly. Started in 1972 by five organizations from France, South Africa, the United States, Great Britain, and Sweden, IFOAM now has 600 member organizations and institutions in 100 countries. The "IFOAM Basic Standards of Organic Agriculture and Food Processing" is currently translated into 17 languages.[24] In the United States, the California Certified Organic Farmers (CCOF), started in 1973 by a group of 50 farmers to define uniform standards for organic food and establish a certification program for farmers' practices, now has 750 growers, 110 processors, and 372 supporting members.[25] In addition, the organizing around the federal organic rule has resulted in the creation of two new NGOs, the Organic Consumers Association and the Organic Farmers Association Council, as well as invigorating and increasing ties among existing organizations.

The political action beginning to take place around organic agriculture could lead to a more powerful civil society, a society that more readily challenges the state, both on the organics issue and on other environmental and social issues.

Green Consumerism and the Future of Organic Agriculture

The transparency created by the organics industry – reaching into the farm, the scientific laboratories, and government agencies – could enable the organics marketplace to harness the power of environmentally responsible consumers and bring about significant change. One person who shares this vision is Peter Roy, formerly the president of Whole Foods Market, the largest retailer of organic foods in the U.S., and currently a board member for several organic food companies. In a speech at an organics industry conference in August 1999, he predicted the future course of the organics industry.[26] The 1990s, he said, would be remembered as "the decade of political definition," when a clear definition of organic would be written into U.S. law. The years from 2000 to 2005, he said, would be a time for consumer education. He said,

> I think that there is increasing awareness and demand for organic products, but I think that there is still a tremendous amount of confusion about what organic really is. . . . We really need to educate potential customers of ours about the importance of organic, what it really means, what it stands for.

This education process has two goals: first to educate consumers about what organic is – i.e., the production processes – and second, to educate them about why it is important – i.e., the scientific arguments for environmental and health benefits. Roy believes that this education process has the potential to have a significant impact. He said, "Beyond 2005, I see this wide-spread demand for organic leading to major changes in how we grow food."

Part of the appeal of green consumerism is that a small number of consumers can make an impact, and that it is an easy thing to do. Elkington *et al.* write,

> [I]t takes only a fairly small portion of shoppers – as few as one person in ten – changing buying habits for companies to stand up and take notice. For example, if 15 percent of American consumers decided to buy only those napkins, paper towels, toilet paper, and other goods made of recycled paper, you can be sure that the nation's leading paper goods companies would seriously consider making recycled paper products widely available.[27]

Furthermore, green consumers need not drastically change their lifestyles. "By choosing carefully, you can have a positive impact on the environment without significantly compromising your way of life. That's what being a Green Consumer is all about."[28] Because green consumerism is relatively easy, the argument goes, it is conceivable that a critical mass of people could shop differently and make a difference.

At the same time, there is reason for caution. Along with progress in organic farming, the growing market for organic food, and political changes, there are questions about the "real" as opposed to symbolic power of green consumerism. While the market for organic foods is growing, it is still small. In 1998, 9.8 percent of U.S. households bought organic products;[29] this means, of course, that more than 90 percent of American households did not buy organic products. In addition, there are forces driving organic agriculture to engage in practices antithetical to its original philosophies. In California, the production and distribution of organic food are being integrated into the commodity chain, with the result that organic agriculture in California is beginning to resemble conventional.[30] And, while a recent federal research bill authorized an organic farming research program, no funding provisions were written into the legislation.

Still, given the significant advances made so far, it is tempting to forecast that the trend will continue, bringing about a fundamental change in the way agriculture is done. Organic agriculture has "softened" the technologies for appropriating "nature," which may allow ecological conditions of production to become more self-sustaining. And, although the market for organic products is small, organic consumers tend to be more educated and affluent than "average" consumers,[31] and therefore are likely in a better position to effect change in the food system. Organic agriculture has the potential to develop an innovative set of alternative social and economic relations within agriculture, potentially capable of significantly transforming the entire food and agriculture system, from the farm to the halls of government.

- Patricia Allen and Martin Kovach

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Events

Organic Cotton: A Developing Story in Rural India, a photo exhibit by UCSC graduate student Lisa Bunin, will take place at Porter College's Bridge Gallery, UC Santa Cruz, from January 1-16, 2000. Bunin writes, "Having recently returned from a trip to central, rural India I invite you to join me on my journey through cotton country and visually experience organic cotton growing in the context of rural life in India. This exhibit grew out of my dissertation research in Environmental Sociology at UC Santa Cruz on the re-emergence of organic cotton farming in the Nimar (Madhya Pradesh) and Vidarbha (Maharashtra) regions."

The 20th Annual Ecological Farming Conference will take place January 19-22, 2000 at the Asilomar Conference Center in Pacific Grove, California. This year's conference theme is "Riding the Organic Wave: 20 Years on the Crest of Eco-Agriculture." Bus tours, workshops, organic wine tasting, and more. For more information and registration material, contact the Committee for Sustainable Agriculture, 406 Main St., Ste 313, Watsonville, CA 95076. 831/763-2111, 763-2112 (fax); csaefc@csaefc.org; http://www.csa-efc.org

Pruning Backyard Fruit Trees, a hands-on workshop, will take place Saturday, January 29, 10 am - 12 noon at the Louise Cain Gatehouse on the UCSC Farm. Fruit tree expert Orin Martin will demonstrate pruning techniques for the home gardener and small-scale orchardist. $5 for members of the Friends of the UCSC Farm & Garden; $10 for non-members, payable at the workshop. For more information, call 831/459-3240.

Conservation Tillage Conferences will take place Thursday, February 10, 2000 at the UC West Side Research and Extension Center in Five Points, California, and Friday, February 11, 200 at the UC Davis Western Equipment and Technology Center in Davis, California. Both conferences will feature presentations on successful reduced tillage crop production systems, equipment and management. For more information, call 530/752-1748, meschlosser@ucdavis.edu

Farming and Ranching for Profit, Stewardship, and Community, a conference of the USDA Western Region Sustainable Agriculture Research and Education program, will take place March 7-9 in Portland, Oregon. This conference is designed for producers, researchers, policymakers, agricultural extension agents, educators, and others interested in sustainable agriculture. Conference topics include SARE-funded research and education projects on cropping systems, biological pest control, direct marketing, community food systems, and more. Progressive farmers, ranchers, and researchers will be sharing their experiences and results. For more information or registration materials, contact Gina Hashagen, Department of Horticulture, Oregon State University, Corvallis, OR 97331, 541/737-5477, 737-3479 (fax); hashageg@bcc.orst.edu; http://wsare.usu.edu/2000

"Good Bugs" for the Garden, a free slideshow and talk on biocontrol options, will take place Saturday, February 26, 7 pm - 9 pm at the Patagonia Store, 15 River St. in Santa Cruz. Center entomologist Sean Swezey will discuss how to use and attract beneficial insects to the garden and small-scale farm. For more information, call 831/459-3240.

The Center for Agroecology & Sustainable Food Systems is located at the University of California, Santa Cruz. Through our research and education efforts, we seek to increase understanding of the social, economic, political, and ethical foundations of agricultural sustainability; to establish the ecological and agronomic basis for sustainable production systems; and to demonstrate and facilitate the use of information critical to the adoption of these systems.

On the UCSC campus, the Center manages the 25-acre Farm and 2-acre Alan Chadwick Garden, which are open daily to the public.

For more information about the Center and its activities, contact us at CASFS, University of California, 1156 High St., Santa Cruz, CA 95064, 831/459-4140 (phone), 831/459-2799 (fax). Home page address: http://zzyx.ucsc.edu/casfs

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