Global Organic Trade and the Buy Local Objective: Is There Room for Both?

Mark Ritchie is President of the Institute for Agriculture and Trade Policy in Minneapolis, Minnesota. This article is adapted from a presentation given at OFRF’s biennial organic regulatory and marketing conference. Organic: Growing into the 21st Century, in Berkeley, California, August 1999.

The current state of affairs in the organic products trade is a bit like a new marriage. Traditional organic producers are co-existing with a boom in interest from agribusiness and Wall Street investors. This marriage is in its honeymoon, and we know that there will be bumpy times ahead. I think the organic industry has to figure out a way to prolong the honeymoon, while being very conscious about our interests when the honeymoon is over, and what to do when there is real conflict between the attempt to globalize the industry and the impetus for a more local and grassroots form of control.

I’ve had two experiences in organic companies that influence my thinking. The first was back in the seventies—I had an organic egg farm near Morgan Hill, California. It was called LW Poultry—Left Wing Poultry. We were trying to farm in the way we believed in our hearts was the right way to farm. And about every six months there would be a big influx of breakers—of eggs in bulk commodities—from Canada and sometimes from Europe, and the commercial egg market would die.

As all of you know, when the import market spreads, and gets beyond 25%, it really starts to affect your sales. After two or three years of losing money and a lot of time we eventually gave it up. But there’s a lesson that I learned—when you want to do something the right way there are policies and practices that get in the way of you doing that. My second experience is that our organization has an alliance with an organic coffee company. We import and roast coffee beans and I’m very aware of the job creation on both ends and the positive benefits as part of the fair trade movement. We’re also seeing some of the impacts and possibilities when you have a political message—coffee has a lot of political messages and so there are a lot of opportunities.

How can you separate trade in organic products from trade in general? This is a very good question. My egg-raising story is an example. It’s not just about trade and organic products and whether we should be promoting more export or more import. We’ve got to look at the whole trade situation. We also have to ask questions about local. What do we mean about local? Local production that is corporate, industrial or absentee-owned? We have to think about that. We also have to think about why people are importing and exporting. What are the business and other imperatives? How does...
OFRF’s 1999 Mantra: “Money in Money Out, Grants in Grants Out...” OFRF’s biggest news at the transition into the New Year is our record level of funds both received and awarded in 1999. At the close of December we crossed the half-million mark in annual income for the first time, raising just over $500,000 for the year, while awarding a record $173,000 in competitive and donor-directed organic farming research and education grants.

We would like to thank and acknowledge our supporters as a whole—farmers, foundations, organic industry members—the many individuals, companies and groups who have financially provided support for our mission and objectives. Funding organic research has always been our priority, but this year has been a turning point and we feel we are now able to really “spread our wings” in the grantmaking arena.

Thanks to all whose support has helped make our success possible—both through the years and in 1999.

OFRF Endowment Campaign 2000
Last year’s organizational success has brought us to the point where we are ready to embark on another of OFRF’s long-range goals: the development of OFRF’s Endowment Fund. We recognize that the sustainability of the Foundation is incumbent upon a secure source of funding for the organization. OFRF’s long-term goal is to build an endowment of $6 million by the year 2005. We’ve been fortunate to secure over $50,000 so far toward this goal, but we are just now beginning to solicit and sign on co-chairs for Phase I of our Endowment Fund Campaign, with the goal of raising $1 million over the next year. If you’d like further information on how to contribute to or secure funds for OFRF’s Endowment Fund, contact Bob Scowcroft at 831-426-6606.

Pick Up the Phone!
We recently received the good news that Working Assets, the long distance telephone company, has again selected OFRF (for the second time) for their 2000 donations ballot. In case you’ve ever wondered about the effectiveness of their donations program—it can make a huge difference for selected non-profit groups—OFRF received $117,000 in donations through Working Assets subscribers in 1998—resulting in OFRF’s largest “single-source” contribution ever received. If you’re not already a Working Assets subscriber we think this year is a good time to check them out—along with the hundreds of worthy groups they support. Call 1-800-788-0898 to sign up, or to find out more about other groups and Working Assets’ donations programs, visit their Give for Change website at www.giveforchange.com.

Board Transitions
At our Fall 1999 board meeting at Lew Grant’s Farm in Wellington, Colorado, Helen Atthowe and Stephen Porter were elected as new board members. Helen operates a 30-acre organic farm in Missoula, Montana raising vegetables, fruit, hay and pasture. She also works part time as a Missoula County Extension Agent. Stephen farms 400 acres with his brother and father in Elba, New York raising organic vegetables and field crops, a 500 ewe sheep flock and 20 head of cattle per year. Their organic produce is marketed through a 180 member CSA.

Leaving the Board at this time were Mark Mayse and Raoul Adamchak. Mark had served on the Board since 1994, providing invaluable scientific and common sensibilities to OFRF’s Research and Education Committee grant review process. Raoul joined the Board in 1996 and shared his expertise as a farmer and macro-organizational and movement thinker. We appreciate their many contributions to OFRF’s programs and development.

Policy Program Update
The OFRF Policy Program continues to be busy on many fronts. Biotechnology, new organic research programs, organic standards, and our SCOAR project are the major headlines.

Biotechnology: OFRF has been called on to help articulate organic growers’ specific concerns about genetically modified organisms. In formal policy forums and in a number of media interviews we have raised the issues of Bt-resistance, contamination of fields and farm inputs, labeling and testing costs, and the fallacies of biopesticide “silver bullets.” We’re also concerned about the potential pitfalls of organic producers having to bear the whole burden of providing a “GM O-free” food supply, along with the unintended consequences of some labeling proposals. Mark’s Lipson’s testimony to the FDA is available on our website at http://www.ofrf.org/policy/fdahearing.html.
New Organic Research Programs: Our efforts to stimulate dedicated organic research at the federal level have begun to bear fruit. USDA’s Agricultural Research Service has started new on-farm organic projects in Beltsville, M.D., Salinas, CA, and Beaver, WV. Permanent base-funding for an organic initiative is being proposed within ARS for FY 2001. We may also see a new proposal for a federal competitive grants program (like SARE) dedicated specifically to organics. A number of universities— Iowa State, Ohio State and North Carolina State—have recently started new organic research programs.

The SCOAR Project: OFRF’s primary policy project for 2000 is organizing the Scientific Congress on Organic Agricultural Research (SCOAR). With growers and scientists playing equal roles, we will develop a “blueprint” for new state and federal organic research programs (as well as farmer-researchers) to work from. Grower-participants are needed! If you are interested, call Mark at the OFRF office or check out the web page at http://www.ofrf.org/policy/scoar/scoards.html.

The Rules (Again): Last summer the Policy Program completed a contract with the USDA National Organic Program to run a mini-survey of organic packers and manufacturers, to gauge industry support for a proposed mill-fee for use of the USDA seal as a means to fund the USDA organic program. Call the office if you’d like a copy of the results. The survey results should show up in USDA’s new proposal for national standards, expected once again in February or early March. We’ll be commenting on the new (and hopefully improved) version. The Rule changes this spring will have major implications for every aspect of organic farming, including the research and education issues at the core of our mission. Watch the OFRF web page after the proposal comes out.

Conference Season: Among other appearances this spring, Mark will be anchoring a panel on organic issues at the annual meeting of the American Association for the Advancement of Science, on February 22 in Washington, DC.

Technical Program Update

Grant Awards OFRF’s spring grantmaking cycle is just under way, and grant awards will be made at our March meeting.

OFRF’s fall 1999 grant cycle received a record number of grant applications—46—and resulted in 1999 being OFRF’s biggest competitive grant-making year ever, with 23 projects funded.

“State of the States” The technical program’s big project for 2000 is researching and documenting the status of dedicated organic research plots at Land Grant universities in every state of the nation. This “State of the State” report will be a resource for farmers and researchers who want to know where to turn for meaningful organic production information. We also hope that it will be an effective organizing tool by highlighting the excellent programs that exist in states such as North Carolina, Ohio, and Iowa and create demand for such programs in every other state of the nation.

OFRF’s technical program is designed to bring farmers and researchers together to

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importing and exporting affect a value that we have about promoting the local, and also, how does promoting the local potentially impact importing and exporting?

If we're trying to figure out a way for our value on the local to coexist in a honeymoon with the growing globalization of the industry, we have to be more sophisticated in how we understand each of the pieces.

There are very specific issues that trade and globalization of organics can create for the local imperative. If we move toward globalization...it’s hard to argue that organic is about local, fresh, quality...

Because there are impacts of importing and exporting. Impacts on price. Importing is a standard tool for driving down prices. There is impact on market share and an impact on consumers’ perceptions. If we’re trying to promote local purchasing, eating seasonally, eating within our bioregions, importing foods has a direct impact on this value.

There is clear advantage and opportunity in importing and exporting organic products. I would also argue that there are some positive impacts on sustainable development and helping to keep some family farmers on the land. I do a lot of work in certified forestry through the Forest Stewardship Council (FSC), and it’s clear that the decisions by large, home depot-types of companies in England to move toward FSC certified wood in their products is driving demand and certification on forest lands all over the U.S. Orders are coming in from British companies to the county forester's office in this tiny, very poor county in northern Minnesota because that county took the initiative to get their forest certified, and now there is a demand. Another fuel is the whole issue of genetically modified organisms. The Europeans saying “no” and the demand for non-gmo products is definitely driving changes here. So when markets are globalized, this builds in some leverage for political, environmental and social change that wasn’t there before. The new European Union standards on organic are going to change things as well. A really important factor in the globalization question is, can we figure out how to use these changes that are taking place elsewhere?

When we discuss global trade, we’re talking about importing and exporting, but we’re also talking about trade negotiations and rules of trade, and sometimes we’re talking about the disputes that are part of the international set of rules of trade. All of these affect our industry and some of our local initiatives. I’d like to start with the positives. One is that it’s possible, with imports, to build some local markets. Sometimes you need products from other places to build a local market so that other producers can get in. There are potential pitfalls of course. This can result in a lower price, which then makes it harder for some producers to get in. Perhaps the imported product fills the whole market and there isn’t room for local producers. However, exporting a product can help a producer survive. And, as you know, there is weather, there are bugs, and there is market demand that can collapse. It’s often necessary to have as many outlets as possible to deal with your own personal diversity and sustainability. And exports provide a place for that. Exporting can tie in to regional sustainability in other ways. I live close to Canada, and selling into Canada is considered an export, but for us it’s part of our watershed, it’s part of our region.

But there are downsides. For example, all the folks that got hooked into organic soybean contracts in Japan had a pretty rough year, and not only did they have a rough year, but because that whole market collapsed, the chaos got pushed out into the rest of the organic industry. So while there can be these positive benefits, all of the events that happen in international trade—from currency de-valuations and re-valuations to changes in governments and collapses due to IMF policies—all of these chaos-creating events also affect organic support, and that can create trouble for the rest of the industry.

There are very specific issues that trade and globalization of organics can create for the local imperative. First, if we move toward globalization, and a heavy emphasis on trading organic products, it’s hard to argue that organic is about local, fresh, quality, etc., and we’re attacking some of the fundamental perceptions people have of organic. Second, more trade equals more volume, generally speaking. More volume has a lot of characteristics. One is that there is more government intervention. We’ve all spent a lot of time and money on organic standards. We will spend a lot of time and money on issues that are driven by an increase in volume in international trade. But globalization brings about other characteristics of the product. It turns organic into more of a commodity. It also brings a whole new characteristic of passing across a border. Today, we’re experiencing more border problems because we’ve cut back tariffs. There’s less money for inspections and more trouble moving products across borders. The industry can handle that. But with this comes the potential for more trouble with food safety and standards. If organic becomes a big part of importing and exporting we’re going to have food safety problems on organic food, and the perception of organic as a safe place to go when there are food safety concerns in other parts of the food industry could be lost. This would be a very devastating blow for organic, if it happens.

There are reasons why people consider exporting that are natural from a distance. But there are other reasons people think about it—there’s government financing, and there’s an ideology in our current government saying, well, farm prices may be horseshit but we’ll export our way out of this. Often the motivation for major busi-
business decisions come from incentives, subsidies, and government pressure, recommendations from Extension agents, you name it, but they often don’t work out. So many people coming into the industry are getting some bad advice, and that can be very negative, psychologically, on the industry.

There are proposals on the table for big changes in trade rules. Most of these rules are within the World Trade Organization (WTO) and some are under the North American Free Trade Agreement (NAFTA). A big proposed change is to prevent and make illegal under these trade regimes local and state government procurement preferences. Many of us have seen, with green forestry and recycled products and organic foods, that getting schools, hospitals, and local governments to take a position that buying green-certified products is preferable and will be given some advantage—this feeds the success of these industries. A second change is in overall agricultural policies. Certain kinds of subsidies are being approved and encouraged, and other kinds of farm programs are being abolished. Those aimed at supporting prices are under the greatest attack, and those based on export subsidizing are getting the greatest support. So if overall farm policy moves away from price supports and toward export subsidies, we are going to see distortions that will be negative for our local imperatives. And finally, most of these trade negotiations are really aimed at maximizing the volume of trade and commodities. Some components of this—the great expansion of genetically modified organisms, of monocultures and the lowering of biologic diversity—all of these will affect the organic industry overall.

When I think about these problems, I think we need to actively address how we want to see the co-existence of the local imperative with this globalization that is coming from a lot of different sources but is in our midst. And I thought of some criteria that we should be applying to globalization or to trade. These are just a few that I think might be useful for consideration. First, one way that the globalization of organic could help over the long term is if it raises the income of the local community at both ends. And if it raises the overall market at both ends. We need to ask ourselves, are we just rearranging the deck chairs, or are we boosting markets? Does trade increase and boost food safety and food security at both ends? And does it increase, raise, and strengthen the positive image of organic at both ends? If we can say that trade can boost income at both ends, can raise the image, and can help food security, then I think we can say that it is contributing to sustainable development, and is being a positive part of the local imperative.

There are some very specific responses that flow from these kinds of criteria. One is that as our industry gets more money to study and promote exports, we should spend the exact same amount studying the impact of imports. We need to think about this comprehensively—currently the USDA behaves like it’s a mercantilist world, and we’re just going to sell and there’s no recognition of both sides of this. Second, we need to put these social and other standards into our own standards. There will be more products on the global market grown by child labor, and situations of real or seemingly real slavery. We’re going to have trouble with the image of the industry unless we take action, right now, on the front end. There’s been incredible work done by our colleagues and allies in this area. Our organization has sponsored several joint certifications with the Forest Stewardship Council and Fair Trade Organic. It’s amazing to see what can be done when you put those certifications together.

Epilogue: Beyond Seattle
At the December World Trade Organization Ministerial meeting in Seattle, a number of organizations organized a Food and Agriculture Day, an international summit to discuss the impacts of the WTO on food and agriculture. Mark Ritchie helped organize and attended the summit and has this follow-up report:

The recent World Trade Organization (WTO) Ministerial talks in Seattle failed largely because the negotiation process was undemocratic. Negotiators from nearly all of Africa, Latin America and the Caribbean and parts of Asia bitterly condemned the talks as coercive and exclusionary. Accordingly, these representatives of the South would not agree to a new round of talks.

With respect to global governance, I believe that something profound happened in Seattle. The process of re-examining the framework and rationale behind the entire system of global governance has taken a giant leap forward.

However, key WTO-led negotiations are already under way in the areas of agriculture, services, and the patenting of life that will go forward despite the collapse in Seattle. We already know that talks in these areas will be greatly accelerated in hopes of finding quick agreements to prove that the WTO is not dead or damaged.

Particularly in agriculture, there is great danger that these new agricultural talks will make matters even worse for farmers and fishers, both in the North and South. At the same time, the current WTO rules in agriculture have proven to be disastrous for both producers and consumers. They must be changed.

Before Seattle, we had little hope of making any changes. After Seattle, the situation has changed completely. If the WTO cannot deliver a successful agricultural negotiation it may, in some respects, be placed on “life support.” If the WTO continues to refuse to take our concerns into consideration, the outcome will most likely be unsuccessful and threaten the very survival of the WTO.

To test this opportunity we need to move quickly. We need an efficient and inclusive global process over the next months that can hammer out our ideas in three areas.

First, we need to determine areas in which we do not desire any WTO involvement whatsoever. Second, we need to highlight some of the areas of current WTO rules, such as prohibitions against the dumping of agricultural exports, where we want the WTO to start enforcing its own rules. Third, we need to identity key issues on which we want the WTO to take affirmative action. For example, we want the WTO to prohibit the patenting of life and essential drugs.

Seattle will be remembered for a lot of things, including the courage of people who stood solidly and steadfastly in the face of a furious assault. My hope is that it will also be remembered as a watershed event—a time and place where “we the people" confronted dysfunctional and oppressive global institutions with new ideas and new energy. I hope I will be able to look back someday soon and be able to say that this Battle in Seattle helped jolt the world onto a new path, one leading towards a just and truly sustainable system of global governance and world peace.
**Guest Commentary**

However, if trade negotiations change the term of law, if they change investment law so that we can’t protect farmland, if they in fact make our borders so that we can’t control infection and other issues, it’s going to have a negative effect on the industry. Trade negotiations are very complicated, and a lot of you farm full time and are very busy, but as an industry, we need to pay attention to these issues. It could be that the U.S. will use this trade regime to try to prevent Europe from protecting themselves from genetically modified foods, and from beef with hormones. These issues that will come back to haunt us if we don’t get active today. We should use this opportunity to ask questions about the mix of things we are importing and exporting. I believe we need to import and export the technology, wisdom, and ideas that you and others have, because in fact, exporting and shipping food around the planet may have a limited life. With climate change, acid rain and the biological calamity that comes from moving food halfway around the planet, if all of these issues are added up, this may not be something that the human race can go on with much longer. The exchange of ideas, of culture, of information, of technology, of approach, people-moving, these are the kinds of things that in my mind, make up a richness of exchange. We need to use the web and internet to promote the local. Using a website locally can help a CSA, just like a website can help with global exchange. But in general, so many of the things that we think about, and are promoted to us as ways to boost globalization, are things that we could redirect if we said, now, “What about the local?”

I would argue that if our values are truly values, that they need to be cast into the real world. But they shouldn’t be tested with our hands tied behind our backs or with subsidies poured into other values and approaches. Our industry should not just chase and follow the global imperative that is driving a lot of the rest of our lives. We need a collective approach so that the emphasis on making organic bigger and more global, and the commodification that that implies and the loss of biodiversity and the increase in climate change, and all those things that it will create, can be balanced, and played off of, and incorporated with the values-based approach — the grassroots, the local, the quality, the freshness, the purity, all of the things that we care about. There’s no “ending” companies that don’t want to go with us—there’s no kicking people out of an industry. We’re married. We’re going to try and make a go of it. Sometimes marriages fail. But there’s a whole lot to be said for self-consciously trying to make this honeymoon go on as long as we can.

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**OFRF News**

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Cooperate in organic farming research projects. You are welcome to contact Jane Sooby with any questions you have on organic farming production, OFRF’s grants program, on-farm research, or the “State of the State.”

**Event appearances:** Jane will be in La Crosse, Wisconsin, for the Upper Midwest Organic Farming Conference March 16-18. She also plans to work with selected OFRF grant recipients to organize farm tours highlighting some of the exciting research projects we’re funding. If you know of any activities focused on organic farming research this year, give her a call!

**National Organic Survey 2000**

The development phase of OFRF’s National Organic Farmer’s Survey 2000 is under way. Organic farmers will be asked to respond to the survey in the fall of 2000, and results will be tabulated over the course of next winter.

Right now we’re contacting organic certifiers to obtain grower certification lists for the 2000 survey—this process alone takes several months to complete. Many thanks to certifiers who have volunteered their lists and sent them in!

Until now, OFRF’s organic farmers’ surveys have been biennial (1993, 1995, and 1997), however our most recent survey results had such impact and longevity as a data resource that the next survey will be “triennial.” We’re utilizing this time to evaluate our survey design and gather resources—human and technological—to develop a quality survey. Stay tuned.

For further information, input or commentary on the next survey, or to obtain a copy of the 3rd Biennial National Organic Survey Results (a $10 donation is requested), contact Erica Walz.

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**We Get Around...Come Look for Us!**

Over the coming months, OFRF board and staff members will be attending a variety of food and farm-related events. Following are some of the highlights of our winter/spring event schedule:

**January 19-22** Ecological Farming Conference, Pacific Grove, CA. Attending: Bob Scowcroft, Mark Lipson, Jane Sooby, Rebecca King, Erica Walz.

**January 21-23** Southern SAWG Conference, Jekyll Island, GA. Attending: Jerry Dwelley, Cynthia Hizer.

**February 4-5** Pennsylvania Association for Sustainable Agriculture 9th Annual Conference, State College, PA. Attending: Stephen Porter.

**February 22** Meeting of the American Association for the Advancement of Science, in Washington, D.C. Attending: Mark Lipson.

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**February 24 & 25** USDA Ag Outlook Conference, Washington, DC. Attending: Bob Scowcroft, JB Pratt.

**March 7-9** Western SARE Conference, Portland, OR. Attending: Mark Lipson.

**March 16-18** Upper Midwest Organic Farming Conference, La Crosse, WI. Attending: Jane Sooby.


**March 27-29** Soil, Food, and People Conference, Davis, CA. Attending: Rebecca King.

**May 4-6** The Culture, Ecology and Economics of Ranching West of the 100th Meridian. Ft. Collins, CO. Attending: Erica Walz.
Establishing a Plant Corridor to Enhance Beneficial Insect Biodiversity in an Organic Vineyard

Clara Nicholls, Michael Parrella and Miguel A. Altieri

Production agriculture typically results in a simplified landscape. Monocultures decrease the number and activity of insect natural enemies by removing critical food resources and overwintering sites. One remedy to this decline is to increase the diversity of vegetation in agricultural landscapes, either by maintaining natural areas or by planting vegetation adjacent to crop fields. Ideally these areas provide alternative food and refuge for insect predators and parasitoids, thereby increasing the numbers of natural enemies and colonization of neighboring crops. Although most organic viticulturists in California use cover cropping as a diversification technique, large-scale vineyards remain monocultures at the landscape level, and generally lack the functional biodiversity necessary to provide natural pest control and to supplement other integrated pest management strategies.

This study explores whether changing the spatial structure of a vineyard landscape, particularly the establishment of a vegetation corridor, enhances movement of beneficials beyond the "normal area of influence" of adjacent habitats or refuges. This study took advantage of a flowering plant corridor composed of at least 65 species, connected to a riparian forest that cut across a monoculture vineyard, and allowed for testing whether such a corridor serves as a biological highway for the movement and dispersal of natural enemies into the center of the vineyard. The vineyards were monitored to assess the distribution and abundance of the western grape leafhopper (Erythronema degantula) and its parasitoid Anagrus spp., western flower thrips (Frankliniella occidentalis), and generalist predators.

The research was conducted in two adjacent Chardonnay vineyard blocks (blocks A and B, five acres each) from April-September, 1996 and 1997. Both blocks had been under organic management for four years, and planted yearly to winter cover crops (barley and vetch) and to summer cover crops (buckwheat and sunflower) in an alternating row pattern. The vineyards received an average of five tons of compost per acre and preventative applications of sulfur against Botrytis spp. (bunch rot) and Oidium spp. (powdery mildew). Although both vineyards are surrounded on the north side by riparian forest vegetation, the main difference between the two blocks is that block A is penetrated and dissected by a 600 m long flowering plant corridor composed of sixty-five plant species.

Objective and Methods

Objective: To determine diversity and abundance of insects and other arthropods associated with the flower corridor's shrub and herb layers.

Sampling methods: Corridor vegetation was sampled twice monthly with a D-Vac. Observations were made of adult and immature stages of beneficial insects associated with flowers on select corridor plant species. Ten yellow and ten blue sticky traps were randomly placed within the corridor throughout the season for seven day periods.

Objective: To determine whether the flower corridor influences predatory insect diversity and abundance in the adjacent vineyard by acting as a biological corridor.

Sampling methods: Malaise traps (tent traps with a 1-quart glass catch jar filled with ethyl alcohol) were placed across flight paths between block A and the corridor on the south side, and the riparian forest on the north side. One malaise trap was also placed between block B of the vineyard and the adjacent bare edge. Each trap was replaced every two weeks. Samples were taken from May through September, and arthropods were counted and sorted into families and trophic guilds.

Objective: To monitor diversity and abundance of insects in the vineyard.

Sampling methods: Ten yellow and ten blue sticky traps were placed at different points within blocks A and B at increasing distances from the corridor and the bare edge (rows 1, 5, 15, 25, 45). Yellow sticky traps were used to monitor leafhoppers, the leafhopper egg parasitoid Anagrus epos and various predator species. Blue sticky traps were used to assess thrips and minute pirate bug populations. Traps were deployed in April, replaced weekly throughout the growing season and examined with a dissecting microscope to count the number of plant-eating insects and associated natural enemies on the traps.
leafhopper infestation, densities of leafhopper nymphs and egg parasitization rates by Anagrus.

**Sampling methods**: In the same rows where sticky traps were placed, grape leaves were visually examined in the field and the number of leafhopper nymphs recorded. Populations of leafhopper nymphs were weekly estimated on 10 randomly selected leaves in each row. Egg parasitism in vineyards was determined by examining grape leaves with a dissection microscope for the presence of parasitized or healthy leafhopper eggs.

**Results**

**Diversity of predators in the corridor**

Data show that the predator species commonly present were: green lacewing (Chrysoperla carnea, N europtera: Chrysopidae); minute pirate bug (Orius spp., H emiptera: Anthocoridae); common damael bug, (N abis sp., H emiptera: N abidae); big-eyed bug (Gecocoris spp. H emiptera: Lygaeidae); and several members of the families Coccinellidae (“ladybugs”), Syrphidae (hoverflies), M ordellidae (tumbling flower beetles), and some species of thomisid spiders. These predators were commonly found on the flowers of the dominant corridor plants such as fennel (F eniculum vulgare), yarrow (A chiilea millefolium), daisy fleabane (Erigeron annuus) and butterfly bush (B uddenia spp.). Certain predator species were continuously found associated with specific flowering plants (Fig. 2).

**Flower corridor influence on adjacent vineyard species**

A considerable exchange of insects occurred at the forest, flower corridor and the adjacent block A interfaces. Greater numbers of predators and parasitoids were caught at the interface of the vineyard and the flower corridor in block A (63% of all insects caught), and also at the interface of the vineyard and the riparian habitat (60% of insects caught), than at the interface of block B and the vegetation-free edge (48%). More plant-eating insects were caught at the block B bare-edge interface than in the block A interfaces, indicating that in this block, exchange of plant pests was more prevalent than the exchange of natural enemies. The net effect was that the total number of generalist predators tended to be greater in block A than in block B without a corridor.

**Distribution of insect pests in the vineyards**

In block A, adult leafhoppers exhibited a density gradient, reaching lowest numbers in vine rows near the flower corridor and forest and increasing in number towards the center of the field. The highest concentration of leafhoppers occurred beyond the first 20-25 rows downwind from the corridor. This gradient was not apparent in block B, which showed a uniform dispersal pattern of leafhoppers. Nymphal populations behaved similarly, reaching highest numbers in the center rows of block A. The area of influence of the flower corridor extended to rows 15-20, whereas the area of influence of the forest on nymphs reached up to 10-15 rows. Nymphs were similarly distributed over the whole block B field.

A similar population and distribution gradient was apparent for western flower thrips. Catches in block A were substantially higher in the central rows than in rows adjacent to the forest; catches were particularly low in rows near the corridor. In block B there were no differences in catches between the central and bare edge rows.

**Distribution of natural enemies: parasitization rates of leafhopper eggs**

Generalist predators in the families Coccinellidae, Chrysopidae, N abidae and Syrphidae exhibited a density gradient in block A, indicating that the abundance and spatial distribution of these insects was influenced by the presence of the forest and the corridor, which channelled dispersal of the insects into adjacent vines. Predators were more homogeneously distributed in block B, as no difference in spatial pattern in predator catches was observed between bare edges and central rows, although their abundance tended to be higher in rows close to the forest.

In block A the distribution of Orius spp. was affected by the corridor and forest as higher numbers of Orius could be found in vines near the borders, whereas in block B no dispersal gradient was apparent.

Anagrus from the corridor and forest colonized grape vineyards throughout the sampling area, exhibiting higher densities in late July and throughout August in the central vineyard rows where leafhoppers were most abundant. The increasing A. epos capture over time indicated that parasitoids began moving into vineyards in early June, a few weeks after leafhopper adults moved into vineyards. The appearance of A. epos coincided with the beginning of the egg laying period of leafhopper adults.

Leaf examination revealed high levels of parasitism across leafhopper generations in
both blocks. Eggs in center rows had slightly higher mean parasitization rates than eggs located in rows near the forest or corridor. The proportion of eggs parasitized tended to be uniformly distributed across all rows in both blocks. It is assumed that the presence of the forest and corridor was associated with the colonization of A. epos but this did not result in a net season-long prevalence in leafhopper egg parasitism rates in rows adjacent to such habitats.

Conclusions
This study indicates that dispersal and subsequent within-vineyard distribution of herbivores and associated natural enemies is influenced by adjacent landscape features. The presence of riparian habitats enhances predator colonization and abundance in adjacent vineyards, although this influence is limited by the distance to which natural enemies disperse into the vineyard. The corridor amplifies this influence by allowing enhanced movement of predators into the center of the field. The great availability of pollen and nectar displayed by the various flowers of the corridor as well as the presence of neutral insects attracted high numbers of generalist predators.

Any of the predator species in the corridor originated from the riparian forest edge. For some predators such as ladybugs, lacewings and hoverflies, the corridor influenced numbers and dispersal in late spring and early summer, the effect acting through the presence of non-crop pest aphids—and other H omoptera—as a food source for ladybugs and lacewings, and nectar and pollen as food sources for hoverflies. Some plant species harbored populations of neutral insects (H omoptera and H emiptera), which acted as an important food reservoir for predatory insects (Anthocoridae and M iridae) migrating from the forest and later moving into the vineyard.

Various patterns were detected in this study: Adult and nymphal leafhopper and thrips populations exhibited density gradients tending to reach highest numbers in the centers of the vineyards.

Although it's been shown that Anagrus epos colonizes vineyards from edges, in this study the parasitoid followed the abundance patterns of leafhoppers and did not display the distribution response exhibited by predators. Other researchers who have found positive effects of flowers on parasitoid diversity and abundance have also reported the difficulty of showing an evident gradient of parasitoids from a rich flowering habitat into a crop area. Given that A. epos dispersed similarly across rows in both blocks, apparently predator enhancement near the vegetation interfaces explained the lower populations of leafhoppers and thrips in the border rows of block A. Such successful impact of predators can be assumed because fewer adults and nymphs of leafhoppers and thrips were caught near the corridor than in the middle of the vineyards.

Recommendations
Findings from this study suggest that the creation of corridors across vineyards can serve as a key strategy to allow natural enemies emerging from riparian forests to disperse over large areas of otherwise monoculture systems. Such corridors should be composed of locally adapted plant species exhibiting sequential flowering periods, which attract and harbor an abundant diversity of predators and parasitoids. These corridors may link various crop fields and riparian forest remnants, creating a network which would allow many species of beneficial insects to disperse throughout whole agricultural regions, transcending farm boundaries.

For further information on this project, Miguel Altieri may be contacted at tel. 510-642-9802. An expanded report on the results of this project is available from O FRF. The full report is 22 pp, including two tables and twelve figures. Report #96-40.

References
Finishing Beef Cattle in a Strip Cropping System

What is the feasibility of finishing beef cattle in a strip cropping system with little or no supplemental feed?

This study took place at the Land Institute's Sunshine Farm, an energy-integrated organic farm where projects are taking place to determine whether a farm can provide its own fuel and fertility. Initiated in 1993, each transaction on the Sunshine Farm undergoes a detailed accounting of energy, materials and labor costs.

This project evaluated the productivity, economic viability and agronomic sustainability of finishing beef cattle during late summer and fall using polywire (temporary electric fence) to break-feed strip crop residues and forages. The cropping system consisted of grain sorghum, soybeans, oats, wheat and cowpeas, on a five year rotation. Within this system, we focused on the grazing of a legume cover crop, cowpeas (Vigna sinensis L.), which features regrowth and nitrogen fixation after grazing, whereas crop residues do not.

Project objectives included investigating the following: Would cowpea regrowth after grazing, including nitrogen fixation, offset the removal of nutrients through the carcasses of the marketed yearlings? To what extent would nitrogen fixation from the second growth between two feeding passes offset the removal of nitrogen from grazing? What effect would grazing cowpeas have on the yield and quality of the subsequent grain sorghum crop, compared with ungrazed cowpeas? Could some beef production be obtained without decreasing subsequent crop yields and soil quality?

Studies show that grazing stimulates nitrogen fixation in legumes, and diskilling in manures after grazing encourages soil microbial activity.

Would this system lead to more efficient nutrient cycling than an ungrazed cover cropping system?

A partial budget analysis was conducted to compute the expected change in profit due to adding beef finishing into the rotation. Soil respiration tests in grazed and ungrazed plots helped determine the microbial effect on soil, and subsequent grain sorghum yields and additional soil quality factors in grazed and ungrazed plots were tested.

Materials and Methods

Beef finishing system From August 12 to November 18, 1996, seven Texas longhorn yearlings (Gelbvieh sire X Texas longhorn dam crosses, average birth date March 29, 1995) were finished on 17.2 acres of crop strips, consisting of 2.9 acres of cowpeas and 1.4 acres of pearl millet plus some strips of wheat and oat stubble, and 4.8 acres of alfalfa aftermath and 5.0 acres of eastern grama grass. The yearlings were transferred to the crops from prairie, which was in active growth during August. Hence, there was no compensatory gain as typically occurs when cattle are taken off an inactive prairie in late fall and put on cool-season pasture and feed. The yearlings received no supplemental feed but bloat blocks were supplied. To prevent crop trampling, the crops were break-fed by moving polywire daily to expose fresh feed to the yearlings (see Fig. 1. Plot layout).

Experimental site Experimental plots in the 1996 cowpea strips were located in a strip cropping system with the following 5-year rotation: grain sorghum, soybeans, oats, winter wheat and cowpeas. Cowpeas were drilled at the rate of 29 lbs per acre on June 14. The grazed cowpea strips and manure deposited by the yearlings were disked down on October 18. The sorghum was planted at the rate of 4.0 lbs per acre on June 3, and harvested on October 7.

Economic analysis A partial budget analysis computed the change in profit from adding beef finishing onto our cropping system. The output is the value of the beef gain during finishing. To compute the change in profit, only the following costs
had to be determined: the yardage costs (labor and miscellaneous supplies) for finishing the yearlings, the cost of bloat blocks, and the annual operating interest on the investment in the fence and watering system. Some computation adjustments were made because the fence and water system included some inefficient use of land. For example, the grazed wheat and oat stubble consisted of relatively low total digestible nutrients (TDN). In addition, there were crop strips that the cattle did not have access to. A crop rotation efficient for beef finishing would contain only high TDN forages, all accessible to the cows. So, the capital cost of fence and water was prorated in the economic analysis to reflect a more efficient crop rotation.

**Experimental design for soil quality and grain sorghum yields** A randomized complete block design was defined by the break-feeding areas outlined by the polywire fence. There were 20 blocks, each with two permanent adjacent experimental plots consisting of one randomly assigned grazed treatment and one ungrazed control exclosure. Each plot was 4 x 6 m, with the latter dimension parallel to the length of the strip. Within strips, each pair of plots was separated from other pairs by distances ranging from 57-88 m.

**Soil properties and bulk density** Soil samples were collected several times before cattle grazing and afterwards. The sample dates reflected one-year changes in soil properties due to grazing and included the measurement of seven chemical properties. Water infiltration rate and water holding capacity measurements were made to reflect one-year changes due to grazing. Soil respiration was measured in each plot to assess the effect of disking manure on the evolution of carbon dioxide by microbial activity in the grazed plots.

**Results and Discussion**

**Beef production** The seven yearlings gained an average of 121 lbs during the 14 weeks of finishing. The average liveweight was 1,049 lbs at slaughter with a dressed carcass of 61 percent (Table 1). After one week of cooled hanging, the standard-grade beef had a respectable rating of 6 for tenderness, juiciness and no off flavor. The average daily weight gain during various stages of production was 1.6-1.9 lbs., typical of rangeland beef operations. The 14 acres of high TDN forages provided an average of 1.0 acres per yearling, or a gain of 60 lbs per acre.

**Grain sorghum yields** During 1997, in the crop strips that were formerly cowpeas in 1996, grain sorghum yields were 92.8 and 95.4 bushels per acre in the ungrazed and grazed plots, respectively. These yields were not significantly different across 20 blocks.

**Economic analysis** The perimeter fence enclosed 24.5 acres, consisting of: 9.8 acres of grazed fields and 14.7 acres of crop strips (7.4 acres grazed and 7.3 acres ungrazed for combine harvest). Hence, the yardage cost of $674 averaged $27.50 per acre (Table 2). This is much greater than the yardage cost of $17.00 per acre reported for larger pastures in conventional grazing and rotational grazing. This is due to our small grazing area and also to inexperienced interns requiring extra labor to move the interior fence and water tanks daily. The capital costs, including labor and fuel, were $6,582 for water, interior fence and one mile of perimeter fence. There were 14.1 acres of high TDN forages, or roughly 2 acres per yearling. After prorating the capital costs for the fence and water system to 14.1 acres to simulate a cropping system efficiently designed for grazing, the total annual cost for finishing the seven yearlings on forage would have been $1,605. The income from the beef gained only during the 14 weeks of finishing was $424, based on a value of $82 per hundredweight of cooled hanging standard-grade carcass. The resulting net loss of $1,181, or $169 per yearling, was expected due to the small scale of the system which leads to a lot of fence and water systems relative to the grazed area surrounded by the fence.

This suggests that the net income during finishing would become positive if the length of the perimeter fence were enlarged, since the grazed area would increase relative to the perimeter itself. If we maintain the per-acre stocking rate, then this will also be true for the herd size relative to the perimeter. That is, the yardage and capital costs for fence and water will increase as the square root of the increase in grazed area or herd size.

At the above stocking rate of 2 acres per head, the grazed area for finishing yearlings must be at least 600 acres. Herds of 500 and 1,000 head finished on 1,000 and 2,000 acres, respectively, would result in...
in profits of $7.70 and $14.64 per head. Since our yardage cost was excessive compared to several other studies, a cost figure of $239 (14.1 acres times $17 per acre) was substituted for the figure of $674 in our final budget analysis. In this case, for the carcass value of $82/cwt, the herd size must be at least 150 head finished on 300 acres to make any profit. Likewise, herds of 300 and 500 finishing on 600 and 1,000 acres, respectively, would generate net incomes of $10.30 and $15.05 per head. However, higher prices could be obtained by means of niche markets or positive changes in general consumer preference for pasture-finished beef.

Table 1. The average weights and daily weight gains between various ages for the seven Texas longhorn yearlings. The period of finishing was from August 6, 1996 through November 18, 1996.

<table>
<thead>
<tr>
<th>Date</th>
<th>Age (months)</th>
<th>Weight (lbs)</th>
<th>Daily weight gain (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/29/95</td>
<td>birth</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>11/03/95</td>
<td>7</td>
<td>487</td>
<td>**</td>
</tr>
<tr>
<td>4/04/96</td>
<td>12</td>
<td>692</td>
<td>1.7</td>
</tr>
<tr>
<td>8/06/96</td>
<td>16</td>
<td>928</td>
<td>1.9</td>
</tr>
<tr>
<td>11/18/96</td>
<td>20</td>
<td>1,059a</td>
<td>1.6</td>
</tr>
</tbody>
</table>

* Average dressed carcass was 61 percent.

Table 2. Costs and returns for partial budget analysis on finishing seven yearlings on 14.1 acres of high TDN forages.

<table>
<thead>
<tr>
<th>Transactions</th>
<th>dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td></td>
</tr>
<tr>
<td>yardage</td>
<td>674</td>
</tr>
<tr>
<td>bloat blocks</td>
<td>204</td>
</tr>
<tr>
<td>annual operating interest</td>
<td>727</td>
</tr>
<tr>
<td>total</td>
<td>1,605</td>
</tr>
<tr>
<td>Returns</td>
<td></td>
</tr>
<tr>
<td>beef from finishing only</td>
<td>424</td>
</tr>
<tr>
<td>Net income</td>
<td>-1,181</td>
</tr>
</tbody>
</table>

One-year changes in soil properties Soil samples from grazed and ungrazed plots on April 24, 1997 showed that grazing of cowpeas did not cause any statistically detectable one-year differences in soil chemical or physical properties at any depth. Measurements of soil respiration did not show greater microbial activity in the grazed plots in terms of respired carbon dioxide.

Immediate changes in soil properties Measurements and statistical analyses for soil nitrate, ammonium and bulk density in August 1996 immediately before grazing were fairly consistent with those in spring 1996. That is, there were no significant differences between grazed and ungrazed plots, except for bulk density at 15-60 cm depth.

* M earurements in September and November 1996 soon after grazing found significant effects on nitrate levels and on bulk density. Grazed plots had significantly more nitrate than ungrazed plots at 0-15 and 15-60 cm depths. This may have been due to greater mineralization of nitrogen in the manure and urine dropped on the grazed plots or to stimulation of nitrogen fixation in cowpeas by grazing. Grazed plots also had greater bulk density than ungrazed plots, most likely due to compaction of the soil by the cattle. After the plots were disked on October 18, measurement of bulk density showed that disking had eliminated the soil compaction in the grazed plots relative to the ungrazed plots. Also, soon after grazing, water infiltration rate was greater in the grazed than in the ungrazed plots. However, with the ungrazed plots having less soil compaction, we would have expected the ungrazed plots to have the greater infiltration rate instead. Casual observation and immediately subsequent measurement revealed greater water content in the ungrazed plots, perhaps due to the greater shading by the more abundant cowpea cover on the ungrazed plots compared to the grazed plots. Two rounds of rotational grazing removed almost all of the cowpea cover in the grazed plots. It’s possible that the greater soil water content of the ungrazed plots was impeding the infiltration rate.

Conclusion

Our partial budget analysis showed that large herd sizes and grazing areas would be required to generate a profit from the beef produced only within our finishing system. This was not surprising since ranchers know intuitively that capital costs of perimeter fencing increase more slowly than herd size as the pasture area is enlarged. The range of net income for these large herd sizes, roughly $5-15 per head, concurs with the $20 profit per head suggested by data from a study on fescue pasture-based finishing in Missouri. A larger net income would be possible if we could utilize forage crops with a longer duration of finishing to increase the net beef gain per acre.

An expanded report on the results of this project is available from OFRF. The full report is 25 pp, including seven tables and three figures. Report #96-02.

For further information on this project, Martin Bender may be contacted at tel. 785-823-5376.

References


2 Janke R, Kansas State Univ., Dept. of Agronomy, pers. comm.


4 Wright E. Tailgrass Prairie Producers. Personal communication. 11/25/96.


A Comparison of Grape Phylloxera and Root Rot Levels in Organic and Conventional Vineyards

Don Lotter

Grape phylloxera (Daktulosphaira vitifoliae: Homoptera: Phylloxeridae) is potentially the most serious grape (Vitis vinifera) pest in the world. A native parasite of North American Vitis species, phylloxera is an aphid-like insect that feeds voraciously on the roots of European grapevines causing decline and eventual death. Resistant rootstocks developed by the French in the late 1800’s originating from selections of North American Vitis or crosses between North American Vitis species and V. vinifera, almost completely eliminated vineyard losses caused by phylloxera. One of these rootstocks, AXR #1, once constituted about 70% of the plantings in Napa and Sonoma counties of California. Populations of phylloxera known as Biotype B, capable of infesting the AXR #1 rootstock, were discovered in California and by the late 1980’s in eight California counties were infested with it. Resistant rootstocks with no V. vinifera parentage are the only strategy being focused on for control of phylloxera, a process which entails ripping out phylloxera infested vineyards and replanting the stronger phylloxera resistant stock, often using methyl bromide for nematode and pathogen control.

In California, anecdotal accounts suggest that vineyard soils may be developed which are suppressive of phylloxera damage and in some cases phylloxera infested vineyards recovered to full production by implementation of specific cultural practices such as cover cropping in vineyards, use of organic amendments, and the elimination of pesticides and synthetic fertilizers. Although these practices are associated with organic farming methods and are associated with increased soil microbial diversity, abundance, and activity as well as root pathogen suppression, there has been virtually no assessment of the effects of soil microbial activity and organic soil management methods on grape vine root damage by insects or nematodes.

Very little work has been done on either the soil ecology or biological control of phylloxera. No natural enemies of significance are known for phylloxera in California, yet no concerted work has been done in this area. Soviet and German researchers correlated increased natural enemy density and reduced phylloxera damage in vineyards with proximity to undisturbed natural vegetation, inter-row cover crop use, additions of organic materials, and vineyards untreated with pesticides. These methods were considered to be as or more effective at controlling infestations of phylloxera than fumigation treatments. In some cases, recovery of phylloxera-infested vineyards was achieved by cover crop use and compost amendments. No work has been done on the community ecology and natural enemies of the insect.

Damage to phylloxera infested grape roots has been shown to be the result of both phylloxera feeding and from secondary fungal infection, primarily Fusarium and Pythium. Soil mediated suppression of phylloxera damage to grape roots may be in part the result of suppression of secondary pathogen infection of phylloxera feeding wounds. Inhibition of fungal pathogens of plant roots has many sources, the common element being a high level of soil microbial activity associated with decomposing organic matter. In soils suppressive to Fusarium solani numbers of total bacteria and total fungi were higher than soils that were less suppressive, while organic matter content of suppressive soils was twice that of non-suppressive soils.

Materials and Methods

Greenhouse experiment Soils from five vineyards were used as potting media with phylloxera infested grape plants to determine if differences exist in suppressiveness/conduciveness of soils to phylloxera damage. Two conventionally managed (no cover crops, synthetic inorganic fertilizers, chemical pest and weed control) and three organically managed (composts, cover crops, no synthetic fertilizers, no pesticides, organically managed for at least five years) vineyards were selected for soil samples. All organic vineyards were certified organic. Soils were collected from around the roots of vines and transported to UC Davis where they were planted to 3-month old grape plants in 3-liter pots in a greenhouse. Plants were infested with phylloxera at the time of transplanting by placing a piece of laboratory cultured Biotype A phylloxera on a root piece at the base of the plant. Each piece of inoculum contained approximately 30 phylloxera individuals. Each of the five vineyard soils was replicated eight times for a total of 40 plants. At two months plants were harvested and the nodosities removed from the roots. Nodosities were assessed for phylloxera populations and percent rot, then dried and weighed.

Vineyard survey Using the same criteria as outlined above for conventional and organic vineyards, two cycles of vineyard sampling were carried out, a summer cycle and a fall cycle. In the summer cycle thirteen phylloxera infested vineyards were selected, nine conventionally managed and four organically managed. Phylloxera infested organic certified vineyards are few in number, thus the skewed ratio. Of the thirteen vineyards, four were situated in the San Joaquin Valley, six in the Napa-Sonoma area, and one in Mendocino County. In the summer sampling cycle, 4 organic and 5 conventional vineyards were selected. No organic infest-
ed vineyards have been located in the upper San Joaquin Valley. All vines were on AXR-1# rootstock except for the San Joaquin Valley vines which were own-rooted. Root samples were taken from vines by digging a hole approximately 60mm long, 30mm wide and 20mm deep at the base of the vine and collecting all roots. Root samples were kept in coolers taken to the laboratory and examined for phylloxera within 24 hours. Phylloxera eggs and individuals were counted using a microscope and classed as egg, 1st, 2nd, 3rd or 4th instars, and adult. Root damage was assessed by examining the roots for necrosis of phloem tissue. All samples showed signs of phylloxera infestation, either tuberosities, nodosities, or phylloxera individuals. Roots were washed and cross-sectioned at 4 cm intervals. Percent rot of the phloem tissue was recorded for each cross-section along with root diameter and length. Samples of rooted tuberosities were collected from the roots of each vineyard for culture and identification of microbial pathogens.

Soil samples were sent to the UC Davis R laboratories for analysis of percent organic matter, total and nitrate nitrogen, and percent sand.

Results and Discussion

Greenhouse experiment with vineyard soils
Nodosities from roots grown in soils from organically managed vineyards had significantly less rot (30.3%) than nodosities from roots from conventionally managed soils (54.5%). Phylloxera populations per unit of root tended to be greater in the organic soils and were inversely correlated with root rot. This is probably a result of the weakened condition and poor nutrition of the roots with higher levels of rot, which are unable to support high populations of phylloxera.

Vineyard survey
Two vineyard sampling cycles, summer and fall, in which a total of 212 samples were taken and assessed for phylloxera and percent rot show, as in the greenhouse experiment, decreased rot in the organically managed vineyards (ave=11.8%) relative to conventionally managed vineyards (ave=27.1%). Unlike the greenhouse experiment, phylloxera numbers are not significantly different between organic and conventional vineyards. Lower ratios of juveniles and eggs to adults in the conventional vineyards indicate a declining population, generally limited by nutrition, which would be consistent with higher root rot levels. As in the greenhouse study, there may be a trend toward higher numbers of phylloxera in the organic vineyards, probably due to their better nutritional value and ability to support higher populations.

Conclusion

More work needs to be done on the relationship between root rot and plant performance. We would also like to elucidate the species complex in vineyard soils to determine possible associations between microbial species and reduced root rot. Work remains to be done on predation on phyloxera. Phyloxerated vineyards which have low levels of root rot combined with low or moderate levels of phylloxera may be candidates for this focus, since vineyards with low levels of root rot have been characterized by higher levels of phylloxera.

Recently discovered susceptibility to phylloxera of current “resistant” rootstocks, the SC rootstock in particular, in Germany, make research on biological control of phylloxera more important. California is said to be at a stage of phylloxera infestation where Germany was 40 years ago, with “resistant” rootstocks beginning to show nodosities but lacking damage. German vines have developed phylloxera damage in the last two decades on rootstocks which are currently being used as phylloxera resistant replanting stock in California. The current system of replanting vineyards in California is optimal for selection for phylloxera virulence. It is common for growers to replant into infested vineyards such that infested roots intertwine with the newly planted roots, giving an optimal environment for infestation.

References

Bird and Arthropod Predation of Codling Moth in Organic Apple Orchards

JoAnn Baumgartner

C codling moth is a serious worldwide pest of apples and pears, and is becoming an increasing problem in walnuts, prunes, and a few varieties of plums. Codling moth eggs are laid on the leaves or fruit, and upon hatching, the tiny larvae bore into fruit, where, after about 10 to 40 days of feeding, they emerge at maturity and seek sheltered places, such as holes or cracks in the trees or ground, or crevices under bark scales, in which to spin their cocoons. Here they either pupate in a couple of weeks, or, if winter is near, postpone pupation until the following spring. This project was designed to study the effects of birds on codling moths at their overwintering (diapause) stage, i.e. when the insects are in cocoons and concealed under bark during the coldest part of the year.

Birds have been shown to be part of the system that reduces codling moth numbers. In 1911, McAtee, a USDA researcher, reported that 36 bird species were important codling moth predators, which was determined by examining the stomach contents of birds and by other methods.

Some insects are also important natural enemies of the codling moth in its diapausal stage. Two imported wasp species are documented to parasitize larval cocoons. Certain ants and beetles have been known to prey upon diapausing larvae and earwigs are thought to be important predators of codling moth at this stage.

Methods & Results

Predation Trials

Year one methods Replicated trials were located in two dry-farmed organic apple orchards in the fall and winter of 1996. Deer Park orchard contained seven acres of Pippin and Red Delicious apple trees, and was adjacent to mixed evergreen vegetation on two sides. Happy Valley orchard was three acres of mostly Pippin trees, with a few Red Delicious and European pears, located on a one-hundred acre tract with an extensive pear orchard and mixed evergreen habitat surrounding the parcel.

Codling moth larvae were obtained from UC Berkeley, where the insects were raised in conditions comparable to the fall equinox. The cool temperatures and short day lengths present in the lab physiologically triggered the larvae into a long diapause instead of a quick pupation into moths.

In the first year, the larvae were placed directly on the trees to spin cocoons. The insects were put on the trunks or branches at a height where codling moth are typically found, and were covered with a plastic cup until they had spun cocoons in crevices of tree bark or under bark scales. One or two codling moths were exposed and compared with one or two caged (excluding birds) and screened (excluding insects) codling moths per tree.

To determine what the effects of bird predation looked like, the literature was consulted. It was assumed that cocoons that were partially or totally missing must have been attacked by a large predator, such as a bird, since a small predator would not be able to remove pieces of the cocoon without repeated effort, and for no obvious purpose. A small rip in the cocoon was counted as arthropod attack. If a predacious arthropod was found on top of a cocoon and the larvae was either dead or missing, the moth’s demise was attributed to an arthropod predator. Mortality was attributed to a pathogen if the larva inside the cocoon was covered with fungal hyphae, or if the larva looked melted, as if it were decaying.

Year one results Nineteen percent and 11% of codling moth cocoons appeared to be attacked by birds in the exposed trials at Deer Park and Happy Valley orchards respectively. Eleven percent and 4% of codling moths appeared to be preyed on by arthropods in the caged trials, and 11% of moth larvae were diseased in the screened trials at both the Deer Park and Happy Valley orchards.

Year two methods For the cool season trials of 1997-8, Happy Valley orchard was again utilized and a new abandoned nine acre orchard containing mixed varieties of apples in the Bonny Doon area was used. The Bonny Doon orchard, abandoned for at least ten years, had 38% coverage of apple trees interspersed with invading shrubs, herbs and grasses, several ancient redwood stumps and was surrounded by native mixed evergreen habitat.

The procedure for placing codling moth in the orchards changed in the second year because of a larvae crop failure at UC Berkeley in the early fall.
of codling moths would not have been at the proper stage until the weather had turned cold, so methods used by British researchers were employed. The larvae were placed on apple logs indoors where temperatures allowed the insects to actively spin secure cocoons. Once properly outfitted, the codling moths and their logs were placed in the trees. Each tree contained the same treatment, either all exposed or all caged; the screened trials were discontinued because of the increased incidence of disease. The numbers of larvae placed on each tree increased to a median of 13.5 codling moths, which was equal to a naturally occurring number found in some of the orchards.

Bird predation was scored the same as in year one if the cocoons were mostly missing, completely missing, or if the bark chip covering the cocoon had a bird peck through it to the codling moth. An additional technique was used by rating a cocoon with rips or holes larger than 2.0 mm as bird predation. Larval mortality was attributed to arthropods if the cocoon had a hole smaller than 2.0 mm, or if it contained a parasite. Disease was scored the same as the previous year.

**Year two results** Very high total predation was recorded in the exposed treatments: 83% mortality in Happy Valley orchard, and 99% mortality at the abandoned orchard, of which 77% and 91% respectively were caused by birds, and the remainder by arthropods and diseases. Even though there appeared to be some accidental bird predation under the cages, there was a statistically significant difference between the exposed and caged moth data at each orchard, which suggested that bird predation was occurring in the exposed trials.

Arthropod predation and disease impacted the larvae in the two treatments at Happy Valley at about the same rates, with 5% and 2% in the caged trials and 5% and 1% in the exposed trials, respectively. A greater influence was exerted on the caged than the exposed treatments in the abandoned orchard, where 12% arthropod predation and 18% disease versus 5% and 3% were recorded, respectively. The wasp parasitoid Lithyrphon caudatus was found inside one of the caged cocoons at Happy Valley orchard, presumably a descendant from an earlier UC Berkeley release of these parasitoids.

**Year three methods** The abandoned Bonny Doon orchard was used for predation trials in the winter months of 1998-9. A new technique for placing the codling moth in the orchard was used to save time. The larvae were put in trays that were lined with brown paper and strewn with pieces of apple bark chips. After the larvae spun cocoons between the paper and the bark, the paper was cut and trimmed to the size of the chip. These bark chips were subsequently nailed to the apple trees at an average of nine per tree, twelve trees in all. Half the codling moths were exposed to all predators, and the other half were caged. The abundance of insect-eating birds (114) was recorded in Deer Park, Berkeley release of these parasitoids. Some of the remaining birds species present in the orchards were noted, but only the insect-eating species were reported. The insect-eating songbird data was used in the analysis of foraging guilds, species diversity, abundance and in an index of diversity.

**Bird Surveys**

**Year one and two methods** Bird surveys were conducted in the orchard approximately once per month from November through July of year one to determine which birds were most likely responsible for codling moth predation. All birds present in the orchards were noted, but only the insect-eating species were reported. Bird surveys were conducted about once per month from September through May in year two. The insect-eating songbird data was used in the analysis of foraging guilds, species diversity, abundance and in an index of diversity.

**Year one and two results** The relative importance of the thirty-one insect-eating bird species present in all three orchards was assessed in relation to foraging guilds. Figure 2 shows the average number of insect-eating bird species per survey in all the orchards that periodically or continuously forage in trees. Six species in Figure 2 had been documented by McAtee in 1911 to be found with codling moths in their stomachs (scrub jay, American robin, downy woodpecker, Brewer's blackbird, bushtit, black-headed grosbeak, Pacific slope flycatcher, California towhee). Four different bird species recorded in the three orchards were found to be predators of codling moth by either McAtee or other researchers around the world (European starling, ruby-crowned kinglet, northern flicker, oak titmouse). Some of the remaining birds species present in the orchards are related to important codling moth predators indigenous to other locations globally.

Differences in insect-eating bird species diversity between the abandoned orchard and the managed orchards was significant, suggesting that species diversity is greater in the abandoned orchard. Differences between all the orchards were also significant. The least number of bird species (15) was recorded in Happy Valley orchard, while the greatest number (23) was documented in Bonny Doon orchard.

The abundance of insect-eating birds in the abandoned orchard was significantly higher than in both managed orchards, and the differences between all orchards were significant. The lowest abundance of birds (114) was recorded in Deer Park.
Discussion

The results of this study show that birds, and to a lesser extent, arthropods, can be important allies in reducing codling moth in apple orchards. More insect-eating bird species and a greater abundance of individual birds were recorded in the abandoned orchard, which had a higher diversity of annual grasses, herbs and shrubs, than were observed in the managed orchards. Maintaining diverse habitats may attract birds to orchards and thereby encourage predation of codling moth. Species diversity of insect-eating birds appeared to be influenced by habitat quality at Happy Valley and Deer Park orchards in year one. Plant varieties, habitat structure, and percent vegetative cover all influence the local diversity of birds. The food value, nesting and roosting sites in quality habitat, especially the oak woodland community at Happy Valley, is undoubtedly attractive to the birds, which seemed to come into the orchard more often from this locality in year one.

Ants, beetles, spiders, earwigs and wasps were potential predators and parasitoids present in the experimental orchards. None of these natural enemies, except a wasp species, were the known moth larval predators or parasites, although some were implicated either by their close proximity to dead larvae, or the size of holes in the empty cocoons.

Arthropod predation and disease may be amplified when birds are excluded. The increase in mortality caused by arthropods and disease as seen under the cages in the abandoned orchard appears to result from excluding birds as the primary predators that were suppressing the secondary mortality agents. This reduction in competition and replacement of the bird niche by the arthropods and pathogens was not seen in the Happy Valley orchard, perhaps because the diversity in this managed orchard was not as great and did not support as many mortality mechanisms. Happy Valley orchard had sparse ground cover in year two compared to the abandoned orchard which had wild radish, milk and Italian thistle over six feet tall. Thus, arthropod predation and disease may best serve as back-up mortality agents when bird predation is low, such as in an orchard surrounded by miles of monoculture, where diversity of secondary mortality agents is high because of a cover crop and interplantings of native plant species.

Bird and arthropod predation has been shown to be part of an orchard system that can reduce codling moth, rather than completely control this pest. Many of the bird species recorded in the surveys are known to consume codling moth diapausing on trees, especially those that are arboreal foragers. Birds impact the codling moth during the wintering stage when pesticides are least effective, and may be instrumental in reducing the higher codling moth density on the edges of orchards. These insect-eating bird species appear to increase in diverse orchards and in orchards near native habitat.

Arthropods and disease seem to impact the codling moth in diverse orchards, chiefly when birds are not present. By conserving habitat in and around the orchard which supplies diverse food, reproductive, and cover resources, growers can provide favorable conditions for birds, arthropods, and disease whose prey or host includes codling moth.

Recommendations

Apple growers should conserve native bird habitat adjacent to their orchards, and increase habitat by planting native shrubs and trees within and surrounding the orchards. Leaving a few dead limbs in the apple trees, that are manicured so as not to offer hiding places for overwintering codling moth, will furnish woodpeckers with roost sites during the winter and will provide chestnut-backed chickadees nest sites in the spring. Most birds are not pests in apple orchards. One exception is the scrub jay, which is both a known predator of codling moth and can be a pest during apple season. The benefits of the scrub jay should be weighed against the damage it can cause to the fruit. Bird netting can effectively protect the crop in the summer as the apples mature if birds are a problem.

For further information on this project, JoAnn Baumgartner may be contacted at tel. 831-722-5556. The complete final report for this project (22 pages, including eleven figures and extended references) is available from OFRF upon request. Report #97-38.

References

Development and Application of Aerated Compost Teas

Elaine Ingham, Michael Alms, and Karl Rubenberger

In 1996, Karl Rubenberger, an organic apple and Asian pear producer, received funding from OFRF to research the effects of various substrates (molasses, kelp, rock dust, and food yeast) on microorganism production, to help develop recipes for the highest quality compost teas.

As a farmer collaborator, Rubenberger worked with Elaine Ingham, Associate Professor in the Department of Botany and Plant Pathology at Oregon State University and Director of Research for Soil Foodweb, Inc., and with Michael Alms, President of Growing Solutions, Inc.

This collaborative effort produced a report, Compost Tea Manual 1.1, written by Elaine Ingham and Michael Alms. The full report is a comprehensive guide to compost teas. The report discusses factors involved in compost tea quality, beneficial organisms, aerobic versus anaerobic teas, various methods of making compost tea, application methods, and matching compost teas to plant and soil needs. A unique feature of this report is that it discusses matching the compost tea formulation with the crop and soil type, then gives recipes for composts with various bacteria/fungi ratios, including one high in mycorrhizae (8 recipes are given).

The following report is excerpted from the Compost Tea Manual 1.1.

Factors Affecting Compost Tea Quality

Compost tea quality can be highly inconsistent from batch to batch. Below are some of the major factors to consider. Most of them are relatively easy to control. However, when you make your own tea, you will need to do some testing to make the best tea for your system.

Compost Source and Quality

Because the organic compounds, toxins, and beneficial microorganisms, as well as the pathogenic or pest microorganisms present in the compost, can all be extracted into the tea, good compost is essential. If the compost is properly made, disease-causing microorganisms will be killed, out-competed, inhibited, or consumed by the beneficial organisms. In order to maximize the populations of beneficial organisms, it is important that an adequate range of food resources be extracted into the tea. Minerals will be extracted from the compost as well, making it critical that the salt level not be too high, and that no toxic chemicals, or at least no high concentrations of toxins, be present.

We recommend that you ask your compost supplier to confirm the peak temperature reached during the composting process, and what oxygen concentration (or the reverse measurement, carbon dioxide concentration) was measured at that temperature. Because the heat during composting is generated by bacterial growth, the compost may become anaerobic during peak temperature times. Temperature must exceed 135°F for at least three days, although higher temperatures for 8 to 15 days are safer. The temperature should, however, not exceed 150° to 155°F and the oxygen level should not drop below 8 to 12% during this time. If compost gets too hot, does not heat enough, or becomes anaerobic, you risk making a poor tea.

Mesh Size of the Tea Bag

The mesh size of the bag or filter that holds the compost determines the kind of particulate material that passes into the tea. The finer the mesh, the more likely that only soluble components will be extracted. This becomes critical when the tea will be applied through sprayers or irrigation systems. The bag or filter should be made of a material with a small mesh size. Nylon stocking, silk and fine-weave cotton are best, but window screening, wire mesh and burlap may also be used. Fresh burlap should be used with caution, though, as it is soaked in preservative materials which can be extracted into the tea.

Brew Time

The longer the “brew” time—the time the compost remains suspended in the water, or tea solution—the greater the amount of soluble material extracted from the compost. More soluble material in the tea means more food resources to grow beneficial bacteria and fungi, and more nutrients that will potentially be made available for plants.

If the tea is well-mixed and well-aerated, maximum microorganism growth and extraction of soluble nutrients occurs within 18 to 24 hours. But it is possible to have too much of a good thing. Brewing longer can produce too much food for the bacteria, which can lead to oxygen depletion and anaerobic conditions.

The Water Source

Water high in salts, heavy metals, nitrate, chlorine, or contaminated with pathogens (human, animal or plant disease-causing microorganisms) should not be used. Where any of these are present, removal becomes a priority before using the water.

We recommend that you contact your water treatment department or send a water sample to a testing lab for analysis.

Added Materials

Many ingredients can be added to compost tea to enhance the growth of specific microorganisms and provide micronutrients for plants. This report gives a basis for choosing some of these materials, but a great deal more work is needed to understand why some additives work in certain conditions and not in others.

Water Recirculation Method

Recirculation has two major goals: mixing and aeration.

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Research Reviews

**INFORMATION BULLETIN**

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**Project Coordinator:**
Karl Rubenberger
Umqua Organic Farm
Roseburg, Oregon

**Co-investigators:**
Elaine Ingham
Oregon State University
Michael Alms,
Growing Solutions, Inc.

**OFRF Support:** $3,500

**Project Period:** 1996
Both of these processes need to be controlled. Too rapid mixing will physically destroy beneficial microorganisms in the tea, and be just as detrimental as no mixing. When aeration is too great, the tea can become “super-charged” with oxygen, which is detrimental to beneficial microorganisms. Too little oxygen causes anaerobic conditions, which results in materials that are toxic to plant growth in the tea (see Aeration below). Properly controlling recirculation produces a more consistent tea.

Proper recirculation is often a problem, as is enough mixing to extract all the soluble materials from the compost. Recirculation units are often made from recycled farm equipment, such as water troughs; wood, on which to lay a wire screen and cotton filter material; a sprayer nozzle with a water pump, and air pumps with bubble.

Aeration Oxygen is required by all aerobic organisms. As oxygen concentration is reduced, strictly aerobic organisms will not survive. Lack of oxygen allows the growth of facultative anaerobes and strictly anaerobic bacteria. Anaerobic organisms are not detrimental in themselves, but their metabolic products are extremely detrimental to plants as well as many beneficial microorganisms. Anaerobic products kill many disease-causing microorganisms, too, but the balance of reduction of disease-causing microorganisms versus negative impact on plant growth must be considered. Usually the death of a few disease-causing microorganisms is not positive enough to offset the reduction in plant growth.

Microorganism growth in compost teas
It is desirable to have a wide diversity of bacteria, fungi, protozoa and nematodes present in the compost and resulting compost tea. When the diversity of beneficial microorganisms is high, disease suppression is greater, nutrient retention is higher, production of plant-available nutrients occurs at a more beneficial rate, and soil aggregation improves, along with water-holding capacity, breakdown of toxic materials and decomposition rates. When the diversity of microorganisms in the compost is low, disease control is limited, and one particular set of metabolic products can accumulate to the detriment of plants and other microorganisms.

Ratio of compost to water
The “dilution” of soluble materials and microorganisms from the compost into the water is important. Too little compost will result in too dilute a tea. There is a minimum concentration of soluble nutrients which will result in growth of microorganisms that will suppress disease, retain nutrients, cycle nutrients into plant-available forms, perform the processes that aggregate soil, and decompose toxic materials. Because the optimal ratio of compost to water tends to be a bit variable, you will want to experiment to find the best ratio for your system.

Environmental conditions
Temperature, humidity, evaporation and other abiotic conditions influence the growth rate of microorganisms. For example, high temperatures volatilize nutrients. Evaporation concentrates salts, while low temperatures slow microorganism growth. Obviously, these conditions can have a significant influence on the quality of the tea.

But, you can’t do much about the weather. The growth of microorganisms in the tea-maker elevates the water temperature, but as long as the tea is well mixed, temperatures will not exceed 100° to 110° F. In hot weather, covers will prevent evaporation and concentration of salt.

The Compost Tea Recipe Table

<table>
<thead>
<tr>
<th>Plant Type</th>
<th>Kale Mustards</th>
<th>Grass Row Crops</th>
<th>Berries Vinca Shrub</th>
<th>Deciduous Trees</th>
<th>Conifers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Type</td>
<td>Clay A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E-H</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>G</td>
<td>H</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Recipes

Eight recipes are presented in the Compost Tea Manual 1.1. Following are three examples:

A High B Tea
20 lbs bacterial compost
16 oz blackstrap molasses
8 oz soluble cold water kelp
1-6 oz liquid, filtered plant extract material (for example, yucca extracts, nettle soup, dandelion wine, comfrey tea)

B B Tea
20 lbs bacterial compost
16 oz blackstrap molasses
Optional: 8 oz soluble kelp (additional proteins)

C 1:1 F:B, Fungal Foods
20 lbs 1:1 fungal to bacterial biomass ratio compost
0.5 to 1 pint humic acids
8 oz soluble kelp
4 lbs rock dust

Table 1. Requirements for the tea recipe given major divisions in plant and soil types. See page 24 [of the Compost Tea Manual 1.1] for recipes. B=bacterial, F=fungal, F:B=ratio of fungal to bacterial biomass.
Grants Awarded

OFRF awards grants for organic farming research and education projects two times per year. Grant application deadlines are January 15 and July 15. Projects may be farmer initiated, and/or should involve farmers in project design and execution and take place on organic farms, whenever possible. OFRF accepts funding requests within the range of $1,000 to $10,000.

To obtain our Procedures for Grant Applications, please contact OFRF at: tel. 831-426-6606, or visit our website at www.ofrf.org.

The OFRF Board of Directors awarded $65,379 in grants for the following projects at our fall 1999 meeting:

- **Organic nutrient and biological pest management for greenhouse production of edible flowers, culinary herbs and leafy greens.**
  John Biernbaum, Michigan State University, East Lansing, MI $5,500

- **Natural products for control of parasitic honeybee mites.**
  Nicholas Calderone, Cornell University, Ithaca, NY $6,275

- **Controlling gastrointestinal parasites of livestock with organic management and materials.**
  Derrick Exner, Practical Farmers of Iowa, Ames, IA $7,630

- **The effects of green manure, compost and feather meal on soil nitrogen dynamics, beneficial soil microorganisms and bell pepper yield.**
  Mark Gaskel, U.C. Cooperative Extension, Santa Maria, CA $10,000

- **Developing open-pollinated corn varieties for organic farmers.**
  Walter Goldstein, Michael Fields Ag. Institute, East Troy, WI $8,800

- **Use of walnut hull mulch as weed control in organic citrus orchards.**
  Zachary Heath, Heath Ranch, Orland, CA $770

- **Increasing organic farmer access to relevant and practical research-based information.***
  George Kuepper, National Center for Appropriate Technology/ATTRA, Fayetteville, AR $4,500

- **Integrated organic raspberry disease control study in the Pacific Northwest.**
  Carol Miles, Washington State University, Chehalis, WA $4,480

- **Organic management of garden symphylans in annual cropping systems.**
  Gale McGranahan, Student Experimental Farm, U.C.-Davis, CA $6,950

- **Conservation tillage systems for organic vegetable production.**
  Jeff Mitchell, Kearney Agricultural Center, Parlier, CA $3,330

- **Evaluation of alternative cultivators for vegetable production.**
  Richard Smith, U.C. Cooperative Extension, Salinas, CA $3,665

- **Evaluation of kaolin partial film coatings on insect and disease suppression in apples.**
  Andrew Thomas, University of Missouri—Columbia, Mount Vernon, MO $3,479

*Conditional upon meeting the terms of a matching grant.