Symposium Proceedings

Organic Agriculture: Innovations in Organic Marketing, Technology, and Research

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Coordinating Committee
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Organic Agriculture: Innovations in Organic Marketing, Technology, and Research — Introduction to the Proceedings

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Organic farming is one of the fastest growing segments of US agriculture. Some US producers are turning to certified organic farming systems as a potential way to lower input costs, decrease reliance on nonrenewable resources, capture high-value markets and price premiums, and boost farm income. Organic farming systems rely on ecologically-based practices, such as cultural and biological pest management. They virtually exclude the use of synthetic chemicals in crop production and prohibit the use of antibiotics and hormones in livestock production. Many producers, manufacturers, distributors, and retailers specialize in growing, processing, and marketing an ever-widening array of organic food and fiber products.

As consumer demand for organic food and production increases, research and education can help support the sector. However, gaps in research, education, and information exist in all areas of the organic industry. The workshop brought together a wide variety of experts from government and the private sector to identify key obstacles and explore new opportunities for continued growth in the organic sector. Six broad themes were explored and the papers presented here are arranged by theme.

The keynote address by Dobbs presents a strategic look at the initiation of –and innovations promoting — a "second green revolution." He discusses the challenges that remain in the organic sector, including: (i) technology, prices, and markets; (ii) the structure of agriculture; and (iii) public policies.

The next four papers explore producer options and obstacles. Duram presents data from five case studies of organic farmers and identifies barriers and opportunities. Wolf explores organic farming from the conventional grower's point of view, and discusses his conversations with a grower who transitioned to organic in 1990. He also asks the question "Does organic fit my operation?" Yeager provides an excellent review of the factors that squeeze corn growers, and the technical difficulties in transitioning to organic. He highlights USDA's Conservation Security Program as an opportunity for organic growers. Siemon describes the issues facing the development of a farm cooperative and discusses the technical and policy obstacles facing the

organic dairy industry in particular.

The second group of papers includes three perspectives on market growth in the organic sector. Dimitri and Oberholtzer provide a retrospective of growth in the organic sector by comparing consumers, supply chain players, and growers in the industry in 1997 and 2003. Harris presents a retail perspective on market growth and trends. DuPuis presents a sociological view of the organic market by discussing the set of rules under which the organic market operates and the risks in violating these rules.

Growers and agricultural professionals with training in organic agriculture can play key roles at all levels in the industry, but until recently there have been few programs for training students with interest in this area. The papers in this section provide inspiration for training farmers (Melone), students at land grant universities (Biernbaum), and agricultural professionals (Moynihan).

Measuring and communicating the benefits of organic farming was the focus of the next set of papers. Dabbert evaluates the environmental effects of organic farming and the policy intervention that may be justified. Delate explores the benefits and perceived risks of organic food, while Merrigan explores the complexities of conducting side-by-side comparisons of organic- and conventionally-produced foods.

The established research infrastructure has been criticized for its lack of attention to the organic agriculture industry. The last three papers address this issue and examine recent research conducted on organic production (Reganold), data access (Kuepper), and strategies for building a research base (Bull) within existing research frameworks.

Yeager, whose family has farmed in Indiana for many generations, commented that US farmers are still losing ground financially and openness to organic agriculture has reached "critical mass." He also echoed other speakers in calling for additional research to help make organic production successful. The papers presented here review pioneering efforts to create and evaluate organic farming and marketing systems — efforts that new research can expand and go beyond to help create a "second green revolution."

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USDA's Economic Research Service (ERS) has reported on the growth of the US organic agriculture sector for nearly two decades. With ERS leadership, and funding from USDA's Risk Management Agency, the workshop was developed by a dozen public and private groups: USDA's Agricultural Marketing Service; Agricultural Research Service; Cooperative State Research, Education and Extension Service; Foreign Agricultural Service; National Agricultural Library; and Office of the Chief Economist; along with the Farm Foundation; National Association of State Organic Programs; Organic Trade Association; and Organic Farming Research Foundation.

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Challenges Facing a Second Green Revolution: Expanding the Reach of Organic Agriculture

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> "The word 'revolution' has been greatly abused, but no other term adequately describes the effects of the new seeds on the poor countries where they are being used. The technological breakthrough achieved by agricultural scientists foreshadows widespread changes in the economic, social, and political orders of the poor countries."
>
> -- Lester Brown (2), describing the "Green Revolution" in developing countries, in his book *Seeds of Change: The Green Revolution and Development in the 1970s*

> "The future for organic farming is uncertain. Much depends on the availability and price of fertilizer (especially nitrogen) and farm labor, produce-price relationships, the domestic and world demand for food, concern for soil and water conservation, concern for health and the environment, and U.S. policies toward the development and promotion of organic farming practices. Due to one or more of the above factors, it may be economical for some farmers to produce certain crops and livestock organically rather than conventionally."
>
> -- From the USDA's classic *Report and Recommendations on Organic Farming* (44)

Introduction

It is timely now to review the status of organic agriculture, especially for those of us old enough to have observed or participated in the 1960s/1970s "Green Revolution" in many developing countries. As Lester Brown explained in *Seeds of Change: The Green Revolution and Development in the 1970s* (2), US government policy emphasis shifted in 1965 from direct food aid for developing countries to more active assistance to these countries in developing their own food production capacities. At the time, Brown was a senior US Department of Agriculture (USDA) official dealing with international agriculture policies. Also at about the same time, governments of several major developing countries such as India and the Philippines began to place much more emphasis on aggressive, coordinated programs to boost food production. The result was dramatic increases in cereal production between the late 1960s and the mid-1970s in many parts of the developing world, especially in regions with abundant rainfall or irrigation water. The increases

were the result of rapid farmer adoption of "packages" of inputs consisting of high-yielding seed varieties [especially wheat (*Triticum aestivum*) and rice (*Oryza sativa L.*)], inorganic fertilizer, and, in many areas, irrigation from groundwater. The dramatic changes in farming practices and in cereal output per hectare soon became known as the "Green Revolution." I witnessed the unfolding of this agricultural revolution on the Gangetic Plain of north India while conducting research there in 1967/1968 for my doctoral dissertation (10,13).

The groundwork for this Green Revolution in developing country agricultures had been laid much earlier, of course. The basic technologies and practices had been evolving for some time in Europe and North America — to some extent since about the 1930s, and especially following World War II. I have described elsewhere the specialization and intensification "evolution" in United Kingdom (UK) and US agricultures (11). More specific groundwork for the Green Revolution of developing countries, however, can be traced to plant breeding work supported by the Rockefeller and Ford Foundations in Mexico and the Philippines. This work was critical to development of short-stemmed wheat and rice varieties that were adapted to climates of developing countries and that could utilize high applications of water and nitrogen fertilizer without lodging.

The year 1980 also is of historic significance for this review of the status of organic agriculture. In that year, only 10 years after the publication of Brown's *Seeds of Change* book, the USDA released its *Report and Recommendations on Organic Farming* (44). Although USDA scientists had shown interest in organic agriculture in earlier eras—most notably F. H. King (27), in writing about agriculture in east Asia—the 1980 report signaled recognition that there might still be some role for organic farming systems in the intensification, high-yield era that had evolved since World War II. Like the Green Revolution described above, the intellectual and political groundwork that made the USDA study team's work and report possible had been laid by numerous individuals and organizations. In the US, the work of J. I. and Robert Rodale and the publication of Rachel Carson's *Silent Spring* (3) were of special significance. Prior to that, the contributions of England's Sir Albert Howard, author of *An Agricultural Testament* (25), and Lady Eve Balfour, founder of Britain's Soil Association, were of enormous importance (32). Later, the formation of California Certified Organic Farmers (CCOF) in 1973 (29) helped give visibility and credibility to the emerging US organic farming movement.

The release of the 1980 USDA report may have been politically bold at the time, but the report itself was written — and appropriately so — with careful scientific qualifications. The report helped open the door for renewed scientific investigation of organic agriculture in the USDA/Land Grant University complex. Although organic research today still makes up only a small fraction of publicly funded agricultural research in the US, organic agriculture research has much greater visibility and perceived credibility than it did 25 years ago. Unlike in Western Europe, however, US public policies, for the most part, do not actively encourage expansion of organic farming. There are no national goals or strategies in the US to encourage growth in organic farming and food consumption.

To set the stage for this examination of the status of organic agriculture, I will outline some challenges this country would face if policy makers were to decide to follow Europe's path in attempting to launch a second "Green Revolution" based on organic agriculture. As we have seen, the "green" terminology previously symbolized high-yield cropping based on synthetic chemical inputs. Ironically, "green" terminology also has been used for some time now in both Europe and the US to characterize more environment-friendly agriculture based on organic and other ecologically-

based farming systems. Therefore, it seems appropriate to identify lessons that might be drawn from the first "Green Revolution."

The term "organic agriculture" is used in this article in ways consistent with the current definition of the USDA's National Organic Program. In condensed form, that definition reads as follows:

> "Organic crops are raised without using most conventional pesticides, petroleum-based fertilizers, or sewage-based fertilizers. Animals raised on an organic operation must be fed organic feed and given access to the outdoors. They are given no antibiotics or growth hormones." (45)

Essentially, this means that organic crops are grown without synthetic chemical inputs and organic livestock are raised and maintained on organic feed. This definition does not limit organic production to farms and ranches of any particular size or method of business organization. Although many supporters of organic agriculture feel that it is, potentially, one form of ecologically "sustainable" agriculture, most people do not restrict their definition of "sustainable" agriculture to organic agriculture. In other words, other forms of agriculture also may be ecologically sustainable. Moreover, even if a particular system of agriculture satisfies the above definition of organic agriculture, that system may not be ecologically sustainable in all respects and under all conditions.

Framework for Developing Green Revolution Strategies

Let us go back again to the mid-1960s when, as indicated above, US government policy began to place much greater emphasis on food production within developing countries. In 1966, a non-profit agency called the Agricultural Development Council released a little booklet by Arthur Mosher (33) entitled *Getting Agriculture Moving: Essentials for Development and Modernization*. Mosher discussed five "essentials" for "agricultural development" in his booklet: (i) markets for farm products; (ii) constantly changing technology; (iii) local availability of supplies and equipment; (iv) production incentives for farmers; and (v) transportation. In addition, he listed five potential "accelerators" of agricultural development: (i) education for development; (ii) production credit; (iii) group action by farmers; (iv) improving and expanding agricultural land; and (v) national planning for agricultural development.

Interestingly, Leslie Duram's list of "influences" on organic farming in her recent book has many similarities to Mosher's lists. Duram (21) lists the following four broad categories of influences on decisions of organic farmers: (i) economic (markets, organic food prices, etc.); (ii) ecology (balance, soil health, etc.); (iii) society (American culture, policies/information); and (iv) personal (independence, innovation, tradition).

The similarities between these lists, separated in time by nearly 40 years, should not be surprising. Agricultural adoption and diffusion theories received a great deal of attention during the years leading up to the first Green Revolution, and social scientists have continued to adapt, refine, and apply the theories and concepts from that period to new situations. In my own recent work with Jules Pretty on agri-environmental policies (14,16), we have utilized a conceptual framework that focuses on the following three important goals of farmers (Endnote 1): (i) to have adequate net income (profits); (ii) to keep risk within manageable proportions; and (iii) to achieve good stewardship of natural resources.

The framework is focused on how agri-environmental policies, including policies for organic agriculture, influence farmers' incentives to

move from "conventional" to more ecologically sustainable farming systems by effects on their abilities to achieve these goals. The following "contextual factors" can either enhance or inhibit the effectiveness of policies in moving farmers to more ecologically sustainable farming systems: (i) prices and access to markets; (ii) technologies; (iii) the structure of agriculture; and (iv) social and human capital.

To some extent, social capital accounts for influences of neighbors on farmers' decisions. Where organic and similar "sustainable" farming societies and networks are strong, farmers receive positive feedback for decisions to farm organically (14); this helps to offset any remaining negative peer pressure from conventional neighbors. Fifteen or 20 years ago, negative peer pressure from neighbors may have been more of an inhibiting factor for adoption of organic and other "alternative" or "sustainable" farming systems than it is today (1). At present, negative peer pressure from neighbors is probably greater in some regions of the US than others. Durum notes the more positive atmosphere in California, compared to some other parts of the country (21). Some studies also have noted family traditions as an inhibiting factor (20,38). Social capital that supports organic agriculture can influence family values over time, however.

Drawing on these various conceptual frameworks — from those of the first Green Revolution period, represented by that of Mosher, to ones of more recent vintage, including Durum's and Dobbs and Pretty's — I will focus on challenges facing a second Green Revolution based on organic agriculture by considering three sets of influences:

1. technology, prices, and markets;
2. the structure of agriculture;
3. public policies.

Research, education, and planning leading to the first Green Revolution gave a great deal of attention to #1 and #3. The "institutionalists" also paid attention to #2, but the structure of agriculture received even more attention as the Green Revolution matured. While pre-Green Revolution attention of institutionalists was on the necessary structural conditions for agricultural development, post-Green Revolution attention turned to issues of equity, especially with regard to impacts on the poorest members of society, including landless laborers. Drawing on the first Green Revolution experience, I will consider the "structure of agriculture" from both *cause* and *effect* standpoints. Post-Green Revolution analysis also focused much greater attention on "appropriate technology," which I address briefly in the following section of this paper.

Influences of Technology, Prices, and Markets on Farm Profits and Risk

Technologies, consumer demand, and markets together strongly influence the profitability and risks for farmers in changing from more conventional farming systems to organic systems. Therefore, central to any strategy for expanding organic agriculture is the challenge of developing appropriate technology and marketing institutions.

Klonsky and Greene (28) recently described the trends in US organic food consumption. They present a picture of rapidly expanding consumption — annual rates of growth averaging 20% since 1997 — based, to a substantial extent, on consumers' health and food safety concerns. Organic food sales reached $10.4 billion in 2003, about 2% of total US food sales. They suggest that the US organic food market could realize continued expansion by:

> "1) increasing the number of retail outlets with respect to type and number, 2) increasing the number of organic products available in each outlet type, 3) entry of mainstream food manufacturers into organic, 4) branding of organic, and 5) increased export." (28)

Streff and Dobbs (42) have documented relatively high price premiums for organic grains and soybeans (*Glycine* max) during some periods between 1995 and 2003. Also, the USDA's Economic Research Service (9) has reported substantial price premiums for some organic vegetables in recent years. However, there remain many challenges in expanding processing and retail outlets for organic farm products and strengthening the marketing linkages from farmers all the way to consumers (7,17). Research cited by Dimitri and Oberholtzer (8) indicates that price is the leading barrier to greater organic purchases by consumers. Organic price premiums at the retail level are due to many factors in addition to sometimes higher production costs at the farm level, including higher transaction costs associated with dispersed and relatively small production levels (8). Closely related to these transactions costs are the costs of identity preservation throughout the food chain.

Reviews of US comparative profitability studies indicate that price premiums at the farm level are necessary for some organic systems to be competitive with their conventional counterparts. This is especially true for crops like processed tomatoes (*Lycopersicon esculentum*) and cotton (*Gossypium hirsutom*). However, some organic systems have been shown to be competitive even without price premiums at least some of the time. This is the case for organic systems featuring corn (*Zea mays*) and soybeans in some Midwest areas (28,47). Recently reported research in Iowa indicated that an organic corn/soybeans/oats (*Avena sativa*)/alfalfa (*Medicago sativa*) rotation could be more profitable than a conventional corn/soybean rotation even without price premiums, but the organic system was less profitable when a charge for purchasing compost was included in the organic budgets (6). In a similar study in Minnesota, the 4-year organic rotation consisting of corn, soybeans, oats, and alfalfa had higher average net returns over the period 1990 through 1999 than conventional corn/soybean rotations when organic price premiums were included. When organic price premiums were excluded, the organic system still had higher average net returns, but the differences were not statistically significant (31). Recently reported comparisons of organic and conventional small grain/oilseed crop systems in Alberta, Canada found the organic systems to be less profitable, on average, than the most profitable conventional system (continuous wheat) when organic premiums were not included. When the "most likely" organic price premiums were included, however, one of the organic systems had net returns that were similar, on average, to the most profitable conventional system (41).

Given the fact that organic price premiums do exist for many crop and animal products, why does organic agriculture remain such a small proportion of US agriculture? Although certified organic cropland in the US increased by 53% between 1997 and 2001, it was still only 0.36% of total US cropland. Certified organic pasture and rangeland was only 0.23% of the total in 2001, in spite of more than doubling since 1997 (22). Some clues to answering the question about why there is not more organic production in the US may be found in the most recent (2002) organic farmer survey by the Organic Farming Research Foundation (OFRF) (46). Farmers responding to that survey ranked the following (in order) as their top eight *production, marketing, or regulatory problems*:

1. weather-related production costs;
2. organic certification costs;
3. obtaining organic price premiums;
4. high input costs;
5. lack of organic marketing networks;
6. high labor costs;
7. weed-related production losses;
8. production losses due to pests or diseases.

Four of these eight problems (#1, #3, #7, and #8) involve some aspect of *risk*. Organic farming systems are not inherently more risky in all respects than conventional systems. In fact, organic systems tend to be more drought tolerant, and organic farms have a larger mix of crops (and often of livestock) than do conventional farms. Both of these features tend to make the economics of organic farms less risky than conventional farms. To gain greater insight on risks associated with organic farming, Hansen, et al. (24) solicited organic farmers' views in a series of focus groups during 2001 and 2002. Among the risks identified in this study that are of special concern to organic farmers are: (i) risks of contamination of organic crops by genetically modified organisms (GMOs); (ii) shortages of particular inputs such as certified organic seeds and biological pesticides; (iii) access to capital, because banks are sometimes unfamiliar with organic production systems; (iv) instability of organic price premiums; and (v) some crops in organic rotations do not benefit from USDA commodity program price and income protection. The study was used in part to identify ways that Federal risk management programs (e.g., crop insurance) might better serve organic farmers.

Organic certification costs (#2 on the above list) reflect a portion of the farmer's costs of identity preservation (mentioned earlier in the context of transactions costs). Farmers often have handling and storage costs associated with identity preservation, also, especially when only a portion of a farm is organic. This can contribute to some farmers' reluctance to convert to organic, or part-organic, production.

The OFRF 2002 organic farmer survey also included a place for respondents to give open-ended responses to a question about *marketing conditions* that have the greatest negative impact on organic farming economic sustainability and profitability. The most common responses were these:

1. competition with large-scale producers;
2. competition with organic imports;
3. low prices;
4. buyer consolidation in organic market place;
5. finding buyers and markets;
6. market overproduction [in soybeans, especially; also apples (*Malus* spp.) and raisins (*Vitis vinifera*)].

These responses suggest that, though organic markets have been rapidly expanding at the retail level, expansions in supply and demand do not always move smoothly together, thereby sometimes resulting in price declines at the farm level. Also, farmers are concerned about the changing structure of the organic industry (40), which I address in the next section of this paper.

Continued expansions in demand and reductions in transactions costs throughout the marketing chain can help enable price signals to be effective in encouraging continued growth in organic production at the farm level. What is the role, then, of *technology* in facilitating further growth in organic

production? After all, it was new technology packages that triggered the first Green Revolution. It is highly unlikely that we will see technology breakthroughs for organic systems that could have the dramatic effect that the high-yielding grain varieties had in the first Green Revolution. Some lessons about technology can be drawn from that previous Green Revolution experience, however.

One lesson is that there were long, sustained plant breeding efforts that led to the varietal breakthroughs. A second lesson is that agricultural development professionals took a systems approach in attempting to encourage adoption of the new varieties. In India, for example, there was an integrated agricultural development strategy that targeted districts with high production potential. The integrated approach attempted to see that all the key ingredients — seeds, fertilizer, irrigation water, and information — were in place to encourage rapid and high rates of adoption. When all the key ingredients were in place, the result was, indeed, rapid adoption of the Green Revolution technology packages.

The first Green Revolution experience does not imply that plant breeding should necessarily lead the way for a second Green Revolution based on organic agriculture. However, the previous experience does suggest that research and education on organic technologies should continue to have a heavy *systems orientation* and should focus on *technology packages*. In fact, organic agriculture research and education have been known for their systems approaches. I am concerned, however, that as organic research programs mature and garner their own sources of funding, there is a very real danger that the research will look more and more like that of conventional agriculture. Although projects may continue to have systems and multidiscipline appearances, the appearances may simply mask the same old kinds of highly specialized research on small technological refinements. While there is an important place for disciplinary and reductionist research in organic agriculture, we need to be wary of researching-to-death particular technologies. It seems as if research on conventional agriculture has produced an endless stream of fertilizer response and pesticide application studies. Ten or 20 years from now, will organic research consist mainly of a similar stream of biological pest control studies on virtually every crop, under every conceivable growing condition?

A key concept that arose in the 1970s out of some of the unintended consequences of the first Green Revolution was that of "appropriate technology" (Endnote 2). Some of the of the post-Green Revolution concerns about the "successful" technologies was that they were not always appropriate for poor farmers in marginal, dryland (rainfed) areas and that they generally led to great losses in biodiversity. While almost everyone agrees that economically successful organic systems are specific to agro-climatic regions and resource conditions, there is a tendency among some organic researchers to feel that the main challenge in each region is to adapt the "conventional" crops and livestock of that region to organic farming methods. Instead, we should back up and ask whether the crops and livestock that have evolved over time due to specialization and the use of chemical inputs really are appropriate to that region. Maybe there is no "natural" comparative advantage for some crops or livestock species in a particular region. An "appropriate technology" approach would focus on technologies and systems for crops and livestock that are ecologically "appropriate" for the climate and resources of each region.

The Structure of Agriculture

As noted in the "framework" section of this paper, the structure of agriculture is an important consideration from both *cause* and *effect* standpoints in strategies for expanding the reach of organic agriculture. At least in Great Plains and Midwest agriculture, the evolving structure of agriculture appears to inhibit expansion of ecologically diverse farming systems, including organic systems [e.g., see Dumke and Dobbs (19)]. Organic and other ecologically diverse farming systems require a great deal of management attention to both production and marketing. They also generally require more labor in the production process than do conventional systems. Historically, moderate-sized, full-time farms that also had several family members available to assist with farming operations were best able to supply the requisite management and labor for diverse operations. As we all know, US farm structure for several decades now has been evolving into an increasingly bi-modal structure — with very large farms on one end and smaller, part-time farms on the other. Both of these farm types lend themselves best to specialization in just a few crop or livestock operations. With smaller families and usually either wife or husband (or both) working off the farm, this structure lends itself best to capital-intensive, rather than labor-intensive, farming systems.

Dumke and Dobbs (19) have examined and explained the numerous forces that have contributed to the growing farm size, increased specialization, and reduced ecological diversity of US agriculture over the last half century. Among those forces have been agricultural price and income support policies, discussed briefly in the next section of this article. The agricultural structure that has evolved presents somewhat of a "chicken-or-egg" situation with respect to organic agriculture. The current structure makes it difficult for widespread adoption of organic and other ecologically diverse farming systems to take place. But, unless and until organic and other forms of ecological agriculture displace significant portions of the currently dominant chemical-intensive agriculture, the US's agricultural structure is unlikely to change substantially.

Given the current structure of agriculture, it is sometimes difficult to be optimistic about the prospects for a major expansion in US land area covered by organic farming systems. One might envision some major expansion in organic *farm numbers*, based on small-hectareage operations near major urban markets that produce fruits, vegetables, and specialized livestock or other value-added products. From the standpoint of producing organic food for urban consumers, this kind of expansion would be regarded as a very positive thing by most organic agriculture proponents. However, from the standpoint of impact on the environment and ecology of US agriculture, the effect might be very limited because it could leave the vast majority of US agricultural hectareage in chemical-intensive conventional farming.

This brings us to the question of whether large-scale — what some might refer to as "industrial organic" — farms can fulfill the goals of organic agriculture. Recall that the definition of organic agriculture used by the USDA, presented in the opening section of this article, makes no reference to farm size. Nevertheless, large-scale organic farms would not fulfill the "Jeffersonian" or "agrarian" small family farm goals that have characterized much of the early organic movement in Midwest and Great Plains agriculture. We need to bear in mind, however, that this "Jeffersonian" ideal has not traditionally been central to all of US agriculture. California, for example, "*never had an agrarian tradition*," according to Guthman (23; the italics appear in the original). Guthman argues that in the far West, "the central struggle has always been between industrial producers and wage labor" (23),

not between large growers and small growers. Hence, adopting the Midwest's large farm/small farm agrarian rhetoric in California implies, in Guthman's view, that organic agriculture could or should save a type of family farming tradition that actually never existed to any substantial extent in much of California agriculture.

Guthman's observations also are relevant to areas other than California, however. If organic agriculture is going to have social goals, the goals should go beyond some idealized vision of a family farm. Concern about agricultural laborers should take on much greater importance. Many agricultural laborers (beyond those who are part of the farm family) also are involved in organic agriculture in the Midwest, even where organic agriculture still comes close to the "Jeffersonian" ideal. They are involved not only in production — especially in hand weeding in the case of grain/oilseed crop farms — but also in processing. Seldom if ever do organic and sustainable agriculture forums in the Midwest feature sessions on the sources of labor or wages and working conditions of these field laborers and laborers needed to slaughter organic chickens, hogs, or cattle. The organic farming movement is on very weak footing when it asks for consumer and public support on "social" grounds when almost the only social focus is that of the farm operator family (Endnote 3).

Aside from social goals, then, can "industrial organic" satisfy the environmental and ecological goals inherent in the organic agriculture movement? If we take the Federal rules for organic certification as necessary conditions for satisfying environmental and ecological goals, then the answer might be yes — for those large-scale operations that can achieve certification. But, as we can all observe, these rules continue to be challenged and debated. There is great pressure to have rules that industrial organic can live with, particularly for animal agriculture. Depending on where lines are drawn in many of these rule disputes, large-scale organic farming operations may or may not be able to achieve and maintain certification.

The first Green Revolution had one overriding goal — to satisfy extremely pressing food needs of large and rapidly growing populations in developing countries. Other social goals and environmental goals were not central to the strategies of most countries leading up to that revolution, but such goals have taken on much greater importance in the revolution's aftermath, as unintended consequences have become more apparent. The original, and still primary, driving goals of the organic movement are environmental or ecological. In addition, food safety and nutrition goals are now taking on greater importance. However, the place and nature of social goals related to the "structure of agriculture" constitute an outstanding issue in the US organic agriculture movement.

Public Policies

I noted earlier in this article that public policies played an important role in the first Green Revolution. After the first waves of success in agricultural areas that were especially well-suited to the Green Revolution technology packages, economic policy took on even greater importance as governments of developing countries and donor agencies such as the US Agency for International Development tried to increase agricultural production in other areas. In a sense — though we are yet to see a comparable Green Revolution in the US based on organic agriculture—the situation today with respect to adoption of organic farming systems is somewhat like the mid-1970s regarding adoption of the first Green Revolution technology packages. By the mid-1970s, many farmers in areas of the developing world where the Green Revolution packages were profitable and not too risky had adopted them. It was then clear that much greater attention to a range of policy factors

was needed in order to increase food production in other areas. Today, roughly 25 years after release of the USDA's *Report and Recommendations on Organic Farming*, it is abundantly clear that much greater attention to public policies is needed if there is to be a major expansion of organic hectareage in the US. There has already been more than a decade of such policy attention to organic agriculture in Western Europe (5).

Several decades of agricultural price and income support policies in the European Union (EU) and the US that "coupled" support, either directly or indirectly, to crop and livestock production had the effect of favoring chemical-intensive systems over organic and other ecologically-based systems (15,34). US agricultural policy took important steps toward "decoupling" supports from current production in the 1996 Federal farm bill, and then, in effect, took some backward steps in the 2002 farm bill. Like the US, the EU began the decoupling process in the 1990s. However, unlike in the US, the latest major agricultural policy changes in the EU's Common Agricultural Policy (CAP)—approved in 2003 and now in the process of being implemented in EU member states—appear to constitute a significant step toward even greater decoupling (16). These latest CAP reforms should help greatly to further "leveling of the playing field" for organic agriculture in Europe.

EU member states also have many agri-environmental policies, some of which aggressively support organic agriculture (5). There is growing documentation of the negative environmental externalities of "conventional agriculture" in Europe and the US (e.g., 36,37,43). That research and an emerging body of literature indicating that organic agriculture performs better in at least some environmental and energy use respects than conventional agriculture (5,26,35) provide bases for pubic policies that go beyond simply leveling the playing field for organic agriculture. There is not as much evidence in support of the argument that organic farming also provides a significant boost for rural economic development. However, to the extent organic farming is tied to local food systems, local value-added products, and a positive image of rural areas, it may play at least some positive role in rural development (4,5,21). If that additional dimension of organic agriculture's "multifunctionality" is present, there is further rationale for public policies actively supporting organic agriculture.

In some ways, the challenges in developing and sustaining public policies to support organic agriculture may be even greater than they were for supporting the first Green Revolution. In that previous Green Revolution, new technology packages clearly and dramatically increased profits for many farmers. Those highly profitable technologies could be sold in the market, so there was clear potential for private sector industries to emerge and develop to market the technology package ingredients — namely, seeds, fertilizers, irrigation equipment, and chemical pesticides. A new Green Revolution based on organic farming systems, in contrast, would have more emphasis on natural and human capital than physical capital. There is less potential for the private market to profitably promote and provide the ingredients for natural and human capital. The benefits of organic agriculture, for the most part, are expressed in ways other than yield increases, which constituted the central feature of the first Green Revolution. Organic agriculture's multifunctionality implies that many segments of society in addition to farmers receive benefits, and many of those benefits are not easily captured in market mechanisms.

At present, there is only very limited policy support for organic agriculture in the US. There is very modest but growing support for organic agriculture research, and there is a program that provides some cost-share funds for organic certification. The Federal crop insurance program has been revised to somewhat better accommodate organic farmers. The Environmental Quality Incentives Program (EQIP) has been used in some States as an organic transition assistance program somewhat like transition

assistance programs in the EU. However, all of these programs are extremely modest in comparison to agri-environmental programs focused on organic agriculture in Europe.

There was some hope that the Conservation Security Program (CSP), newly created in the 2002 US Federal farm bill, might serve in part as an organic incentive payment program like ones in Europe (30). At South Dakota State University, we recently analyzed potential for the CSP to induce adoption of more ecologically diverse crop rotations, including organic crop rotation systems, in the US's Western Corn Belt (18). At the time our analysis was conducted, implementation rules for the CSP had not been finalized and no CSP signup had yet been approved for South Dakota, where our case study region was located. Therefore, it was necessary to make a number of assumptions about qualifying practices and payment rates. We assumed that organic crop rotations would qualify for payments in Tier 3, the highest of the CSP's three payment tiers. Later, when the first CSP signups took place in South Dakota in 2005, eligible practices and payment rates were examined. Payment rates actually allowed for establishment of ecologically diverse crop rotations were substantially lower than those assumed in our representative farm analysis for southeastern South Dakota.

Briefly stated, our results suggest that both organic and non-organic systems that are ecologically diverse may be more profitable than conventional corn-soybean systems in the region of southeastern South Dakota that we studied—with or without Federal commodity payments, CSP payments, or price premiums for the organic system. If that is actually the case, are CSP or other agri-environmental program payments really needed to encourage adoption of organic systems? The results would seem to imply "no," if the decision is simply whether to continue with a conventional corn/soybean system or to go organic. If the choice is between ecologically diverse systems that are not organic and ones that are organic, the answer might be "yes," if farmers are not confident of the level and continuity of organic price premiums. However, neither organic nor non-organic ecologically diverse systems are very common in the study region. This suggests that some of the risk and other factors discussed earlier in this paper are holding back the adoption of organic and other ecologically diverse farming systems. If that is the case, CSP or other incentive payments may be critical to any major expansion of organic hectareage, at least for so long as Federal farm program commodity-type payments continue to be so important to the net returns and associated land values of conventional agriculture.

Summary

I have tried to raise some issues and challenges facing organic agriculture in the US. The articles to follow identify and elaborate technology, market, research, policy, and other components of a possible second Green Revolution, this one based on organic farming methods. As researchers and policy makers develop strategies addressed to those components, it is important to keep in mind some experiences and possible lessons of the previous Green Revolution based on chemical-intensive farming methods. Though many proponents of organic agriculture are quite critical of some aspects of that previous Green Revolution, there are lessons about strategies that we can draw from that experience as we lay groundwork for the next agricultural revolution.

Endnotes

1. Farmers have other goals, also, of course, but these three are considered especially important from a policy standpoint. Among the other goals that could have been included are ones to maintain flexibility and not be tied down by bureaucracy (12). Back to text.
2. This is closely related to the term "intermediate technology" that Schumacher used in his famous *Small is Beautiful* book (39). Schumacher also used the term "appropriate technology," but he used the term "intermediate technology" in the title of one chapter devoted to the subject, and he used that term in most of his discussion. Back to text.
3. I am not including food nutrition and safety goals and environmental goals under the "social" heading here. Those are important organic agriculture goals, but I am simply not placing them under the "social" heading. Back to text.

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Assessing Producer Options and Obstacles for Organic Agriculture

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Introduction

Fall is a perfect time, as we harvest this year's crop and begin planning for the 2006 season, for me to explore organic farming opportunities and discover the challenges and opportunities that might exist. The first question that arose in my mind was: "Is organic farming a viable business option or a cultural movement?" Over the last 11 years, through my experiences with the US Grains Council and Council for Food and Agricultural Research (C-FAR), I have met several organic producers, not only in the U. S. but also in Cuba, Vietnam, China, and Austria, all with different perspectives on both the business and the culture of organic.

First, let me give you a snapshot of our farming operation. I am 57 and my wife, Jan, is 54. We both entered farming from a business background in the retail and wholesale grocery industry 29 years ago. Jan and I farm about 2500 acres in east-central Illinois, employing our son Jeremy and a fourth cousin, Tom. In addition to farming, we sell Mayrath grain augers to help balance the income flow and provide additional income opportunities for Jeremy and Tom.

Of the acreage we farm, Jan and I own 16%, my father owns 31%, and six landowners account for 53%. The farms are scattered over four counties in 25 tracts. The distance from our home to the farthest farm is about 45 miles or two hours by tractor or combine. This gives us a weather hedge but requires many hours on the road moving from field to field.

We all enjoy farming, but it is a business. Our success or failure impacts not just Jan and me, but 14 other families whose livelihoods depend in whole or part on the farming income generated by our operations. The capital needs required to farm in today's world are substantial, as are the risks. Since 1983, we have produced food-grade white and yellow corn, under contract, for a major snack food company. This has added marketing stability and discipline to our operation, but there is always a reason they pay you a premium — risk. The key to success is beating the averages in not only quantity, but also quality.

As chair of the Illinois C-FAR, I worked closely with the organic/sustainable producers in Illinois. One of my best friends and fellow board members, Jack Erisman, farms 2300 acres near Pana, Illinois. Jack switched to organic farming in 1990, going "cold turkey" and incorporating feed grains, forage crops, and organic beef cattle in his operation in a 14-year rotational cycle. Jan and I spent a day in Pana visiting with Jack and Jeannie about their experiences in organic farming. Jack and I had discussed organic agriculture over the years, but this allowed us a great opportunity to focus on organic production in Illinois and let me test some of my perspectives against his reality. My comments today reflect my thoughts as verified or challenged by Jack's 15 years of trials and tribulations in organic farming, and his thoughts about the challenges to entering organic farming in Illinois.

Risk of Self-Esteem and Credibility

I asked Jack: "Is organic farming a business venture or a cultural movement?" I think the answer is some of each. Each person's motivation is different. The world is full of perceptions and this is the first challenge in contemplating organic production in Illinois. We are a product of our experiences, and to many people in Illinois, organic farming is perceived as interchangeable with weeds, low yields, "last resort," "on the ropes," counter culture, and the list goes on and on. The majority of producers, landowners, and farm managers have a very skeptical view of organic farming — and I am probably being kind. Of course, when I started raising food-grade white and yellow corn under contract, people thought I was crazy. Anyone contemplating adopting organic farming in Illinois needs to be prepared to be under a microscope. This is one of the biggest barriers to entry. Before embarking on this path, honestly assess your ability to sustain criticism from your spouse, family, banker, landowners, and friends. I do not mean to imply you will not have any support, but it will be limited at best. If you can pass this crucial test, then you can move on to assess the risks and rewards involved in organic production. It takes strong conviction and determination to succeed in organic farming.

Financial Risks of Organic Farming

The biggest risk anyone entering organic production will encounter is financial. For three years, as you go through the certification process, you will have to change your farming practices completely. This will be a time of education, learning, and trials, with some failures and a few successes scattered in. The markets for these transitional years' crops are not going to be high value streams, so be prepared for some lean years during this transition. Jack's experience of switching his whole operation in one year is not the path of choice. Start small and limit your exposure during this learning experience.

Managerial Risks

As a traditional corn and soy producer, I would probably be switching to a four-year minimum rotational crop pattern including corn and soybeans. If I added cattle to utilize the small grains and forage, I would need to establish pastures, build fences and buildings, and add equipment to support the livestock production. In addition, I would need to learn new techniques to grow organic crops utilizing non-traditional methods. This would be a challenging time. Planting would be delayed by three to four weeks on corn and soybeans due to the new cultural practices, and to reduce the chance of pollen drift. The labor and management needed to succeed would be constant and intensive, as crops need continual scouting, hoeing, and cultivation. Despite my best efforts, I would probably have weeds in my crops unlike any I have experienced. By harvest time, which would begin weeks later than my neighbors, I probably would be faced with harvesting soybeans fields which may barely be recognizable as soybeans due to the weed pressure, and waiting for a hard frost to kill the weeds before beginning harvest. Cornfields might be weedy and lodged so badly that I might have to hire people to walk along with a pitchfork pitching the corn into the combine, and all for scant profits.

Financial risk in entering organic crop production in Illinois is very real. You should be financially able to withstand years without a crop. Crop failures are a very real possibility and you need to have the ability to weather those years. Debt load should be minimal in order to reduce risk. The risks are definitely higher in organic production than traditional crop production, but so are the rewards.

Land Base, Labor, Investment, Educational, and Locational Risks

As mentioned earlier, we rent about half of our farmland. In my case, none of my landowners would consider organic farming. One of my key landowners owns a fertilizer and chemical dealership and the others would not be willing to go through the transitional costs and risks to enter organic. They range in ages from the mid 40s to 87, and all the principles are over 70. This does not preclude all landowners from organic production, but in my case, it is not debatable.

Labor needs, and therefore costs, in organic production are also higher. The labor market for production agriculture is very tight in central Illinois and finding good qualified help is always a challenge. Jack said he is continually short two men in his operation and cannot fill those positions. In our operation, we are always looking for efficiencies in our production practices to reduce labor needs instead of increasing them.

Equipment needs would also increase for me because we are not equipped to plant or harvest small grains and forage crops. We also do not have fences or animal sheds, and this would increase our investment if we entered organic production with cattle in the mix. Jack has three different rotary hoes to use depending upon the crop and conditions he encounters. Most farmers have one rotary hoe at most.

Another challenge is gaining the knowledge needed to enter organic production. Since organic production is relatively small in Illinois, this process is not simple and would again take time. As Jack said, "There are a lot of people selling snake oil in the market and you have to separate the wheat from the chaff." The key would be working with someone like Jack who could council us as we moved through the transition.

An ideal farm for organic would be compact and contiguous with natural water supplies available for livestock. As I mentioned previously, our farming operation is so spread out that it would be very difficult to convert all of it to organic. Larger tracts of land are suited best to organic feed grains to lower pollen drift and allow for more efficient fieldwork. If we were to focus on crop production and eliminate the cattle in our operation, we would be better suited, but then we would need to purchase more outside inputs and sell more of the output instead of marketing it through animals.

Marketing Risks

Marketing is always a challenge and organic is no exception. Contract production would be preferable to me for the high value cash crops, while beef production would be a logical outlet for the forages and the other crops produced. Storage of crops is almost a necessity, and again, our operation is not designed for long-term storage of smaller volumes of differentiated crops. Organic marketing channels can be very challenging according to Jack, and all types of problems can disrupt the flow of crops and income. From both the producer's and the buyer's standpoint, insects are a very serious problem in stored grain. I talked last week to a major buyer of white, yellow, and blue organic corn and he said he is finding bug infestation in nearly all organic corn he is trying to purchase. His company has zero tolerance for live insects so he cannot take organic grain with insects. Jack too has had this problem as his deliveries were on buyers' call and he was forced to carry his grain into the summer months. This is another price risk. You can quickly move from very profitable premium organic prices to very unprofitable, discounted commercial prices. In Jack's experience, the risk from grading and discounts has been, and continues to be, significant. You are at the mercy of the buyer

and have little control over timing of deliveries and grading. We experience some of these same risks with food-grade corn, but to a lesser extent.

Risk of Increased Global Competition

During the last five years, I traveled to many areas of the world and one commonality is that both producers and policy makers in every production area in the world are looking for value-added opportunities, and they are eyeing the US and EU organic markets for export opportunities. When I visited with Fidel Castro, he was very interested in trade with the United States. His focus was on organic production of fruits and vegetables because Cuba does not have the money for fertilizer and chemicals so they felt they could export their organic production to the US market to capitalize on the premium prices here. Vietnam, China, the Philippines, and Brazil are a few of the countries with their eye on capturing a larger share of the lucrative US market. As these countries gain access and increase supplies, market opportunities will erode.

Rewards of Organic Crop Production

Now let's focus on the marketing opportunities. Once certified as an organic producer, there are good market opportunities to sell white and blue corn into the specialty food market and the yellow would probably enter the organic feed grain market. Several buyers in the central Illinois/Indiana market are contracting for production of these crops.

Blue corn is selling for $0.14 to $0.16/lb or about $7.84 to $8.96/bu (see Table 1). Realistic yield expectations would be from 50 to 80 bu/acre, resulting in an income per acre of between $392 and $716. White corn should yield from 90 to 150 bu/acre, and prices are about $5.75/bu, resulting in a range of income per acre between $517 and $862. The organic feed market is currently good and one could expect to earn from $5.00 to $6.00/bu on a yield range of 130 to 150 bu/acre, grossing $650 to $900/acre. These are excellent returns but remember only 25% of the acreage is in corn and soybeans each, rather than 50% each. Food-grade corn yields are generally range from 140 to 200 bu/acre and prices range from $2.50 to $2.90 for yellow and $2.75 to $3.20 for white.

Table 1. Selected organic and conventional commodity prices, yields, and income potential (estimated).

Crop		**Price** (per bu)	**Yield range** (bu/acre)	**Income potential** (per acre)
Organic	Blue corn	$7.75-$9.00	50-80	$387-$720
	White corn	$5.75	90-150	$517-$862
	Yellow corn	$5.00-$6.00	100-150	$500-$900
	Soybeans	$16.00-$17.00	20-30	$320-$510
Conventional	Food-grade yellow	$2.50-$2.90	140-200	$350-$580
	Food-grade white	$2.75-$3.20	140-200	$385-$640
	Soybeans	$5.00-$7.50	50-65	$250-$487

Organic soybeans are the second cash crop I would produce for the soy milk, soy flour, and soy meal markets. Yield expectations would be in the 20 to 30 bu range. Prices are in the range of $16 to $17/bu resulting in revenues of

$320 to $510/acre. Conventional soybean yield expectations would range from 50 to 65 bu/acre and price expectations would be from $5.00 to $7.50/bu resulting in revenues of $250 to $487/acre.

On the expense side of the ledger, I would be saving the cost of herbicides, insecticides, and conventional fertilizer, which could save up to $100 per acre on corn. However, I would have additional expenses from the practices needed for organic production, for which I have no cost figures. The chemical costs in soybeans are minimal and would be offset with the cost of the tillage operations during the spring and summer. The best option for the forage crops is to keep them on the farm so the primary cash crops from organic farming are from corn and soybeans, which would compromise about 50% of our acreage on a four-year rotation. In other words, divide the revenue from the corn and soy by half to see the multi-year return per acre over the whole farm. This is why cattle in a rotation would make good sense to me if a person has the setup for livestock or is willing to make the investment.

Will It Work?

Organic farming can work if one is really determined to make it succeed. I go back to my first question "Is organic farming a viable business venture or cultural movement?" If a producer is fully committed, prepared to withstand the criticism, financially strong with low debt, preferably owns the ground he farms, and is willing to work extremely hard, he can make a good living farming organically. Organic production reminds me of farming when my grandfather farmed. It is a step back in time from a production standpoint. A producer should switch over gradually, from my perspective, as he develops the skills and knowledge needed to be successful without assuming too much risk.

Does It Fit My Operation?

Having explored this information, I do not anticipate we will be entering organic production soon. Our farming locations are too scattered, I do not own a large enough percentage of my ground to consider organics, my debt load is not low enough to take the risks, and frankly I am not motivated to take on the risks and challenges associated with organic production. If I were younger, I might take a shot at a small acreage, but currently I think our specialty contracts are a better fit for me. I think many producers in the Midwest would look at this from a similar perspective and the outcome would be the same. The current adoption rate would verify that. When I was in Austria last year, the driving force in organic adoption was government subsidies of over $400 per acre. The percentage of producers in organic production was 7% and has been at that level for several years. One of the most profitable farmers we met was a large organic producer who was also building a potato processing and storage facility to capitalize on the higher prices during the off-season. He was not only a good organic producer, but also a very good businessperson. Absent any outside incentives, I do not anticipate a widespread conversion to organic agriculture in the Midwest, and that is good for the producers in this market, as their prices should stay stable for some time to come.

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Some Opinions on Farmer Options and Obstacles to Adopting Organic Agriculture

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I appreciate the opportunity to think about options and obstacles to adopting organic agriculture. I am the Director of Government Relations for the Indiana Farm Bureau. I want to emphasize that I will be expressing my opinions today and look forward to talking with you more later.

I want to quickly cover a few things most of you already know. Having been a farmer, and for the last 10 years renting out my land, it really strikes me how difficult it is to keep up with changes on the farm, now more than ever. Things have changed so drastically. Even in the last ten years we have seen a range of issues affecting farming, including: (i) declining farm numbers; (ii) competition for limited resources; (iii) specialized production; (iv) off-farm employment and the influence of part-time farming; (v) consolidation everywhere that has really played a part in everyone's life, especially in agricultural production; and (vi) production technology.

I want to focus on a couple of things quickly so that you know where I'm coming from in terms of traditional, Midwest farming. Working for the Farm Bureau, I come about as traditional as they get. We have had steadily and substantially increasing yields over the last 30 years. Corn yields have increased almost 60% since 1975, and we pretty much see the same increases for soybeans, cotton, and wheat. I wanted to emphasize this because I want you to have in your mind what people are thinking when they are growing corn and, at least in Southern Indiana where I'm from, selling it for $1.50/bu. It is pretty tough! It is hard to grow enough at that price.

I want to also mention a few government influences on organic and the farm sector. This is not an exhaustive list. First, there are the risk management programs that were mentioned this morning. Then there is crop insurance and revenue insurance, and obviously the difficulties with that, even more so with organic production. There are disaster assistance programs, and as you know we have had so many of those lately and these have meant a lot to traditional, commercial farm operations. The tax issues are certainly an issue. Most especially, I want to mention the farm programs, including the commodity price safety net we have right now: the direct payments, counter-cyclical payments, and the marketing loan or LDP, which everyone in the Midwest is so interested in when prices are low because you get the LDP on all the bushels you produce. Finally, the fruit and vegetable restrictions (FAV) that were written into the 1996 Farm Bill also represent possible challenges. I won't go into detail about these but I know that some of the people in the room probably have dealt with some of those problems.

On the other hand, the Conservation Security Program (CSP) is something which appears to offer the organic movement a great deal of opportunity. But, as you all know, it has been under-funded. In fact, it has been hardly funded at all. It is also very limited and has had problems with sign-up. Some of these problems probably go back to the funding, since

obviously you cannot have too many people go into it when the funds are so limited. However, it does represent some potential. Finally, I wanted to mention the Conservation Reserve Program (CRP). Especially when you look at the transition period for organic, the CRP gives you an opportunity to gain during the three-year transition. Of course, recently we have had a significant amount of acreage coming out of CRP between 2007 and 2010 that can be re-enrolled now, and that will be a little bit of a factor there.

Most farmers are still losing ground, and I mean that financially. The USDA-NASS statistics on prices received and prices paid by farmers demonstrate the cost-price squeeze that farmers face. So, the question is: Why do farmers continue to do it? We heard a bit about tradition this morning and there is a lot in the concept of tradition. I know this myself as a farmer, and certainly as I talk to people, you can see it in so many ways. It really is a big factor. Another issue is that most of us tend to like the familiar, especially farmers, even if it is the devil we know. We would rather stick with the familiar as long as possible. Farmers also generally tend to be optimistic that prices will increase at some point. Big yields are also appealing. I know I still enjoy getting in the combine with my friend who farms my land and watching as that corn just rolls into the bin. And, then there are just those that like steel and black smoke. I know some guys who like to get out there on their equipment and just do something in the dirt, even if it isn't something very productive for them.

So, the next question is: why don't farmers try something new like organic? You have heard some of these points already. The first is the transition period. As I talk to people, the transition period is certainly a deterrent to people thinking abut trying organic. Tillage is also a huge factor. A lot of people, especially where I live, have farms that are no-till and people just are not used to cultivating any more. You just don't find rotary hoes around anymore, unless it is on an organic farm. Another key issue is livestock. There just isn't much livestock left around on most farms and as you begin to look at organic and forage, it is back to how agriculture was in the late 1950s and early 1960s when we had general farms, livestock, forage, and you did the crop rotation. That is essentially what you are talking about. Today, the livestock isn't there and the fences are not there.

I cannot say enough about the labor issue as well, and especially as you relate it to the others. As you look at tillage, livestock, and a few of the other things I'll mention, the labor that is required for that can be a deterrent. I think back to the early 1960s when we were doing soybeans without herbicides on our farm. I spent a lot of my afternoons out in fields pulling Johnson grass. That is some of what we are back to here. The amount of labor it requires — well, first of all, most farmers are not used to doing it. Secondly, their kids are not excited about doing it.

Other critical issues include: (i) weed and insect pressure, which you've already heard a little bit about today; (ii) fear of low yields; (iii) limited research to help make organic production successful, and certainly I think there should be more; (iv) segregation and handling issues that you have heard mentioned — the issue here is that it takes a different type of management than many people are used to; and (v) lack of established markets.

There are some other income alternatives, besides trying to increase income on the farm, for farmers as well, and these can compete with farmers' interest in moving to organic. In a lot of the Midwest, we are blessed to have a great deal of good off-farm employment opportunities. These jobs spread the risk in that it is something to fall back on and is income insurance, and a lot of these jobs are taken for the health care and insurance benefits.

I wanted to talk a bit about segment opportunities for farm income type — high sales, low sales, lifestyle, and retirement. If you look at the data,

in the retirement segment, farm income is negative. It is also negative in the lifestyle farming. I am essentially a lifestyle farmer — with off-farm income being our income source. In low-sales, still a lot of the income on the family farm is coming from off-farm sources. You have to get into the high-sales farms before a good deal of the income is coming from farm sources. Yet, there is still a good amount of money coming from off-farm sources as well. I also wanted to look at the different types of farms, farm numbers, and production on these farms: moving across the graph from limited resource farm across to retirement, residential, lower sales, higher sales, large farms, very large farms, and non-family corporate farms. The last four categories (high sales, large farms, very large farms, and non-family corporate farms) are where the mass of the agricultural production gets done in our country. In my opinion, however, there is a great deal of opportunity and interest for organic in the limited income and limited residential farms, and then especially in the lower sales farms as well as the higher sales farmers, which comprise probably close to 40% that might be interested in organic production in some way.

Let's talk a bit about organic opportunities. There are many consumers willing to pay more for food. There are many farmers interested in the product concept. In addition, there are many farmers that want to gain more control. This is something I hear again and again as I talk to farmers. As consolidation has increased, these farmers feel like they have lost control. Something that seems to be driving an attitude toward looking at organic is that some land owners, and it is limited, don't just want the highest dollar that they can get for the land. These land owners are interested in encouraging organic and bearing the possible loss and increased risk that might go along with organic during the transition period.

The one point I want to make, and I don't want to emphasize the point too much, but I did want to raise the point. There is generally a good attitude among non-organic farmers about organic. However, if I go to a meeting in the country after some public statement has been made about organic products being much healthier than conventional products, it is all I will hear about: it sets them off. It has absolutely driven a wedge between organic and non-organic producers and I would just suggest that we have a dual structure rather than a dueling structure.

Finally, I believe, from what I see in Indiana, the thought of organic can sustain itself now. It has reached critical mass. I will tell you as traditional as I am, I have contemplated organic. On the 100 acres I live on, I have 60 in traditional corn and soybeans (rented out), 25 in woods, 5 in farmstead, and 10 in hay that my nephew has been making hay off of for the last four years. Last year, my nephew said, "You know, Uncle Kent, we could probably get a little more hay if we put some fertilizer on that." I said, "Yeah, Kyle, I know we probably could but we might want to do something else with that at some point. I am kind of toying with maybe doing something organic with that. So, just get what you can off that now." It is something I have been thinking about.

Again, I appreciate the opportunity to have been here with you and to have shared some of my thoughts.

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Options and Opportunities for Producers in Organic Agriculture

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I've been asked to talk a bit about options and opportunities for producers in organic agriculture. I'm going to start out by talking about the market first and work back to the farm and what the challenges are. I used to be a farmer, and I am still a farmer. I have about 3,000 organic chickens, raise about 4 acres of specialty crops, and have all my corn and small grains for my chickens at this time. But mostly I'm the CEO of Organic Valley.

Our cooperative is the CROPP Cooperative (the Cooperative Regions of Organic Producer Pools), started in 1988. The purpose of CROPP is to create and operate a marketing cooperative that promotes regional farm diversity and economic stability by the means of organic agricultural methods and the sale of certified organic products.

When we started we had no idea how we would succeed, and I think that really speaks to this conference. When we started, there were lots of farmers that needed infrastructure building out there, and so they asked us to help. Like the Minnesota farmers who said they wanted to do what we did, and we told them how we did it, and finally they said, "Why don't you just come over here and pick up our milk." So, we basically ended up becoming a national cooperative. We now have farmers in 22 states and it has been a phenomenal ride, and a wonderful experience to get to know farmers all over the country and see what organics has become for them.

Today we have farmers throughout the nation, and dairy is the bulk of our business. But we are a very diverse Co-op, and it is because farms have come to us. We are slowly growing our dairy pools in other regions to access both supply and markets with a more local approach. We have been in the meat business for about 5 years, and we are largely in the Midwest, but we are doing meat processing on the West Coast as well. We have an Egg Pool that is really doing well with eggs in the Midwest and the East Coast. And this all fits into our national marketing of the Organic Valley brand.

This year we are around $245 million in sales. We have been sustaining $30-50 million growth for the last 5 years. It has been a phenomenal experience to keep up with it all. And, our branded sales are about 70% of our business. Our brand is Organic Valley. Our product line — being from Wisconsin of course we have way too much cheese. We have tried to focus on the refrigerated dairy set, largely to have efficiency in the transportation, marketing, sales, and processing. We try to be focused, but again, we are driven by farmers. Milk is our main business overall, but our diversity fits not only the consumer demand but also helps balance supply and, a very important issue, utilization of all the ingredients and products.

Eggs are a very strong product as well. One of the things we have tried to do, because organic consumers are not only concerned about organic but also interested in supporting local agriculture, is have different milks that we label all over the country with a regional label so that farmers feel good about

selling their milk locally and consumers can feel good about supporting local agriculture.

We started a separate meat company, for several different reasons, and a separate brand. One of the things I will emphasize here is not all categories of organic agriculture are the same. When people say organic is growing 20% and anything works, that just isn't the case. Some categories are rather strong, some are weak, and some are underdeveloped. As a matter of fact, "organic" meat was illegal until October 2002. So, it has been very handicapped in its development and it is very, very small right now, probably one-tenth of one percent of meat sold. So, you hear a lot about meat, but it is still a category that is in development.

Behind all of this is a tremendous complexity of production plants. We are really a virtual business of sorts and this is where the interaction between us and the rest of the food system is so good, in that we utilize processing plants to process both conventional and organic. We manage over 70 processing plants and own one, and it is really a big difference to have that access.

The top organic categories start with produce followed by soy, milk, and yogurt. The growth rate really varies, but there are a couple of things I wanted to point out. One is the mass market is 59% of sales and the natural market is 41%. The market has changed tremendously in the last few years toward the mass market. Obviously there is a lot of market opportunity here. The mass market is just fueling a growth that no one ever dreamed about. Organic milk in some mass markets is now 5% of sales, and it is growing fast. In fact, we are holding back the market right now by lack of supply.

It is easy to think this is a big thing and that there is no bottom to it. But it is small enough that supply is a big deal. You can easily be oversupplied or undersupplied. Right now in dairy we are undersupplied. In eggs, last year it grew at 40%. But because of diet issues, the first six months of this year, eggs went flat as a pancake. A lot of producers had jumped in, but we had to depopulate some of the egg houses because the market dried up. And now it has taken off again. So it is a very small market and you have to be cautious. You have to have relationships in the marketplace, you have to know what you are going to do, and what your risk is for the markets. It is also the utilization. You have to use your butterfat and your skim. There is a lot to it.

There are a lot of limitations about why farmers do not go into organic. You have heard a lot of them today. The lack of infrastructure is a pretty major one. The lack of support, which I know a lot of people in this room are trying to counter. Presently you cannot even go to your extension agent. Although they are warm to organic, they have very little information to share. There is little outreach other than what is going on in the private world. And, of course, there is no better teacher than your fellow farmer and that is what really happens. People in organic go into it for one of two reasons. The first is personal choice. A lot of farmers just say "no more" to chemicals. The other reason is the economic incentive. And I refer my comments here to dairy — we heard that grains are a challenge for organic, but dairy is a natural fit for organic. You have rotation crops already, you have manure, and you have people on the farm already doing the work. It is also one of the lead categories for organic.

But as we heard, farmers also face criticism. We have neighbors that have been organic for 30 years and their brother next door farms conventionally, and he used to rub their nose in it. It isn't anything like it used to be. It used to be really bad. Organic is starting to gain a lot of respect, especially in the dairy world. Contrary to what was said, we actually have bankers seeking organic dairy farmers to finance because they know where they are at, and they know there is a stable price. That is a whole new paradigm.

But farmers are traditionalists. It is hard to change what you are doing and it is hard to change relationships. We have dairy farmers that could go organic now, but they are hard pressed to change their milk hauler or feed mills because it is based on the relationships. We come to them and say, throw all your traditional relationships away and work with us and that is hard for them. That is not the way they are. But people are also frustrated with farming not working — the need for off-farm income and the lack of income on farms. So a lot of farmers actually go organic as their last step — "if this doesn't work, I'm going to leave farming." It is better than quitting I would say.

However, there are problems. The lack of government programs is a real problem; the lack of loan deficiency payments as you rotate and diversify your crops is also a serious issue. Transition is a serious issue. It actually takes 5 years before you see top production, so that is not an easy time period to go through. There are ways to go through it on the dairy farm. With grain farms I think it is much harder. If you reduce your corn or soybean acreage, you get less money from the government. So, right away you are getting that whack. Then you have the potential of lower yields depending on how you go at it, because organic is more of an art form. A lot of farmers go at it by changing their inputs and not their thinking, and that is a formula for disaster. A lot of farmers will change for economic reasons but then a few years later figure out that they have to change their whole way of thinking. It is a big challenge. The last thing of course is the need for more paperwork — certification. There is nothing that a farmer hates more than another form to fill out.

So there are all kinds of challenges that stop farmers, but there are all kinds of reasons why they do it. I think the real reason farmers are doing it is because they are trying to find a way to make their farm go and to feel good about farming again, and to give their children an opportunity. Probably the most rewarding thing I see is the youth in organic are extremely excited about farming. Going back 20 years, farmers were telling their children, "I just don't want you to farm because I don't want you to go through what I went through." With organic farmers now, you just see youth really excited about farming and the generation changes. They are more assured by the economic stability they found and the enthusiasm. Because organic farmers are really "reborn" farmers – they have thrown away the yoke of someone telling them how to farm and opened up their eyes to how they should farm, what their place tells them is best to do. They are not throwbacks. They are using modern technology. It is a wonderful marriage. There is new machinery out there that isn't just traditional no-till. That has all been real rewarding for me to be a part of.

Economics is a big part of the reality of it. They are trying to find a way to overcome the $1.50 corn. The treadmill of pulling more and more yields to keep up with a falling price. So, it makes a big difference. Organic has to offer economic stability and economic opportunity. But it isn't a magic bullet. Farmers have to be cautious. I've seen a lot of farmers go into organic and they didn't have their marketing taken care of. I've seen a lot of them see how their neighbor did it and say, "Well that's great but I'm going to try it my way the first year," and then they found out that is not the way they should do it. You should find a success and follow it. Organic is also a way to have a greater connection to the marketplace, something farmers have an inherent need for. Organic is a phenomenal message from the marketplace going back to the farmer that we want to reward and honor you for what you do. There is a real satisfaction there for the farmer. The economics are there, but the satisfaction is very high and that is a major factor.

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A Brief Retrospective on the U.S. Organic Sector: 1997 and 2003

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Introduction

Organic products have shifted from being a lifestyle choice for a small share of consumers to being consumed at least occasionally by two-thirds of American consumers (5), consequently increasing opportunities for producers, handlers, and retailers of organic products. Along with the increased market opportunities, the production and distribution sides of the sector have taken on a new character. Formerly, organic foods were judged not only by taste, price, and appearance, but also by their social and environmental benefits. As the market has grown, consumers and businesses have developed broader reasons for purchasing and producing organic food.

Today's organic industry consists of new entrants — including most notably conventional supermarkets, manufacturers, and distributors — as well as long-time, established organic firms — including producers, natural foods stores, and distributors. Each group has a comparative advantage in the industry. Conventional firms have established, low cost ways of moving product along the supply chain. In many cases, they are building up knowledge of the organic sector by purchasing organic firms and their expertise. Long-time organic firms have extensive knowledge of organic products and how to access the natural products markets, and are learning to compete with and coexist with conventional firms new to the industry.

In this paper, we trace some of the changes in the organic sector by comparing the industry in 1997 and 2003, starting with consumers and moving back through the supply chain to the farm level. We conclude with a brief discussion of opportunities and obstacles to market growth in the organic sector.

The Organic Consumer

The portrait of the typical organic food consumer has changed over time, reflecting the dynamic nature of the organic industry. Just a few years ago, most studies characterized organic consumers as Caucasian, affluent, well-educated, and concerned about health and product quality (6,11,12). While this type of consumer still purchases organic food, consumers today are far more diverse and not as easily characterized. Income and ethnicity are no longer significant predictors: half of those who frequently buy organic food have incomes below $50,000, and African Americans, Asian Americans, and Hispanics purchase more organic products than Caucasians (4). In addition, the average age of organic consumers is clustered in two age groups: 18 to 29 years and 40 to 49 years (7,12). One element has remained constant as the industry grows: many consumers of organic food are parents of young children or infants.

Consumers have many reasons for buying organic food. While health motivations have remained constant over time, purchasing organic food because of environmental concerns has become less important to today's organic food consumer than to those from a decade ago. Analysis of responses to the 1997 Hartman survey and a 1994 study commissioned by the Food Alliance of Portland indicated that health and environmental issues were the most important factors organic-interested consumers considered when making decisions about purchasing organic food (1). More recently, consumers indicated that health and nutrition (66%), taste (38%), and food safety (30%) were the top three motivating factors behind organic food purchases, with the environment fourth (26%) (4).

Consumer interest in organic products rose rapidly between 1997 and 2003, resulting in total US retail sales increasing from $3.6 billion to $10.4 billion (9). The eight-year increase of 190% translates to an average annual growth rate of 24%. The top-selling category in both 1997 and 2003 was fruits and vegetables, which grew 166% from $1.6 billion to $4.3 billion, or an average annual increase of 21% (Tables 1a and 1b). Produce retail sales made up 46% of the value of all organic sales in 1997, declining slightly to 42% in 2003. While the same five categories dominate sales in 1997 and 2003, with the exception of produce, the ranking of categories changed as the value of retail sales of beverages grew 236% and of dairy increased 282%.

Table 1a. Top five organic product categories in 2003 (9).

Category	**Sales** ($ millions)	**Percentage of total sales**
Fruit and vegetables	4,336	42
Beverages	1,581	15
Dairy	1,385	13
Packaged/prepared	1,326	13
Breads and grains	966	9
Total organic sales	10,400	—

Table 1b. Top five organic product categories in 1997 (9).

Category	**Sales** ($ millions)	**Percentage of total sales**
Fruit and vegetables	1,642	46
Packaged/prepared	511	14
Beverages	471	13
Breads and grains	389	11
Dairy	362	10
Total organic sales	3,600	—

Organic Food Retailing and Distribution

Before the late 1990s, organic food was sold almost exclusively in natural product stores. This has been changing over the greater part of the last decade. In 2003, 47% of organic food sales took place in natural food stores, a decrease from 63% in 1998. The share of sales in conventional supermarkets has risen from 31 to 44% over the same time period. Direct sales and exports have also increased, from 6 to 9% (9,10). As organic products have become

more available in a wider range of venues, organic food has become accessible to more consumers. As a result, sales of organic products as a share of total food sales have grown from 0.8% in 1997 to 1.9% in 2003 (10), and annual new organic product introductions have nearly doubled from 290 to 536 new product introductions (14).

Some products are sold mostly in conventional stores, while others are marketed primarily in natural products stores. For example, in 2003, conventional stores dominated the following categories: nondairy beverages (86% of all organic sales); packaged fresh produce (75% of all organic sales); baby food (74% of all organic sales); and milk, half and half, and cream (74% of all organic sales). Many of these products are manufactured and distributed by conventional firms that have acquired a successful independent organic company; these firms possess extensive distribution networks, allowing easy access to conventional supermarkets. The natural food stores sold more organic meats (96%), candy and individual snacks (81%), organic baked goods (65% of all organic sales), organic soup (60% of all organic sales), and yogurt and kefir (59% of all organic sales) (8). Many of these products are produced and distributed by independent organic firms.

Interestingly, products dominant in the conventional market are those referred to as "gateway" products, or the first organic products purchased by consumers. Organic gateway products, which include produce, dairy, nondairy (soy), and baby food products, are considered important frontline commodities for the industry that steer consumers toward other organic products, such as cereals, snacks, and meat and poultry, many of which are dominate in natural food stores. The focus on gateway products in conventional markets indicates that firms are concentrating on new organic consumers at these retail outlets, while natural product stores seem to be catering to long-time organic consumers.

Certified Organic Acreage

Rapid growth at the farm level is also observable between 1997 and 2003, although the growth is slower than on the demand side. Overall, certified US organic cropland increased from 850,000 acres in 1997 to 1.45 million acres in 2003, while certified organic pastureland increased from 496,000 acres to approximately 745,000 million acres over the same period. The total acreage increase from 1.36 million acres in 1997 to 2.2 million acres in 2003 represents a 10% annual growth rate over the six years. Growth is also evident in the livestock sector. The number of certified organic dairy cows increased from almost 13,000 in 1997 to almost 75,000 in 2003 and beef cows from 4,000 to 27,000. Broilers also experienced a considerable increase during this period, from 38,000 in 1997 to over 6.3 million birds in 2003 while layer hens rose from almost 540,000 to almost 1.6 million hens (15).

In addition to the domestic supply increases, imports of organic products in 2002 were an estimated $1 to 1.5 billion. At the same time, exports of US grown organic products were an estimated $125 to 250 million (16). A key imported category is fresh produce in the winter, paralleling an established trend in the conventional sector. However, imports also consist of raw ingredients used for manufacturing. The high level of imports relative to the total size of the market may suggest that increases in certified organic farmland may not be keeping pace with growth in domestic demand.

Growing Pains: Market Opportunities and Obstacles

Over the past decade, as the sector has evolved, a natural tension has emerged between established organic industry members and new entrants, most notably conventional firms. At the core of this friction is a concern whether the essence of "organic" can be maintained as the industry expands,

firms grow larger, and conventional agricultural companies enter the sector. Primary research has shed some light on industry concerns about the changing nature of the organic sector at the farm and intermediary levels.

Long-time organic farmers, speaking in focus groups, indicated that the industry is experiencing growing pains as a result of rapid market expansion (3). Competition from new market entrants was an issue highlighted by all organic farmers in the focus groups. Small organic farmers feel increasing competition from larger operations able to provide retailers with large volumes of production, thus reducing small farmer access to retail markets. Some farmers feel threatened by the approach taken by new entrants to organic production and marketing. Others indicated that price premiums have become less stable and are decreasing in some cases, and that long-time markets can disappear quickly. Supermarket chains, according to some farmers, appear disinterested in selling locally-grown organic food.

Intermediaries (or organic handlers) in the organic chain have also expressed similar concerns. Approximately 25 organic industry stakeholders, representing certifiers, producers, and processors, attending a 2004 workshop at the Economic Research Service of the US Department of Agriculture, voiced concern about the direction of organic industry growth, echoing the sentiments expressed by farmers in the focus groups. Many of their comments focused on whether organic handlers and retailers work with large or small suppliers, promotion of organic foods, local versus national procurement and distribution, and company philosophies.

Differences are also apparent in the recent dialogue around the 2005 ruling in the case Harvey v. Johanns (formerly Harvey v. Veneman) [Docket No. 04-1379 (1st Cir. 2005), amended at 396 F.3d 28 (1st Cir. 2005)], which found that multiple provisions of the National Organic Program Final Rule, 7 C.F.R. Pt. 205, are inconsistent with the Organic Foods Production Act of 1990. A portion of the ruling refers to USDA's allowing the use of 38 synthetic substances in manufactured food products labeled as organic. Following the court ruling, the National Organic Program (NOP) could no longer allow most of these substances. Harvey had asked that there be a two-year phase-in of the ruling so that manufacturing of organic products not be disrupted. However, amendments were made to the NOP legislation in the FY2006 Appropriations Act that allow the use of synthetic ingredients in products labeled organic if they are listed on the National List (2). Many long-time organic firms and farmers, as well as consumers, see this as a weakening of the organic standards (13). Debate is likely to continue on these and other related issues.

Although there is a tension between new and old organic industry members, each has a comparative advantage in the industry. Conventional firms have established, low-cost ways of moving product along the supply chain. In many cases, they are building up knowledge of the organic sector by purchasing organic firms and their expertise. However, these businesses also face challenges. Many of the leading organic brands have now been acquired and relatively few independent brands of size remain. Conventional firms will most likely need to focus on internal development of their organic businesses to expand (9). In addition, the lack of expertise in organic products on the part of these conventional firms, and the high transaction costs for larger firms to distribute niche organic products will, for now, probably slow their involvement in organic food (9). Long time organic firms, on the other hand, have extensive knowledge of organic products and how to access the natural products markets, and are learning to compete with and coexist with conventional firms new to the industry. However, access to conventional markets is a significant challenge.

Many of the concerns outlined are the opinions of those firmly entrenched in the organic industry, who may feel the most threatened by the market's changing character. Their uncertainty about the future of the

industry as a whole, and the future of their business, is understandable: it would appear that the industry is at a crossroads, and like anything in a state of flux, accurately predicting the sector's future form is not possible. One possible outcome, however, is that organic and natural products retail markets will coexist with conventional outlets but serve different customers. They may rely on different distribution networks or rely on the same distribution networks. Regardless of how the two streams mix, the supply and distribution of organic products is crucial to the success of the organic sector. A better understanding of the organic industry supply chain, paying careful attention to opportunities and obstacles for different size organic businesses, including farms, intermediaries, and retailers, and both new entrants and long-time participants, could help ease the industry's growing pains.

The views expressed in this article are the those of the authors and not of the Economic Research Service.

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Opportunities and Challenges for Organic from the Retailing Perspective

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This is an unusual place for me to be speaking. I spend a lot of time talking to growers, shippers, and processors about the opportunities they have to expand their markets and improve some of their returns by planting and cultivating organically. Today, I want to speak about the opportunities and challenges we have in the market. I will cover sales and consumption trends, supply and availability of organic items, opportunities for organic produce, challenges to the industry, and the taste "revolution."

As retailers, we have a good-guy, bad-guy image. Coming from the natural and organic channel of retailing, I hope that we are the guys in the white hats most of the time. I grew up on a family farm in northern Colorado on the Platte River. I remember my father and uncle worrying each year about what they were going to grow on their farm. What to grow has always been a big challenge for growers. I believe, as a retailer, we have a responsibility to give them a market.

First, I want to talk a bit about Wild Oats. Wild Oats has been around since 1987. We have 115 stores across the country, scattered all around, but none in Washington, DC. We really do not have any saturation except in Colorado and California. That is not a great thing from the distribution standpoint. We are starting to build larger stores now. We have a lot of stores around that are 10,000 to 12,000 square feet. The new prototype being built is 25,000 square feet, still about half the size of a conventional supermarket.

Wild Oats has always been a believer in a lifestyle: we sell a natural and organic lifestyle. I want to take you on a tour around the store with my powerpoint slides. One of the first places a consumer walks into in one of our stores is the fresh produce department. We try to carry a wide variety of product in the produce section, about 325 fresh items and many varieties. Of those, 70% are organic. I have been asked many times why that number isn't higher. We used to have a higher percentage of organic — around 80 to 85% — but we also had gaps in supply at the time. We would have an item for a while, and then we wouldn't. It is very hard for consumers to get used to their buying habits when you have an item in and out all of the time. During the summer, some of our stores run up to 90% with the use of local growers.

We decided to go with the presentation method of bulk display at Wild Oats. We frequently get asked why we don't do more packaging of produce like some of our competitors. We found, however, that every time we try to sell more packaged produce, customers have a number of concerns. One is economic, and the other is ecological in that they don't like the wrapped product and the resources that go into things like plastic. They also want to make their own selection. They want the farmers' market appeal where they can grab what they want.

Organic floral was mentioned earlier. We do sell some organic items in the floral department. We also sell reduced pesticide items from the United

States, and from overseas from people working to improve the overall health and welfare of those harvesting the items, especially in Columbia and Central America. We also work with small growers who are local and organic.

In the seafood section, we are now using organically-farmed salmon. We also buy shellfish produced without additives or phosphates, methods prevalent in the conventional sector. Also, very important to the seafood people are the line- and naturally-caught ocean and salmon fish that we buy. In the meat section, this is where the conventional stores can't or don't have the where-with-all to compete. They no longer have the labor to service the meat counter, which goes back to what we said in produce in that people want to select what they want to buy. The meat section has both meat products, like chicken and beef, and prepared products such as stuffed pork chops. The products are "natural," some are organic, but the largest sales are with meat that has been produced without artificial hormones or antibiotics.

The dairy section is the biggest area in which organic is making inroads in stores because it is so easy to integrate. For instance, these containers are no different than ones that might have the brand name Lucerne on them. You can find Horizon in conventional stores now. But what you won't find there are private-label organic. Whole Foods, Wild Oats, and a lot of the natural and organic channel retailers are going to private labels in dairy to distinguish themselves, as well as other products to supplement those: juices and yogurts, for instance. The dairy section in Wild Oats is probably one of the most conventional looking parts of the store.

The bulk section of the store is something that the conventional stores have abandoned. For Wild Oats, however, it is a very big deal because the consumer we service and the new consumers coming into our stores enjoy shopping for the spices and bulk nuts and everything else that is in the bulk section from the grains, to the oats and flours. Bulk is disappearing from almost all conventional stores, but is very popular in our stores.

Cheese is a huge department as well at Wild Oats. We have organic and "natural" cheeses and also artisan cheeses from the across the globe to appeal not only the organic customer, but to the more "foodie" types. We also have an olive bar in this section with some organic olives. The bakery section is another section that uses organic products (organic flour) and focuses on Old World recipes.

One of the fastest growing areas in all stores is food service. Our food service area is a little different than most. You are going to see a large selection of salads made from organic ingredients, from the chicken salad to the organic barbeque tempeh salad. Again, sometimes it is "natural" chicken, and sometimes it is organic. Other parts of the food service section include organic pizzas, sushi bar, dessert bar, and the salad bar. A lot of conventional stores are abandoning salad bars but it is a huge thing for us. One of the primary contacts we have with the occasional consumer is the organic salad bar.

The other part of the natural and organic grocer is the "holistic health" section. This has been called a number of things over the years but it is the section with vitamins and supplements.

Last but not least, the standard grocery place in the middle of the store. This really gives the look of conventionality to the store. However, if you walk down the chip isle, I can guarantee that you won't find Frito Lay. This area includes the frozen section, which is a lot smaller than what you are used to in the conventional sector mainly because of the variety that we carry in there.

Mentioned earlier was the issue of fair trade. This is one of the signatures of Wild Oats over the last few years. We carry fair trade coffee and tea. We also now buy, as often as we can, fair trade bananas, pineapples, and mangoes. We do have some supply issues there from time to time still.

I want to talk a bit about retail sales of organic: sales are estimated to double between 2002 ($15 billion) and 2007 (over $30 billion). This is just a tremendous amount of growth, and this amount of growth is not being seen anywhere else in the food industry except maybe with some occasional items. And I don't see any reason why it won't continue to have strong growth into the future. You look at the trends in the organic and natural retail sector versus those in the conventional sector, and we see 60% growth over the next 5 years versus 2.5 to 3% in the conventional sector.

In produce, the growth trend is very similar, but maybe a bit steeper climb. This growth is primarily facilitated by the fact that bigger companies are introducing organic items. This is also where we are seeing the growth in availability and the increase in people trying organic. Back in 1990, only 15% of people tried organic. In the last survey I saw in 2004, almost 60% tried organic at least once in the last month. The message is getting out there.

We did an "Organic Produce Availability" chart to find out the percent of supply in different months of the year in the stores so that we could show growers where some of the opportunities are, especially for those in southern areas like Arizona, Florida, and then also California. As many of us know, during the winter months we do not have enough organic production. During the summer, it is really easy to get the supply and what we do then is focus on local growers, to give that store in say Ohio that local feeling. I also show growers more specific charts on products such as green bell peppers, tomatoes, and cucumbers – three of the items in shortest supply almost all year-round. Again, there are some excellent opportunities for growers in Florida, Arizona, California, and even Texas.

Finally, I want to also talk about the challenges to the industry. These include:

1. Regulations and requirements. The county of origin labeling, which Wild Oats has already complied with, but will leave some problems out there, especially for the growers because the retailers are going to shove the identity down that low. Procedures for displaying organic are additional issues. Insurance is a big problem for the small growers; they cannot come to us without insurance, especially in terms of food safety. What we are doing is working with the Farm Bureau to put together a blanket policy for 6 to 8 growers to participate so we can use those growers.
2. Traceability. Traceability is a major issue, and one that the industry is worried about. I know the FDA wants to be able to trace the food should there be a food safety problem. That requires records on our part and on the part of the growers, and this represents an added burden.
3. Supply of product, which has been talked about, is also a concern. We need to get additional sources of supply, especially during the winter, so that we can continue the growth in organic.
4. Transportation is going to become a critical challenge. Most of the small retailers, like Wild Oats, don't own trucks. So, the issue is both the availability of trucks and the cost of fuel. The recent changes in the cost of fuel have been scary. Another component of that is that the trucking industry says in the next 6 years, half of their drivers will retire.
5. "Modified" products — GMOs — are also a challenge. We are going to have problems with this, especially in our industry as we try to make sure that consumers don't worry about modified products and organic food.

6. Consumer product and industry knowledge is also a challenge. On the retail end, because the cost of goods and of growing organic food is higher, we have a problem with sticker shock. Produce is not so bad, but meat and some of the other goods are. So, we have to look at consumer education and talk about the benefits of organic food. This is a huge challenge for us.

The last thing I want to touch on is taste. In the past, we have taught people to buy with their eyes and look at appearance. People want pretty. But, this is changing; most of the dollars that are going into regular breeding programs are for developing better tasting items. Recent studies by Food Marketing Institute on consumer preference have shown a change. Even six years ago, quality and appearance of the food were ranked higher than taste by consumers. Now, taste is the most important. Although the standard for organic is that it takes longer to mature in the field, but especially in the fruit, the taste is better than the conventional.

The key thing to remember is that with the demand for organic produce continuing, we are going to depend a lot on growers to get behind it and give us what we need to continue the growth. Because demand is going to be there. More people will continue to see they need to eat better and smarter. The kids we raise are more exposed to it and will continue the trend.

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Civic Markets: Alternative Value Chain Governance as Civic Engagement

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Introduction

Both conventional and organic farmers face an increasingly challenging marketing environment. The commodity-based marketing system of the past generally presented farmers with the choice of a few stable market outlets. Today, however, markets have become more diverse, fragmented into market "niches." As a result, farmers are finding that — on top of all their other hats — they need to become market strategists. Even the organic market niche is fragmenting into several sub-niches. Understanding how markets work has become as important to organic farmers as understanding soil fertility. Meanwhile, the challenge is growing; the growth of large-scale industrial organic agriculture has left smaller farmers with diminishing access to the major mainstream markets, since supermarkets prefer to deal with larger firms (24,36,43). In other words, even though the market for organic food may be expanding, smaller organic farmers are increasingly unable to gain access to the mainstream buyers that represent an increasingly large portion of the growing market.

Some of these farmers are therefore turning to alternative markets. Direct marketing, farmers markets, Community Supported Agriculture (CSAs), etc., are frequently mentioned as marketing alternatives. More recently, localized and ethical or "fair-trade" markets have also emerged as potential alternatives. While these markets do not always involve organically-grown commodities, they are often main channels for smaller-scale organic production. As alternative markets expand, they have become a key factor in organic farmer marketing strategy — as well as for extension officials and others interested in rural economic development marketing assistance programs — to increase smaller and mid-sized farm income (12). Yet, these alternative markets are particularly diverse and the dynamics of these markets are poorly understood. Consequently, those seeking new organic marketing outlets need to have a clear answer to the question, "What makes organic markets work?"

Many see markets as "free," as private and non-social, moving buyers and sellers away from bureaucracy and regulation. From the free-market perspective, consumers and producers emerge from their own private worlds to meet, one-on-one, in the market. However, finding a new market is more than discovering a consumer looking for a new kind of cheese or carrot. Also, in most cases, farmers cannot just show up at a farmers' market with crates of produce. Even such straightforward buyer-seller arrangements are codified by rules concerning who can participate in the market and what sort of practices they can undertake. These rules are created through dynamic processes of social interaction without which a market simply cannot exist (21).

Social scientists have begun to study the socially-interactive rulemaking around markets which they refer to as market "governance."

There are a number of social scientists who study organic and alternative market governance, and their work can be useful to farmers looking to expand these markets. This paper will provide an overview of this research as it might contribute to a better understanding of alternative markets in organic agriculture. To provide real-life examples, the discussion will include illustrations from the author's own personal experience observing the creation of alternative market governance structures (Endnote 1). The article will also highlight some areas of alternative market governance in need of more substantial and rigorous research.

The Nature of Governance

According to John Humphrey and Hubert Schmitz of Britain's Institute of Development Studies, governance is "the inter-firm relationships and institutional mechanisms through which non-market co-ordination of activities in the [marketing] chain is achieved" (29). In other words, "market" here does not necessarily mean just buyers and sellers, it also means a network of other actors that affect the exchange of commodities along the value chain, including government (both as regulators and as rural development policymakers), NGOs, business and citizens lobbying groups, and consumers, organized or not. Also, "governance" according to their definition involves both structure (the rules) and process (the ways in which these rules are determined through relationships and social coordination). Therefore, this overview of alternative market governance will include both a consideration of rules and of the social interactions necessary for the creation of these rules.

Needless to say, the actors that get to formulate the rules are often those with the greatest amount of power in the network. Humphrey and Schmitz (29) and Kaplinsky and Morris (31) discuss the types of control or power that large buyers have over the system, which enable these actors to gain most of the value (profit) from the system. These authors describe the many transactions between buyers and sellers as a market "chain." Much of their research focuses specifically on what they call the "value chain": how actors gain more or less of a commodity's value, or profit, based on the amount of power they exercise over the market chain. In particular, many of these studies note the increasing supermarket control of food purchasing in conventional value chains, which enables these actors to have increasing control over profits. For example, ten large food retailers are responsible for half of all food sold in the United States today, and these large economic actors are increasingly calling the shots in the purchase of fresh produce (30). Value-chain studies, therefore, look at the ways in which some actors "call the shots" in the formulation of mainstream market governance, generally with negative consequences for smaller, less powerful actors in the chain.

Rural development programs seeking to preserve small-scale agriculture often try to counteract these trends. One effort has involved trying to provide an amount of countervailing power to less powerful actors in the mainstream value chain, particularly farmers and consumers. This is probably most prominent in European Union rural development policy (15,17,38). In some cases, the efforts have been to enable small third-world farmers to gain access to EU markets (15,38). In other cases, policymakers are interested in protecting artisanal and territorially-based specialty food producers (6,7,38). For example, officials may work with smaller farmers to help them negotiate their access to supermarkets as an outlet for their production.

However, the most prominent approach has been to focus on the development of alternative market niches, helping smaller farmers develop strategies to make these markets work for them. In general, the idea is to create new "value chains" in which actors (both consumers and producers)

who have less power in mainstream value chains are able to gain more power and therefore gain more of what they want from their food system, whether that be greater income, better food quality, or protection of the environment. To fulfill these mandates, alternative value chains must formulate and follow different market governance rules.

Social scientists studying these alternative markets — such as organic, fair-trade, or local markets — have all come to one major conclusion: these markets are more "civic" in nature than mainstream markets. In other words, the vitality and growth of these markets depends heavily on democratic engagement, dynamic and interactive public conversations that are more social and more public (8,27,34,46), what Lyson calls "civic agriculture." If one looks at the history of the national organic agriculture rules from a market governance perspective, one can see this public conversation taking place (46). I call these more democratically-engaged forms of market governance "civic markets." Civic markets are the creations of public engagement over the way commodities are made and sold, in which "supply" and "demand" are the mutually-constituted product of these conversations.

The idea that civic engagement is a part of market governance combines two major sociological perspectives. First are the ideas prominently put forth by sociologists Robert Putnam (41) and Robert Bellah (9) that democratic societies cannot thrive without active and organized civic engagement. Second is the research of social scientists who have shown that markets are "embedded," creations of their particular social and political context (21). The creation of market governance rules is therefore a social activity. Social scientists talk about a "public sphere," a social arena in which people discuss possible social rules, including market rules, and implement them.

What studies of alternative markets have found is that these markets are even more civically engaged, more socially embedded, than mainstream markets. In these markets, there tends to be an ongoing — and never finished — public conversation about who wins and who loses from that market's particular governance structure. This does not mean that these markets are intrinsically "fair" or equitable. For example, Raynolds has shown that organic farmers in the less-developed world are often faced with organic rules they had no role in creating (42). However, the question of fairness, equality, or social justice, while often seemingly invisible at any one moment (4), tends to re-emerge with marked regularity, whether in terms of public engagement with the institution of the National Organic Rules (46), the more recent National Organic Rule controversies over the Harvey Decision, or even more specific struggles over who gets defined as "local" in a local farmers' market. Social scientists have tended to look at these struggles from a social justice perspective, asking whether the results of these civic conversations lead to more fair and equitable governance structures.

What do these questions about fairness have to do with farmers seeking alternative market outlets? From the civic markets perspective, the answer is "a lot." Consumers participate specifically in fair-trade markets because they perceive them to be more fair. This is also often the case with local and other alternative markets, to the extent that people are participating as buyers in these markets in order to consume responsibly. However, even if consumers are only concerned about more personal issues such as health and taste, they are participating in alternative markets because they trust farmers are "dealing straight" with them on these issues. If the fairness of these markets becomes suspect, the future of the market itself also comes under question. Conversely, as consumers gain confidence in the fairness of alternative markets, it is more likely that these markets will expand and support a greater number of smaller-scale farmers. Therefore, questions of fairness have already and will continue to come to the fore in these markets,

whether farmers like it or not. Even more importantly, how actors in these alternative value chains deal with these questions of fairness will have a lot to do with the continued growth and vitality of these markets. Therefore, farmers who participate in these markets will thrive to the extent that they are willing to engage in these civic conversations. Farmers seeking to build new market links to consumers would do best to consider the possibility of doing so in a civically-engaged way. Interaction with consumers through food policy councils, described below, is one method of expanding markets through civic interaction.

In other words, civic engagement has been part and parcel of the creation of markets in general and alternative markets in particular. An additional implication here is that a number of potential new alternative markets — such as the new movement for farmers to sell to local school cafeterias ("farm-to-school") — can come out of civic processes and can be part of initiatives to expand markets for organic farmers. However, there has been very little research looking closely at the ways in which sellers and buyers engage in a public conversation about the rules around organic markets. One possible arena of future research into understanding the civic aspects of alternative agricultural markets is to take a look at water and electricity markets, where the rules of transaction are set through public processes that are participatory and which have been widely studied (25,40).

New forms of private market contracting have also arisen, making farmers become producers of custom products for particular purchasers. These are basically private contract systems tend to be arranged on a bilateral, one-on-one basis. The term "civic markets," on the other hand, describes the more public forms of exchange in which the rules are transparent and are generally open and negotiable by a larger group of buyers and sellers. From this perspective, it is possible to see that each civic market has its own form of governance; that is, each follows a distinct set of rules, including rules for public deliberation. Each kind of market governance has its own civic dynamic.

Social scientists are just beginning to study what makes alternative markets thrive and grow. A major challenge to alternative markets is managing their co-existence with mainstream markets. Government regulation of mainstream markets, particularly those protective of sanitation, often apply to alternative markets as well and can make it difficult for alternative markets to remain competitive. In my own work on the industrialization of dairy agriculture, I looked at the role of sanitation and other regulations in the decline of more artisanal forms of dairying in the United States. This continues to be true for raw milk, artisanal cheeses, and other highly perishable products. This research indicates that there needs to be a larger civic conversation about how we keep food safe while giving artisanal enterprises the opportunity to survive and grow.

What I also found was that dairy market governance systems had a strong influence on how farmers were able to use their land resources. In particular, milk marketing orders and land-use regulations worked against the sustainability of pasture-based dairying (13,16). On the other hand, recent research on the rise of artisanal dairying in California shows that (civically-derived) local environmental regulations conserving open space have recently facilitated the growth of pasture-based, artisanal dairies in those localities (23). Different market governance structures may support different agro-ecological practices, making the environment part of the public conversation about market governance, even when markets are not explicitly designed to meet environmental goals.

A further challenge from mainstream markets is the entry of mainstream buyers into markets for alternative products. While the expansion of demand for organic products from mainstream buyers is often welcome, it

can also threaten the continuation of alternative market chains. For example, work by British researchers Sonnino and Marsden shows that the entry of large food retail companies as buyers of organic production has had a negative impact on alternative marketing channels (45). Maintaining the civically-engaged aspect of alternative market governance processes could hold the key to their survival despite aggressive mainstream market competition.

The rest of this paper will review the social science literature that discusses a number of current alternative markets, including organic markets, and talk a bit about the governance structures of these markets. This overview will also indicate areas where more research about governance structures may provide insight into processes that increase trust and thereby strengthen alternative markets.

CSAs

Most of the rules around CSA membership are based on a private contract between two parties. However, these contracts often involve rules of behavior that affect the entire membership of the CSA. Those rules are often set by the grower or informally between the grower and the members of the CSA. In addition, according to the report "CSAs Across the Nation," 28% of all CSAs have a kind of governing board, generally called a Core Group (33). In other words, some CSAs are more "consumer-driven" while others are more "producer-driven" (37).

Whether CSA control lies primarily with consumers or with the farmer, the survival of the CSA depends not just on the writing of a check, but also on the creation and following of formal and informal rules. Some of these rules are part of a strict contract between the member and the farmer. Others tend be more informal group expectations. For example, according the CSA report mentioned above, more than three-quarters of all CSAs put together events that go beyond the provision of produce, such as festival days for members, tours, etc. Festivals are generally not part of CSA contracts. However, I can tell you from my own experience that if the farmer of my CSA in New York cancelled her strawberry festival without explanation, she would get an earful from her members.

More formal rules often involve things like whether or not a member is expected to put in labor hours on the farm or at the pickup points. There are also often specific rules of behavior for members at pickup points, in terms of maintaining cleanliness, controlling noise, and other things such as the ability to trade-off unwanted produce with others. In addition, approximately half of the CSAs have a subsidized share program so that low-income families can participate as members (33).

Member-farmer commitments to acquire land have also been a part of CSA governance in some cases. Because access to quality land is difficult and costly in many places, some CSAs have become increasingly involved in gaining access to land for the CSA farmer, and sometimes sharing in land costs. These "equity-based" CSAs involve, obviously, another layer of rules of behavior between the consumer-landowners and the farmer (33).

Consumer-driven CSAs usually have core groups actively involved in farm budget decisions, including farmer salary. In these governance structures, the annual membership fee pays the farmer a collectively-determined specific salary over the costs of growing. However, having participated in a core group of a CSA, I am very much aware, as long-time organic observer-journalist Steve McFadden notes, "if a core group has a say in the farm, the farmers can feel their lives are more complicated" (37). Exactly what fee would maintain membership at what adequate farmer salary was a constant source of worry in my core group. I still marvel that many farmers remain committed to CSAs, despite the poor income and benefits.

Clearly, health care and the need for a secure retirement are issues that CSA farmers want to address with members but often can't.

In these various cases, decision-making, especially in subscription CSAs, is often by "exit or voice" (29). In other words, members "vote with their feet" and leave the CSA or they choose to stay and voice their concerns and hope the farmer listens. Farmers, in turn, if they cannot achieve their goals of health or income security, or have other management issues with members, also shut down their farms or move to other types of farm markets (37). In addition, numerous smaller issues are a constant topic in newsletters (written by farmers or by core group members), with or without various forms of sanction ("please remember to ... or we may no longer be welcome here as a pickup point next year").

More information needs to be collected on exactly how CSAs create and implement governance structures. The issue of whether or not to have a core group, and the extent to which that group has decision-making ability, continues to be a topic of conversation in relation to CSA governance (37).

Farmers' Markets and Farm Stands

On the Central Coast of California, where I now live, the turn to local markets is a mantra among small organic farmers who tell us they are losing access to larger mainstream outlets. It's important to note that market strategy in California has historically been oriented to out-of-state export. The organic sector has been no exception, even for smaller farmers. However, even mid-sized organic farmers in California speak of increasing difficulty finding mainstream market outlets. In many cases, these farmers are seeking access to local farmers markets (or are starting additional CSAs). In Santa Cruz County there are now nearly a dozen farmers markets. Yet, those additional local farmers now turning to home markets often find that local outlets are already at a saturation point.

On the other hand, in many other places, farmers' markets are looking for farmer participants to create the critical mass necessary to attract consumers. In these cases, the challenge is to attract and keep farmers. Needless to say, the governance issues in "thin" vs. saturated markets are very different and governing boards face significantly different issues under these two scenarios. However, except for one very good practical survey by the National AgLaw Center (26), farmers' market governance issues have not been heavily researched and are generally not well understood. This is a potentially very rich field of study. In part, the richness comes from the sheer variety of rules set by municipalities, business associations, etc., around farmers' market governance. For example, some markets have rules about how far away a farm can be from the market (another issue to be addressed in the market localization section) and what can be sold. Others certify whether or not the farmers produce all the products they sell in the markets. Organic-only farmers' markets rely primarily on a farm's organic certification for compliance with organic rules, but may certify the farm's "producer-only" status. Unlike CSAs, most larger farmers' markets have governing boards, which can be made up of farmers, consumers, local business members and others. However, there has been no comprehensive survey of these practices (10,26).

The National AgLaw Center report on farmers' markets gives us the most comprehensive view of these organizations to date (26). The report shows that who controls farmers' market rules and rule-setting processes differs from one market to the next. Farm market "owners" include farmers, non-profits, chambers of commerce, states and municipalities, and others. Also, "some markets are dictatorships and some are democracies" depending on the governance structure of a particular farmers' market. More research

needs to be done on how more or less democratic farmers' market governance structures deal with controversy and change.

In places with many well-established farmers' markets with a stable pool of farmers, new entrants can find it difficult to get space (26). Farmers' market governance structure in saturated markets often limits access to additional entrants, especially those who wish to sell the same produce sold by other farmers in the market. This can result in the rise of less formally-organized farmers' markets. For example, here in Santa Cruz, over and above our two Saturday morning state-certified markets, we also have an informal downtown market that is more of a hodgepodge of food, crafts and community activities. We also had for a few years what was sometimes referred to as the "guerilla" farmers market which set itself up outside of one of the local bakeries. The issue of access to farmers' market spaces will continue to be a contentious issue; however, according to the National AgLaw Center report, "market associations can benefit from talking openly about the issues" (26).

The number of direct-marketing farm stands has also risen in my region, particularly along Central Coast Route 1, which has a great deal of tourist traffic. The governance structure of these farm stands is probably the closest to "Wild West" standards. Hand-painted signs on the highway make claims about organic or "no spray" fruits and vegetables, although evidence of certification of claims is often slim. The general governance system appears to be "let the buyer beware." However, farm stands do fall under direct marketing regulations, which can be either state or county regulations. These stands can also be under various rules about zoning, sanitation, and other city rules that apply to local businesses.

My current work aims to fill out the picture of farmers' market governance by examining the ways in which farmers' markets create and maintain governance structures and processes that deal with issues pertinent to these markets. I hope to examine both communities with saturated markets as well as those with thin markets, to understand how governance structures differ in these two situations.

Farmers' markets, like CSAs, are a form of food system relocalization and the section on relocalization will continue the discussion of farmers' markets.

Fair Trade and other Ethical Marketing

Even though fair trade represents only a small fraction of global commodity chains, it is the arena in which civic markets are developing most intensively, both in terms of determining standards fairness and the fairness of processes by which those standards are set. The last ten years has seen the publication of some excellent social science research on fair trade markets (5,17,19,38,42,43,44). This work can contribute to the understanding alternative governance structures as civic processes.

Fair trade markets generally develop their own unique market governance structures. Because "fairness" is the prevailing idea behind these markets, civic engagement is generally part of the process. Who decides and who benefits from a fair trade market, however, differs from one system to the next. In many cases, consumers determine what the rules of fairness will be, and then work with farmers who are willing to work within those rules. However, as recent studies by the authors listed above have shown, a "fair" market is not easy to define and is therefore generally a constant topic of public conversation among actors in the market chain. Once again, actors participate through both "voice" and "exit" strategies; they either try to make a system that does not work for them more "fair" or they leave the chain and participate in other markets.

Much of the research in this area has focused on whether fair trade actually "helps" farmers. Issues of market governance are only beginning to come to the fore, particularly in relation to coffee markets. markets. The website of the Center for Fair and Alternative Trade Studies at Colorado State University has a wealth of information on this topic.

Relocalization Strategies and Local Food Policy Groups

Food Policy Councils (FPCs) have been the main institutional umbrella under which relocalization projects have taken place. FPCs vary greatly in their formal structure (sometimes being less of a "council" and more of a "working group") as well as in their activities from one place to the next. They can be organized by state, county, or city (or sometimes all three). In many cases, however, FPCs have taken as a main mission the provision of local food to consumers through the expansion of markets for local farmers (49). Sometimes this involves initiating new farmers' markets in underserved areas, starting or assisting "Farm-to-School Programs" in which farmers provide produce directly to school cafeterias (2), outreach and education, and other projects.

For example, my local Upstate New York FPC helped to start an extremely successful farmers' market in an underserved community (Troy, NY). The group also published a widely-used directory of local farmers. We put on events that advertised CSAs, such as "sign-up days" that supported the farmer and other CSA farmers in the area. We also established a yearly "Harvest Dinner" that showcased the produce of local farms and (more recently) local chefs. There were never any formal rules that we were to take on these responsibilities, but the FPC's activities did reflect informal rules of trust and mutual farmer-consumer acceptance of responsibility for creating the social interactions and engagements that maintained and expanded alternative markets in the region.

Relocalization efforts include the "Buy Fresh, Buy Local" advertising campaign, which has put a single "face" on the marketing of local food as a way to grow markets for local produce. Despite its national organizational status, "Buy Fresh, Buy Local" works in partnership with local FPCs or other relocalization groups (3). While not confined to organic markets, in many cases local organic farmers are featured in these campaigns.

As these examples show, FPCs are often involved in alternative market expansion activities through relocalization projects. Consumer movements concerned about the problems of the mainstream food system — obesity, decline of family farms/rise of industrial agriculture, environmental and landscape issues, etc. — often see relocalization as a way to deal with some of these problems. Social scientists are currently involved in a very intense debate about relocalization as a way to resolve concerns about the food system. Some are optimistic about the power of relocalization to create a new food system (e.g., 8,27,34). Others have been more questioning about equating "local" with "fair" (1,2,4,14,15,29,48).

Conclusion: Creating Reflexive Governance Structures

As this overview demonstrates, how alternative market governance issues get resolved will have a significant effect on the future vitality and growth of organic markets. While this discussion has brought up many more questions than answers, existing social science research leads to some tentative conclusions. First, the social context that embeds alternative markets is very important and more attention needs to be paid to the civic interactions around organic markets to understand how and when civic processes and governance structures help or hinder organic market growth.
Secondly, fairness is an important issue in the creation of civic market

governance structures. If people think governance is unfair, they may exit the system.

One of the most important unresolved questions involving fairness in alternative market governance is the definition of the term that separates the alternative from the mainstream market, such as "organic," "fair-trade," or "local." Let's take the definition of local as an example. As my work on milk market orders indicates, the definition of which farmers are in and which are out of the local market "milkshed" has been intensely political. Historically, people have vigorously defended their right to sell into city milk markets, to be defined as "local" (13,16). Similarly, local farmers' market boards struggle over definitions of local. For example, what happens to the farmers 101 miles away from a city that puts in a 100 mile definition of "local" in the farmers' market rules? Farmers attempting to preserve a highly risky and often marginal livelihood may question a farmers' market board decision to give access to spaces in the local farmers' market to some while excluding others. Hopefully, the more fair a decision-making process, the less conflict will occur.

Exactly how to create fair governance structures about access to limited farmers' market spaces is one of the challenges faced by the food relocalization movement. In some cases, questions that need to be asked are: Are the farmers who have access to the market representative of the diversity of farmers in the surrounding area? Or, do farmers' market governing boards give access to certain less-than-representative groups of people? On the other hand, "the interests of the existing vendors who have created the market's success must be considered, as well as any rights or expectations on the part of the vendors applying to participate" (26).

Many people talk about food localization as the creation of networks of trust. This is also true for organic and fair trade markets. However, as David Goodman and I have recently argued, "trust" tends to be "black boxed"; that is, everyone talks about trust but no one ever says directly what trust is and how you can recognize it when it exists (14,15). It is necessary to open up this box to understand how and when trust is made and, conversely, destroyed. Understanding market governance structures and processes can help all participants in alternative, civic markets maintain and grow trust with consumers. To this end, careful attention needs to be paid to how civic processes build trust in alternative market governance, including questions of openness, inclusion, and transparency. Those working to develop new alternative markets — whether organic, fair trade, or local — need to do so with the awareness that certain forms of governance may be perceived by others as being more fair. People have to approach these problems "reflexively," that is, by being aware of potential unfairness in the ways decisions tend to get made. While no process can be totally fair, constant attention to issues of fairness is important, especially in situations where people define "fair" differently (14,15).

How do we design processes that are considered fair but also get the work done? That is a question that needs further social science research, most importantly through observing real people in real places. My own research includes understanding how my local food policy group is grappling with questions of fairness. The group has developed a kind of structured public discussion that grew out of a non-violent communication movement called the "World Café" forum. In our "Food Forums," we have structured public conversation to try to give participants an equal chance to have their voices heard in a non-threatening environment which involves active listening and non-judgmental behavior. What has emerged from these conversations is a greater willingness for diverse groups to work together. Groups pursuing various local food projects attend the forums in order to gain input and support for their efforts. Nevertheless, participants in the group continually ask the question, "Will this process get the work done?"

In our interest to expand market opportunities for organic farmers, we therefore need to recognize that the expansion of local organic markets will require market-expanding governance structures that involve more public interaction between farmers and consumers. In many cases, the context for these civic interactions is place-based, with local consumers in food policy councils working with local farmers to create new local markets. Unfortunately, as someone who has been inviting farmers to local consumer events for years, I realize that, for farmers, going that extra mile to schmooze with consumers can seem like yet another stress on already overwhelmingly stress-filled lives. Farmers who are interested in growing their local markets need to talk to each other to learn how to interact with local consumers in ways that are not only sane but efficient and maybe even pleasurable. Consumers also need to figure out how to interact with farmers in ways that do not simply exhaust everyone. This may sound like an unimportant point, but I've sat at many consumer-led local food policy meetings in which farmers, glassy-eyed with exhaustion, were clearly wondering why they were there. Consumers in these organizations often have day jobs, too, and personal lives. We need to come up with processes that create governance structures that are straightforward and easy, while being respectful of both diverse views and limited amounts of time.

As this overview shows, social science research on alternative market governance could provide useful information for those seeking to expand organic markets. It is clear that the vitality of organic markets depends on maintaining their "civic" nature, that is, their openness to ongoing public deliberation about the goals achieved through the maintenance of alternative market standards. Otherwise, consumers will become doubtful as to why they are paying a premium for organic, fair-trade, or local products.

Endnotes

1. I was on the founding board of the Farm and Food Project in Albany, New York; I participated in the Core Group of my New York CSA; and I have more recently worked closely with the Santa Cruz County Food Policy Working Group and with the UC Santa Cruz Student Environmental Center food policy group. This experience has brought me into contact and interaction with numerous farmers, activists, extension agents, local entrepreneurs and public officials involved in these efforts. I am fortunate to live in Santa Cruz County, which has one of the highest percentages of organic farmland under cultivation of any county in the US. Ironically, it also has one of the highest intensities of pesticide use. My home county, in fact, provides me with a great real-life laboratory in which to study the social context around the governance of alternative markets. Back to text

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Broadening the Education Infrastructure in Organic Agriculture for Farmers

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Abstract

Access to high-quality information and continuing education for farmers is essential for them to remain competitive and viable in today's marketplace. The organic sector, while only representing 1 to 2% of the entire US agricultural economy, continues to enjoy growth rates in the range of 16 to 21%, as it has since 1997. Organic agriculture is management intensive, relative to conventional production systems, and requires individuals that are well-trained and proactive and holistic in their management strategies. Many of today's new farmers, whether organic or conventional, are immigrants, ethnic minorities, or otherwise socially disadvantaged. Some of these new farmers are entering the organic sector, yet they are likely not to have access to the necessary information or technical assistance required to make their operation successful, due to language, cultural, and other barriers. This paper explores the current and potential role of producer-targeted organic agriculture programs around the US in building the capacity of new farmers and immigrant and refugee farmers to establish, transition, or strengthen their operation.

Introduction

This paper explores the current and potential role of producer-targeted organic agriculture education programs around the US in building the capacity of new farmers and immigrant and refugee farmers to establish, transition, or strengthen their operations. I postulate that there is a convergence of interests and needs among three producer groups — organic farmers, including those interested in transitioning to organic; new/beginning farmers (Endnote 2, Endnote 3); and immigrant, refugee, minority, and otherwise socially disadvantaged farmers (Endnote 4) — and that this convergence represents an important opportunity to further the goals of the three groups.

Based on a preliminary assessment of educational programs around the country that support the development of new and immigrant farmers, the conclusion is reached that there is clearly a predisposition among these programs towards encouraging farmer participants to pursue sustainable production methods (Heifer Project International, ALBA, Land Stewardship Project, Center for Rural Affairs, The Intervale, Growing New Farmers, Southside Community Land Trust, and Grow Alabama, to name a few). Several of these programs offer organic-specific educational programs, while most focus on teaching sustainable agriculture practices. Program participants tend to be diverse in terms of their farming backgrounds, socioeconomic status, and countries of origin. Their very diversity represents fertile ground to further the goals of the organic movement. The organizations that run these educational programs have an opportunity to encourage this

pool of growers to establish their operations as organic, and lay the groundwork for up-and-coming farmers to utilize a systemic, integrated, and conservation-minded decision-making framework in their operations. At the same time they will be taking advantage of the growth in the organic market and consumer demand for local, regional, and sustainably-produced foods.

Organic Agriculture and Immigrant Farming on the Rise

The second half of the 20th century and the onset of the 21st century has witnessed impressive growth in the utilization of organic production systems among farmers, ranchers, market, and home gardeners, and the codification of these practices in private, third-party certification systems, then state, and most-recently federal law. These factors, together with a growth in popularity of organic products among consumers, have largely represented a response to "conventional," chemically-intensive agricultural systems (1,3,27). There is ample evidence that the organic sector is growing and will continue to grow (Box 1).

Box 1. Evidence of growth in the organic sector.

- Expansion of certified organic land: In 1997 certified organic acreage totaled 1,346,558; in 2003, certified organic acreage reached 2,196,874 (33). This represents a 64% increase.
- Retail sales growth from 1.4% to 1.8% of total food sales between 2001 and 2003 (23); organic segment estimated to represent 3.5% of total food sales by 2010 (22).
- Policy development: Establishment of the Organic Caucus in the US House of Representatives in 2002. As of September 2005, caucus has 45 members (25).
- Growth in the availability of research funding specifically for organic agriculture, both through public sources such as the USDA Integrated Organic Program, as well private sources such as the Organic Farming Research Foundation (20,25).
- Public and private funding to support the development of the sector in general, again as evidenced by the establishment and funding of the USDA Integrated Organic Program, as well as by foundation affinity groups such as Funders for Sustainable Food Systems, and Sustainable Agriculture and Food Systems Funders.

At the same time extensive growth is occurring in the organic sector, the larger agricultural industry is experiencing a host of conditions and challenges that may change the face (literally and figuratively) of agriculture in current and future generations (Box 2). Somewhat ironically, these conditions which pose challenges overall to the agricultural industry may in fact pose even greater challenges to the organic sector. Three factors — aging of the farmer population, number of farms decreasing, and farmland being converted to alternative uses — represent threats to the agricultural industry

as a whole. However, two factors — average farm size increasing, and number of farms of less than 10 acres and 10 to 49 acres decreasing — may represent particular obstacles for the continued growth of the organic sector. Organic farms tend to be smaller (9) thus any national trend towards increasing farm size should be cause for investigation. Additionally, the reduction in the number of farms of less than 10 acres and 10 to 49 acres should be of particular concern for organic advocates. If the number of farms in the > 10 acres and 10 to 49 acres categories is decreasing, this suggests that the pool of organic farmers in this size category may also be being squeezed from the marketplace.

Box 2: Context in which organic sector is growing.

- Farmers are getting older and becoming fewer. Farm entry rates have declined, the farmer "replacement" rate has fallen to below 50 percent, there are twice as many farmers over 65 as under 35 years old, nearly half of all farm operators in the US are over 55 years of age, and nearly three-fifths of all farm assets are owned by those 55 and older (29).
- Farms are becoming few in number: There was a nearly 10% decrease in the total number of farms in California between 1997 and 2002, compared with a 4% decrease nationally (30).
- Farmland is being converted to alternative land uses: This is evidenced by reduced acreage in cultivation. Total acreage in agricultural production during the same period dropped 4% in California, compared with a 1.5% decrease nationally (30).
- Average farm size is becoming larger: Average farm size during the 1997-2002 period grew in California from 327 to 347 acres, compared with 431 to 441 nationally (30).
- The number of farms of less than 10 acres and 10 to 49 acres is decreasing rapidly: In California during the same 1997-2002 period, the number of farms of 1 to 9 acres decreased nearly 20%, while the number of farms of 10 to 49 acres decreased approximately 5%. Nationally, the number of 1 to 9 acre farms noted a reduction of about 13%, but interestingly, the number of 10 to 49 acre farms for this period enjoyed an increase of 6%, for the same period (30).

Extraordinary growth in organic retail sales may suggest that much of that growth is occurring at large retail outlets. One recent development that may support this notion is the announcement by WalMart that it plans to double its offerings of organic products (24). This raises the question of whether or not small-scale producers have access to these markets and can participate in their growth. The proliferation of Buy Local/Regional marketing campaigns around the country suggest that consumers are interested in supporting local agriculture. Given the structure of the produce distribution

industry, direct marketing channels (such as farmers markets, farm-to-food service, community supported agriculture, etc.) will likely be the best way for small-scale producers to take advantage of this increased demand for local and organic products. However, there is likely a limit to the amount of produce which can be marketed direct to consumers, especially at volumes and prices that will support farmers long-term. The recommendations section of the paper addresses this issue to some degree.

Despite the seemingly insurmountable challenges associated with small-scale farming in this country, farming remains a dream for many immigrants and minority laborers. According to the 2002 Census of Agriculture (30), minorities, and in particular those of Spanish, Hispanic, or Latino descent, represent one of the few expanding demographic sectors of the US farm population. The 2002 Census of Agriculture offers some hopeful trends for socially disadvantaged farmers. Both at the national level and in California, the numbers of Spanish, Hispanic or Latino (SHL) farm operators have enjoyed significant increases. In California, the number of SHL principal operators increased 45%, from 5,347 in 1997 to 7,771 in 2002. The "All Operator" category in California (Endnote 5), which includes up to three operators per farm, shows 12,083 SHL operators in 2002, representing nearly 10% of Total Operators in the state. Nationally, SHL principal operators grew 51% for the same period, while the All Operators category registered 72,329, representing only 2% of Total Operators nationwide. It cannot be assumed that the SHL category represents solely, or even a majority of immigrants. Rather it denotes origin, but does not clarify the generation which emigrated. This clarification is important because in many parts of the southwestern US there are farm operators who classify themselves as SHL, but who are not immigrants. The Census of Agriculture does not identify immigrant status of operators (18).

These Census of Agriculture figures paint an alarming picture of US agriculture in which small farms (whether categorized by size or farm sales) are decreasing in numbers, yet farm operators of Spanish, Hispanic, or Latino descent, those most likely to operate small farms, are increasing. Compared with other demographic groups, Hispanic farmers have a higher proportion of "very small farms" (less than $10,000 Farm Sales) and a high proportion of "small farms" (less than $250,000 Farm Sales). The share of high-value specialty crops produced by Hispanic farmers is much higher than for US farms. Only 12% of Hispanic farmers specialized in traditional commodity crops such as corn and grain (30). Under these conditions, what might the future hold for small, limited-resource, socially disadvantaged and beginning farmers in California and the US? Are they entering a particular sector of an industry that is only destined to continue to contract? Small and immigrant farm advocates believe that strategic market positioning, with an eye towards developing niches, may be the path offering the most promise for small and organic farmers.

Barriers to Entry and Success

All of this growth in the organic sector and among new immigrant farmers may lead one to believe that barriers to their establishment and success have fallen. Interestingly, many of the issues that immigrant, new, and organic farmers must deal with are similar in nature, suggesting that economies of scale may be achieved by providing some sort of consolidated, or at least coordinated, service delivery. There certainly are differences among these groups which warrant specialization of support schemes, as evidenced by the emergence of Growing New Farmers (regional Northeast), as well as the National Immigrant Farming Initiative (national network of immigrant farming projects or IFPs), both discussed below. While there does not appear

to be a precise equivalent for organic farmers beyond local efforts, the Organic Farming Research Foundation (OFRF) and the Organic Trade Association (OTA) nationally, as well as state-based certifiers and local programs such as Marin Organic in California, fill this advocacy and information diffusion role. Recently, OFRF announced the establishment of the Organic Farmers Action Network (OFAN). OFRF's goal for this network is to keep organic advocates informed about federal policy issues that directly affect organic farmers, and provide educational tools about how to effectively get involved. This new effort has the potential to build a stronger national network of organic agriculture advocates and experts (26).

ALBA has conducted a series of needs assessments with new and limited-resource farmers, largely of Hispanic origin. Farmers interviewed report that government and university sources of information and technical assistance are often not appropriate for various reasons (including language, cultural appropriateness, or financial) for their particular needs and conditions. There are enormous obstacles which these farmers face, as evidenced by their responses to surveys and interviews (2,5,16). These findings confirm what others have found, as described in Box 3.

Box 3. Obstacles to the success of Hispanic farmers.

- Limited access to training in effective farming techniques;
- lack of technical assistance and experience in management and marketing, crucial to survival and success in farming;
- language barriers and cultural differences which limit Spanish-speaking farm workers' ability to participate in vital skills training programs;
- low confidence and ability to seek alternative marketing channels, financing options, or access existing farmer networks;
- limited exposure to sustainable agriculture production information;
- extremely limited support systems through which farm workers can gain confidence in developing alternative career plans, leadership skills, and solving common problems;
- difficulties in securing credit, opening and maintaining bank accounts;
- lack of financial literacy (ability to read, analyze, manage, and communicate about the personal financial conditions that affect material well-being);
- lack of understanding and access to agricultural risk management concepts and tools;
- a marketing and financing system which tends to protect the interests of brokers, middlemen,

wholesalers, and larger-scale producers, leaving these limited-resource farmers to bear the brunt of fluctuations in the market; and

- a lack of trust, stakeholder inclusion, and reciprocity between and among Hispanic farmers and government agencies and agricultural technical assistance organizations.

Agricultural programs and service providers such as USDA, Extension agencies, credit providers, and growers' organizations require a greater awareness and understanding of immigrant farming issues in order to provide new immigrant farmers with ongoing support services as they work towards economically viable operations. Immigrants who farm need better access to established agriculture programs, regulatory services, viable markets, agricultural education, and financial assistance. Language, cultural differences, and education are impediments to such access, as are policies and programs at the federal, state, and local levels that influence support for such services (11). Table 1 summarizes the barriers to entry and success for immigrant/refugee farmers, new farmers, and organic farmers. The table illustrates the fact these three types of farmers have some commonalities in terms of their barriers to entry and success. Overcoming barriers to entry is not an identical process for any two farmers. However, the common needs, experiences, relative sizes, and market focus among organic, immigrant, and new farmers may lend themselves to a pedagogy which builds community across racial, ethnic, and social lines by targeting this broad audience. Training and education programs should be designed to result in diverse and active farmer networks.

Table 1. Barriers to entry and/or success.

Immigrant/Refugee Farmers (11)	**New Farmers** (8)	**Organic Farmers** (15)
Agricultural and technical competency		Limited availability of production information
		Limited availability of market information
Access to resources for small farmers, Agricultural Support Services	Access to information and education	Limited access to production information
		Limited access to market information
		Training in management systems
Access to credit and capital	Access to financial support	Cost of conversion-related investments
Access to land	Access to land	
Access to markets	Access to markets	
Racial and cultural discrimination		
Immigration history and emotional well being		

Small Farm Renaissance

In an environment of budget cuts and increasing demand for the products which these farmers produce, there is a clear need for greater outreach and technical assistance to this audience, a need which is simply not met through traditional extension services. The emergence and growth of support systems, educational programs and government funding for new and immigrant farmers can be seen at least in part as a response to the changing demographics described above. Consider the following:

In 1981, Secretary of Agriculture Bob Bergland issued his report, *A Time to Choose*, in which he warned that "... unless present policies and programs are changed so that they counter, instead of reinforce or accelerate the trends towards ever-larger farming operations, the result will be a few large farms controlling food production in only a few years" (Endnote 6). Despite this warning, at the time the USDA National Commission on Small Farms released its report: *A Time to Act* (32), the plight of small farmer in the US had only worsened. Perhaps in spite of this adversity, the efforts of new, immigrant, sustainable, and organic farmers, as evidenced by the above statistics and demographics, have succeeded in carving out a niche for themselves.

Certainly, the recommendations of the National Small Farms Commission played a part in making the 2002 Farm Bill one of great importance for small farmers, in which the Beginning Farmer and Rancher Development Program was created. Unfortunately this program has never received any funding, despite the well-demonstrated need. Advocates for new/beginning, socially disadvantaged farmers are now working to influence policy blueprints that are being developed as part of preparations for the 2007 Farm Bill debate. Given the multiple benefits provided by small-scale organic agriculture to society, including economic development and environmental protection, there is a significant amount of convergence among the interests of these farmers and other sectors, such as rural development. Capitalizing on this convergence to achieve serious policy wins will be important in reversing the trends affecting small farms, and expressed so ominously in the titles of the above referenced USDA reports: *A Time to Choose*; and *A Time to Act*. If not, the next report might be titled *The Time has Passed*.

Local/Regional Food System Renaissance

There is a resurgence taking place in small-scale, sustainable and direct market-oriented, specialty crop agriculture. Fueling this interest in the pursuit of farming as a career, is the interest of a much larger population in supporting, benefiting from, and accessing local and regional food production. New policies are promoting and facilitating institutional purchases of locally produced fresh food; aims of such policies are to improve health of target audiences such as school children, and to contribute to the economic viability of local producers (13). Food policy councils are surfacing all over the country as tools to achieve multiple goals associated with agriculture, nutrition, economic development, and land use (6). The food service industry is following the lead of upscale restaurants in "doing well by doing good," featuring (sometimes exclusively) locally and sustainably-produced foods on their menus. An example of this is the September 29, 2005 "Eat Local Challenge" organized by Bon Appetit Management Company (4). The challenge offered 150,000 diners at 190 corporate, university, and museum restaurants from Seattle to Washington, DC the opportunity to eat a 100% locally-grown meal, made entirely of ingredients from within 150 miles of the kitchen where they are served. Regional branding is another strategy farmers are using to capitalize on the interest of consumers to support small, sustainable, and local farmers.

Support Networks

Similar to industry groups that aim to support businesses in their sector, the following groups are examples of efforts to support new and immigrant farmers, and especially those organizations and individuals that provide services to this farmer audience.

New farmers. Growing New Farmers (GNF) is a regional initiative to provide future generations of Northeast farmers with the support and expertise they need to succeed. GNF brings together service providers from across the Northeast who are committed to working with and advocating for new and beginning farmers from Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Delaware, and West Virginia.

Immigrant farmers. The National Immigrant Farming Initiative (NIFI), a project of Heifer Project International, supports the establishment of immigrant farmers and "Immigrant Farming Projects" around the country (7). The initiative was launched in part based on the increasing number of requests for assistance Heifer received from a variety of immigrant farmer groups, indicating that many immigrants are interested in developing their

own farming enterprises. Heifer and other NIFI partners determined that immigrant farming activity is poorly documented and remains largely hidden to many government agencies and other farm programs, and to food and agriculture policy making in general (11). This is certainly changing, as NIFI has been around now for more than two years, and member IFPs are working to raise the level of awareness of this demographic group among other service providers.

To help address these and the many other challenges confronting immigrant farmers, groups around the country have organized Immigrant Farming Projects (IFPs). In Massachusetts, the New Entry Sustainable Farming Project (20; H. Joseph, *personal communication*), as well as a private landowner that serves as a mentor farmer (M. Moreira, *personal communication*), assists dozens of Southeast Asian and African families to farm and market commercially, combining enterprise and whole farm approaches. Greenmarket and Cornell Cooperative Extension's New Farmer Development Project in New York City uses multiple approaches to link Latino immigrants to the area's farms and to its network of farmers' markets, offering employment, training opportunities, education, and technical assistance (M. Moreira, *personal communication*). The Glover Organic Farm, near Atlanta, Georgia, provides farmland and resources to low-income, Asian families (including Korean, Laotian, Cambodian, and Vietnamese) for raising traditional crops and helps these families market excess produce in farmers' markets scattered throughout Atlanta (S. Glover, *personal communication*).

Programs targeting beginning, immigrant, and organic farmers are identified in Table 2. This is not an exhaustive list, but attempts to provide some geographic diversity. Of the 16 programs listed, 14 have an explicit or obvious focus on organic and sustainable production systems, based on reviews of promotional literature, websites, as well as personal communications with project staff. These programs and others like them are providing essential information, training, and technical assistance to farmers. Collaboration among projects that serve a specific farmer audience (beginning, immigrant, organic) has the potential to strengthen broader efforts to incorporate a sustainable and organic focus to farmer education programs.

Table 2. Education and support programs by type of producer.

Program	Beginning	Immigrant	Organic	Sustainable ag focus
ALBA (CA)	X	X	X	X
CSA Learning Center at Angelics Organics (IL)	X	X	X	
Intervale (VT) (12)	X		X	X
New Entry Sustainable Farming Project (MA) (Endnote 7)		X		X
New Farmer Development Project (NY) Council on the Environment of New York City (Endnote 8)		X		X
Center for Lation Farmers (WA)		X		
Farm Beginnings (MN+) Land Stewardship Project (14)	X			X
Grow Alabama	X		X	X
New Farm	X	X	X (FarmSelect Transition to Organic)	X
Minnesota Food Association	X	X	X	X
Southside Community Land Trust (CT)	X	X	X	X
New Immigrant Farm Program, UMN/Center for Rural Design	X	X		X
Southeast Immigrant Farm Partners (GA)	X	X	X	X
Clallam County Sustainable Farming Program (WA)		X		X
Washington State University Small Farms Team	X	X		X
Marin Organic (CA)			X	X
Small Farm Resource & Training Center (CA)	X	X		

Organic farm incubator. An organic farm incubator is a relatively new term, referring to a concept which attempts to approximate the goals of a traditional business incubator. Similar to a traditional business incubator, an organic farm incubator is a business support process that accelerates the successful development of start-up and fledgling organic farmers by providing entrepreneurs with an array of targeted resources and services (17). Incubators of any sort of business offer services such as provision of management guidance, technical assistance, and consulting tailored to young growing companies.

Incubators usually also provide clients access to appropriate rental space and flexible leases, shared basic business services and equipment,

technology support services, and assistance in obtaining the financing necessary for company growth (28).

There are hundreds of examples of business incubators – both "bricks and mortar" and virtual. Examples of organic farm incubators in the US, which require a sizeable land base, are very few in number. Based on research conducted for this paper, evidence suggests there are many other individuals and organizations that are providing some of the services of an incubator, perhaps just not in a comprehensive way. Lists that include these efforts are most likely available regionally, through the NIFI regional networks, Extension, and others in the agricultural community.

At this time, ALBA (CA), Intervale (VT), the Farm Business Incubator Program of Southside Community Land Trust (CT), and the Grow Alabama Organic Farm Incubator Program are the only explicit and functioning organic farm incubator programs that I have been able to identify to date.

Box 4. Elements of ALBA's Organic Farm Incubator.

- PEPA graduates can farm ½ to 5 acres of ALBA land for up to four years.
- Lease rates increase from subsidized to near-market rates over four-year period.
- Fee-based access to water, equipment, post-harvest and cooling infrastructure.
- Personalized technical assistance in production, business planning, and marketing.

Marketing support is key to farm incubation. Groups of farmers that have banded together to access markets are pursuing Collaborative Marketing Schemes. In many cases the markets being pursued are institutional markets. One entity usually serves as the distributor of record for the institution purchasing produce, and serves the function of consolidating product from many farmers. Despite the challenges of developing such schemes, their value cannot be understated, both for the farmers and the buyers, since it allows farmers to access institutional markets and provides institutions access to food grown by family farmers. These types of marketing schemes offer hope in expanding farm-to-institution (school, college, hospital, etc.) marketing efforts, as described above.

Examples of such efforts include the Monterey Bay Organic Farming Consortium and ALBA Organics, which together services the University of California Santa Cruz, Stanford University, Asilomar Conference Grounds (owned by concessionaire Delaware North Company), Sutter Maternity, and Surgery Center and Dominican Hospital. The California Growers Collaborative serves Ventura County school districts and has its sights set on other regional school districts and institutional markets. The Red Tomato (redtomato.org), based in Massachusetts, serves a similar function, pooling product from farmers all over the eastern region of the US, delivering it to buyers that value sustainably-produced foods that have been grown by family farmers. Yet another example is Access Organics (accessorganics.com), which serves markets nationwide with organic product grown by independent family farmers.

Recommendations and Conclusion

Much progress has been made over the past two decades in advancing the goals of the organic agriculture movement. Immigrant and minority farmers are entering the organic sector, as evidenced by the programs described in this paper. Outreach and education programs that target minority farmers tend to have a bias towards sustainable and organic production systems. However, the true impact of such programs is largely unknown. In addition, existing conventional agriculture programs have generally not been effective at integrating a sustainable and organic component. The following recommendations attempt to address some of these issues.

1. Effective marketing is one of the essential elements to the success of any farmer. Marketing can be a significant barrier to entry and success for beginning, minority, and immigrant farmers, largely due to lack of information, as well as cultural and language barriers, and access to capital. Research into and support for collective and cooperative marketing schemes that facilitate the consolidation of product from multiple farmers and its sale into institutional and wholesale markets should be pursued by the USDA. In many cases farmers can organize themselves for collective marketing purposes. However, if information, culture, language, or access to capital are barriers, it might not be enough for farmers to organize themselves. They may benefit from the support of an organization such as those mentioned above in the previous section. The USDA should help determine what role such organizations can play in supporting the marketing efforts of farmers, and how USDA can support those organizations more effectively.
2. Coordinated, outcomes-based program evaluation should be developed for all programs (public and private) that aim to educate producers about organic agriculture, with the goal of determining "the extent to which producer-targeted organic education programs have succeeded in helping participants to successfully transition to (and remain) organic, and/or improve the viability of their existing organic operations". An example of a similar evaluation effort can be found in the report entitled *USDA Programs: What do we know about their effectiveness in improving the viability of small farms?*, produced by the Henry A. Wallace Center for Agricultural & Environmental Policy at Winrock International that explored the degree to which USDA programs that aim to support small farmers actually do have a positive impact on small farmers. Their research explored three questions: (i) Does the program intend (either explicitly or implicitly) to support small farms? (ii) Has an evaluation been done of the program's effect on small farms? (iii) If an evaluation has been done, what does it show as to the effectiveness of the program? (10)
3. USDA-funded organic extension agents should exist in all counties, much like the Marin County model, to facilitate knowledge transfer generated by research institutions into on-the-ground know-how for farmers. Where these already exist, they are often the same extension agents that serve small and immigrant farmers.
4. NRCS staff should be trained in organic pest management and organic fertility management so they can provide good, sound advice to farmers, in the context of whole-farm conservation planning. Currently it is extremely difficult to obtain organic-specific advice from NRCS agents.

5. Organic practices should be incorporated into NRCS approved practices so that NRCS resource conservation strategies can capitalize upon growth in the organic sector.
6. Membership of USDA Advisory Committee on Beginning Farmers and Ranchers should be expanded to include individuals that represent (aspiring/beginning) immigrant and organic farming interests and organizations.
7. An organic-focused research agenda should be developed and prioritized by USDA and all of its dependent agencies and offices. This agenda should take into consideration the role of the immigrant and minority farmer in the organic sector, and in particular, the non-monetary value they provide to society.

This paper, while a work in progress, generally represents the current perspective within the sustainable and organic agriculture community regarding the role of beginning and immigrant/minority farmers in the organic sector. The author works at the intersection of sustainable and organic agriculture, economic development, and social justice. Any errors or omissions are solely the responsibility of the author.

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Endnotes

1 The author is currently Executive Director of the Agriculture & Land Based Training Association (ALBA), member of the Board of Directors of California FarmLink, member of the Coordinating Council of the Sustainable Agriculture Coalition/Midwest Sustainable Agriculture Working Group, and member of the Steering Committee of the National Immigrant Farming Initiative. These organizations provide a range of services directly to farmers and to service

providers that further the interests of new/beginning farmers, immigrant farmers, as well as sustainable and organic farmers. Back to text.

2. According to the Growing New Farmers Consortium, a "new" farmer is someone who is considering starting/developing, is starting/developing a farm business, or has been farming for 10 years or less (8). Back to text.
3. The USDA defines a "beginning farmer" as someone who has never operated a farm or ranch, or who has less than 10 years experience managing an agricultural operation (33). Back to text.
4. In this paper I will refer to this subset of farmers collectively as socially disadvantaged farmers. Back to text.
5. 2002 was the first year this category existed, thus there is no comparative data. Back to text.
6. A Time to Choose: Summary Report on the Structure of Agriculture. USDA. Washington, DC. January 1981. p. 142. Back to text.
7. As of this writing, project staff are participating in the NorthEast Organic Network (NEON) 2005 Advanced Training in Organic Crop Production, with the aim of providing this training to program participants in the future. Back to text.
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Student and New Farmer Education to Support the Growth of Organic Farming

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Introduction

This presentation is part of a 2-day USDA conference exploring opportunities and challenges facing organic agriculture. The purpose of the Education Session of the conference was to consider broadening the education infrastructure in organic agriculture. This student-oriented presentation: (i) describes student audiences to be addressed; (ii) outlines an example of curricular content for organic farming; (iii) identifies established K-12 student-based gardening and farming education programs that would benefit from organic farming content; (iv) identifies several current sources of organic farming information; and (v) addresses university student farming programs in general and the Michigan State University Student Organic Farm (MSU-SOF) year-round community supported agriculture program in detail.

Developing Curriculum: Who is the Audience?

When considering the education of future generations of organic farmers, a good place to start is with recognizing that for several decades, experienced farmers have provided organic agriculture training to new farmers. The farmer-to-farmer organic training has occurred generally in the absence of the land grant universities or governmental support, and at times, in the face of active criticism from agricultural educators and leaders. For me personally, as a relative newcomer to both farming and organic farming, it was and is important to be aware of and respectful of the early organic educators. One of the key reasons I am involved in organic farming education is because of my first experience at the 1998 Upper Midwest Organic Farming Conference in Wisconsin. I experienced over 1,000 registered participants that were very motivated learners. The presenters were doing the best they could, but at times without a foundation of basic biological or physical principles and without monetary resources to prepare visuals or handouts. I love to teach and here was an eager audience. To prepare I had to experience and understand the basic principles of organic farming by visiting farms, learning from organic farmers, reading, and practicing organic farming myself.

A second important point is that there are at least two distinctly different audiences that need information about organic farming. In one case, there are established farmers that know how to farm and want to know how to farm organically. An example from personal experience is the Great Lakes Fruit and Vegetable Expo held annually in Grand Rapids, Michigan. This education and trade show has over 3,000 registered participants. The first two days of the show contain a lot of information about what and when to spray for weeds, insects, and diseases. Those who stay around to attend the last day of organic sessions are mostly conventional farmers wanting to find out just

what organic is all about. We started by presenting a soils component and a marketing component, then adding some weed management. We focused more on the soil quality and living soil component including aspects of transitioning to organic, and then letting successful organic farmers talk about what they do and why it works.

A second audience that wants to learn about organic farming is the young or new farmers that are both learning to farm and how to farm organically at the same time. It makes sense to me to include K-12 youth that are the farmers of the future in this group. Many of the new farmers may be those seeking a second career in farming or farming related activities. With the inexperienced farmer audience, the goal is to provide a strong foundation of information and examples that will help them to avoid common misunderstandings and expensive learning experiences. It is also important to recognize the importance of scale, the required investment in equipment as scale increases, and that starting small-scale is helpful for new farmers. Scale is also often related to diversification, with small-scale farms possibly having a high degree of crop diversification. Learning about and experiencing the dozens of vegetable, fruit, herbs, and flowers of the successful market garden does not require but a few of each.

Developing Curriculum: What is Organic Farming?

When I ask the question "What does organic mean to you?" or "What does it mean if I say food was grown organically?", the most common answer from students or adults that know little about organic farming is that it was grown without chemicals, fertilizers, or pesticides. So step one is to explain that organic farmers do use some chemicals, fertilizers, and pesticides, but that the principles are to minimize the use of these and to only use certain types which are acceptable under a set of rules or guidelines that evolved over time and that organic farmers support. This might include an explanation of the start of the farmer developed organic certification and the more recent USDA National Organic Program (see Appendix: Author's List of Related Links). It might also include an explanation of things that are not allowed such as genetically modified organisms (GMOs), irradiation of food, and confined animal feeding operations (CAFOs).

We quickly follow this discussion with explaining that if we ask the same question (What does organic mean?) to organic farmers or people that know about organic farming, the most frequent answer by far is that organic farming is about the "living soil" or the "soil food web" or protecting soil health as the foundation for healthy crops, healthy animals, and healthy people. From protecting the soil and its biological diversity the discussion can lead to many topics including the importance of crop rotations, crop and animal diversity, and feeding the soil. We often hold up the double handful of soil and point out that a cup of soil can be home to as many microorganisms as there are people on the planet — 6 to 7 billion. We talk about "microbe manure" and the soil food web with bacteria and fungi as the primary feeders. This usually includes the reminder of all the antibiotic drugs and cleaning agents and the potential negative impact as well as evidence indicating that soil fungi are some of the first to go in response to excess cultivation, fertilization, and pesticide applications. We can even explain how a bacteria with a carbon to nitrogen (C:N) ratio of 5:1 can be eaten by an organism with a higher 15:1 C:N ratio resulting in the release or excretion of nitrogen that plants use to grow.

Things like green manures, compost, and minimizing cultivation, fertilizer, and pesticides all start to make perfect sense in light of the soil food web. So does the idea of microbe manure and humus as the glue that holds the soil in place and helps prevent erosion. Most are surprised when told that the

annual amount of soil washing and blowing from the United States alone is enough to fill train cars loaded to the legal limit that would wrap seven times around the globe. We point out how we grow 40 to 50 different crops and that crop diversity provides us with a type of crop insurance as the annual weather pattern changes from cooler to hotter years or from dryer to wetter years, and protection in case of crop loss due to insect or disease damage.

From here we go onto things that are not part of the NOP, like local food, direct marketing, how little of the food dollar gets back to the average farm, the impact of farm products on the local economy, how far the average meal in the US travels from field to fork (~1500 miles), and the high fossil fuel input and transportation subsidies that allow our current food system to continue. We spend time describing our MSU year-round local farming with unheated greenhouses and cold storage as a possible solution to the situation. Most of the students have not heard of community-supported agriculture (CSA) marketing yet. CSA goes beyond the NOP and gets to the bottom line of connecting people to their food including the farmers who grow it and the land where it is grown.

Another common way to outline the principles of organic curriculum to farmers is to use the organic farm plan template (see ATTRA in Appendix,) that many certifying agencies now use. The farm plan requests information in the key areas of site layout, field history, seeds and seed treatment, sources of seedlings and planting stock, soil and crop fertility management including compost and manure, natural resources protection, crop management including pest management, maintenance of organic integrity, post harvest handling and storage, and record keeping. Teaching from the farm plan benefits both transitioning and new farmers.

Established Youth (Student) Farming and Gardening Educational Programs

A brief review of existing youth programs that already have a proven track record of impact seems essential to insure that age-appropriate information about organic gardening and farming methods are available to help prepare the organic farmers of the future. I noticed the USDA "for kids" site had lots of neat stuff but could use an "organic farming" icon.

How many people currently in farming or some aspect of agriculture are there because of the 4H program? (see Appendix). Showing animals or exhibiting crops at the county fair, learning about natural resources, experiencing food processing and preparation are just some of the curriculum areas of 4H clubs around the country. The four Hs of Head (mental), Hands (physical), Heart (emotional), and Health (spiritual) are at the foundation of any holistic approach including organic farming. Are 4H programs getting necessary information about organic farming? A MSU colleague who is a statewide 4H horticulture program coordinator says no. She also reminded me that one of the still valid reasons for starting 4H was to provide children information to take home to mom and dad. I think she is also now looking at how to integrate organic curriculum into 4H. I would guess there are others trying also.

The National FFA Organization (formerly Future Farmers of America, see Appendix) is another important part of the exposure of youth to agriculture. Are organizations that support FFA, like the Farm Bureau, supportive of organic farming curriculum in the FFA? Are organic farming and pastured animal production being taught? I know of examples in Michigan where pastured animal livestock are being raised by high school students. High school agriscience teachers are mostly prepared to be teachers and have limited crop or livestock experience unless they grew up with it. They need support and curriculum materials. I presented a one-day workshop

this summer for 30 agriscience teachers at the MSU-SOF and they were interested to learn about organic and year-round vegetable farming. Here is another place where funding could go a long way to helping youth learn about organic farming.

The Junior Master Gardener program (see Appendix) is newer but rapidly growing program introducing urban youth to gardening and growing plants. My experience with adult Master Gardeners is that they are looking for organic gardening information that mostly is not there yet, not due to a lack of desire but more due to a lack of resources for development.

Elementary and middle school gardening programs are a fourth place where organic gardening and farming information can have a large impact. School gardening programs seem to readily accept the logic of not using pesticides and using compost. In addition to growing their own food, students get the opportunity to prepare and enjoy the leaves and fruits of their efforts in many school garden programs. The Edible School Yard program in California is perhaps one of the best known projects (see Appendix). As part of an NCSARE funded project, we built a solar greenhouse at a school near MSU and with the help of a graduate student, K-5 students grew and harvested organic salad greens throughout the academic year. Teachers are inundated with new curricula. The goal is to use gardening to help teach the mandated curriculum and to get volunteers to establish and manage the organic gardens.

Examples of regional programs focused on youth include The Food Project in Boston and Growing Power in Milwaukee (see Appendix). These two programs incorporate organic farming principles and are successful models for those interested in involving youth (students) in food and farming programs.

Established Sustainable and Organic Farming Information Sources

Over the past decade educational materials for organic farmers have increased tremendously. Examples (see Appendix) include publications from The National Sustainable Agriculture Information Service (ATTRA), The Sustainable Agriculture Research and Education Service (SARE), the Alternative Farming Systems Information Center (AFSIC), Organic Agriculture Information, The Organic Farming Research Foundation, The NEWFARM — Rodale Publications electronic publication, and the NOFA Organic Principles and Practices Handbook Series. Regional organizations such as The Midwest Organic and Sustainable Education Services — MOSES/*Organic University* and Northeast Organic Network — NEON and farmer training efforts such as CRAFT (Collaborative Regional Alliance for Farmer Training), The Center for Agroecology and Sustainable Food Systems (CASFS), and Growing Growers, are helping both to define, prepare, and present many aspects of an organic farming curriculum (see Appendix). In addition there are a number of state, regional, and national organic and small farm conferences which farmers attend and over time are also defining the organic farming curriculum. The amount of money invested in these programs pales in comparison to some other programs, say like genetic modification of organisms, but the demonstrated impact is great.

In recent years, the UC Santa Cruz Center for Agroecology and Sustainable Food Systems had taken a leading role in making curriculum materials for sustainable agriculture, organic farming, and direct marketing methods available online or at a low cost for printed materials. The American Society of Horticulture Science (ASHS) Organic Farming working group hosted a workshop in July 2005 on developing organic curriculum and ten schools presented their existing or developing programs. Proceedings of the workshop with reports from each school will be published in HortTechnology

(2006). The UC Davis College of Agriculture and Environmental Sciences & Student Farm and the UC Santa Cruz Center for Agroecology and Sustainable Food Systems are jointly convening a national sustainable agriculture education conference, January 24–25, 2006. Details are available at zzyx.ucsc.edu/casfs. The focus is sustainable including organic curriculum. We are making progress.

These are just a few examples of programs that are currently providing or developing information to support organic farmers and markets. There are many other important periodical publications and many state, regional, or national organic farmer conferences. Supporting and growing these existing programs can greatly increase the availability of information and amount of impact in a short time frame.

Organic Farming at Community Colleges and Universities

Regardless of what method of agriculture, some agricultural educational goals are common at the college or university level. To develop a strong foundation of knowledge we want to:

(i) Balance two key concept areas — how plants/animals grow and how to grow plants/animals — since most agree with the L. H. Bailey premise that "if you teach a farmer why, they will figure out how";
(ii) Describe the impact of weather and environmental conditions on plant or animal growth particularly as it relates to soil type (the importance of place);
(iii) Help students learn concepts of plant health and to learn to identify, anticipate, and manage key plant/animal pests and diseases for the geographic location. In organic agriculture, we are trying to establish an understanding not based on the enemy to eliminate, but an understanding that there are many herbivores, decomposers, or parasites and they are just doing an ecological role — and we need to minimize any negative impact on overall farm productivity;
(iv) Describe the relationship between inputs/costs and product value/marketing and how to make the desired amount of net income. The emphasis here is less on cash profit and more on the triple bottom line of sustainability and holistic management; and
(v) Provide historical perspective and information about people including something about culture and food — "why are we here?" including some history of our current "make food cheap" policy.

Experiential Education. You can only learn so much in a classroom setting. Students of all ages enjoy active learning or experiential education and learn and remember more when they do something. At the collegiate level, students pay X dollars (>$200 at MSU) for one credit of lecture time (often 50 minutes per week for 15 weeks) and they pay the same X dollars for one credit of lab time with is usually 2 to 3 hours of contact time. My experience in 20 years of teaching is that students like labs better and they report learning more in labs. Teaching labs is clearly more difficult and expensive because class size is often limited to 30 or less versus hundreds in a lecture hall. Yet we don't seem to consider charging more for labs and giving the students what they want?

As we have been reminded during the 150th anniversary of MSU, many land grant university farms were initially built and staffed by students. In the late 1970s, a new group of students started asking for a chance to farm on campus. This new group wanted to farm organically. Student farms were started at University of California Santa Cruz, UC Davis, and a few other

schools. There was another group of campus/student farms that started through the 1990s and the trend continued to grow with a big spurt of new farms in the last few years. The Rodale Publishing NewFarm has posted a list of, and, where available, websites for over 50 student farms in 25 states (see Appendix) where students and the farmers of the future from a wide variety of majors and curricula are seeking smal-scale, organic, and community-oriented farming opportunities. The farms have been student-driven and have often not been supported. The support needs to be there now. Just a generation or two ago, many students came to campus from farms. Today very few know anything about farming or what happens on a farm. Many college students are eager to learn about farming.

One of the ways I like to promote the student farm and experiential education is by reminding people of the vision and a task link. The quotation (author unknown) goes: "A vision without a task is a dream. A task without a vision is drudgery. A vision and a task are the hope of the world." Students want and need the balance of a vision and a task. When lecture concepts are balanced with a chance to apply them or to see them in action, students are more motivated learners. Rather than a snapshot in time, an active farm where students can participate on a regular basis provides a never-ending action story where students are the story.

MSU Student Organic Farm. Before starting the MSU-SOF, we looked carefully at the existing student farms to determine what was working and what was not. That information and some grant funding helped us get off to a very quick start. The MSU-SOF is a certified organic, 10-acre site with 14,000 square feet of greenhouse space and 7 acres of cultivated plots used for research of year-round diversified vegetable production, operation of a 48-week, 50-membership CSA, and outreach for small-scale farming (see Appendix). Our students started asking for information about organic farming and for the chance to grow crops on campus in 1999. We combined methods of community-supported agriculture with research on winter salad greens production in unheated/solar greenhouses and in 2002 made a proposal to the W.K. Kellogg Foundation to start a 48-week CSA organic farm run by students. We started building more greenhouses that fall, planted our first crops in February of 2003 and had 25 memberships filled by April (one week after offering memberships by email).

One of the challenges with teaching farming at the University level is that most of it happens when school is not in session. What we proposed in our USDA Higher Education Challenge Grant Program (2003) and have since demonstrated is that with the use of unheated/solar greenhouses (also called hightunnels or hoophouses), farming principles can be taught and practiced during the academic year. Students prepared soil and sowed seeds in early September and harvested a range of leafy green vegetables like baby leaf salad mix and spinach, as well as radishes and turnips through the fall season, including taking salad greens home for Thanksgiving dinner. For the spring semester, students sowed seeds in early February and also were able to harvest a range of vegetables before the end of the semester in early May. We were able to address all of the topics mentioned in the opening discussion of "What is Organic?" plus topics such as what food is available in the dormitory/campus food system and why.

We started developing curriculum by inviting instructors of existing classes to bring their students to come and visit the farm for an hour or two. We have several standard presentations including: (i) the "What is Organic?" outlined earlier; (ii) "The Living Soil and the Soil Food Web," including compost production; (iii) "What is community supported agriculture?" and the importance of supporting local food and farms; and (iv) "The Winter Greenhouse" and how we use unheated /solar greenhouses to harvest fresh vegetables in the winter. During farm visits we also try to get students to do

something like planting garlic or harvesting potatoes. Based on surveys completed after the visit, they remember the key concepts and like doing something.

Once we demonstrated student interest and a successful year-round production and CSA marketing program generating over $50,000 in produce sales, we developed a proposal for courses. Details of the proposed courses are available at www.msuorganicfarm.com. We have proposed 40 credits (approximately $10,000 at $250/credit) over 16 months. The focus will be hands-on growing and operation of a diversified community supported farm. Students would take at least 9 credits of course work fall and spring semester and a 3 credit practicum class designed for students to learn by assisting with the day-to-day operation of the MSU-SOF. The summer and second fall sessions will include MSU-SOF experience focused on field production of vegetables, fruit, herbs, and cutflowers, a "Study Afarm" class to provide field trips to organic farms, and the opportunity for a specific focus area selected by the student. Development of the courses is primarily funded by MSU and the USDA-CSREES Organic Transitions Program.

An important trait of our program and courses (Table 1) is that we have designed them to serve several audiences. Some of the for-credit courses are being developed from materials first used for farmer training workshops and the *Organic University*. We will be developing additional courses that will first be offered on campus for credit but will then be offered to farmers. The same courses will also be available to certificate program students and bachelor degree students. By packaging the information in smaller units, it is easier to present to farmers in either a two day workshop or an online format. We are following the lesson we learned from organic farmers, get as much as you can from monetary and human capital investment. There is definitely room for much more information, but we also have to keep the program financially within reach.

Table 1. Summary of courses being developed for the 16-month, year-round organic horticulture certificate program starting at Michigan State University in September 2006.

Organic farming courses	(7 1-credit courses) Organic Farming Principles and Practices Organic Soil Fertility Management Compost Production and Use Organic Solutions for Crop Competition Organic Solutions for Plant Health Organic Produce Direct Marketing Organic Produce Wholesale Marketing
Horticulture crops courses	(8 courses, 15 credits) Plant Science (2 credits) Vegetable Production and Management (3) Fruit Production and Management (3) Greenhouse Structures and Operation (3) Passive Solar Greenhouse Crop Production (1) Organic Transplant Production (1) Specialty Cut Flowers (1) Culinary and Medicinal Herbs (1)
On-farm courses	(6 courses, 18 credits) SOF Practicum Fall (3) SOF Practicum Spring (3) SOF Practicum Summer (3) AgTech Placement Training (3) Independent Study (3) Study Afarm (3) (Field Trip Course)

Summary of Recommendations

- USDA can work with and financially support existing organic farming organizations so these organizations are able to (a) contribute to student based programs at many levels and (b) work cooperatively with educational institutions towards the continued growth of a detailed national organic curriculum.
- Perhaps the best way to help anyone really understand organic farming and consider the option that organic is more than a niche market is to take them to successful organic farms for in-depth visits.
- USDA can support and facilitate development of age- and skill-appropriate organic curriculum or necessary information for existing youth-oriented farm and garden education programs like 4H, FFA, and Junior Master Gardener.
- Help elementary, middle, and high school students by supporting efforts to demonstrate how organic school gardening and farming can help teachers make the mandated curriculum exciting and connected to student's daily lives and diets.
- USDA can continue to encourage land grant universities to create physical spaces for experiential education and curricular opportunities for all students to explore and investigate organic production and marketing methods, including the impact of local food on local economies and homeland security. Funding full-time farm manager and academic specialist or instructor positions appears to be an important first step.

- There clearly is room for regional cooperation, distance, and internet learning methods, and possible tuition reciprocity in the area of organic farming until demand dictates that each university develop a program.
- Non agriculture colleges and community colleges can also be supported to provide experiential connections to farming and the food system.

Closing Thoughts

The urgency around student-based organic farming education is likely not just about teaching organic, ecological, or sustainable farming principles. The urgency is more about connecting people of all ages with their food, farmers, and the land. As a horticulturalist, I have come to see that the important food system issues at the moment are less horticultural and more social. However, I can use what I know — horticulture — to help people experience the connections. People get excited about flowers, vegetables, and fruit and about farm animals. The year-round CSA farm is one exciting model of how a large number of people can be connected to farmers and the land and at the same time keep farmers on the land to protect and develop our natural resources.

The shift to organic agriculture starts with developing an understanding of interconnectedness. The garden or the farm is a great place to experience principles of interconnectedness, a willingness to accept that which we should not control, the beauty of simple things in life, and the cycles of growth and decay (life and death). We cannot teach important life lessons through the use of poisons to kill unwanted pests, the unsustainable use of energy to satisfy our desires in the easiest and fastest way, the genetic modification of living organisms, the confinement of animals in crowded feeding operations, the creation of the illusion of low cost by ignoring true costs, and by the manipulation of our fellow human beings to live (farm) the way we live (farm) and not the way they choose to live (farm).

We have an exciting invitation before us that includes the opportunity to contribute to the further evolution of agriculture into a more holistic expression of humanity that frees and empowers people to grow the human spirit. Over the last century, organic agriculture movements have questioned the lack of wisdom and the absence of plans for long-term sustainability inherent in many of the agricultural technologies introduced with the false hopes of eliminating hunger. Agricultural methods have been widely imposed that are not consistent with any understanding of the roots or foundation of the evolution of the human spirit in the wholeness of life. The methods to alter the course of agriculture have been demonstrated by organic farmers and merely await our broader application. Some might question if Organic can feed the world. I do not. Regardless of what organic can do, it is clear the current methods will not work for the long term. Kenneth Wilbur, a philosopher and author that I have come to admire, points out that rarely are people wrong in regard to their ideas, but often they are working with incomplete information. We have the chance to be more thoughtful, caring, and complete.

Appendix: Author's List of Related Links

4H
4husa.org

AFSIC — Alternative Farming Systems Information Center
www.nal.usda.gov/afsic

ATTRA — National Sustainable Agriculture Information Service
attra.org

CASFS — The Center for Agroecology and Sustainable Food Systems
www.ucsc.edu/casfs

CRAFT — Collaborative Regional Alliance for Farmer Training
www.brookfieldfarm.org/craft.html

Edible School Yard
edibleschoolyard.org

The Food Project
www.thefoodproject.org

FFA — The National FFA Organization
ffa.org

Growing Growers
www.growinggrowers.org

Growing Power
www.growingpower.org

Junior Master Gardener
jmgkids.com

MOSES/*Organic University* – Midwest Organic & Sustainable Ed. Services
www.moses.org

MSU Organic Farm
www.msuorganicfarm.com

NewFarm from Rodale Publications
www.newfarm.org

student farms list from NewFarm and Rodale Publishing
www.newfarm.org/features/0104/studentfarms/directory.shtml

NEON — Northeast Organic Network
www.neon.cornell.edu

NOFA — Northeast Organic Farming Association
www.nofa.org

NOP — National Organic Program of the USDA
www.ams.usda.gov/nop

Organic Agriculture Information
www.organicaginfo.org

Organic Farming Research Foundation
www.ofrf.org

SARE — Sustainable Agriculture Research and Education Service
www.sare.org

UC Santa Cruz Center for Agroecology and Sustainable Food Systems
zzyx.ucsc.edu/casfs

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Engaging Everyone: Catalyzing Organic Leadership and Education in Minnesota

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Introduction

Organic activity in Minnesota is becoming ubiquitous. It is happening within the Minnesota Department of Agriculture (MDA), in University of Minnesota research programs, in state and county Extension efforts, inside at least four USDA agencies, at nonprofit agricultural organizations, in food businesses, and, ultimately, on a growing number of farms. There is no single agency or organization responsible for leading organic agriculture efforts in Minnesota. Instead, a collaborative approach built on personal relationships and shared leadership has evolved to further organic interests in the state. Public agencies (including federal, state, and land grant systems) and nonprofit organizations are collaborating to build agricultural institutions' and individual agricultural professionals' capacity to understand the principles of organic agriculture and the unique opportunities and challenges that organic and transitional farmers face. This activity, occurring as it has on many fronts, has furthered the credibility of organic production systems – perpetuating interest and support as a growing array of organizations begin to consider themselves to be organic stakeholders.

Relationships

Strong personal and institutional relationships – both formal and informal – have made this collaborative model work because they foster trust and legitimacy for organic efforts. One formal partnership is a *Memorandum of Understanding on Organic Agriculture* (MOU). In April 2002, the Minnesota Department of Agriculture drafted this MOU, modeling it after a national agreement between the USDA Natural Resources Conservation Service (NRCS) and the Organic Trade Association. Leaders of the MDA, Minnesota NRCS, USDA Farm Service Agency (FSA) in Minnesota, University of Minnesota Extension Service (Extension), and University of Minnesota College of Agricultural, Food and Environmental Sciences (U of M) signed onto the MOU, recognizing organic as a choice preferred by growing numbers of farmers and consumers and pledging to undertake complementary efforts to assist organic producers' efforts to improve profitability, identify new market opportunities, and conserve natural resources. The agencies agreed to undertake activities including:

- Developing and implementing conservation farm plans for organic crop production;
- Providing staff support for organic professional development, service delivery, and outreach efforts;

- Sharing training opportunities for staff, farmers, and other professionals;
- Sharing information about innovative organic programs taking place in other states or countries; and
- Encouraging the use of demonstrations and field days with organic field operations to showcase conservation and organic production.

This recognition and support for organic at the highest levels of these agencies communicated to staff people that working in and for organic agriculture was legitimate. For example, the MDA increased the organic responsibilities of agricultural specialist Meg Moynihan, who now spends more than 80% of her time on organic activities, and supports her active participation in the National Association of State Organic Programs. NRCS State Conservationist Bill Hunt has authorized a large number of his staff to attend, has approved travel funds for, and has co-sponsored numerous state and regional organic trainings, workshops, and conferences. The State FSA Director has made it possible for one of his state staff members to serve on the MDA's Organic Advisory Task Force. Extension educators have received support from the Dean's office for using time and funding to conduct organic variety trials and on-farm research projects with organic farmer cooperators, and to deliver educational sessions at conferences and workshops. University of Minnesota faculty and research associates have investigated agronomic, economic, and policy implications of and for organic agriculture (including studies on University-owned certified organic land and on farms across the state).

Each January, representatives designated by the signatories meet to reflect on MOU-related activities their organizations undertook during the previous year, and to set goals for the coming year. During these discussions, the representatives inevitably identify areas in which they can cooperate to carry out projects of mutual interest. There is ongoing discussion among the five initial signatories about whether and how to expand the MOU partnership to include other members.

While the MOU is a formal partnership, another critical relationship-building mechanism has been the Minnesota Organic Network – a self-selected group of people who are interested in working together to coordinate and support organic agriculture in Minnesota. The network currently has 61 members, who have a wide array of affiliations. Members include organic farmers, university faculty, extension educators, USDA-NRCS and FSA staff, food cooperative administrators, food writers, for-profit business people, staff from nonprofit agricultural originations (both organic and non-organic), crop consultants, independent organic inspectors, Minnesota Department of Agriculture officials, and interested consumers.

In practical terms, the network operates through two mechanisms: monthly conference calls and an e-mail listserv to connect multiple stakeholders, facilitate information sharing, and promote collaboration around emerging organic opportunities. Leadership of the network, too, is a shared responsibility. The Minnesota Department of Agriculture hosts the listserv, on which members announce events and action items, share news and journal articles, and ask for other members' opinions and experiences with regard to various organic production, marketing, and policy topics. The Minnesota Institute for Sustainable Agriculture at the University of Minnesota (MISA) sponsors the conference calls which typically have 10 to 20 participants. Different individuals volunteer to moderate and take and disseminate notes each month. Each call includes a "round robin" section, in

which participants share news and announcements, keeping other members connected with organic happenings across the state. Finally, the nonprofit Sustainable Farming Association (SFA) is currently developing a website for the Network. Sharing responsibility for the network has kept financial and administrative costs to the sponsors low and has fostered an egalitarian esprit – no single group has assumed ownership (either real or perceived) of the group or imposed an agenda on it.

Collaborative Activities: Sharing Leadership and Sharing Credit

The other main driver for interest in and legitimacy of organic agriculture among agricultural professionals are activities undertaken by groups of partners. Agricultural organizations in Minnesota, including MOU signatories and Organic Network members, have jointly undertaken a number of special projects. Collaborative approaches have been successful because they have resulted in projects that better meet agricultural professionals' needs, have engaged more and broader ownership of the sponsored activities, and have resulted not only in shared responsibility for the work of the project, but in shared *credit* for the sponsoring organizations which, in turn, has promoted shared ownership of, and recognition for, organic agriculture in Minnesota.

Organic Short Course

One outstanding example of these mutual efforts was the "Organic Short Course for Ag Professionals," a two-year, $60,000 project funded by the North Central Region Sustainable Agriculture Research and Education (NCR-SARE) Professional Development Program.

In response to complaints from farmers about difficulty locating information and support from the agricultural service sector, and to concerns from agricultural service providers that clients were coming to them with organic questions the service providers couldn't answer, this project created a professional development program and delivered introductory-level organic agriculture information to agricultural service providers at six locations throughout Minnesota.

Fig. 1. Organic short course locations, 2003-2004.

The MDA put together a statewide program team to identify desired outcomes and design the training program framework, and assumed responsibility for coordinating the team, submitting the proposal, and administering the grant. Team members included representatives from the USDA's NRCS, FSA, and Risk Management Agencies, the University of Minnesota, the U of M Extension Service, the MISA, the MDA, and the farming community. These individuals remained involved throughout the term of the project to help advertise sessions, evaluate feedback, and make recommendations for changes to the delivery of sessions. Their involvement and support were also recognized on publicity materials. Courses were publicized using print media, radio, and electronic networks and direct mail to agency leaders. For later courses, postcards to "alumni" of the program asked them to encourage colleagues to attend.

To encourage *local* ownership of and identity for the programs, planning and local arrangements for each event were undertaken by local groups. In five of the locations, the MDA contracted with the area Resource Conservation and Development Districts (which, in turn, are affiliated with MOU partner NRCS) to serve as the host for the session. For the Southwest Minnesota course, the MDA contracted with the University of Minnesota Southwest Research and Outreach Center (the SWROC, affiliated with the U of M College of Agriculture, another MOU partner). The regional approach benefited both the coordinating organization and the project. Local hosts benefited by gaining programming funds and visibility as the event organizers within their communities. The project benefited from better, more effective sessions — local committees were more familiar with the needs of agriculture professionals in their areas of the state, and with local resource people, including organic producers. Contact with farmers was critical because they were some of the most important instructors we had for all of these sessions.

Each local host organization convened a planning group, which typically included host organization staff, NRCS, Extension, MDA, consultants, FSA, and producers. A subgroup of the team that wrote the project proposal designed the first training with a curriculum that included general presentations by two or more organic farmers about their motivations and practices, a session covering the National Organic Rule and the certification process, an overview of market trends, and topical group field trips to organic operations in the afternoon — crops, livestock, business/marketing, greenhouse, etc., appropriate to the type of agriculture in a given part of the state. This design worked so well that, for the most part, planning teams for subsequent sessions kept the same format, with large group sessions in the morning, and field trips in the afternoon.

The project trained 200 agricultural professionals, reaching service providers at the Natural Resources Conservation Service, Farm Service Agency, Risk Management Agency, University of Minnesota Extension, Minnesota Department of Agriculture, Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, Soil and Water Conservation Districts, Minnesota State College System Farm Management Program, crop consultants, and lenders. The U of M offered continuing education credits.

A pre-course assessment was designed to get the trainees thinking about major issues and to assess their familiarity with organic agriculture. Attendee knowledge was generally weakest about the federal organic regulation and enforcement responsibility. Respondents said they thought the biggest motivators for farmers to transition to organic were financial/economic, followed by environment/stewardship, health/safety (of consumer and/or operator), and philosophical/moral. We also used the pre-workshop assessment to get a sense of how far people traveled to attend this training. The team that conceived the project specifically designed it to offer separate, stand-alone introductory trainings in diverse regions of the state in

order to give these trainings a competitive advantage in a world of busy schedules and decreasing travel and training funds. The project team reasoned that agricultural professionals would be more likely to attend trainings that were closer to them geographically. Our strategy worked; nearly 40% of attendees traveled less than 50 miles round-trip to attend their workshop of choice. Two-thirds of them traveled less than 100 miles round-trip to attend. Only 15% traveled more than 150 miles round-trip.

Responses to an end-of-day survey (return rate 68%) validated the effectiveness of the pedagogy, which used a model based on adult learning preferences. Respondents rated the quantity and quality of information high (average score 4 out of 5). A full 96% said the course was worth the time and effort to attend, and well over two-thirds said they'd recommend the training to a colleague. The best-liked portions of the day were morning organic farmer presentations (nontraditional presenters for groups of trainees like these) and afternoon organic farm visits/tours (active and inter-active learning). There was a great disparity in their reaction to the session on the National Organic Rule. While some called it their favorite session, more called it the least useful.

Responses to a one-page follow-up mail survey sent to the Organic Short Course attendees six to nine months after the course indicated that the attendees remained interested in and engaged with organic agriculture after they returned to their workplaces. About 58% of trainees returned the follow-up survey. The high return rate – outstanding for a mail survey – indicates that the graduates felt that providing feedback about the training was worth their time and effort. A majority of the survey respondents had worked with organic growers, and had discussed organic agriculture with colleagues since attending the training. As in the end-of-day evaluations, the farmer presentations and tours remained the sessions that participants rated most useful when surveyed several months after the workshop, further validating the power of tapping farmers as educational presenters and of incorporating active learning for adult students.

The MDA shared the evaluation report for this project by posting it on a public web site and sending copies directly to project partners, so they could incorporate lessons learned (about delivering educational programs locally and regionally, for example, or the power of including farmer presenters and field trips) into their own institutional programming.

Other Shared Efforts

There are many other examples of shared projects as well – usually initiated by one organization or group with significant assistance and participation by others in the state:

- The U of M Southwest Research and Outreach Center in Lamberton, MN, where University faculty members have been conducting applied research on certified organic land for more than 10 years, has offered organic training courses for agricultural professionals, principally the NRCS, and included Extension educators, MDA staff, individual Minnesota Organic Network farmers, and a crop consultant as instructors and session facilitators at the courses.

- The state Sustainable Agriculture Research and Education Professional Development Program, housed at MISA, has used some of its professional development funds in the last year to underwrite organic professional development activities, sending eight agricultural service providers (MDA and extension) to workshops, trainings, conferences, and events, and additional funds to sponsor organic conferences and other events.

- An annual two-day Minnesota Organic and Grazing Conference has targeted producers and agricultural professionals and has succeeded with significant planning help, financing, and session delivery by all of the MOU partners and many other agricultural groups in the state.

- The Minnesota NRCS incorporated organic transition into its EQIP cost-sharing program.

- The MDA secured $85,000 from USDA-RMA for an organic outreach project carried out in partnership with the SWROC, the Sustainable Farming Association, and several other Minnesota Organic Network participants, all sharing the work of the project and the credit for it. The project undertook three specific organic outreach activities, which engaged and benefited agricultural professionals and their ability to serve the organic sector:

  (i) Expanded and refined a pilot organic farmer mentor program network (certified organic farmers who answer questions from beginners) to ensure geographic and production diversity, as well as reliability. The MDA contracted with the U of M SWROC to accomplish this objective and promoted the service to agricultural professionals throughout the state as a resource they could use or to which they could direct clients.

  (ii) Created 10 farmer-initiated, on-farm outreach demonstrations of organic practices through which growers share insights about organic production and economic issues of organic agriculture. A number of these farmers sought help with their projects from extension educators or other agricultural professionals.

  (iii) Produced and disseminated organic processing fact sheets to expand value-added and marketing options. Three fact sheets (feed, meat/poultry, and basic food processing) were created and promoted as educational tools to agricultural professionals working in value-added agriculture.

- With land and financial support from the U of M College of Agriculture, the Minnesota Agricultural Experiment Station, and MISA, U of M faculty and students have created a two-acre organic student farm on the U of M's Saint Paul Campus to educate the next generations of agricultural professionals about practical aspects of organic agriculture.

Importance of Context

While the commitment of individuals and the formal support of agricultural institutions in Minnesota have promoted activity and engagement in organic agriculture, it is important to recognize that context has been a contributing factor to an increasing respectability or legitimacy of organic systems across the state. Consumer response to organic food has been enthusiastic and steady, steep demand has ensured premium prices for farmers. Every new story about organic agriculture that runs in lifestyle magazines or business sections of newspapers, every new organic section that appears in a mainstream grocery store, every organic conference or workshop publicized on an agricultural radio broadcast, contributes tacitly to the legitimacy of organic agriculture in the eyes of the farming community and the

agricultural professionals who serve their interests. Visibility contributes to credibility, perpetuating even more activity and involvement.

Partnership and collaboration continue to be the keys to increased organic activity on Minnesota farms and in Minnesota agricultural organizations. While from an organizational perspective it can be frustrating to have no single entity "in charge," sharing the work and credit of organic programming have galvanized enormous activity, resources, leadership, and institutional buy-in by administrators and agricultural service providers, resulting in a broad and growing spectrum of support for organic agriculture in Minnesota.

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Measuring and Communicating the Environmental Benefits of Organic Food Production

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Abstract

Perceived environmental advantages are a key motivation for the interest in organic farming. The comparison between the environmental effects of organic and conventional farming poses a number of methodological challenges. Empirical evidence shows that organic farming is ranked at least equal, and in a number of instances better, than conventional farming for key environmental indicators. In communicating these advantages to consumers, the concept of credence characteristics is important; attempts to sell organic products to consumers on their non-use values alone are likely to fail. The positive environmental effects of organic farming can, under certain circumstances, justify policy intervention. Organic farming as an agro-environmental policy instrument is particularly useful where the goal is overall improvement of a large number of environmental indicators; in such instances its comparatively lower transaction cost is a distinct advantage. However, organic farming cannot address all agro-environmental problems.

Introduction

The International Federation of Organic Agriculture Movements (IFOAM) — the umbrella organization of organic farming organizations — has formulated principles for organic farming:

> "Principle of health: Organic agriculture should sustain and enhance the health of soil, plant, animal and human as one indivisible. [...]
>
> Principle of ecology: Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them. [...]
>
> Principle of fairness: Organic agriculture should be built on relationships that ensure fairness with regard to the common environment in life opportunities. [...]
>
> Principle of care: Organic agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment. [...]" (14).

These principles make it obvious that organic farming sees itself as not being limited to producing positive effects on the environment alone, although it is clear that environmental friendliness or benefits for the environment are

a key concept of organic farming. For many outside the organic farming movement, such environmental benefits are the most interesting.

The organic principles addressing environmental benefits cannot be measured directly. However, for organic farming to uphold its principles it is necessary that it performs better than conventional agriculture with respect to environmental indicators. This implies that a comparison of the environmental performance of organic farming to conventional farming is a useful undertaking.

The Methodological Challenge

There are numerous studies comparing environmental impact of organic and conventional farming. Most studies measure and compare only a small subset of environmental indicators and are limited to a specific region or even to an experimental site. Such comparisons are quite interesting in their specific context, but difficult to transfer to other situations. Consumers who prefer organic food generally consume food from a variety of sources and origins. Agricultural and food policies often have a national and, increasingly, an international dimension. These arguments underpin the necessity to amalgamate earlier studies in an attempt to create an overview of the environmental benefits of organic farming across regions and countries, including broad sets of indicators. This synthesis would need to be based on the original measurements and studies mentioned above. However, the data must first be critically examined. The issues most important to this task will be addressed here.

Organic farming is in itself a diverse system. Within organic farming the intensity of land use differs widely, depending on factors like soil, climate, and market access but also on belief systems and preferences of farmers. This is also true of conventional farming. Due to such sources of variation even within these two agricultural methods, a first and fundamental challenge for any comparison study is to define appropriate subunits for comparison between organic and conventional systems.

A possible approach would be to compare representative samples of all existing organic and conventional farms in a region, state, or country. However, in reality organic farming is not evenly distributed, geographically speaking, so this might be misleading. Within Europe, organic farming is more likely to be found in disadvantaged, mountainous, and extensively managed areas (5). For organic farming and conventional systems to be compared, they should, as much as possible, be in the same region and under similar natural conditions.

Also quality of management differs in farming, especially in comparisons on the basis of field-trials suffered in the past from this intervening factor. For comparison quality of management should be at the same level in both systems.

Most studies relate the environmental effects of organic farming to land area. Under certain circumstances a case could be made for relating the environmental impact to the unit of manufactured product. Because yields in organic farming are frequently lower, the latter method will tend to give larger figures for organic farming, whether in terms of positive or negative environmental effects. In cases where the agricultural area is not considered scarce, there is a good argument for relating the environmental benefits to area. This seems to be the case for instance in the European Union, where set-aside is still a political instrument in order to limit the quantity of agricultural products. If not land area but total output is measured, it may be found that conventional agriculture uses less land to produce the same amount of output. The surplus land could then, in theory, be used for environmental purposes.

In such a situation, it might make sense to evaluate environmental effects per unit of manufactured product.

In a study by Stolze et al. (18), a per-area comparison was used because most previous studies use this method and often do not contain enough information to convert measurements into per-output comparisons. Although under current political conditions, for many industrialized countries, the assumption of agricultural land being more or less constant seems to be justified.

Proponents of the method see organic farming as a broad concept which should improve environmental status in general, rather than an approach targeted to solve specific environmental problems. If we follow this line of thought, then it is important to look for key indicators to structure the empirical evidence. The Organisation of Economic Co-operation and Development (OECD) (16) has developed such a system of indicators, which is used widely in agricultural research. The assessment presented in the next section of the paper is based on this system with some simplifications and modifications.

Aggregation and presentation of indicators is important for communication. A quantitative presentation on a cardinal scale would be desirable, but is not feasible in this context because existing studies are difficult to compare with respect to quantitative measurements. They relate to different regions and circumstances and often use specific indicators which form part of broader indicators. Thus, it was decided to rate indicators on a qualitative scale. In order to arrive at prudent results, the hypothesis was that there is no difference between the two farming systems unless clearly shown by studies. From this, a scale was developed where organic farming performs much better, the same, worse or much worse than conventional farming.

In many circumstances, it is difficult to communicate detailed indicators; questions are posed such as: "Is organic farming better for the soil?" In order to answer such questions, it is necessary to integrate the results for several soil indicators, such as soil organic matter, biological activity, soil structure, and erosion. Again, for lack of a quantitative aggregation procedure, the synthesis of results was done by a group of four scientists conducting the study. In the original publication (18), every integration step is clearly indicated, so the reader can judge whether he or she agrees with the method, and can also draw their own conclusions from the material presented.

Empirical Evidence: A Synopsis

The results of the comparison of organic and conventional farming systems are presented in Table 1 and Box 1. A summarizing assessment of the indicators and subjective confidence interval is given. This should remind the reader that, in some cases, the studies differ quite substantially with respect to their results. In view of the literature published since 2000, the results of Table 1 have been recently checked (12). While clearly the scientific level of more recently published research on the environmental effects of organic farming has risen, the inclusion of more recent studies did not change the results in any substantial way. Some examples of this are given here.

In the overall assessment, organic farming is ranked at least equal to conventional farming for each indicator. In many cases organic farming performs better or much better. With respect to the indicators erosion and nitrate leaching, it was judged that under certain circumstances organic farming performs worse than conventional farming. For a number of indicators no clear difference between the two farming systems was found.

For the indicator "biodiversity", these results are supported by a meta-analysis of Bengtsson et al. (2). They concluded that "organic farming usually

increases species richness, having on average 30% higher species richness than conventional farming systems" (2). They also point to the high variability among studies. Of the studies examined, 16% showed organic farming to have a negative effect on species richness. They conclude that "the attitude of individual farmers, rather than which farming systems is used, is probably the most important factor determining biodiversity at the farm level" (2).

Similarly, Hole et al. (13) summarize their synopsis on biodiversity in stating: "The majority of the 76 studies reviewed ... clearly demonstrates that species abundance and/or richness, across a wide range of taxa, tend to be higher on organic farms than on locally representative conventional farms."

For the indicator "biodiversity," it can be concluded that a meta-analysis independently done by other authors came to largely the same results as those of Stolze et al. (18).

Auerswald et al. (1) performed a large scale modeling exercise to compare the effects of organic and conventional farming on erosion. They found that "on average organic agriculture will cause about 24% less erosion than conventional agriculture." They also pointed to a large variation in extent of erosion for both systems, showing that within both systems erosion could be reduced considerably. This finding is completely in line with the description of Stolze et al. (18) on the topic of soil erosion. Green et al. (11) point to potential disadvantages of organic farming with respect to erosion if it is compared to no-till systems.

Recent results report considerable potential for carbon sequestration by conversion to organic technology (10).

Table 1. Assessment of organic farming's impact on the environment compared to conventional farming (18).

INDICATORS	+ +	+	o	–	– –
Ecosystem		X			
Floral diversity		X			
Faunal diversity		X			
Habitat diversity			X		
Landscape			X		
Soil		X			
Soil organic matter		X			
Biological activity	X				
Structure			X		
Erosion		X			
Ground and surface water		X			
Nitrate leaching		X			
Pesticides	X				
Climate and air			X		
CO_2		X			
N_2O			X		
CH_4			X		
NH_3		X			
Pesticides	X				
Farm input and output		X			
Nutrient use		X			
Water use			X		
Energy use		X			
Animal health and welfare			X		
Husbandry			X		
Health			X		

Organic farming performance: ++ much better, + better, o the same, – worse, – – much worse than conventional farming; if no data was available, the rating was "o the same"

Subjective confidence interval of the final assessment which is marked with X.

Box 1. Background on the environmental impact of organic farming on the indicator categories given in Table 1 (18).

Ecosystem indicators: Floral and faunal biodiversity, habitat diversity and landscape conservation. Organic farming performs better than conventional farming in respect to floral and faunal diversity due to the ban of synthetic pesticides and N-fertilizers, with secondary beneficial effects on wildlife conservation and landscape. Diverse crop rotations in organic farming provide more habitats for wildlife due to the resulting diversity of housing, breeding and nutritional supply. However, direct measures for wildlife and biotope conservation depend on the individual activities of the farmers. With respect to habitat and landscape diversity, research deficits were identified. As with any other form of agriculture, organic farming cannot contribute directly to wildlife conservation goals. Nevertheless, in productive areas, organic farming is currently the least detrimental farming system with respect to wildlife conservation and landscape.

Soil indicators: Soil organic matter, biological activity, structure and erosion. Organic farming tends to conserve soil fertility better than conventional farming systems. This is mainly due to higher organic matter content and higher biological activity. Therefore, organic farming seems to control erosion more effectively. A more continuous soil cover due to close crop rotations also supports this. In contrast, no differences between the farming systems were identified for soil structure.

Ground and surface water indicators: Nitrate leaching and pesticides. Organic farming results in lower or similar nitrate leaching rates than other farming systems. Leaching rates per hectare are up to 57% lower. However, the leaching rates per ton of produced output were similar or slightly higher. Ploughing legumes at the wrong time, unfavourable crop rotations, and composting farmyard manure on unpaved surfaces increase the possibility of nitrate leaching in organic farming. However, awareness of the problem and alternative measures have been developed and introduced in practice. The risk of ground and surface water contamination with synthetic pesticides is zero.

Climate and air. CO_2, N_2O, CH_4, NH_3, pesticides: Research on CO_2 emissions shows varying results: On a per-hectare scale, the CO_2 emissions are 40 to 60% lower in organic farming systems than in conventional ones, whereas on a per-unit output scale, CO_2 emissions tend to be higher in organic farming systems. Similar results are expected by experts for N_2O and CH_4 emissions, although to date, no research results exist. Calculations of NH_3 emissions in organic and conventional farming systems conclude that organic farming bears a lower NH_3 emission potential than conventional farming systems. Nevertheless, housing systems and manure treatment in organic farming should be improved to reduce NH_3 emissions further. Air contamination with synthetic pesticides is significantly lower due to their ban under organic standards.

Farm input and output: Nutrient, water, and energy use: Nutrient balances of organic farms are generally close to zero because organic farms rely heavily on internal nutrient cycling; N surpluses of organic farms were significantly lower than on conventional farms, for P and K deficits prevail. Energy efficiency of annual and permanent crops seems to be higher in organic farming than in conventional farming, mainly due to lower inputs which require a high energy input, i.e., N. Research results on water use in organic and conventional farming systems are not available.

Animal health and welfare. Husbandry, healthy housing conditions, and health status depend highly on farm-specific conditions. Thus housing conditions do not differ significantly between organic and conventional farms. Preventive use of synthetic, allopathic medicines is restricted by some national standards and recently also by EU rules. Although the application of homeopathic medicines should be preferred, conventional veterinary measures are permitted and used in acute cases of disease. Health status seems to be closely related to economic relevance of animal husbandry on the farm: Significantly fewer incidences of metabolic disorders, udder diseases, and injuries were found when dairy production was properly managed. Organic dairy cows tend to have a longer average productive life than conventional dairy cows.

Communication with Consumers

An important aspect of communication with consumers is the concept of "credence characteristics" (6). The fact that a product is organic is not immediately apparent to the consumer. There is no way for the consumer to directly check whether a product has been produced organically or not. With the exception of direct sales from farmer to consumer, a well-functioning certification and labeling system is an important pre-requisite for successful communication with the consumer. It has to be made credible for the consumer that the product is actually organic, and organic products have to be easily distinguished from non-organic products.

Environmental advantages of organic food can also be regarded as a credence characteristic. Even if the consumer is sure that the product he or she is buying is organic, he or she must also believe that, during production, environmental advantages have been realized.

But are consumers really interested in the attribute "environmentally friendliness" of organic food? A review of the literature (15,17,19,20) shows that environmental friendliness of the production process of organic food is generally only the second most important argument for purchase. Magnusson et al. (15) found "health concern is a better predictor than concern for the environment" and interpret this as an indication "that egoistic motives seem to be stronger than altruistic motives." Wier et al. (19) conclude that consumers generally acknowledge non-use benefits of organic products, "but only those having use values in addition actually purchase organic to a high degree."

Two conclusions emerge from this: First, attempts to sell organic products to consumers based only on reference to their non-use values are likely to fail. On the other hand, evidence from the literature suggests that

communication about the non-use values as a secondary aspect can have positive effects on sales.

This understanding of the organic farming market can, for instance, be found in the slogan used by the most successful German organic supermarket chain ALNATURA: "Organic — makes sense for man and earth." Another example of practical implementation is the information campaign on organic farming by the Federal Ministry of Consumer Protection, Food and Agriculture in Germany, which stresses the advantages of organic food for the individual and puts the societal advantages second (8).

Policy Relevance

There are two major reasons why organic farming can justify policy intervention. Government regulation can define clear (minimum) standards, transparent certification and labeling of organic food which helps the market function better. The two biggest markets for organic food in the world – the US-market and the European market — are examples where this type of government intervention has taken place. The other argument in favor of government intervention is based on the notion that organic farming benefits the public. Among these benefits, the environmental effects of organic farming are often mentioned. In general, an economic argument can be made for public support because relying on the private provision of such environmental benefits would most likely lead to an insufficient supply.

Within the EU, this argument has been of major importance for introducing political support for organic farming. Within the context of agro-environmental programs, organic farming has been policy supported in nearly all member states, mostly on a per-hectare basis (5). The European Union regards these measures as being under the green box of WTO and thus non-distorting to international trade. This type of environmentally motivated support for organic farming can influence markets for organic food which has led to a call for balancing these measures with other measures in support of organic farming. This call has been taken up by the European Commission to a certain extent (3,4).

In communicating the environmental benefits of organic farming to policy makers, it is important to consider the following: If looked at as an agro-environmental policy instrument, organic farming will lead to a broad, but not targeted, improvement for a large number of environmental indicators. If a specific environmental problem in a region needs to be addressed, it is likely that using specific measures within conventional farming is a more cost-effective way to reach the objective than to convert to organic farming. Thus, it is clear that organic farming as an agro-environmental policy instrument is only suitable in certain situations and with the objective of a move towards a more environmentally friendly farming system in general.

Organic farming will not address all agro-environmental problems. If cultural heritage systems in agriculture are to be sustained, a conversion to organic farming will not necessarily do the job. Also, if some extensive grazing systems are demanded for specific environmental purposes, conversion to organic farming might not be a sufficient replacement for these systems. In such cases, an additional agro-environmental program might be needed to help deliver the desired environmental outcome.

If politicians are interested in supporting environmentally friendly farming systems, organic farming is an interesting choice, because consumers bear much of the increased cost for producing organic foods. On the other hand, making a conventional system more environmentally friendly by means of agro-environmental programs, the additional cost is borne by the public. However, this argument only holds if the environmental support of organic

farming will not completely distort the existing markets for organic food.

Politicians interested in organic farming should note that the system is quite sensitive to the way in which it is regulated; an ongoing discussion on a revised version of the EU organic regulation (7) shows that since organic farming is a market-oriented system, stakeholders may react quite harshly to changes in the regulatory system. A lesson to be learned is that regulation of organic farming is not a purely technical problem on how best to achieve environmental performance but also a problem of good governance dealing with questions like stakeholder participation and subsidization (7).

Organic farming is a dynamically evolving system – as is conventional farming. Any comparison of the environmental benefits from either of these systems may change over time, for example by introduction of new regulations in organic farming or conventional farming. With more stringent environmental regulations for all types of agriculture, the relative benefit from organic farming might decrease, while a tightening of the standards for organic farming might increase its relative advantage. The advent of new technologies and their introduction into agricultural practice, like genetically modified organisms, also change the picture over time.

Within the context of these dynamic changes, organic farming can currently be seen as a role model for creating an environmentally friendly farming system. This role model can have an indirect influence on conventional farming whose effects might even go beyond the direct effects of organic farming on the environment. Keeping such a role model alive and developing it further through research and other measures might also be a way to improve environmental friendliness of farming in general. Seen in this light, the influence of organic farming could grow far beyond its present borders.

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Measuring and Communicating the Benefits of Organic Foods

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Introduction

The growth of the organic industry is no longer confined to the East and West Coasts, as organic production and processing is booming in the Midwest as well. In Iowa alone, for example, there are over 100,000 acres in organic production farmed by over 500 producers (13). In 1997, the increasing organic trend was brought to the attention of Iowa State University by Dr. Jerry DeWitt and a group of stakeholders who approached the Dean of the College of Agriculture and proposed to create the first Land Grant University tenure-track position with a specialty in organic production (10). Over the past eight years since the inception of the position, the growth in the organic industry has averaged in excess of 20% annually (19,26). As the market has grown, so have consumers' expectations of quality organic products that are healthy and produced in an ecologically sound manner. In return for fulfilling these expectations, the organic consumer is willing to pay a premium. In addition to consumers, chefs, in many ways, have been leading the way in promoting organic foods. Several organizations, including the Chefs' Collaborative, the Slow Foods Convivium, and individual restauranteurs are advancing the notion that customers are willing to pay a premium for local and organic foods on the menu.

One of the challenges for the organic producer, processor, and marketer is to differentiate their products in the crowded food marketplace. Not only must the organic industry be concerned with competing with conventional products, they must also compete against a range of products that are advertised as "natural," "farm fresh," "raised locally," and a host of other Eco-Labels, attesting to some form of production standards. However, despite the plethora of production claims and labels, the market for USDA Certified Organic products continues to exhibit robust year-to-year growth. Among other reasons, perhaps paramount is that the term "organic" has legal standing and an internationally recognized label conveying the message that the production system that created the product was governed by a set of well-developed rules regardless of the country of origin (25). As a result of the requirements of labeling and the national regulation of the term "organic," when consumers purchase organic products they enjoy a level of confidence that the supply chain involved in creating the product has been thoroughly vetted and monitored over time.

While the evolving organic production systems in the US and the world are often viewed as a relatively small market, there are profound implications for the larger food system, especially in the area of food security.

In a survey conducted by scientists at North Carolina State University (17), most respondents preferred US rather than foreign-sourced food, and local, family-farmed products rather than those produced by large corporate entities. While identifying the reasons for this preference is difficult, a likely factor is the notion that if the product on the retail shelf is locally produced, the consumer can find the producer should the need arise. This notion is reinforced in the case of organic products, as all ingredients and processing aids must, as a matter of law, be identified, reported, and approved by an independent agency whose charge is assuring compliance with USDA standards (25). Applying the implications of the North Carolina findings to the US organic market, it is easy to conclude from a food security perspective that organic products would have a competitive advantage in the market if the product was locally produced. Applying the established audit trail protocols developed for the organic marketplace with the North Carolina findings to the larger food market would yield a safer, more secure food system in the US.

Transgenic crops, also referred to as genetically modified organisms ("GMOs") in popular literature, are an evolving issue in organic and conventional markets worldwide. Across the globe, most participants in the organic industry eschew GMOs as a matter of course. The basis for the GMO prohibition in organic production is environmental and philosophical and it is unlikely that the prohibition will be lifted anytime in the foreseeable future. Driven by the fear of losing market share due to consumers' resistance to purchasing and consuming foods that include GMO ingredients, many US, Japanese, and European Union (EU) conventional processors require the use of non-GMO ingredients in their products. Often the product will be differentiated in the market by noting this fact somewhere on the label. Consumer resistance to GMO ingredients is higher in the EU and Japan than the US; however, US consumers, like their Japanese and E.U. counterparts, desire a labeling scheme indicating whether a product contains GMO ingredients. Absent a label, the only way for a consumer to be confident a product does not have GMO ingredients is to purchase products for which there are no GMO ingredients possible or purchase certified organic products. Communicating all aspects of the fast-changing GMO dynamic is critical to consumers' understanding of how the GMO prohibition dovetails with the organic system approach to production and concomitant environmental concerns.

As organic production has increased, several limiting assumptions have been raised to the level of fact supported by little, if any, direct evidence. These include: (i) inherent lower yields; (ii) higher production costs; (iii) limitations on the number of acres that can be effectively managed in accordance with the organic rules; (iv) manure applications lead to soil and water and contamination; (v) organic foods are not as safe as those produced in a conventional system; and (vi) organic production degrades soil quality. However, a review of some of the existing literature (5,15,21) reveals that much of the evidence supporting these assumptions can be traced to a lack of effective management practices, rather than a function of an organic system. These details on organic management should be part of the message communicated to the public.

Productivity of Organic Systems

Our research at the Iowa State University Neely-Kinyon farm in southwest Iowa has shown that, from a business planning standpoint, one should assume that yield will be lower in an organic grain system during the transition phase. However, we discovered that careful execution of good management protocols, based on local practices, produced no significant differences between organic and convention yields of the primary cash crops,

yellow dent corn, and food-grade soybeans (8). Researchers at the University of California at Davis (22), The Rodale Institute (20), and in Europe (16) have gathered similar results.

Profitability of Organic Systems and Limitations in Growth

Production costs were also compiled and compared for the certified organic and the conventional systems. The most notable discovery was that while labor costs were greater in the organic system, material costs were significantly lower. Moreover, the most significant accounting notation was that the organic system was more profitable (11).

Without information about the limitations of land, labor, capital, and production involved, the absolute number of certified organic acres that can be effectively managed is unknowable. Once budgets that include these four items are compiled, a determination can be made regarding the potential dimension for organic operations (18).

Food Safety Concerns

The fertilization regimen of most organic crop production relies heavily on the application of manure and composted manure. It has been observed in many contexts that continuous application of manure, as well as any other fertilizer, can lead to polluting run-off. This fact has often been extrapolated to the point of concluding that, since organic producers use manure, they are adding to the water pollution load. Scant evidence exists showing any facts behind this claim, whereas overwhelming evidence suggests that excess applications of any fertilizer can result in some form of water pollution. In addition, the application of raw manure is regulated in organic production where raw manure must be applied during a period of active up-take by the plant (for horticultural crops – 120 days before harvest) (25), thus mitigating pollution due to agricultural run-off.

The suggestion that organic food is less safe than conventional food generally surfaces when a case of food-borne illness has been traced to an organic product, usually produce. As in most cases of such illnesses, the cause is not the production system per se, but the post-harvest handling of the product during which time some pathogen is allowed to remain on, or comes in contact with, the product at some point in the journey from the field to the table. This problem of sanitation is shared across all levels of the food system and can only be addressed by adherence to effective food sanitation protocols.

One of the most apparent benefits from consuming organic food is lower pesticides in foods. The Consumers Union began a study in 1998 determining that organic fruits and vegetables in US groceries had significantly lower pesticide residues compared to conventional produce, which was substantiated four years later in a similar study (2). The University of Washington measured pesticide metabolites in pre-school children over a three-day period and found concentrations of pesticides metabolites six times lower when children were fed organic over conventional food (7). The Organic Center for Education and Promotion has also compiled peer-reviewed information finding lower pesticide levels in organic food (3), which has led to increasing consumer confidence with organic food consumption.

Concern over mycotoxins in food is also driving consumer interest in organic foods. Studies in Europe have consistently reported 50% more mycotoxins in conventional food and livestock feed than in organic counterparts (3). In a comparison of organic and conventional corn grain quality at Iowa State University, we found no mycotoxins in the organic corn. Scientists have speculated that fungal infections may arise due to the lack of diversity and heavy use of fertilizer coupled with fungicide applications.

In terms of *E. coli*, this pathogen was the target of our comparison of organic versus conventional apple cider in Iowa (12). We did not find *E. coli* in either system and no statistical difference in yeast and mold populations in conventional versus organic apple cider.

Food Quality Comparisons

In comparing organic and conventional food quality, identical conditions — soil, weather, varieties — as the conventional system must occur when producing the organic crop. In addition, the organic crop should be *certified* organic to assure that only NOP-compliant practices are involved. Several studies have followed these two criteria and are reported here. At the Citrus Research Institute in Acireale, Sicily, researchers found higher concentrations of Vitamin C in the organic versus conventional citrus fruits (23). At the University of California-Davis, after 10 years of organic management, organic tomato fruits had higher calcium (Ca) and phosphorus (P), which corresponded to greater levels of Ca and P in the organic system's soils (6). In Denmark, Brandt and others (4) have focused on phenolic compounds, which are the plants' natural defense chemicals that act as cancer-fighting compounds in humans. She found that plant disease incidence was not higher in organic compared to conventional (sprayed) crops, suggesting higher intrinsic resistance and phenolic composition in organic plants. In a similar organic fruit comparison study at UC Davis, organic and sustainably-grown fruits were also found to contain higher phenolics than conventional produce (1). Another nutraceutical of interest to consumers is lycopene, which assists in mitigating damage; Ishida and Chapman (14) found that organic catsup had 50% more lycopene than conventional brands. Benbrook's study of the literature (3) found that organic food, on average, contained 30% higher levels of beneficial antioxidants than conventional food. Taste is more of an illusive issue, but seminal work by Reganold and others (24) at Washington State University confirmed through lab analysis and taste tests that organic apples were less acidic and firmer than conventional apples.

Soil Quality Under Organic Conditions

Weed control in organic systems often requires tillage operations. For cash grain crops, this usually involves multiple passes over the field. This observation has lead to the conclusion that organic grain production degrades the soil by compaction. Our observations at the Neely-Kinyon research site have cast considerable doubt on this conclusion (9). One of the reasons for the doubt is that the average number of field operations we conduct over the course of a 4-year rotation (corn-soybean-oats/alfalfa) has been similar to that of a conventional corn-soybean-corn-soybean no-till operation. In addition, the compost, oats, and alfalfa contribute significant organic matter to the organic system. Thus, by measures analyzed by soil scientists at the USDA National Soil Tilth Lab, soil quality in our certified organic system has improved over time.

The Role of Extension

Communicating the proven benefits of a certified organic production system to a larger audience is a key factor in sustaining growth of the overall organic industry. At a Land Grant institution, such as Iowa State University, this communication is accomplished by employing the well-structured Extension Service. In any given year, Iowa State's Extension Organic Program holds about ten workshops and field days throughout the state. Over the course of the school year, we train about 100 elementary students at the Neely-Kinyon farm site on organic principles and practices. Of equal importance is the publication of organic research results in peer-reviewed

journals. Over the past year, the *Agronomy Journal*, *Crop Management*, *HortScience*, and *Renewable Agriculture and Food Systems* have published some of our organic research.

We also have worked with the writers at The Rodale Institute's online publication "New Farm" to provide research-based organic information to a larger audience. Additional on-line sources can be found at the organic webpage at Iowa State which is linked to many other information sources, the Organic AgInfo website which is housed at North Carolina State University and is a product of the Organic Agriculture Consortium between ISU, Ohio State University, Tufts University, NC State, and the Organic Framing Research Foundation. Another established source for researchers, producers, and the public is the USDA-SARE (Sustainable Agriculture Research and Education) Program Sustainable Agriculture Network (SAN) and the Appropriate Technology Transfer for Rural Areas (ATTRA) program. Reflecting the robust growth of the organic industry, an increasingly effective way to communicate the benefits of organic production are mainstream groceries. In Iowa, we have been approached by Hy-Vee Supermarkets to provide accurate information regarding the benefits of consuming organic foods.

In conclusion, I think the most apparent benefit of organic production that can be communicated to consumers is preservation of our environment. With less pesticides used in organic production, organic produce has clearly been shown to contain lower pesticide residue. Other food quality studies have shown organic foods with lower nitrates, higher soluble solids, higher antioxidants, and higher phenolic compounds. Whether these additional claims will induce consumers to increase organic food purchases or not, the current practices and philosophies embodied in organic production (i.e., protection of the environment and support for family farms) will most likely provide incentive enough to continue organic purchases.

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www.ota.com

OCA — Organic Consumers Association
www.organicconsumers.org

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Challenges in Measuring the Benefits of Organic Foods

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Today, I want to talk to you about some research I have been doing at Tufts University. One thing that I would like you to remember from this presentation is the website organic-center.org. This is the website of the Organic Center, an exciting new venture. The focus of the Center is to look at the issues being addressed in this panel. How do we compare organic versus conventional food and agriculture? What are the benefits of growing and eating organic food? These are areas that funders are starting to dip their toes into, and we hope that federal funding will also start to loosen up to address these issues. Right now, however, the most interesting work is being privately funded by the Organic Center.

The Organic Center has recently released three "State of the Science Reviews" (SSRs). Chuck Benbrook is the chief scientist for the Center. The first SSR addressed pesticide residues and was really capstone work for Benbrook, because he has been working on these issues for 20 years. The second SSR concentrated on antioxidant and polyphenol favonoid comparisons. The third report just came out this fall and focuses on mycotoxin comparisons.

My work at Tufts University has been funded by the Organic Center. Tufts University has one of the five USDA nutrition centers, the Human Nutrition Research Center. They have a wonderful antioxidant laboratory there that provided an opportunity to do some research on antioxidants and the comparison between organic and conventional food. Within this research, my job is to do the farm pairings and bring the product to the lab for analysis. We are currently in the final stages of writing a paper on the methodology that we have been following.

I want to talk today about the challenges of doing these comparisons. A lot of the information has already been discussed here today, but I wanted to give you my experience. I will go over some of the major questions and challenges. First: How do you pick which crops to study? USDA has several databases that tell us which crops are antioxidant rich — blueberries, for example. So, we first looked at the crops that are antioxidant rich and were already of interest in the scientific community. We then focused on those that are grown in our region, leaving us with blueberries, tomatoes, cranberries, and then also dairy for a variety of reasons.

During our next step, we called organic certifying agents to help identify possible farms. We also talked to Cooperative Extension and the Natural Resource Conservation Service. We tried to get the farm pairs as geographically close as possible because of weather patterns, water sources, and soils. We found that often when we called to ask farmers to take part in

the comparative research, the conventional farmers were immediately on the defensive.

How many farms do you need for these comparisons? When I talked to John Reganold at Washington State University, generally the convention is that you want four pairs. But, you really have to start with more than that, because when you get into your research, you will find that what the farmer tells you about his crop on the phone may be really different than when you have driven 15 hours to that farm. You may lose that pairing. In addition, the question is how long do the comparisons need to last? We found out that for the data to be published in the literature, they really want two years of data.

In terms of implementing the study, it was amazing what farmers did not know about their own farms when we got there. We found that, in general, organic farmers tend to know more. Ideally, you would be taking soil samples, but we didn't do that in this study. Some farmers had soil analysis and all kinds of data that they shared with us. Some knew what kind of soil types were on their farm. But then, in any field you have many types of soil, so this can be a challenge.

Farmers also didn't know much about their operation. Maybe they been farming the organic farm for 10 years, but what if the blueberry bush is 30 years old or if the cranberry bog is 100 years old? To obtain the historical data and make those comparisons is very difficult. In addition, some farmers fell out of organic production during the study. For example, we had a cranberry operation fall out in the middle of the study – cranberries are very difficult to operate organically.

There were numerous other challenges we faced. There are all kinds of organic, and all kinds of conventional. For example, on the one end, you might have industrial organic, and I use that phrase not in terms of size, but in terms of the number of inputs; these may be farms that are as conventional as organic can get. On the other hand, you may have a conventional guy using Integrated Pest Management (IPM) methods that are very close to organic production. Then, you may have the farmer that is doing organic by neglect. The hypothesis with antioxidants and polyphenols is that they are produced as a plant defends itself. Thus, possibly, on this farm where the plant is neglected (which is not the ideal organic in my mind), these plants may be the ones with the highest antioxidant capacity. So, you have that sort of farm versus the industrial conventional – and maybe that is where you will find your biggest differences. Thus, the important issue is how you portray these comparisons and when you write it up, how you describe these farms. For example, I find that when I compare small non-organic dairy operations in Vermont with some organic dairies, they have a lot in common.

Another major challenge is varieties. If your blueberry bush is 30 years old, or the cranberry bog is 100 years old, it is difficult to discern their variety. Many times, organic farmers are doing completely different varieties than the conventional farmers. For instance, with tomatoes, the organic farmers are growing Brandywine tomatoes, the delicious two-pound heirloom tomato that most of us know. The conventional farmers are not doing that. If I do find the conventional farmer growing Brandywine heirloom tomatoes, which we were able to do, he is likely selling it at a farm stand or a local market in a different type of system than the ordinary conventional farmer because Brandywine tomatoes don't travel well over long distances. Thus, trying to match varieties between organic and conventional systems takes out a number of varieties from consideration.

The parameters are also important. We were trying to match soils, irrigation, inputs, planting time, ages of the bush or the bog, how long the farm may have been organic, rotations, and the list goes on and on. We haven't succeeded yet in getting a perfect match. We also leave room for farmer speculation on the comparison of conventional and organic when we

talk to them and in follow up with the paper. I found some of the richest discussions and important insights coming from the farmers themselves because they have thought a lot about this. I would urge researchers to allow for some free-flowing conversation beyond the interview protocol to get these insights.

What do you do for sampling? The guys in the lab coats said, "Bring back 20 units." Well, they meant 20 tomatoes per farm or 20 cranberries per farm. This did turn into a magnitude problem, however. These lab technicians were pretty surprised when we came back with 20 2-pound tomatoes. We also tried to sample so it was representative of the field. For example, who pulls the sample? Initially I had the farmer pull the sample. Later, I decided that it was better if I, as the researcher, pull the sample because I do the same thing on every farm, and farmers individually will do things differently.

We also try to pull the sample as close to harvest time as possible. It is great if I have two farms that are 10 miles apart. However, maybe their harvest time is different because they planted at different times. As a researcher, I've decided I want to collect the samples on the same day. Which factor trumps the other is really what this brings up. In addition, if you are pulling samples at harvest time, you have farmers who are very busy. Those are some of the challenges we are dealing with in my current research. I think we will have some interesting results to publish next year. What has been really great about this research is that it has really excited some of the scientists in the laboratory. This kind of research wasn't in their scope previously. Now they really want to learn about it — they are reading the literature differently, they are scanning the literature more, and they are thinking about NIH money. So, the little bit of money we got from the Organic Center is paving the way for bigger things. For those of you that have research ideas about comparing organic and conventional, the Organic Center provides up to $5,000 in small grants to do the groundwork to prepare proposals.

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Sustainability of Organic, Conventional, and Integrated Apple Orchards

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Introduction

Kathleen Delate summarized some of the farming systems studies that have been done and Kathleen Merrigan gave a good overview of some of the problems encountered in doing on-farm field research. I have been doing on-farm research for 20 years. The farming systems I have studied include organic, integrated, biodynamic, no-till, and conventional systems. Most of my studies deal with real farms, ranging from 2 to 500 ha in size. I either use the farms themselves as replicates, with two different farming systems or treatments represented, or I set up plots, that represent different farming systems or treatments, on a single commercial farm. I thought I would summarize the results of one of my studies that fits in the latter category. This on-farm study was published in *Nature* in 2001 (1) and examined organic, conventional, and integrated apple production systems for six growing seasons between 1994 and 1999.

Objectives of Study

My research team wanted to look at a number of indicators of environmental and economic sustainability with these three apple production systems — the first objective of the study. These indicators included: (i) soil quality, including numerous physical, chemical, and biological properties; (ii) horticultural performance, including tree growth, yield, nutrients, fruit quality, storage potential, and sensory evaluations; (iii) profitability, including costs and gross and net returns; (iv) environmental impact; (v) energy efficiency; and (vi) pests, diseases, and disorders.

For a second objective, we were interested in developing alternative practices for apple growers in Washington State who might like to convert to organic or integrated production. When we started the study in 1994, not even 1% of the growers were organic; today, about 6 to 7% are organic. We have about 170,000 acres in apples in the state. Apples are a significant crop in Washington State, which produces about 50% of all apples in the United States. Finally, a third objective was to help build a research base for organic production.

Study Area and Management of Farming Systems

Located on a 20-ha (50-acre) commercial apple orchard in the Yakima Valley of Washington State, a 1.7-ha (4-acre) study area was planted with 'Golden Delicious' apple trees in 1994 in a randomized complete-block design

with four replications of three treatments: organic, conventional, and integrated. Each of the twelve experimental plots were 0.14 ha (0.33 acre) and consisted of four rows (spaced 1.4 m apart) each 80 trees (spaced 3.2 m) long trained on a three-wire trellis system for a density of 2240 trees/ha (903 trees/acre). The study was on-farm, grower/scientist managed. We have had three USDA grants for this project and we also have had the benefit of the farmer supplying the labor and most of the other inputs for the treatments, without which the study would not have been possible.

In cooperation with the farmer, professional consultants, and extension agents, we chose appropriate management practices for the three systems. The organic system included compost and foliar sprays. In the first three years (1994-1996), bark mulch and landscape fabric controlled weeds; thereafter, cultivation and mowing were used for weed control. Organically certified biological controls, including applications of *Bacillus thuringiensis* and pheromone mating disruption to control codling moth (*Cydia pomonella* L.), were used for pest management. Fruit thinning was by hand. The conventional system included synthetic soil fertilizers and foliar sprays, pesticides, chemical fruit thinners, and pheromone mating disruption. The integrated system used both compost and synthetic fertilizers and controlled weeds with both bark mulch and herbicides. Pest management and fruit thinning were similar to those of the conventional system. The three systems had similar total soil N inputs. Pests, diseases, and physiological disorders were monitored throughout each growing season by the farmer and by professional consultants, who recommended organic, conventional, or integrated treatments for their control.

More information on the study area and treatments as well as details of the analytical procedures were described in Reganold et al. (1).

Soil Quality

Organic matter was higher on the organic and integrated treatments because of the addition of compost. Any introductory soil science textbook will tell you the benefits of adding organic matter to the soil in your garden or farm. Instead of just reporting the data on the numerous soil quality properties, we used a soil quality index developed by a USDA scientist at Iowa State University. It was designed for corn and soybean systems. We modified it for apple production systems. The physical, chemical, and biological soil properties we examined, such as bulk density, water content, total nitrogen, nitrate-nitrogen, extractable phosphorus, cation exchange capacity, pH, electrical conductivity, organic carbon content, aggregate stability, microbial biomass carbon and nitrogen, and earthworm populations, were incorporated into a soil quality index. The index accounts for four functions of the soil (accommodating water entry, facilitating water movement and availability, resisting surface degradation, and sustaining fruit quality and productivity). Each of the functions receives a value of 25% or 0.25. Adding the four values together gives an index between 0 and 1, with 1 being the best. The soil quality indices were higher for the organic and integrated treatments for both 1998 and 1999. Because of poorer ability to accommodate water entry and to resist surface structure degradation, the conventional system (no organic amendments added) scored the lowest overall in soil quality.

Horticultural Performance

We looked at a number of horticultural parameters. We measured the size of the trees, and tree growth was identical for all three systems. We measured yields every year which is so important to growers. One of the main problems for organic apple production was that there were not any really good organically certified thinners for apples. In conventional or integrated

systems, you can use chemical thinners that do a great job in maintaining similar yields every year. Because apples are bi-annual bearing, they tend to yield high one year and low the next. With the organic treatment, we had to hand thin because you cannot use those non-certified chemicals and there is not yet a good alternative on the market. In 1996, the conventional treatment had the highest yields, but in 1997 and 1998 the organic yielded more. Then, in 1999, the organic treatment had the lowest yields. However, when you add all those annual yields together – cumulative yields from 1995-1999 – there are no statistical differences in yields among the three systems. Maintaining equal organic yields with conventional yields is probably easier to do with horticultural crops than with grain crops.

We also looked at fruit weight which gives you an indication of the size of the fruit. Usually the bigger the apple, the more money you get for the apple. In 1998 and 1999, organic apples were smaller than conventional and integrated apples. To an apple grower it is not financially beneficial to have to sell smaller apples. Another indication of quality is firmness of apples. Some apples are sold fresh after harvest and some are put in storage for up to six months to sell later. Sometimes they are in regular-atmosphere storage, but most often they are in controlled-atmosphere storage with carbon dioxide added. So, the data is for harvest, three months, and six months. And, apples have to meet a minimum firmness test at harvest or after storage to be sold as fresh apples rather than culled as juice or sauce. We found that the organic apples were either firmer or always as firm as the conventional and integrated apples.

Growers and consumers generally like a Golden Delicious apple to be sweet. Ratios of soluble solids (sugar) content to acidity (tartness), an indication of sweetness, were most often highest in organic fruit. These data were confirmed in blind taste tests by untrained sensory panels (students, staff, and faculty at Washington State University) that found the organic apples to be sweeter after six months storage than conventional apples and less tart at harvest and after six months storage than conventional and integrated apples

In 1995-1997, all marketed fruit produced from the three systems was sold for processing because it was downgraded primarily due to skin russetting, a physiological skin disorder that reduces the fruit's visual appeal but not its taste or other attributes. Although russetted Golden Delicious apples are not sold as fresh fruit in the US marketplace, Italy domestically markets a fully russetted Golden Delicious apple, and in the world market fully russetted Bosc pears are preferred to non-russetted ones. The low landscape position of the experimental site in the orchard resulted in early season cool, humid conditions that contributed to the unusually high level of russetting. Fruit damage due to other physiological disorders, pests, and diseases were minimal and equal for each of the three systems. In 1998 and 1999, marketable fruit not graded as Washington Extra Fancy or Fancy was sold for processing.

Profitability

Enterprise budgets were generated each year to calculate net returns from total costs and gross receipts. Receipts for the integrated system were estimated using prices for conventionally produced fruit, since unlike organic fruit there was no price premium for integrated fruit. Receipts for the organic system were estimated using prices for conventionally produced fruit in the first three years (1994-1996), the number of years necessary to transition from conventional to certified organic. The price premium to the grower for each grade of organic fruit in the next three years (1997-1999) averaged 50% above conventional prices.

The three systems did not show a net annual profit until 1999 under measured fruit quality conditions (with skin russetting). When we adjusted the economic analysis by eliminating the effects of russetting but maintained the estimated crop loss of 15% due to other factors and the measured size, grade, and firmness of fresh fruit in this study, the organic system was more profitable than the conventional and integrated systems in 1997 and 1998.

The breakeven point, when cumulative net returns equal cumulative costs, is projected to occur 9 years after planting for the organic system under measured fruit quality conditions. The conventional and integrated systems would break even 15 and 17 years after planting, respectively, under measured conditions. Under non-russetted fruit quality conditions, the breakeven point would occur 6, 8, and 9 years after planting for the organic, conventional, and integrated systems, respectively. Assuming similar non-russetted fruit quality conditions, estimated breakeven points for conventional apple orchards in central Washington range from 8 to 11 years from planting. The main reason the organic system can out-compete the conventional and integrated systems is that it has similar yields and receives a price premium for its fruit.

Without price premiums for organic fruit, the conventional system would break even first, the integrated second, and the organic third under russetted or non-russetted fruit quality conditions. For breakeven points of the organic and integrated systems to occur in the same year as the conventional system, price premiums of 8.3% for the organic system and 2.2% for the integrated system would be necessary under measured fruit quality conditions. Under non-russetted fruit quality conditions, premiums of 14.1% for the organic system and 5.7% for the integrated system would be necessary to match the breakeven point of the conventional system.

Environmental Impact

The biggest apple packer in Washington State is Stemilt Growers and they have developed an index, "Responsible Choice," that measures the impact of pesticides on the environment. It takes into account for each pesticide the active ingredient, dose, application frequency, and targeted pest and is based on chemical efficacy, leaching potential, soil sorption index, chemical half-life, potential worker and consumer exposure, and effects on beneficial organisms of pesticides used in an orchard. The higher the rating, the greater the potential negative impact. Since only about 35% of conventional Washington growers in 1999 used pheromone-mating disruption (PMD), an environmentally benign biological control used in our conventional treatment, we also included a non-PMD conventional system in which synthetic pesticides were used in place of PMD. The total environmental impact rating of our conventional system was 6.2 times that of the organic system, whereas the integrated system rating was 4.7 times greater and the non-PMD conventional system rating was 7.7 times greater.

Energy Efficiency

We kept track of energy inputs and output from 1994-1999. This included labor, machinery, fuel, electricity, fertilizer, insecticides, fungicides, weed control, water, and infrastructure. Energy efficiency is expressed as an output/input ratio. You want the number to be larger rather than smaller. I thought these ratios would be pretty even across the three systems because apple production is an energy intensive system. The organic system, however, was about 7% more energy efficient than the conventional system and 5% more energy efficient than the integrated system.

Conclusion

Summarizing the data, we found the following:

- The organic & integrated systems had higher soil quality and potentially lower negative environmental impact;
- yields and tree growth were similar, but organic fruit was smaller;
- organic fruit was sweeter and as firm or firmer than conventional and integrated fruit;
- the organic system was more profitable than either the conventional or integrated system;
- the organic system was the most energy efficient; and
- if you combine all of these sustainability indicators, then the organic system ranked first in overall sustainability, the integrated second, and the conventional last.

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Addressing the Information Needs of Organic Farmers: The Confessions of an ATTRA Specialist

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Introduction

I work for the National Center for Appropriate Technology (NCAT), a non-profit organization that addresses issues of renewable energy, community development, and sustainable agriculture. NCAT is best-known in the agricultural community for its largest project, ATTRA. ATTRA — the acronym stands for Appropriate Technology Transfer for Rural Areas — is the National Sustainable Agriculture Information Service, which is sustained with funding from the USDA through the Rural Business Cooperative Service.

The ATTRA Project

The ATTRA Project has been active since 1987. During that time, it has provided information on sustainable production systems, specialty crop and livestock enterprises, and alternative marketing strategies to thousands of farmers, teachers, researchers, Extension agents, and agri-business men and women across the country.

We generally call ourselves "secondary researchers." That is, we see our task as collecting primary information and synthesizing it into a farmer-friendly form. The primary information we collect often includes anecdotal information as well as peer-reviewed research. In the earliest years of the Project, anecdotal information was often all that was available on many sustainable farming topics. Fortunately, one of the clear trends we've seen over the years is a generous increase in published research.

ATTRA's information delivery is accomplished mainly through three means: publications, individual case question responses, and seminars and workshop trainings. In this way, we are similar to Cooperative Extension. In fact, we commonly say that we exist to back-up Extension in many non-traditional areas.

Our methods are increasingly successful. At the present time we are logging roughly 5,500 visits each day on our website. In addition, we provide 30,000 to 35,000 "hardcopy" publications or custom case responses annually.

NCAT/ATTRA and Organic Agriculture

Throughout the 18 years that ATTRA has existed, the organic community has always been a major user of our services. Members of the community were among the first to call our office with questions about soil management, pest control, and direct marketing. The volume of interest motivated the development of a growing number of publications that

specifically address organics. At the moment more than one-quarter of our roughly 250 publications are specifically targeted to organic producers. Many more contain information applicable to organic production and marketing.

The kinds of information ATTRA provides to the organic community have changed over the past 18 years. The change is, I feel, a mirror of the changes that organic agriculture is undergoing in the United States. In the first 10 years of ATTRA, from 1987 until about 1997, our approach to organic agriculture was rather simplistic and naïve. Though many of us knew better, we essentially accepted any production system that avoided the use standard commercial pesticides and fertilizers as being "organic." When I say some of us "knew better," I mean that there was recognition of organic farming as a deliberate strategy for sustainable production, and also an awareness of on-going industry efforts to develop standards and certification procedures. The lack of clear definition on our part reflected both public misconceptions about organic agriculture and the lack of size and coherence in the organic marketplace at that time.

The change began with the release of the first draft of the National Standard in late 1997. Those of us at NCAT who reviewed the draft and made comments began to realize two things. First, it was clear that organic agriculture was going to grow rapidly, as would the need for accurate and timely information. And ATTRA, in its unique role as a national program, would be expected to take a leading part. Secondly, we realized we were ill-prepared to assume that role. Our specialists were generally conversant with the biology and technology of organic farming, but not up to speed on what was happening on the regulatory level and its implications. Many of our publications contained information that would soon be dead wrong as far as organic farming and marketing were concerned. We needed to fix that.

The fix began with several specialists taking the initiative to study the industry and how it was evolving. A few trained as organic inspectors, something I would advise anyone to do if you want to understand the Standard and how it is applied at the ground level. We also began monitoring the on-going evolution of the National Standard and its implementation, attending National Organic Standards Board (NOSB) meetings and making frequent lengthy visits to the National Organic Program (NOP) website.

One of the first tasks was to make all existing organic publications, and those containing advice for organic farmers, consistent with the National Standard. Since most ATTRA publications are on a 2-year review cycle, the procedure was fairly straight-forward. Every update was reviewed by at least one staff member who was conversant with the regulations.

A second task involved the development of a new class of materials — checksheets, workbooks, documentation forms — that simplify and clarify regulatory language and provide tools for record keeping. The goal was (and is) to make the process of certification easier for farmers. To assist in this we sought and obtained additional funding from the National SARE and the National Organic Program.

What We've Learned

This is a very quick overview of where our organization, particularly the ATTRA Project, has been with regard to serving the organic community. So what have we learned that informs us as regards organic research and information needs?

Increased complexity. The National Standard has imposed new levels of complexity on organic farming. By extension, this complexity is imposed on those who do research on organic systems, and those professionals, like Extension agents, who advise organic farmers. On occasion we are consulted by researchers about experimental "organic" treatments they

plan to use that involve the use of biosolids, treated seed, and other prohibited materials that not only make the findings less relevant or irrelevant to organic farmers, they lead to decertification of the research site. In some instances, the proposed sites have been working organic farms!

Increased sophistication. The need for basic organic production and marketing information continues to arise as more growers continue the transition to organics. However, at the same time we have observed an increase in the number of sophisticated questions. On the production end, this reflects the availability of new knowledge and technologies in recent years, including biopesticides, particle-film pest barriers, soil food-web concepts, compost teas, and so on. On the marketing end, it reflects the influence of the Internet, export opportunities for organics, and expanded demand for less-traditional organic products like meats, for which there is less infrastructure and less industry experience.

Systems design and management vs. input substitution. Organic production is defined as:

> A production system that ... respond[s] to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity. (NOP §205.2)

Despite this enlightened definition in the Regulation and a growing awareness of the value of systems management, the organic community is obsessed with issues surrounding what can and cannot be used in organic production. This creates particular challenges for new organic producers who assume that the key to organic production is product selection, much as it was when they farmed conventionally. While we are, on occasion, asked to advise on improving crop rotations and selecting cover crops and beneficial habitat species, such questions take a backseat to the number of questions about materials.

The roots of input substitution and the general obsession with materials are varied and have a tortuous history. They are reinforced by the Standard itself, which requires three years of decertification wherever a prohibited substance is applied. At the same time a weak crop rotation, poor nutrient management, and lack of biodiversity would rate nothing more than a minor non-compliance, if the organic inspector notes it at all.

On the positive side, the organic research community is really getting a pretty good handle on this. This is reflected in some of the excellent proposals that have been submitted to the USDA-CSREES Integrated Organic Program, for example. The downside is the lack of good farmer-friendly literature that works to illustrate the importance of systems. And I include ATTRA in that criticism. I authored the publications we have on this topic and consider them wanting. So there is more work to be done.

For More Information

The ATTRA Project is not the only federally-funded entity tasked with developing and delivering sustainable agriculture information. We are one of three. The other two are the Alternative Farming Systems Information Center (AFSIC) — which is part of the National Agriculture Library — and the Sustainable Agriculture Network (SAN), which is part of the Sustainable Agriculture Research and Education (SARE) program. We refer to ourselves as the "troika" and do a lot of our work cooperatively.

For more information on the ATTRA Project or the other programs that NCAT works on, visit www.attra.ncat.org or call 800-346-9140.

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US Federal Organic Research Activity is Expanding

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Abstract

The United States Department of Agriculture/Agricultural Research Service is the agency responsible for the federal effort in agricultural research. A recent survey of the ~2340 USDA/ARS scientists revealed that approximately 8% of the scientists were interested in working on research topics for organic agriculture. At the time of the survey only about 4% had worked in or were working on projects useful to certified organic industries. The survey identified several obstacles hindering work in organic agriculture. Some obstacles such as low funding levels were not unique to organic research while other obstacles were. A recent USDA/ARS workshop on organic agriculture helped to identify and alleviate some of those issues.

Introduction

The growth of organic agriculture as an industry has mandated an equivalent growth in organic agriculture research. Local, state, and national research institutions are beginning research programs in organic agriculture and the resulting publications are beginning to emerge. A literature search in the CABI database revealed that, in the five years from 2000 to 2004, nearly 4 times as many (2168) publications on organic agriculture were published as compared to the five years from 1990 to 1994 (558). The interest of the US federal government is also increasing and more scientists from the US Department of Agriculture/Agricultural Research Service (USDA/ARS) are conducting research on organic agriculture than ever before. This paper provides a glimpse of organic agriculture research currently underway at the Federal level.

Early pioneers in organic agricultural research were mostly growers and researchers working with Non-Governmental Organizations (NGOs). The lack of funding for state and federal research was in part due to the lack of economic impact and political clout of the organic sector during its early years. Organizations like the Organic Farming Research Foundation (OFRF) were created to fill the vacuum that existed due to the lack of institutional support for organic farming research (5). As the political and economic clout of the organic sector has grown, so has the involvement of government research organizations. Consequently more state institutions are implementing organic research and extension programs. Approximately 44 states now have some evidence of organic research activity supported by state resources (9). Although some universities and cooperative extension agencies have just recently begun to serve the research needs of the organic industry, others, like the University of California at Santa Cruz, have been conducting organic agricultural research for decades. Their record is exceptionally impressive considering that they are not a Land Grant University and thus

have limited resources available to them for agricultural research in comparison to the Land Grants.

Organic Agricultural Research at the Federal Level

Three agencies within the USDA are responsible for the national effort in organic agricultural research. Cooperative State Research Education and Extension Service (CSREES; csrees.usda.gov) is responsible for competitive funding programs within the Department. Until recently there were no funds designated specifically for organic agriculture research, although there were several programs from which scientists received funds for conducting organic agriculture research. The Sustainable Agriculture Research and Education program (SARE; sare.org) and individual programs within the National Research Initiative (NRI; csrees.usda.gov/funding/nri/nri.html) have funded organic research projects. However, in 2000 the first program explicitly aimed at funding research on organic agriculture was established. The Organic Transitions Program is part of the Integrated Pest Management Integrated Competitive Grants authorization in the 1998 farm bill (AREERA). A second program, the Organic Research and Extension Initiative (OREI) was authorized in the 2002 farm bill. Grants from OREI were funded for the first time in 2004 as part of the Integrated Organic Program (IOP), which combined both authorizations into a single program. To date these two programs have awarded approximately $8.5 million dollars for organic research projects. Although funds are provided to state, private, and other federal organizations, this program directs the funds toward issues that are significant at the national level. Part of this research focus was influenced by the research agenda developed by the Scientific Congress on Organic Agriculture Research (7). While CSREES runs granting programs in organic agriculture research, this agency does not conduct research.

The Economic Research Service (ERS; ers.usda.gov) is responsible for research on agricultural economics. Members of the ERS published have published important analyses of market and economic trends in the organic industry. They have led the way in our understanding of growth in the US organic industry.

The Agricultural Research Service (ARS) is the national agricultural research organization in the US, and is comprised of approximately 2340 scientists. The agency is divided into eight administrative areas that are based on regional proximity. There are over 20 National Programs with 1373 individual projects organized in the themes: (i) Animal Production, Product Value and Safety; (ii) Natural Resources and Sustainable Agricultural Systems; and (iii) Crop Production and Product Value and Safety. The National programs are run by National Program Leaders (NPL) who prioritize the national research agenda within those programs. There is no specific national program for organic agriculture and therefore until recently there was no documentation of which scientists were conducting organic research or the extent of the USDA commitment to organic research.

Until the 1ate 1970s the USDA/ARS had no official policy toward organic agriculture but this sector was most often neglected and at times demeaned by USDA administrators (5). The first attempt by the ARS at a national organic research agenda was made in the late 1970s. In 1979 the USDA/ARS began an extensive assessment of organic farming in the US by the "USDA Study Team on Organic Farming" which published what is still one of the most comprehensive analyses of organic agriculture in the US conducted by government agencies (5). The resulting publication from this study team called for the establishment of a permanent resources coordinator on organic agriculture (10). These recommendations were initially taken seriously but in 1982 the full-time organic farming coordinator position that

was recommended and established was abolished. Although some scientists continued to work in organic systems, the organic nature of their work was not emphasized and they didn't report the organic nature of their work in the project reports.

Nine years ago, an informative survey of the Current Research Information System (CRIS) database was conducted by Mark Lipson of OFRF (5). He reported that less than one-tenth of one percent of the USDA's research portfolio consisted of "strong organic projects." He recommended that the level of commitment should be raised to the level of the industry market share. This survey was done with the best available data and provided valuable insight into the current research being conducted. However, because of the structure of CRIS project documentation systems, very little of the scientist's research can be documented there. Additionally because of the lack of support for organic research in the agency, some scientists did not explicitly state that their research was done in organic systems. In order to try to better understand who was working in organic systems or who would be interested in doing so, I was asked by the USDA National Program Staff (NPS) to survey USDA/ARS scientists in 2001 (3). All supervisors were asked to forward a request for scientists working or interested in organic research to contact the NPS. All respondents were asked if they knew of other ARS scientists interested or working in organic research.

A total of 188 USDA/ARS scientists responded that they were interested in organic agriculture research. Many of them hadn't yet had the opportunity to work in organic systems but were eager to. Of the 188 who responded, 89 stated that they work in organic research. All 188 scientists received a survey to evaluate the nature of the work they do and/or the obstacles they face in conducting organic research. Some of results from this survey are reported here.

Of the 89 scientists who indicated that they conduct organic research, four scientists reported that 100% of their research was directly applicable to organic agriculture. However, only one appropriated project within the ARS is dedicated to work in organic systems (Cover Cropping Practices to Improve Weed and Fertility Management in Organic Production Systems). This new project, established in 2001, has a single scientist located in the Crop Improvement and Protection Research Unit at Salinas, CA. There were 15 scientists who reported that at least 50% of their research was explicitly organic. Nevertheless, the commitment of other scientists' time varied, with the average scientist spending about 18.5% of their time and presumably resources working on organic research projects. At the time of the survey, there was only one location that had certified land that they owned (Salinas, CA with 22 acres certified) (Fig. 3). In addition, Beltsville, MD (Fig. 1) had 30 certifiable acres, and Fort Pierce, FL was developing 10 acres on 80-year lease (Fig. 2). Thus, most ARS scientists conduct their organic research in collaboration with established organic growers or NGOs. For example, scientists in Morris, MN have developed a long-term relationship with an NGO, Barnes-Aastad Soil and Water Conservation Research Association, where they have initiated a long-term systems trial that includes 3.8 acres that, while not certified, are managed according to organic regulations (Fig. 4).

Fig. 1. USDA/ARS Organic Research Farming Systems Trial in Beltsville, MD. Dr. Michel Cavigelli, a soil scientist with the Sustainable Agricultural Systems Laboratory, manages this farming systems trial, which was initiated in 1993. The trial emphasizes organic production systems and the replicated plots are big enough to use standard-sized farm equipment. The research team compares organic and conventional production systems by evaluating crop performance, soil fertility, soil quality, weed population dynamics, nutrient cycling, soil bioloigical activity, and other measures of agronomic performance among the five cropping systems.

Fig. 2. Paper mulch being evaluated as an alternative to plastic mulch at Rosie's Organic Farm, Gainesville, FL. Dr. Erin Rosskopf of the Subtropical Plant Pathology Research Unit in Fort Pierce, FL is evaluating biodegradable paper mulches as an alternative to plastic mulches for weed control in organic and conventional systems. Like many ARS scientists, Dr. Rosskopf collaborates with organic growers to test promising technologies on the growers' land. In addition, Dr. Rosskopf and her colleagues are working to certify 10 acres of land for which the USDA/ARS holds a long-term lease.

Fig. 3. Organic Weed Management Systems Trial, Salinas, CA. Dr. Eric Brennan and colleagues are evaluating cover crop variety and seeding rates on a variety of agronomic, horticultural, and economic aspects in an organic vegetable production system on a portion of the 22 acres certified in Salinas, CA. Dr. Eric Brennan's research program (Cover Cropping Practices to Improve Weed and Fertility Management in Organic Production Systems) is the first and only USDA/ARS project specified to work in organic systems.

Fig. 4. USDA/ARS Farming Systems Plots, Morris, MN. In 2002, Dr. David Archer and his colleagues established 96 organically managed plots out of the 192 plots in this long-term farming systems trial. This represents 3.8 acres that could be certified organic. The experiment is comparing tillage, rotations, and fertilization in plots managed organically and conventionally. The plots in the foreground are a tofu variety of soybeans (Vital), conventional tillage on the left, strip tillage on the right. This work is being done in conjunction with an NGO, Barnes-Aastad Soil and Water Conservation Research Association.

Although the scientists work in a wide range of disciplines (Table 1), less than 2% work in animal systems. National Programs in the Animal Production, Product Value and Safety National Program could potentially offer a great deal more that would directly impact organic agriculture. The remaining 98% of research was split evenly between national programs in Natural Resources and Sustainable Agricultural Systems and Crop Production and Product Value and Safety. Interestingly, 12 scientists were working on organic systems as alternatives to methyl bromide as part of National Program 308.

Table 1. The number of USDA/ARS scientists and locations conducting organic research.

State	Location	Number of scientists	Disciplines represented
Arkansas	Booneville	1	Agronomy
California	Davis	1	Plant pathology
	Parlier	4	Entomology, plant pathology, soil science
	Salinas	2	Horticulture, plant pathology
	Shafter	1	Entomology
Colorado	Fort Collins	1	Soil science
Florida	Fort Pierce	2	Microbiology, plant pathology
	Gainesville	2	Entomology
	Miami	1	Chemistry
Georgia	Athens	1	Microbiology
	Dawson	2	Food technology, plant physiology
	Tifton	4	Entomology, plant pathology
Iowa	Ames	5	Agronomy, entomology, soil science, plant pathology
Idaho	Kimberly	1	Soil science
Kansas	Manhattan	2	Entomology
Maryland	Beltsville	14	Agronomy, chemistry, genetics, microbiology, plant physiology, soil science, weed science, zoology
Minnesota	Morris	5	Agronomy, plant physiology, soil science
	St. Paul	1	Soil science
Missouri	Columbia	2	Chemistry, microbiology
Mississippi	Oxford	1	Agronomy
	Mississippi State	1	Entomology
	Poplarville	1	Entomology
North Dakota	Mandan	1	Soil science
Nebraska	Lincoln	2	Soil science
New York	Ithaca	1	Ecology
Oklahoma	Lane	3	Agronomy, entomology, plant physiology
Oregon	Corvallis	4	Entomologist, plant pathology
Pennsylvania	Wyndmoor	3	Chemistry, microbiology
South	Florence	1	Genetics

Carolina			
Texas	Weslaco	2	Soil science
Utah	Logan	1	Entomology
Washington	Prosser	1	Plant physiology
	Pullman	1	Soil science
	Wapato	6	Entomology
	Wenatchee	2	Plant pathology, plant physiology
West Virginia	Beaver	3	Plant physiology, soil science
	Kearneysville	3	Entomology, soil science

Obstacles to Organic Research in the USDA / ARS

As part of the survey, ARS scientists were asked what obstacles prevented or hindered their work in organic agriculture. This was an open-ended question to which 171 of the 188 scientists interested in organic agriculture responded. Many of the scientists had multiple responses. The obstacles fell into six categories, five of which were easily defined. The main categories of obstacles were related to: (i) resource issues; (ii) scientific issues; (iii) agency acceptance; (iv) cooperators; and (v) regulatory issues. Additionally, 22 respondents reported issues that didn't fall into one of these categories and 8% said they had no obstacles.

Over 40% of the scientists who responded identified resource issues as a significant obstacle to their research in organic systems. One respondent summed up the situation, "We have no obstacles except for lack of time, funds, and personnel." The lack of resources is not a new phenomenon to agricultural research in general (8). The total US federal support for agricultural research is typically 2% of the nation's total expenditure for research and development (1). Many years the *increase* in the budget for the National Institutes of Health is greater than the *total* research budget for all research conducted by the ARS.

In addition to funding issues, which are common to all of agricultural research, there appear to be resource issues that are particular to organic production systems. Many research stations have farm equipment and land that could be used for organic production; however, the burden of cleaning pesticides and other substances that are not permitted in organic production from machinery often falls to the organic programs. Additionally, problems that arise from potential chemical contamination due to shared irrigation or run-off are usually the burden of organic programs to solve. This often leads new organic programs to buy their own equipment and develop independent infrastructure that new conventional-based programs usually do not need to do. To help mitigate these problems, organic researchers may place a greater emphasis on on-farm research, which in turn leads to a greater need to address problems with the grower-cooperators, as discussed below.

When scientists refer to the lack of time they are indicating that they do not have mandates to work in organic agriculture 100% of the time. Generally ARS field personnel are not trained in organic production methods. Most ARS scientists must then balance work in other farming systems with work in organic systems and learn how to manage organic land. Additionally many scientists expressed that they have little time to dedicate to organic systems since they already are fully occupied with their work in conventional systems.

Issues with cooperators represented 28% of the obstacles identified and some of these obstacles relate directly to grower numbers. One common

comment was "Organic growers just don't come to us for help." Many scientists expressed the sentiment that the number of organic growers was low relative to conventional growers so they can't find cooperators or grower land on which to work or there isn't a demand for their help.

In addition to the lack of contact between researchers and growers, concerns with the grower-scientists collaboration were expressed. Some expressed a potential lack of commitment by growers to complete the research once it is started. More than one scientist indicated that growers quit experiments in the middle of an experiment, wasting the scientist's investment. This is a problem that growers and scientists face in any cooperative research project due to different imperatives (4). However, this problem can be minimized by choosing the appropriate research-management model. Moreover, including growers from the beginning of the research planning process as equal partners helps to alleviate this problem.

In addition to difficulty finding organic growers, scientists had difficulty finding scientific cooperators interested in organic agriculture or associated agriculture industries for support. It appears that the perception of the quality of organic research is not the issue, since only a small percentage (1%) identified legitimacy as an issue. Previously, this was a major issue preventing scientists from working in organic agriculture (5). This difficulty may be because the scientists are already over-worked, or because of the smaller pool of scientists available for teamwork in organic systems.

Approximately 20% of the scientists that responded identified scientific issues as major obstacles. For example, the need for huge land resources for replicated experimental plots was given as a scientific issue since these are not available. Additionally, experimental design for organic research was recognized as an obstacle. In particular the size of plots needed to do research in the replicated designs in vogue for single-component analysis is impractical.

In fact, a change in the over-all approach to research may be needed in order to adequately study complex organic systems. According to Drinkwater (2) systems research evaluates how complex systems function as a whole in contrast to component research, which evaluates cause-effect relationships of individual components of the system. Systems research is often discussed as an integral approach to advancing organic agriculture due to the systems-level functions that are thought to be operating (6). Many ARS scientists recognized the need for more complex statistical methods for analyzing their work, but these methods have not yet been standardized and are sometimes not well accepted.

Scientists are still struggling with how to truly do interdisciplinary research instead of multidisciplinary research and many don't understand the conceptual difference (11). The distinction between these two is significant for organic agriculture. Multidiciplinary research has several scientists from different disciplines working on the same project. Multidisciplinary research is often essentially single component research replicated for each discipline on the same research plot with little interaction among the disciplines. On the other hand, interdisciplinary research begins to approach systems research because the disciplines interact and share approaches and analyses. Notwithstanding these difficulties, over 60% of the ARS scientists working in organic research say that they are already taking a systems approach to their research.

Because of the national presence of ARS across many climates and cropping systems, it is uniquely poised to ask questions about transferability of organic practices and knowledge from one environment and system to another. This transferabililty is an issue for scientists who believe that their research won't be broadly applicable if conducted on organic farms. Because organic growers use unique mixes of crops and approaches for their individual

farms and their approaches to farming have tended to be less formulaic than those of conventional production, the applicability of research conducted in one specialized farming system to other farming systems is questioned. Thus, scientists want to know if research conducted on one farm or location applies to other locations, and how to improve the breadth of that applicability. A coordinated research project organized at the national level could be conducted by the USDA/ARS to answer these questions.

Equal to scientific issues, agency-specific obstacles were identified by 20% of the respondents. These issues relate to the lack of support or approval of organic research given by administrators at all levels. The majority of the ARS scientists responding stated that organic agriculture had a low priority compared to conventional agriculture in their project goals. Others cited lack of local administrative support or support from the NPS. Another agency-related issue indicated the contrasting requirements of long-term and systems research and the evaluation system for scientists. Essentially, conducting long-term systems research may not benefit the scientist in the evaluation system. Systems research may take longer than component research and that is bad for early career scientists. In particular, one respondent noted that "A process-based approach is not beneficial to young scientists' careers because of risk and length of time to publication."

Regulatory issues are significant for at least 10% of the scientists who responded. Some scientists expressed that the definition of organic agriculture does not allow practices that would be more sustainable. One respondent noted: "They (regulators) put the definition ahead of alternative sustainable practices." It might be best for the definition of organic to evolve as the science of organic systems evolves. In addition, some scientists just don't understand the regulations or process of certification. Several scientists indicated that they just don't know if their research would fit within the rules.

Ideological differences still exist and scientists sometimes see the organic industry as a different kind of constituency then other grower groups with which they interact. An excellent illustration of this was the scientist who stated that he didn't want to work on organic agriculture because he might sound like an advocate for organic agriculture. He thought that by supporting organic agriculture through research he would be advocating for this production system over another. However, all scientists within the USDA/ARS work for particular sectors of agriculture at the exclusion of others. It is likely that this scientist could, for example, work on wheat without being concerned that he or she was advocating for wheat and thus implying that corn was not so good. Thus, scientists sometimes have different beliefs and actions with respect to organic agriculture that present unique obstacles to research.

Recent Progress on Obstacles

Recently the NPS and upper ARS administrators demonstrated renewed support for organic research in the agency. In addition to the support provided for the survey itself, NPS held an organic research workshop, which brought ARS scientists from around the country together to develop and exchange ideas on organic research projects and help develop an organic research action plan. The first USDA/ARS Workshop on Organic Agriculture was held in January 2005 in Austin, TX and was attended by 63 scientists. During the solicitation for this meeting, additional scientists indicated that they were interested in organic research, bringing the number of interested scientists to 196. Several significant results developed out of this meeting, including the development of an action plan. Moreover, important scientific contacts were made and research collaborations were established due to this meeting. One suggestion from the workshop was to reestablish a position at

the national level to coordinate all organic agriculture research in the USDA/ARS. This would transfer the onus of keeping the program going from individual scientists and move it to a strategic position. This would also demonstrate the intent of the agency to increase or emphasize organic agriculture in the near future and give an official level of legitimacy to research in this area.

Conclusions

The USDA/ARS is the premier federal agricultural research organization in the US. The renewed interest of this organization in organic agriculture research should both help resolve the scientific questions surrounding organic agriculture and meet grower needs. The agency has already taken several steps to help the scientists within the agency accomplish more in this area, and the removal of identified institutional barriers to organic research will demonstrate continued intent to support organic research. If taken, the recommendations from the ARS organic workshop should significantly aid scientists in their research efforts. These steps could increase the number of scientists in varied disciplines who are conducting organic research, which is necessary in order to conduct meaningful research in organic agriculture. Though many scientists are conducting research on a wide variety of crops using a range of disciplines already, research in organic animal production is clearly lacking.

Significant advancement of organic research in the ARS will require administrative coordination at the national level. Because of the national nature of the organization, questions fundamental to organic agriculture could be asked across all regions of the country to determine the general applicability of principles developed from one location to another. Because ARS projects are funded in multi-year cycles, the organization should be able to organize long-term projects that are difficult to execute in institutions relying on grant funding. The development of regional organic research centers was one idea suggested at the ARS National Organic Workshop that could facilitate coordinated research at both the local and national levels.

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