Renewable Agriculture and Food Systems: 19(2); 80–91 DOI: 10.1079/RAFS200365

Building a farmer-centered land grant university organic agriculture program: A Midwestern partnership

Kathleen Delate[1,*] and Jerald DeWitt[2]

[1]Departments of Agronomy and Horticulture, and [2]Department of Entomology, Iowa State University, Ames, Iowa 50011, USA.
*Corresponding author: kdelate@iastate.edu

Accepted 22 October 2003 **Research Paper**

Abstract

Based on citizen demand, Iowa State University (ISU) established the first organic specialist faculty position at a US land grant university in 1997, as a shared appointment in the departments of horticulture and agronomy, with a 70% extension and 30% research split. By 1999, a national survey determined that ISU had reached the upper percentile of organic research, extension and educational activities at land grant universities in the US. This result was attributed to a series of successful Organic Agriculture Focus Groups in 1998, convened to help direct the new organic research and extension program at ISU. Partnerships with the Leopold Center for Sustainable Agriculture and the College of Agriculture facilitated the ISU sustainable agriculture extension leader and organic specialist's participation in an extensive focus group dialogue with a diverse group of farmers (organic and conventional), agribusiness professionals, bankers and consumers in six agricultural communities across Iowa. Focus group responses included the need for organic research at the university level, since the majority of organic farmers (65%) were receiving their information from other organic farmers and non-governmental publications. Paramount in the needs assessment was the establishment of organic research sites across the state to demonstrate the economic and environmental benefits associated with organic farming practices over the long term. Specific outcomes-based extension needs were articulated, which led to the development of an annual schedule of organic workshops, field days and conferences. In 2001, in a survey of 300 farmers to assess the outcomes of the Organic Agriculture Program, all respondents (39% return rate) reported benefiting from an extension organic program. Similar to focus group results, farmers rated workshops and field days as the most likely venue for information dissemination. As a result of organic farming practices, 90% of respondents reported an increase in soil quality and 67% reported a 6–30% increase in farm income. The success of land grant university organic programs will be dependent upon administrative support, sufficient resources and community involvement in the decision-making process.

Key words: extension, focus groups, long-term research, outcomes-based, producer-driven, surveys

Introduction and Background

The demand for lower pesticide residues in food and in the environment has led 90% of US citizens to consider including organic foods in their diets[1]. US organic acreage has increased from 607,500 ha in 1995 to 931,500 in 2001, with annual organic sales exceeding 20%[2]. Based on the increase to 8100 ha of organic production in Iowa in 1996[3], a diverse group of producer and industry citizens approached Iowa State University (ISU) College of Agriculture administrators to request the establishment of an organic program at ISU to help Iowa producers meet the increasing demand for organic products. The group consisted of extension staff, agricultural professionals, organic farmers and conventional farmers interested in transitioning to organic agriculture. These citizens recognized that, despite the growth in organic agriculture across the US, research and extension activities in organic farming systems were limited, particularly at land grant universities.

This project was supported by Project 3801 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa, USA.

The Organic Farming Research Foundation (OFRF) had determined that less than 0.1% of US Department of Agriculture research addressed organic farming systems in 1999[4]. Much of this omission derived from the complexity of questions arising from organic farming systems research[5,6], and the limited knowledge of the mechanisms operating in organic farming systems[7]. In another survey conducted in 1999, 'extension' was cited as one of the critical impediments to adoption of organic practices[8], due to limited organic agriculture educational opportunities for extension and research faculty prior to 1997. Subsequently, farmers were driven to develop solutions to research problems within their own farmer groups, without the assistance of their local extension specialists[9].

Iowa State University sought to address this gap by hiring an organic specialist in 1997 to serve on the College of Agriculture faculty. It was decided that the position would reside in the departments of horticulture (70%) and agronomy (30%), in order to serve organic grain, vegetable and fruit growers in the state. The job description for the position was developed with community involvement, including local farmers and Department of Agriculture and Land Stewardship (IDALS) Organic Program staff. Subject matter expertise required in the position included the aforementioned crops, in addition to herbs, turf and agroforestry systems, as a 70% extension and 30% research appointment. Some of the benefits and drawbacks of this broad, multidisciplinary job description will be discussed in this paper. Recruitment for the organic specialist position included advertisements in agricultural professional society journals and other venues. Included in the interview process were members of the original group who had approached administrators on the need for this position, the faculty search committee, and members of IDALS and Practical Farmers of Iowa. Community members queried the candidates regarding their experience with organic systems and on-farm research, which they viewed as important criteria for success in the position.

Once the organic specialist was selected, a Sustainable Agriculture (SA) Summit was held on June 30, 1997, to acquaint the new specialist with faculty members and Iowa farmers working in sustainable and organic agriculture. Sponsored by the USDA-SARE (Sustainable Agriculture Research and Education) program, this day-long workshop, organized by the SA extension coordinator at ISU, served as the initial venue for reviewing the research and educational needs of organic producers.

Organic Agriculture Focus Groups

Also participating at the SA Summit was the Leopold Center for Sustainable Agriculture (LCSA), a public institution housed at Iowa State University to provide support for research and educational activities that increase the viability of Iowa agriculture through more environmentally sound and community-based practices. Early in the appointment of the organic specialist, the LCSA offered financial and logistical support to the Organic Agriculture Program. Based on concepts described by Chambers et al. (1989)[10], the LCSA recognized farmers as central to the research process, and encouraged the organic specialist to establish a research agenda based on organic and transitioning farmer-identified problems. Extending research results throughout the state's farming communities was also a goal of this new program.

In February 1998, a series of Focus Groups was organized by the organic specialist and the ISU SA extension leader (J. DeWitt). Using lists of active extension participants from state extension staff (Table 1), 60 organic and conventional farmers (crop, livestock and vegetable producers), agribusiness professionals, bankers and consumers received personal invitations to participate in the development of the organic research and extension agenda for Iowa State University. Focus Group meetings were held in conjunction with a locally produced supper in six diverse communities across Iowa. A set of ten questions related to participants' perception of support for organic producers at ISU and their research needs was distributed in the letter of invitation to community members (Table 2). Each Focus Group differed in their specific responses, depending on their operations (agronomic versus horticultural).

The Focus Group meetings began with several general questions regarding knowledge of the associations in Iowa working with organic farmers, including the Leopold Center for Sustainable Agriculture, the Iowa Department of Agriculture and Land Stewardship, and Practical Farmers of Iowa. When queried on personal knowledge of the new (7-month-old) organic agriculture program at Iowa State University, 67% expressed some familiarity with the program. The majority of participants (52%) perceived a positive future for organic agriculture in Iowa, with the greatest optimism (86% positive) from the areas of highest organic farming concentration (northeast and southwest Iowa). Several areas of interest were presented by participants:

- 'Vegetables could be a new area for Iowa's organic producers, but volume is the key. We need to develop needed infrastructure, such as processing centers.'
- 'Farmers are very interested in doing more organic research.'
- 'The organic movement will continue to grow quickly, with opportunities for small scale, family producers, especially organic fruit.'
- 'There is a good potential for organic herb production in Iowa.'
- 'Organic meat opportunities exist, but will take time.' (This has since changed, with the passage of labeling for certified organic meat in 2000.)
- 'Conventional farmers need help to become more knowledgeable about organics.'
- 'My organic crops are going great and there is a need for more organic grains.'

https://doi.org/10.1079/RAFS200365 Published online by Cambridge University Press

Table 1. Focus Group participant attributes.

Focus Group community location and principal farming operations	Participant profession (total number over six groups)
Group 1: Southeast Iowa, agronomic/livestock	Organic producer (15)
Group 2: Northwest Iowa, agronomic/livestock/horticultural	Conventional producer (19)
Group 3: Southeast Iowa, vegetables	ISU extension, agronomy (4)
Group 4: Northeast Iowa, agronomic/livestock	ISU extension, horticulture (2)
Group 5: Southwest Iowa, agronomic/livestock	ISU extension, communities (2)
Group 6: Central Iowa, agronomic	ISU farm manager (4)
	Grain cooperative manager (2)
	Community ag. marketer (1)
	Crop consultant (2)
	Banker (1)
	NRCS (1)
	Livestock feed operator (1)
	Other ag./environmental business (6)

ag, agricultural; NRCS, Natural Resources Conservation Service

Table 2. Organic Agriculture Focus Group questions.

1. Prior to receiving this letter and coming to this meeting, were you aware that Iowa State University has a full-time faculty member working in organic agriculture?
2. Are you aware of the Leopold Center for Sustainable Agriculture and its conferences?
3. Are you aware of the IDALS Organic Agriculture Program? Practical Farmers of Iowa?
4. What do you see as the future for organic agriculture in Iowa, related to:
    Field crops?
    Horticultural Crops?
    Livestock?
5. What is your feeling on how much work in organics ISU has undertaken to date?
6. How much effort (faculty positions, research, extension efforts) *should* ISU spend in organic or transition (to organic) research, teaching and extension?
7. If ISU embarked on organic research, how much effort should be devoted to:
    Organic field crops?
    Organic horticultural crops?
    Organic livestock?
8. If you are an organic farmer, or you know organic farmers, what are the main sources of information for organics?
9. What do you think is the most effective method for reaching organic farmers (or those interested in organics):
    Extension workshops/conferences?
    Publications?
    Newsletters?
    Other methods?
10. What specific research in organics would you like to see at ISU?

- 'There is a high demand for organic, food quality, tofu soybeans.'
- 'I am cautious, because, currently, the driving force is organic soybeans. I'm afraid that this will not be the big picture down the road.'
- 'Organic provides an opportunity for farmers to ''size-down''. Because it is more labor intensive, I am concerned about the larger organic operations, who may not realize labor demands.'
- 'People want to see more ''Iowa grown'' products.'
- 'Profitability will be key for most producers.'

In response to the question on availability of existing organic research, only 39% of respondents considered organic research activities at ISU to be adequate at that time. Half of the Focus Groups requested that '100% more effort be given' with the average response requesting '93% more effort'. Because Iowa is primarily an agronomic state, 42% felt that the majority of organic research should be in agronomic crops, followed by livestock, composting and horticultural crops. Most organic farmers (65%) were receiving their information from other organic farmers and non-governmental publications because of the lack of university-based information on organic farming in 1998. When queried on the preferred method of information dissemination, 45% felt that intensive workshops were more effective than publications or field days.

https://doi.org/10.1079/RAFS200365 Published online by Cambridge University Press

Research needs

An open discussion among Focus Group participants identified the need for increased research on transition strategies for organic production, including crop rotations for specific Iowa conditions. Other research requests included crop (horticultural and agronomic) variety trials under organic management, and pest management strategies for organic vegetable production. A prevailing theme articulated by producers and agricultural professionals at the Focus Groups was the need for a long-term evaluation of organic agriculture systems. As a result of this request, Long-Term Agroecological Research (LTAR) sites were established in 1998 in four areas of Iowa[11] to examine the short- and long-term physical, biological and socio-economic effects of organic and conventional farming systems. Altieri (1995)[12] defined 'agroecology' as the science of agroecosystems, including the physical, biological and cultural features (socio-economic) operating within and upon the agricultural system. All aspects of soil quality and pest status, as affected by the farming system, are included in the agroecological analysis. Feedback from the local farm associations that are responsible for farm stewardship and farm finances at the LTAR sites was considered an integral part of the LTAR process[11].

By establishing long-term experimental sites in four distinct agroecological zones in Iowa, researchers could test the hypothesis that longer crop rotations, typical of organic farms, would provide yield stability, improve plant protection, and enhance soil health and economic benefits compared to conventional systems with shorter rotations and greater off-farm, synthetic inputs. Spatial and temporal variation in physical, chemical and biological soil constituents are quantified in all LTAR sites to identify changes in soil quality, a key component of sustainable farming systems[13]. Because organic farmers undergo organic certification to obtain premium prices, adherence to certified organic practices and third-party certification of all organic research fields are important components of these projects. Supporting factors for long-term research, identified at the Focus Group meetings, included the recognition that, because most farmers begin their transition into organic production from conventional fields, a minimum of 3 years of research was needed, as required for organic transition[14]. In addition, organic farmers reported improvements in soil quality and plant productivity after several years of organic management, and only longer research trials could elucidate this effect. By involving local farmers in the planning process, experimental design, sampling protocols and review of research results in the long-term experiments, we sought to obtain outcomes that would benefit the entire community.

Financial support for these long-term sites was secured through grants written by the organic specialist, with cooperators located in research and extension faculties from ten Iowa State University departments, a local farm association, and the Adair County Extension office (Table 3). The Leopold Center for Sustainable Agriculture provided the initial investment in the organic research program, funding a full-time technician to support the organic specialist. Grants were also secured from the USDA-North Central Region Sustainable Agriculture Research and Education Program (SARE), and the USDA-IFAFS (Initiative for Future Agricultural and Food Systems) program, in the third and fourth year of the program, respectively. The interdisciplinary nature of the LTAR program is reflected in the diverse disciplines of the ISU staff working at the site, Heartland Organic Marketing Cooperative and four organic seed companies who provide materials and marketing support.

Extension needs

Specific extension needs were also assessed in Focus Group discussions. An outcomes-based plan was developed to address these needs, based on producer requests for a combination of publications, intensive workshops and field days. Publications have been developed into an Organic Agriculture series through the Iowa State University Extension Communications office, and an Organic Gateway webpage was initiated (Table 4). An annual series of organic workshops and field days are also held (Table 5). The demand for information was unparalleled in this program. Over the course of 3 years (1997–2000), the organic specialist presented 140 invited talks on organic agriculture to an audience of 6000 producers, agricultural professionals and consumers. Field days attracted 1150 participants, ranging from organic and conventional farmers to extension specialists and students.

Outcomes driving this research and extension program include:

- number of increased hectares in organic production;
- decrease in nitrate pollution from use of slower-released nitrogen in organic systems;
- increase in soil quality from soil amendments, including crop rotations and compost;
- decrease in pesticides from reliance on natural control (biological, cultural and physical controls); and
- increase in family farm income as a result of adopting organic practices.

Education needs

The Focus Groups also requested that an organic agriculture academic program be developed at Iowa State University. The first organic course at ISU, Organic Crop Production, was developed as a joint agronomy and horticulture undergraduate class in spring semester of 2000 and offered to 168 students [43 on campus, 125 attending via the Iowa Communication Network (ICN)] from ten remote sites throughout the state (see Appendix 1). Evaluations from course participants included an appreciation for knowledge gained and requests for additional courses. In addition to undergraduate activities,

https://doi.org/10.1079/RAFS200365 Published online by Cambridge University Press

Table 3. Interdisciplinary team in the Iowa State University Organic Agriculture Program.

Cooperator title (number of individuals)	Professional home	Role
Assistant professor (1)	Iowa State University Department of Horticulture and Agronomy	Coordinate Organic Agriculture Program; provide leadership on organic production aspects of project
Advisory committee (15)	Farmers, marketers, consumers	Provide input on research needs, design and evaluation; provide expertise at trainings/conferences
Extension (field staff): community specialist (1), agronomist (1), farm management specialist (1)	Three county offices	Provide input on community involvement and area of expertise in organic projects
Professors (2)	Department of Entomology (with biological control and sustainable agriculture responsibilities)	Provide leadership on entomological aspects of project and assist in coordination of extension activities
Associate professors (6)	Department of Agronomy (with responsibilities in soils, small grains, weeds and forages)	Provide leadership on crop and soil aspects of organic projects
Research scientists (2)	USDA-ARS National Soil Tilth Laboratory	Provide leadership on soil biology aspects of organic projects
Assistant professor (1)	Department of Agriculture and Biosystems Engineering	Provide leadership on composting aspects of organic projects
Associate professors (2) and professor (1)	Department of Plant Pathology	Provide leadership on plant pathology and nematology aspects of organic projects
Professor (1)	Department of Anthropology and Sociology	Provide leadership on sociological aspects of organic projects
Professor (1)	Department of Economics	Provide leadership on economical analysis of organic projects
Extension coordinator (1)	Practical Farmers of Iowa, Department of Agronomy	Provide leadership on Field Day and farmer-cooperator aspects of organic projects
Professor (1)	Department of Food Science	Provide leadership on food science aspects of organic projects

Table 4. Organic agriculture publications through Iowa State University Extension.

Publication title	Authors
Organic Agriculture	Organic specialist
Soil Quality in Organic Agriculture	Organic specialist, USDA-ARS soil scientists
Integrated Weed Management in Organic Agriculture	Organic specialist, ISU weed specialist
Growing Organic Soybeans on CRP Land	Organic specialist

four graduate students have matriculated in the organic program in 4 years (3 M.S. degrees; 1 M.Ag.), with degrees in horticulture, agronomy or agricultural education. Research theses in the graduate program have included organic apple pest management, food quality of organic and conventional crops, alley-cropping in agroforestry systems, and weed management in organic medicinal herb production. Because undergraduate student education is also key in influencing future leaders in organic agriculture, an average of six undergraduate students have worked as research assistants in the organic program each year since 1997. Ten student interns from the US and abroad have also played a significant role in research and extension activities in the organic program from 1997 to 2001 (Table 6).

Comparison of the ISU Organic Program: An Overview of US Land Grant University Organic Activities

Eighteen months into the organic program, at the request of the OFRF, we composed a questionnaire for a national survey of land grant universities' activities in organic agriculture. These results were presented at a workshop at the American Society of Agronomy annual conference in Salt Lake City, Utah, on November 2, 1999. The goal of

https://doi.org/10.1079/RAFS200365 Published online by Cambridge University Press

Table 5. Extension activities in organic agriculture at Iowa State University.

Extension event	Description	Frequency of offering
Organic research field days	In-field reporting of research results for farmers, NRCS, extension, local agricultural business, students	Annually: five research sites per year
Organic on-farm trials field days	In-field reporting of research results with farmer-cooperator for farmers, NRCS, extension, students	Annually:one farm per year (average)
Organic Weed Management Workshop	Intensive day-long workshop demonstrating in-field practices for farmers, NRCS, extension	Annually: rotating to different research farms every year
Organic Fruit Production Workshop	Workshop with farmer-cooperators on principles and practices of organic fruit management	Annually: at research farm or on-farm site
Organic Conference	Day-long conference on organic certification, crop production and marketing	Annually (winter)
'Toolbox Training for Organic Agriculture' Workshop	Intensive workshop with farmer-cooperators on principles, practices and legalities of certified organic production	Annually (summer)

this survey was to identify trends in organic agricultural research, extension and education at land grant universities and establish a network of scientists working in organic agriculture. A concomitant goal was to identify unmet organic research needs based on the OFRF producer survey[8]. Land grant university survey results were intended for dissemination to agricultural administrators and funding agencies whose mission included assistance to organic and conventional farmers.

Beginning in 1988, when the USDA-SARE program provided funding to enable land grant universities to implement extension training in sustainable agriculture, each land grant university identified a coordinator to administer these funds and develop sustainable agriculture programs. Our questionnaires were mailed to these SARE-funded sustainable agriculture coordinators at 50 land grant university programs in August 1998. We targeted these coordinators because they were acknowledged leaders in sustainable agriculture at their universities, and it was presumed they would be cognizant of organic agriculture activities as part of their sustainable agriculture duties.

Organic activities at land grant universities survey results

By March 30, 2000, 23 responses (66% return rate) were tabulated. According to the sustainable agriculture coordinators surveyed at land grant universities, organic agriculture activities had progressed rapidly in the past decade, but additional support was critical for full implementation of producers' requests. Off-campus extension personnel were cited as the main educators in organic agriculture, rather than campus faculty. Fifty-four percent of the respondents identified 1–4 extension staff offering organic extension activities (workshops, meetings and field days). Of the remaining sites, there were limited extension activities. One university reported that 'beyond a handful of local Extension educators', organic agriculture activities were practically nonexistent at their institution. Thirty-four percent of respondents had not developed any extension brochures on organic agriculture. Twenty-nine percent reported publishing 1–3 organic brochures, and one university listed 12 organic agriculture brochures, although half of these related to components (e.g., composting,

Table 6. Internships in the organic agriculture program at Iowa State University.

Year	Type of internship	Number of students involved	Gender	Country or state
1999	Women in Science and Engineering	1	F	Iowa
1999	Agriculture Minority Program	1	M	Hawaii
2000	International Agriculture Program	3	F (3)	Spain, Mexico, France
2001	Agriculture Minority Program	2	F	Missouri, California
2001	International Agriculture Program	2	M (2)	Spain, Brazil
2002	International Agriculture Program	1	M	Spain

https://doi.org/10.1079/RAFS200365 Published online by Cambridge University Press

biological control) that could be used on organic or conventional farms.

Confusion over the term 'organic', however, may have skewed some responses in favor of organic activity. Several coordinators did not distinguish 'organic' from 'integrated pest management' or 'sustainable agriculture'. 'Our research is *close* to organic farming, using a minimal amount of inorganic fertilizer and pesticides,' a respondent from a western state wrote. Because synthetic fertilizers and pesticides are prohibited in organic farming, however, even 'a minimal amount' of these products would not constitute organic agriculture research. It is important to note that research in 'sustainable agriculture' and 'integrated pest management' may provide potential application in organic farming, but only dedicated organic farming research will provide specific answers for organic farmers[4].

There were also some uncertainties expressed regarding which faculty members were working in organic agriculture at their university. A sustainable agriculture coordinator for a northwestern land grant university wrote: 'There is no central database for this kind of information'. Despite this purported lack of networking among scientists working in organic agriculture, 45% of the respondents reported having 1–4 faculty working on organic research activities at their university. Six universities listed organic research and demonstration farms. Personal notes, including initial organic agricultural research results, were added, such as, 'Our organic corn did great this year in spite of the drought'.

The importance of conducting organic research using certified organic practices cannot be overstated[9]. Conducting research on certified organic farms expedites this process, in addition to facilitating community involvement and clientele support. While 39% of the respondents identified 1 to 4 on-farm university trials on organic farms, 24% had not involved organic farmers in their research. Educational activities in organic agriculture at land grant universities were lagging behind extension efforts. Thirty-two percent of surveyed universities offered 1–3 courses in organic agriculture, although some of these 'courses' constituted a section of a larger course, in the areas described above. No courses on organic agriculture were offered at 45% of the responding land grant universities.

Constraints to organic agricultural activities that were cited by respondents included lack of administrative support and resources (funding, personnel and time). 'Change to date has not been dramatic, but gradual, steady', was a typical trend reported in the surveys. Fifty-seven percent of the respondents received administrative support for organic agriculture activities, while 37% received minimal support from their administration. An equal number (57%) received support from their home departments. A number of faculty reported an interest in organic agriculture, but their 'over-commitment in current position responsibilities which do not include organic agriculture' has restricted their activities in organics. Three respondents wrote of great interest expressed in their colleges, but that 'limited financial resources had been directed toward organic research, Extension and education activities at the college level'. Some of the larger commitments to organic research (US$250,000 at one Midwestern land grant university) were single appropriations with uncertain long-term assurances. Two universities mentioned US-EPA grants as sources of funding for organic extension activities. Additional problems with continued commitment toward long-term organic activities included 'failure to follow-up' on initial organic activities. Sixty-one percent of respondents reported that efforts in organics would increase at their institution in the next 5 years. Thirty-six percent, however, expressed doubt over any increase in efforts. Of the respondents who predicted increased efforts, many ascribed this effect to increased farmer demand.

Organic research programs identified in the surveys focused on methods to improve organic farming systems. Because organic farmers rely on crop rotations, compost or manure applications, and/or cover crops to satisfy crop nutrient requirements[15], much of the organic agriculture research efforts focused on nutrient management. This interest corresponds with that expressed by organic farmers in a national survey[8], where pest management and soil fertility were the most critical management problems for organic growers. Employing the goal of a sustainable, organic farm by replacing external inputs with on-farm or locally produced inputs, many producers are constrained by the lack of adequate inputs (e.g., manure, compost or cover crop biomass) to provide sufficient nutrients for optimal yields. Thus, several research programs are examining the effect of crop rotations and organic amendment combinations on crop performance and soil health. Fewer organic agricultural programs were involved in an analysis of the underlying mechanisms operating in organic farming systems, as described by Niggli and Lockeretz (1996)[16]. Long-term agroecological, systems research requires resource commitments that few land grant universities have made at this time.

ISU Organic Agriculture Program Evaluation

In November 2001, 300 questionnaires were mailed to Iowa farmers and other agricultural professionals to assess the value of the ISU Organic Program after 4 years of operation (1997–2001). At this time, Iowa was listed as both a leader in organic production and number of organic operators in a national survey[2]. Program evaluation survey results were anonymous and coded by independent assistants. After allowing 6 months for returned surveys, a summary was developed in May 2002, from 116 surveys, representing a return rate of 39%. Trends that were observed from survey results (see Appendix 2) included a high return rate from organic family farmers, farming 120–300 acres, of primarily corn, soybean and oat crops. Twenty-one percent of respondents reported organic fruit, vegetable, herb and

https://doi.org/10.1079/RAFS200365 Published online by Cambridge University Press

tree crop production. These results corresponded with Focus Group responses from 1998, where the majority of farmers expressing interest in ISU's Organic Program produced agronomic crops. The majority of respondents had been farming organically for 3–6 years, which mirrors the organic industry growth of 18% from 1994 to 2000 in Iowa[17]. Respondents reported using a variety of marketing outlets, with primary markets listed as wholesale cooperatives or brokers (25% average). A growing number were direct marketing through Community Supported Agriculture (CSA) operations (5%), farmers' markets (4%), on-farm sales (10%), and direct sales to retail outlets and consumers (24%).

When queried on methods for maintaining soil fertility and soil quality, farmers reported using a diversified, systems approach, with 85% reporting a mixture of crop rotations with leguminous crops, manure and compost applications. These results correspond with those of earlier reports[15,18], where animal-based and cover-crop-based fertilization have been effective for increasing soil organic matter and biological activity within organic production systems. In following the organic agricultural principles of recycling local inputs, only 15% of respondents reported off-farm purchases of soil amendments. Because the majority of Iowa organic farmers raise livestock on their farms, on-farm sources of manure and compost tend to be more available in Iowa than in many other states, such as California (B. Leahy, personal communication, 2003). Soil amendments and crop rotations have been shown to increase soil organic matter and improve water-holding capacity. Thus, survey results attempting to quantify environmental effects from organic practices in Iowa (see Appendix 2) were generally positive with regard to soil enhancement: positive changes in soil quality were reported by 90% of respondents, including decreases in soil erosion (71% of respondents reported observing the decrease) and improvement in water-holding capacity (86% of respondents). The average reported reduction in erosion was 41%, measured against erosion observed on farms prior to initiation of organic practices.

Other beneficial effects included enhancement of the following indicators: earthworm populations (49% increase), crop performance (31% improvement), crop health (28% improvement) and beneficial insects (40% increase). Pest insects were, on the average, 33% of population levels during conventional farming periods. A full 55% of respondents reported observing a reduction in nitrates leaching from their farms. Unlike other categories, where a limited number of deleterious effects were reported from organic agriculture practices, there were no reported increases in nitrate contamination from organic agricultural practices on any survey. Similar beneficial environmental effects have been reported on organic farms in California[19–21]. Of particular importance to farmers in the survey was the relationship of organic practices to farm income, with 67% reporting a 6–30% increase from the adoption of organic practices.

In reviewing the applicability of the ISU Organic Program to organic farmers, all respondents had participated in at least one extension program, with the majority attending field days (31%), conferences (23%) and workshops (20%). Twenty-one percent of respondents reported a direct exchange of information via telephone, e-mail or personal contact with staff in the ISU Organic Program. Participation at conferences and workshops was preferred over reading extension publications (11% reported reading at least one of the organic publications), although, at the time of the survey, the Organic Agriculture series of extension publications had been available for only a short period of 6 months. Nine percent of respondents reported attending the ICN Organic Agriculture course, which may have included some of the 125 farmer-students enrolled in the course. When respondents were asked to select best methods of communication from ISU staff, 'personal visits without compensation to ISU' was rated as the most important method. However, when queried on willingness to pay for services, the majority of respondents (49%) stated that they would pay a nominal fee, and another 20% would cover full program costs. In this era of cost-recovery, the fact that 69% of respondents would be willing to support the program through nominal or full costs for services suggests a perceived high value for these services.

Discussion

The growth in organic production is expected to continue, as more farmers struggling with current low commodity prices become interested in organic farming. Consistent federal standards for products marketed as 'organic' in the US will allow the industry to pursue other growth opportunities[22]. New government support for organic research and education activities is the result of increased organic demand across the US[23]. Research results from land grant universities suggest that organic cropping systems are economically viable, particularly when producers receive certified organic premiums[11,24], and could be even greater if credit were applied to agricultural operations that accrue benefits to society as a whole[25]. Governmental support for organic agriculture in the European Union has exceeded US support[26], but with the implementation of the 2002 Farm Bill, opportunities for organic farming research and cost-sharing activities are scheduled to increase[2].

Land grant universities are expected to respond to this growing demand through the development of organic agriculture research, education and extension programs at their institutions. The Organic Agriculture Program at Iowa State University ranked in the top 10% of extent of organic activities at land grant universities in 1999, and was listed as one of three land grant universities with certified organic research lands[9]. Inherent in the success of the ISU organic program is administrative support, sufficient resources and community involvement in the decision-making process. In order to develop policies to enable establishment of

https://doi.org/10.1079/RAFS200365 Published online by Cambridge University Press

alternative agricultural enterprises, an ongoing assessment of farmers' needs and constraints will be required[27].

Constraints affecting further adoption of organic agricultural practices include the need for additional staff in the organic agriculture program at Iowa State University to meet the increasing demands for research and educational information in all sectors of organic agriculture (agronomic crops, horticultural crops, livestock and marketing). Grant-writing for funding from extramural sources, including private industry and governmental agencies, has required 20% of available time. Newly formed organizations, including the Scientific Congress of Organic Agriculture Research (SCOAR), sponsored by the Organic Farming Research Foundation[28], will assist understaffed land grant university scientists by serving as sounding boards for organic farmer research and education needs. The ultimate goal of this network of agricultural scientists currently involved in organic agriculture research and extension is to improve the viability of agriculture through the development of sustainable practices by involving local producers and consumers in the process. A promising development on the federal front is the recently articulated 'Vision for Agricultural Research', which acknowledges the role of the environment and communities among its goals[29]. This increase in environmental and community awareness in agriculture suggests an expanded role for researchers and extensionists, with a focus on organic agriculture at land grant universities.

Acknowledgements. We gratefully acknowledge the help of W. Wintersteen, R. Turnbull, H. Friedrich and the organic farmers of Iowa for their support of this extension and research program. We also thank the Leopold Center for Sustainable Agriculture and the USDA-IFAFS (Initiative for Future Agriculture and Food Systems) program for supporting this project.

References

1 Hartman Group. 2001. Natural Sensibility, Typification of the New Wellness Consumer, Vol. 3(2). Hartman Group, Bellevue, WA.
2 Greene, C. and Kremen, A. 2002. US Organic Farming: A decade of expansion. In Agricultural Outlook (November). USDA-Economic Research Service, Washington, DC. p. 31–34.
3 Iowa Department of Agriculture and Land Stewardship (IDALS). 1997. Annual Survey on Organic Production. Iowa Department of Agriculture and Land Stewardship Diversification Bureau, Des Moines, IA.
4 Lipson, M. 1999. Looking for the 'O' Word. Organic Farming Research Foundation, Santa Cruz, CA.
5 Norgaard, R.B. and Sikor, T.O. 1995. The methodology and practice of agroecology. In M. Altieri (ed.). Agroecology. Westview Press, Boulder, CO. p. 21–40.
6 Vogtmann, H. 1990. Research structure in biological farming: general view, justification, development. In Biological Farming in Europe. REUR Technical Series, 12. Proceedings of the Expert Consultation. FAO, Bern, Switzerland. p. 41–47.
7 Høgh-Jensen, H. 1998. Systems theory as a scientific approach towards organic farming. Biological Agriculture and Horticulture 16:37–52.
8 Walz, E. 1999. Final Results of the Third Biennial National Organic Farming Survey. Organic Farming Research Foundation, Santa Cruz, CA.
9 Sooby, J. 2001. State of the States. Organic Farming Research Foundation (OFRF) Bulletin 6. OFRF, Santa Cruz, CA. p. 14–16.
10 Chambers, R., Pacey, A., and Thrupp, L.A. 1989. Farmer First: Farmer Innovation and Agricultural Research. Intermediate Technology Publications. Bootstrap Press, New York.
11 Delate, K. 2002. Using an agroecological approach in farming systems research. HortTechnology 12(3):345–354.
12 Altieri, M.A. 1995. Agroecology. Westview Press, Boulder, CO.
13 Delate, K. and Cambardella, C. 1999. Comparison of organic and conventional rotations at the Neely-Kinyon Long-Term Agroecological Research (LTAR) site. Iowa State University Armstrong Research and Demonstration Farm Progress Report. College of Agriculture, Iowa State University, Ames, IA.
14 USDA-AMS. 2002. National Organic Program. Final rule: 7 CFR Part 205. US Department of Agriculture, Agriculture Marketing Service, Washington, DC. Available at Web site http://www.ams.usda.gov/nop (verified 10 July 2002).
15 Kelly, W.C. 1990. Minimal use of synthetic fertilizers in vegetable production. HortScience 25:168–169.
16 Niggli, U. and Lockeretz, W. 1996. Development of research in organic farming. In International Federation of Organic Agriculture Movements (IFOAM) (eds). Fundamentals of Organic Agriculture. IFOAM, Switzerland. p. 9–23.
17 Iowa Department of Agriculture and Land Stewardship (IDALS). 2001. Annual Survey on Organic Production. Iowa Department of Agriculture and Land Stewardship Diversification Bureau, Des Moines, IA.
18 Wander, M.M., Traina, S.J., Stinner, B.R., and Peters, S.E. 1994. Organic and conventional management effects on biologically active soil organic matter pools. Soil Science Society of America Journal 58:1130–1139.
19 Astier, M. 1990. Developing Low-input Energy Saving Vegetable Cropping Systems for Small Farmers in Salinas Valley. Association of Community Based Education, Washington, DC.
20 Altieri, M.A., Trujillo, J., Astier, M., Gersper, P., and Bakx, W. 1991. Low-input technology proves viable for limited-resources farmers in Salinas Valley. California Agriculture 45:20–22.
21 Astier, M., Gersper, P.L., and Buchanan, M. 1994. Combining legumes and compost: A viable alternative for farmers in conversion to organic agriculture. Compost Science and Utilization 2:80–87.
22 Organic Trade Association (OTA). 2001. OTA Newsletter. OTA, Greenfield, MA.
23 Dimitri, C. and Greene, C. 2002. Recent growth patterns in the US organic foods market. USDA–Economic Research Service, Washington, DC.
24 Delate, K., Duffy, M., Chase, C., Holste, A., Friedrich, H., and Wantate, N. 2003. An economic comparison of organic and conventional grain crops in a long-term agroecological research (LTAR) site in Iowa. American Journal of Alternative Agriculture 18(2):59–69.

25 Brumfield, R.G., Rimal, A. and Reiners, S. 2000. Comparative cost analyses of conventional, integrated crop management, and organic methods. HortTechnology 10(4):785–793.
26 Lampkin, N.H. and Padel, S. 1994. Organic farming and agricultural policy in Western Europe: An overview. In P. Midmore and N.H. Lampkin (eds). The Economics of Organic Farming: An International Perspective. CAB International, Wallingford, UK. p. 437–454.
27 Doran, J.W. and Peck, S. 2003. Editorial. American Journal of Alternative Agriculture 18(4):173.
28 Organic Farming Research Foundation (OFRF). 2002. Scientific Congress on Organic Agricultural Research. Available at Web site http:/www.ofrf.org/scoar/index.html (verified 10 July 2002).
29 National Research Council. 2003. Frontiers in Agricultural Research: Food, Health, Environment, and Communities. NRC–Committee on Opportunities in Agriculture. National Academies Press, Washington, DC.

Appendix 1: Topics and instructors in the Organic Crop Production course at Iowa State University.

Instructor	Topic
	Organic overview and soil health
Kathleen Delate, Iowa State University	Introduction to course: objectives and goals
Doug Karlen, USDA-ARS	Soil health as the basis for organic farming
Steve Hickenbottom, Producer	Crop rotations from a farmer's perspective
Maury Wills, IDALS Organic Program	Overview of IA organic program and certification
	Extra time for questions
	Composting, pasture health, integrated weed management
Tom Richard/Cindy Cambardella, Iowa State University	Composting for organic producers
Ken Moore, Iowa State University	Forages
Matt Liebman, Iowa State University	Principles of weed management for organic producers
	Pest management for organic producers
Jerry DeWitt, Iowa State University	Insect pest management for organic producers
Mark Gleason, Iowa State University	Disease management of fruits and vegetables
Gary Munkvold, Iowa State University	Disease management in agronomic crops
Greg Tylka, Iowa State University	Soybean cyst nematode management for organics
Joe Lynch, Producer	Pest management from a farmer's perspective
	Organic grain production and marketing
Kathleen Delate, Iowa State University	Organic grain research
Dale Farnham, Iowa State University	Corn research and information at ISU
Grace Welke, Iowa State University	Soybean varieties for the Tofu/Natto markets
David Brenner, USDA-ARS	Amaranth research and possibilities for organics
Jim Boes, Producer	Heartland organic marketing co-op, organic grain market
	Extra time for questions
	Organic fruits, vegetables, and herbs
Maury Wills, IDALS Organic Program	Organic apple production
Angela Tedesco, Producer	Organics—strawberries
Gary Guthrie, Producer	Organics—sweet corn and tomatoes
Larry Cleverley, Producer	Organics—garlic and greens
Jan Libby, Producer	Organics—broccoli and squash/pumpkins, INCA
Renne Soberg, Producer	Organic herb production and marketing
	Organic livestock production and marketing
Bill Welsh, Producer	Organic poultry production
Jim Russell, Iowa State University	Rotational grazing for organic producers
Dick Thompson, Producer	Organic cattle and hogs
Francis Thicke, Producer	Organic dairy
Ron Rosmann, Producer	Organic livestock production and marketing
Dave Carter, Private vet. services	Animal health practices

https://doi.org/10.1079/RAFS200365 Published online by Cambridge University Press

Appendix 2: ISU Organic Program Survey Results at the 4-year Milestone

	Percentage of respondents
Operation description	
Organic family farmer	53%
Transitioning family farmer (entire farm to organic)	11%
Mixed organic and conventional	19%
Organic corporate	1%
Conventional farmer with organic interest	6%
Other	8%
Organic acres farmed	
Less than 1	4%
1–5	5%
6–10	3%
11–20	4%
21–70	10%
71–120	19%
121–300	32%
301–500	10%
Other	10%
Organic crops and livestock	
Corn	21%
Soybean	22%
Oats	18%
Barley	4%
Wheat	4%
Livestock	8%
Vegetables	6%
Fruit	4%
Other	11%
Years in organic agriculture	
Thinking of starting	5%
In transition for 1 year	0%
In transition for 2 years	5%
In third year, certified organic	22%
4–6 years	41%
More than 6 years	17%
More than 6 years, not certified (≤US$5000/year)	3%
Primary markets for organic crops	
Organic cooperative	24%
Organic product broker	26%
Direct to consumer sales	17%
Direct to retail outlets	7%
CSA	5%
Farmers' market	4%
Wholesale produce markets	2%
On-farm sales	10%
Other	4%
Maintain fertility and soil quality	
Crop rotation with legumes	35%
Manure	24%
Compost from manure	17%
Compost/composted manure from purchased source	9%
Purchased organic fertilizers	6%
Other	6%

	Percentage of respondents
Environmental effects from organic practices	
Soil quality improvement	90%
Erosion mitigation	71%
Nitrate contamination reduction	55%
Water-holding capacity improvement	86%
Earthworm increase	88%
Crop performance improved	42%
Crop health improvement	79%
Pest insect reduction	69%
Beneficial insect enhancement	88%
Income increase from organic sales	
Not selling yet	10%
0–5% increase	12%
6–10% increase	18%
11–20% increase	30%
Other	19%
Organic extension events attended	
Field days	31%
Workshops	20%
Conferences	23%
ICN series on organics	8%
Special presentations	10%
Other	4%
Contact or activity	
Telephone or email contact	13%
Personal visits	9%
Field day	14%
Workshops	12%
Meeting/conference	17%
Publications	11%
ICN series on organics	9%
Other	1%
ISU organic publications read	
Overview of Organic Agriculture	13%
Weed Management in Organic Agriculture	22%
Growing Organic Soybeans on CRP Land	8%
Soil Quality in Organic Agriculture	12%
Other	1%
Most important organic activities	
Field days	18%
Publications	16%
Full-day workshops	14%
One-day conferences	14%
Half-day workshops	13%
ICN series	10%
Two-day conferences	9%
Other	1%
Organic activities that should be repeated (activities rated as most important)	
Organic weed management workshops	18%
Field days	18%
ICN series	10%
Composting workshops	13%
Certification workshops	11%
Organic fruit workshops	9%

https://doi.org/10.1079/RAFS200365 Published online by Cambridge University Press

	Percentage of respondents
Organic conference	15%
Other	1%
Future of ISU organic program	
Very important—needs to expand as budget allows	64%
Very important—need to retain as is	13%
Somewhat important	7%
Not important	0%
Other suggestions—all positive	3%

CSA, Community Supported Agriculture; ICN, Iowa Communication Network; ISU, Iowa State University.

https://doi.org/10.1079/RAFS200365 Published online by Cambridge University Press