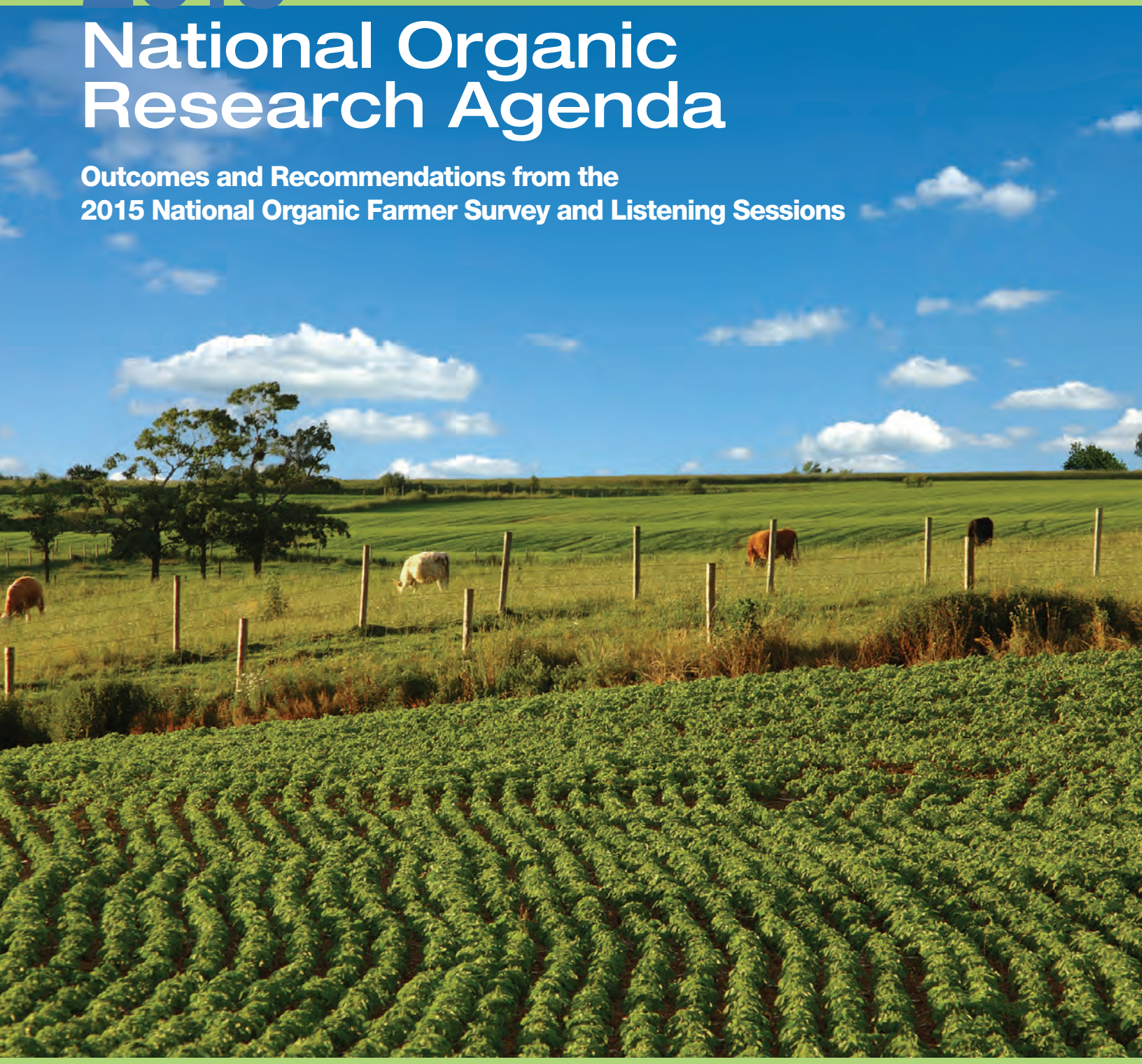
2016 National Organic Research Agenda

Outcomes and Recommendations from the 2015 National Organic Farmer Survey and Listening Sessions



By Diana Jerkins and Joanna Ory

ORGANIC FARMING RESEARCH FOUNDATION

2016 NATIONAL ORGANIC RESEARCH AGENDA

Outcomes and Recommendations from the 2015 National Organic Farmer Survey and Listening Sessions

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EXECUTIVE SUMMARY

This 2016 National Organic Research Agenda (NORA) report provides comprehensive recommendations for future investment in organic agricultural research. These recommendations are based on the Organic Farming Research Foundation's 2015 survey of organic farmers, nationwide listening sessions with organic farmers, and a review of key documents and recommendations from other organizations, including the National Organic Standards Board (NOSB). The 2015 Organic Farmer Survey was conducted online and completed by over 1,000 organic farmers. Their responses directly inform our top recommendations for organic research.

Top OFRF Recommendations

Based on feedback from survey respondents regarding high priority needs, OFRF recommends intensified research funding and attention to the areas of:

- Soil health and fertility management
- Weed management
- Nutritional benefits of organic food
- Insect management
- Disease management

OFRF also recommends prioritizing research in the following areas:

- Building the economic, environmental, and social sustainability of organic systems through more holistic studies, using functional agricultural biodiversity, permaculture, crop-livestock integration, and other advanced agroecological or agroecosystem research frameworks and methodologies.
- The impacts of genetically modified organisms (GMOs) on organic farms and strategies to avoid GMO contamination.
- The efficacy and environmental sustainability of approved products included on the USDA National List of Allowed and Prohibited Substances (organic insecticides, fungicides, and soil amendments).
- Livestock health, especially parasite control and organic animal nutrition.
- Development and selection of public livestock and poultry breeds for organic systems: performance in pastured systems, and parasite resistance.
- Social science research on the marketing, policy, and economic barriers to successful organic production and barriers to transition.
- Development of public crop cultivars bred and selected for organic systems: regional adaptation, nutrient efficiency, weed tolerance, and disease resistance.

This report details the research priority areas and includes a discussion of the survey results leading to the development of OFRF's recommendations.

Chapter One of this report discusses the research areas OFRF recommends for increased funding and prioritization. The first set of recommendations is directly informed by results from the 2015 National Organic Farmer Survey. The second set of recommendations refers to methodology and outreach activities related to organic farming research, and these recommendations are based on a broader review of recommendations from partner groups and the listening sessions that were held across the country. The chapter concludes with research priorities for each of the four U.S. regions.

Chapter Two provides detailed results from the 2015 National Organic Farmer Survey. These results include farmer demographics, stated research priorities, production challenges, and responses to open-ended questions. In addition, this chapter includes survey results on the special topics of climate change, food safety, and GMO impacts, and organic seed availability.

Chapter Three reviews several farmer surveys and reports that inform the OFRF recommendations. This chapter describes overlap between recommendations made by OFRF and other entities. This chapter also describes the research topics that were recommended for prioritization in the past, such as soil health and organic plant breeding, which remain areas in need of increased attention.

Joanna Ory

The report concludes in the appendices section with four reports containing regionally specific results from the 2015 National Organic Farmer Survey and regional recommendations for organic research. The survey found that the topics of soil health and weed management were top priorities for all four regions. However, there was variability among regions for other top research priorities. For example, in the Southern region, there is a strong need for social science research to identify and provide strategies for overcoming barriers to market entry. In the Western region, a top priority is research on irrigation efficiency and coping with drought. For the North Central region, research on GMO impacts was among the top priorities. Pollinator health was a high priority for survey respondents in the North East region.

The recommendations and information in this 2016 NORA report will ensure research funding is relevant and responsive to the needs of today's organic farmers. In addition, we hope this research will be used to expand organic farming education at colleges, universities, and farms. We expect this report to help significantly increase funding for research that assists producers in adopting new practices that enhance the environmental sustainability and economic viability of organic operations.

INTRODUCTION

There have been significant advances in our knowledge of organic agriculture since OFRF's 2007 National Organic Research Agenda (NORA) (Sooby et al., 2007). This landmark document provided a clear and comprehensive blueprint for successful organic research systems, drawing upon the results of regional and topical working sessions of farmers, scientists, and agricultural professionals that took place over a period of three years to identify and prioritize research needs for organic agriculture.

The seed for the 2007 NORA report was planted almost a decade earlier when the OFRF report, "Looking for the 'O' Word," (Lipson, 1997) documented the virtual absence of federal support for research relevant to organic agriculture. OFRF then worked to rectify this unacceptable omission by sponsoring unique collaborations between organic farmers and agricultural researchers to set organic research priorities.

The 2007 NORA report centered on four core topic areas: soil microbiology and fertility; system approaches to pest management; ruminant and poultry production systems; and crop and animal breeding and genetics. The report consolidated the results of existing research with practical experience from the field to validate the benefits of organic agriculture, especially with regard to yield potential, resource conservation, and biodiversity. Many of the recommendations from the 2007 report are still relevant today.

The 2007 NORA report firmly endorsed four principles that have become hallmarks of organic research:

- Work must occur on certified operations.
- Farmers must be actively engaged in experimental design and data analysis.
- Work should employ multidisciplinary system approaches rather than input substitution.
- Research must be maintained over an extended period of time.

Current Needs for Organic Research

Continued interest in organic research from the research community, combined with incremental increases in funding for organic research, inspired OFRF to provide a new, updated research agenda for organic agriculture.

The 2016 NORA report reviews areas of the original research agenda where significant progress has been made, and identifies areas where research needs have yet to be met. This analysis will help focus the next generation of research on the most relevant needs of farmers and ranchers.

Organic agricultural producers face unique challenges, from the availability of organic seeds, crop cultivars, and livestock breeds adapted to organic systems, to coping with weeds and pests, and using approved organic methods. As consumer demand for organic products soars, there is a growing need for solutions to organic farming challenges, training for future agriculture producers and leaders, and information on the benefits of organic agriculture.

Organic farming methods are knowledge-intensive and site-specific. Organic agriculture uses methods that protect the environment, avoiding the use of synthetic pesticides and fertilizers, antibiotics, and genetically engineered crops. Because organic farmers cannot use synthetic pesticides to control weeds

Domestic Demand

Domestic demand for organic products is growing rapidly. Although US organic sales reached an all time high of $6.2B in 2015, there was also an increase in the importation of organic products in order to meet demand (USDA, 2016 a). To meet the growing US demand for organic products in the long-term, domestic production of both crops and livestock and poultry products (especially

milk and eggs) will need to increase. The majority of organic sales are concentrated in the top five organic-producing states: California, Washington, Pennsylvania, Oregon, and Wisconsin (USDA, 2016 a). These states have historically had strong links with land grant universities and non-government organization infrastructure supporting the growth of their organic industry.

and pests, they must rely on practices that holistically promote health of the agroecosystem and protect against pest infestations and soil degradation. Careful organic management includes:

- Selecting varieties suited for local soil, pest, and weather conditions.
- Managing the soil fertility specific to the past and present conditions of the land.
- Using rotations and crop diversity to protect against crop diseases and pests.

The needs of farmers in this quickly growing industry are continually evolving and include new concerns about food safety and regulation, invasive pests, environmental and social issues, changes in and expansion of national and international markets, changing weather patterns, and biological threats. These trends call for a fresh analysis of the needs of organic farmers and ranchers.

Specific research, education, and extension programs are necessary to foster partnerships between producers and organic agriculture professionals; programs that integrate scientific knowledge with farmer expertise to develop practical and sustainable solutions.

In order to meet the growing demand for organic products domestically and internationally, research efforts need to provide solutions to production, risk management, marketing, and social issues confronting organic producers and distributors. In conjunction with these research efforts, there needs to be greater organic-specific extension activities to educate producers and consumers. By furthering research that directly meets the needs of the organic sector, we can enable U.S. producers to meet more of this demand. The 2016 NORA report helps chart the most efficient and effective course for USDA spending for organic agricultural research and for university and broader funding by State Departments of Agriculture, private foundations, and NGOs.

About OFRF

OFRF is sowing the seeds to transform agriculture by working for the continuous improvement and widespread adoption of organic farming systems. OFRF sponsors organic farming research and education projects and disseminates the results to organic farmers and growers interested in adopting organic production systems. The organization also informs the public and policymakers about organic farming issues.

OFRF is a leading grant maker for organic agriculture research and education, funding innovative research and education projects that lead to new production solutions for farmers and a stronger community among organic farmers. Since its founding, OFRF has funded 322 research projects with the aim of directly addressing the needs of organic farmers and ranchers. OFRF is one of the first nonprofit organizations to award grants dedicated to organic farming research, making important scientific contributions to organic knowledge and practice since 1990.

OFRF and its partners successfully lobbied for increased federal funding for organic research in the Farm Security and Rural Investment Act of 2002 (aka 2002 Farm Bill), which resulted in the establishment of the Organic Agriculture Research and Extension Initiative (OREI) grant program authorizing $3M annually for five years specifically for organic farming research. Section 7408 of the 2002 Farm Bill directed research resources reflecting the growing interest in organic production and the need to provide enhanced research for the growing organic sector. This section of the 2002 Farm Bill created the Section 406 "Organic Transitions" competitive grants program.

In fiscal 2016, Congress approved the highest ever budget of $2.94B for USDA agricultural research. Within the USDA National Institute for Food and Agriculture (NIFA), funding for Agriculture and Food Research Initiative (AFRI) programs, the primary competitive grants programs within NIFA, has increased 20% over the last five years, and is slated in the 2017 presidential budget for additional funding.

Only 0.1% of AFRI funding was used specifically for organic research between 2010-2014 (National Organic Coalition, 2016). Non-organic research within AFRI was $1.38B, while spending on organic research was $1.48M.

Joanna Ory

Goals of the 2016 NORA Report

The 2016 NORA report presents a catalogue of research needs for organic agriculture based on feedback OFRF obtained through an extensive survey and listening sessions with organic farmers. This survey was an opportunity to make organic farmers' and ranchers' voices heard. In an ongoing effort to reach out to the organic community, OFRF wanted to learn

about challenges and research priorities directly from producers. The feedback received identified the obstacles today's farmers face and the information they need most to be resilient, grow, and thrive.

As with any agricultural endeavor, scientific research needs can be applicable to all farmers and ranchers and/or specific to location, soil type, crop, and livestock produced, and the agricultural knowledge level of the farmers and ranchers. As seen in previous surveys and reports, the specificity of research needs is almost unlimited in the sense that each farmer or rancher has unique needs and requirements to meet the demands of their individual enterprise

This research agenda looks at both the general research needs and specific challenges identified by multiple stakeholder groups. The recommendations cover six topical areas from national and regional perspectives, as well as the most appropriate approaches to conducting organic research. The report also includes continuing priorities and specific research topics that were identified in previous surveys and reports. It also includes recommendations to address basic and applied research needs, as well as organic agriculture education and extension activities to promote optimum delivery and use of research outcomes.

Vicki Lowell

The 2016 NORA report will inform USDA researchers, universities, agricultural extension agents, farmers, ranchers, and others on how research, education, and extension activities can be focused to meet the needs of organic farmers and ranchers to support organic agriculture and increase organic acreage. The report provides key information for how OFRF and other funding entities can continue to inform grant making to most effectively support the success of organic farmers and ranchers.

1. NATIONAL RESEARCH RECOMMENDATIONS

U.S. Wide Priorities for Research, Education and Extension

OFRF's 2015 National Organic Farmer Survey, auxiliary stakeholder input, and supplemental reviews provide a basis for making recommendations for future research to support the production, marketing, environmental, and societal needs of current organic farmers, ranchers, and those entering organic agriculture. Farmers were asked to rate research topics based on their priority. The five areas rated highest in priority by the 2015 respondents are displayed in Table 1.

Table 1.
Priority ratings for research topics from the 2015 OFRF National Organic Farmer Survey.

Research Topic	Percentage of survey participants who rated as a HIGH priority
Soil health, quality, and nutrient management	74%
Weed management	67%
Fertility and nutrient management	66%
Nutritional quality, health benefits, and integrity of organic food	55%
Insect management	51%

Based on these top priorities, OFRF recommends increased research in the following areas.

- **Soil health as the basis of organic agricultural productivity, specifically:**
  - Defining soil health criteria.
  - Researching soil health and best practices for coping with climatic variability.
  - Developing tools for rapid measurement of soil health/quality.
  - Investigating the relationship between soil quality and crop management practices, such as cover cropping, crop rotation and diversification, crop-livestock integration, and reduced tillage.
  - Researching the efficacy of different soil amendments for building soil fertility and enhancing yield.

- **Organic weed control, specifically:**
  - Researching how weed infestations are impacted or enhanced by soil management, crop rotation, cover crops, crop-livestock integration, and inputs.
  - Researching the most economical ways to manage weeds in organic systems.
  - Evaluating weed management strategies that integrate soil improving practices (cover crops, rotation, reduced tillage) with NOP-allowed control tactics.

- **Organic fertility methods and practices, specifically:**
    - Researching agroecological approaches to organic farming and moving beyond input substitution.
    - Determining appropriate levels of fertility inputs to match crop needs throughout the season and minimize nutrient losses.
    - Researching how organic farming can integrate agricultural methods from biodynamic and permaculture practices to decrease environmental impacts.
    - Evaluating, breeding, and selecting crop cultivars for greater nutrient use efficiency and ability to thrive on low-solubility organic nutrient sources.
    - The relationship between nutrient balancing fertilization practices and microbial life in the soil and susceptibility or resistance to pests.

- **The whole farm ecosystem, specifically:**
    - The impact of habitat diversity and cropping systems on biological diversity on the farm as well as yield stability and pest and disease resistance.
    - The ecosystem services provided by diverse agroecological systems.
    - How food safety practices can coexist with practices that protect wildlife.
    - The environmental and agricultural effects of homogeneity in conventional production management, i.e., only using GMO seeds, only chemical sprays, etc.
    - The environmental benefits of organic farming for water, soil, climate, biodiversity (including pollinators), wildlife, native plants, soil microbes, and agro-biodiversity.

- **Nutritional quality, health benefits, and integrity of organic food, specifically:**
    - Researching how organic and conventional foods differ in terms of nutrients, pesticide residues, and impacts on consumer health.
    - Researching how to best educate and inform consumers about the benefits of organic food.
    - Comparing the nutritional value of organic versus conventional food.
    - Examining the best ways to attract new organic consumers and increase consumer demand for organic products.

- **Organic insect pest control, specifically:**
    - The control of new, invasive insect pests.
    - The efficacy of organic pest control products, especially the Organic Materials Review Institute (OMRI) approved products.
    - Integrated pest management strategies.

In addition to the 2015 National Organic Farmer Survey results, OFRF conducted listening sessions with organic farmers and researchers to further understand how research can meet the challenges of organic farmers. Based on these listening sessions and review of the recommendations presented by the National Organic Standards Board (NOSB), OFRF offers additional recommendations aimed to increase the environmental, economic, and social sustainability of organic farming and ranching in the U.S. These recommendations include:

- **Increase research on specific systems within organic agriculture to understand best management practices.**
    - Researching the applicability and benefits of techniques used in aquaponics, biodynamic production, and permaculture to enhance organic production.
    - Researching different tillage systems such as low or no tillage systems for organic systems.
    - Measuring the benefits of ecosystem services and how organic producers can enhance these services for their economic benefit.
    - Increasing research on row crops to raise the percentage of agriculture adopting organic methods to produce row crops.

- **Increase research investment in grain and seed production, specifically:**
    - Economic and agronomic research to increase organic grain production. Grain production in the U.S. does not meet the demand for the organic food, seed, and feed industry (USDA, 2013). A difficulty for farmers is a lack of scientific knowledge and training on how to change from traditional continuous grain production to more complex rotational patterns needed for organic production.
    - Researching rotational patterns that take into account plant nutritional needs, water resources, soil quality, weed and disease control mechanisms, and the variety of crops to be grown for soil building and economic needs.

- **Increase investment in animal production research, specifically:**
    - Researching organic production of minor species such as sheep, pigs, and bees.
    - Past research funding by OFRF and OREI has focused on crop production instead of animal production. For example, OREI funding was allotted 71% to crops, 10% to livestock and poultry, and 19% to general topics covering both crops and animals, including crop-livestock integrated systems. OFRF recommends that a greater portion of research funds be allotted for animal production research.

- **Increase research on climate change and associated environmental and agronomic impacts, specifically**:
    - Researching precipitation variability and the impacts and innovations for drought and flooding.
    - Researching climate change adaptation strategies for organic farmers.

- **Increase breeding crop varieties specific to organic production, specifically:**
  - Crop breeding to enhance performance in sustainable organic production systems.
  - Crop breeding to improve market quality and nutritional content.
  - Crop breeding to increase resilience to stresses like disease and weed pressure.

- **Increase research on economic and social issues, including:**
  - Economic and social barriers to adopting organic farming practices.
  - How to decrease barriers to entrance into organic agricultural production.
  - The unique technical assistance and programmatic needs of minority producers and women farmers and ranchers. Minority and women farmers are making up a greater percentage of the agricultural workforce and may have specific needs (USDA, 2014).
  - How to balance economic and environmental outcomes in a multifunctional agricultural production system.
  - The retention of current producers, access of new and transitioning farmers, and how to entice new farmers/ranchers, i.e., access to land and financing, economic support, training, and long-term mentoring.
  - Ways to decrease the loss of agricultural lands in rural areas and nurture the revitalization of urban agriculture.
  - How to improve and meet market demand for organic agriculture products nationally and internationally.
  - The link between crop insurance and organic production and conservation practices.
  - Researching the marketing needs of future farmers including market access and structure, land access, and rural economics.

Minority and women farmers are making up a greater percentage of the agricultural workforce and may have specific needs (USDA, 2014).

Regional Recommendations

The National Organic Farmer Survey results were analyzed by region to take into account specific geographic needs, cropping/animal species, and environmental issues. In general, the regional research priorities reflect the overall national trends, with some variations based on regional concerns. Based on the survey results, OFRF recommends the following research prioritization by region (Figure 1).

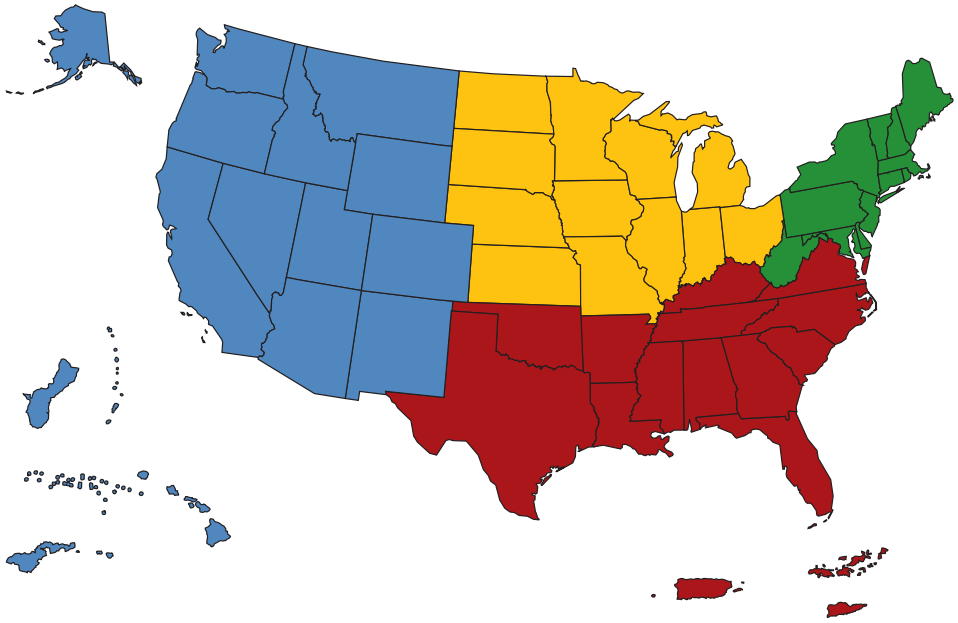


Figure 1. Regions listed by color. Blue=Western, Yellow=North Central, Green=Northeast, and Red=Southern (Source: SARE).

Western Region

- Provide beginning and transitioning farmers and ranchers the tools, knowledge, and on-going mentoring to be successful organic producers.
- Prioritize research on water management in drought conditions, water efficiency technologies, and innovations for water deficit management.
- Continue long-term research on soil health with focus on nutrient and water management.
- Prioritize research on organic production practices that can increase carbon sequestration and mechanisms for producers to capture economic benefits from that ecosystem service. Current research shows that organic soils with higher soil organic matter can increase the sequestration of carbon in the soils. Organic practices such as cover cropping and incorporating residues into the soil build organic matter and sequester carbon.
- Prioritize research on weed control. Research can increase the effectiveness of weed control practices, especially for decreasing the pressure from invasive weeds. Efficacy of organic weed management practices and products will also benefit farmers as they select efficient and cost-effective products. Different tillage regimes and plant and animal rotations are of special interest to the relationship between soil quality and weed control.

- Invest in research to find solutions for disease and pest problems of high regional importance. In addition to general research on specific insect controls, continued efforts in breeding plants specific to organic production challenges, will increase the productivity and economic viability of organic producers.
- Increased research and extension efforts need to be provided for all aspects of animal production, especially information on best practices for rotational and grass fed animals. The Western region is a major producer of milk products and organic livestock and poultry, and research should prioritize animal health in relationship to environmental health as well as follow the integrative OneHealth approach to attain optimal health for humans, animals and the environment. In addition, forage and pasture management is an important focal area for research.

North Central Region

- Increase research on soil health, especially soil fertility under different tillage regimes.
- Increase research related to livestock production and management.
- Increase research on the environmental and economic impacts of genetically modified organisms (GMOs) on organic farmers, as well as strategies for GMO avoidance.
- Increase research on any verifiable health benefits of organic food, and how this can be used to enhance labeling and broader marketing strategies.

Southern Region

- Increase research on marketing strategies and profitability of southern organic operations.
- Increase research and technical outreach on maintaining soil health through organic methods like cover cops, crop rotations, and soil amendments.
- Increase research on weeds and insect management, especially pests of increasing concern like squash bug.
- Increase research on climate adaptive agricultural practices for coping with the higher prevalence of extreme weather patterns like excessive rain and flooding.

Northeast Region

- Increase research on different tillage techniques and the impact on soil health and weed control.
- Increase research on the soil health and fertility impacts of integrating animal production within field crop systems.
- Increase research on cover crops (different varieties) for erosion control and fertility management.
- Increase research on the nutritional benefits of organic production practices and the resulting foods produced.
- Increase research on pollinator health and providing native pollinator habitat.
- Increase research on managing weeds, disease, and animal health challenges during wet years.

Recommendations for Organic Research Methods and Outreach Strategies

Research for organic systems must reflect the foundational principles of sustainable organic production, and be compatible with restrictions of practices or products used in organic production and processing. Specifically, organic research should:

- Be conducted under certified organic conditions.
- Involve organic producers as active team members.
  - Organic farmers should be trained to write research proposals and conduct research, maintain records of data, and maintain areas where trials have been established. They should be engaged in project goal setting and planning as well as execution, outreach, and evaluation.
  - Advisory boards that include producers, and compensate them for their time and expertise, should be a priority for funding research**.**
- Expand the work in farmer participatory plant breeding and animal breeding, and evaluation of cultivars and livestock and poultry breeds for organic systems. Organic and sustainable farmers need access to plant and animal germplasm suited to their regions and management systems, and resilient to climate change.
- Emphasize multidisciplinary and agroecological systems approaches, rather than input-substitution approaches.
- Have capacity for long-term studies of organic systems.
- Include compliance with the National Organic Program (NOP) rules and the principles of sustainable agriculture as criterion for proposal review and field management during the study.
  - Include research on medium- and large-scale production systems. Research questions should also include the techniques needed for scaling up or the adoption of larger scale organic agriculture, i.e., production techniques, technologies, transition methodologies, and marketing strategies.
- Ensure information is delivered in appropriate forms to appropriate audiences.

Education and extension programs intended to deliver research outcomes to organic farmers and ranchers must be tailored to the unique needs and learning styles of the organic farming sector. Producers must be engaged as equal partners with scientists, service providers (Extension, other agencies, independent consultants), and other stakeholders in the process of acquiring and applying science-based information. Specifically, education and extension efforts should:

- Enhance and encourage producer adoption of research results by engaging producers in all phases of research and outreach, and by presenting scientific outcomes as complementary to farmer experience, skills, perspectives, and on-the-ground knowledge of their farming systems, integrating education and extension with research efforts.
- Identify the most effective approaches to facilitate adoption of organic production and marketing research results.

- Identify appropriate venues to successfully reach growers, crop consultants, agency personnel (Natural Resources Conservation Service, Risk Management Agency, Farm Service Agency, etc.), commodity organizations, state organic organizations, the extension system, and consumers.
  - Organic research funders should provide dedicated funding through scholarships and fellowships for undergraduate and graduate students choosing to work in fields related to agriculture and specifically organic agriculture to support future teaching and technical careers. Attention should be given to the special need for more plant and animal breeders and soil scientists.

Liz Birnbaum

2. OFRF 2015 NATIONAL ORGANIC FARMER SURVEY

The 2015 National Organic Farmer Survey describes new and continuing research needs that farmers and ranchers have expressed since the last NORA report. OFRF believes this information will provide a basis to guide researchers, extension personnel, and educators in identifying future work that will be most relevant to producers. This information is especially needed for new and transitioning organic farmers and ranchers. In order to meet the goal of significantly increasing participating organic producers and acreage into organic production, relevant research information is required. Justification for the need and relevance of research on organic agriculture has been well documented. Therefore, the goal of this report is to identify the next generation of research activities.

Methods

A mixed methods approach was adopted to better understand the research needs of certified organic farmers in the U.S. A national survey, developed by OFRF and administered by Washington State University, was used to solicit feedback. The survey data was augmented by 21 listening sessions held around the country, in conjunction with regional organic farming meetings.

Researchers, farmers, and other organic organizations vetted the survey to determine the most appropriate questions to understand the current needs of organic farmers and ranchers, and their responses were consolidated into the survey document. OFRF conducted the survey from July to September 2015. It was sent electronically to 6,631 certified organic producers who provided email addresses on the USDA National Organic Program certified producers list. OFRF mailed postcards to farmers who did not provide emails to inform them of the survey opportunity. In addition, organic certifiers contacted farmers on OFRF's behalf to encourage them to participate in the survey. However, because the survey was web-based, there may be a bias that farmers with computers and Internet were much more likely to participate in the survey than those without.

The survey received a response rate of 1,403 organic farmers, which represents approximately 10% of the current population of U.S. organic farmers (USDA, 2015). Survey responses came from every state, yet there was a predominance of responses from the Western (45%) and North Central (28%) regions, as defined under the USDA Sustainable Agriculture Research and Education (SARE) program.

Concurrent with the development of the survey document, OFRF worked in partnership with regional farming associations to gather additional input through 21 listening sessions around the country. Attendees were asked about general research topics and participated in small breakout groups related to specific topics. For example, at the MOSES conference, the listening sessions covered the topics of animal production, plant health, and soil health.

Farmer Demographics

Survey participants included organic farmers throughout the U.S. The Western region had the highest participation (555 farmers), followed by the North Central region (341), the Northeast region (204), and the Southern region (139). According to the 2014 USDA NASS organic survey, the number of organic farmers are: Western region (5,029); North Central region (4,309), Northeast region (3,371), and Southern region (1,294). Thus, about 11% of Western and Southern region farmers participated in the survey, while participation was closer to 7-8% in the Northeast and North Central regions.

- Farmers ranged from 20 to 84 years in age, with the average of 55 years of age. The median age was in the 60-65 age bracket.
- 70% of respondents identifying as the primary farmer or rancher were male and 30% were female.
- Farmers ranged in their organic farming experience from less than one year to 80 years, with the average being 13 years.
- Most farmers had between 5-10 years of organic farming experience, indicating that many survey respondents were either beginning farmers or had recently transitioned to organic production.
- The size of organic farms ranged from less than an acre to 40,000 acres. The median organic farm size was 48 acres.
- 98% of surveyed respondents had certified organic acres, 24% also had conventional acres, 18% had acres transitioning to organic, 16% had organic but uncertified acres, 7% had organic acres exempt from certification, and several farmers used biodynamic methods.
- The farmers in the survey were evenly divided among those who transitioned to organic agriculture from conventional farming (46%) and those who began farming using organic practices (48%). Several other farmers began farming in other ways, such as transitioning part of their land or starting to farm on conservation acreage.
- 38% of farmers earned 75-100% of their net income from organic farm production, yet the majority of farmers also received much of their income from off farm activities.
- 46% of respondents reported that a family member works off-farm for more than 20 hours a week.
- 25% of respondents stated that neither they nor their employees have access to health insurance practices, and 48% began farming using organic practices.
- 6% percent of farmers entered into organic farming either by taking over an existing organic farm, starting a split organic/conventional farm, or farming land from the Conservation Reserve Program (CRP).
- Surveyed farmers grew a wide variety of crops, with the most common being vegetable crops (55%). Forty-one percent (41%) of farmers produced animal products, with the most commonly produced animal product being beef. Twenty-eight percent (28%) of respondents also produced value added products.

Educational Background

Twenty-five percent of respondents received a masters or higher degree, 38% received a four-year (bachelor) college degree, 8% received a two-year college degree, 17% had one or more years of college but did not receive a degree, and 11% had high school education or less.

On-farm Research

Most surveyed farmers (66%) reported that they are experimenting or trying new production techniques on their farm. On-farm experimentation included the use of different cover crops, trying different tillage practices, performing variety trials, growing new crops, using different kinds of mulch, using different rotational design, monitoring and experimenting with irrigation practices, and breeding animals. One farmer expressed their experience as, "Almost every act is an experiment in improvement. Every year I try something new."

Marketing Venues

Surveyed farmers sold their products in many different venues. The most common marketing strategy was selling wholesale to processors or packers. The second most common marketing strategy was selling to a local food store or co-op. Direct to consumer marketing was commonly achieved through "U Pick," farmers' markets, and community supported agriculture (CSA). Only 21% of surveyed farmers used their websites for direct-to-consumer sales

Selected Research Priorities

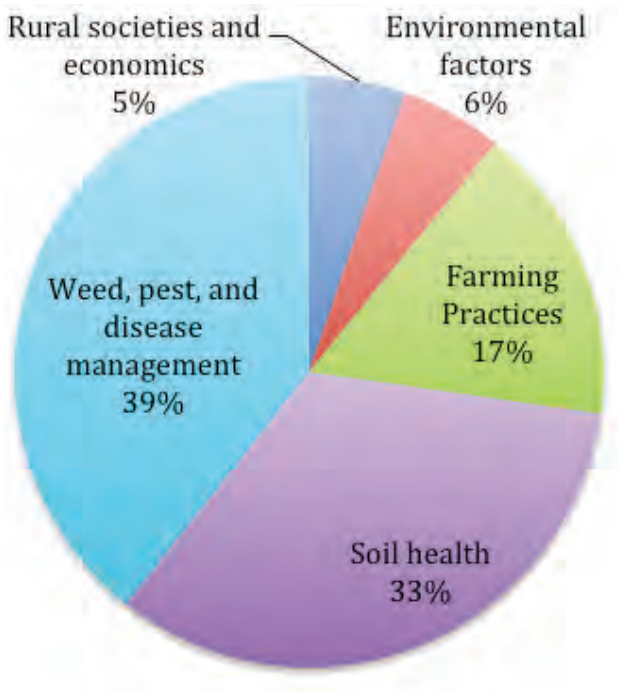


Figure 2. Prioritization of research topics by surveyed organic farmers (N=1039).

When survey participants were asked to designate their highest priority overall for organic farming research, the most common topic was weed, pest, and disease management. The second most common top priority was soil health, followed by farming practices, environmental factors, and rural societies and economics (Figure 2). Weed, pest, and disease management as the highest priority matches the results of the 2011 National Organic Farmer Survey. Soil health, which ranked as a moderate challenge in 2011, has increased as a current priority. This may be due to a better understanding of the importance of healthy soil as the basis of organic production, and the ability to better cope with environmental and nutritional impacts.

Top Rated Research Topics U.S. Wide

Producers surveyed were asked to rate specific research topics individually as high priority, moderate priority, low priority, or not applicable. Each topic was ranked independently, and surveyed farmers were able to mark multiple topics as high priority. Figure 3. shows the topics most often rated as high priority research topics by survey participants. The five research areas that received the greatest percent of high priority ratings are:

1. Soil health, biology, quality, and nutrient management
2. Weed management
3. Fertility management
4. Nutritional quality, health benefits, and integrity of organic food
5. Insect management

We selected these top five priorities for further discussion in the following section of this chapter.

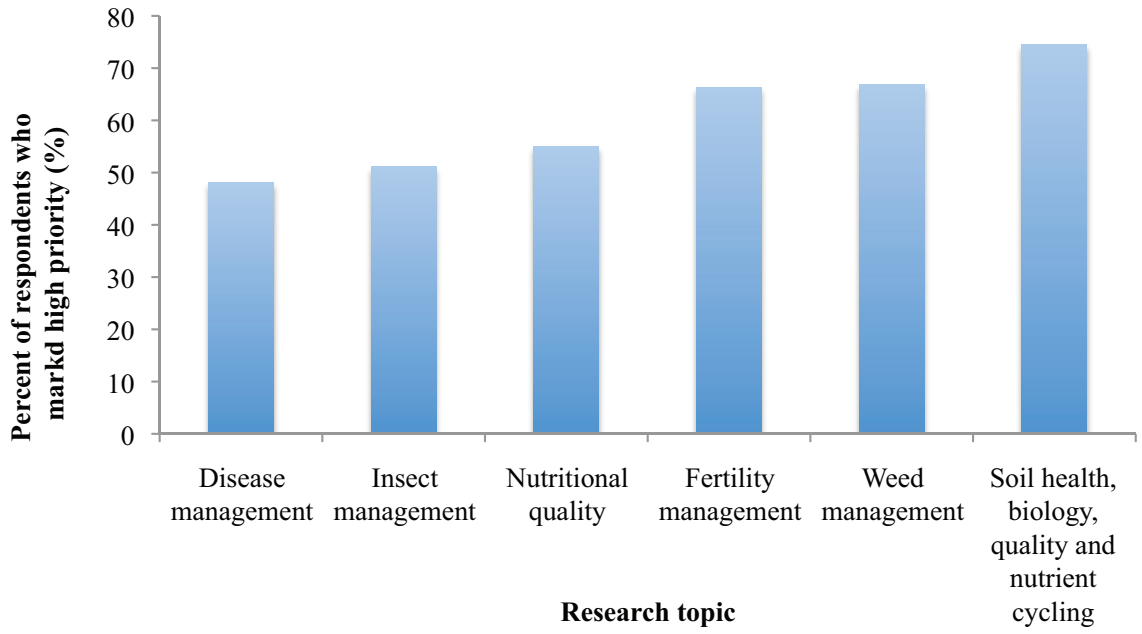


Figure 3. Topics rated as high prioirty research topics US wide.

Soil Health, Biology, Quality and Nutrient Cycling

Federal organic standards require producers to maintain or improve soil organic matter content. Practices such as cover cropping, reduced tillage, compost application, and rotational grazing are standard organic farming practices. The research topic of soil health, biology, quality, and nutrient cycling was consistently rated as a high priority in all regions, and overall was rated a high priority by 75% of respondents.

Specific needs in this research area focused on the interactions between soil health and the need for holistic soil research that examines the farming challenges of weeds, soil disease, maintaining a diversity of soil microbial life, climate stresses, and the economics of maintaining fertility. One farmer stated, "I would like to know more ways to increase healthy mycorrhizal interactions and other microbial activity, as well as improve the health for our plants without importing a ton of stuff."

Top issues related to soil health for which respondents requested research include:

- The connection between different tillage practices and the loss of soil carbon.
- The effects of cover crops, compost, and diverse rotations on fertility rates.
- Strategies for building soil organic matter.
- The needs of soil microbes and their role in crop health and disease and weed suppression.
- Insect and disease management interactions with soil biology, including the control of nematodes.
- The best ways to source effective and affordable soil amendments.

The 2007 NORA report had several recommendations for applied soil health research. Many of these recommendations have been addressed in research funded by the USDA OREI program. Sixty-five percent (122) of projects funded by OREI from 2002-2014 studied a topic related to soil management in organic production systems, with most projects focusing on soil fertility and nutrient management. These projects have produced important contributions to the knowledge surrounding organic soil health.

At least 36 OREI and ORG funded projects tackled the weed management/soil health dilemma with integrated approaches emphasizing cover crops, diversified crop rotations, and reduced tillage. Many of these projects also addressed nutrient management, crop pests, and diseases. In addition to field assessments of soil quality, weeds, and crop yields, many project teams analyzed soil microbiological communities or weed seed banks, and soil carbon sequestration. An example of a holistic project with a focus on soil health is: *Cropping intensity and organic amendments in transitioning farming systems: effects on soil fertility, weeds, diseases, and insects* (ORG 2003-04618, PI: Eastman, University of Illinois, $483,000).

Most organic crop growers operate on the premise that high quality soils are healthy soils, which yield healthy plants that are better able to resist insect and disease pests and produce high-quality food. Research on the relationships between above- and below-ground biodiversity, soil quality, plant health, systemic pest resistance, and crop quality need to be prioritized for future funding.

CLIMATE CHANGE

The survey respondents were asked about research needed on climate change. Specifically, respondents were asked to prioritize research on adaptation and mitigation for fluctuations in temperature and rainfall. Thirty-four percent of respondents nationwide marked this topic as a high priority for research (Figure 4). The Southern region stood out with 42% of respondents having marked climate fluctuations as a high priority for research.

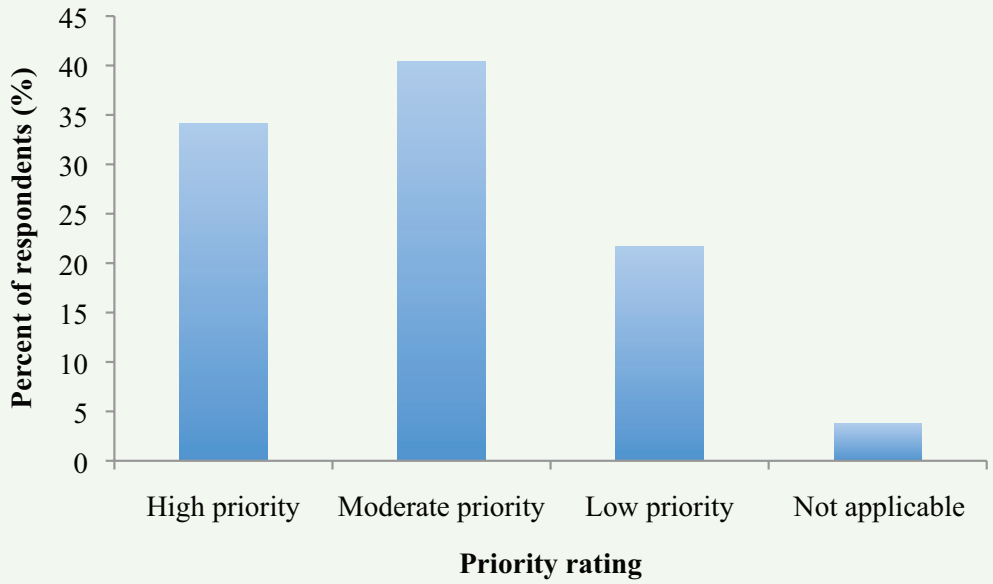


Figure 4. Priority rating for research on adaptation and mitigation to temperature and ainfall fluctuations (N=1104).

Recommendations

It is recommended that future research focus on the following topics of importance to organic farmers:

- Water and soil management to cope with drought and flooding (in crop and pasture systems).
- Coping with new insect and weed species.
- Ways to manage fluctuations in chill-time for nuts and fruits crops.
- Education and outreach on organic farming climate change adaptation and mitigation.

Survey Participant Comments

Specific comments given in the survey related to climate change reveal that organic farmers are experiencing negative impacts from climatic shifts. Impacts reported by farmers include new challenges with irrigation, weeds, energy costs, chill time for tree crops, and the difficulty of dealing with variability in the production system. Farmer quotations related to research needs and challenges of climate change include:

- *Irrigation is not truly sustainable, and especially with challenges due to climate change we need better practices that improve our water capture, retention, and cycling (rather than relying upon irrigation that too often utilizes below ground water faster than those reserves can be replenished). It is clear that much of the farming (even certified organic) being practiced in arid parts of the U.S. and abroad is not sustainable. We need to retain sustainable agriculture in more temperate areas (subject to development and land use conversion pressure) before that land is lost forever to farming. Research is needed to "validate" and further the alternative practices that are working.*

- *How can I cope with effects of climate change and increased energy costs?*

- *We need better ways to manage weeds and new insects. How to cope with them? Old diseases showing up more often due to climate change.*

- *Climate change is about to put me out of business. 2011 was too wet, 2012 too dry, 2013 and 2014 too wet and 2015 on track to be too wet. Plus devastating extreme cold temps in Jan 2014 and Feb 2105. How can I, as the manager, and the beef cattle deal with it?*

- *Two perennial crops particularly important to our farm income are (1) berries; (2) dry hay. In climate change, it will be very important for us to know what varieties of berries and varieties of dry forage we should eliminate and what varieties we should add.*

- *Climate change, radical fluctuations of temperatures and rainfall.*

- *Climate change adaptive techniques and crop breeds.*

- *Climate change, and specifically chilling hours, is negatively affecting our walnut orchards. Research into this field is very important to us.*

- *The role of grazing livestock to reverse climate change.*

- *Anticipating the changes on the horizon—increased energy costs, climate change, depleting natural resources—and how to adapt.*

- *Weather fluctuation from climate changes. Hot to cool or overly wet to bone dry conditions.*

- *Impact of climate change (weather extremes) on vegetable production.*

- *Climate change has drastically affected our pistachio production due to insufficient chilling hours. We need trials and research to help this growing industry survive these new challenges.*

- *Impact of climate change and unpredictability. Flexibility to adapt to unexpected and extreme conditions.*

- *Climate change disrupting fruit set and maturity dates.*

- *Climate change with water issues.*

- *Weeds and climate change.*

- *Sadly, I think climate change is going to catch up with all of us: it is getting hard to produce crops that have been routine to me over the decades.*

Weed Management

Weed management was rated a high priority for research by 67% of respondents. One farmer stated, "Weeds are killing me. I need better ways to control them in row crop production." Another farmer noticed cyclical patterns in the weed pressure on their farm, stating, "Weed pressures on our farm seem to change over time. When we were conventional, we had a lot of velvetleaf. While we can still find it since we have gone organic 16 years ago, it is not a problem for us at all. However, in recent years, we have some fields with a terrible bindweed infestation that we struggle with, and last year jimsonweed went from something we were hardly aware of to a big problem. More information on weed control would be valuable to us."

Respondents stated the need for research on several weed related topics, including:

- Cost effective methods for controlling weeds in medium/small scale operations (including organic herbicides).
- The role of cover crops in improving weed control.
- The role of crop rotations in improving weed control.
- Specific weed species: jimsonweed (*Datura stramonium)*, Canada thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*), pigweed (*Amaranthaceae amaranthus spp.*), lambsquarters (*Chenopodium album*), and problematic perennial weeds.
- *Weeds and What They Tell* by E. Pfeiffer needs to be updated and expanded.
- Weed pests, insect problems, and diseases can be symptoms of wrong cultural practices and we need to learn to read the symptoms and know how to address the core problems.

Recommendations for research on weed management from the 2007 NORA report are still relevant, especially the need for models of weed population dynamics under different cover crop, tillage, and crop rotation management strategies. In addition, bindweed, pigweed, nutsedge, lambsquarters, and Canada thistle were all identified in the 2007 NORA report as difficult-to-control weeds. These weeds continue to be problematic and were identified in the 2015 National Organic Farmer Survey as top weed pests.

Fertility Management

Fertility management was rated the third highest priority, with 66% of respondents rating it a high priority. This research category is closely linked with the soil health category, yet it is more specific to the soil fertility challenges experienced by many organic growers. Growers' comments expressed particular research needs on soil fertility including:

- The correlation between soil biology adjustments (compost tea and other products to stimulate soil biology) and yield and fertility.
- The connection between soil fertility and weed pressure.
- How cover crops can be used to provide fertility requirements in perennial systems where tillage is not used.
- The types of compost that work best to maintain fertility and improve biological processes. Research on varieties that require less fertility inputs and compete better with weeds.
- The preparation of soil for pasture management, including timing and technique for amendment application and incorporation and grazing. What does the five to ten year pasture management plan look like?

Nutritional Quality, Health Benefits, and Integrity of Organic Food

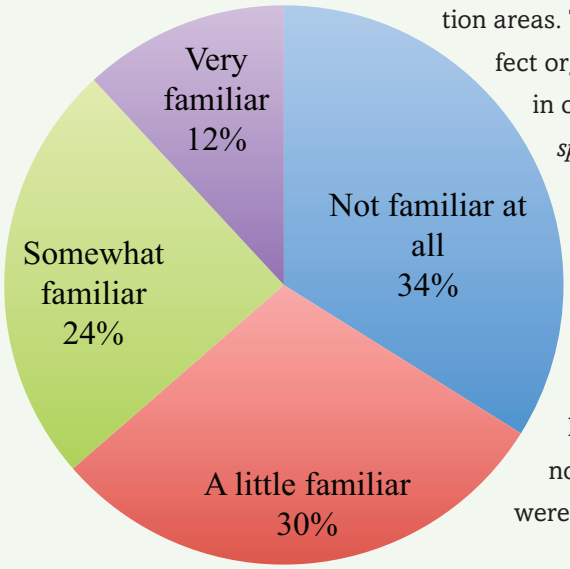
OFRF recommends increased research on nutritional quality and the integrity of organic food. Organic marketing faces the challenge of many different food labels, like natural and non-GMO, which may lead to consumer confusion about the organic label. Fifty-five percent (55%) of growers rated nutritional quality, health benefits, and integrity of organic food as a high priority. Increased research in this area is important for aiding organic farmers with marketing tools. Key issues for research include:

- The quality, health benefits, and organic integrity of organic food and body care products.
- Consumer education regarding the irregularities in appearance of organic produce, the health benefits of organic food, and the environmental benefits of organic farming.
- Research that shows the nutritional and other benefits (environmental and consumer) of mindfully, truly sustainably grown organic products (e.g., 100% grass-fed organic dairy products vs. confinement organic dairy).
- Research to educate the younger generation on the benefits of organic nutrition and farm practices.
- Economic structure and integrity of labeling and marketing messages of organic milk products.
- The organic integrity of imported organic grain, including the environmental and social impacts of production. Farmer quote: "The rising tide of industrial scale organic grain and livestock production threatens the integrity of organic food and the social and environmental benefits that come with ecologically based, diversified organic crop/livestock production systems."
- The organic label needs to integrate good labor practices and reduced energy use.

Joanna Ory

FOOD SAFETY

In 2011, the U.S. Food and Drug Administration (USDA) created a new law, the Food Safety Modernization Act (FSMA). This act directed the Food and Drug Administration (FDA) to establish a set of preventative controls across the food system in order to minimize the occurrence of food-borne illness. These controls include requirements that food facilities develop a food safety plan that includes hazard analysis, prevention controls such as a food allergen controls and recall plans, monitoring, corrective actions, and verification such as product testing. Farms are required to have produce safety standards for the safe production and harvesting of fruits and vegetables, considering potential sources of pathogens, the use of soil amendments, hygiene, packaging, temperature, and the presence of animals in crop production areas. These on-farm requirements have the potential to affect organic farms. For example, compost must be stabilized in order to limit the amount of bacteria like *Salmonella spp.* FSMA also encourages waiting periods between grazing and harvest. The rule exempts small farms (sales less than $500,000/year), which sell directly to local consumers.



In the 2015 National Organic Farmer Survey, OFRF asked organic farmers to rate their familiarity with the FSMA rules. Most respondents (64%) reported little or no familiarity with the rules, and only 12% stated they were very familiar (Figure 5).

Figure 5. Familiarity of respondents to FSMA.

Further, farmers were asked to rate and describe any possible impacts they feel FSMA may have on their operations. Most farms stated that FSMA would have a slight or moderate impact on their operations (Figure 6).

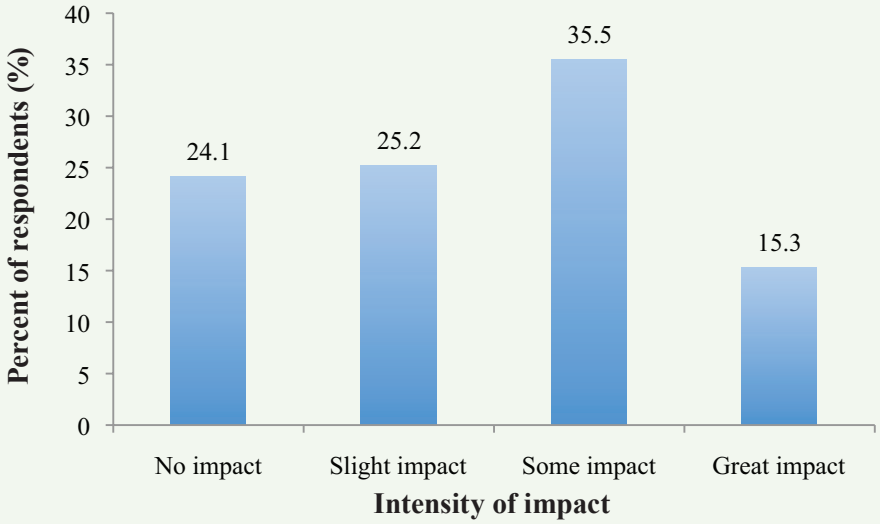


Figure 6. Respondent predicted impact severity of FSMA.

When asked what the specific impacts may be, many farmers stated that they are uncertain. The most common impact reported is the burden of record keeping and paperwork. However, some farmers stated more significant impacts like changing their growing practices. One farmer stated, "We have been USDA certified (food safety) now for three years and have had to fight to maintain our livestock on the farm each year. We have decided to quit growing leafy greens and other crops that keep hitting the news with food scares. We have been able to maintain our tree crops as food safety certified because these crops do not come into contact with the ground. The food safety regulations are totally against integrated crop-livestock operations, which have so much potential to stabilize farm income and provide a great agronomic program as well. The cost of the inspections is very high, and the effort we go through to pass inspections is very taxing. I'm certainly not against food safety, but there needs to be more research to demonstrate the real causes of food poisoning: it's the processing, handling and packaging on an industrial scale."

Other farmers mentioned no longer growing crops that will be eaten raw. Still others were concerned that the costs of inspections and compliance could "force them out of business." One respondent stated, "We are facing the possibility of losing my ability to do simple on-farm processing (sun-drying) of my products, because of ill-guided 'food safety' new regulations."

Many farmers feel that the rule will have minor impacts because they already have certain rules in place to meet organic certification. For example, the rule for the waiting time between raw manure application and harvest will most likely be equivalent to the National Organic Program standards. Therefore, many organic farmers are already in compliance with at least some of the new food safety rules. One farmer stated that there is a benefit of the new rule, "I think it can help make our farm more aware of food safety issues on the farm and therefore will likely motivate us to pay closer attention to this often overlooked area."

Research on Food Safety

Research on food safety issues was rated a high priority by 36% of respondents. Farmers stated they were interested in several research areas related to food safety, including:

- Quantifying food safety risk, or lack thereof, in providing on-farm habitat in the form of hedgerows and buffer strips.
- Evaluating post-harvest handling with regard to food safety.
- Evaluating the wait time before harvest for food safety.
- Minimizing food safety risks on small farms - beyond just getting GAP certified.
- Researching food safety risks of animal manure (either left there by grazing rotations or applied).

Insect Management

Insect management was rated a high priority by 51% of respondents. Farmers noted specific insect pests for which they would like new research and treatment options, as well as more general topics such as insect conservation and research on habitats for beneficial insects, like syrphid flies. The most frequently reported problematic insect pests are aphids, flea beetles such as *Phyllotreta cruciferae*, ants, Bagrada bug *(Bagrada hilaris),* and cucumber beetles *(Aclymma vittatum, A. trivittatum, and Diabrotica undecimpunctata).* Since the publication of the 2007 NORA, there have been several invasive insect pests that have been introduced to the US or increased their range. These new invasive pests include:

- Chilli thrips (*Scirtothrips dorsalis* Hood) was discovered in Florida in 2005.
- European grapevine moth (*Lobesia botrana*) was first discovered in California in 2009.
- Kudzu bug (*Megacopta cribaria*) was introduced to the US in 2009.
- Light brown apple moth (*Epiphyyas postvittana*) was introduced into California in 2007.
- Bagrada bug (*Bagrada hilaris*) was first discovered in California in 2008.
- Spotted wing drosophila (*Drosophila suzukii*) was first detected in California in 2008 and has since spread through the West Coast and has been problematic in many states nationwide.
- Brown marmorated stink bug (*Halyomorpha halys),* although detected in 2001, the BMSB has become a serious pest in many Eastern region states (Figure 7).

Figure 7. Brown marmorated stink bug, by Yerpo - own work, https://commons.wikimedia.org/wiki/File:Halyomorpha_halys_nymph_lab.jpg

Insect pests are a major cause of crop losses, with one farmer stating, "There is no organic approved method to control pecan weevil (*Curculio caryae* Horn). This insect will cut my production from 10-35% in most years."

Some topics for future research include:

- Influence of soil components on disease and insect vulnerability.
- Varieties with insect resistance for organic production.
- Impact of rotations and companion crops on insect pressure.
- Beneficial insect habitat through green manures and field borders and other habitat plantings.
- The impact of beneficial insects on crop yields.
- Fly and parasite management practices and their impact on non-target insects (dung beetles, pollinators, etc.).
- Control of insects in organic fruits in humid eastern U.S.
- Developing biocontrols for Swede midge (*Contarinaia nasturtii)* (first discovered in the US in 2004) and leek moth (*Acrolepiopsis assectella).*

Economic and Social Science Research

Joanna Ory

OFRF recommends increased social and economic research to address the marketing challenges experienced by organic farms. Throughout the survey responses, the topic of economic viability of different production practices was a recurring focal area for growers. Farmers expressed the challenges of knowing where to source affordable soil fertility inputs as well as frustration among struggling enterprises to pay their farm crew the fair and livable wages they deserve. Several expressed challenges related to isolation from markets. One farmer stated, "Local people, including restaurants, don't want to pay the organic price for vegetables or hay. We are a small grower but we live within 20 miles of some areas who might pay the price."

Top Areas for Increased Research Related to Organic Marketing and Economics Include:

- Research on the different approaches to organic marketing (such as using a CSA, farmers market, cooperative, etc.) and the associated costs and benefits.
- Research on reducing high transportation costs, especially for meat producers whose distance from processors makes it difficult to do direct and wholesale marketing.
- Research on how to enter or remain viable in a saturated market.
- Research on how to best educate consumers about different organic practices with the goal of increasing market demand and opportunities.

- Research on how to best educate consumers about the organic label and standards in order to avoid confusion with other labels, such as natural and non-GMO.
- Research on the discrepancies of how animal operations are providing adequate outdoor access, specifically how large operations may be shifting demand from smaller, diversified operations which provide greater outdoor access.
- Research and training for finding buyers who will purchase from small-scale farms or strategies for how small producers can collaborate to approach institutional buyers.
- Research on building markets to help domestic organic farmers compete with inexpensive imports (especially grain).
- Research on how small farms can cope with the pressure to make organic food affordable and the need to receive a fair price.
- Research on how the organic check-off may affect organic farmers of different scales.
- Research on how to create alternative markets for imperfect produce.
- Research on viable price information and market volume data.

Joanna Ory

GMO IMPACT ON ORGANIC FARMERS

Under the National Organic Program, organic agriculture prohibits the use of genetically modified organisms (GMO). Nationwide, 39.8% of surveyed organic farmers rated the impact of GMO crops on production, practices, sales, markets, and seed availability as a high research priority. Regions in the Midwest where there are more GMO crops grown (like corn and soy) expressed the greatest need for research on GMO impacts.

Farmers stated that there is a need for specific types of research and information on GMO drift and other contamination issues. In addition, farmers stated that there is a need to communicate with conventional farmers about problems of drift without alienating them. One farmer mentioned that there is an opportunity to find solutions to the problem and conflicts surrounding GMO contamination by reinforcing the understanding that both small organic farmers and small conventional farmers make important economic and social contributions to the economic viability of rural communities.

Impacts on Organic Farmers

The survey asked whether organic farmers had experienced GMO contamination and the rejection of a shipment of goods. Nationally, 2.2% of farmers reported having a shipment of product rejected due to GMO contamination (N=881). However, this rate of contamination is not uniform throughout the U.S. The North Central region had 6% of respondents report having a product shipment rejected due to GMO contamination (Figure 8).

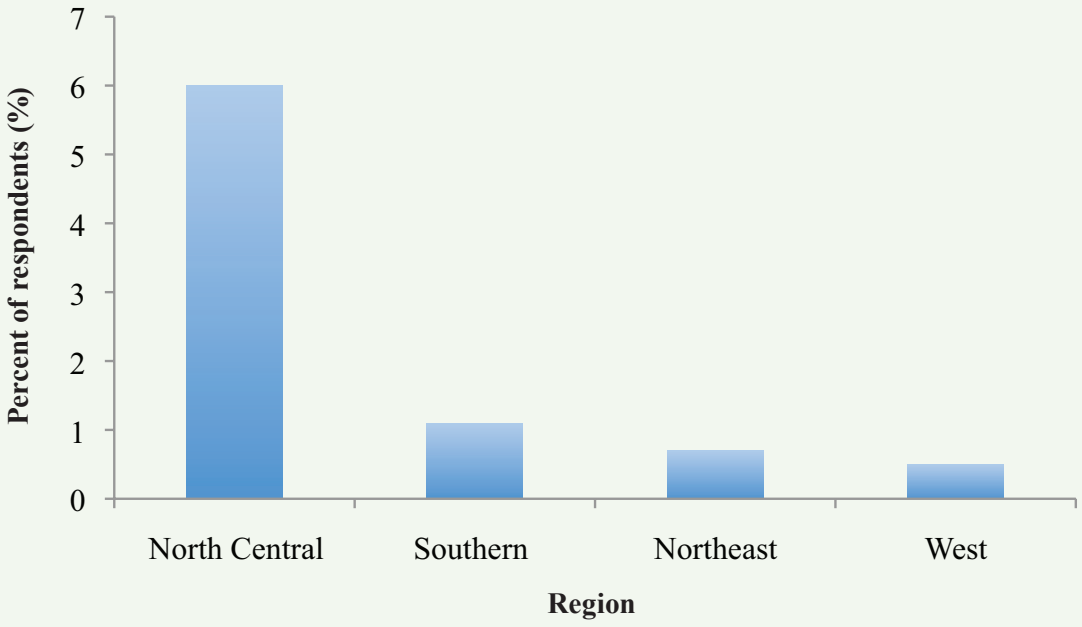


Figure 8. Regional distribution of organic rejections due to GMO contamination (N=881).

The survey asked farmers to describe the impact GMOs have had on their farm. The responses indicate that in addition to the direct financial impacts of having products rejected as organic, organic farmers expressed a range of different ecological, financial, and psychological impacts they experience from the threat of GMO contamination. The 263 open-ended responses fall into several categories: pollen drift, delayed or altered planting, lost production, environmental pollution, increased pesticide pollution/drift, and psychological/emotional concern.

A word cloud created using keyword counts visually depicts the important terms represented in the survey (Figure 9).

Figure 9. Word cloud for GMO impact open-ended questions.
The size of the word represents the number of times it was mentioned in the survey responses.

Recommendations

Based on the survey data collected and listening sessions, OFRF makes the following recommendations for research:

- Increase research on GMO avoidance practices, especially in the North Central region.
- Increase research and monitoring of the true economic impact of GMOs on organic farmers.
- Increase research on environmental impacts of GMOs.

For the complete discussion of GMO impacts, see Appendix E.

Livestock and Animal Agriculture Research Needs

In the U.S., about 120M acres of pasture land (e.g., cultivated or native grassland managed for grazing or forage harvesting) are used by ruminant animals to produce milk, meat, and fiber (NRCS, 2014). In addition, of the more than 100M head of livestock that utilize grazing lands in the U.S., about 45% is concentrated on pasture lands in the humid eastern region of the conterminous U.S. Today, grassland-based agriculture is valued at $44B annually (Natural Resources Conservation Service, 2014).

Forty-one percent (41%) of farmers in the 2015 National Organic Farmer Survey produced animal products, with the most commonly produced animal product being beef followed by poultry and dairy. A commonality among recent surveys and research reports has shown a significant lack of funding related to organic animal agriculture, including OFRF and USDA OREI/ORG programs. The reason for this discrepancy compared to funding for plant related research efforts is unclear. It may be due to a lower number of animal producers as compared to plant producers, the lower number of proposals submitted to funding agencies on animal production topics, or the high cost of animal research. Inherently, it should be noted that crops are part of animal production systems as they are a major feedstuff/input for those systems, so they indirectly benefit from cropping systems.

The Union of Concerned Scientists (UCS) found that the organic dairy sector provides more economic opportunity and generates more jobs in rural communities than conventional dairies. The first-of-its-kind study, "Cream of the Crop: The Economic Benefits of Organic Dairy Farms," calculated the economic value of organic milk production. "Over the past 30 years, dairy farmers have had a choice: either get big or get out. Dairy farmers either had to dramatically expand and become large industrial operations or they went out of business," said Jeffrey O'Hara, agricultural economist for the Food and Environment Program at UCS and author of the report. However, in a summary of work conducted through USDA NIFA, it was found that organic dairy production offers farmers another option—one that is better for the environment, produces a healthier product, and leads to greater levels of economic activity (O'Hara and Parson, 2012).

Organic livestock farmers experience particular issues of concern related to food safety standards, animal health, and veterinarian care. Research needs on organic animal production were assessed at the 2015 Organic Agriculture Research Symposium. The results of a breakout session on animal research needs determined there are several areas in need of prioritization for organic farming. These topics include:

- Efficacy of available treatments, therapies, and approved products.
- Impact of grass-based systems on animal disease (long-term study).
- Incidence of lameness on organic farms, causes, nutrition, symptoms, housing, stress, environment, and preventative practices.
- Breed performance in organic systems (health, pathogens, and parasites).
- Parasite prevention on pastures.
- Poultry breed and ration customization for season/climate, environment, available feeds, pasture, and markets.
- Integrated livestock/crop systems (food safety and pest/disease suppression).

- Effective treatment options for poultry diseases and the interactions with human pathogens.
- Effective alternatives to synthetic methionine.
- Soil health and mineral balancing impacts on animal health, i.e., how to assess holistic impacts/nutritional informatics.
- More research on the economics and efficacy of probiotics for animal health (efficacy, risks, costs/benefits, regulatory status).
- Parasite management for hogs and small ruminants.

Organic Seed Breeding

The 2007 NORA report stated that the organic seed requirement for organically certified crops, combined with increasing risk of organic crop contamination by GM gene sequences, has led to increased interest in organic variety development and seed production on the part of organic farmers. Organic farmers have two distinct needs relating to seed. The first is for well-adapted crop varieties that perform well under organic management; the second is for accessible, affordable, high quality seed that produces what a grower expects it to produce.

Schonbeck et al. (2016) indicates that even though classical breeding research for crops and animals has increased over time, there is still a very limited number of breeding programs and a decline in professional researchers in this specialty.

In the 2015 National Organic Farmer Survey, farmers commonly stated the need for increased on-farm plant breeding and variety improvement for organic seeds. Specifically, farmers noted the need to develop more organic hybrids for disease resistance. Farmers also expressed different views related to the policy for organic seed sourcing, especially the need to increase the number of organic seed breeders and distributors.

ORGANIC SEED

According to the National Organic Program guidelines, organic farmers must use organic seed when it is commercially available. However, if the desired organically produced seed or planting stock variety is commercially unavailable, organic farmers may use conventionally grown, untreated, non-GMO seeds. To assess the availability of organic seed, we asked the survey participants to categorize the frequency of organic seed availability for the primary crops they grow. The survey found that for 20% of respondents, organic seed was rarely or never available (Figure 10). There were some regional differences. Farmers in the Western region reported less organic seed availability; reporting that organic seed was never available 14% of the time.

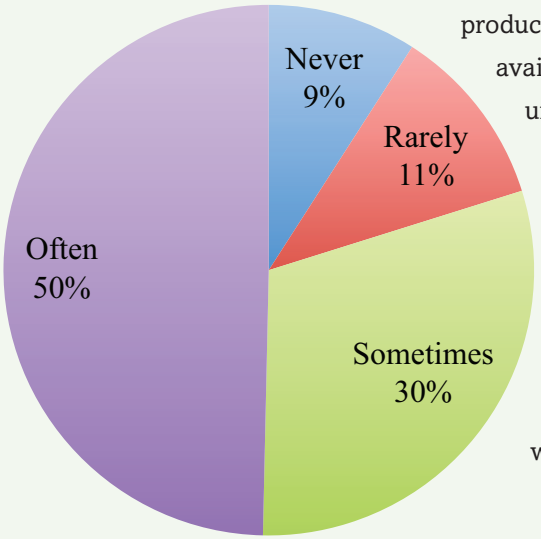


Figure 10. Frequency of organic seed availability as reported by U.S. organic farmers.

Farmers reported several major areas of concern regarding organic seed. The biggest challenge reported was the price of organic seed being much higher than non-organic seed. Other major challenges are the quality and regional and temporal unavailability. As a result of challenges regarding the availability of organic seed, many surveyed farmers reported doing their own seed saving.

One farmer described the disadvantage small organic farmers face with obtaining organic seed in a rural market. The farmer stated, “Many of the large agricultural product cooperatives through which rural people source feed and seed do not carry organic seed as a standard. They require the purchase of a full semi load to even consider making the order. Small- and mid-scale operations struggle to gain affordable access to untreated, non-GMO, and certified organic field seed.”

Organic Seed Price

The higher price for organic seed was the most common challenge reported by growers in the survey. The large price discrepancy between organic and conventional seed is a disincentive for farmers to use organic seed. Survey participants stated that high organic seed cost is interfering with profit, and that price is an important factor with regards to seed sourcing. Several farmers also expressed an understanding that the limited number of organic seed distributers is helping to create the situation of high prices for organic seed.

Organic Seed Quality

Survey respondents reported that the quality of organic seed was often inferior to conventional seed in terms of germination rate, yield, vigor, and contamination with weed seeds. Respondents also reported that there are fewer organic seed varieties to choose from. Organic farmers need varieties specific to their needs, such as high nutrient-use efficiency, disease resistance, insect resistance, weed competition, and good quality. Although there has been progress in seed breeding for organic production, it is a slow process and some farmers report dissatisfaction with organic seed germination rates.

Organic Seed Availability

Many farmers reported that organic seed was not available locally in their area for certain crops, or became harder to find during the peak of the planting and growing season. There were several crops for which respondents reported very little availability, specifically grass, cover crops, kale, and flower seeds.

Specific Areas of Need

Surveyed farmers highlighted several areas for which there is a need for more research or policy change regarding organic seed. Farmers commonly stated the need for increased on-farm breeding and variety improvement for organic seeds for the development of more organic hybrids for disease resistance. Farmers also expressed different views related to the policy for organic seed sourcing. Several farmers stated the need for stricter enforcement of using organic seed.

For a complete discussion of organic seed issues, see Appendix F.

Jack Dykinga

Information Sources and Formats

The 2015 National Organic Farmer Survey asked participants to list their primary source of organic production and marketing information. Respondents listed many different information sources including the Internet, other farmers, certifiers, chemical companies, seed catalogs, and conferences. Despite having many different resources for organic farming information, several farmers expressed the need for greater availability of organic specific production and marketing information. For example, one farmer stated, "We are lacking of research into our main problems in the Great Northern Plains on the problems that we face in organic agriculture."

Of the farmers surveyed, 902 responded to an open ended question about their primary source of production and marketing information. The top sources of information used in order of their priority are: Internet searches, other farmers, magazines like Acres and Tilth, certifiers, university publications and research, producer association newsletters, and their own research (Figure 11). As farmers gain experience, they report moving from learning from books and classes to doing their own research on the Internet and in the field. Because Internet searches are the most used source of information, it is important to strengthen resources like eOrganic and let organic farmers know about reliable data sources and sites where they can exchange information with other farmers.

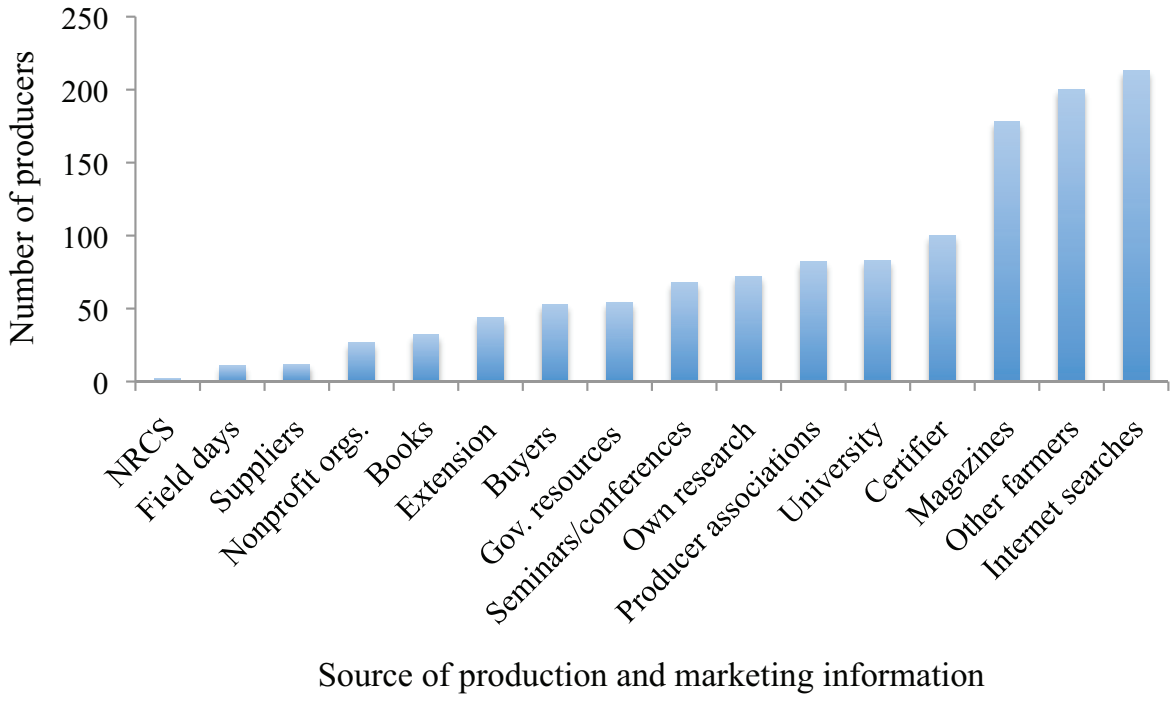


Figure 11. Most used information sources for production and marketing by surveyed farmers.

When asked to rate different information sources based on their usefulness, information from other farmers was listed as the most highly useful information resource (Figure 12). For example, one farmer stated, "I get my information from other farmers. Extension is helpful, but usually a bit behind many farmers in assessing production techniques." Another farmer stated that getting information from other farmers has a long history in the development of organic agriculture, "Other farmers who share their experiences - we learn and support one another. When you're developing or on the cutting edge of adopting new practices there isn't research out there to benefit from. Such was the case with organic when we certified 20 years ago - we only had other farmers and our own (expensive) process of trial and error."

Other resources with high scores for being highly useful include organic certifiers, growers' associations and university researchers. Many farmers reported limited use of information from crop consultants and nonprofit organizations.

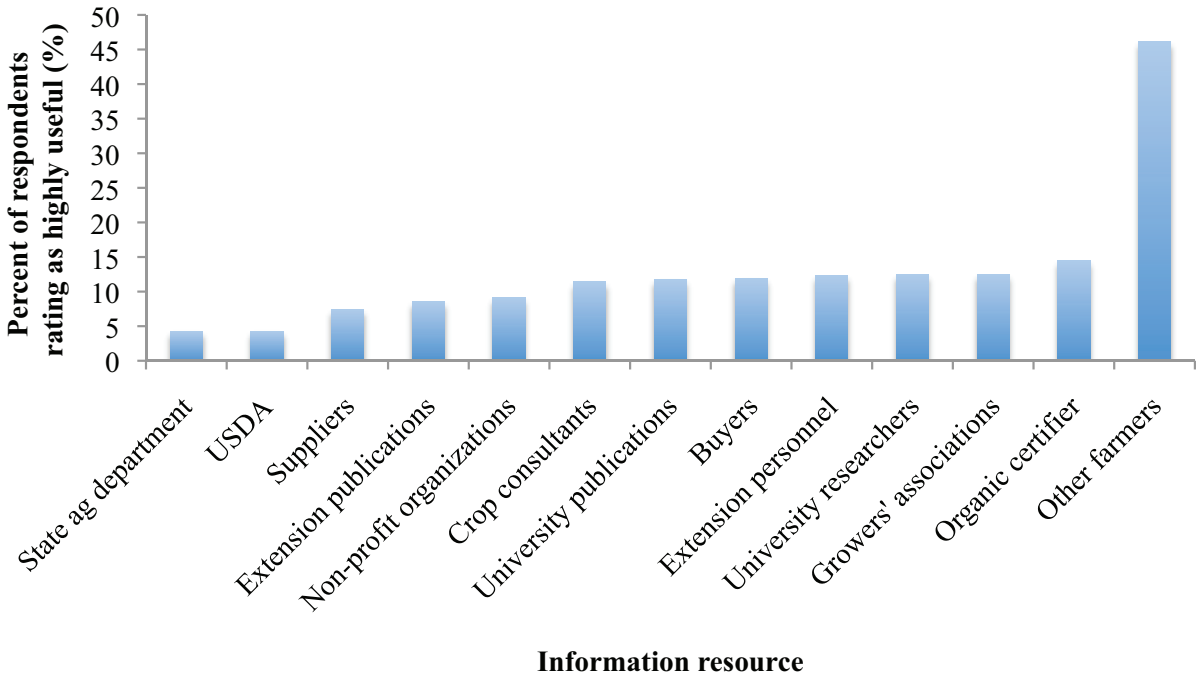


Figure 12. Respondent rating of high usefulness of different information sources.

Respondents were asked to rate their preferences for different information formats. The respondents listed field days/on-farm demonstrations as the most highly preferred format (Figure 13). Other popular formats include conferences and workshops, websites, and print periodicals. Considering this was administered as an online survey, there may be a bias towards online informational resources as the survey does not include responses from farmers who lack Internet access. The preference for field days and conferences indicates that the respondents prefer experiential, in-person learning on organic production and marketing topics.

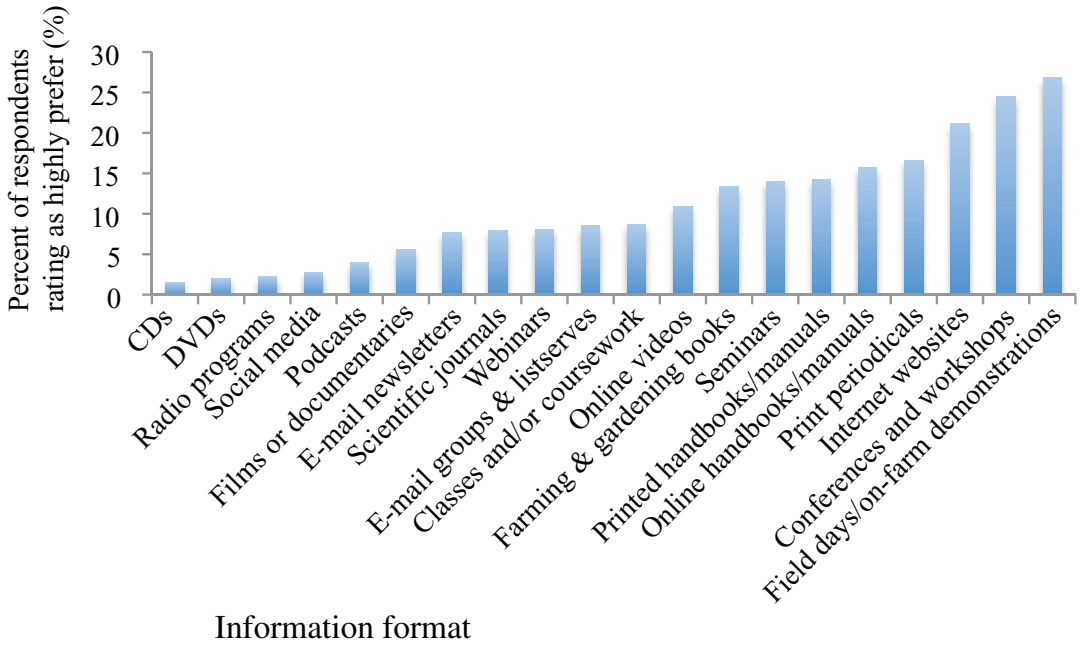


Figure 13. Respondent rating of high preference for different information formats.

REGIONAL RESULTS

Production Challenges

In the survey, farmers and ranchers were asked to describe their biggest production challenges. These challenges varied depending on the region (see major challenges for each region below). These challenges are areas for which future research can be prioritized, as they indicate the most difficult obstacles growers face in organic production.

Western Region

- Coping with and adapting irrigation systems to drought conditions.
- Weeds: puncture vine weeds *(Tribulus terrestris),* Johnsongrass *(Sorghum halepense)*, and cape ivy *(Delairea odorata)*.
- Soil diseases like *fusarium* pathogens.
- Insect pests like Bagrada bug (*Bagrada hilaris)*.
- Insufficient animal slaughter facilities.

North Central Region

- Marketing and profitability strategies best suited to organic enterprises.
- Weed management.
- Weather and climate change, e.g., too much rain.
- GMO contamination and avoidance.
- Not enough organic meat processors and USDA meat and poultry inspectors, and how such supply chain barriers can best be addressed.
- Meeting the Food Safety Modernization Act requirement.

Southern Region

- Stink bugs such as the brown marmorated stink bug *(Halyomorpha halys)*.
- Johnsongrass *(Sorghum halepense)*.
- Lack of accessibility to the commercial market.
- The development of a food safety plan that suits organic production systems well.
- Weather and climate change – heavy rain causing weed and disease problems.
- Profitability and consumer education.
- Lack of reliable labor, of particular import to organics because of increased labor intensity.

Northeast Region

- Maintaining soil health.
- Weed control.
- Animal health, including availability of good pasture and forages.
- Frequent and severe precipitation causing flooding and increased disease.
- High labor and land costs.

Research Priorities

There was regional variance for the top research priorities depending on the production challenges and crops grown in different parts of the country. For example, the Western region rated irrigation and drought management as a top priority, and the North Central region rated research on genetically modified organisms (GMO) contamination as one of the top priorities. Despite these regional differences, the topics of soil health and weed management were consistently top priorities for future research throughout the nation. The list below shows the top high rated priorities with the percent of respondents who marked "high priority" in parentheses.

Western Region

- Soil health, biology, and nutrient management (71%)
- Fertility management (66%)
- Weed management (63%)
- Irrigation and drought management (56%)
- Insect management (56%)

North Central Region

- Soil health, biology, and nutrient cycling (78%)
- Weed management (75%)
- Fertility management (66.6%)
- Nutritional quality and health benefits of organic food (62%)
- Soil conservation and restoration (59%)
- Contamination from genetically modified organisms (GMO) (52%)

Southern Region

- Soil health, biology, and nutrient cycling (79%)
- Weed management (69%)
- Fertility management (67.4%)
- Nutritional quality and health benefits of organic food (66%)
- Insect management (61.9%)

Northeast Region

- Soil health, quality, and nutrient management (74%)
- Fertility management (66%)
- Weed management (61%)
- Nutritional quality and health benefits of organic food (51%)
- Pollinator health (48%)
- Soil conservation and restoration (48%)

3. DISCUSSION AND SUPPLEMENTAL REVIEWS

To inform the recommendations in this NORA report, OFRF reviewed USDA funded research, results from other surveys, OFRF funding programs, and recommendations from other organizations such as the National Organic Standards Board (NOSB).

OFRF reviewed USDA OREI and Organic Transitions (ORG) funded programs between 2002 and 2014, to evaluate what research, education, and extension projects had been funded. Research recommendations from that review have been evaluated in reference to the research objectives identified by farmers and ranchers in the 2015 National Organic Farmer Survey

In addition to national reviews, OFRF has conducted internal reviews of research funded since the beginning of the OFRF competitive grants program in 1992. Relevant research recommendations have been provided based on gap analysis of not only what was funded, but also the priorities for future funding needs. The first review was *Investing in Organic Knowledge, Impacts of the First 13 Years of the Organic Farming Research Foundation's Grantmaking Program* (Sooby, 2006). The most recent report was the *Trends and Impacts of the Organic Farming Research Foundation Grants Program: 2006-2014* (Ory, 2015). This report provides an analysis of 106 OFRF-funded projects that have had positive impacts on organic farming in many areas. From research projects examining new varieties and organic seed breeding, to educational projects that link beginning farmers with mentors, OFRF grants have helped produce important tools and informational sources for organic farmers.

Review of USDA Funded Research on Organic Farming

The Report and Recommendations on Organic Farming issued by the Organic Study Team in 1980, provided an initial review of organic programs within the USDA. The report acknowledged that the USDA knew very little scientifically about organic agricultural productivity, much less about the economic benefits and costs of organic farming (USDA Study Team on Organic Farming, 1980). A dominant question posed by the Study Team was, "Under what specific circumstances and conditions can organic farming systems produce a significant portion of our food and fiber needs?" Now that organic agriculture is an established part of U.S. and international diets, it is clear there is a need to increase organic production worldwide. Not only is research on organic methods and practices important to organic producers, it is also relevant to conventional producers as they may adopt many of the fundamental organic practices to meet environmental and societal goals for agricultural sustainability (USDA Study Team on Organic Farming, 1980).

Since the 2007 NORA report (Sooby et al., 2007), USDA investment in organic research has increased. In 2016, OFRF conducted a review of the USDA OREI and ORG organic grants programs titled, *Taking Stock*: *Analyzing and Reporting Organic Research Investments, 2002 – 2014*. This report examines the research, education, and extension areas that have been funded and those that have been underserved (Schonbeck et al., 2016). The majority of funded projects related to crop instead of animal systems with 91% studying crops and 25% researching animals (some projects included both). Only 6% of awards went to animal system projects. Similar to the NORA report, *Taking Stock* recommends increased re-

search on animal health, organic plant breeding, soil quality and weed management, as well as pollinators and pollinator habitat. In addition, *Taking Stock* recommends that USDA:

- Continue funding priorities identified in the 2007 and 2016 NORA reports, especially on the topic of organic weed control, soil health and fertility, and co-management of weeds, nutrients, and soil health.
- Increase research on organic livestock production systems, especially pork, beef, and turkey.
- Increase funding for historically underrepresented commodities such as rice, cotton, tree nuts, and cut flowers.
- Invite and fund proposals on functional agricultural biodiversity, and practical strategies for different regions to meet the National Organic Program (NOP) requirement to conserve biodiversity and use cover crops.
- Fund meta-analyses of outcomes of multiple OREI and ORG projects on complex topics such as soil quality/weed co-management; and carbon sequestration/net greenhouse gas impacts of different systems; and the challenges of dryland organic production in semiarid regions.

Although advances have been made, organic agriculture research remains underfunded and requires greater commitment by funding agencies. OFRF recommends significant increases in USDA funding for organic agriculture research in order to implement the recommendations of both this NORA report and the *Taking Stock* report.

Review of OFRF Surveys and Reports

OFRF has published several national farmer surveys and reports to assess farmer needs and advocate for better policies. The 2007 NORA report had a significant influence on the dramatic expansion of federal organic research funded through the Food, Conservation and Energy Act of 2008, commonly known as the 2008 Farm Bill. It also helped guide OREI program priorities and was widely cited in applications to the USDA OREI program as justification for specific research projects.

Since the 2007 NORA report, the research community has focused and contributed knowledge in several key areas. For example, there have been new successes in organic plant breeding, including the development of several varieties of open-pollinated sweet corn. In addition, many OREI projects funded by the USDA addressed issues of organic soil health and fertility, a top priority identified in the 2007 NORA report.

Even with increased attention to key organic priority areas, many of the recommended areas for research require continued attention from the research community. The 2015 National Organic Farmer Survey results show that soil health and applied research for weed and pest management are the highest priorities for organic research.

Soil organic matter, fertility, and microbial impacts are identified as needs in both reports. Weed pressure remains a major concern for farmers and ranchers, as well as appropriate control measures, efficacy of control products, and effects of different tillage practices. Major outbreaks of specific insect pests may have changed, but insect and disease control research needs are of high priority, especially in more humid and warm geographic areas. Since the 2007 NORA report was released, there are several new insect pest species that affect organic growers, like Bagrada bug (*Bragda hilaris),* Asian citrus psyllid which transmits citrus greening disease, and Light Brown Apple Moth (*Epiphyas postvittana*).

Animal systems research has been limited in past research efforts, and the specific needs for nutritional studies, pasture management, and breeding remain high priorities.

A survey of organic farmers conducted in 2011 by OFRF provides complementary information to the 2015 National Organic Farmer Survey regarding why organic farmers choose to become organic. The survey asked 422 farmers to rate the importance of the reasons they became organic farmers. The reason most commonly rated as very important was land stewardship, and the reason least commonly rated as very important was price premiums for organic products (Figure 14).

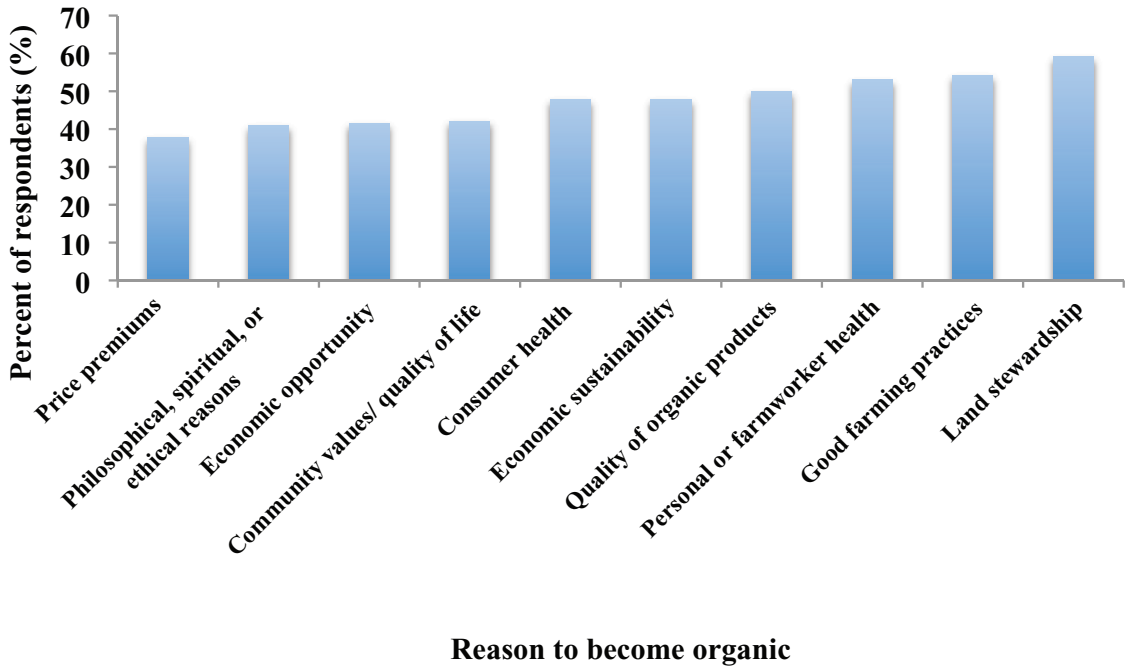


Figure 14. 2011 Survey results on why farmers became organic.

The 2011 farmer survey found that the production challenge most rated as a strong challenge was weed management (Figure 15). This finding of weed management as a top priority was reinforced in the 2015 National Organic Farmer Survey with weed, pest and disease management rated the top research priority by 39% of respondents. Other top challenges in 2011 included finding organic seed and the cost of organic certification. The USDA is now providing payment support for initial certification costs through the National Organic Certification Cost Share Program (NOCCSP) and the Agricultural Management Assistance (AMA) Organic Certification Cost Share Program. These programs provide a combined $11,632,000 in assistance in 2016 (USDA, 2016 b, https://www.ams.usda.gov/services/grants/occsp). During FY 2012, 7,245 producers received assistance from the NOCCSP and 2,348 received assistance from the AMA (https://www.ams.usda.gov/sites/default/files/media/2013OCCSPReport%20to%20Congress.pdf)

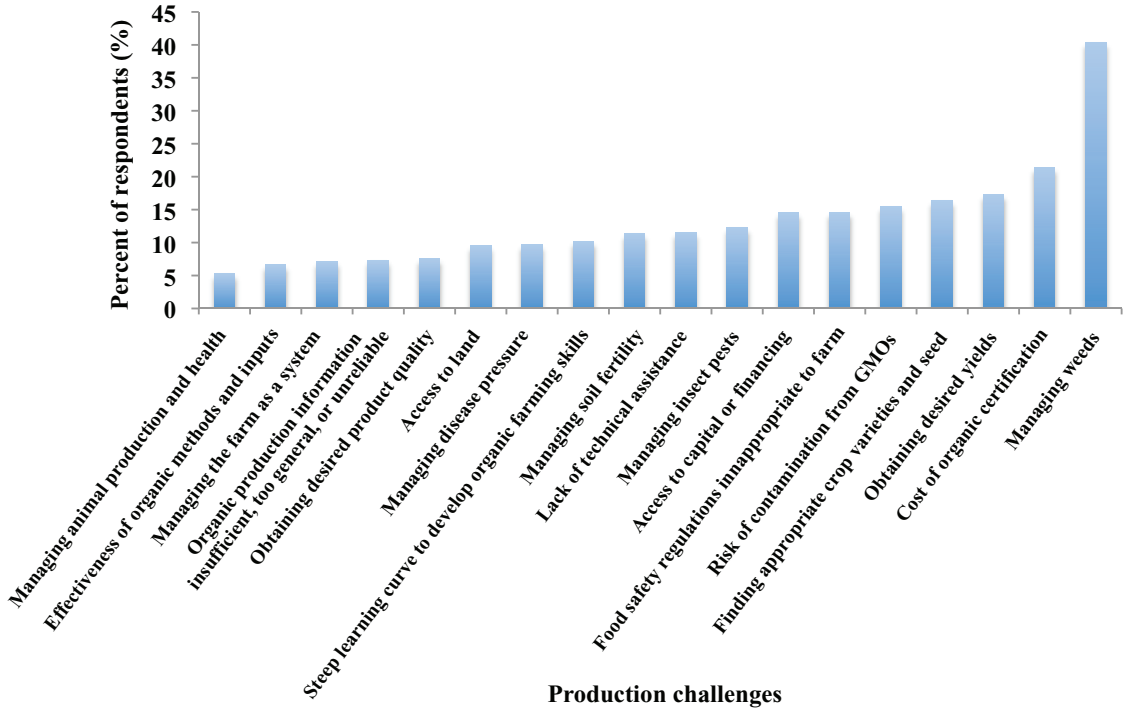


Figure 15. 2011 survey responses on top production challenges.

In the 2011 survey, the marketing challenge most rated a strong challenge was downward price pressure from less expensive or imported products (Figure 16). The competition of less expensive/imported products was rated a strong challenge by 21% of respondents, demonstrating that importation of organic products is a major concern for U.S. farmers. Other top challenges included the difficulty of obtaining sufficient prices for sustaining the farm, and competition with "unverified" organic product.

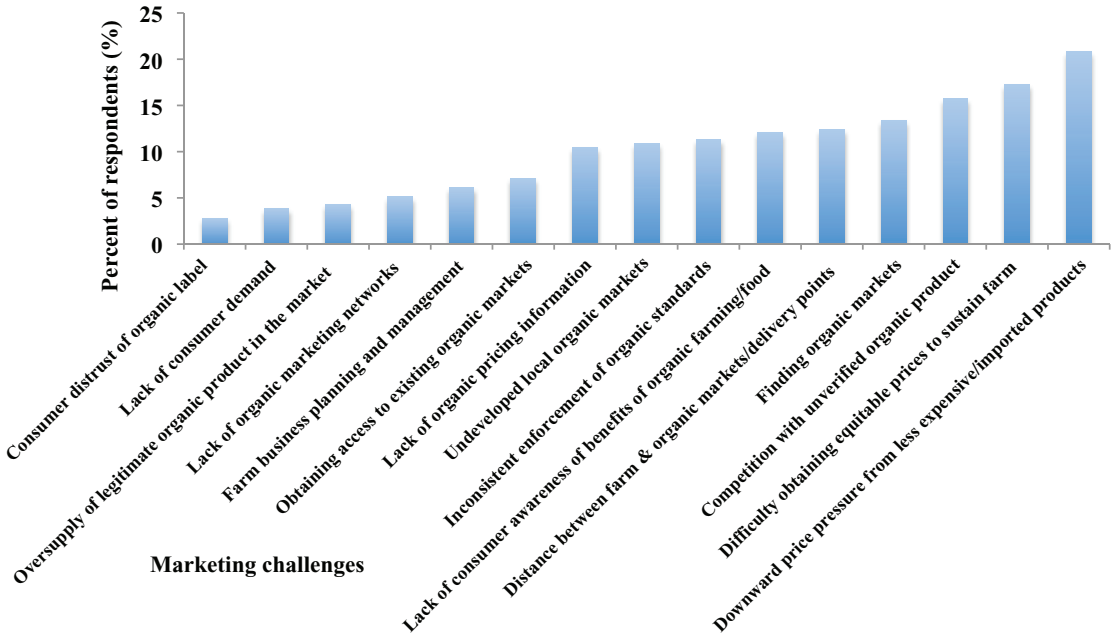


Figure 16. 2011 survey responses on top marketing challenges.

The 2011 National Organic Farmer Survey gave important background on the different production and marketing challenges of organic growers. The 2015 National Organic Farmer Survey builds off this information by focusing on the specific current research needs of organic growers.

The 2015 National Organic Farmer Survey and listening sessions highlighted some of the most pressing economic, social, and marketing challenges and research needs of organic farmers, an area that was not well developed in the 2007 report. The information in the 2011 survey on marketing challenges provides support for the recommendations in the 2016 NORA Report to increase consumer education and economic and marketing research.

Overlap of OFRF and NOSB Recommendations

The NOSB is a Federal Advisory Board that makes recommendations regarding the production, handling and processing of organic products. Attention to production issues as they relate to evolving organic standards is an important area of research. OFRF recommends strengthening the communication channels between the NOSB, NOP, and the research community in order to provide growers with information and recommendations in advance of phasing-out a previously approved substance. (www.ams.usda.gov/rules-regulations/organic/nosb/recommendations)

NOSB created a list of research recommendations, mostly related to the organic certification standards which were presented to the NOP in 2015 (AMS, 2015; https://www.ams.usda.gov/sites/default/files/media/MS%202015%20NOSB%20Research%20Priorities_final%20rec.pdf). The 2015 National Organic Farmer Survey results support many of the NOSB recommendations, including:

- Increased research on field management practices for organic whole farm systems.
- Increased research on organic plant and animal breeding.
- Appropriate product reviews for toxicity and efficacy of NOP approved products, including food additives and food packaging products.
- Increased research on the effects of GMO materials, including GMOs in organic compost.
- Increased research on organic livestock systems, including animal herd health, parasite treatment and avoidance, and animal nutrition.

In addition, OFRF recommends increased research to support improved clarity in the standards that govern animal welfare on organic farms. The 2015 National Organic Farmer Survey respondents and listening session participants stressed the need to verity the efficacy of products and practices used by producers and approved by NOSB.

The 2015 National Organic Farmer Survey results indicate a concern regarding GMO contamination (see GMO critical issues section). OFRF is in agreement with NOSB that research to prevent GMO contamination is a high priority. Specific topics for future research include: evaluation of effectiveness of prevention practices (cleaning equipment, creating buffer rows, maintaining seed purity, reducing spread of GMO pollen by pollinators.) In addition, research on practices conducted by conventional growers to determine where GMO contamination is coming from, is a valuable research area. Other NOSB recommendations that complement OFRF recommendations include:

- Comparing till and no-till practices related to soil health, level of soil organic matter, biodiversity, fertility, weed control, and pest management.
- Finding effective alternatives to allow eliminating the use of antibiotics for plant disease control and animal production.
- Finding alternative plant disease management practices and materials, especially in humid (i.e., Southern region) areas.
- Increasing information on biological control of plant diseases and bio-pesticides.

Conclusion

This report demonstrated the importance of monitoring the needs of organic farmers. OFRF is committed to our ongoing effort of communicating the research needs of organic farmers to the policy and research communities. We encourage the funding of projects that have solving farmer needs at the core of the research questions and full farmer participation in the research process.

This report contains recommendations for future research to be put into action by the USDA and the broad agricultural research community. Greater regional and federal funding will be necessary to achieve the growth of organic agriculture and the associated environmental and social benefits.

We encourage policy makers and researchers to use the findings in this report to work towards funding and conducting research projects that will solve the challenges faced by organic farmers.

Results from the 2015 Survey of Organic Farmers and listening sessions provide insights into the most pressing challenges and topic areas that require additional research and outreach. Increased funding for research on critical issues related to soil health and fertility, weed control, invasive insect pests and the nutritional quality of organic food will provide organic farmers with knowledge and tools to enhance their production and marketing. In addition, areas of particular concern to organic farmers, such as GM crop contamination and climate change, warrant increased attention. The survey results highlighted the opportunity for farmer-to-farmer learning, field days, and online resources to increase farmer learning and the application of research results. Through greater extension and outreach to the organic sector, organic farming will benefit from information and guidance that supports the most environmentally and economically sustainable agricultural production systems.

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APPENDIX A: WESTERN REGION

Introduction

The Western region includes Alaska, American Samoa, Arizona, California, Colorado, Guam, Hawaii, Idaho, Micronesia, Montana, Nevada, New Mexico, N. Marianas Islands, Oregon, Utah, Washington, and Wyoming (see blue region on map; Figure A.1). The Western region is a leader in organic production with four states (California, Washington, Oregon, and Colorado) in the top ten U.S. states for organic product sales (USDA, 2015).

Research, Extension, and Educational Recommendations for the Western Region

- Provide beginning and transitioning farmers and ranchers the tools, knowledge, and on-going mentoring to be successful organic producers.
- Prioritize research on water management in drought conditions, water efficiency technologies, and innovations for drought management.
- Continue long-term research on soil health with focus on nutrient and water management.
- Prioritize research on organic production practices that can increase carbon sequestration. Current research shows that organic soils with higher soil organic matter can increase the sequestration of carbon in the soils.
- Prioritize research on weed control. Weed control continues to be an area where research can benefit more sustainable weed control practices, especially for resistant and invasive weeds. Efficacy of organic products will also benefit the farmers as they select efficient and cost-effective products. Tillage and plant and animal rotations are of special interest.
- Invest in research on disease and pest problems of high importance in California. In addition to general research on specific insect controls, continued efforts in breeding specific for organic production and management of these issues will increase productivity and economic viability of organic producers.
- Increased research and extension efforts need to be provided for all aspects of animal production, especially information for rotational and grass fed animals. California is a major producer of milk products and organic livestock and poultry.

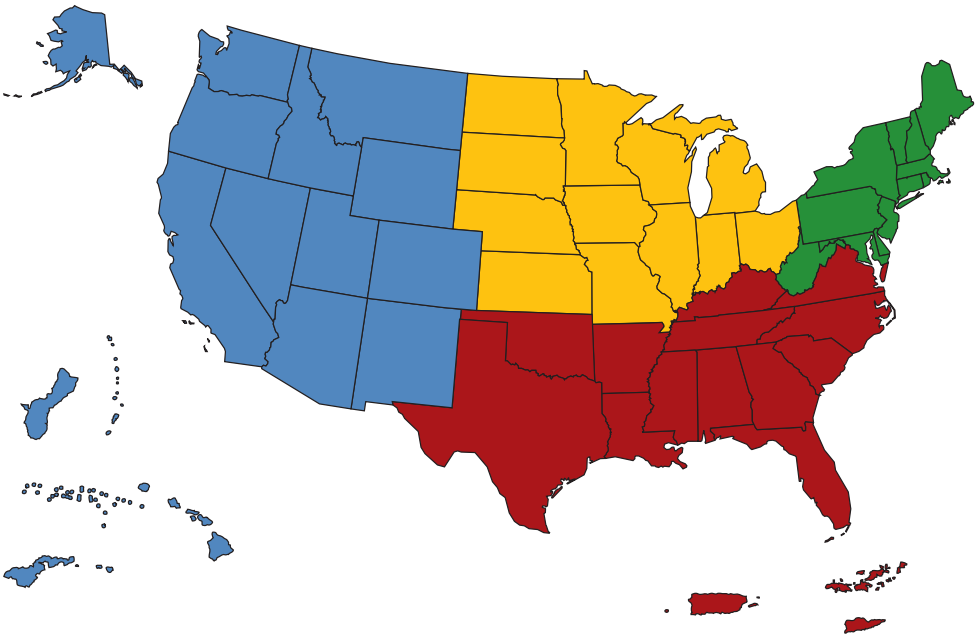

Figure A.1. Western region in blue (SARE, 2015).

The Organic Farming Research Foundation (OFRF) conducted a nationwide survey of organic farmers to identify their research needs. Three hundred and ninety-seven organic farmers from the Western region completed the survey. This report is based on their responses.

Organic Farmer Survey Results

Western farmers who participated in the survey ranged from having one year of organic farming experience to those who have been farming organically for more than 50 years. The size of the organic farms ranged from less than a tenth of an acre to over 20,000 acres. Forty-six percent of farmers surveyed transitioned to organic farming from conventional farming practices, and 48% began farming using organic practices. While 98% of the survey respondents had at least part of their land certified organic, many farmers also had uncertified acres under organic production and acres in transition to organic production. Twenty-seven percent of respondents had a mix of acres under organic and conventional production. CCOF was the certifier for 40% of the survey respondents. Other top organic certifiers included Oregon Tilth, the Washington State Department of Agriculture, the Colorado Department of Agriculture, and the Idaho Department of Agriculture.

Top Research Priorities for the Western region

The highest priority identified for research in the Western region was soil health, quality, and nutrient management, which was rated as a high priority by 70.7% of respondents. Other top research priorities in order of importance included: fertility management, weed management, irrigation and drought management, insect management, disease management, and the nutritional quality and health benefits of organic food (Figure A.2).

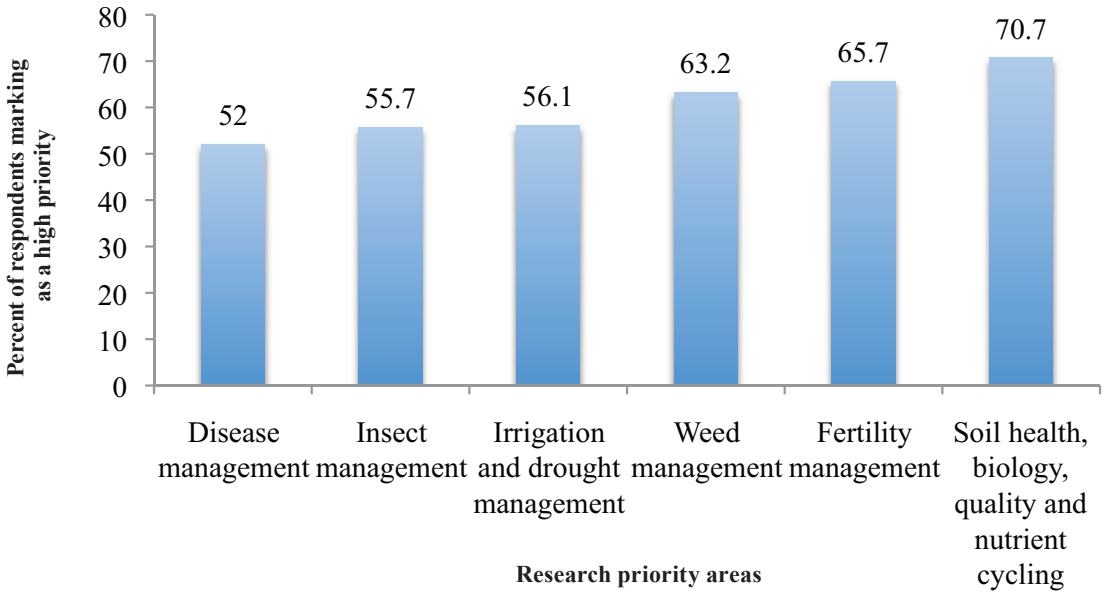

Figure A.2. Top six research priority areas identified in the OFRF survey of organic farmers in the Western Region.

Soil Health, Biology, and Nutrient Cycling

Research on soil health was identified as a high priority by 70.7% of respondents (Figure A.3). A common theme for transitioning growers is the need for cost effective ways to "jump-start" soils that have been weathered from conventional production practices. Survey respondents reported the need for research on:

- How to maintain and enhance soil biology while using standard tillage.
- How to maintain and enhance soil biology while using minimal tillage.
- How to bring health to soils that were degraded by conventional agriculture.
- The role of tillage in the ability of soil to sequester carbon.
- Best ways to add organic matter to soil with minimal or no till practices for commercial scale.
- How to design diverse cropping systems to optimize soil health. Impact of specific crop and crop mixes on soil biology.
- How to remediate glyphosate residue in the soil profile.
- Building soil health via cover cropping with limited water.
- How to measure the health of the soil microbiome and how soil microbes influence crop health.

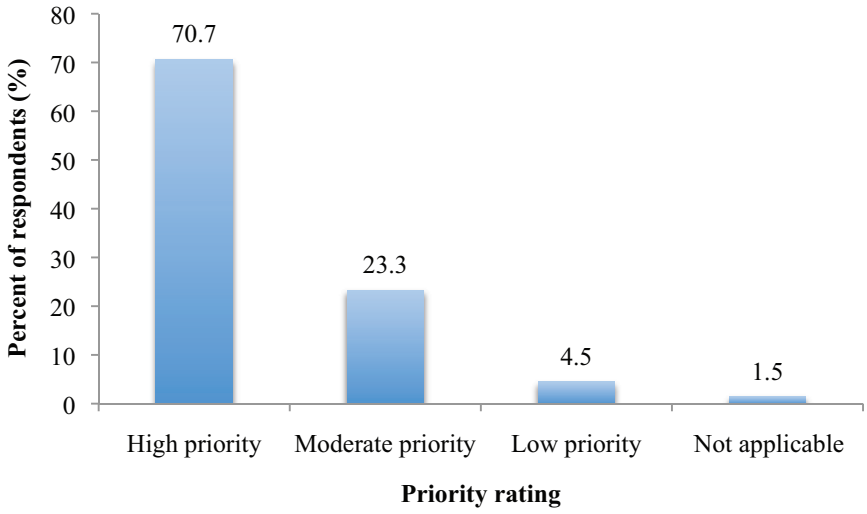

Figure A.3. Priority rating of research on soil health by Western region organic farmers in 2015

Fertility Management

Research on fertility management was identified as a high priority by 66% of respondents (Figure A.4). Survey respondents reported the need for research on:

- Microorganisms and fertility.
- Cover crops for building fertility in perennial crops.
- Nitrogen-fixing cover crops for the arid west, specifically for use in surface/sub-surface drip irrigation systems between beds.
- Research related to biology and nutrient cycling for a desert climate.
- Nutrients added by sheep grazing in winter, specifically nitrogen (N).
- Soil fertility for organic apples.
- How much fertilizer should be used when, and in what form?
- Liquid fertility management techniques also important to reduce leaching of N.
- Research on varieties that require less fertility inputs and compete better with weeds.
- Organic seed production, use of poultry in rotation to build soil fertility.

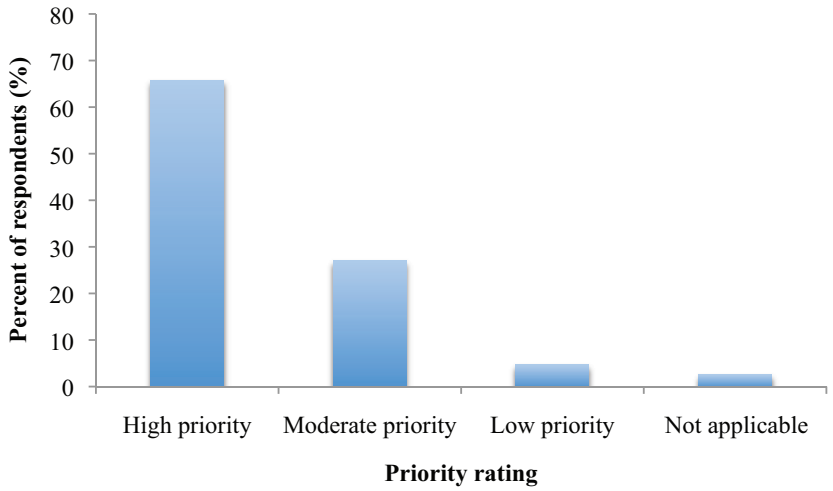

Figure A.4. Priority rating of research on the soil fertility management by Western region organic farmers in 2015

Weed Management

Weed research was a high priority for 63% of respondents (Figure A.7). Farmers expressed the need for solutions to weed challenges, such as optical weeding research and organic herbicides. One farmer stated, "We are losing organic farmers due to field bind weed. It will be vital to organic farming in this area to have some way to eradicate this weed. Disking only slows it down." Common problematic weeds in the Western region include: field bindweed (*Convolvulus arvensis*) (Figure A.5), Canada thistle (*Cirsium arvense*) (Figure A.6), common lambsquarters (*Chenopodium album*), Bermudagrass (*Cynodon dactylon*), yellow foxtail (*Setaria lutescens*), johnsongrass (*Sorghum halepense*), nutsedge (*Cyperus esculentus*), hound-stongue (*Cynoglossum officinale*), common cocklebur (*Xanthium pennsylvanicum*), hawkweed, puncture vine weeds, and cape ivy (*Delairea odorata*). Some farmers also reported what is working for them in terms of weed control. For example, one farmer stated, "Cows for grass between the trees, goats for star thistle and berry vines coupled with our dry farming practices has resulted in a strong grove with many less issues than our neighbors."

Figure A.5. Bindweed (Convolvulus arvenis) (Photo: Jason Hollinger)

Figure A.6. Canada thistle (Cirsium arvense) (Photo: Peggy Greb)

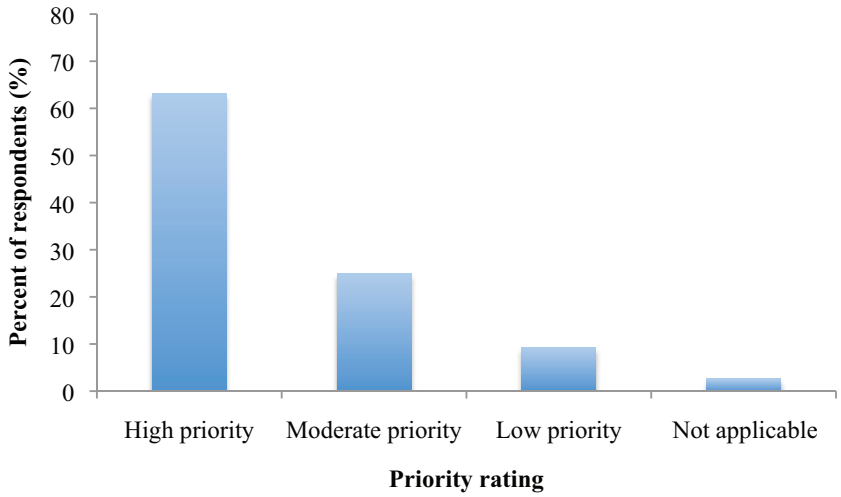

Figure A.7. Priority rating of research on weed management by Western region organic farmers in 2015.

There was substantial interest in the role crop and livestock rotation management could play in weed control. Survey respondents reported the need for research on:

- Using animals to manage weeds, disease and pests and the effect animals might have on these types of management.
- Rotation strategies to decrease annual weed pressure.
- Rotation/tillage strategies or organic approved materials to eliminate bind weed.
- Weed tillage to benefit soil. Reducing the cost of weed control.

Water and Drought Management

As of January 2016, California has been in drought for over four years. Other areas of the arid West also struggle with having a reliable water supply for agriculture. One farmer stated, "Drought conditions, increased temperatures, long 'over 90 degree' heat waves, and the cost/time involved in mitigation has me concerned that I can no longer do this cost effectively." The topic of water management, irrigation, and drought was rated a high priority by 56% of Western region farmers (Figure A.8).

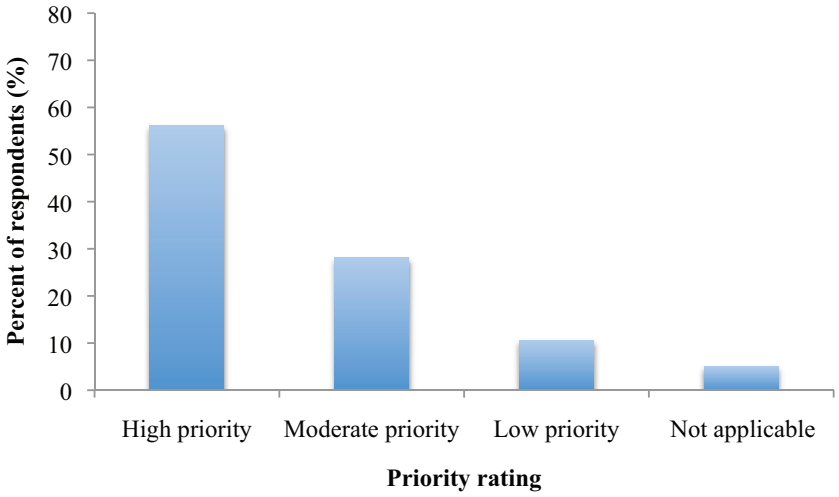

Figure A.8. Priority rating of research on the drought by Western region organic farmers in 2015

Many growers, especially those in California, listed the impact of the drought as their biggest production challenge. Growers also expressed concern about weather fluctuations and unpredictability caused by climate change.

"Weather, particularly drought issues are our most pressing concern. However, three years ago we were faced with the issues associated with drowning rain and lack of sunshine. We seem to be swinging between extremes annually. This June our weather was a 1 in 400 year drought." Survey respondents reported the need for research on:

- Tracking water quantity, increasing soil water retention, water storage grant funding, and design for drought resistance.
- Coping with high salinity soils due to drought.
- Absorption and soil moisture maintenance.
- The impact of drought on pasture management (both soil and grass health).
- Increasing compost to reduce water use.
- The correct timing and type of irrigation (drip versus sprinkler) to reduce water use.
- Drought and pasture management.
- The effects of drought on soil and grass health.

Insect and Pest Management

Research on insect management was identified as a high priority by 56.3% of respondents (Figure A.9). Specific insect pests identified in the survey included bagrada bug (*Bagrada hilaris)*, vine mealybug (*Planococcus ficus)*, lygus bug (*Lygus Hesperus)*, codling moth (*Cydia pomonella)*, peach twig borer (*Anarsia lineatella)*, wooly aphids (subfamily: Eriosomatinae), black cherry aphid (*Myzus cerasi*), cherry fruit fly (*Rhagoletis indifferens* Curran), filbertworms (*Cydia latiferreana*), olive fruit fly (*Bactrocera oleae)*, aphids, wireworms, spotted wing drosophila (*Drosophila suzukii*) (Figure A.10), and alfalfa weevil (*Hypera postica* Gyllenhal).

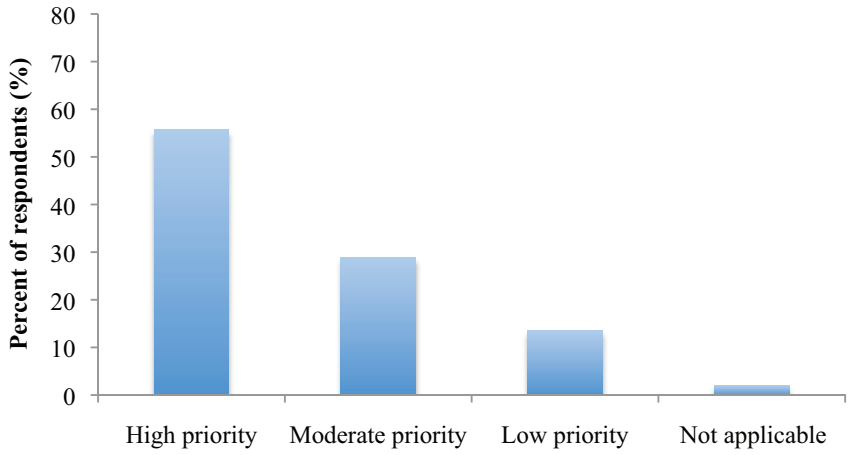

Figure A.9. Priority rating of research on insect management by Western region organic farmers

New Pests of Interest

Survey participants listed management challenges with several new pests of interest that have recently become invasive in Western region states. There is a special need for research on these pests. Below are a few examples that were listed in the survey as top pests. A full list of invasive insect pests is available through the UC IPM Program at: http://www.ipm.ucdavis.edu/EXOTIC/.

The Asian citrus psyllid (*Diaphorina citri)*- Since 2008, the Asian citrus psyllid has been present in California, and there is concern that it will spread to other Western region states. The Asian citrus psyllid can ultimately kill citrus trees by infecting the tree with toxic bacteria.

Figure A.10. Spotted wing drosophila (Drosophila suzukii) (Photo: Matt Huffington).

Polyphagous shot hole borer (*Euwallacea sp.)* – This is a type of ambrosia beetle that has been prevalent in Southern California since 2010. It attacks over 200 tree species and can cause severe damage by infecting them with *Fusarium* fungus.

Bagrada bug - The bagrada bug was found in June 2008 in southern California, and it has now become a major problem throughout southern California and southern Arizona. Bagrada bug is a pest of crop plants in the *Brassicaceae (Cruciferae*), which includes important foods like cabbage, kale, turnip, cauliflower, mustard, broccoli, and radish.

Survey respondents reported the need for research on:

- Effective controls to supplement current organic pest control products to avoid resistance.
- Citrus and wine grape insect control.
- Natural enemy introduction.
- Influence of changing climate on insect pests.
- Crop management to encourage beneficial insects.
- The use of organic insecticides.

Other Pests

Respondents reported problems with symphylans, voles, gophers, moles, squirrels, frogs and birds.

Disease Management

Figure A.11. Coryneum blight (pathogen Wilsonmyces carpophilus) on the leaves and stems of orchard trees (Photo: Victor M. Vicente Selves).

Research on disease management was identified as a high priority by 52% of respondents (Figure A.12). Several diseases were identified as a concern for Western region organic growers, including fusarium wilt (*Fusarium oxysporum*), charcoal rot (*Macrophomina phaseolina*), curly top virus, downy mildew (example: *Peronospora farinosa*), powdery mildew (example: *Podosphaera xanthii)*, Pierce's disease (*Xylella fastidiosa)*, verticillium wilt (*Verticillium spp.),* phytophthora (*Phytophthora spp.),* fireblight (*Erwinia amylovora)*, coryneum blight aka shothole blight (*Wilsonmyces carpophilus)* (Figure A.11), *Pseudomanas syringae*, peach brown rot (*Monilinia fructicola)*, and botryosphaeria canker (*Botryosphaeria spp.)*.

Specific disease issues noted in the survey include:

- Soil disease and nematode control.
- Plant breeding for disease resistance.
- Disease resistant rootstocks for avocado, citrus, and grapes.
- Disease control research for peaches, basil, tomatoes, grapes, and kiwis.

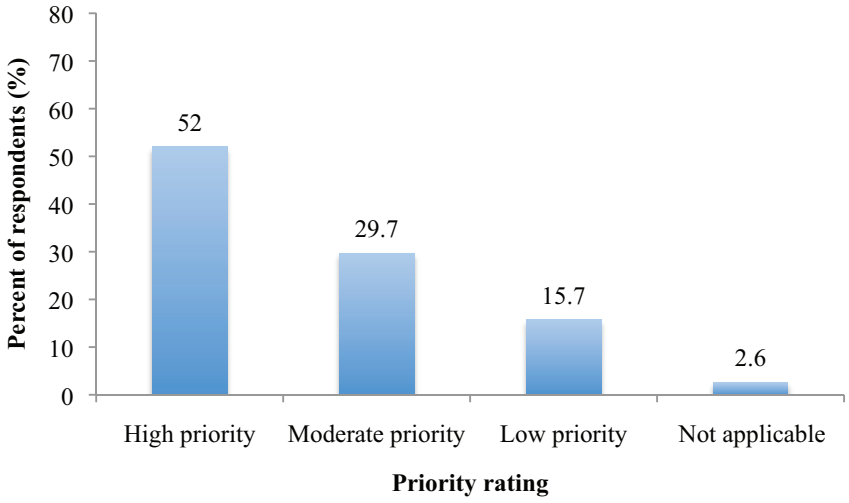

Figure A.12. Priority rating of research on the disease management by Western region organic farmers in 2015

Animal Agriculture

Survey respondents noted several areas related to animal health and production for additional research. Food safety and the new requirements of the Food Safety Modernization Act are a topic of concern for many growers.

> "We have been USDA certified now for three years and have had to fight to maintain our livestock on the farm each year. We have decided to quit growing leafy greens and other crops that keep hitting the news with food scares. We have been able to maintain our tree crops as food safety certified because these crops do not come into contact with the ground. The food safety regulations are totally against integrated crop-livestock operations, which have so much potential to stabilize farm income and provide a great agronomic program as well."
>
> – Western region respondent

Survey respondents reported the need for research on:

- The causes of food poisoning related to processing, handling and packaging on an industrial scale.
- How to reduce or eradicate plant species that the cattle cannot eat.
- How to get the best marbled meat through genetics.
- What is the most efficient and, cost-effective way to get the most out of our pasture while keeping it healthy and productive?
- An effective way to discourage flies on the cattle's face.
- Protection against pathogens such as *E. coli*, *listeria*, for grazing animals.
- Research on integrated crop-livestock farming in arid climates, examining both economics and agronomics.
- Comparisons of USA beef and imported beef.
- Information on the nutritional benefits of grass-fed organic beef.

Conclusions and Recommendations

Survey and listening session participants raised the need for research on broad-scale questions, such as the difference between organic and conventional production in terms of the impacts on water quality, biodiversity, and ecosystem health. Based on the responses, more research and education should be focused on:

- Providing beginning and transitioning farmers and ranchers the tools, knowledge, and ongoing mentoring to be successful organic producers.
- Prioritizing water management in drought conditions for Western region growers. Research on water efficiency technologies and innovations for drought management are of high priority for organic farming.

- Continuing long-term research on soil health focused on nutrient and water management.
  - Current research shows that organic soils with higher soil organic matter can increase the sequestration of carbon in the soils. Additional research needs to improve production practices that can increase sequestration levels. This increase can lead to increases in soil organic matter levels and economic benefit to the producer through carbon credits.
- Controlling weeds. Weed control continues to be an area where research can benefit more sustainable weed control practices, especially for resistance and invasive weeds. Efficacy of organic products will also benefit the farmers as they select efficient and cost-effective products. Tillage and plant and animal rotations are of special interest.
- Managing disease and pest problems is of high importance. In addition to general research on specific insect controls, continued efforts in breeding crops specific for organic production and management of these issues will increase productivity and economic viability of organic producers.
- Researching challenges involved with animal agriculture in the Western region. The Western region is a major producer of milk products and organic livestock and poultry. To increase the availability of these products to the market place, significant increases in research and extension efforts need to be provided for all aspects of animal production, especially information for rotational and grass fed animals.

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APPENDIX B: NORTHEAST REGION

Recommendations for Future Research in the Northeast Region

- Increased research on different tillage techniques and the impact on soil health and weed control.
- Increased research on the soil health and fertility impacts of integrating animals with field crops.
- Increased research on cover crops (different varieties) for erosion control and fertility management.
- Increased research on the nutritional benefits of organic food.
- Increased research on pollinator health and providing native pollinator habitat.
- Increased research on managing weed, disease, and animal health challenges during wet years.

Respondent Characteristics

The Northeast region includes Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Washington, D.C., and West Virginia (see green region on map; Figure B.1).

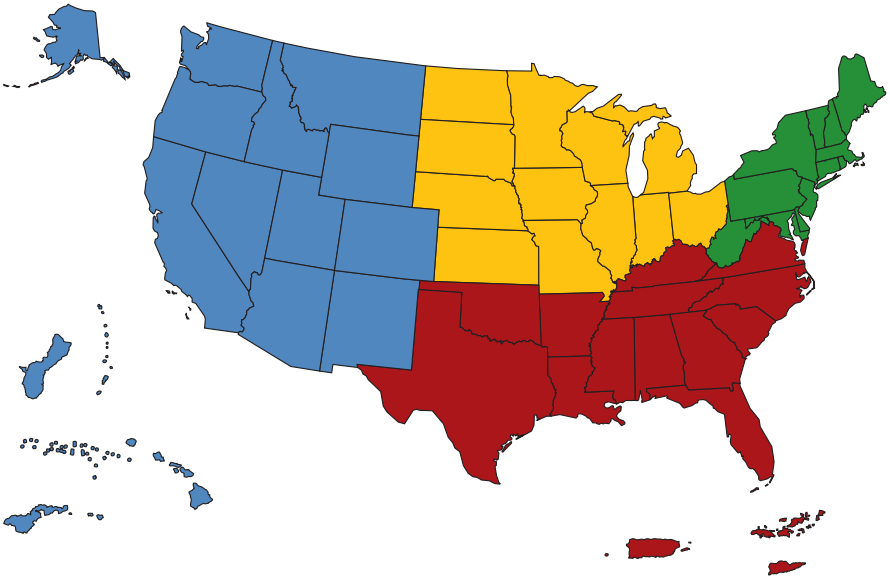

Figure B.1. Northeast region in green (SARE, 2016).

The Organic Farming Research Foundation (OFRF) distributed a nationwide survey to organic farmers asking about their research needs. One hundred and thirty-six complete responses came from the Northeastern region, and there were also 60 partially completed surveys that were used in this analysis.

Northeast region survey participants are farmers with diverse production systems, farming backgrounds, educations, ages, and income levels.

Organic Farming

Ninety-eight percent of respondents had certified organic acres, and 14.4% of respondents had mixed farms with both organic and conventional production. Thirty-seven percent of northeastern farmers transitioned to organic farming from conventional farming practices, and 60.4% began farming using organic practices. Of the certified farmers in the Northeast, the most common certifiers in order are Maine Organic Farmers and Gardeners Association (MOFGA), Pennsylvania Certifies Organic (PCO), NOFA New York and NOFA Vermont, New Hampshire Department of Agriculture, and Global Organic Alliance (Figure B.2).

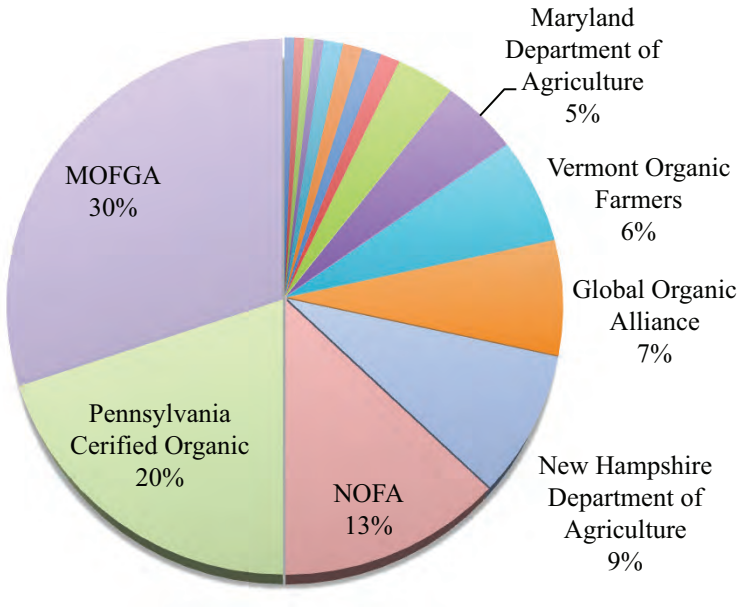

Figure B.2. Certifying agencies for the northeastern farmer survey participants (N=196).

Type of Farm Products

Northeastern farmer survey participants grew a wide range of crops. The most common type of crop produced was vegetables, with 67% of respondents growing vegetables (Figure B.3). In addition to the crops listed in Figure B.3, Northeast region farmers reported growing nuts, gourds, maple trees and syrup, seeds, garlic and ginger.

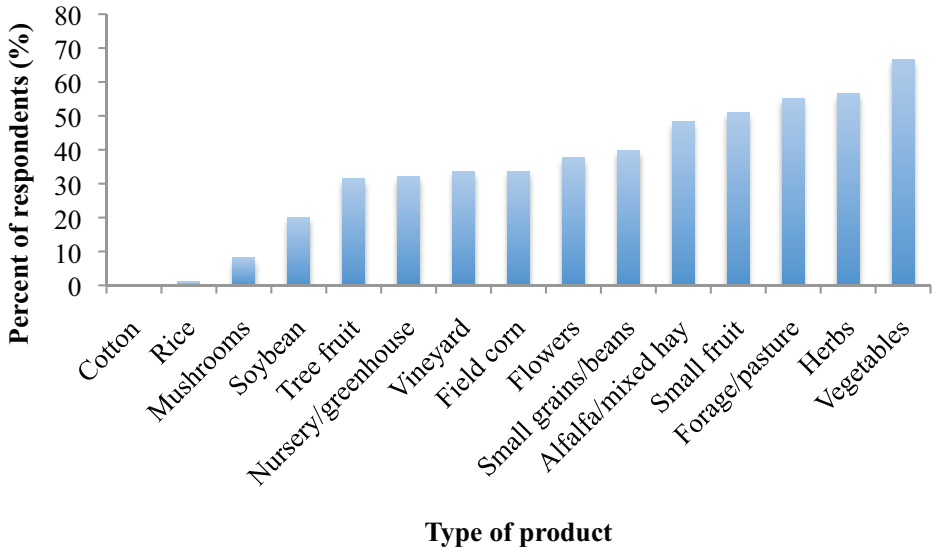

Figure B.3. Plant based products produced by surveyed farmers in the Northeast.

Type of Animal Products

75.8 % of respondents produced animal products. The most common animal product produced was eggs, but the surveyed respondents produced many different animal products including dairy, beef, and poultry (Figure B.4).

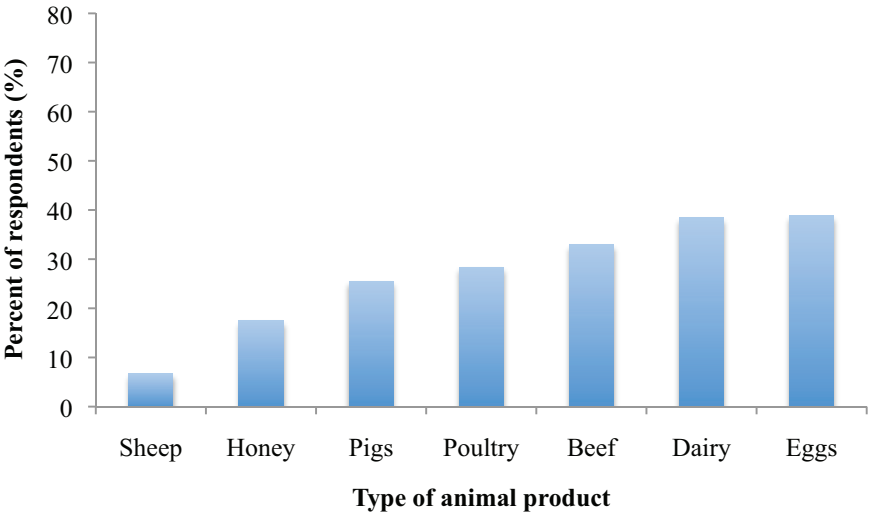

Figure B.4. Animal products produced by surveyed farmers in the Northeastern region.

Farming Experience

Surveyed farmers have been farming from one to 60 years, with the largest percent (17.6%) farming for 1-5 years and the fewest number of farmers having farmed for more than 45 years (Figure B.5). Many farmers started farming organically, yet the majority (54.7%) report transitioning to organic.

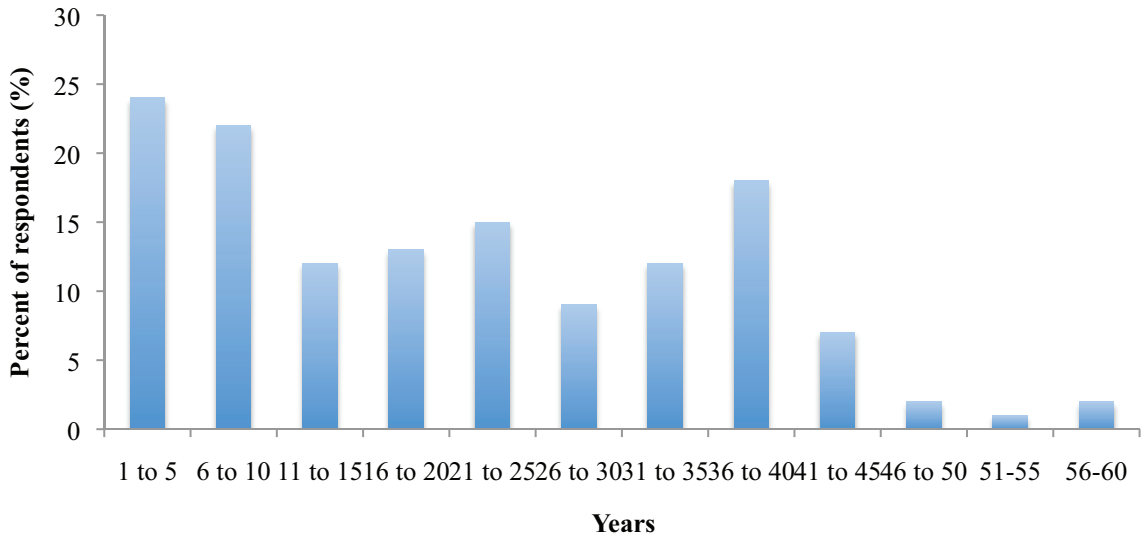

Figure B.5. Number of years survey respondents reported farming.

Demographic Information

Of the Northeastern respondents, 68.2% were male and 31.8% were female. Participating farmers ranged in age from 23 to 79. The average age of northeastern farmers in the survey was 53.7 years (N=150). It was most common for the respondents to have completed a 4-year educational degree (37%), yet many participants also had master's degrees (18%). 13% of participants did not go on to pursue higher education after college, and 14% completed some college.

Farm Economics

Northeastern farmers who took the survey vary in the size, value, and income coming from their farming operations. It was most common for respondents to rely on farm production for 76-100% of their net income, yet other farmers had diversified incomes and jobs other than farming (Figure B.6). Half of the farmer participants had farms where a household member worked off-farm for more than 20 hours a week.

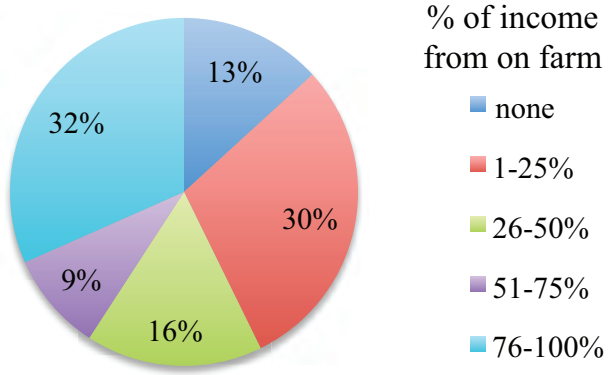

Figure B.6. Percent of income from farm production.

Gross income from farming ranged from no income or a loss, to over $5M for northeastern survey respondents. It was most common for respondents to earn between $100,000 and $249,999, yet there was great variability in income (Figure B.7).

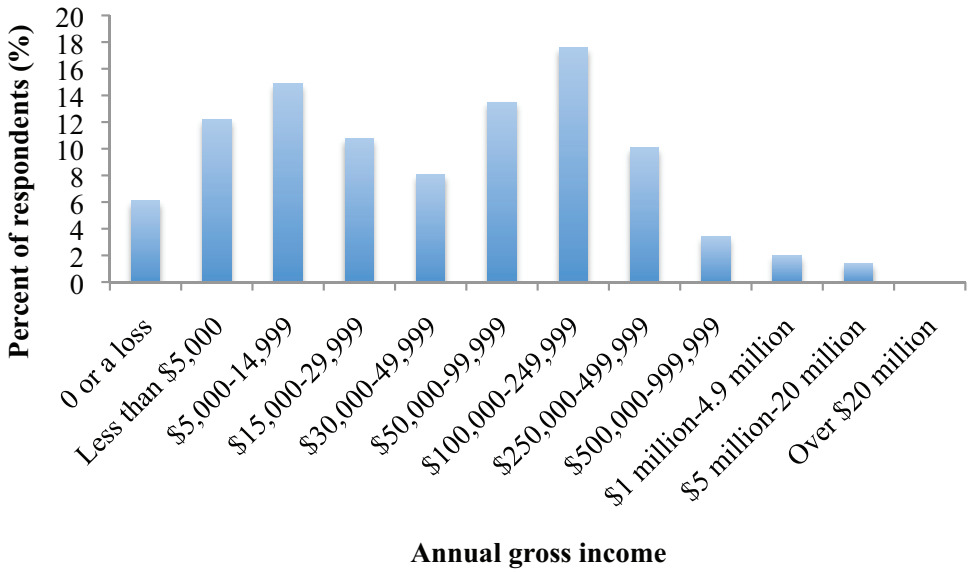

Figure B.7. Annual gross income for survey respondents in the Northeast regions.

Top Research Priorities

For the Northeast region, the highest priority identified for research was soil health, quality, and nutrient management, which was rated as a high priority by 74.4% of respondents. The top ten research priorities in order of importance include: 1) soil health, quality, and nutrient management; 2) fertility management; 3) weed management; 4) nutritional quality and health benefits of organic food 5) pollinator health; 6) soil conservation and restoration; 7) disease management; 8) insect management; 9) breeding crops and animals; and 10) cover cropping and green manure (Figure B.8).

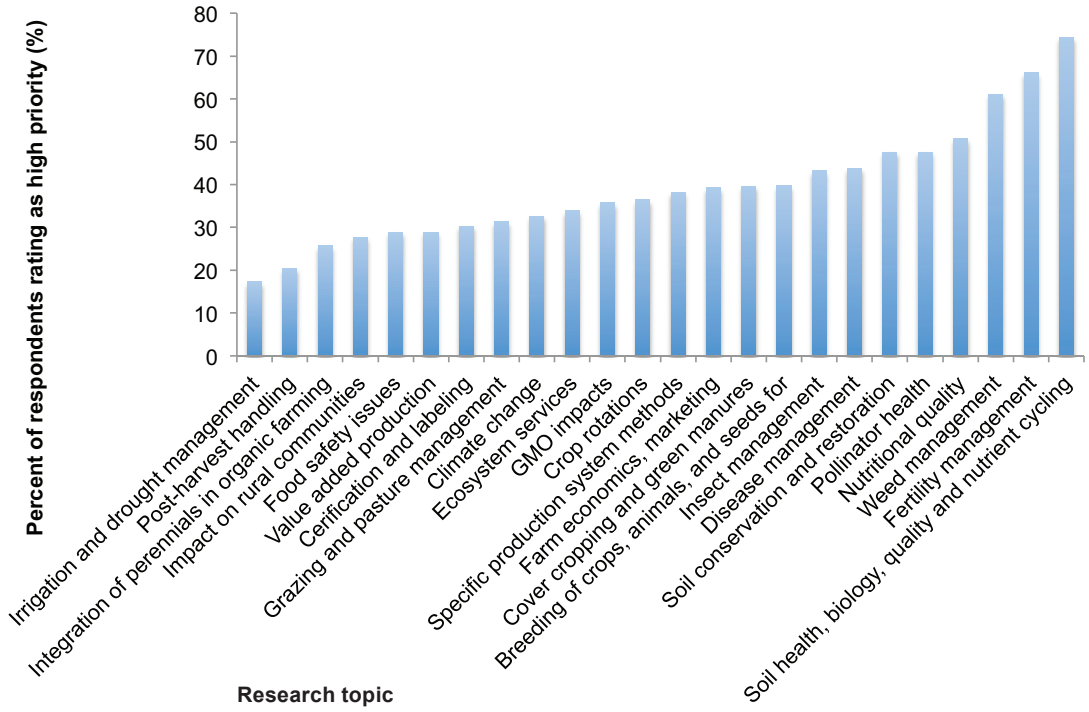

Figure B.8. Research priorities of surveyed farmers in the Northeastern region.

Northeastern growers were asked to list their top production challenge. Several themes emerged including: weed management, coping with variable weather, lack of time, economic pressures, aging, soil health, balancing cover crops with economics, finding enough forage, sourcing labor, large pests (groundhogs and deer), and livestock health. One farmer stated that their most pressing challenges are, "labor, cost of labor, and not being able to pay farm crew fair/livable wages that they deserve for the physically demanding work." A common theme in the responses was the challenge of weed and pest control. One farmer explained their challenges as the "accumulation of weeds, insects and disease. Each year I have more volume of each and more variety of each. These three issues make farming more difficult each year." The economic challenges of being a small organic farmer were expressed by many farmers. One farmer stated their challenge is "balancing monetary needs with soil health needs. I should have half of my organic land in cover crop right now but financially I can't afford it, I need land to be in crop production to pay all of my overhead and labor costs." Another farmer expressed the pressure wielded by the structure of the food system, and stated that the "biggest threat we face is the gobbling up of smaller producers by big producers. Pressures of regulation, created by the pressure of large food corporations on legislators, cripple smaller producers."

Soil Health, Biology and Quality

Of the farmers surveyed in the Northeast, 74.4% rated soil health, biology, and quality as a high priority for organic farming research, making it the most commonly rated high priority research topic (Figure B.9). 18.5% of respondents rated it as a moderate priority, showing that it is a major priority for the vast majority of farmers in the survey. In an open-ended question on soil health research needs, many farmers commented on the specific needs of their farms. One farmer stated the need for "more accessible information on proper soil management and what is being done in our region would be helpful. A stronger network of farmers and shared information on best practices."

Common comments include a need for more research on:

- The interaction between soil health and weed management.
- Nutrient cycling details as it relates to specific crop rotation patterns.
- Using livestock and grazing as a way to increase soil, livestock and human health.
- How best to manage and balance nutrients when using compost, cover crops, and a very diverse rotation.
- Keeping healthy soils through minimized tillage.
- Developing beneficial soil microbes and mycorrhyzae.
- Soil building and nutrient management.
- The effect of compost, cover crops, and diverse rotations on soil health.
- How organic farming can contribute to carbon sequestration.
- Soil health and nutrient cycling related to weed control, livestock forage and hay production.

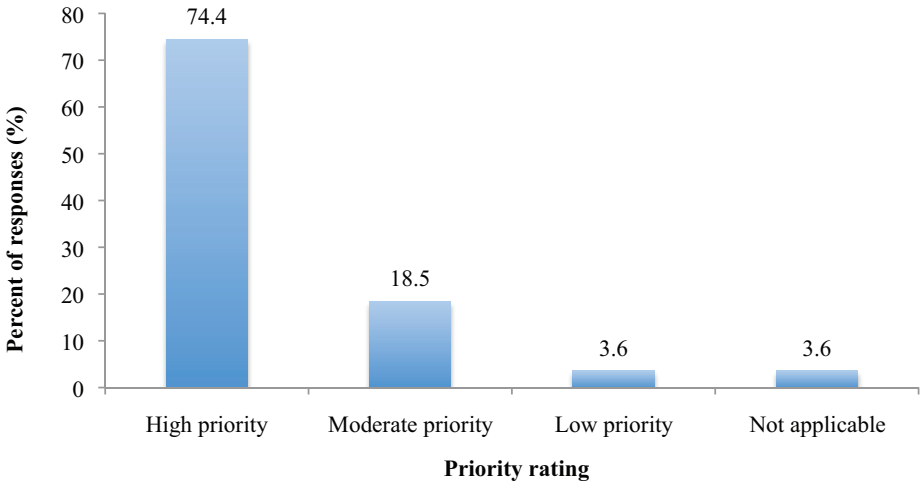

Figure B.9. Priority rating of soil health research.

Fertility Management

The majority of respondents rated fertility management as a high priority (66.1%), with many rating it as a moderate priority (28.1%) (Figure B.10). One farmer stated, "I'm interested in how fertility connects with weed, pest, and disease management and whether it's possible to build fertility to grow disease and pest resistant crops. Also, how fertility management relates to weed pressure."

Specific research needs stated by farmers in the Northeast region include:

- How the soil fertility balance relates to weed growth, specifically wild mustard.
- Apple and chestnut fertility needs.
- Soil building and fertility improvements for increased yields and carrying capacity.

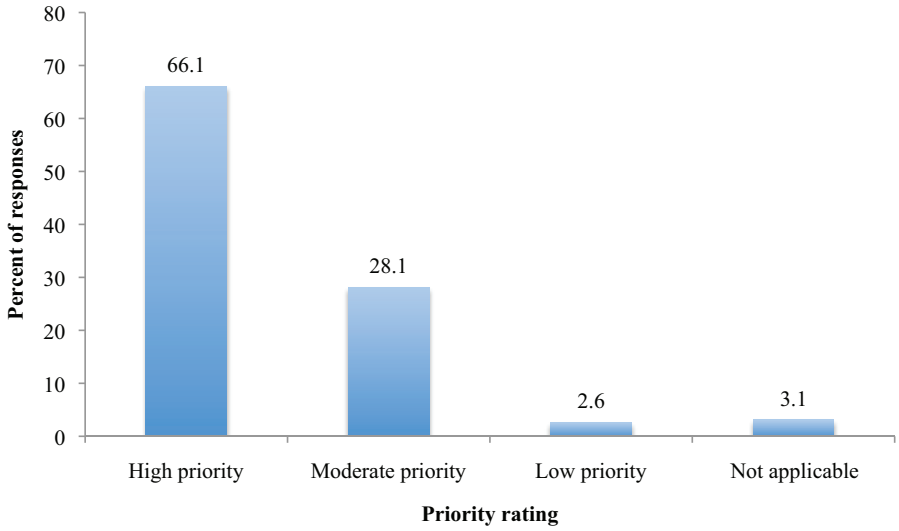

Figure B.10. Priority rating of fertility management research.

Weed Management

Over 60% of Northeastern growers listed weed management as a high priority, and many commented that weeds are a major challenge (Figure B.12). One grower stated, "Weeds are the number one problem to being a successful organic grower." Respondents were commonly interested in research on the following topics:

- No-till weed control.
- Organically approved herbicides.
- Rotations for weed control.
- How to prevent weeds from overtaking early stage corn.
- How fertility connects with weed management.
- Effective and economic weed control.
- Weed management techniques during wet years.
- Weed management in orchards.

Farmers also reported specific weeds being challenging in the Northeast region, including: Canada thistle (*Cirsium arvense*), jimson weed (*Datura stramonium*) (Figure B.11), annual grasses and field bindweed (*Convolvulus arvensis*).

Figure B.11, Jimson weed (Durata stramonium; Photo by Betty Marose, University of Maryland Extension, 2016).

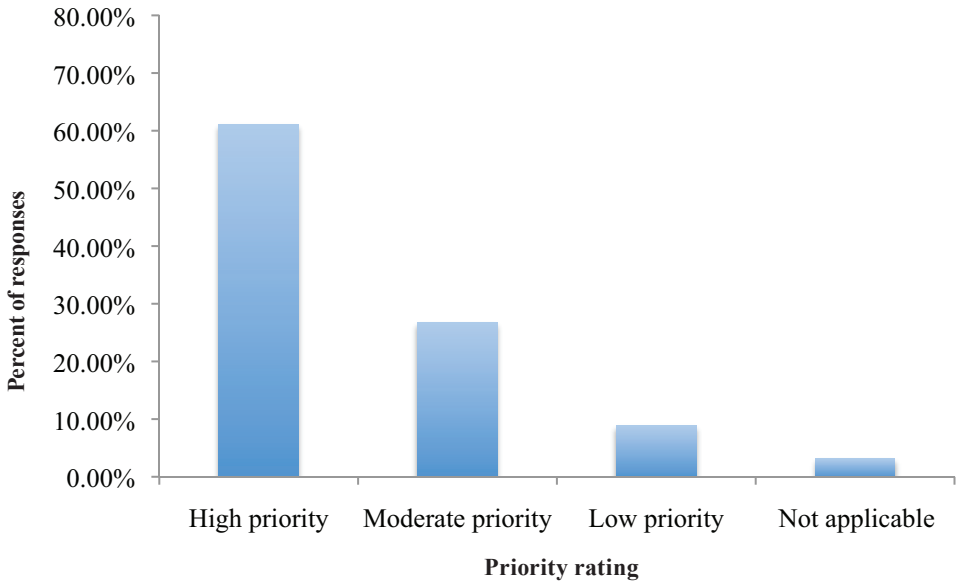

Figure B.12. Priority rating of weed management research.

Nutritional Quality of Organic Food

The majority of Northeastern region respondents rated nutritional quality, health benefits, and integrity of organic food as a high priority (Figure B.13). One farmer stated, "Consumers are largely unwilling to pay the appropriate prices for certified organic produce that reflect the higher costs of production." To increase consumer knowledge and demand for organic food, farmers expressed interested in the following research topics:

- Distinguishing nutritional variance between new and heirloom varieties.
- How consumers view organic and non-GMO. How consumers see the relationship between the two and what farmers can do with labeling to get them to look for organic.
- Meeting animal welfare guidelines.
- Vitality and storage quality comparisons between conventional, organic and biodynamic food.
- Scientific findings on the value of organic food over conventional.

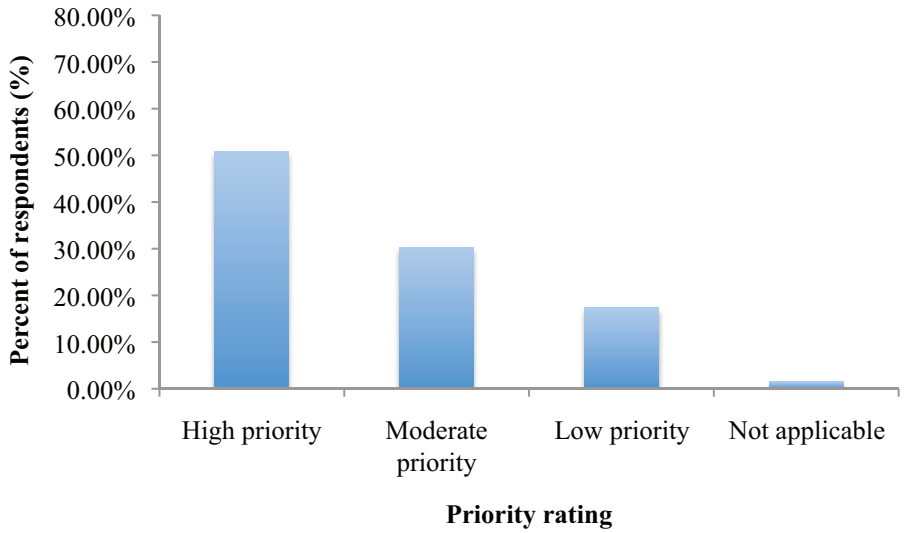

Figure B.13. Priority rating of nutritional quality of organic food research.

Pollinator Health

Pollinator health was rated as a high priority for 48% of Northeastern respondents (Figure B.14). With bee health a major topic of environmental concern, it is expected that farmers who rely on pollinators for the success of their crops desire research on how to improve pollinator health. Northeastern farmers expressed the need for more research on wild pollinator mortality in greenhouses and which native plant species are best for aiding pollinators. Northeastern farmers also noted the need for organic open-pollinated crop seeds and seeds for organic, native flowering plants.

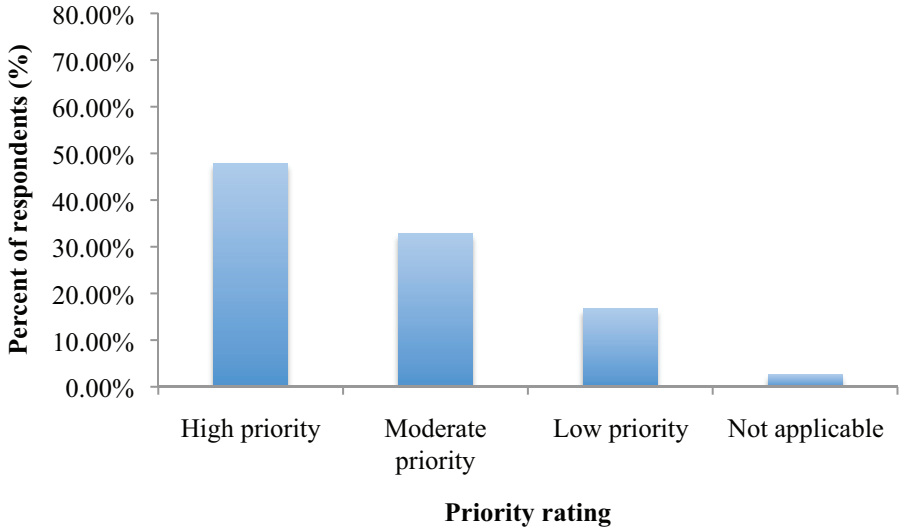

Figure B.14. Priority rating of pollinator health research.

Soil Conservation and Restoration

Most respondents rated soil conservation and restoration as an important area of organic research. Forty-eight percent of respondents rated this topic a high priority (Figure B.15). Particular issues of interest include:

- Using perennial crops/pasture and no-till for soil health and conservation.
- Erosion prevention.
- Managing cover crops for soil conservation.

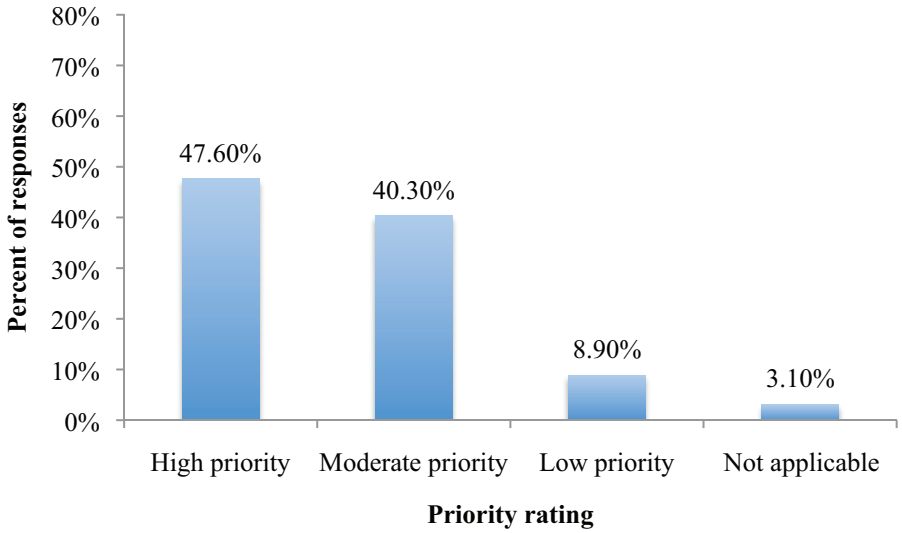

Figure B.15. Priority rating of soil conservation and restoration research.

Disease Management

Plant diseases were reported as a production challenge in the open-ended portion of the survey. Farmers listed the following as topics of interest: soil diseases in high tunnels, potato late blight, livestock diseases, and the need for an effective fungicide other than copper.

Insect Management

Insect management is an important challenge for northeastern growers. Several survey respondents reported managing flies and parasites in cattle as a major obstacle. One farmer stated the need for a computer application to be used in the field for pest and disease identification. Insect pests reported in the survey include mushroom flies, swede midge (*Contarinia nasturtii*), leek moth (*Acrolepiopsis assectella* Zeller), cucumber beetles, squash bugs, spotted wing drosophila (*Drosophila suzukii*), and potato leafhopper (*Empoasca fabae*).

Breeding of Crops, Animals, and Seeds for Organic Production

Over 70% of respondents listed breeding of crops, animals, or seeds as a moderate or high priority. Only 39.7% of respondents listed breeding as a high priority, demonstrating that issues related to soil are more widely applicable and of interest to the northeastern farmers.

Farmers were asked to comment on their specific needs related to breeding. Open-ended responses to the question included the need for fruit varieties with disease and insect resistance, like scab resistant apple, alternative crops suited for the Northeast temperature zone, and developing nitrogen fixing green manures.

Animal Agriculture

With 75% of the surveyed farmers producing animal products like eggs and dairy, many farmers desired research on animal health topics. Farmers expressed interest in research that would lead to better fly and parasite control for livestock. In addition, some farmers expressed their success with dealing with animal production challenges. For example, one northeastern farmer noted that during a wet year they limited the hours of time dairy cows spent on pasture and increased the time spent resting in the barn with plenty of shade and water. As a result, the cows had lower somatic cell counts and had almost no hoof problems.

Conclusions and Recommendations

Surveyed farmers and listening session participants were asked to describe their most pressing production challenge. Several topics emerged as recurrent challenges experienced by many of the Northeast region producers. These challenges are topics for which future research can be prioritized in this region, and include:

- Managing soil health in conjunction with managing pests, weeds and diseases.
- Managing weeds, especially in times of heavy rain.
- Adapting to extreme weather conditions.
- Controlling parasites in livestock.

In addition, recommendations for additional research based on listening sessions in the Northeast, especially the meeting held at the Organic Trade Association Organic Center in Washington, D.C., include:

- Control practices for wireworm and nematodes.
- Marketing/consumer education about organic agriculture as a GMO free production system.
- Weed control/use of perennial crops to reduce weed pressure.
- Economic research on organic production systems.
- Alfalfa as a rotational crop and the impact of GM alfalfa on organic production.
- Technology for the field knowledge, funding, technology.

APPENDIX C: NORTH CENTRAL REGION

Research, Education, and Policy Recommendations in the North Central Region

- Increased research on livestock health.
- Increased research on GMO contamination and prevention.
- Increased research on soil health practices.

Respondent Characteristics

The North Central Region encompasses 12 states: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin (see yellow states in Figure C.1).

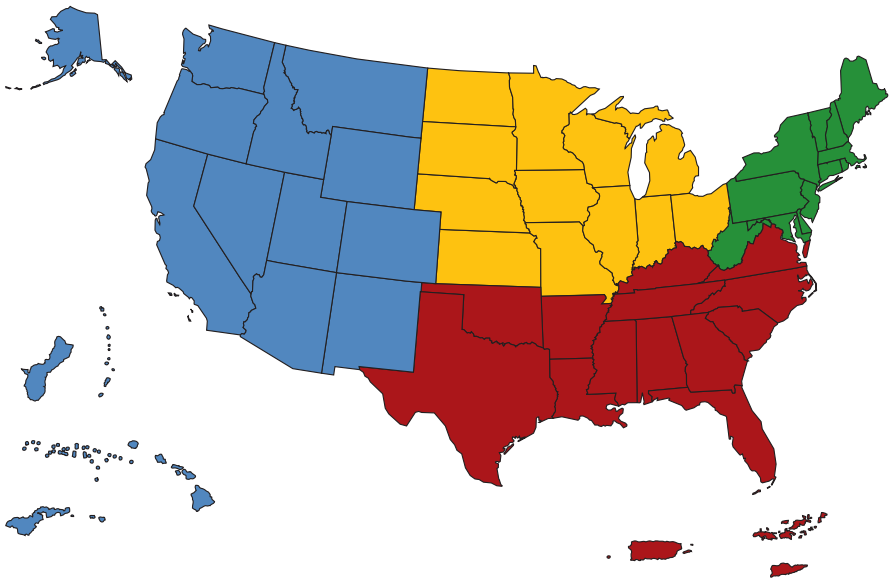

Figure C.1. North Central region in yellow (SARE, 2016).

This regional report is based on 253 complete responses and 68 partially completed surveys from the North Central region.

North Central survey participants are farmers with diverse production systems, farming backgrounds, educations, ages, and income levels.

Farmers in the North Central region had been farming from a range of one to 51 years.

Organic Farming

The size of the farms in the survey ranged from 0.25 acres to over 5,000 acres. Fifty five percent of farmers in the North Central region transitioned to organic farming from conventional farming practices, and 37% began farming using organic practices. Seventy-seven percent of respondents only farmed organically, and 23% had mixed organic and conventional production. Some farmers began farming organically as a gardening project, or bought land already certified organic, and several farmers had land taken out of a conservation reserve program (CRP). Of the certified farmers in the North Central region, the most common certifiers in order are Global Organic Alliance, OCIA, MOSA, and OEFFA (Figure C.2). Because the survey was conducted online, the opinions of the Amish organic dairy farms in the North Central region are not part of this analysis.

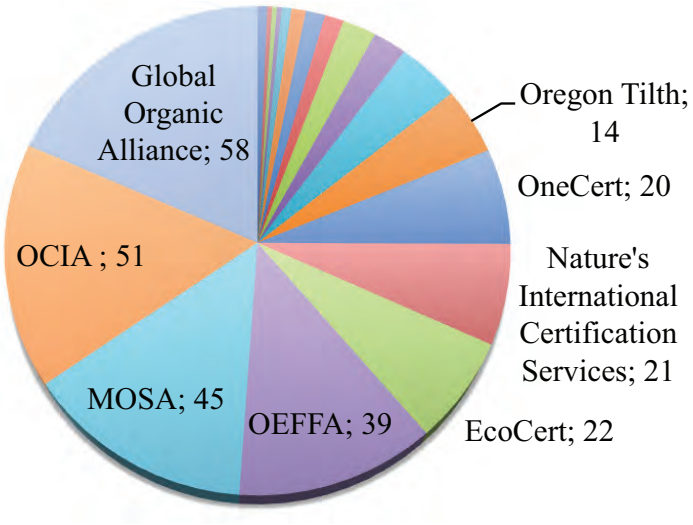

Figure C.2. Top organic certifiers for North Central operations.

Type of Farm Products

North Central farmer survey participants grow a variety of crop and animal products, however production is concentrated on grain, pasture, and livestock. The most common type of crop produced was small grains and beans with 67.5% (Figure C.3). Other common crops grown include alfalfa, field corn, soybean, and forage and pasture. The dominance of these crops distinguishes this region from other regions that grow predominantly fruit and vegetables. The production of corn, soy, and alfalfa crops in the North Central regions puts these growers at increased risk of GMOs, and the survey found that these farmers are more concerned with GMO contamination than farmers from other regions.

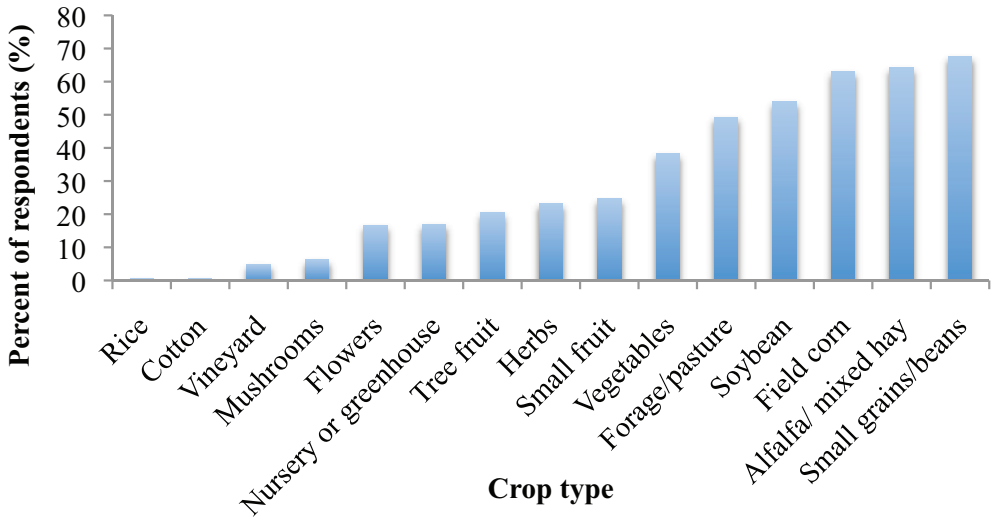

Figure C.3. Crops grown by North Central operations

Of the surveyed farmers, 61% produced animal products. Out of the farmers that do produce animal products, the most common product was beef, followed by eggs and poultry (Figure C.4). The survey identified research questions and needs specific to animal production. One north central participant stated, "Organic livestock nutrition and health practices are important research areas for us, especially identifying and testing effective allowable treatments for when animals are sick (pneumonia, scours and other intestinal problems, milk fever, pinkeye, etc.). It's fine to say organic farmers should use systems that keep animals healthy, but they do get sick and you want to know how to be able to help them right away."

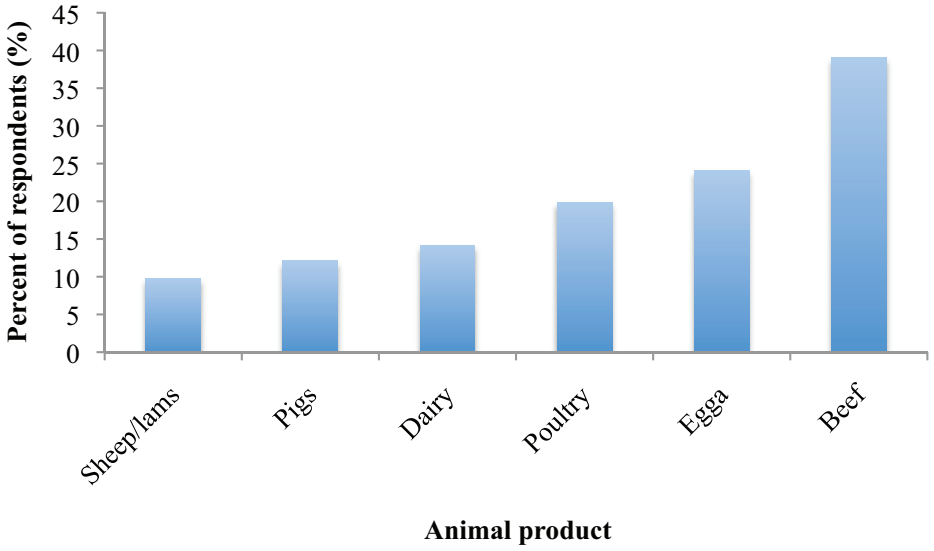

Figure C.4. Animal production by North Central producers.

Top Research Priorities in the North Central Region

Farmers in the North Central region marked many research topics as high priority (Figure C.5). The top five priorities in order of highest number of respondents rating it a high priority are: (1) soil health, biology, and nutrient cycling, (2) weed management, (3) fertility management, (4) nutritional quality and health benefits of organic food, (5) soil conservation. The impact of GMOs, crop rotation, cover cropping, and pollinator health were also all marked as high priorities by 50% or more of the respondents.

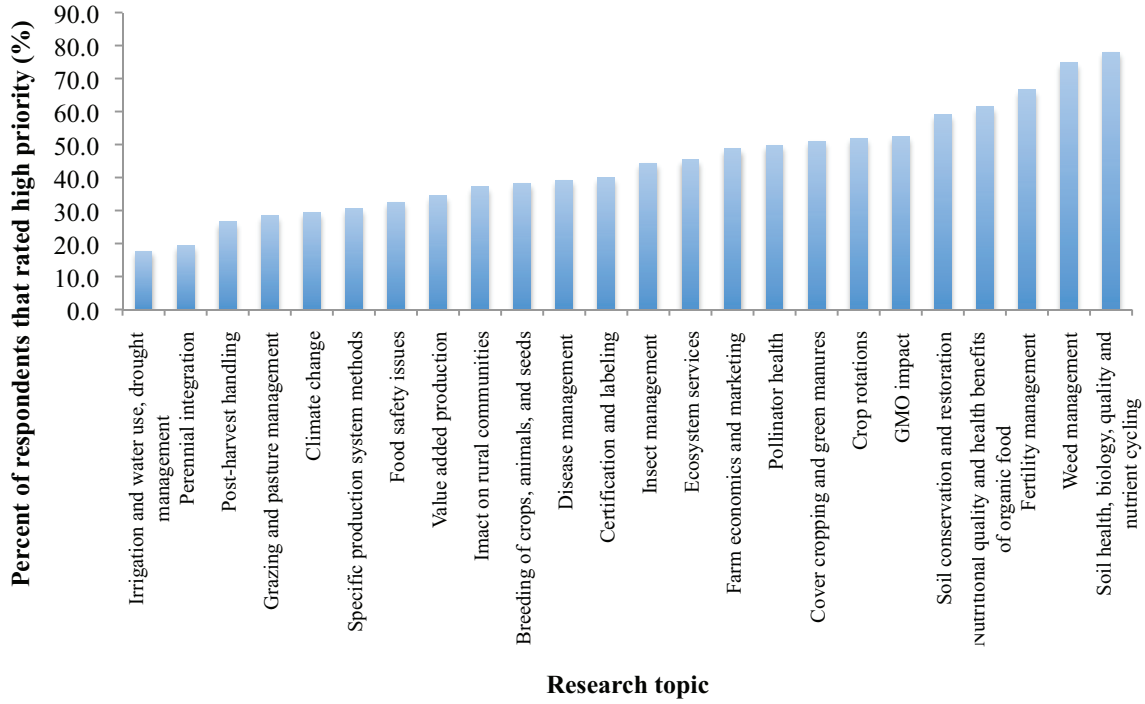

Figure C.5. Top research priorities listed by North Central producers.

Soil Health, Biology, and Nutrient Cycling

Research on soil health was identified as a high priority by 78% of respondents in the North Central region (Figure C.6). Main areas for which farmers requested research were tillage and reduced tillage and soil health, cover crops and soil health, and crop rotations and soil health. Farmers expressed the need for research to answer questions such as:

- "How can cover crops be used to provide fertility requirements in perennial systems where tillage is not used?"
- "How does active soil biology relate to lessening of erosion?"
- "What is the impact of various methods of tillage on soils?"
- "How can I find products and sources I can trust to build my soils at affordable costs?"
- "How does livestock manure affect soil biology?"
- "What are practices to improve soil carbon/ increase soil organic matter, water holding capacity, and biology?"

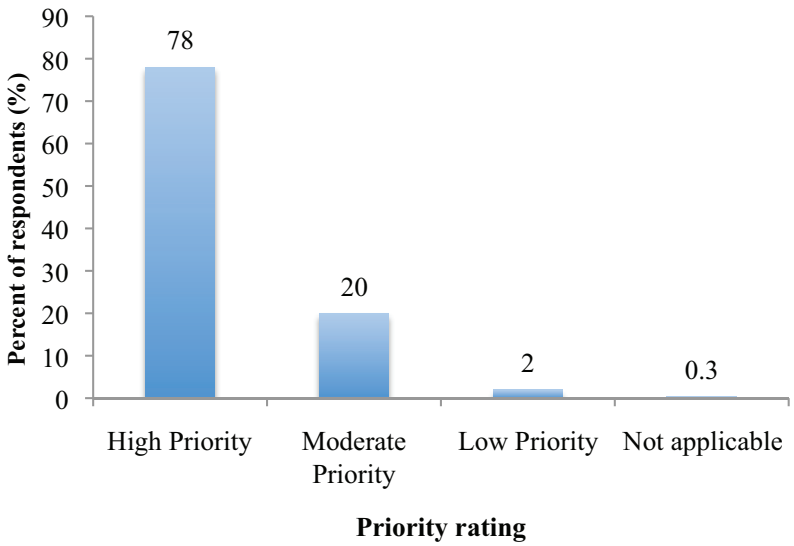

Figure C.6. Priority rating of soil health among farmer respondents.

Weed Management

Weed research is a high priority for 75% of North Central farmer respondents (Figure C.7). North Central farmers identified several problematic weeds in the region, including purslane (*Portulaca oleracea)*, bindweed (*Convolvulus arvensis)*, and giant ragweed (*Ambrosia trifida)*. There was substantial interest in the role crop and livestock rotation management could play into weed control. Farmer comments on specific needs include:

- "Using animals to manage weeds, disease and pests. The effect animals might have on these types of management."
- "Rotation strategies to decrease annual weed pressure."
- "Rotation/tillage strategies or organic approved materials to eliminate bind weed."
- "Using weeds to our benefit - what do they put back into the soil if tilled in?"

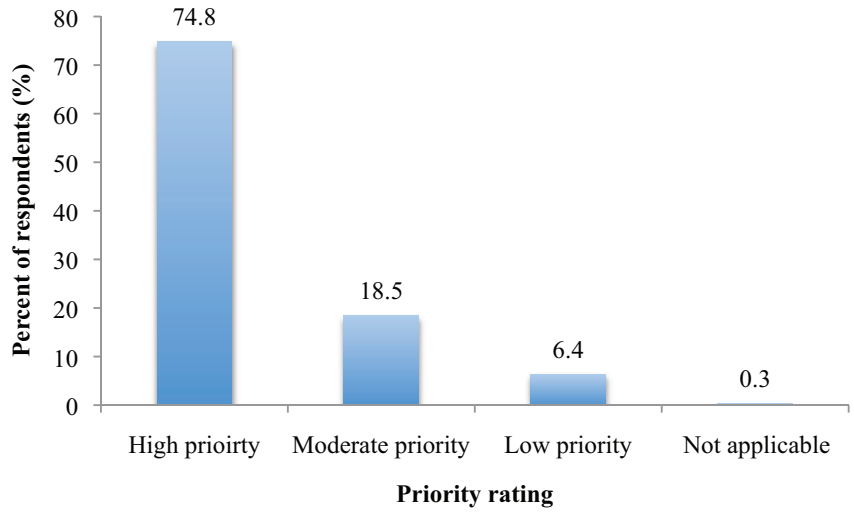

Figure C.7. Priority rating for weed management.

Fertility Management

Fertility management, as part of the larger topic of soil health, was rated as a high priority by 66.6% of respondents (Figure C.8). Survey respondents particularly highlighted the need for research related to fertility management and soil conservation and crop rotations.

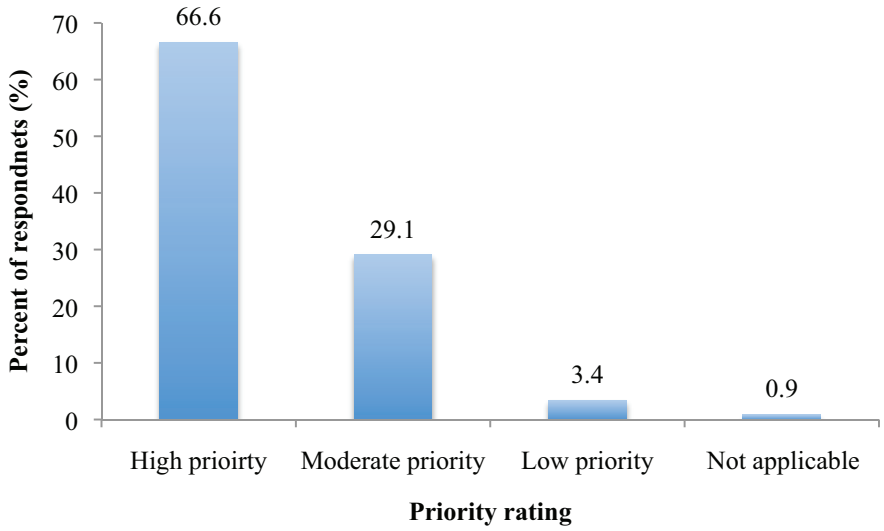

Figure C.8. Priority rating for fertility management.

The respondents listed the following as specific topics of interest:

- Soil fertility balance and natural nitrogen, phosphorous, and potassium sourcing.
- Need research on cost effective ways to maintain or improve soil health and fertility when farmed organically particularly when there is no access to organically improved inputs within a reasonable distance.
- Fertility based on microbial populations as opposed to inputs.
- There are many inputs for fertility with little research to back it up. Much more could be done with this.
- Building and maintaining soil fertility organically without manure.
- Pasture and forage soil fertility topics to support organic dairy and grassfed systems.

Nutritional Quality and Health Benefits of Organic Food

Sixty-two percent of respondents rated nutritional quality and health benefits of organic food as a high priority (Figure C.9).

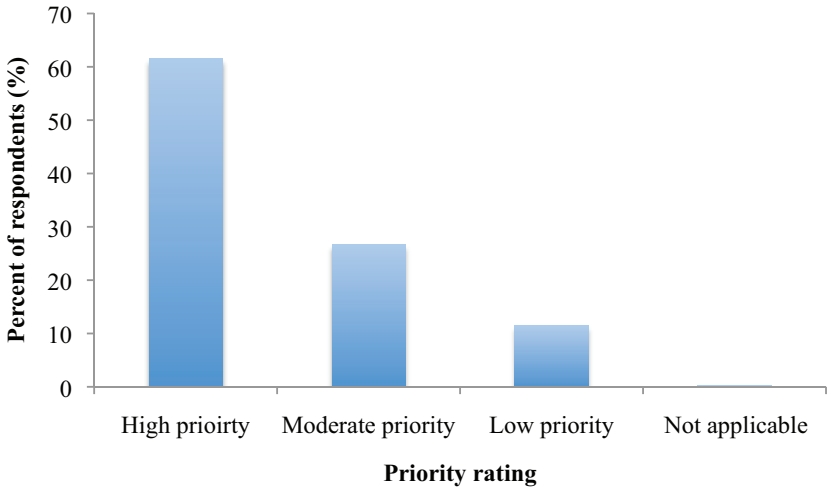

Figure C.9. Priority rating for nutritional quality and benefits of organic food.

North Central farmers stated they were interested in the:

- "Impact of pesticides: drift, health impacts to farmers, consumers, wildlife and livestock."
- "Nutritional information of organic versus conventional food."
- "Consumer perspective on food health and safety."

Impact of GMOs

Research on the impact of GMOs on organic farming was rated as a high priority by 52% of North Central farmer respondents. GMO research is of greater interest to North Central growers than for growers in other regions. One farmer stated, "Organic crop markets are very strong at this time. The issue for me is that I would like to see some sort of common sense policy within USDA that would address the issue of GMO contamination given that I was not able to sell all my entire corn crop into the food grade market this past spring, (2014 crop), due to GMO contamination from my neighbor's farm. It appears that people within USDA consider our loss to be a loss in our premium only. They do not realize that typically the potential of receiving a premium comes at a cost, such as growing specific varieties that yield a little less, more time and money dedicated to weed control, etc." Six percent of farmers (15 farmers) in the region reported having a shipment of product rejected due to GMO contamination. Farmers in the survey report:

- Feeling "uneasiness and concern."
- "Losing production due to sizable buffer strips."
- "We have to plant later to prevent cross pollination. This really hurt us."
- "All my neighbors plant GMO and I am always concerned with cross pollination."
- "We need more published research on the effects and differences of GMO vs. non GMO crops. Also for pollinator health!!"

Cover Crops

Of the North Central farmers surveyed, 47.3% reported regularly using cover crops, demonstrating that this is an important fertility management strategy. Many farmers (51%) reported that research on cover crops is a high priority. One farmer stated the need for "optimal practices in terms of cover crop incorporation (timing and tillage tools)." Another farmer expressed the desire for enhanced educational opportunities on the topic of cover crops, and stated, "I would like to have more discussions, trainings, workshops and specifically EXAMPLES. I would like to visit farms that are doing cover crops and talk to farmers who have tried it."

Pollinator Health

Research on pollinators was rated as a high priority by 50% of North Central farmer respondents. One farmer respondent stated, "Regarding pollinator health, insufficient attention is given to the benefits of legumes that bloom multiple times of year, such as alfalfa and red clover, distributed over multiple farms in a community so that there are always some field in bloom." Another farmer stated that there needs to be more research on pollinator habitat and conservation.

Insect Pests

Respondents rated research on insect pests as less of a priority than weed management, with only 44% of respondents listing insect research as a high priority. However, farmers did list several topics for which they would like more research. These include:

- Types of insects in our area that are harmful and helpful to row crops.
- Fly and parasite management practices and their impact on non-target insects (dung beetles, pollinators, etc.).
- Organic control of diseases and insects in organic fruits in humid eastern U.S.
- Livestock insect management (flies and parasites).

Livestock Research

OFRF held a listening session in La Crosse, Wisconsin at the MOSES Conference in 2015. During this listening session, a group of organic farmer attendees were asked to list their research needs related to livestock management. The needs identified include:

- Veterinary care (costs, preventative practices).
- Impact of grass-based systems on animal disease (long-term study).
- Incidence of lameness on organic farms; causes; nutrition; symptoms; and housing.
- Stockmanship/cattle handling/humane treatment best management practices.
- Breed performance in organic systems (health, pathogens, and parasites).
- Parasite prevention on pastures.
- Poultry breed and ration customization for season/climate, environment.
- Feeds, pasture, and markets.
- Food safety and health implications for outdoor access of poultry.

- Integrated livestock/crop systems (food safety; pest/disease suppression).
- Effective treatment options for poultry diseases and human pathogens.
- Effective alternatives to synthetic methionine.
- More research on probiotics for animal health (efficacy, risks, costs, and benefits).
- Parasite management for hogs and small ruminants.

Conclusions and Recommendations

In the survey, farmers were asked to describe their biggest production challenge. Several topics emerged as recurrent challenges experienced by many of the North Central producers. These challenges are topics for which future research can be prioritized in this region, and include:

- Marketing and profitability.
- Weed management.
- Weather and climate change (excess rain).
- GMO contamination and avoidance.
- Insufficient organic meat processors and USDA meat and poultry inspectors.
- Meeting the Food Safety Modernization Act requirements.

In addition, comments from the listening sessions in the North Central region emphasized the need for additional research on more consumer related research on:

- Food quality as a function of production practices.
- Food waste in organic production chains compared to conventional chains.
- Sociological research on the transition to organic production and data that establishes the economic benefits or organic production.

APPENDIX D: SOUTHERN REGION

Summary of Research Recommendations

Based on the organic farmer survey detailed below, the Organic Farming Research Foundation recommends research in the Southern region that focuses on top priorities, including:

- Management of fertility and soil health.
- Management of problematic insect pests such as stink bugs.
- Control of weed pests like johnson grass *(Sorghum halepense)*.
- Market opportunities and consumer awareness concerning organic food.

Respondent Characteristics

The Southern region encompasses Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, Puerto Rico and the U.S. Virgin Islands. (See red states in Figure D.1).

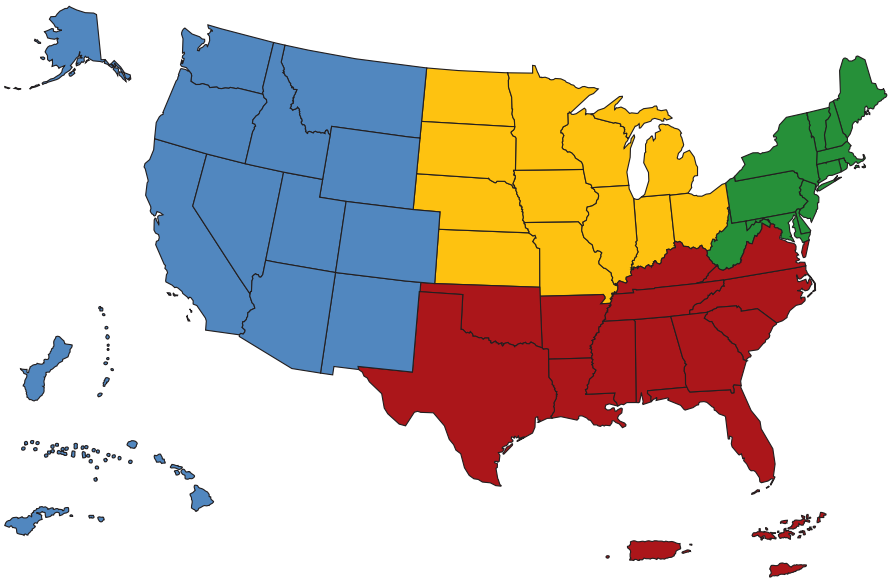

Figure D.1. Southern region is shown in red (SARE, 2016).

This regional report is based on 93 complete responses and 46 partially completed surveys, for a total of 139 participants in the Southern region. Southern survey participants are farmers with diverse production systems, farming backgrounds, educations, ages, and income levels. The length of time farmers in the Southern region have been farming ranged from less than one year to 56 years.

Organic Farming

The size of the farms in the survey ranged from less than one acre to over 57,500 acres. Thirty five percent of southern farmers transitioned to organic farming from conventional farming practices, and 58% began farming using organic practices. Seventy-two percent of respondents only farmed organically, and 27% had mixed organic and conventional production.

Type of Farm Products

Southern region survey participants grew many different crops. The most common type of crop produced was vegetable crops with 67.5% (Figure D.2). Other common crops grown in this region include: herbs, small fruit, nursery crops, and small grains. In addition to the crops listed in Figure D.2, growers in this region grew pecans, tobacco, peanuts, and chia seeds.

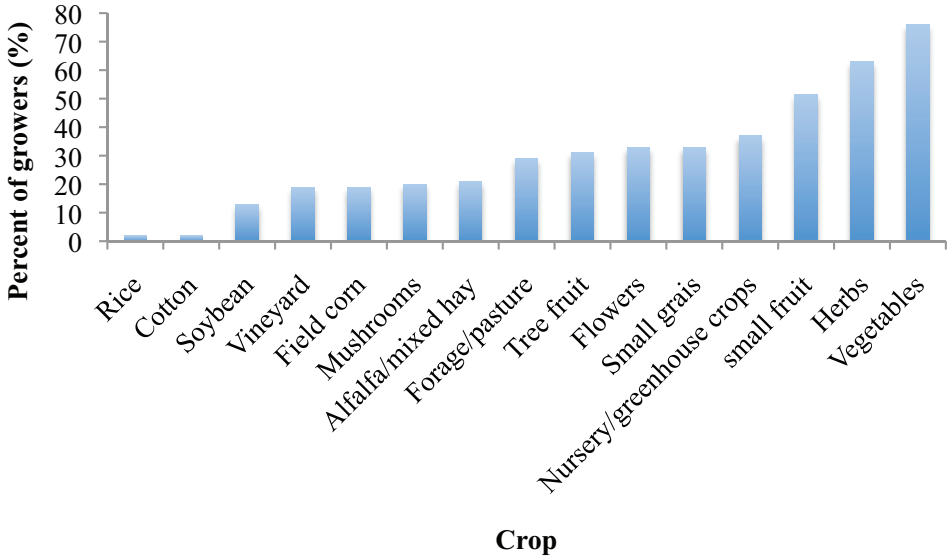

Figure D.2. Percent of Southern region survey participants growing different crops.

Of the surveyed farmers, 45.8% produced animal products (Figure D.3). Out of the farmers that produce animal products, the most common product was eggs, followed by beef and honey. The survey identified research questions and needs specific to animal production in the Southern region. One farmer expressed concern about the Food Safety Modernization Act requirements and another farmer requested research to study using chickens to improve soil health.

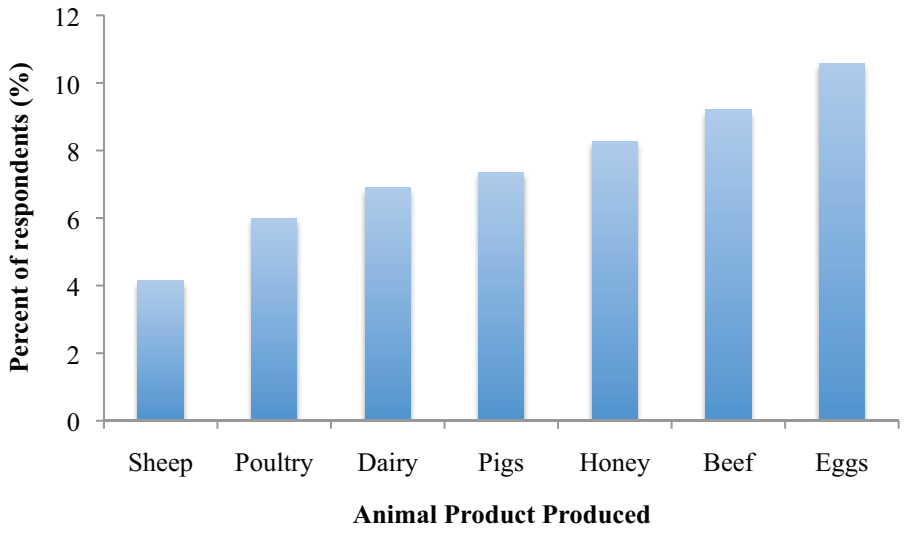

Figure D.3. Animal products produced by surveyed farmers in the Southern region.

Top Research Priorities in the Southern Region

Farmers in the Southern region marked many research topics as high priority (Figure D.4 and D.5). The top five priorities in order of highest number of respondents rating it a high priority are: (1) soil health, biology, and nutrient cycling, (2) weed management, (3) fertility management, (4) nutritional quality and health benefits of organic food, (5) insect management. The impact of GMOs, crop rotation, cover cropping, and pollinator health were also all marked as high priorities by 50% or more of the respondents.

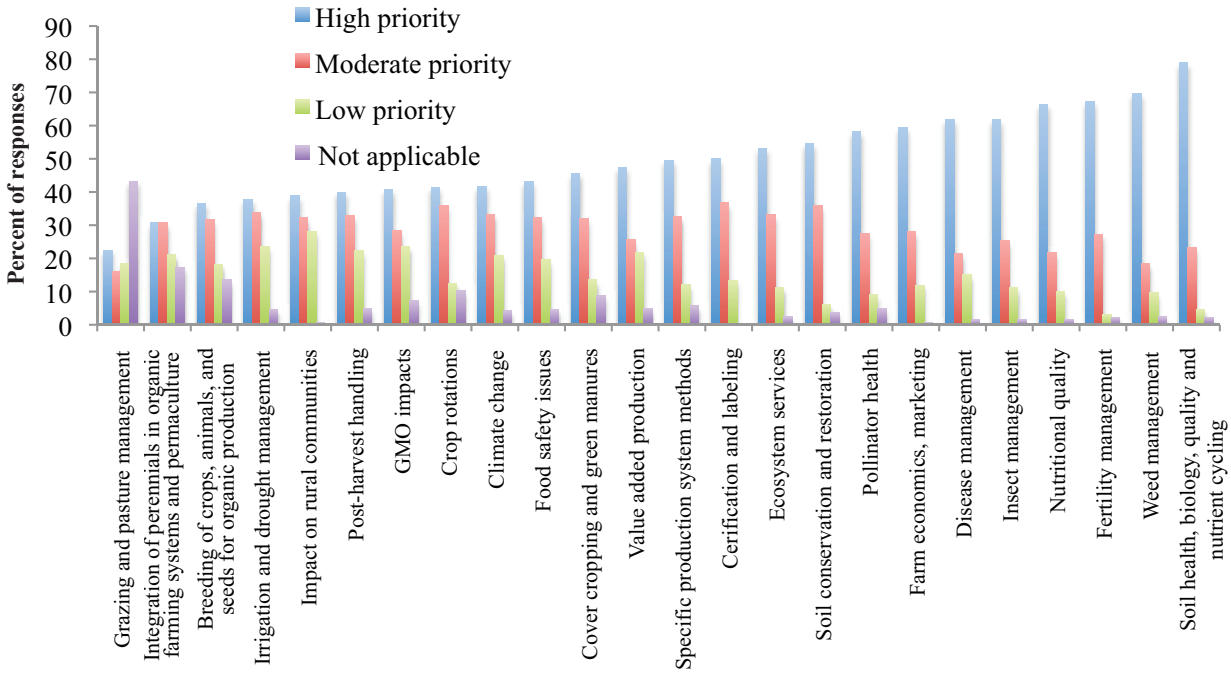

Figure D.4. Priority ratings for all research topics listed in the survey.

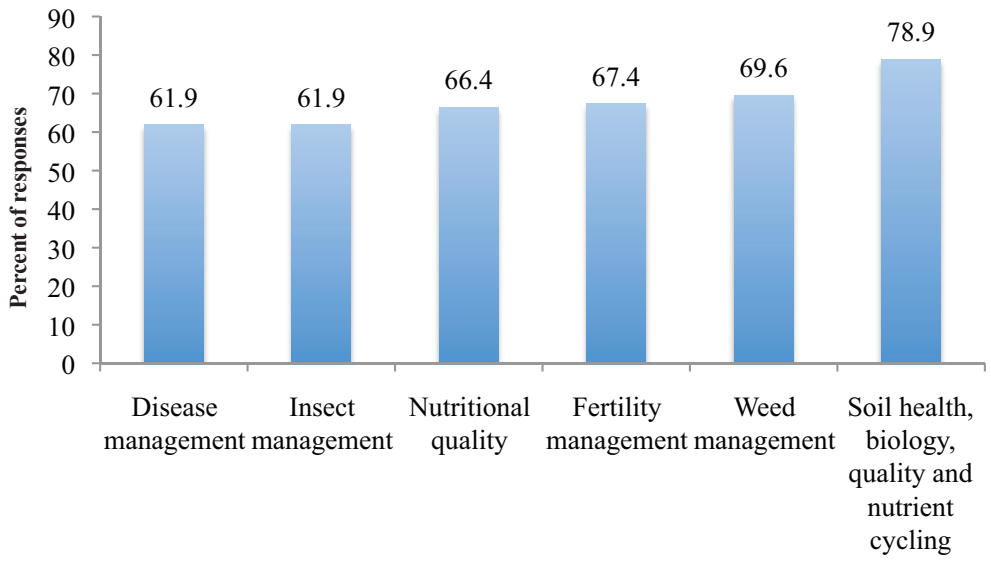

Figure D.5. Top six priorities in the Southern region.

Soil Health, Biology, and Nutrient Cycling

Research on soil health was identified as a high priority by 79% of respondents in the Southern region, making it the topic most commonly marked high priority (Figure D.6). Main areas for which farmers requested research were no-till organic practices, fertility for pest and disease resistance, identifying the soil bacteria and microbial requirements, cover cropping and green manures for improved soil health, and tillage and reduced tillage practices to build soil fertility. One southern farmer stated, "Soil health is the foundation to the organic method. As a new farmer, the more that I can learn about improving the soil, the better my farm results will be." Another farmer stated that their goal is, "achieving adequate fertility levels so that crop yields can approach those of conventional farming." This farmer went on to voice a concern about "the exposure of viruses and bacteria to workers spreading approved manure based soil supplements."

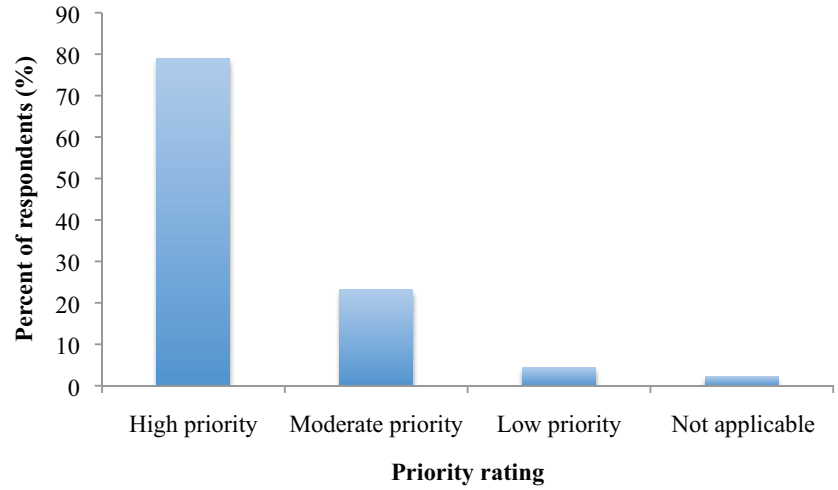

Figure D.6. Priority rating of soil health among farmer respondents.

Weed Management

Weed research is a high priority for 69% of southern farmer respondents (Figure D.9). Southern farmers identified several problematic weeds in the region, including knotgrass (*Paspalum distichum*), coffee weed, pigweed (*Amaranthus palmeri)* (Figure D.7), crab grass (*Digitaria sanguinalis)*, johnsongrass (*Sorghum halepense*)(Figure D.8). One Southern farmer stated, "Weeds/ Pig weed has come out of nowhere to consume my tomato, eggplant, okra and pepper field. We are hand pulling thousands of the weeds from one to five feet tall."

Figure D.7. Palmer amaranth pigweed, By Pompilid - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=2008288

Figure D.8. Johnsongrass (public domain)

Another farmer expressed the magnitude of the research need as follows: "Weeds have been the biggest issue through the years. Research into the favored growing conditions of different weeds would be great. If possible, we farmers can create a soil environment which favors crops and hampers weeds by different nutrient levels. Information on the growth cycles of weeds would be helpful in order to delay planting to miss prime weed germination periods." Farmer comments on specific needs include the need for research on:

- Weed control in perennial crops.
- The plant diseases carried by weeds.
- The impacts of climate change on the invasion of weedy, woody vines.
- Controlling weeds in high rainfall and high humidity conditions.

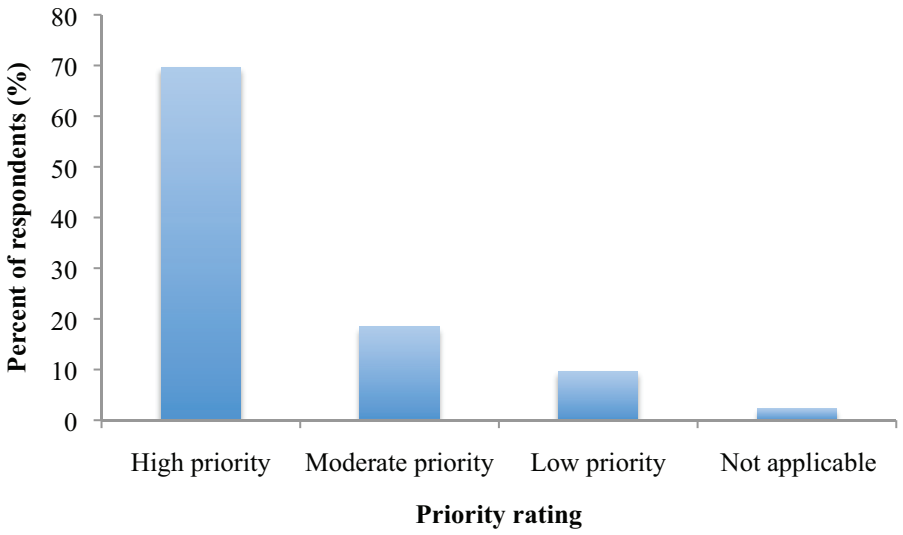

Figure D.9. Priority rating for weed management.

Fertility Management

Fertility management, as part of the larger topic of soil health, was rated as a high priority by 67.4% of respondents (Figure D.10).

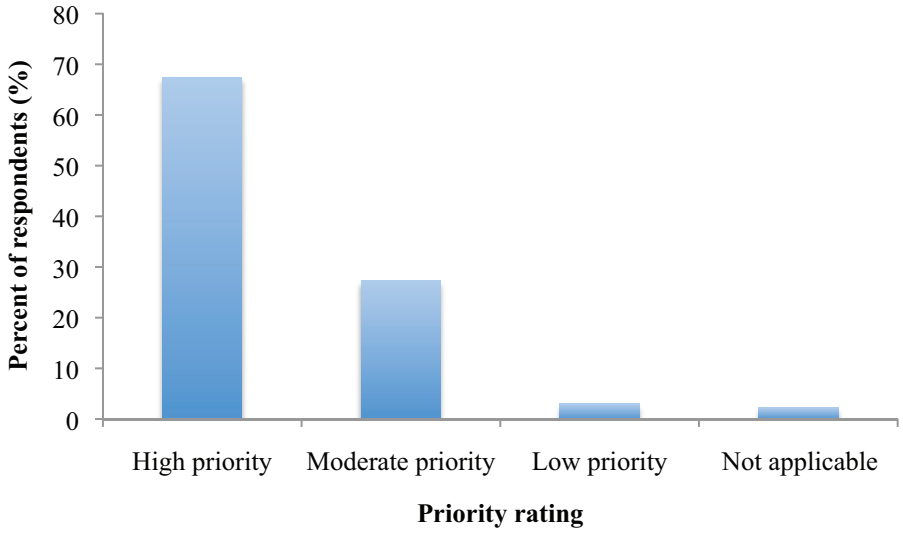

Figure D.10. Priority rating for fertility management research by Southern survey respondents.

Southern respondents listed the following as specific fertility topics of interest:

- Achieving adequate fertility levels so that crop yields can approach those of conventional farming.
- Optimum fertility not only for production but also for pest and disease resistance.
- Maintaining fertility while reducing soil borne disease and overwintering pests.

- Inputs. One farmer stated, "We need more research on the different fertility inputs. There are many "snake oil" products out there which cost people money. Some research on the timing of the release of nutrients from different fertility products would help as well."
- Restoring abused land and improving fertility under organic practices.

Nutritional Quality and Health Benefits of Organic Food

Sixty-six percent of respondents rated nutritional quality and health benefits of organic food as a high priority (Figure D.11).

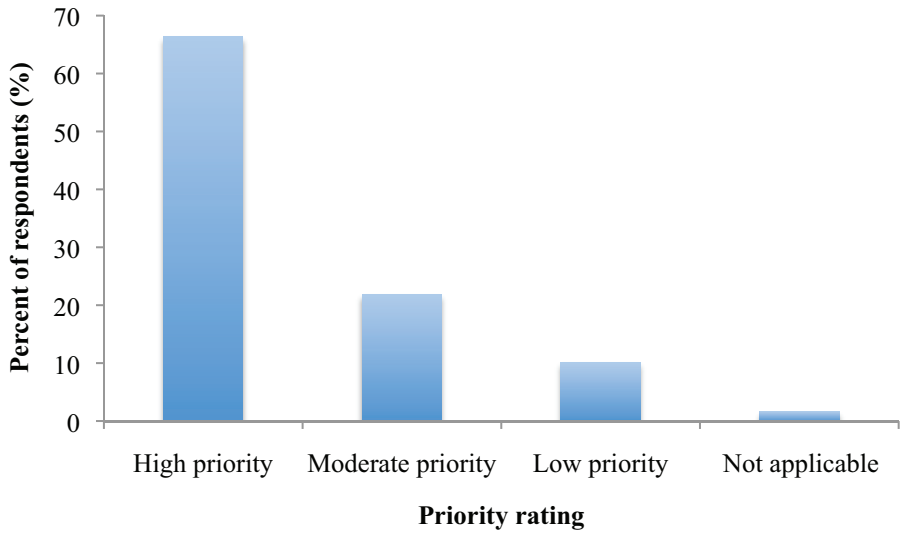

Figure D.11. Priority rating for nutritional quality and health benefits of organic food research.

Southern farmers stated they were interested in the views of consumers regarding the integrity of organic certification. For example, one farmer stated, "The organic label has lost its luster among consumers, who prefer "local" foods now. Organic production has high input costs but cannot command a corresponding price point to remain competitive." Another farmer voiced concerns regarding the health of the nation and convention agriculture's link to cancer. "Educating the public on how much healthier it is to go organic. People need to wake up and understand that this country is overweight, lazy and dying. People want to find a cure for cancer and I strongly believe that the rapid growth in cancer is what we are eating. And the drug makers are getting wealthy on selling a pill for all of our health problems when it could be fixed with food!!!!"

Insect Pests

Research on insect pests was rated as a high priority by 61.9% of Southern respondents (Figure D.12).

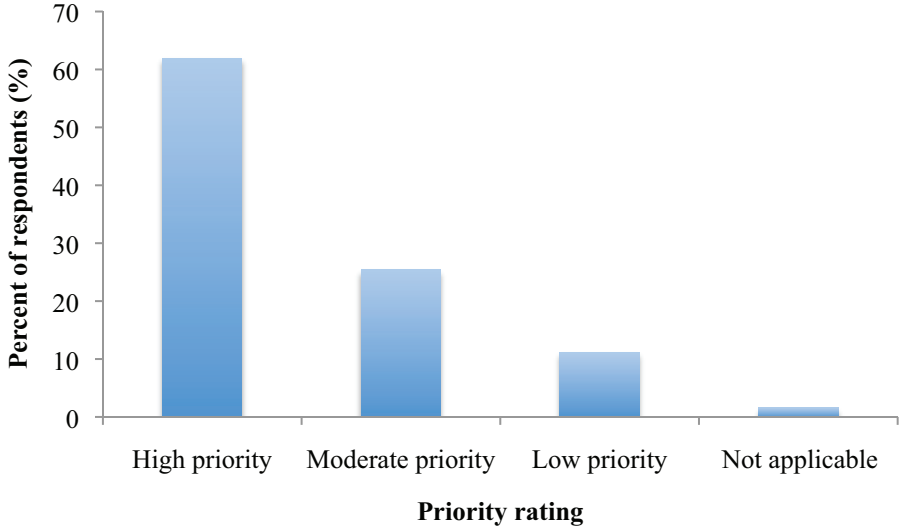

Figure D.12. Priority rating for insect pest research in the South.

Farmers listed specific pests and the most challenging crops infestations such as: root maggots in garlic, onions and cabbage, worm larva in sweet peppers, and stink bug damage in corn and beans. Main pests listed by growers include stink bugs (including harlequin bugs; Figure D.13), spotted wing drosophila (*Drosophila suzukii*), pickleworm (*Diaphania nitidalis*), squash bug (*Anasa tristis*), Japanese beetle (*Popillia japonica*), kudzu bugs (*Megacopta cribraria*), and flea beetle. One farmer described the stink bug problem, "Stinkbugs on all tomatoes, eggplant, and peppers this spring. 100% crop devoured and unsalable." One farmer stated their interest in better understanding of how to use beneficial insects instead of approved substances such as dipel. One farmer also mentioned the need for effective parasite control in beef cattle.

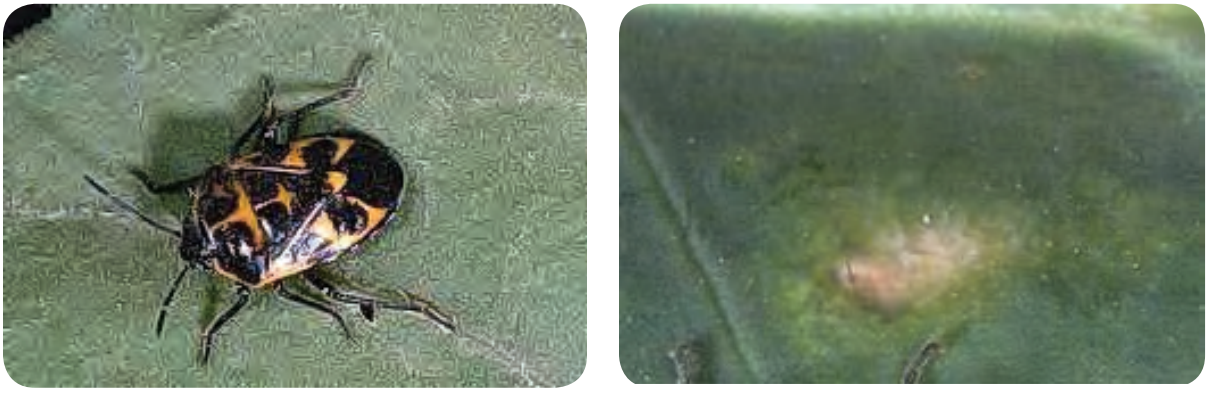

Figure D.13. Harlequin bug (left) and plant damage from harlequin feeding (Right) (Source: UC IPM).

Disease Management

Sixty-two percent of Southern region survey respondents rated disease management as a high priority (Figure D.14). The wet and humid conditions throughout much of the Southern region create conditions which are conducive to the establishment of crop diseases. One farmer stated, "Humidity and high rainfall of the U.S. Southeast makes vegetable crop production difficult given the resulting disease." Specific diseases of concern include orange cane blotch (*C. vericens*) in blackberry and blueberry, downy mildew in cucurbits, and mildew in grape vines.

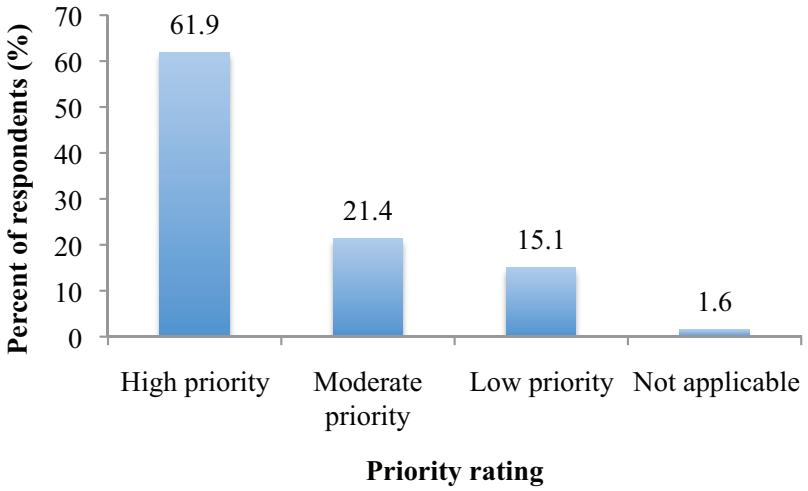

Figure D.14. Priority rating for disease management research among Southern region farmer respondents.

Specific research needs regarding disease management include:

- Maintaining fertility while reducing soil borne disease and overwintering pests.
- Breeding disease resistant cultivars.
- Disease research for organic vegetables in hot, humid, high-rainfall climate.
- Disease control through companion crops and rotation.
- Controlling diseases during wet spells and with climate change.

Farm Economics and Marketing

Many farmers (59%) rated farm economics and marketing research as a high priority (Figure D.15). Compared with the other regions, economics, marketing, and consumer behavior is a much higher priority in the South. With the smallest share of organic acres and value in the South, there is a great need to expand the market and strengthen organic production in the region.

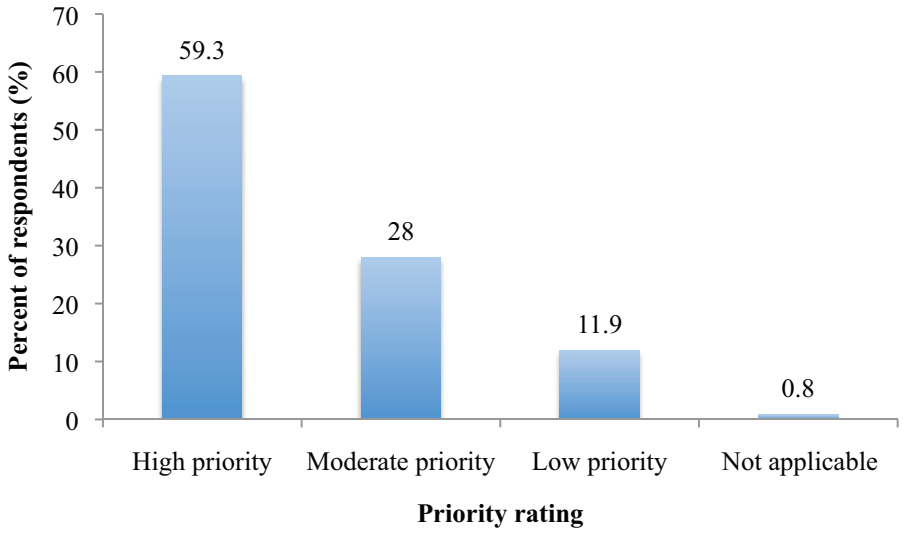

Figure D.15. Priority rating for farm economics and marketing among Southern region farmer respondents.

Some of the specific research priorities in the Southern region include:

- Processing and marketing.
- Balancing production output to match marketing demand. One farmer stated, "Markets are plentiful. Prices are all over the board with different channels. Toughest problem is achieving a steady production volume to fit which volume marketing channel best fits our production from week to week and predicting and marketing to the channel a week or two in advance of actual harvest. Crops come in weak, then strong and the channel varies from wholesale to CSA to farmers market depending on the volume from that crop. Prices vary drastically from channel to channel and juggling which call to make is tough."
- Marketing the organic label.
- Transitional crop marketing.
- Optimal marketing practices for small farm sales
- Effective marketing tools geared toward those with limited education and resources. Creating a new model that supports new farmers.
- Food literacy to encourage more southerners to eat fruits and vegetables.

Pollinator Health

Research on pollinators was rated as a high priority by 58% of southern farmer respondents. Farmers in the south emphasized planting more pollinator attractors and building pollinator habitat (Figure D.16).

Conclusions and Recommendations

In the survey, farmers were asked to describe their biggest production issue. Several topics emerged as major challenges for Southern region producers. These challenges are topics for which future research can be prioritized in this region. They include:

Joanna Ory

Figure D.16. European honey bee (Apis mellifera)

- Insect pests, especially stink bugs.
- Weed control, especially johnsongrass (*Sorghum halepense*).
- Lack of accessibility to the commercial market.
- The development of a food safety plan.
- Weather and climate change – heavy rain which is causing weed and disease problems.
- Profitability and consumer education.
- Lack of reliable labor.

In addition, comments from the listening sessions held in the Southern region reinforced the need for research on the areas listed above. In particular, we recommend research and outreach in the Southern region related to access to markets, soil health, and coping with troublesome insects and weeds.

APPENDIX E: GMO REPORT

Results from the 2015 National Organic Farmer Survey

Under the National Organic Program, organic agriculture prohibits the use of genetically engineered (GE) crops. Organic farmers must not use GE crops and they also must take steps to avoid contact with GE products in order to prevent cross contamination. Examples of GE avoidance methods by organic farmers include the following:

- Testing seed sources for GE traits.
- Changing the schedule of crop planting to have different flowering times for organic and GE crops.
- Creating agreements with neighbors who plant GE crops.
- Creating buffer zones between neighboring GE crop fields.

Despite these methods, organic farmers experience unintentional crop contamination with GE traits. For crops like corn and alfalfa, there is a risk that pollen from neighboring GE crop plantings will contaminate the organic crops. Unintentional GE crop contamination is a source of worry for organic producers, who fear having their products rejected if they are found to be contaminated. GMO avoidance practices are costly for organic farmers due to delayed planting and lost production due to taking land out of production for buffer areas.

In 2015, the Organic Farming Research Foundation surveyed organic farmers and asked about their experience with GMO contamination and the impacts on their farms. Nine hundred and nine organic farmers completed the survey and 494 partially completed the survey. This response of 1,403 organic farmers represents approximately 10% of the current population of US organic farmers (USDA, 2015).

Importance of GMO Research

Nationwide, 39.8% of organic farmers rated the impact of GE crops on production, practices, sales, markets, and seed availability as a high research priority (Figure E.1). Regions in the Midwest where there are more GE crops grown (like corn and soy) expressed the greatest need for research on GE crop impacts.

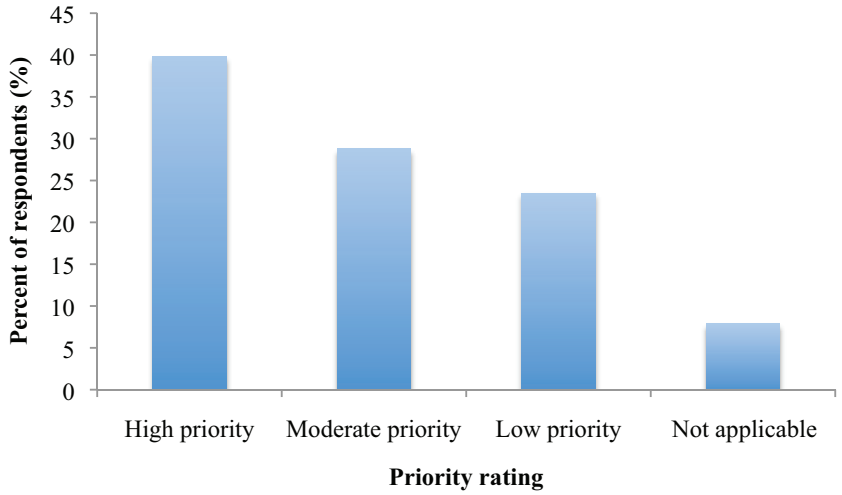

Figure E.1. Priority rating of GE crop research among surveyed organic farmers (N=1130).

Farmers stated that there is a need for specific types of research and information on GE pollen drift and other contamination issues. In addition, farmers stated that there is a need to communicate with conventional farmers about problems of drift without alienating them. One farmer mentioned that there is an opportunity to find solutions to the problem and conflicts surrounding GE crop contamination by reinforcing the understanding that both small organic farmers and small conventional farmers make important economic and social contributions to the economic viability of rural communities.

Impacts on Organic Farmers

The survey asked whether organic farmers had experienced GE crop contamination and the rejection of a shipment of goods. Nationally, 2.2% of surveyed farmers reported having a shipment of product rejected due to GE crop contamination (N=881). However, this rate of contamination is not uniform throughout the US. The North Central region had 6% of respondents report having a product shipment rejected due to GE crop contamination (Figure E.2).

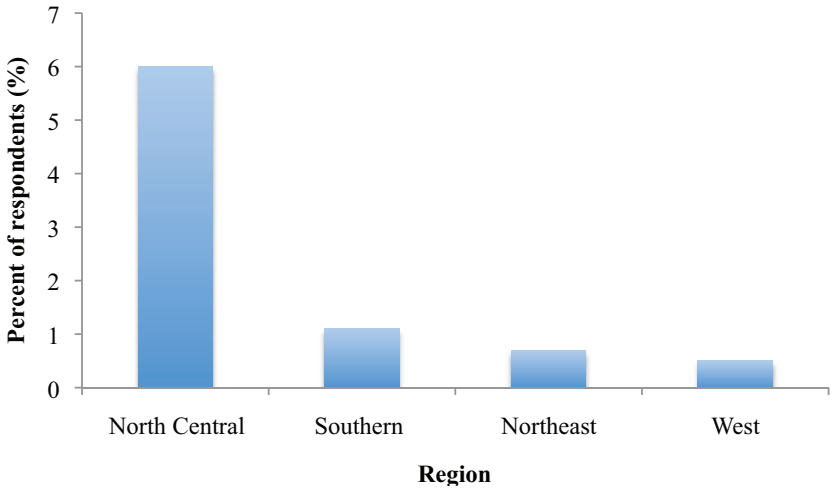

Figure E.2. Regional distribution of organic rejections due to GE crop contamination (N=881).

The survey asked farmers to describe the impact GE crops have had on their farm. The responses indicate that in addition to the direct financial impacts of having products rejected by buyers for failing to be GE free, organic farmers expressed a range of different ecological, financial, and psychological impacts from the threat of GE crop contamination. For example, one farmer stated, "We test before shipment and do not ship if contaminated. In the past our corn was highly contaminated by pollen from neighbors' GE corn. We treated it as hazardous material because we had no use on our farm for GE corn. The result was severe economic loss. We are committed to organic integrity." The 263 open-ended responses fall into several categories of impacts on farmers: pollen drift, delayed or altered planting, lost production, environmental pollution, increased pesticide pollution/drift, and psychological/emotional concern.

A word cloud created using keyword counts visually depicts the important terms represented in the survey (Figure E.3).

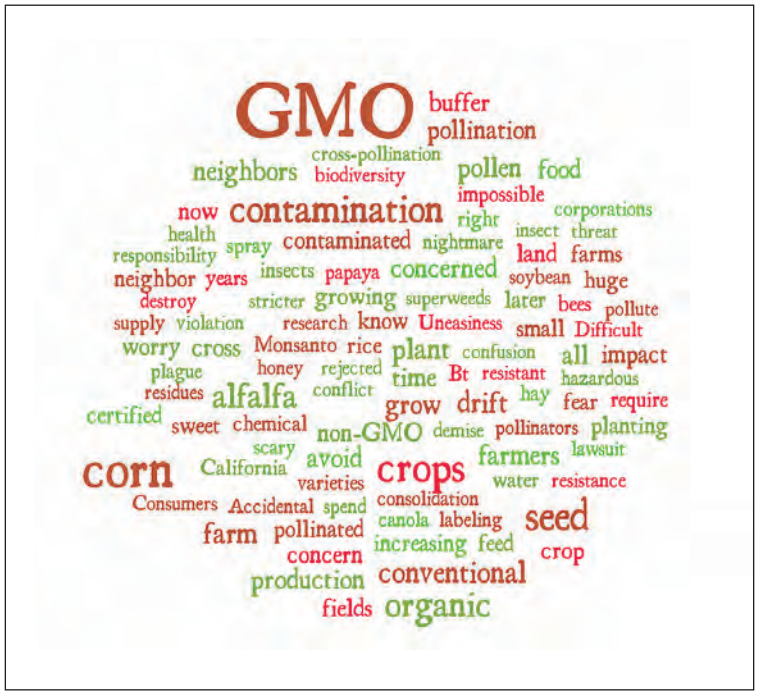

Figure E.3. Word cloud for GE crop impact open-ended questions. The size of the word represents the number of times it was mentioned in the survey responses.

Concern

It was common for survey participants to express psychological distress related to GE crops. Words like worry, concern, fear, stress, and uneasiness were commonly used to describe the feelings the organic farmers had regarding GE impacts. One farmer stated, "I have constant stress due to possible cross contamination and fines for inadvertent violation." Farmers may also feel powerless when neighbors plant GE crops. One farmer stated, "A neighbor planted GMO (genetically modified organism) alfalfa right next to our alfalfa fields. We are asking ourselves: what do we do now??"

Pollen Drift

Many respondents mentioned pollen drift as a major impact on their farms. Responses included the need to monitor what their neighbors are planting. Corn and alfalfa are common crops for which farmers expressed concern for pollen drift. One farmer stated, "I am concerned that GMO pollen is contaminating my beehives and honey." One respondent stated, that they "always have fear that traveling pollen may impact our farm." Another farmer stated that they grow Indian corn for masa and animal feed, and that there is "always a threat of GMO contamination from wind borne pollen." Part of the problem with pollen drift is that many organic farmers are in proximity to conventional neighbors. This issue of contamination from adjacent fields was the most common concern expressed in the survey. One farmer stated that their 2013 corn crop was over 90% contaminated and their 2014 corn crop was 30-35% contaminated. Other responses included:

- "We watch and try to manage our crop rotation alternate to neighboring crops giving us less contamination, as a 25' buffer/border is not enough to stop it."
- "We avoid growing corn on main farm site and try to time plantings on second farm site around the one corn grower."
- "Accidental spaying of herbicide on the comer of our field by neighbor resulting in buffer strip! We get GMO stalks and stover blown all over our property and all over our bottomlands with the yearly floods."
- "Sometimes have to adjust crop rotation schedule to avoid drift from one neighbor."
- "All my neighbors plant GMO so I am always concerned with cross-pollination."
- "We border a GMO corn and alfalfa grower. We worry about drift."
- "I am always concerned about GMO contamination, but we are currently surrounded by fallow land or woodlands, so it is not a big issue, but at anytime, someone could buy that land and put in GMO corn."
- "Concern over what, when and where my neighbors are planting."
- "Difficult to demonstrate buffer against contamination of surrounding conventional corn pollen. Try to have different tasseling dates compared to conventional neighbors, but this is not always possible."
- "We cannot grow sweet corn because we are surrounded by GMO corn."
- "An adjoining field raises conventional crops. Under current law and regulation, any contamination issues are our responsibility. The most significant impact on us is loss of production acreage, which is being used as a buffer."
- "We have had to purposely plant squash away from our neighbor's farm."
- "They are surrounding us, primarily GMO corn, and our main concern will be contamination of our alfalfa, over time, by GMO alfalfa."
- "We have apples and are concerned about the new GMO varieties due to cross-pollination."
- "GMO alfalfa is grown in our area, and impacts local hay; we try to grow all our own feed and not buy hay."

Seed Sourcing and Integrity

Many farmers expressed the difficulty in sourcing non-GE seed, or if they are seed producers, having their production at risk for contamination. Responses related to GE traits contaminating organic seed include:

- "We need stricter testing at the seed companies for GMO's in their organic seed."
- "We cannot grow seed crops for anything that could be pollinated by GM plants (corn)."
- "Seed industry consolidation … somewhat caused by introduction of GMOs in the marketplace, is affecting baseline prices and limiting the number of sources of availability."
- "We grow seed corn and are at risk."
- "I am concerned about feed fed to hens from organic supplier and increasing pressure to find appropriate layer pellets and scratch feed for hens. I am thinking I may source seed to sprout for my small flock - and am concerned about sourcing solid non-GMO seed for this purpose."
- "As more GMO crops are allowed it is also a nightmare to keep up with the paperwork saying the seed in non-GMO."
- "We are starting to grow our own alfalfa seed to avoid GMO contamination of alfalfa seed."
- "It is hard to get some of the corn varieties that interest me."
- "GMOs were very disruptive to our growing of chard seed."
- "As organic seed growers, in seed growing region we deal with isolation concerns all the time. As members in the Willamette Valley Specialty Seed Association (WVSSA) we participate in the pinning map system and respect our neighbors. We have GMO sugar beets being grown for seed in our area, which prevents us from growing any beta crops. So far we've succeeded in keeping GMO canola out of the valley, but if that ban is ever lifted, we'll be in trouble for all brassica production."
- "We cannot find non-GMO canola seed."
- "We bought organic seed, planted on organic land, had adequate space, about 1-2 miles from neighbors and still had some GMO contamination. We wonder about the organic seed being cleaned in elevators who also clean GMO seed."
- "It is impossible to find compostable carbon sources, i.e. peanut hulls and cotton gin trash that is non-GMO."
- "Since papaya is pollinated via all means possible (wind, bees, birds, etc.) it is impossible to declare papaya GMO free. The fruit can be if tested in advance, but through pollination, the seeds cannot be so declared."

Environmental Impacts

Respondents often cited environmental impacts as a larger, ecosystem-wide way in which they are being affected by GE crops. The respondents cited impacts of bees and pollinators and water and air pollution from the increased use of pesticides like glyphosate. One farmer also mentioned that their personal health was being affected as a result of more intensive pesticide spraying. One farmer stated, "GMO crops often mean RoundUp and other chemicals are being used to excess, and may runoff onto our land and end up in our water table. They impact the larger ecosystem of which our farm is but a small part."

Additional comments related to environmental impacts include:

- "Neighbors pollute my air with their glyphosate."
- "GMOs contribute to hazardous algae blooms and water contamination."
- "My apiary has ten beehives I manage for honey production and pollinator stability. I am concerned that GMO pollen is contaminating my beehives and honey. Is there an easy test for this? No."
- "I am concerned over the potential of resistant insects developed by GMO overuse becoming an issue."
- "I am worried about the potential loss of BT effectiveness."
- "RoundUp resistant weeds that have become superweeds."

Societal Impacts

Many farmers expressed the idea that GE crops are having negative effects on the food system as a whole. These effects include consolidation of the agricultural industry as well as the legal ramifications for organic farmers if they experience GE crop contamination. For example, farmers stated:

- "GMOs have had a heavy effect on my community. Round Up Ready corn and beans have made for a huge consolidation of acres. The very large, 6-10,000 acre farming operations, don't have time for the community. Feed lot dairy has came to our region in the last 20 years replacing the many 50 to 100 cow, 200-500 acre dairy farms with 3,500 cow operations on 80 acres. These are huge changes, that I don't think would have been quite as extreme without GMOs."
- "Fewer farmers are covering more ground. I feel like I farm by myself."
- "I believe that the lawsuits that have prevailed to the demise of small farms are a shame to our history. Lawyers who have never farmed are controlling our food supply, and that is very scary to me."
- "The overall transformation of the global food system away from one in which local people buy food from local farmers."
- "We worry about the government siding with corporations instead of farmers and not allowing labeling or interfering with organic's right to say no to GMOs."
- "We need a major class action lawsuit against these companies for contamination of the seed supply and our soils."
- "Hawaii is trying to keep Monsanto off of the Island and out of Hawaii. I have attended many Community/County Council meetings."

Monetary Costs

As a result of GE crop contamination of organic products, organic farmers have suffered financially due to displaced planting schedules, loss of revenue due to project rejection, decreased yield due to buffer areas, and the loss of certain marketing opportunities (like the European markets which have zero contamination standards). Economic losses reported in the survey include:

- "I tried sweet corn seed and it was contaminated by RoundUp ready corn in the area--lost the sale."
- "It is becoming increasingly impossible to maintain zero contamination as is required in European markets."
- "An adjoining field raises conventional crops. Under current law and regulation, any contamination issues are our responsibility. The most significant impact on us is loss of production acreage which is being used as a buffer."
- "Decreases in yields due to missing optimum planting windows for crops in order to avoid contamination. As more GMO crops are allowed it is also a nightmare to keep up with the paperwork saying the seed in non-GMO."
- "Lost production due to sizable buffer strips."
- "We have to plant later to prevent cross-pollination. This has really hurt us on particular years."
- "Sometimes have to adjust crop rotation schedule to avoid drift from one neighbor."
- "Loss of organic premiums."
- "Lower yields from later planting."
- "Insect pressure from conventional fields."
- "Corn that was sold for food grade and had a 1.2% GMO detection and it needed to be less than 1%."
- "All of my 2014 corn crop was rejected for the food grade market due to contamination that came in from most likely my neighbor's corn field. Non-organic corn pollinated later than usual last year due to a cool spring and summer which overlapped into my pollination windowI always plant my corn much later although due to what I mentioned above caused a huge negative impact for me."
- "We spend money on testing, which Monsanto should be paying."
- "Increasing the buffer areas therefore decreasing the land that cam be certified as organic."

Customer Confusion

Many farmers stated that customer confusion about organic products, GMOs, and GE free products as hurting their marketing. Comments addressing customer confusion include:

- "We get a lot of customers very concerned that we are growing GM grass or alfalfa for our cows. One of the reasons we certify as much of our pasture as we can is for this reason."
- "Consumer confusion regarding the allowance by USDA to grow the GMO Arctic varieties. They don't realize the "organic" means GMO free."
- "Consumers don't realize the Certified Organic seal is better than a non-GMO seal."
- "We need to certify products as GMO free for marketing reasons."

Conclusions

The comments from organic growers depicting the impacts from GE crops highlights the need for greater education, research, and policy interventions. Education and training for both organic and conventional farmers is needed on best practices to avoid GE crop contamination of organic crops. Research and monitoring on the magnitude of GE crop contamination is needed at both regional and national scales. Research on the efficacy of different avoidance practices should be a focus of future research. There is a need for stronger U.S. policies designed to protect organic farmers from GE pollen drift and reduce the economic hardships caused by GE crop contamination avoidance practices.

APPENDIX F: SEEDS

Seed Availability

According to the National Organic Program guidelines, organic farmers must use organic seed when it is commercially available. However, if the desired organically produced seed or planting stock variety is commercially unavailable, organic farmers may use conventionally grown, untreated seeds. To assess the availability of organic seed, we asked the survey participants to categorize the frequency of organic seed availability for the primary crops they grow. The survey found that for 20% of respondents, organic seed was rarely or never available (Figure F.1). There were some regional differences. Farmers in the Western region reporting less organic seed availability; reporting that organic seed was never available 14% of the time.

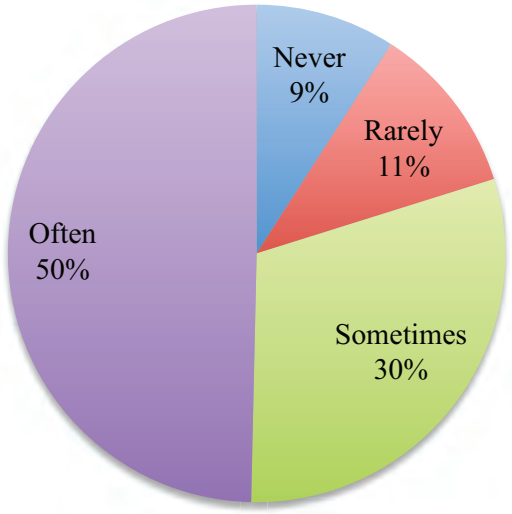

Figure F.1. Frequency of organic seed availability as reported by U.S. organic farmers.

Farmers reported several major areas of concern regarding organic seed. The biggest challenge reported was the price of organic seed being much higher than non-organic seed. Other major challenges are the quality and regional and temporal unavailability. As a result of challenges regarding the availability of organic seed, many surveyed farmers reported doing their own seed saving. One farmer described the disadvantage small organic farmers face with obtaining organic seed in a rural market. They stated, "Many of the large agricultural product cooperatives through which rural people source feed and seed do not carry organic seed as a standard. They require the purchase of a full semi load to even consider making the order. Small- and mid-scale operations struggle to gain affordable access to untreated, non-GMO, and certified organic field seed."

Price

The higher price for organic seed was the most common challenge reported by growers in the survey. The large price discrepancy between organic and conventional seed is a disincentive for farmers to use organic seed. The survey recipients expressed the issue that high organic seed cost is interfering

with profit, and that price is an important factor with regards to seed sourcing. Several farmers also expressed an understanding that the limited number of organic seed distributors is helping to create the situation of high prices for organic seed. Responses related to the high price of organic seed include:

- "Production hasn't reached the place where it is economically feasible to plant certified organic seed."
- "We grow about 100 vegetable varieties, and all but about 6 are available as certified organic seed. However, we have stopped growing certain organic transplant crops (Brussels Sprouts, for one) because the seed has become so expensive we cannot sell tray packs of the starts. The price rises in organic seed in the past 4-6 years are very large, especially since in our region there is no price premium for organic vegetable transplants."
- "Would like to see affordable organic strawberry plants."
- "Cost is more of problem than availability - at least for small grains and forages."
- "It is difficult to obtain small quantities of organic seed - many suppliers have astronomical prices for small quantities and the "next size up" is huge and WAY out of practical for small farmers. "
- "Organic nursery stock is unavailable for the latest commercial fruit tree varieties. The few that are available are insanely expensive and geared toward the home garden market."
- "Organic seed is usually available, even though I may have to order online instead of local availability. But the price is sometimes many times more expensive. Example organic soybeans ($50/lb.), non-treated soybeans ($3/lb.)."
- "Organic seed costs are triple and quadruple sometimes their untreated counterparts, to remain profitable it's very hard to purchase all of your seed organic, but this is not acceptable to NOP and certifying bodies."
- "If it wasn't for a local organic farmer who saves his own seed, purchasing organic wheat, rye, and soybeans would be cost prohibitive."
- "Why do they have to cost so much? Makes it hard to turn profit when I am paying over $410/LB for organic grass seed!?"
- "Honestly - the less organic seed available the better - it's very expensive and cuts into our profitability, plus the quality is often inferior. We would feel very differently if there were cultivars developed specifically to thrive under organic management because the additional cost would be offset by increased productivity."
- "When we were conventional we spent $60,000 a year on fertilizers and sprays. Now that money is all spent on seeds and soil amendments."

Quality

Survey respondents reported that the quality of organic seed was often inferior to conventional seed in terms of germination rate, yield, vigor, and contamination with weed seeds. Respondents also reported that there are fewer organic seed varieties to choose from. Organic farmers need varieties specific to their needs, such as high nutrient-use efficiency, disease resistance, insect resistance, weed competition, and are of good quality. Although there has been progress in seed breeding for organic production, it is a

slow process and some farmers report dissatisfaction with organic seed germination rates. Respondent comments regarding the quality of organic seed include:

- "Organic seeds for the most part are open-pollinated older varieties which don't have the appeal or plant vigor of the commercial conventional seeds."
- "Want newer varieties."
- "In many crops we are generally disappointed with the organic varieties either due to yield or traits."
- "We like good disease resistance, yield, flavor and some capacity for shipping and shelf life."
- "Most companies aren't interested in developing drought resistant varieties with characteristics we need for organic."
- "The genetics are horrible - conventional non treated non-GMO, always out yields organic hybrids."
- "Need to develop better grasses."
- "The wonderful varieties of bell peppers, eggplant, cucumbers, and round tomatoes that are conventionally available are generally unavailable organically. This is very frustrating, as our certifier wants us to have 70% organic seed."
- "Not enough quantity or variety! I often have to use non-organic seed because the organic varieties aren't as developed or as good."
- "Many seed varieties don't yield enough product. This means I have to grow more, which uses more water, seed, labor and land space. Not cost effective."
- "Because we farm in an area that is dominated by large production vegetable farms there are lots of disease inoculum present throughout much of the year. As such, we often rely on "cutting edge" varieties that resist the latest races of prevalent diseases, but for the most part, they are not available from organic seed."

Availability

Many farmers reported that organic seed was not available locally in their area for certain crops, or became harder to find during the peak of the planting and growing season. There were several crops for which respondents reported very little availability, specifically grass, cover crops, kale, and flower seeds. Comments related to the lack of availability of organic seed include:

- "There's a need for cover crop seed."
- "Open pollinated, drought tolerant grain sorghum (milo) is generally not available."
- "Not much for selection in corn and alfalfa. Never find organic seed for grasses. Sometimes clover is available. Organic oat seed is sporadically available."
- "Sweet corn for the south is hard to find. Silver Queen grows best but none available organically. Sun Gold tomatoes a must for markets but not available organically. Cover crop seed is expensive and almost prohibitive with shipping cost."
- "I use tree planting stock. Organically raised trees are almost impossible to find here in CA."
- "Seed sources for herbs is very limited for specialty crops. Also, seed quantity is often limited,

and suppliers rarely offer bulk pricing. Finally, we have had minor problems with mislabeling and/or unknowingly cross pollinating species, resulting in the wrong species."

- "Need more variety development in carrot seed, onion seed, radish and corn seed. There was a nation-wide lack of Breen (mini red romaine) lettuce and curly blue kale. As bigger farms get into organic they are pushing the rest of us around, buying up limited seed, hogging up larger markets, pushing prices down."
- "As for flowers (we sell seedlings) there is almost no significant availability of organic seed. I don't know why, but that is a big area of need."
- "Organic sunflower seed has doubled in price and become much less available."
- "It's almost impossible to find organic pasture mixes or even dryland cover crops, or specific to your area strains of wheat, sudan, bmr sorghum, alfalfa, etc. (Strains that the other conventional growers near you have access to but you don't because there isn't an organic version)."
- "There is only one known organic spawn for mushrooms and it is not commercially acceptable. There needs to be more research and development for this. "

Specific Areas of Need

Surveyed farmers highlighted several areas for which there is a need for more research or policy change regarding organic seed. Farmers commonly stated the need for increased on-farm breeding and variety improvement for organic seeds for the development of more organic hybrids for disease resistance. Farmers also expressed different views related to the policy for organic seed sourcing. Several farmers stated the need for stricter enforcement of using organic seed. For example, farmers stated:

- "If we did not allow conventional seed at all, we would all whine and complain, but then we would have to pay for it, the companies would contract with farmers to grow it for seed, and it would be done. Just like the conventional guys."
- "We need to continue to pressure farms to use organic seed and trial organic varieties to replace their conventional untreated varieties. To be organic you must use organic seed."
- "As long as organic crops can be grown from non-organic seed, there is little incentive to develop a reliable seed production infrastructure. The "loophole" in standards should be closed over a 10-year period to allow and incentive necessary development of an organic seed system."

Farmers also expressed the need for new priorities for the seed breeding industry and university breeders. One farmer stated that wheat varieties currently are "short wheat, short root systems, lower protein and mineral content, higher nitrogen needs, are really not what we need." The farmer expressed the need for breeding that focuses on good root systems for interacting with healthy organic soil (rather than depleted conventional soil). Another farmer stated that they are very concerned about the loss of public seed varieties and declines in non-GMO seed varieties, particularly with soybeans. The farmer stated, " I am also very concerned about the widespread GMO contamination potential from GMO alfalfa. GMO wheat could be a disaster as wellI think the availability of public varieties and farmers ability to save and reuse their own seed is fundamental to agricultural sustainability." Farmers expressed the need for universities to rebuild their public variety development and distribution systems.

Farmers expressed the need for growth in the number of organic seed producers and distributors in order to supply seed at a lower price and in more varieties. One farmer pointed out that lowering the high cost of organic seed is one possible opportunity to change the organic industry and encourage greater adoption of organic farming. “Lower cost of organic seed would lead to better availability of product and better economics for smaller producers. This would entice more folks to grow organic.” Another farmer stated, “Sometimes it feels like all the farmers are buying from the same handful of seed companies which makes it feel like nobody is growing anything very special or unique. It would be great if more “local” and regional variety began to emerge which would add a level of depth to the organic food system and a nice sense of local identity for farming communities around the country.”

APPENDIX G: LISTENING SESSIONS 2015-2016

Twenty-one listening sessions were held in 2015 and 2016 to inform the 2015 National Organic Research Agenda report. The following list contains the names and locations of the meetings where the listening sessions were held.

- Midwest Organic & Sustainable Education Service (MOSES) Conference, (Midwest/ Wisconsin) (2015 and 2016)
- Ecological Farming Conference, (West/California) (2015 and 2016)
- Virginia Biological Farmers Association, (East/Virginia)
- North East Sustainable Agriculture Working Group Conference, (East/New York)
- Minnesota Organic Conference in 2015, (Central/Minnesota)
- Organicology Conference (West/Oregon)
- Organic Agriculture Research Symposium, (West/ Wisconsin)
- Southern Sustainable Agriculture Working Group Conference (SSAWG), (South/Alabama)
- Pennsylvania Association for Sustainable Agriculture (PASA), (South/Pennsylvania)
- Ohio Ecological Food and Farm Association (OEFFA), (Central/Ohio)
- Organic Seed Alliance Conference, (West/Oregon)
- National Sustainable Agriculture Coalition (NSAC) (East/ Washington DC)
- Idaho Organic Growers Conference, (Central/Idaho)
- Natural Products Expo East, (East/Maryland)
- Organic Trade Association, Organic Confluences Summit (East/ Washington DC)
- California Certified Organic Farmers (CCOF) meetings, (3 meetings; West/California)

APPENDIX H: WEB SURVEY INSTRUMENT

Questions from the 2015 National Organic Farmer Survey

We appreciate your thoughtful answers to these questions and have designed the questionnaire so it does not have to be completed in one sitting.

You may leave the survey at any time. Your answers are saved as you progress. When you return, simply enter your access code in the box provided on the survey's welcome screen and you will begin right where you left off.

Your access code is 82867277 Please write this code down for your future reference.

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Question 1 of 34

Do you operate a farm that produces and markets certified organic products?

- Yes
- No

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Question 2 of 34

First, we'd like to start with some questions that will help us learn a little bit about you and your farm.

a. How many years have you been farming?		Years
b. How many years have you been farming organically?		Years
c. How many total acres do you farm including both owned and leased, organic and conventional?		Acres
d. How many acres do you farm organically?		Acres

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Question 3 of 34

In which of the following ways did you begin farming organically? *(Select one response.)*

- Transitioned from conventional farming practices
- Did not transition: began farming using organic practices
- Other, please explain:

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Question 4 of 34

Does your farm have acres in any of the following categories?

	Yes	No
Certified organic *Name of certifying agency*		
Organic and exempt from certification (sales are less than $5,000)		
Farming practices compatible with NOP guidelines but not certified		
Transitioning to certified organic		
Conventional		
Other, please specify:		

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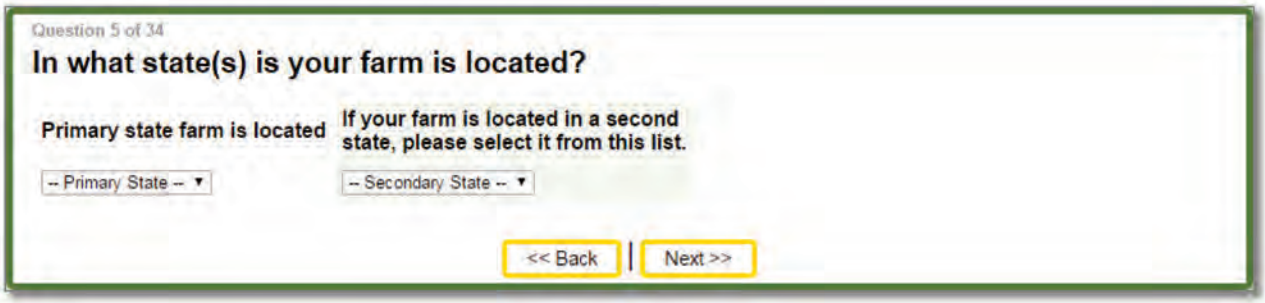
Question 5 of 34

In what state(s) is your farm is located?

Primary state farm is located -- Primary State --

If your farm is located in a second state, please select it from this list. -- Secondary State --

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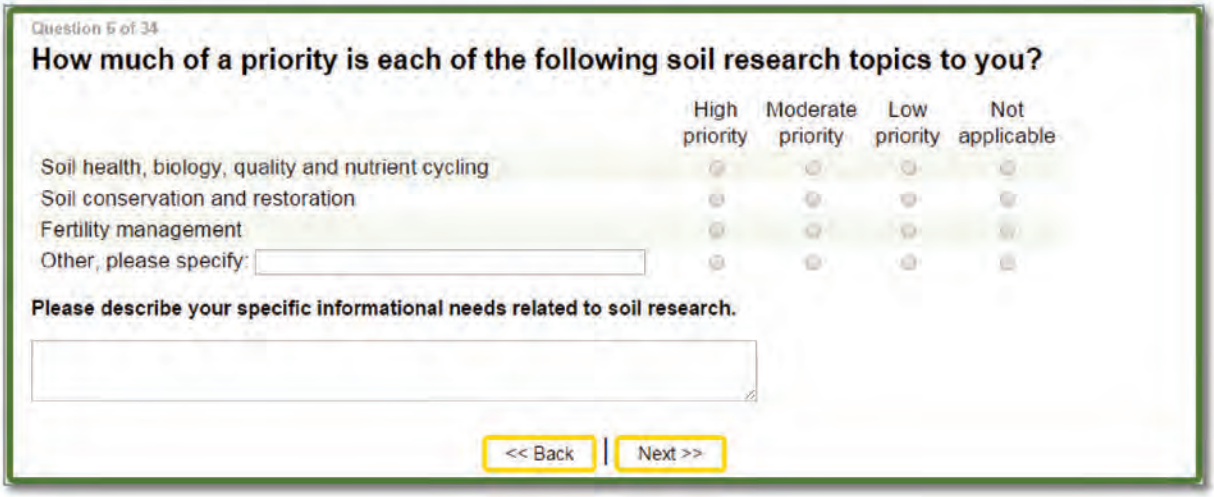

Question 6 of 34

How much of a priority is each of the following soil research topics to you?

	High priority	Moderate priority	Low priority	Not applicable
Soil health, biology, quality and nutrient cycling	○	○	○	○
Soil conservation and restoration	○	○	○	○
Fertility management	○	○	○	○
Other, please specify:	○	○	○	○

Please describe your specific informational needs related to soil research.

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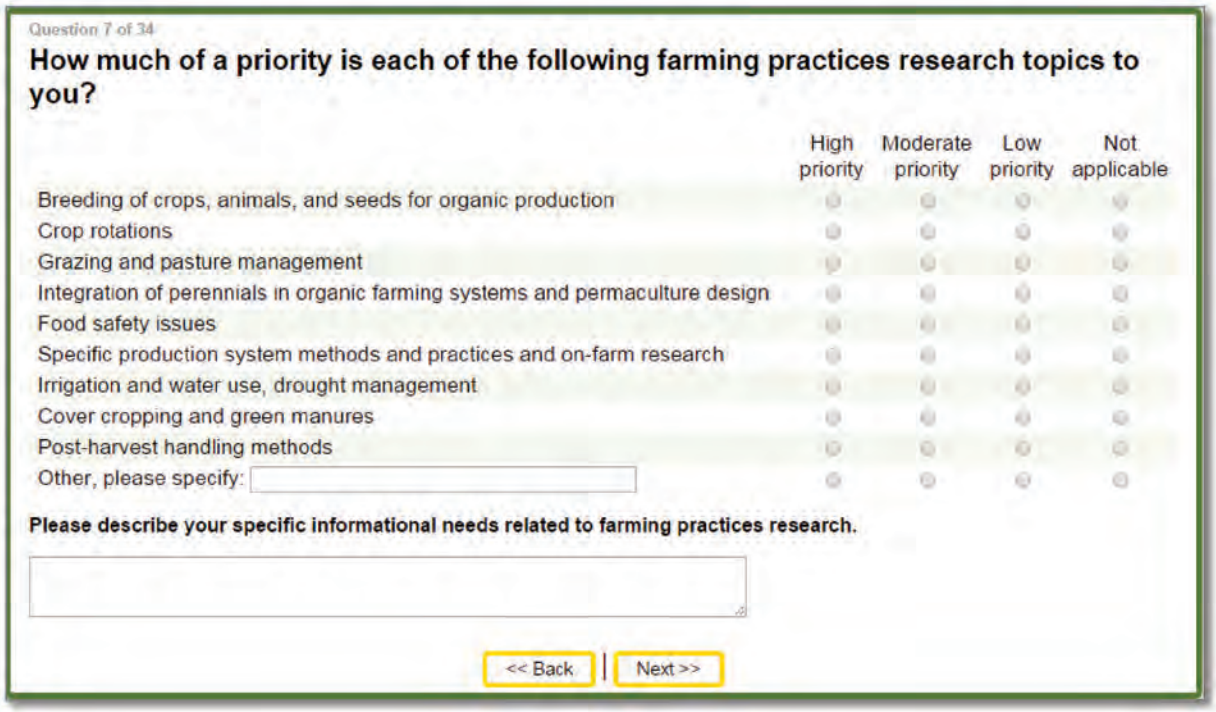

Question 7 of 34

How much of a priority is each of the following farming practices research topics to you?

	High priority	Moderate priority	Low priority	Not applicable
Breeding of crops, animals, and seeds for organic production	○	○	○	○
Crop rotations	○	○	○	○
Grazing and pasture management	○	○	○	○
Integration of perennials in organic farming systems and permaculture design	○	○	○	○
Food safety issues	○	○	○	○
Specific production system methods and practices and on-farm research	○	○	○	○
Irrigation and water use, drought management	○	○	○	○
Cover cropping and green manures	○	○	○	○
Post-harvest handling methods	○	○	○	○
Other, please specify:	○	○	○	○

Please describe your specific informational needs related to farming practices research.

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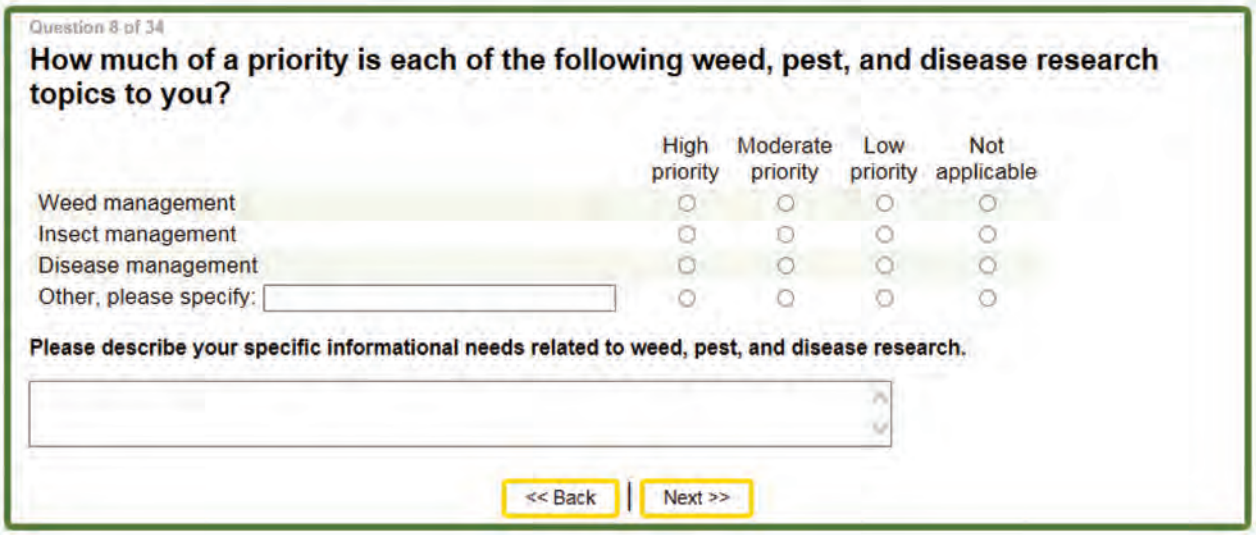

Question 8 of 34

How much of a priority is each of the following weed, pest, and disease research topics to you?

	High priority	Moderate priority	Low priority	Not applicable
Weed management	○	○	○	○
Insect management	○	○	○	○
Disease management	○	○	○	○
Other, please specify:	○	○	○	○

Please describe your specific informational needs related to weed, pest, and disease research.

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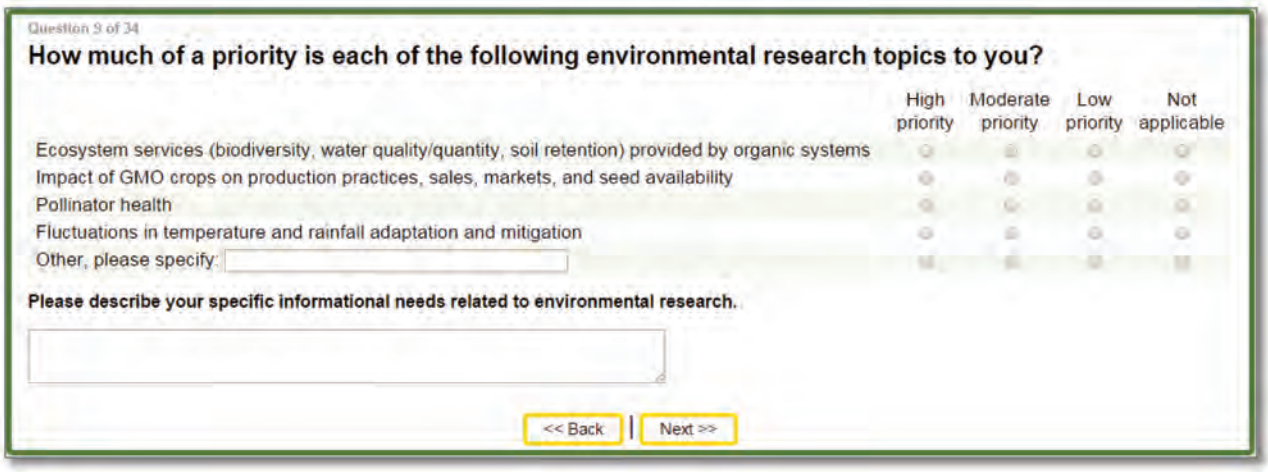

Question 9 of 34

How much of a priority is each of the following environmental research topics to you?

	High priority	Moderate priority	Low priority	Not applicable
Ecosystem services (biodiversity, water quality/quantity, soil retention) provided by organic systems	○	○	○	○
Impact of GMO crops on production practices, sales, markets, and seed availability	○	○	○	○
Pollinator health	○	○	○	○
Fluctuations in temperature and rainfall adaptation and mitigation	○	○	○	○
Other, please specify:	○	○	○	○

Please describe your specific informational needs related to environmental research.

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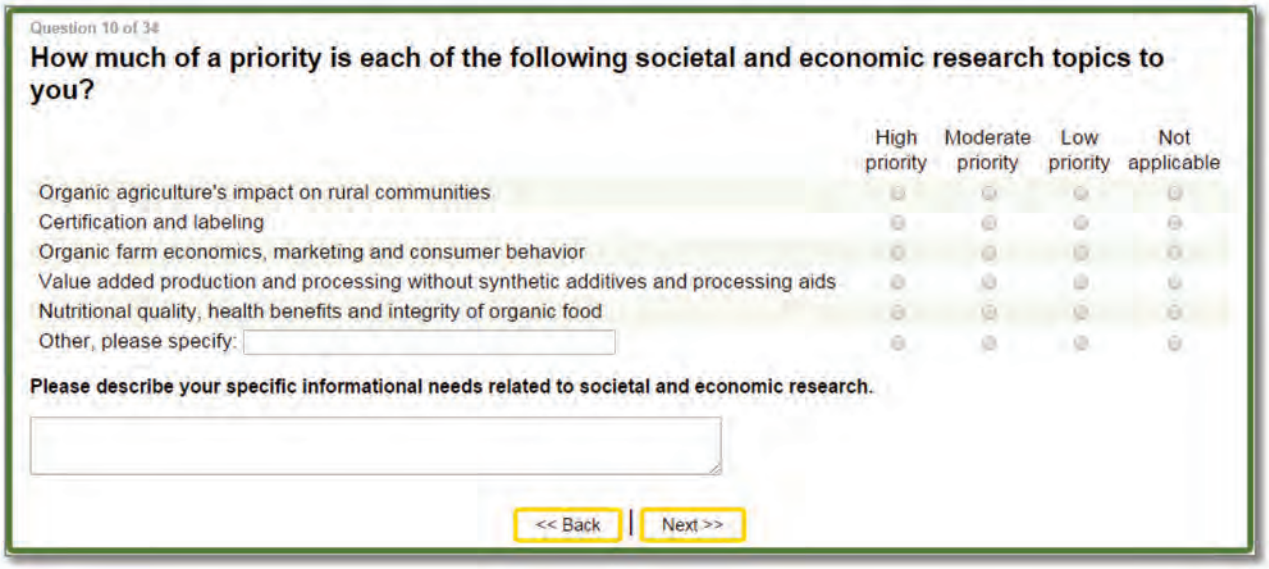

Question 10 of 34

How much of a priority is each of the following societal and economic research topics to you?

	High priority	Moderate priority	Low priority	Not applicable
Organic agriculture's impact on rural communities	○	○	○	○
Certification and labeling	○	○	○	○
Organic farm economics, marketing and consumer behavior	○	○	○	○
Value added production and processing without synthetic additives and processing aids	○	○	○	○
Nutritional quality, health benefits and integrity of organic food	○	○	○	○
Other, please specify:	○	○	○	○

Please describe your specific informational needs related to societal and economic research.

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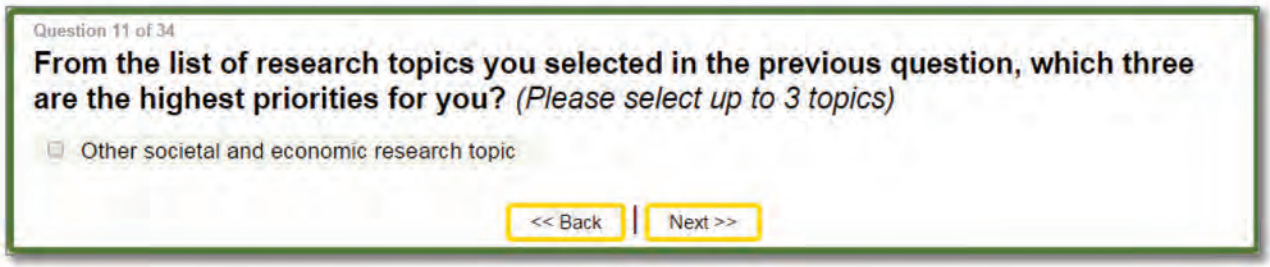

Question 11 of 34

From the list of research topics you selected in the previous question, which three are the highest priorities for you? *(Please select up to 3 topics)*

☐ Other societal and economic research topic

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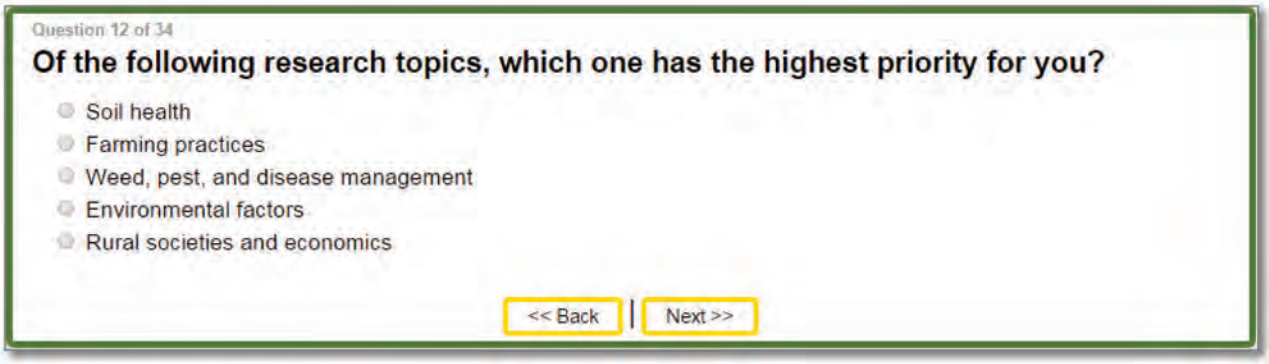
Note: At Question 11 the survey displayed only the topics selected with a high, moderate or low priority in Questions 6 through Question 10, including the text from any of the "Other" categories. Additionally, this page only allowed up to three selections.



Question 12 of 34

Of the following research topics, which one has the highest priority for you?

- ○ Soil health
- ○ Farming practices
- ○ Weed, pest, and disease management
- ○ Environmental factors
- ○ Rural societies and economics

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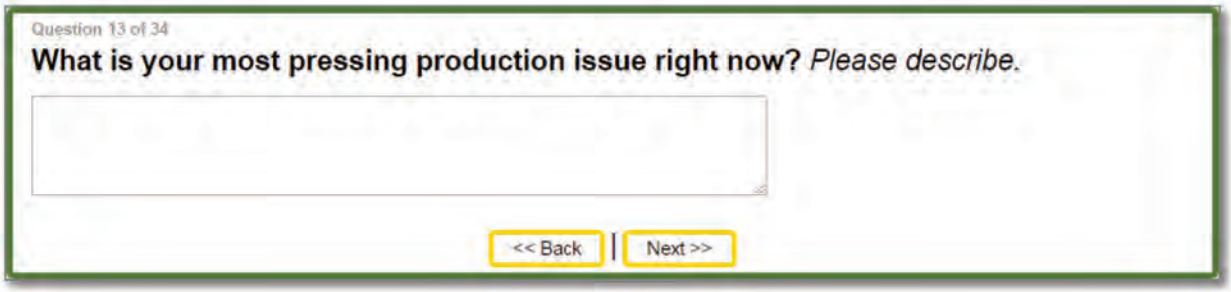
Question 13 of 34
What is your most pressing production issue right now? Please describe.
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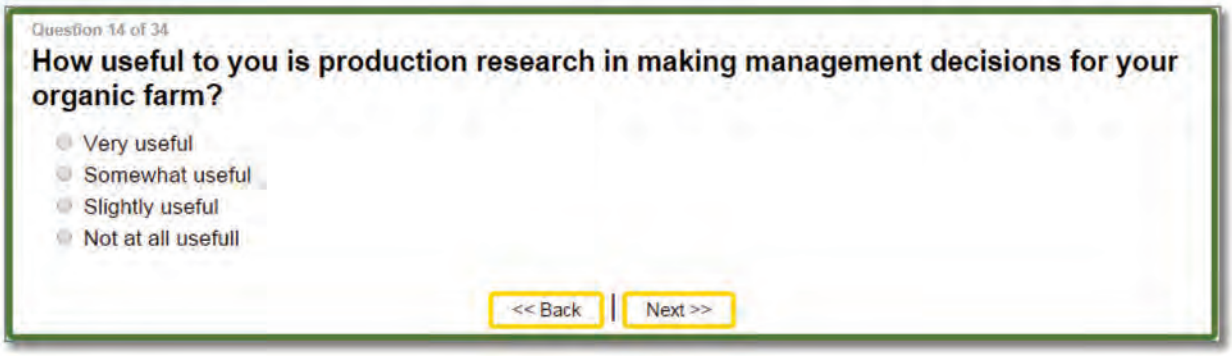
Question 14 of 34
How useful to you is production research in making management decisions for your organic farm?
Very useful
Somewhat useful
Slightly useful
Not at all usefull
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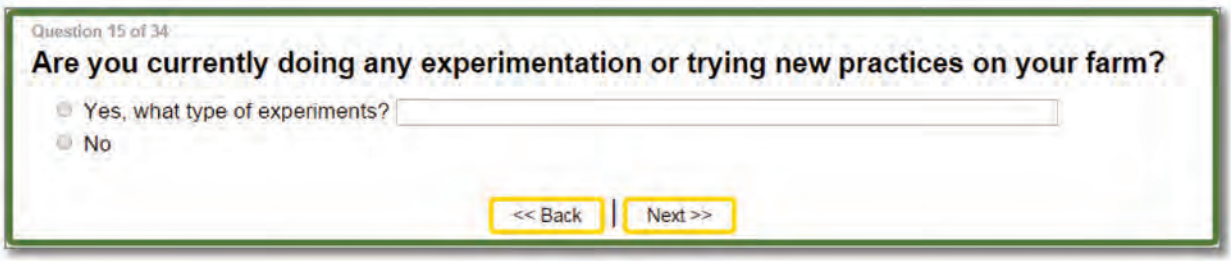
Question 15 of 34
Are you currently doing any experimentation or trying new practices on your farm?
Yes, what type of experiments?
No
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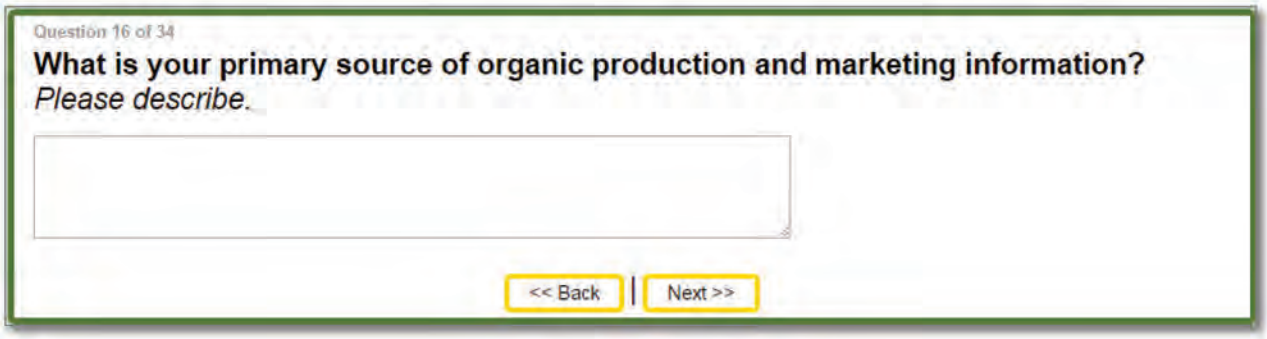
Question 16 of 34
What is your primary source of organic production and marketing information?
Please describe.
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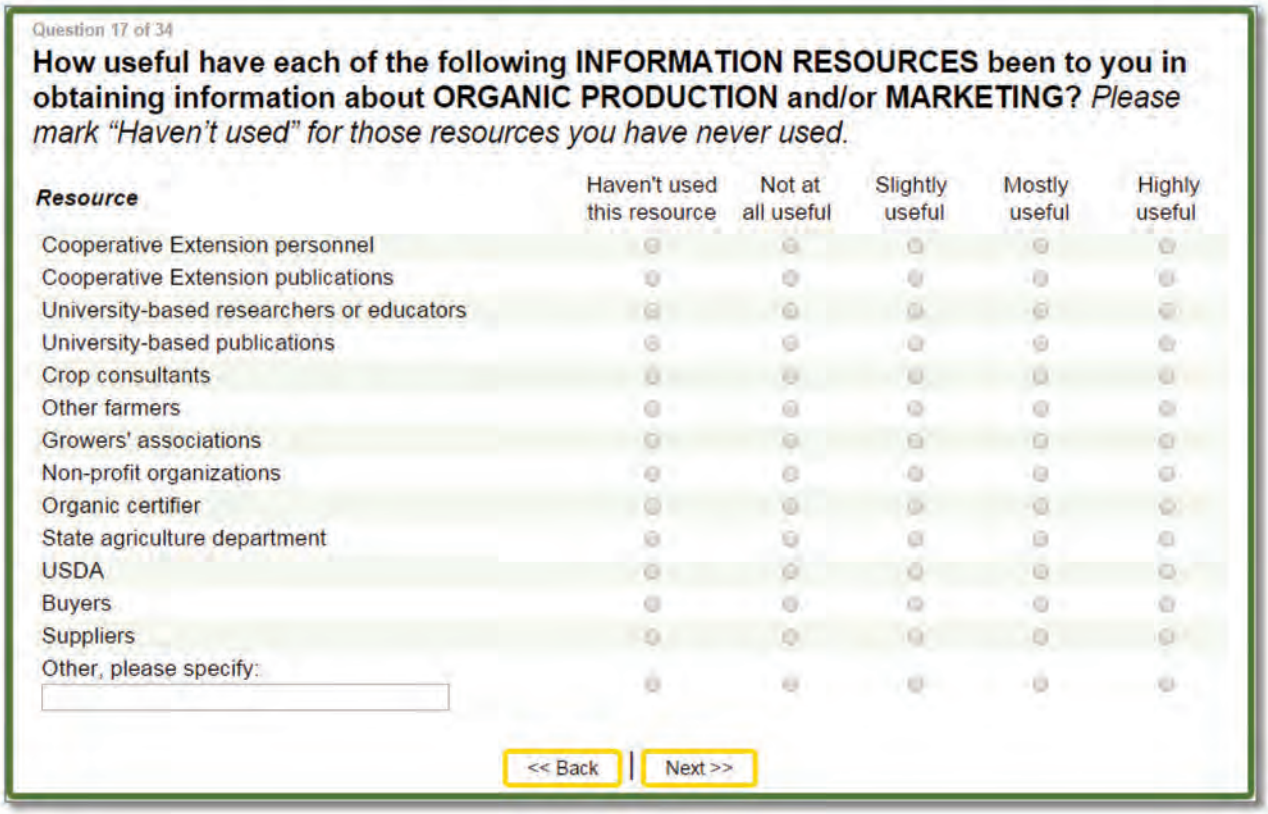

Question 17 of 34

How useful have each of the following INFORMATION RESOURCES been to you in obtaining information about ORGANIC PRODUCTION and/or MARKETING? *Please mark "Haven't used" for those resources you have never used.*

Resource	Haven't used this resource	Not at all useful	Slightly useful	Mostly useful	Highly useful
Cooperative Extension personnel					
Cooperative Extension publications					
University-based researchers or educators					
University-based publications					
Crop consultants					
Other farmers					
Growers' associations					
Non-profit organizations					
Organic certifier					
State agriculture department					
USDA					
Buyers					
Suppliers					
Other, please specify:					

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Question 18 of 34

How much do you prefer each of the following INFORMATION FORMATS for information about ORGANIC PRODUCTION and/or MARKETING. *For those formats you have not used, please mark "Have not used".*

Information format	Have not used this format	Do not prefer	Slightly prefer	Mostly prefer	Highly prefer
Farming & gardening books	○	○	○	○	○
Printed handbooks/manuals	○	○	○	○	○
Online handbooks/manuals	○	○	○	○	○
Print periodicals (newspapers, magazines, newsletters)	○	○	○	○	○
Email newsletters	○	○	○	○	○
Email groups & listserves	○	○	○	○	○
Internet websites	○	○	○	○	○
Webinars (Online seminars)	○	○	○	○	○
Seminars	○	○	○	○	○
Conferences & workshops	○	○	○	○	○
Classes and/or coursework	○	○	○	○	○
Field days, on-farm demonstrations	○	○	○	○	○
Social media (Facebook/Twitter, etc.)	○	○	○	○	○
Radio programs	○	○	○	○	○
Podcasts	○	○	○	○	○
Online videos (YouTube, etc.)	○	○	○	○	○
CDs	○	○	○	○	○
DVDs	○	○	○	○	○
Films or documentaries	○	○	○	○	○
Scientific journals	○	○	○	○	○
Other, please explain:	○	○	○	○	○

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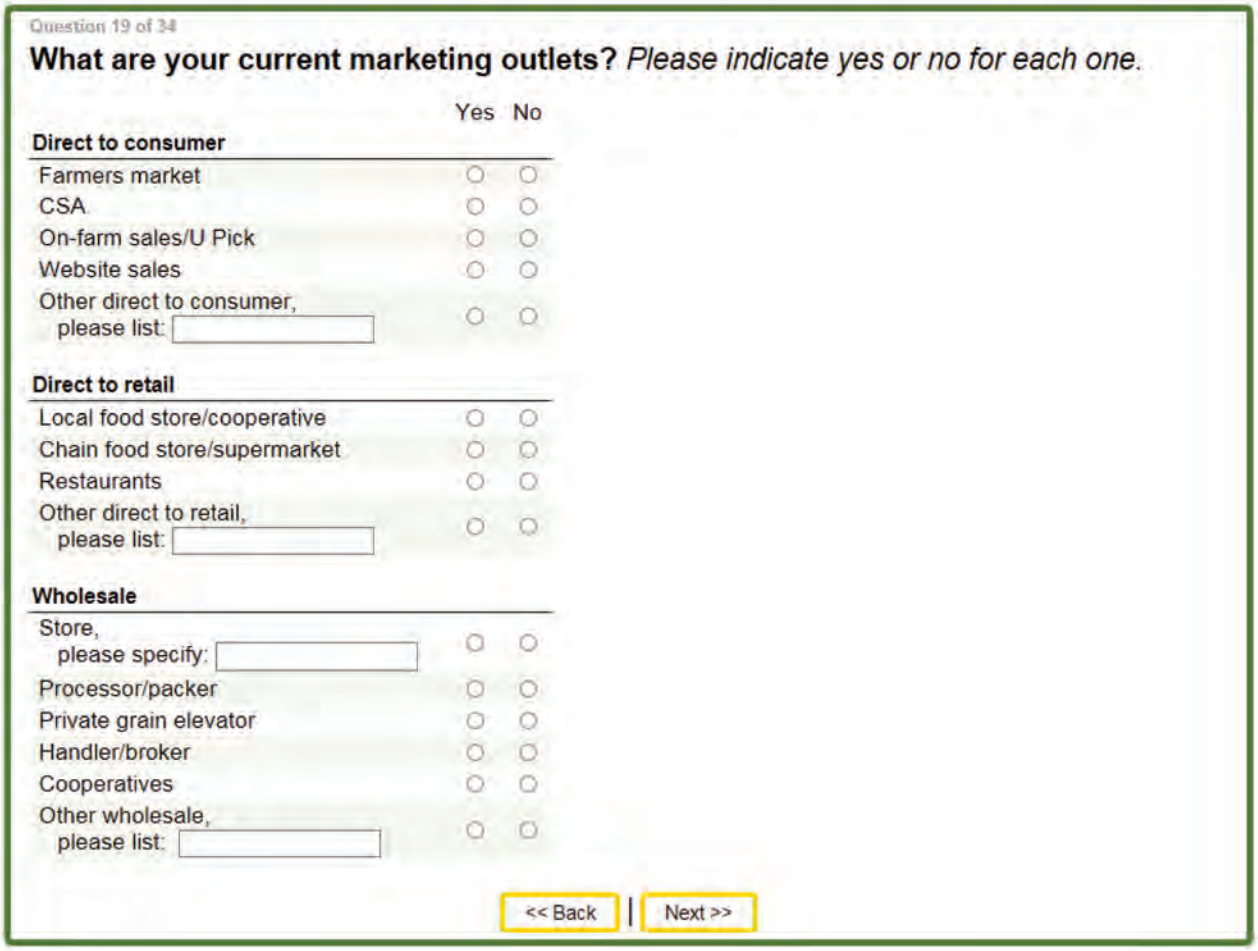

Question 19 of 34

What are your current marketing outlets? *Please indicate yes or no for each one.*

	Yes	No
Direct to consumer		
Farmers market	○	○
CSA	○	○
On-farm sales/U Pick	○	○
Website sales	○	○
Other direct to consumer, please list:	○	○
Direct to retail		
Local food store/cooperative	○	○
Chain food store/supermarket	○	○
Restaurants	○	○
Other direct to retail, please list:	○	○
Wholesale		
Store, please specify:	○	○
Processor/packer	○	○
Private grain elevator	○	○
Handler/broker	○	○
Cooperatives	○	○
Other wholesale, please list:	○	○

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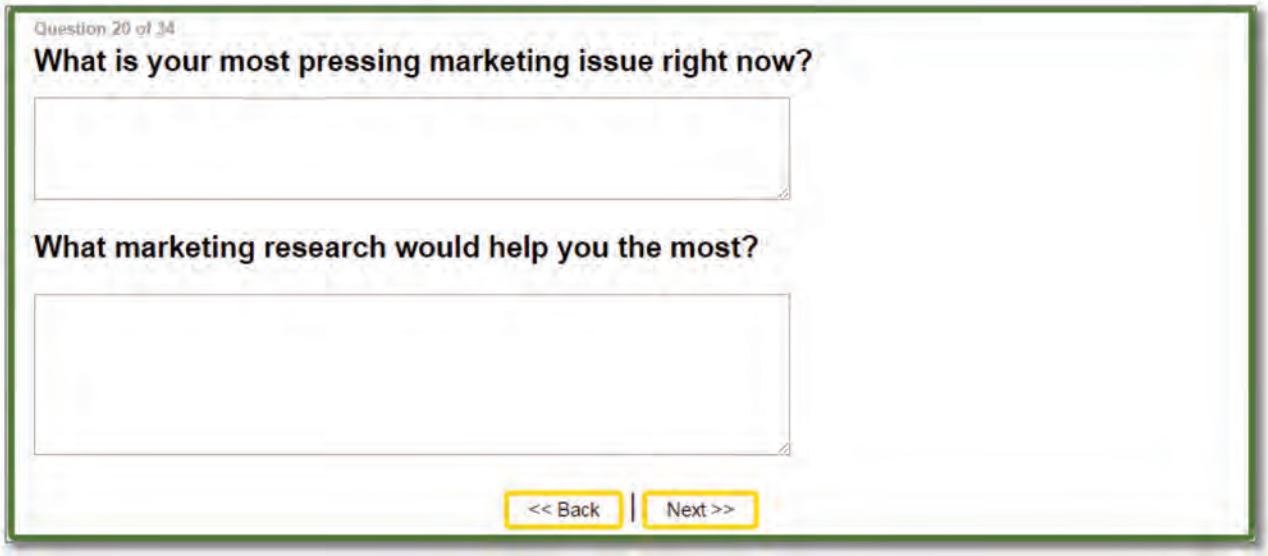

Question 20 of 34

What is your most pressing marketing issue right now?

What marketing research would help you the most?

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Question 21 of 34

How often do you use each of the following fertilization/fertility management strategies and materials?

	Never	Rarely	Occasionally	Frequently	Regularly
Cover crops	○	○	○	○	○
Compost	○	○	○	○	○
Gypsum or lime	○	○	○	○	○
Animal byproducts (such as fish products, bone or blood meal, feather meal, etc.)	○	○	○	○	○
Kelp or seaweed	○	○	○	○	○
Minerals (other than gypsum and lime)	○	○	○	○	○
Raw manure	○	○	○	○	○
Compost tea	○	○	○	○	○
Other, please list	○	○	○	○	○

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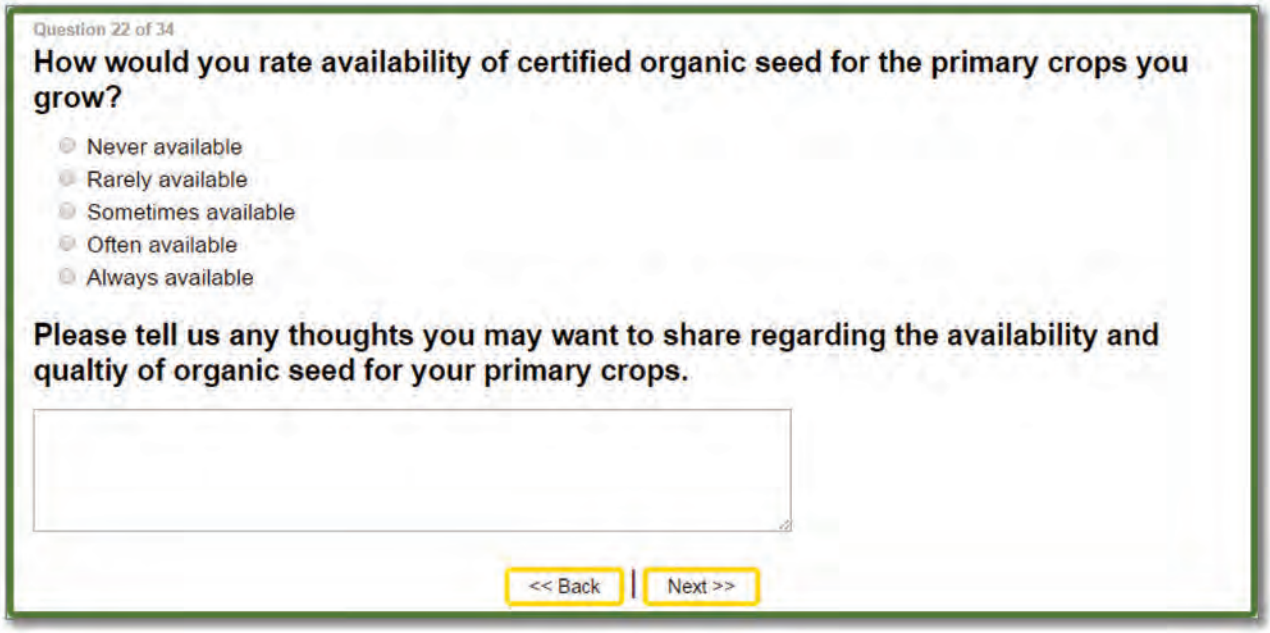

Question 22 of 34

How would you rate availability of certified organic seed for the primary crops you grow?

- Never available
- Rarely available
- Sometimes available
- Often available
- Always available

Please tell us any thoughts you may want to share regarding the availability and qualtiy of organic seed for your primary crops.

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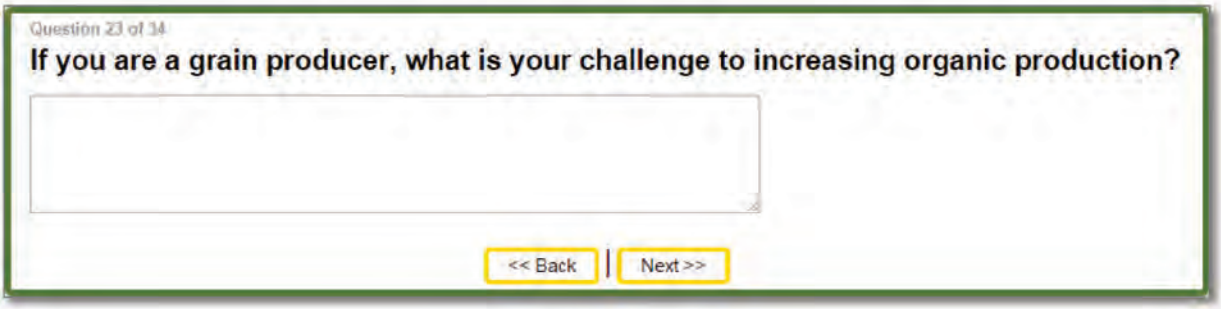
Question 23 of 34
If you are a grain producer, what is your challenge to increasing organic production?
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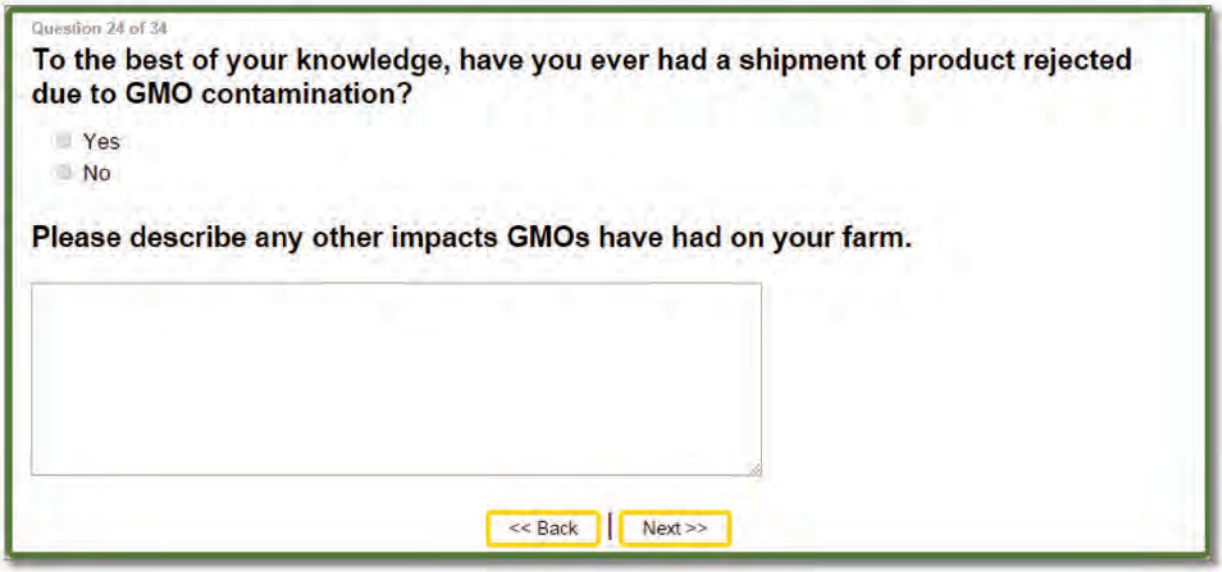
Question 24 of 34
To the best of your knowledge, have you ever had a shipment of product rejected due to GMO contamination?
Yes
No
Please describe any other impacts GMOs have had on your farm.
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Question 25 of 34
Within the last five years, did you lose sales or certification on any organic land due to pesticide spray drift?
Yes, which crops did you lose?
and how many acres did you lose?
No
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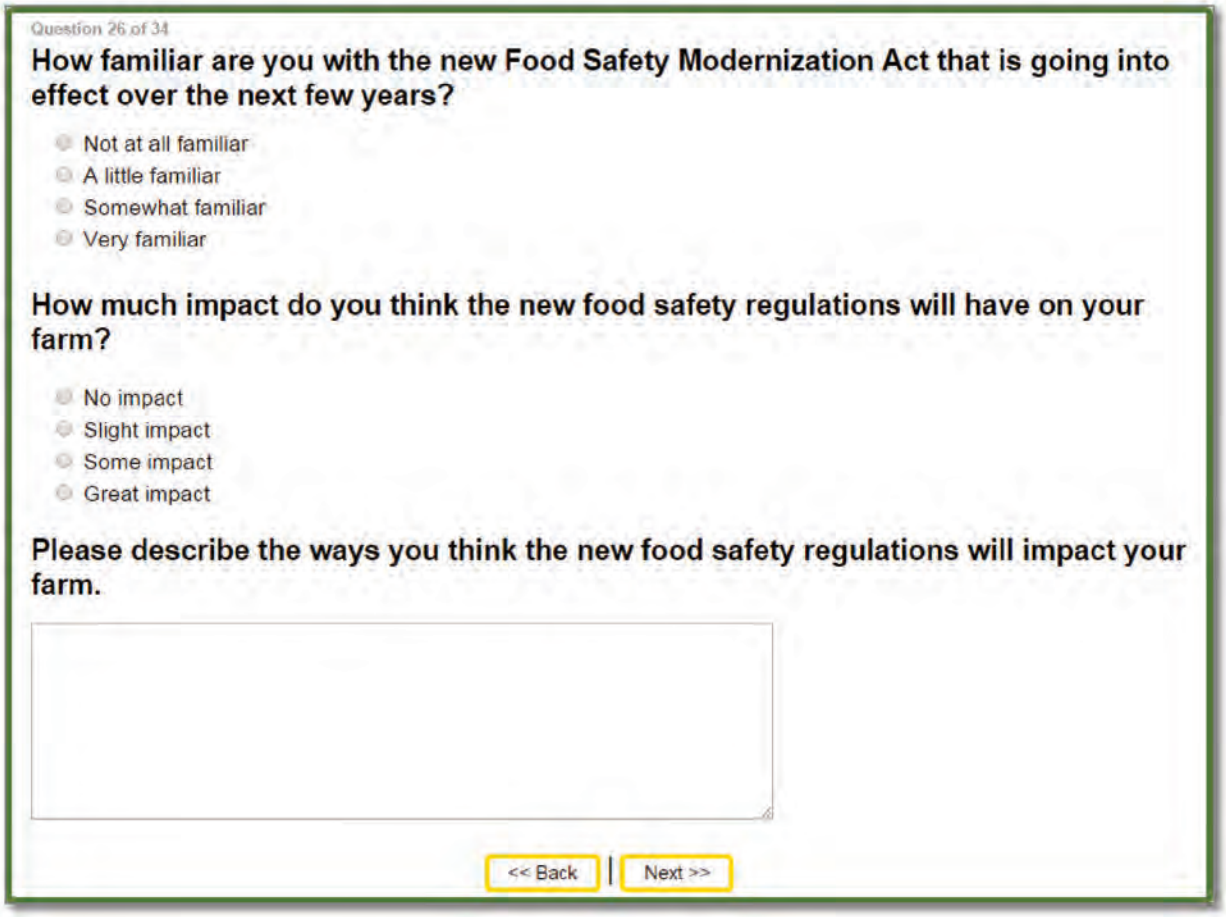
Question 26 of 34
How familiar are you with the new Food Safety Modernization Act that is going into effect over the next few years?
Not at all familiar
A little familiar
Somewhat familiar
Very familiar
How much impact do you think the new food safety regulations will have on your farm?
No impact
Slight impact
Some impact
Great impact
Please describe the ways you think the new food safety regulations will impact your farm.
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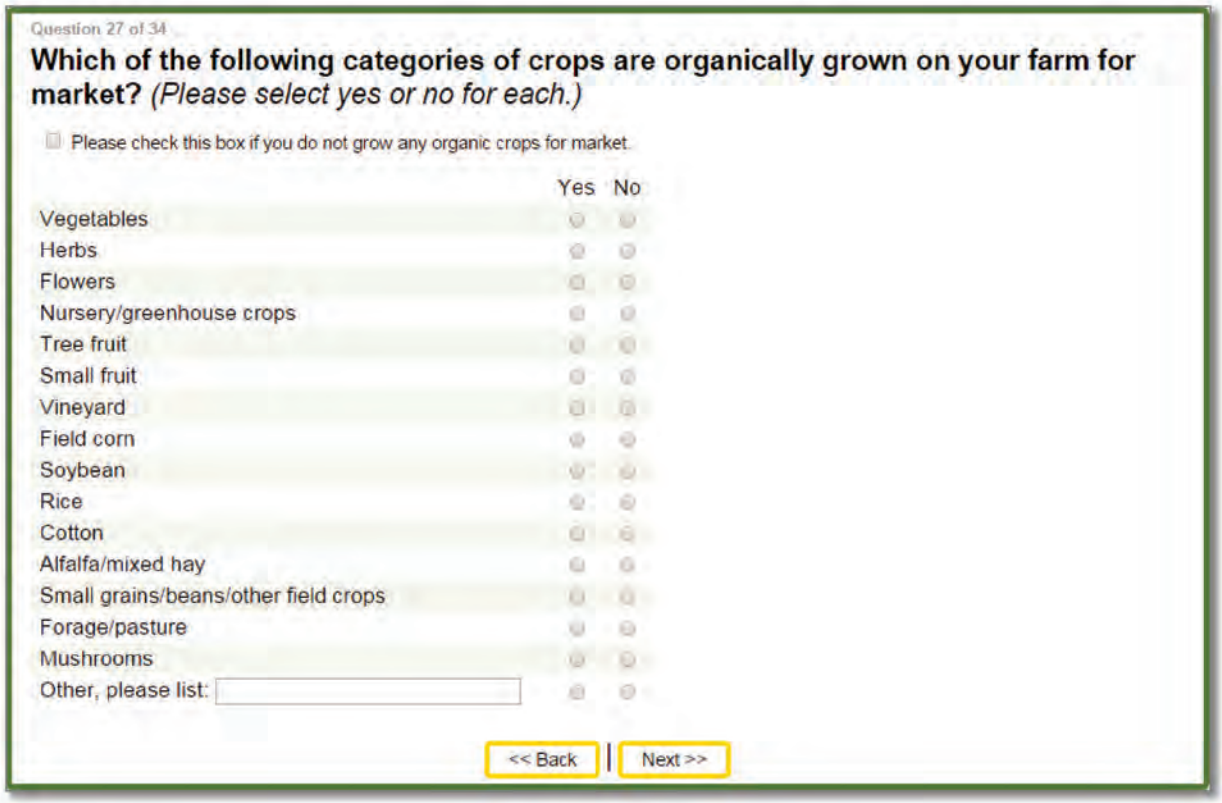

Question 27 of 34

Which of the following categories of crops are organically grown on your farm for market? *(Please select yes or no for each.)*

Please check this box if you do not grow any organic crops for market.

	Yes	No
Vegetables		
Herbs		
Flowers		
Nursery/greenhouse crops		
Tree fruit		
Small fruit		
Vineyard		
Field corn		
Soybean		
Rice		
Cotton		
Alfalfa/mixed hay		
Small grains/beans/other field crops		
Forage/pasture		
Mushrooms		
Other, please list:		

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Question 28 of 34

Which of the following categories of animals or animal products are organically grown on your farm for market? *(Please select yes or no for each.)*

Please check this box if you do not produce any organically grown animals or animal products for market.

	Yes	No
Poultry		
Eggs		
Beef		
Sheep/lambs		
Pigs/pork		
Dairy		
Honey		
Other, please list:		

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Question 29 of 34
Does your farm produce value-added products? (e.g. preserves, juices, dried fruit or nuts, cleaned and bagged grains, processed meats, etc.)
Yes, which ones (please specify):
No
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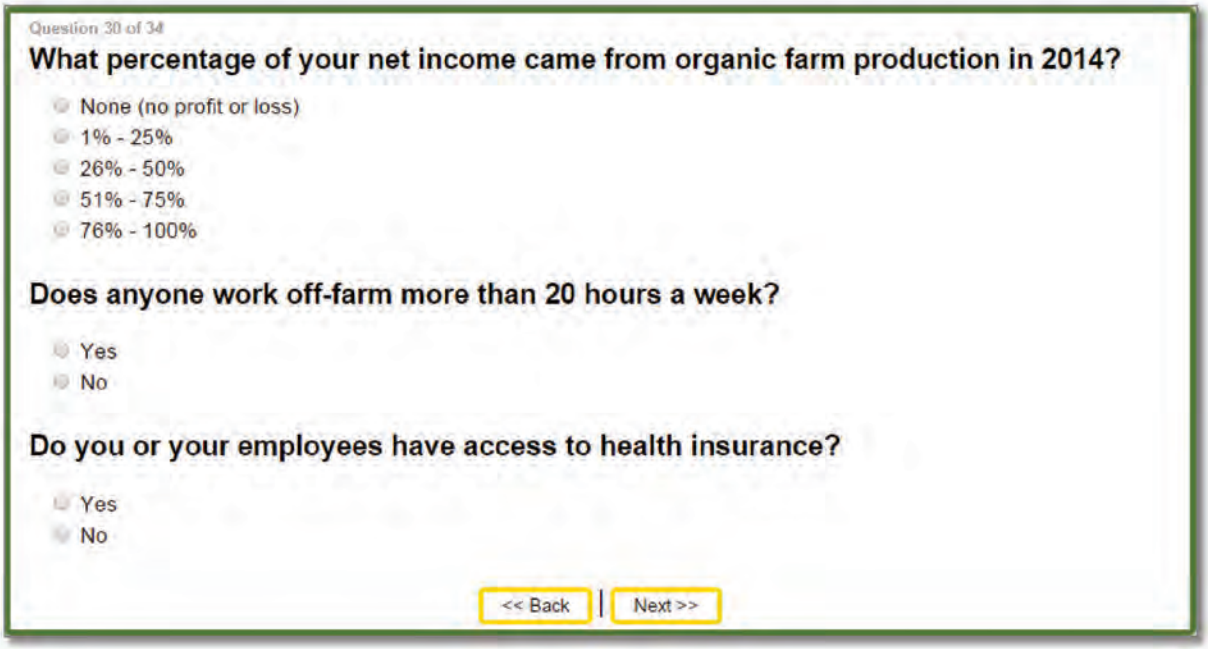
Question 30 of 34
What percentage of your net income came from organic farm production in 2014?
None (no profit or loss)
1% - 25%
26% - 50%
51% - 75%
76% - 100%
Does anyone work off-farm more than 20 hours a week?
Yes
No
Do you or your employees have access to health insurance?
Yes
No
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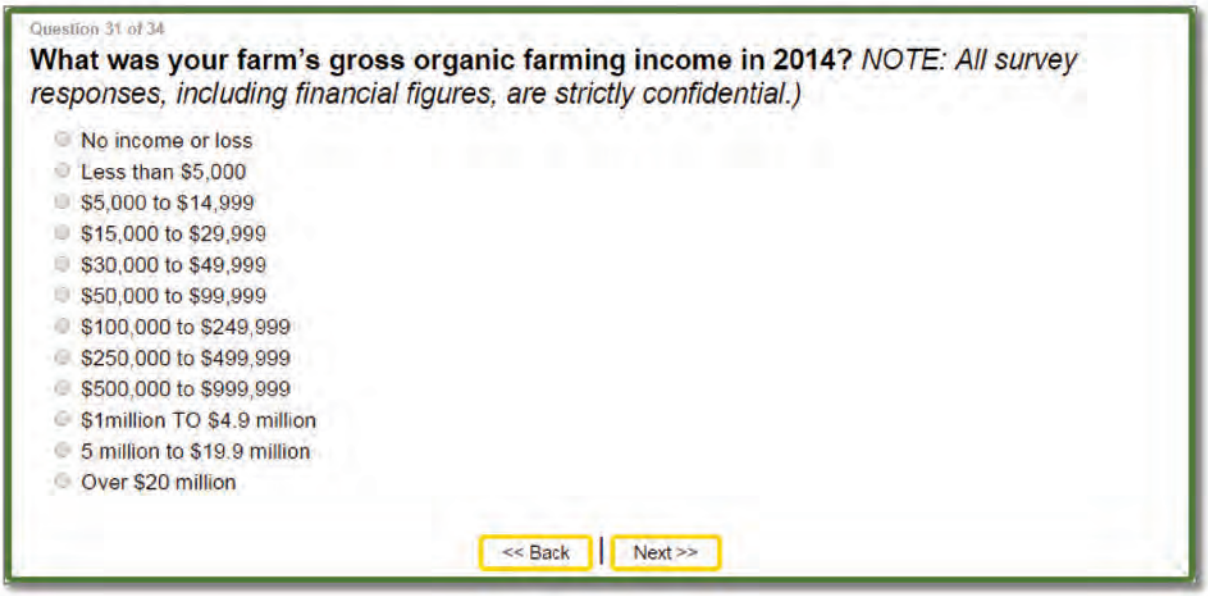
Question 31 of 34
What was your farm's gross organic farming income in 2014? NOTE: All survey responses, including financial figures, are strictly confidential.)
No income or loss
Less than $5,000
$5,000 to $14,999
$15,000 to $29,999
$30,000 to $49,999
$50,000 to $99,999
$100,000 to $249,999
$250,000 to $499,999
$500,000 to $999,999
$1million TO $4.9 million
5 million to $19.9 million
Over $20 million
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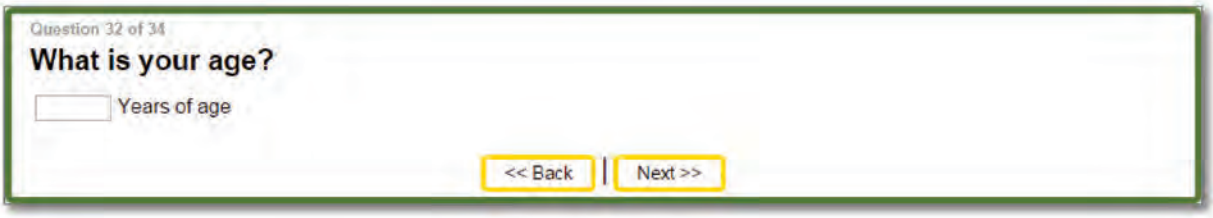
Question 32 of 34
What is your age?
Years of age
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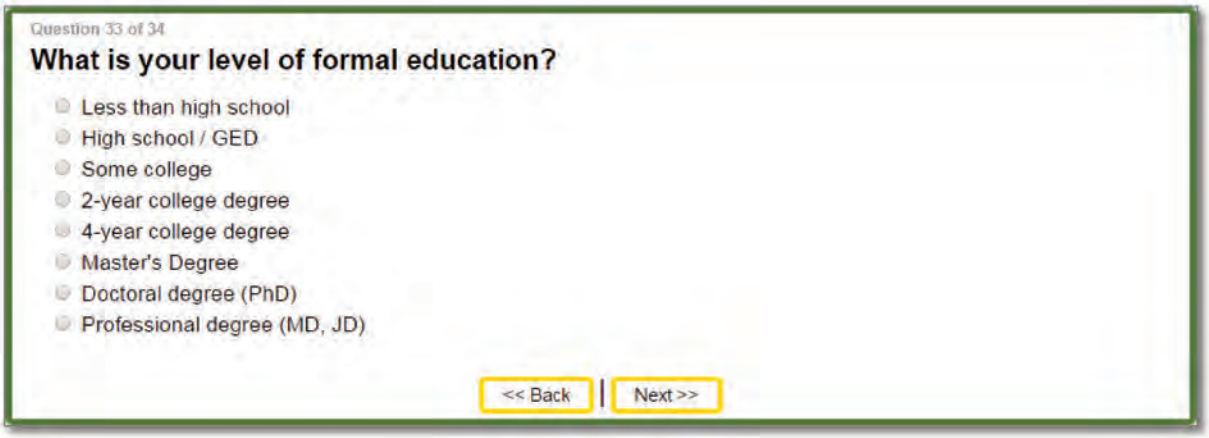
Question 33 of 34
What is your level of formal education?
Less than high school
High school / GED
Some college
2-year college degree
4-year college degree
Master's Degree
Doctoral degree (PhD)
Professional degree (MD, JD)
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Question 34 of 34
Are you . . .
Male
Female
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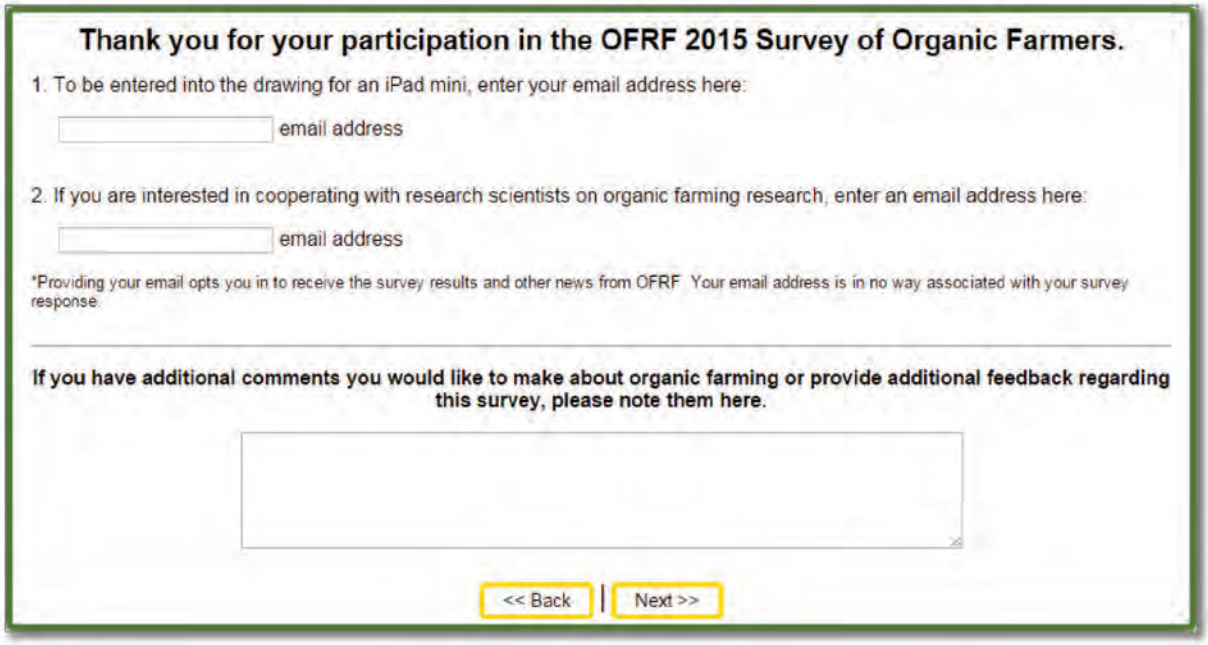
Thank you for your participation in the OFRF 2015 Survey of Organic Farmers.
1. To be entered into the drawing for an iPad mini, enter your email address here:
email address
2. If you are interested in cooperating with research scientists on organic farming research, enter an email address here:
email address
*Providing your email opts you in to receive the survey results and other news from OFRF. Your email address is in no way associated with your survey response.
If you have additional comments you would like to make about organic farming or provide additional feedback regarding this survey, please note them here.
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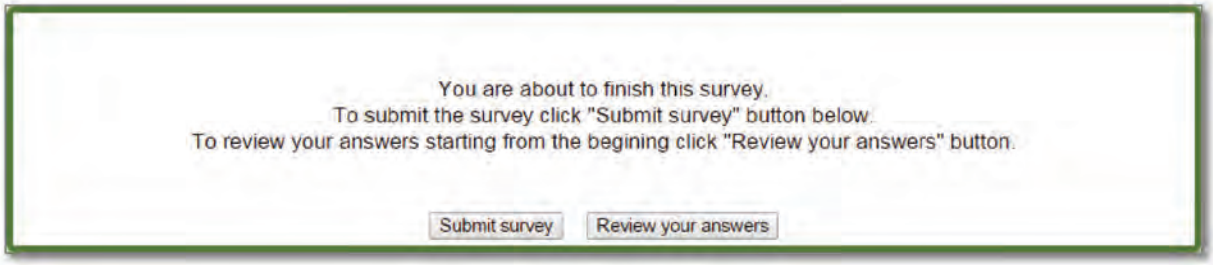
You are about to finish this survey.
To submit the survey click "Submit survey" button below.
To review your answers starting from the begining click "Review your answers" button.
Submit survey
Review your answers