

Organic Innovation

Shaping the Continuous Improvement of Organic



Swette Center for Sustainable Food Systems, Arizona State University

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Introduction

Organic continues to be one of the fastest growing sectors in the United States. In 2019, both food and non-food markets set new records, with organic foods surpassing \$50 billion in sales, up 4.6 percent, and non-food organic sales surpassing \$5 billion, up 9.2 percent over the previous year. Both subsectors easily outpaced the general market growth rate of around two percent.¹ While growth is strong, the industry faces a number of challenges including consumer confusion around what organic means, input and product shortages in organic supply chains, concern about premium-priced products during times of economic hardship, competition from new environmental labels, and the perception by some that current National Organic Program (NOP) rules are limiting further growth and innovation that has been achieved in other markets. In order to uncover opportunities to address these challenges, this research project aims to look at what innovation means in the context of organics and identify specific areas that are ripe for industry leadership.

To get a sense of current industry perspective on the topic of innovation, a survey of organic industry stakeholders was conducted. Results of the survey indicate that there are wide and differing opinions regarding the state of innovation in organic and what innovation means to different respondents and sectors of the industry. When asked to provide feedback on the top challenges facing the organic industry, organic fraud and standards enforcement was a top concern as well as consumer knowledge about the benefits of organics. Participants saw the most opportunity for innovation in consumer education, crop production and NOP standards. Regarding innovations that have had the greatest impact on the industry over the last 10 years, many noted there has been a significant improvement in inputs (seeds, biologicals, applications) and practices as well as consumer education and shared knowledge, pointing to the fact that while improvements have been made, there is more work to do in this area.

Against this background a compilation of opportunities for organic innovation - what we refer to as the organic innovation catalogue - and deep dives on specific opportunities that may be of interest for the Organic Trade Association, or others, to pursue as distinct initiatives are present herein. Based on our analysis and the feedback received from survey participants, we also propose the following prevailing definition for “organic innovation” for consideration: The development and evolution of tools, processes, and standards that enable a culture of innovation across all sectors of the organic industry to meet increasing demands from the environment, consumers, and global markets while

¹ Organic Trade Association. COVID-19 will shape organic industry in 2020 after banner year in 2019. June 9, 2020. <https://ota.com/news/press-releases/21328>

protecting the integrity of USDA organic label and in keeping with the spirit of National Organic Program.

This year marks 30 years since enactment of the Organic Foods Production Act. We hope the information and ideas within will help spur innovation that will help shape the next 30 years to come.

Survey

Methodology

Data was collected through a Qualtrics survey for this study. The survey was designed by ASU graduate students to capture insights from survey participants on challenges facing the organic industry, where organic has the biggest opportunity to innovate, what innovations have had the greatest impact on the organic industry and the future of organic innovation. The following questions were included in the survey:

- What is your relationship to the organic industry? (multiple choice)
- Please list what you consider to be the top three biggest challenges facing the organic industry. (fill in the blank)
- In what areas do you think the organic industry has the most opportunity to innovate? (top three choices)
- What innovation(s) has/have had the biggest positive impact on organics in the last 10 years? (long response)
- What is one innovative idea that has the potential to transform organics? (long response)
- How would you define innovation in the context of organics? (long response)

Before starting the survey, participants were required to agree to participate by signing a consent form.

Survey participants were identified with the assistance of the Organic Trade Association, Kathleen Merrigan, Deb Eschmeyer, and Adam Warthesen of Organic Valley. The goal was to obtain diverse representation from organic industry stakeholders spanning the entire value chain. Personalized survey email links were sent to 319 participants and anonymous survey links were sent out to an additional 50 participants for a total of 369 participants. The survey was open from July 23, 2020 to August 6, 2020 during which time 81 participants (22%) submitted responses.

Participants invited via email were sent two additional email reminders to fill out the survey.

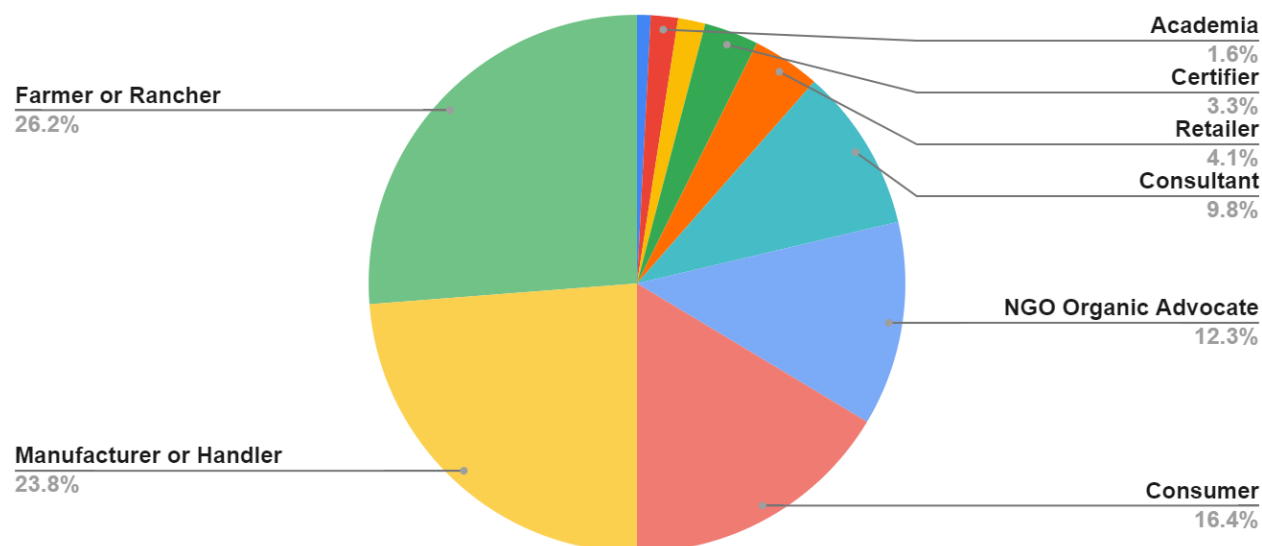
During the first day the survey was available, there was an issue with questions 1 and 2: “Please list what you consider to be the top three biggest challenges facing the organic industry.” and “What is your relationship to the organic industry? (select all that apply)” For question 1, participants could only select 1 answer and not multiple. For question 2, the survey was set up to only allow 1 response to this question instead of 3. These issues were resolved quickly, but if participants had started the survey before the issue was resolved their personal link would only direct them to the old survey, not the corrected version.

Collected data was analyzed by the authors.

Analysis

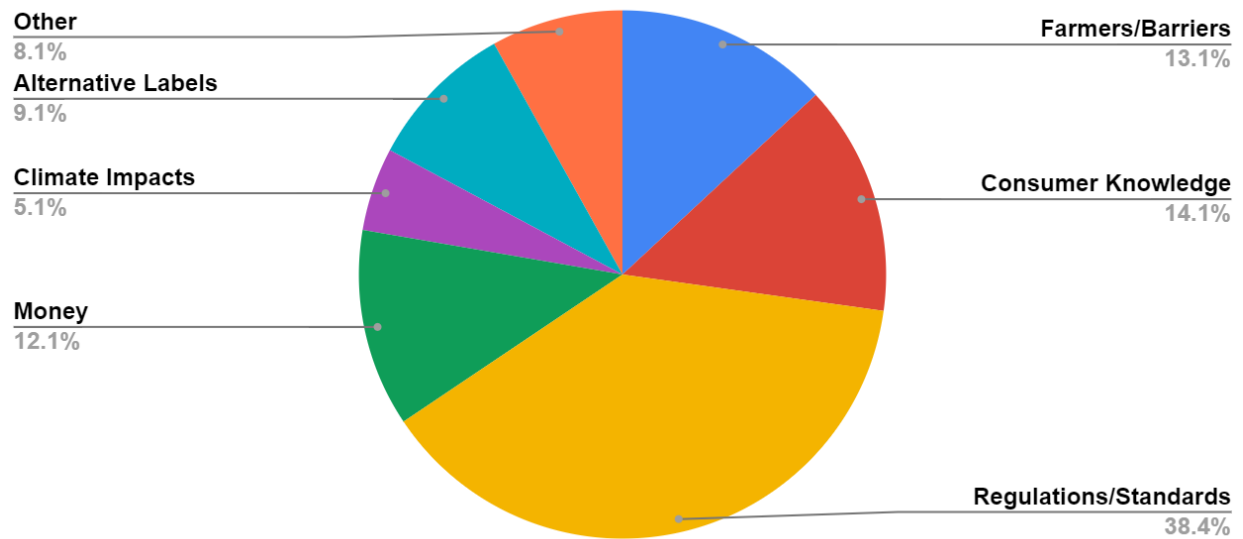
Question 1

The first question of the survey asked, “What is your relationship to the organic industry? (Please select all that apply.)” There were 81 responses to this question, 28 respondents indicated that they had multiple relationships to the industry. If a respondent selected multiple affiliations, each was counted as one. Every response was given the same weight and the distribution is represented in the following graph.



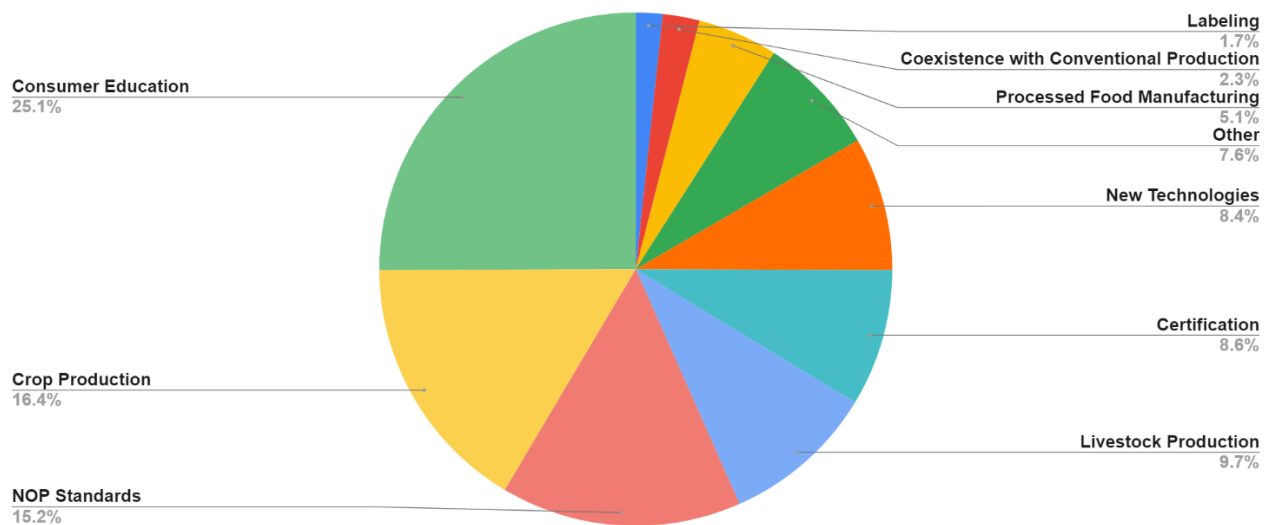
Question 2

This question asked, “Please list what you consider to be the top three biggest challenges facing the organic industry?” Most respondents only replied with one response therefore each response was given the same weight. The responses generally fell into one of seven categories: barriers to farmers directly, consumer knowledge, regulations/standards enforcement, money, alternative labels, climate impacts and “other”. The overall consensus was that organic fraud and standards enforcement was a top concern as well as consumer knowledge about the benefits of organics.



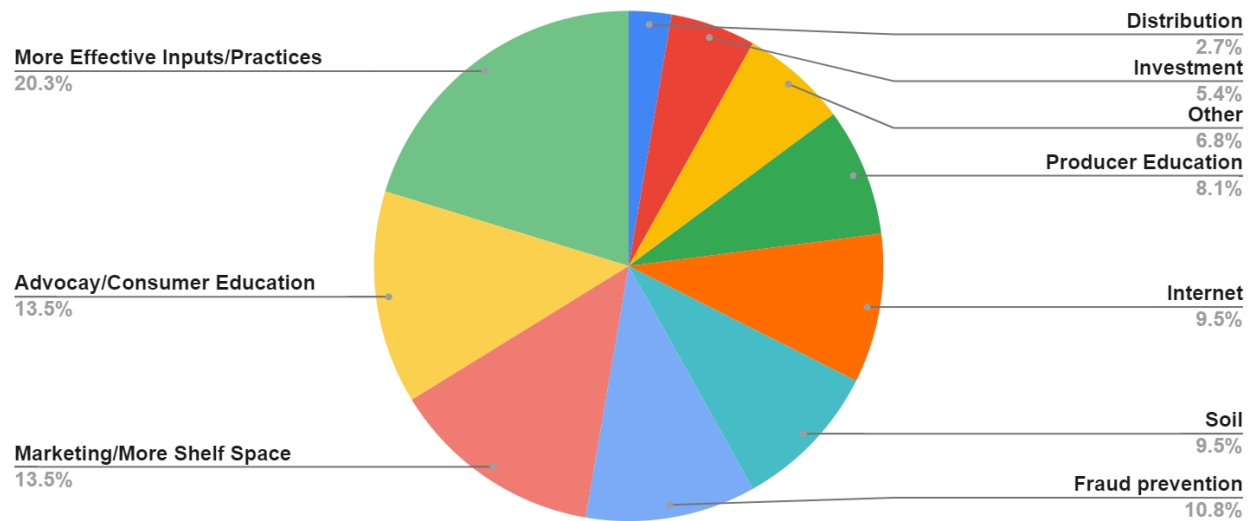
Question 3

This question asked, “In what areas do you think the organic industry has the most opportunity to innovate? (Please rank your top three choices 1-3)” There were 81 responses to this question. Responses were weighted for this dataset. A response of 1 was valued at 3 and a response of 3 was valued at 1. Participants saw the most opportunity for innovation in “Consumer Education” (25.05%) and the least opportunity for innovation in “Labeling” (1.68%). 7.6% of respondents selected “Other” with answers ranging from organic fiber processing to ecosystems services.



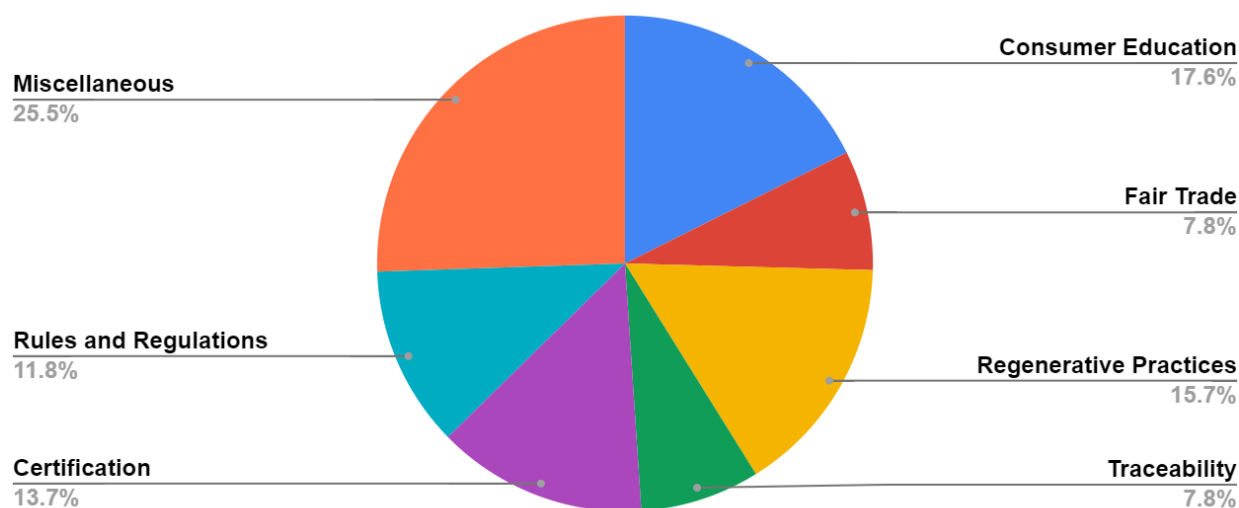
Question 4

This question asked, "What innovation(s) has/have had the biggest positive impact on organics in the last 10 years?". This was a free text question and respondents could submit multiple answers. 62 participants responded to this question. Answers were divided and then categorized. Some participants chose not to respond to this question and others answered but were not sure of what to answer. According to participants, there has been a significant improvement in the inputs (seeds, biologicals, applications) and practices over the last ten years. Education of consumers and shared knowledge within the industry was also an area that saw significant innovation.



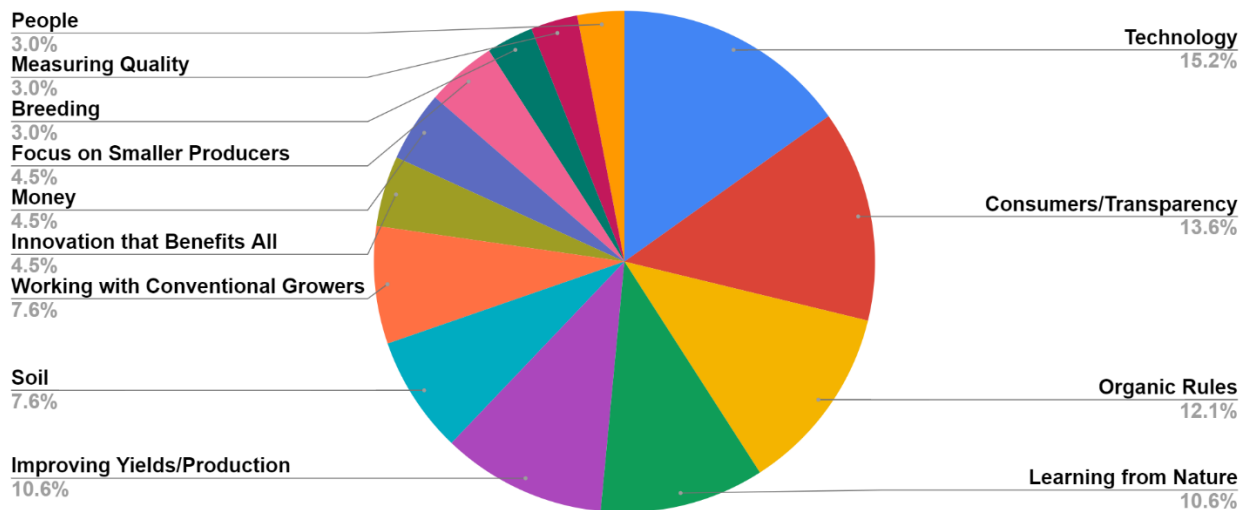
Question 5

This question asked, “What is one innovative idea that has the potential to transform organics?” Participants responded by free text to the survey question. Each response was scored 1 point. Responses generally fell into the following 7 categories: Consumer education, fair trade, certification, rules and regulations, regenerative practices, traceability and miscellaneous. Respondents reported consumer education as key to the adoption of organics for personal health, the health of the environment and climate change. The regenerative category included responses that specifically used the term “regenerative” in reference to either certification or practice, such as no till, climate change or crop rotations. This category could have also been interpreted or categorized as consumer and farmer education to inform the adoption of organics. However, the distinguishing factor was the reference to the term “regenerative” in practice or certification. The fair-trade category included issues regarding labor, pay and equity as separate from certification. Under the certification category, there was specific reference to adding fair trade to the USDA organic label. Other certification responses included transition support for obtaining USDA organic certification. Rules and regulations generally spoke to accountability and compliance. Traceability also included the importance of tracking for compliance and supply chain communication. The miscellaneous category included incentives to producers for environmental services, true cost accounting, government incentives separate from certification label, robotics, and open source technology.



Question 6

This question was a free response and asked, “How would you define innovation in the context of organics?” There were 69 responses to this question. The responses were sorted into the 13 topics represented in the graph. Responses were wide ranging, but the topics with the most responses were tech, consumer education/transparency, and changes/strengthening organic standards. Five respondents' answers involved working with/learning from the conventional industry. One participant thought, “Long term, if organic is able to change conventional ag, such that it becomes harder to distinguish between the two (because conventional ag gets better), that would be a win in many ways.” Other participants thought innovation was an overused word and led to tunnel vision. They thought invention and reinvention were more salient terms for organic ambition.



Organic Innovation Catalogue

As we approach the 30th anniversary of the Organic Foods Production Act, we see an organic industry that has yet to meet its promise and full potential. The USDA National Organic Program Organic label is unique in that it provides the only nationally regulated standard with annual oversight and government enforcement. We gathered feedback from industry stakeholders asking questions including: As the market matures, what does innovation mean in the organic sector? What players are involved in crafting the future of organic? What opportunities exist to further organic? The Organic Innovation Catalogue showcases opportunities for innovation in organic followed by four research briefs detailing specific areas to advance the organic sector.

Allowance for Insect Protein under the NOP

There is an increasing need for more sustainable and renewable sources of high-quality protein to support human nutrition as well as feed for livestock and fish production. Edible insects are a source of high-quality protein as well as essential vitamins and amino acids and have many environmental benefits as compared to other traditional animal-based protein sources. Insects have a high food conversion rate, e.g. crickets need six times less feed than cattle, four times less than sheep, and twice less than pigs and broiler chickens to produce the same amount of protein. Besides, they emit less greenhouse gases and ammonia than conventional livestock. Insects can also be grown on organic waste. For these reasons, insects are a promising potential source for the production of protein, either for direct human consumption, or indirectly in recomposed foods (with extracted protein from insects); and as a protein source for feedstock mixtures. (Source: FAO). There are no insect proteins that are currently allowed for either food or feed uses under the NOP. Given the many health and environmental benefits associated with insect protein, further consideration should be given to this ingredient for use in certified organic products. This could be a mechanism by which OTA could further contribute not only to organic innovation but improve the sustainability of the broader food system. Additionally, this could lead to an opportunity for OTA to bring in new membership from this new sector of the industry.

Supporting NOSB Adoption of an Alternative to EPA List 3 / 4

Pesticides are critical for the production of food, feed, and fiber and those allowed for use under the NOP are currently allowed based on the use of active and inert ingredients that were previously authorized under EPA's List 3 / 4 (minimum risk active / inert ingredients allowed in pesticide formulations). However, EPA no longer utilizes these lists and has since moved to recognize minimum risk ingredients under EPA's Safer Choice Program. After years of discussions between the EPA, NOP, and the

National Organic Standards Board (NOSB), the NOSB issued a proposal in 2015 to revise the listing for inert ingredients at §205.601(m) and §205.603(e) to remove the outdated and obsolete references to EPA Lists 3 and 4, and replace with EPA's current mechanisms for approving the least-toxic ingredients. Adoption of the recommendation is still not final but is up for review this year as EPA List 4 is up for sunset review. At the 2020 NOSB Spring Meeting, NOSB requested comments on a number of questions related to the adoption of the 2015 NOSB proposal (see OTA comments attached separately, in email). OTA has been highly engaged in this discussion and has provide detailed feedback to the NOSB. There may be an opportunity to help bring additional analysis on the impact that the delay in resolving this issue is having on the organic industry, the environment, and the ability of producers to increase the sustainability of their operations to push the discussion forward at the 2020 NOSB Fall Meeting.

Leveraging Robotics to Increase the Efficiency of Organic Production

New robotic technologies are increasingly being developed for agriculture applications and have shown promise in reducing the amount of agriculture inputs needed by targeting applications and doses based on in-field conditions; allowing producers to monitor and better collect data on what's happening in their fields and herds; and increasing the productivity of operations of all sizes. Some examples of new technologies are outlined here, illustrating an exciting new way for organic growers to improve the efficiency of their operations. OTA has an opportunity to take a leadership position by partnering with robotics companies to pilot a use case(s) for the use of robotics in organic applications. To support this, OTA would want to begin with an analysis of available robotics technologies and their potential usefulness in organic production and organic systems plans. The analysis would also take into consideration the environmental and sustainability benefits of leveraging these technologies. OTA members could be engaged to participate in a pilot of these technologies in their own operations which would then serve as a test case to collect data and could serve as a model for future adoption.

Reducing Plastics in Organic Production

Organic producers are increasingly looking for ways to reduce the use of plastics in their operations, particularly when it comes to packaging (Source: Organic Report, Official Magazine of OTA). In addition to packaging, there are many other uses of plastics employed by organic producers, including use of plastic pots, plastic ground covers, and more (Source: NPR). While there are some natural alternatives available such as straw and paper, they are often too costly, labor-intensive, or simply do not meet the specific needs of many growers. Some have pointed to biodegradables inputs, such as

biodegradable plastic mulches, as a solution; but there are currently none allowed under the NOP and there have been ongoing questions related to their impact on soil health. OTA has an opportunity to take a leadership role in identifying and / or developing alternative solutions to the use of plastics in organic production. OTA members could be engaged to participate in a pilot of these technologies in their own operations which would then serve as a test case to collect data and could serve as a model for future adoption.

Reducing Food Waste in Organic Operations

Somewhere between 30 to 40 percent of the United States' food supply is wasted and an estimated 11.1 percent of U.S. households were food insecure at least some time during the year in 2018, meaning they lacked access to enough food for an active, healthy life for all household members (Source: ERS). Globally, one third of the food produced each year—approximately 1.3 billion tons—gets lost or wasted (Source: FAO), which is more than enough food to take care of the approximately 821 million people who suffer from hunger worldwide (Source: Hunger News). As interest in reducing food waste increases, OTA has an opportunity to be a leader in identifying and highlighting opportunities for the organic industry to address food loss and waste in organic operations and their associated supply chains. For example, by identifying mechanisms for growers to reduce food waste in their operations, highlighting successful solutions, and helping growers partner with food loss and waste organizations to increase the role of the organic community in this space. There may also be an opportunity for organic growers to obtain government incentives for these efforts.

Bridging the GAP between Conventional and Organic

Due to the diversity in farming operations and the ever-increasing need for producers to have a variety of tools in their toolbox to address increasing market demands and challenges related to climate change, all production methods should be leveraged to ensure we can build a more sustainable and abundant food system. Many OTA members have products and operations that span both conventional and organic production systems, although historically there has been very little overlap between the two “sides” to develop solutions to address the increasing complexity of producing food, feed, and fiber – solutions that can be employed by BOTH conventional and organic growers. OTA has an opportunity to identify opportunities for the conventional and organic industry to partner so that best practices and technologies may be shared to lead to more holistic solutions.

Organic and conventional growers alike are exploring more sustainable solutions to increase the resiliency of their operations. For example, perhaps a grower that utilizes

genetically engineered seed to reduce the use of pesticides in their operations, may be interested in replacing other inputs used with those allowed under the NOP. While this grower's operation would still be conventional, the inputs they use would support the adoption of products developed by the organic industry. Similarly, an organic grower, may be interested in testing approaches that are utilized by the conventional industry, but still allowed under the NOP.

Incentives for Buyers to Help Suppliers Transition to Organic

The U.S. organic food market surpassed \$45 billion in sales in 2017, according to OTA, a six percent increase over the prior year and more than double the sales a decade ago. Organic acreage in the U.S. increased by 20 percent between 2011 and 2018, according to Mercaris, and now totals over 5 million acres of land, but that amounts to less than one percent of the country's total farmland. As demand for organic food is outpacing production capability, buyers of organic products (many of whom are OTA members), have a role and an opportunity to help transition their supply base from conventional to organic farming. As the leading trade association for the organic industry, OTA can help shape a path to change organic policy that would provide incentives for companies who dedicate resources to supporting the transition of their supply base from conventional to organic production – increasing the amount of organic producers and supporting the adoption of organic across the industry.

Digital Initiatives to Improve Understanding and Adoption of Organic

Despite concerted efforts by USDA AMS, OTA, and other organizations representing the organic industry there continues to be ongoing consumer confusion around what organic really means, and the benefits of organic production to a sustainable food system. In some cases, this lack of understanding and confusion is acting as a barrier to adoption. Most purchase decisions are made in the store, and consumers are increasingly demanding information and transparency to make more informed purchasing decisions. The organic industry, led by OTA, has an opportunity to create a platform that would allow producers and retailers of organic goods who wish to participate to track information related to the benefits of their products which would be accessible to consumers online or via on pack resources (e.g., Quick Response (QR) Code). While some larger producers / retailers have made their own efforts at highlighting the benefits of their products, the focus has been on the specific producer / retailer rather than the benefits of organic as a production method itself. As a marketing advantage, this resource may also bring new members to OTA who are interested in utilizing such a resource.

Organic Certification for Food Service Providers

A large percentage of produce sales in the United States are to restaurants and other food service providers. The integrity of the organic label is lost without a certification for these food service providers. Food service providers that use organic produce sometimes let their customers know through advertising and transparency of sourcing, but having the USDA organic label would add integrity to these statements.

Multiple Modalities for Organic Certification

The traditional organic certification process is a challenge for some organic producers and manufacturers. This creates a barrier for some producers and limits the number of certified operations and depth of the industry. A number of ideas have been proposed to address this issue including: alternatives to a written organic system plan, virtual inspections, and inspections every other year. If the organic industry adopted these practices more operations could be certified and the industry would have more members.

Organic Industry Research within and Outside of Land Grant Universities

Land grant universities have traditionally provided a good deal of research within the agriculture industry, but most of this research has focused on traditional farming practices. Agriculture and horticulture departments often devote very little funding to organic research. Traditional innovation can apply to the organic industry, but more specific research around the industry would lead to more innovation. Additionally, more research institutes like Rodale can conduct research and push the organic industry forward.

Education Commitment to Local Schools from Certified Farms

Connecting students to the soil and food at a young age helps them form a lifelong relationship with it. Who better to educate students about food than the farmers who grow it? This proposed add on to organic certification would require certified farms within 10 miles of a school to provide educational opportunities to that school. This could include field trips, teacher days on the farm, or a school visit from a farmer. The farm would have to be open to the idea of providing these opportunities, but schools would still need to work with the farm. The next generation needs to understand the importance of good farmers who care about the soil and the food they grow.

Consolidation of Newer Labels into USDA Organic Certification

In recent years many new labels have appeared to let consumers know how their food was grown. These labels include Regenerative Organic and Real Organic, among others. Each has its own set of principles and helps inform the consumer. These labels start with organic as a baseline and move beyond what is currently required by the NOP. Organic is all about continuous improvement and innovation and that is what these new labels are doing. There may be a way to incorporate these new ideas into the existing USDA Organic label with a tiered system. Consumers would recognize the USDA label and be able to tell how “sustainable” the operation is based on the color of the seal.

Equity, Diversity, and Inclusion as Part of the Organic Label

This is a really pressing issue at the moment that organizations and businesses across the country are spending time and money thinking about. It is the right thing to do and the organic industry could set an example for the rest of the food industry. Practices to adopt could include: a section of the OSP that depicts hiring practices, credit to the original stewards of the land, and practices that give back to the community that operations call home.

Water Usage Standard

Water levels are becoming increasingly scarce and most agriculture operations are a main user of groundwater, approximately 80% of the nation’s total usage according to USDA. Ensuring water conservation and best water usage practices may help conserve groundwater. The organic industry could lead new standards on water usage practices. Some examples of ways farms can conserve water include: drip irrigation, capturing and storing water (ex. rain barrels), using mulch and/or water recycling.

Deep Dive - Digital Education for Consumers in Organics

Summary

The USDA National Organic Program (NOP) has been the regulatory gold standard for integrity in organics since its inception in 2000.² Recent actions by the NOP including the allowance of soil-less systems and the removal of improvements in animal welfare have caused some industry stakeholders to question the strength of the USDA Organic label.³ Industry members have also expressed concern that fraudulent imported goods bearing the USDA Organic label lack quality control and further threaten the U.S. supply chain and economy.⁴ A growing movement of disenfranchised members of the organic industry are demanding higher standards and accountability. Add-on labels with a minimum requirement of USDA organic certification have been one solution.⁵ However, this is creating consumer confusion in the marketplace, which may act as a barrier to adoption.⁶ Information and communication technology are easily accessible. Transparency and information are becoming fundamental expectations of consumers in the marketplace today. An opportunity exists for a technology-based industry standard platform to seamlessly educate consumers on the benefits of organics at the point of purchase. Industry stakeholders must work together to protect the future of organics and maintain the integrity of the organic label.

Background

The USDA NOP Organic label is unique in that it provides the only nationally regulated standard with annual oversight and government enforcement. According to the USDA, there were 27,494 Organic Certified operations nationwide in 2018.⁷ Organic sales reached 55.1 billion dollars in food and non-food items in 2019, which is a 5 percent increase over the previous year.⁸ The COVID 19 pandemic certainly brings

²Guidance & Instructions for Accredited Certifying Agents & Certified Operations. Guidance & Instructions for Accredited Certifying Agents & Certified Operations | Agricultural Marketing Service. USDA Agricultural Marketing Service. www.ams.usda.gov/rules-regulations/organic/handbook.

³ Reguzzoni, Arianna. What Does the New Regenerative Organic Certification Mean for the Future of Good Food? Civil Eats, October, 28, 2019. civileats.com/2018/03/12/what-does-the-new-regenerative-organic-certification-mean-for-the-future-of-good-food/.

⁴ Whoriskey, Peter. USDA Officials Said They Were Guarding against Organic Food Fraud. Congress Decided They Need Help. The Washington Post, WP Company. December 20, 2018. www.washingtonpost.com/business/2018/12/20/usda-officials-said-they-were-guarding-against-organic-food-fraud-congress-decided-they-need-help/.

⁵ The Rallies to Protect Organic. Cornucopia Institute/The Rallies to Protect Organic. www.cornucopia.org/2018/03/organic-farmers-protest-usdas-attempts-redefine-organic/.

⁶ Beaumont, Warren. Regenerative Organic Certification, Complementary or Creating Confusion?. Organic & Wellness News, January 25, 2019. www.organicwellnessnews.com/?ArticleID=883.

⁷ USDA Certified Organic Operations for 2018. USDA Agricultural Marketing Service. June 19, 2019. content.govdelivery.com/accounts/USDAAMS/bulletins/2427392.

⁸ Organic Trade Association. COVID-19 Will Shape Organic Industry in 2020 after Banner Year in 2019. GlobeNewswire News Room. June 9, 2020. www.globenewswire.com/news-release/2020/06/09/2045936/0/en/COVID-19-will-shape-organic-industry-in-2020-after-banner-year-in-2019.html.

unprecedented and uncertain times. However, consumers may consider health and wellness a top priority given the current environment. The Organic Produce Network reported a 22 percent increase in organic produce sales in March this year compared to last year.⁹ In addition, the flash poll conducted by OTA in April/May, 2020 revealed that more than 90 percent of 3,188 surveyed considered organic purchasing more important now than ever, which further corroborates an exceptional opportunity. The OTA is well positioned to engage industry stakeholders and strengthen collaborations to create a niche in the marketplace. This will allow direct consumer education to differentiate the organic label at the point of purchase.

In addition to the transparency requirements of the USDA organic label, the “one step forward, one step back” bioterrorism guidelines of the Food Safety and Modernization Act (FSMA) of 2011 opened the door for advances in electronic traceability programs. The overhaul addressed transparency across the entire supply chain. Technologies such as Blockchain and HarvestMark offer real time “end to end” traceability and quality management data, which can inform consumers about where their food comes from, farm/farmer highlights, organic practices, nutritional information and recipes.¹⁰ This technology has the capability to seamlessly integrate an industry standard in the USDA Organic label for consumer education and feedback.

Future Innovation

Representing over 9,500 organizations across the 50 states, the OTA is well positioned to lead in an industry standard technology-based consumer education platform to differentiate the organic label in the marketplace. “End to end” traceability and quality management platforms currently exist and have the capabilities to inform consumers about the benefits of adopting organics. This proposal recommends a multi-pronged approach to consumer education that includes a marketing awareness campaign and unique QR code system at the point of purchase. The campaign will serve the purpose of bringing awareness and driving consumers to the unique QR code in store.

Consumers can utilize the camera feature on their smartphones to scan the QR code, which will direct them to a universal platform that can be used to provide consumer education on USDA organic products. Regardless of where the platform is housed, the QR code eliminates the extra step of having to manually enter a web address. A good entry point to focus is on raw, organic produce. Produce is generally the starting point to purchasing organic and is considered the “star” of the industry with sales reaching 18

⁹ Lutz, Steve. Organic Produce Sales Jump 22% in March; Up 8% in Q1. Organic Produce Network. April 16, 2020, www.organicproducenetwork.com/article/1042/organic-produce-sales-jump-22-in-march-up-8-in-q1.

¹⁰ Harvest Mark Traceability. HarvestMark Traceability, Institute of Food Technologists, June 26, 2019. www.youtube.com/watch?v=blROTDnoHbY.

billion in 2019.¹¹ As companies such as General Mills and Cascadian Farms focus on regenerative agriculture and environmental stewardship, perhaps there will be improved traceability for commodity organics to expand this technology to more packaged USDA organic foods.¹²

OTA has an impressive amount of content on the website. This proposal recommends utilizing existing infographics, data, video and written content separated into engaging, digestible chunks of information to tell the story of why the USDA Organic label is the gold standard in the industry. This education has the potential to clear up misconceptions and bring relevancy and meaning to the organic label for consumers.

Part 1: Start with the Why and Highlight the Label- This is the Campaign

- Focus on USDA Organic as the only nationally regulated and enforced standard *-this will build consumer trust.*
- Highlight data and information that supports what is regulated, how it is regulated and why it matters. Your, "Not in Organic" video serves as a great "why" example that uses a hook to engage the consumer.¹³

Part 2: The What, So What and Now What? – Consumer Education at Point of Purchase

First know your consumer, then:

- Reflection* -What matters to consumers and how does the USDA Organic label support this?
- Reflection*- How can I take existing content and make this education as engaging, meaningful and relevant as possible?
- *Do* -Keep it short, simple and multi- sensory. The OTA resource Myth-busting is a great resource to adapt for technology based applications. An additional quick brainstorm of primary concepts includes;
 - Know your farmer (highlight organic practices)
 - Food origin, history and food systems (Trace route from farm to fork map highlighting trust in traceability)
 - Nutrition, soil health and recipes (highlight health benefits of growing in organic versus non-organic)

¹¹ Organic Trade Association. COVID-19 Will Shape Organic Industry in 2020 after Banner Year in 2019. GlobeNewswire News Room. June 9, 2020. www.globenewswire.com/news-release/2020/06/09/2045936/0/en/COVID-19-will-shape-organic-industry-in-2020-after-banner-year-in-2019.html.

¹² Pera, Rob, et al. General Mills Brings Kinetic Energy to Regenerative Ag. Food Tank. April 24, 2019. foodtank.com/news/2019/04/general-mills-brings-kinetic-energy-to-regenerative-ag-says-carla-vernon/.

¹³ Organic Trade Association. Organic Trade Association "Not in Organic" Campaign. YouTube. October 3, 2018. <https://www.youtube.com/watch?v=oM-vxcF60IE&feature=youtu.be>

- Climate, seasonality and greenhouse gas emissions (climate connections to organics)
- Water, conservation, environment, biodiversity, animal welfare (healthy ecosystems)
- Composting and food waste¹⁴

-Reflection- Does this information close the gaps in consumer education and do these concepts highlight and differentiate USDA Organic label as the gold standard? Ultimately, does this change consumer behavior?

Potential objections

Retailers and large producers currently have traceability systems within their private labels for produce and may be solely focused on furthering their own interest. Also, Watchdog organizations and industry members that have invested in add on labels, may push back. However, they still believe the USDA Organic label should be strengthened. And although watchdog organizations criticize the USDA NOP, they suggest consumer education is key to preventing consumer confusion with the proliferation of all the labels.¹⁵ In addition, industry stakeholders in the supply chain that have not embraced technology-based traceability systems may be a barrier to adoption. An open-source industry consumer education platform brings an opportunity to engage potential objectors as allies to focus on common ground within the NOP standards to strengthen the USDA Organic label.

Roadmap to innovation

- Engage stakeholders, members, policymakers and other allies, potential objectors to support different aspects of development and implementation.
- Leverage available resources.
- Work with all members of the industry supply chain to learn and garner support.
- Partner with AMS and/or industry stakeholders to build engaging awareness campaign similar to AMS check-off program (There needs to be a hook to draw consumers to the platform).
- Research traceability software and cloud platforms to determine capabilities of software and work with experts to further develop this technology.
- Develop and adapt available content for platform.
- Promote, pilot and solicit feedback.
- Launch, collect data, measure effectiveness and repeat!

¹⁴ Organic Trade Association. Organic Myth-Busting Resources. August 10, 2020. <https://ota.com/organic-101/organic-myth-busting-resources>

¹⁵ Beaumont, Warren. Regenerative Organic Certification, Complementary or Creating Confusion?. Organic & Wellness News. 25 January 2019. www.organicwellnessnews.com/?ArticleID=883.

Deep Dive - Multiple Modalities for Organic Certification

Summary

The traditional organic certification process is a challenge for some organic producers and manufacturers. This creates a barrier for these producers and limits the number of certified operations and depth of the industry. A number of ideas have been proposed to address this issue including: alternatives to a written organic system plan, virtual inspections, and inspections every other year. It is important to balance the ease of certification with the integrity of the USDA Organic label. If the organic industry adopted these practices while maintaining integrity more operations could be certified and the industry would have more diversity.

Background

The organic label has been around for 30 years and there have been few innovations to how certification is performed. Traditional certification consists primarily of an organic systems plan and an on-site inspection. Technology and the number of certified farms has changed dramatically since the first operations were certified and it is time to rethink certification. As the “Strengthening Organic Enforcement” proposed rule receives comments, now is perfect time to workshop other certification changes.¹⁶

Future Innovations

There are a few ways to think about innovation in the certification process. In 2013 the Accredited Certifiers Association proposed several ideas to rethink the organic system plan.¹⁷ These “Sound and Sensible” examples were organized into three categories: Organic System Plan, Education of / Consulting with Organic Operations, and Focus on Compliance. Notable ideas from these categories included allowing OSP updates electronically and an emphasis on observation of practices over inspection forms. As we move more into an electronic age, data is being kept on computers and can be updated much more easily electronically than with paper copies. Although this is becoming the norm, some members of the organic industry may find it easier to update paper forms or simply have a conversation with their certifier about their practices. As long as these conversations and practices are documented they can uphold just as much integrity as a traditional OSP. Although the new proposed rule clarifies the need to only update practices annually, these alternative updating methods would be more inclusive.

¹⁶ National Organic Program; Strengthening Organic Enforcement. 85 FR 47536. August 5, 2020. To be codified as 7 CFR 205.

¹⁷ Accredited Certifiers Association. “A Roadmap to “Sound and Sensible”. 25 March 2013

https://www.accreditedcertifiers.org/wp-content/uploads/2017/09/Road-Map-to-Sound-and-Sensible-3.2013_Final.pdf

Now, more than ever the world is becoming virtual. Many organizations and agencies are finding ways to navigate in the virtual world. For example, the United State Coast Guard has been performing virtual ship inspections during the current global health pandemic.¹⁸ Although nothing can compare to an in person inspection, virtual organic inspections may be a way to have certifiers work with farmers and producers more often. The real estate industry and developers are using technology from companies like Avatour to facilitate virtual tours and inspections of properties.¹⁹ When technologically feasible, virtual inspections could replace on farm inspections or take the place of unannounced inspections. Virtual inspections could prove particularly useful when more companies in the organic supply chain are included in certification. It might be just as effective to perform a virtual inspection with these new members, like shippers. In addition, this added demand of certifications could be supplemented with the use of virtual inspections. The model for virtual inspections could even match the model for unannounced visits, where 5% of sites are randomly selected for virtual inspections. There needs to be a balance between ease and integrity.

Oftentimes farms and other organic operations do not change significantly year to year. If an operation does not have any significant changes perhaps on-site certification can happen every other year, instead of annually. Alternatively, every other year could be a virtual inspection. If certification pricing was adjusted accordingly, this could save operations money. It might be best for the operations that receive virtual inspections to be selected as part of 5% of operations that receive unannounced visits.

Potential Objections

The organic industry relies on consumer trust of the USDA organic label. There is a potential for fraud in this system just as there already exists in the current system. Fraud is on the minds of many in the industry as the new AMS proposed rule, “Strengthening Organic Enforcement”. Organic fraud can be committed by the large international producers, small domestic producers, and everyone in between. In 2019, according to the AMS Organic Oversight and Enforcement Update, 722 operations lost their certification through suspension or revocation with the main areas of domestic concern being grain and dairy.²⁰ Now is a perfect time to rethink certification and the new AMS proposed rule including random inspections would work well with this innovation.

¹⁸ Glass, Pamela. “Coast Guard increases remote Subchapter M inspections”. Work Boat. 7 May 2020. <https://www.workboat.com/news/coastal-inland-waterways/coast-guard-increases-remote-subchapter-m-inspections/>

¹⁹ Avatour. “How it Works”. 14 August 2020. <https://avatour.co/how-it-works/>

²⁰ USDA AMS. “Organic Oversight and Enforcement Update”. February 2020. https://www.ams.usda.gov/sites/default/files/media/NOP_Enforcement_Update_February2020.pdf

Roadmap to Innovation

The first step to broad implementation of this new kind of certification would be a pilot project with at least three diverse certifying agencies. These agencies would be able to work closely with their longtime clients and new clients. After at least a three-year pilot and thorough review of potential fraud, these innovations could be implemented on a larger scale.

Alternatives to a traditional OSP could be piloted as an additional part of the standard OSP. The results of the differing OSPs could then be compared. Virtual inspections could start now and be supplemented with on farm inspections after the pandemic. A pilot of biannual reviews could also start immediately with potential waivers for fall 2020 inspections. A 2021 on-site inspection could be very thoroughly conducted to see if there is a potential for fraud with biannual reviews.

Who Needs to be Engaged?

These innovations would need broad support and piloting to become standards. In order for this to happen stakeholders across the industry would need to be involved including: Accredited Certifiers Association, small and large farmers, manufacturers and handlers, certifying agencies, USDA, and the National Organic Standards Board. The Organic Trade Association should look to other industries that have embraced technology to improve the certification process, while still maintaining the integrity of USDA Organic.

Deep Dive - Reducing Reliance on Plastic

Summary

The use of plastics in the organic industry is widespread given its versatility, its status as an allowed input in organic production and lack of suitable alternatives, as well as the relatively low cost of plastic materials in growing and packaging applications. These factors have resulted in the expanded and widespread use of plastic by organic producers, negatively impacting the environmental footprint of an industry that strives for more sustainable and climate-friendly production practices. At the same time, growers, suppliers and manufacturers are increasingly looking for opportunities to reduce reliance on plastic in their operations. The Organic Trade Association (OTA) is uniquely suited to take a leadership role in identifying and supporting the transition to plastic alternatives by addressing two of the primary areas of plastic use: food packaging, particularly the packaging of fresh produce, and use of plastics for in-field applications.

Background

Organic producers are increasingly looking for ways to reduce the use of plastics in their operations, particularly when it comes to packaging.²¹ In addition to packaging, there are many other uses for plastics in organic, including in growing applications: plastic pots, plastic ground covers, and more.²² While there are natural alternatives available such as straw and paper, they are often too costly, labor-intensive, or simply do not meet the specific needs of many growers. Some have pointed to biodegradable inputs, such as bio-based mulches, as a solution and some countries have even taken steps to authorize more sustainable alternatives; however, none are currently allowed under the National Organic Program (NOP). Ongoing questions related to soil health and alignment with NOP rules have resulted in a proposed listing for these materials to languish for years. It's time for a fresh look at new approaches that will reduce reliance on plastics.

Future Innovations

Packaging for Fresh Fruits and Vegetables

²¹Organic Trade Association. Organic companies explore cutting their use of plastic. March 3, 2020. <https://theorganicreport.com/organic-companies-explore-cutting-their-use-plastic>

²² Held, L. Organic Farming Has A Plastic Problem. One Solution Is Controversial. NPR. June 7, 2019.

<https://www.npr.org/sections/thesalt/2019/06/07/729783773/organic-farming-has-a-plastic-problem-one-solution-is-controversial#:~:text=Live%20Sessions->

[,Organic%20Farms%20Use%20Plastic%20Mulch%20For%20Weed%20Control%3B%201%20Solution,soil%20health%20and%20the%20environment](https://www.npr.org/sections/thesalt/2019/06/07/729783773/organic-farming-has-a-plastic-problem-one-solution-is-controversial#:~:text=Live%20Sessions-,Organic%20Farms%20Use%20Plastic%20Mulch%20For%20Weed%20Control%3B%201%20Solution,soil%20health%20and%20the%20environment)

Plastic packaging aids in the marketing of produce, providing options to differentiate organic from conventional varieties through design and visual markings and also enables the preservation of quality by regulating the atmosphere around produce as it travels through the supply chain. If these two areas could be sufficiently addressed – marketing and postharvest quality – reliance on plastic packaging could be significantly reduced.

- Marketing: Standardized PLU Sticker for USDA Certified Organic Produce: Consumers are increasingly turning to digital channels as a means to make informed purchase decisions. Through the use of Quick Response (QR) codes on Price Look Up (PLU) stickers affixed to bulk produce, consumers can access a wealth of information about products, much more than could be provided on the packaging itself. Working with the NOSB, OTA could propose a universal organic PLU sticker that suppliers could customize with their individual QR codes. The sticker design elements would denote the produce as organic and the QR code would be individualized and linked to a supplier owned landing page that would contain all information that would otherwise be shared on the packaging itself, and more. Consumers would learn to look for the organic PLU sticker through targeted marketing (something USDA AMS may be interested in supporting) and then would access information with the QR code at point of sale.
- Postharvest Quality: Innovations in Packaging Materials: Many new materials are now available to the industry, including 100% reusable and biodegradable cardboard as well as other biomass-based materials.^{23,24} However, the primary challenge to transitioning to these alternatives is cost. Given the size and influence of OTA, it may be possible for OTA to negotiate a contract with packaging suppliers that would reduce the price of these materials for guaranteed purchase volumes for organic producers to pilot in their operations. The contract could be time bound to allow OTA members to trial the packaging in order to evaluate effectiveness and suitability. Interested members would participate in the trial for an additional cost, but less than what they would pay otherwise. Following the pilot, if the producer wanted to transition to the sustainable packaging, the deal would allow them to purchase at a discounted rate. This provides both incentives, as well as opportunity, for producers who may not otherwise take this step to participate and expanded market access for sustainable packaging manufacturers. In addition to packaging material alternatives, new developments in postharvest coating technologies are making it possible to eliminate packaging altogether. For example, Apeel Sciences has

²³ ReadyCycle. Sustainable Packaging. August 10, 2020. <https://www.readycyclepackaging.com/>

²⁴ Braskem. Products. August 10, 2020. <https://www.braskem.com.br/products>

developed an OMRI-Listed, plant-based edible coating that has been shown to double to triple the shelf life of many types of produce without the use of plastic packaging (such as is commonly used for cucumbers, for example). This coating technology is already being used by several OTA members whom OTA may be interested in featuring as companies that are actively taking advantage of these alternative approaches.

Growing and Production

Polyethylene plastic mulch is an important tool for organic producers, and used widely in organic crop production, due to its value in controlling weeds, conserving soil moisture, increasing soil temperature, and improving crop yield and quality. However, polyethylene mulch is typically only used for one growing season before being sent to landfills or burned as a means of disposal at a significant environmental expense.²⁵ While there are current bio-based alternatives available, these alternatives are not currently allowed under existing NOP rules.²⁶ The topic has languished for years due to questions about biodegradability, soil health, and compliance with current standards – concerns that have been previously addressed through public research and industry comment. It seems what is needed is a different approach to encourage the NOSB to take meaningful action to advance recommendations that will allow for the listing of these materials and ultimately make them available to growers.

- Use of Life Cycle Assessments to Drive NOSB Action on Bio-Based Ground Covers: At this time, much of the NOSB's focus on whether or not to allow the use of these materials in organic production is directed at environmental fate and compatibility with organic standards.²⁷ The story that has not been fully told through data, is the ramifications of keeping the status quo. Life cycle assessments (LCA) offer a mechanism for assessing environmental impacts associated with all the stages of an input or product's life cycle.²⁸ Importantly, they can be used to compare different approaches to illustrate the various tradeoffs in environmental impacts that enable informed decision making toward creating a more sustainable food system. To bring a different and fresh perspective on this issue, OTA may consider commissioning an LCA that would compare the use of polyethylene plastic and commercially available bio-based

²⁵ Corbin, A. Cowan, J. Hayes, D. Inglis, D. Miles, C. Moore-Kucera, J. Current and Future Prospects For Biodegradable Plastic Mulch in Certified Organic Production Systems. eOrganic. November 14, 2019

²⁶ Narayan, R. Biodegradable Biobased Mulch Films in Organic Crop Production. Michigan State University. September 2019. <https://eorganic.org/node/8260>

²⁷ Mirenda, J. Crops Subcommittee – Biodegradable Biobased Mulch Film (Discussion Document). Organic Trade Association. April 3, 2020.

<https://www.ams.usda.gov/sites/default/files/media/2019MemoBiobasedMulchReport.pdf>https://ota.com/sites/default/files/indexed_files/OTA_BiodegradableMulch_NOSBspring2020_AMS-NOP-19-0095.pdf

²⁸ Ecochain. Life Cycle Assessment (LCA) – Complete Beginner's Guide. August 10, 2020. <https://ecochain.com/knowledge/life-cycle-assessment-lca-guide/>

alternatives to illustrate the substantial environmental benefits that can be achieved, and conversely the environmental costs of inaction. Several OTA members use this approach in their own operations, including Apeel Sciences which uses LCA to assess the net environmental impacts of their postharvest coating which extends the quality and shelf life of fresh produce.²⁹

Potential Objections

Suppliers of fresh produce use PLU stickers as a method of branding. With limited space, the idea of removing valuable brand identifiers in place of a standardized label, may not be a compelling solution. Current data indicates that consumers are increasingly concerned about foodborne contamination during the COVID-19 pandemic, perhaps making initiatives to push a reduced reliance on plastic packaging less relevant. Additionally, the feasibility and legal complexities of negotiating contracts that would allow for OTA members to trial plastic packaging at a reduced rate, may be too difficult to overcome. Regarding pushing action through the use of LCAs, the NOSB has specific criteria they must meet in order to put forward recommendations that will be allowed under the NOP. While compelling, using LCAs as a means to illustrate sustainability benefits of bio-based mulches and consequences of inaction, may fall outside their scope of consideration.

Roadmap to Innovation

In order for OTA to best utilize its' resources and fully leverage the capability and knowhow of its' diverse membership base, we recommend to utilize a task force approach to develop a strategy to review, evolve, and implement the above recommendations. Interested members would participate on the task force(s) and may even be able to own some of the work within their organizations, e.g., the commissioning of a third-party reviewed LCA. The task force approach will also enable members to help lead in an area that likely aligns with some of their own internal sustainability objectives.

Who Needs to be Engaged?

Interested OTA members to participate on the task force(s) and corresponding pilots; USDA AMS for alignment with standardized PLU Sticker under the NOP; ReadyCycle, Braskem or other sustainable packaging manufacturers to participate in the pilot; Ecochain or other third party with expertise in the commissioning of LCAs.

²⁹ Vieira, J. Life Cycle Assessment of Apeel Produce. Apeel. October 2019. https://apeelsciences.com/LCA/uploads/2019/11/Apeel-LCA_Webpage.pdf

Deep Dive - Water Usage Standard

Summary

Water consumption is a challenge for many agriculture practices due to decreasing water tables and changing climate conditions. By the year 2050 the world's population is estimated to increase to over 10 billion people.³⁰ Organic farming tends to use less water than conventional farms and creating an organic water standard could help to relay this information to consumers directly.³¹ One of the largest hurdles to implementing change in water usage is the ability to enforce water regulations and stakeholders. The organic industry is uniquely positioned to promote sustainable usage practices. There have been a number of solutions identified to address this challenge including, but not limited to, drip irrigation, water capturing methods and planting drought tolerant crops. The organic industry can be the first to create a standard that influences water usage practices and promotes a more sustainable water management system.

Background

According to the USDA, Agriculture is a major consumer of ground and surface water in the United States. Approximately 80 percent of the United States water usage comes from agricultural practices. With decreased river flow and dependence on glacial melt, water sources in many states, especially in western United States, have begun to face water scarcity issues. Many improvements in irrigation methods have been introduced, but there is room for more advancements. With help from the organic industry, farmers will be able to transition their water usage methods to more sustainable practices.

Future Innovations

The two areas of water innovation that would be beneficial to focus on are the overall pressure on water resources and the efficiency with which the water is being used. This would place into consideration multiple water sources and usage practices. Changing the irrigation infrastructure reduces the impact that agriculture has on water use. Many of these water conservation practices coexist with soil health. Farmers may already be implementing these practices and adding this additional requirement would not create additional strain. This would help to show consumers that the organic industry is working towards creating a long lasting farming system that uses minimal water and aims to limit the usage of water from the water table.

³⁰The World Bank. Water in Agriculture. August 10, 2020. <https://www.worldbank.org/en/topic/water-in-agriculture>

³¹ Gonzalez, N. Reports Show Less Water Used In Organic Farming. Organic Consumers Association. November 13, 2008. <https://www.organicconsumers.org/news/reports-show-less-water-used-organic-farming>

One suggestion would be to allow farmers to choose from a list of options. For example, creating a mandatory minimum number of practices that each farm would be responsible for implementing. Having a list of options would allow each operation to choose the practices that are best fit for their specific organization, climate, and circumstances. Another suggestion would be to have tiered levels of water usage consumption. This process would have farmers start at different levels depending where their farms currently stand. Farms would gradually adopt new practices so the burden of adding new water management systems would not be overwhelming. The goal would be to eventually have all organic farms reach their individual maximum water efficiency level.

Areas where water usage may be controlled include water storage, planting drought tolerant crops and mulching. Water storage implementation could simply be the use and capturing of rainwater using barrels. Utilization of rain barrel collected water is preferred in farms that have a drip irrigation system.³² Drought tolerant crop utilization and mulching could be used in partnership to drastically reduce the amount of water that a single farm would need to consume.

Potential Objections

The most difficult aspect of implementing a water usage standard would be accommodating different growing styles and climates throughout the country. Each region has different weather patterns and rainfall amounts. It is essential to create a system that is flexible enough to be implemented regardless of the growing regions.

Another objection may be to additional paperwork. Creating more additions to the organic standard may cost farmers more time away from their other farm duties. This new component should try to maintain as much simplicity in record keeping as possible.

Roadmap to Innovation

The first step to creating this area of certification will be to decide which practices to include in the process. Drip irrigation, capturing and storing water, specific irrigation scheduling, planting drought tolerant crops, dry farming, mulching, water capturing methods, soil- or plant-moisture sensing devices, reticulation systems and other practices are examples of areas where this innovation may focus.³³ Next, consideration for which methods will be considered mandatory and how many practices each farm

³²EcoFarm. Stewardship. August 10, 2020. <https://eco-farm.org/water-stewardship>

³³ Food and Agriculture Organization of the United States. Water Harvesting and Storage. August 10, 2020. <http://www.fao.org/land-water/water/water-management/water-storage/en/>

should adopt. Creating a solution where individual farms can choose which methods work best with their climate and production style may be a viable option.

Who Needs to be Engaged?

The Water Footprint Network is a nonprofit aiming to transition toward sustainable, fair and efficient use of freshwater resources worldwide. The Irrigation Innovation Consortium, funded by the Foundation for Food and Agriculture Research, was created to research, develop, and improve technology related to water usage practices. Engaging in partnerships with these organizations could lead to further innovation with water.

Bibliography:

1. Organic Trade Association. COVID-19 will shape organic industry in 2020 after banner year in 2019. June 9, 2020. <https://ota.com/news/press-releases/21328>
2. Guidance & Instructions for Accredited Certifying Agents & Certified Operations. Guidance & Instructions for Accredited Certifying Agents & Certified Operations | Agricultural Marketing Service. USDA Agricultural Marketing Service. www.ams.usda.gov/rules-regulations/organic/handbook.
3. Reguzzoni, Arianna. What Does the New Regenerative Organic Certification Mean for the Future of Good Food? Civil Eats, October 28, 2019. <https://civileats.com/2018/03/12/what-does-the-new-regenerative-organic-certification-mean-for-the-future-of-good-food/>
4. Whoriskey, Peter. USDA Officials Said They Were Guarding against Organic Food Fraud. Congress Decided They Need Help. The Washington Post, WP Company. December 20, 2018. www.washingtonpost.com/business/2018/12/20/usda-officials-said-they-were-guarding-against-organic-food-fraud-congress-decided-they-need-help/.
5. The Rallies to Protect Organic. Cornucopia Institute/The Rallies to Protect Organic. www.cornucopia.org/2018/03/organic-farmers-protest-usdas-attempts-redefine-organic/.
6. Beaumont, Warren. Regenerative Organic Certification, Complementary or Creating Confusion? Organic & Wellness News, January 25, 2019. www.organicwellnessnews.com/?ArticleID=883.
7. USDA Certified Organic Operations for 2018. USDA Agricultural Marketing Service. June 19, 2019. content.govdelivery.com/accounts/USDAAMS/bulletins/2427392.
8. Organic Trade Association. COVID-19 Will Shape Organic Industry in 2020 after Banner Year in 2019. GlobeNewswire News Room. June 9, 2020. www.globenewswire.com/news-release/2020/06/09/2045936/0/en/COVID-19-will-shape-organic-industry-in-2020-after-banner-year-in-2019.html.
9. Lutz, Steve. Organic Produce Sales Jump 22% in March; Up 8% in Q1. Organic Produce Network. April 16, 2020,

www.organicproducenetwork.com/article/1042/organic-produce-sales-jump-22-in-march-up-8-in-q1

10. Harvest Mark Traceability. HarvestMark Traceability, Institute of Food Technologists, June 26, 2019. www.youtube.com/watch?v=bIROTDnoHbY.

11. Organic Trade Association. COVID-19 Will Shape Organic Industry in 2020 after Banner Year in 2019. GlobeNewswire News Room. June 9, 2020. www.globenewswire.com/news-release/2020/06/09/2045936/0/en/COVID-19-will-shape-organic-industry-in-2020-after-banner-year-in-2019.html.

12. Pera, Rob, et al. General Mills Brings Kinetic Energy to Regenerative Ag. Food Tank. April 24, 2019. <https://foodtank.com/news/2019/04/general-mills-brings-kinetic-energy-to-regenerative-ag-says-carla-vernon/>

13. Organic Trade Association. Organic Trade Association "Not in Organic" Campaign. YouTube. October 3, 2018. <https://www.youtube.com/watch?v=oM-vxcF60IE&feature=youtu.be>

14. Organic Trade Association. Organic Myth-Busting Resources. August 10, 2020. <https://ota.com/organic-101/organic-myth-busting-resources>

15. Beaumont, Warren. Regenerative Organic Certification, Complementary or Creating Confusion? Organic & Wellness News. 25 January 25, 2019. www.organicwellnessnews.com/?ArticleID=883.

16. National Organic Program; Strengthening Organic Enforcement. 85 FR 47536. August 5, 2020. To be codified as 7 CFR 205.

17. Accredited Certifiers Association. "A Roadmap to "Sound and Sensible". 25 March 2013 https://www.accreditedcertifiers.org/wp-content/uploads/2017/09/Road-Map-to-Sound-and-Sensible-3.2013_Final.pdf

18. Glass, Pamela. "Coast Guard increases remote Subchapter M inspections". Work Boat. 7 May 2020. <https://www.workboat.com/news/coastal-inland-waterways/coast-guard-increases-remote-subchapter-m-inspections/>

19. Avatour. "How it Works". 14 August 2020. <https://avatour.co/how-it-works/>

20. USDA AMS. "Organic Oversight and Enforcement Update". February 2020. https://www.ams.usda.gov/sites/default/files/media/NOP_Enforcement_Update_February2020.pdf
21. Organic Trade Association. Organic companies explore cutting their use of plastic. March 3, 2020. <https://theorganicreport.com/organic-companies-explore-cutting-their-use-plastic>
22. Held, L. Organic Farming Has A Plastic Problem. One Solution Is Controversial. NPR. June 7, 2019. <https://www.npr.org/sections/thesalt/2019/06/07/729783773/organic-farming-has-a-plastic-problem-one-solution-is-controversial#:~:text=Live%20Sessions-.Organic%20Farms%20Use%20Plastic%20Mulch%20For%20Weed%20Control%3B%201%20Solution,soil%20health%20and%20the%20environment.>
23. ReadyCycle. Sustainable Packaging. August 10, 2020. <https://www.readycyclepackaging.com/>
24. Braskem. Products. August 10, 2020. <https://www.braskem.com.br/products>
25. Corbin, A. Cowan, J. Hayes, D. Inglis, D. Miles, C. Moore-Kucera, J. Current and Future Prospects For Biodegradable Plastic Mulch in Certified Organic Production Systems. eOrganic. November 14, 2019. <https://eorganic.org/node/8260>
26. Narayan, R. Biodegradable Biobased Mulch Films in Organic Crop Production. Michigan State University. September 2019. <https://www.ams.usda.gov/sites/default/files/media/2019MemoBiobasedMulchReport.pdf>
27. Mirenda, J. Crops Subcommittee – Biodegradable Biobased Mulch Film (Discussion Document). Organic Trade Association. April 3, 2020. <https://www.ams.usda.gov/sites/default/files/media/2019MemoBiobasedMulchReport.pdf>
https://ota.com/sites/default/files/indexed_files/OTA_BiodegradableMulch_NOSBspring2020_AMS-NOP-19-0095.pdf
28. Ecochain. Life Cycle Assessment (LCA) – Complete Beginner's Guide. August 10, 2020. <https://ecochain.com/knowledge/life-cycle-assessment-lca-guide/>
29. Vieira, J. Life Cycle Assessment of Apeel Produce. Apeel. October 2019. https://apeelsciences.com/LCA/uploads/2019/11/Apeel-LCA_Webpage.pdf

30. The World Bank. Water in Agriculture. August 10, 2020.

<https://www.worldbank.org/en/topic/water-in-agriculture>

31. Gonzalez, N. Reports Show Less Water Used In Organic Farming. Organic Consumers Association. November 13, 2008.

<https://www.organicconsumers.org/news/reports-show-less-water-used-organic-farming>

32. EcoFarm. Stewardship. August 10, 2020. <https://eco-farm.org/water-stewardship>

33. Food and Agriculture Organization of the United States. Water Harvesting and Storage. August 10, 2020. <http://www.fao.org/land-water/water/water-management/water-storage/en/>

Appendix

The following supplementary chart includes raw data from an online Qualtrics survey completed by organic industry stakeholders. Participants were recruited by Arizona State University, the Organic Trade Association, and Organic Valley. Each row across the horizontal axis includes one survey question, with each vertical column corresponding to a single respondent's survey data. The column which reads "array" is in error for question two. In this instance, a change in the version history caused a glitch in the data collection within the Qualtrics software. A blank column is displayed when a respondent chose to skip a question.

Question 1	Question 2			Question 3	Question 4	Question 5	Question 6
What is your relationship to the organic industry? (Please select all that apply.) - Selected Choice	Please list what you consider to be the top three biggest challenges facing the organic industry. (#1 being the biggest challenge) - #1	Please list what you consider to be the top three biggest challenges facing the organic industry. (#1 being the biggest challenge) - #2	Please list what you consider to be the top three biggest challenges facing the organic industry. (#1 being the biggest challenge) - #3	In what areas do you think the organic industry has the most opportunity to innovate? (Please rank your top three choices 1-3)	What innovation(s) has/have had the biggest positive impact on organics in the last 10 years?	What is one innovative idea that has the potential to transform organics?	How would you define innovation in the context of organics?
Certifier	Array	Array					
Certifier, consumer, consultant; have been farmer and processor	Unfavorable public policy	Lack of tools, input materials, and training for transitioning farmers	Limited guarantee options - certification is one option but should not be the only option.	Full cost accounting - compare organic and conventional with the same measurement tools, Processed Food Manufacturing, Certification	Communication and transparency tools	Full cost accounting	Follow the Principle of Care (precautionary principle)
Certifier, Consumer, NGO Organic Advocate	Ability to scale up and increase % organic acreage and food products	Insufficient investment (public & private sectors) in organic research, education and extension	Internal divisions and fights amongst organic advocates	Certification, crop production, shifting assessment and certifications from just process-based to outcomes-based, focused on site-specific operations and conditions	Increased investment in research to inform best practices, followed by increased awareness & technical assistance by ag professionals (both public and private sector)	Harmonized frameworks on key sustainability indicators and associated metrics, that provide on-the-ground case studies and data to inform best management practices and move production and food system closer to goals / benchmarks	Innovation is the application of new knowledge and understanding. Organic agriculture recognizes that each place, production system and seasonal cycle is unique. We need innovation that is designed to respond to and improve each operation's unique circumstances in service of harmonized goals that move us toward greater sustainability and resiliency.
Consultant	consumer awareness	trust that products are actually organic	price	Livestock Production, Crop Production, New Technologies	improvements in processing. more organic products on the shelves.	build in equity for farm workers	positive, new, strategies that lead to shared benefits for all involved.

Consultant	Unfair competition from conventional agriculture, specifically external costs of conventional agriculture are not internalized.	Technology transfer--transforming research into useful solutions available to farmers	Fraud	Agroecosystem management; Open-source technologies; Soil health; What I call "Steam Punk" appropriate technologies; Logistics and marketing; Robotics (especially for weed management), New Technologies	Social media--the ability of organic farmers to tell their story and communicate directly to consumers. Facebook, Instagram, Twitter have had a more widespread impact on organic farming than any single widget or gadget.	Not so much an innovative idea as an innovative process, but farmer-researcher networks have great potential for transforming organics. We must move away from seeing innovation as an individual's flash of brilliance and a system created for "locked in" proprietary technologies. Research is mostly funded by the private sector to create products protected by intellectual property that are sold as input packages. In organic, this leads to favoring an input substitution approach that can never compete with conventional agriculture as a market for new technologies. Organic agriculture is a systems-based approach. The organic community needs to create a culture of innovation to share open-source ideas similar to how open-source software is developed, if it is to be competitive and to turn research into farm-level innovations.	Innovation in the context of organic is a holistic, systemic approach that engages farmers, researchers, and other practitioners in co-innovative processes to develop open-source technologies that can be readily adapted to local conditions.
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Consultant	Array	Array		Consumer Education, Crop Production, you have Processed Food Manufacturing, but I would add "organic textile processing."	The development of the Global Organic Textile Standard (GOTS) - this has driven the development of a full range of non-toxic but equally effective textile processing inputs.	Get more large companies certifying to GOTS to make it more mainstream. More and more companies ARE getting certified to it and the Organic Content Standard, but the OCS doesn't address the dirty stages of processing - it merely confirms that organic fiber is in the product. Companies are then free to still apply formaldehyde or whatever during the processing stages. But for this to happen, GOTS has to invest a lot more in consumer outreach and enforcement of false claims.	Making organic the norm and getting rid of toxic processing inputs.
Consultant	Array	Array		Coexistence with Conventional Production, NOP Standards	The use of technology to improve oversight of organic operations. The innovations of organic poultry producers to create pasture based organic poultry production on a large scale.	There are many innovative ideas that are transforming organics.	Development of organic practices that support organic principles of fairness, care, ecology and health
Consultant	Too many programs and labels that confuse consumers about what organic is and isn't, i.e., Non-GMO, Free Range, Gluten Free, etc.	Economic downturn that would reduce discretionary spending	Potential for fraud and associated reduction in consumer trust	Deceptive marketing prosecution, NOP Standards	Social media and the rise of influencers	Linking environmental services (nutrient cycling, water cycling, GHG reduction) to organic production. Paying farmers/ranchers for those environmental services so that there is market incentive to increase the number of acres under organic production.	Something that disrupts to current market system, is transformative in that things will never go back to the way they were before the innovation.
Consultant, NGO Organic Advocate	sourcing reasonably priced inputs (nutrients, seeds, cover crop seeds)	access to markets who recognize and are willing to pay for organic products	lack of scale appropriate technology for small scale organic grain production	New Technologies, Crop Production	National Standards	scale neutral technologies for automated tilling, planting, harvesting and shipping priced at levels small producers can afford.	how to measure and quantify improvements in soil health over time.

Consumer	Balancing strong regulation and certification with not burdening growers with onerous demands			Labeling, Consumer Education, Certification	Consumer education and demand, better non-chemical production tools/inputs	Consumer education / labeling linking organic production with other consumer concerns (climate, water quality, biodiversity, health); e.g. everyone is hyped about regenerative, but organic actually provides a lot of the same benefits of regen!	To me, innovation in organics falls in two categories: 1) creative ways to educate consumers and expand demand for organics and 2) technology improvements and support for growers to allow more producers to transition to organic and reap the benefits of higher prices, healthier ecosystems, and healthier humans!
Consumer	whitewashing organic	standards on regulations	US Feed	Consumer Education, NOP Standards, Certification	sustainability and education	NA	NA
Consumer	Consumer trust in the label	Impact on small/medium diversified producers given the record keeping and certification requirements	New labels claiming to be beyond organic, creating consumer and producer confusion	NOP Standards, Coexistence with Conventional Production, Certification	Traceability seems to be important particularly in commodity organic production. Businesses like Pipeline Foods have created some price finding services that benefit all organic producers.	More price data to allow for more planning and information	Embracing the changing expectations of consumers around regenerative agriculture and climate change in agriculture.
Consumer, advocate and funder of organic NGOs	Consumer education	peer reviewed research and the publications that will publish the results	Realignment of the industrial farming system and the resources that are devoted to it	Livestock Production, Consumer Education, organic systems research both on-farm and at land grant institutions	soil research; cover crops use and some regional educational initiatives	transfer GMO and its derivative technologies research billions to regional, family farm-based research and education programs.	everything from organic seed research that does best in a crop rotation systems to certain technologies that manage soil moisture for optimum yields. On a separate but important thread -- innovation in labor management meaning full time year round employment; health benefits and housing assistance. Organic must become more aligned to the calls for justice in the field

Consumer, Agtech startup serving the organic supply chain	Achieving scale while maintaining industry integrity	Educating a distracted or low information consumer	Lack of racial diversity in industry leadership	Consumer Education, Crop Production, Ensuring that equity (labor standards etc.) are not left behind	Production and handling techniques that have lowered costs while maintaining high standards.	Pushing the label to adapt (and adopt) social standards (fair wages, humane working conditions)	Long term, if organic is able to change conventional ag, such that it becomes harder to distinguish between the two (because conventional ag gets better), that would be a win in many ways.
Consumer, Consultant, NGO Organic Advocate, Philanthropic	Full implementation / enforcement of original standards (eg origin livestock and other regs that are not fully implemented); space requirements for poultry; removing synthetics that have been on the list forever (synthetic methionine for example)	Lack of oversight on processing-allowing GMO materials to be used in processing	Increasing access to certification for minority and indigenous farmers	NOP Standards, Livestock Production, Processed Food Manufacturing	I don't believe that organics has capitalized on things like more heritage breeds of animals that are designed to be raised in more natural environments. I think if anything, organic has allowed some innovations in food technologies to permeate in a bad way which can lead to things like organic red bull or other processed organic products.	Heritage breeds, soil health measurements (some organic farms have actually reduced topsoil and fertility--this is unacceptable and organic needs to keep pace with what we know if right for soil health)	Adopting more regenerative practices that we know exceed the current standards
Consumer, NGO Organic Advocate	organic integrity, especially dairy and grain sectors	greenwashing related regenerative agriculture	conventional ag industry misinformation campaigns around organic value, price, elitism	Consumer Education, NOP Standards, Certification			
Farmer and manufacturer/handler	Array	Array		Crop Production, Processed Food Manufacturing, Consumer Education	integrated production systems for cropping and livestock	there isn't "one". there will be many and locally unique	development of a management system that improves the quality of local environmental/ecological resources and provides economic stability

Farmer or Rancher	Adequate smaller scale protein/meat processors (5 to 20 employees vs 1000) for improved resiliency and local processing capacity for sustainable/organic producers-- passage of the PRIME act	The regulations are one-size fits all between industrial organic agriculture vs smaller scale regional/local organic farms	Educating consumers in differences between soil-based organic agriculture and chemical-factory based hydroponic agriculture -- loss of credibility with consumers in Organic soil-based farming (shrugs)	Livestock Production, NOP Standards, Consumer Education	On-line food / produce ordering platforms for closer eater to farmer interaction	Passage of the PRIME act	More accessible to more people of lower socio-economic status
Farmer or Rancher	Organic integrity	Sustainable pay price	Domestic grain supply	Consumer Education, New Technologies, NOP Standards	Internet	Better than organic	better and more production
Farmer or Rancher	The fight between soil only agriculture vs container grow. As a grower this brings uncertainty to the planning process	Lack of research into organic practices and organic breeding programs from research Universities	Transition from conventional to organic	New Technologies, Crop Production, Consumer Education	Organic breeding programs from private seed companies	Understanding the soil food web.	yield improvements and pest management with bio-control
Farmer or Rancher	Consolidation in processing and food manufacturing	Competing labels and market claims (regenerative, "real," etc.)	Proliferation of "organic" inputs	Alternative risk-sharing marketing mechanisms, Consumer Education, NOP Standards	Increased understanding of the interaction between crop diversity and soil ecology	Make certification a consumer-protection mechanism, funded at retail and administered as process-verification rather than as a marketing claim	Innovation must drive our practices, systems and relationships to (better) emulate nature and her systems.
Farmer or Rancher	promoting healthy soils and advocating that organic is an answer to climate change	monitoring compliance with organic regulations and certifier consistency	innovation and developing leadership	Consumer Education, Livestock Production, Processed Food Manufacturing	new biocontrol for crops diseases/insects, more understanding of soil ecosystems (but still need much more!), clean labels	climate change and organic systems	ecosystem management, fewer ingredients in processed goods,

Farmer or Rancher	Maintaining profitable prices for organic crops	Chemical and GMO drift/contamination	NOP's zero tolerance for drift residues for which an EPA tolerance has not been established	NOP Standards, Consumer Education, Coexistence with Conventional Production			
Farmer or Rancher	Integrity diminishing because of producers using questionable practices, eg. origin of livestock, origin of imported grains	Growing crops hydroponic, without soil is not supported by biological diversity of soil, and does not heal the earth.	There is a growing view that animal agriculture is harmful to the environment and our health. Livestock harvest almost anything that has collected sunlight, and convert it into healthy food grade protein and fats.	Crop Production, Consumer Education, Livestock Production	The long overdue proving that animal fats had been wrongly disparaged and the growing understanding of how soils work, and why organic makes sense for the environment.	We must show how regenerative farming can produce healthier families from nutrient dense food, while helping improve air and water quality for the health of our planet.	I have decided to find ways to produce crops on a large scale, organically, using less tillage and minimal inputs. We need to find ways to do old things in new ways. Weed control in row crops was done by pulling shanks behind horses 100 years ago, and is still done pretty much the same way today, only now we have harnessed more horsepower.
Farmer or Rancher	Farms that are not playing by the rules and yet are still selling their products as certified organic.	In dairy, a sustainable pay price	Other confusing [to consumers] labels, Natural, BST free, local that have no defined criteria	Consumer Education, New Technologies		Satellite imaging to oversee compliance	New products and/or new processes.
Farmer or Rancher	Ability of certifying agencies to accurately inspect	Endless transitioning of organic dairy cattle	Imports	Certification, NOP Standards		Organic No-till systems	Development of a tool or process that makes the producer more efficient while improving health of the soil/animals
Farmer or Rancher		(please fill in the blank)	(please fill in the blank)	Livestock Production, Crop Production, New Technologies	We now grow a winter annual hybrid rye (4 crops harvested) and this fall seeded crop has really changed our organic rotation and practices. WE were stuck in a groove until that came out and now we have many winter annual choices.	I think that robotics will do us a lot of good in planting and cultivation.	This is what happens when we get engineers, agronomists, biologists etc. and work together.

Farmer or Rancher	loopholes in the NOP rule	lack of enforcement and or prosecution of offenses	loss of small family farm to big industrial factory farms	NOP Standards, enforcement of the rule, Labeling		strengthening and enforce the rule as written	sustainable practices that keep small farms profitable
Farmer or Rancher	farmers pay price	large scale production so called organic	lack of enforcement of violations	Certification, NOP Standards, Labeling	consumer awareness to what is real	take politics out of organic now	new ideas and cultures making more from less
Farmer or Rancher	the Word Natural	overseas fake organic	Big enterprises that skirt the rules	Consumer Education, Holding certifiers to NOP standards			
Farmer or Rancher	standards being enforced uniformly	stop seeking government subsidies was a marketing movement to be economically successful on its own merits	(please fill in the blank)	Consumer Education			
Farmer or Rancher	Conflicting Information coming from competing industries such as Claims that lower production from organic agriculture have a greater environmental impact	Variance of the interpretation of the NOP standards that allow some large organic farms to get away with what most others can't such as continuous animal transition, lower pasture standards, origin of livestock	Importing cheaper foreign organic products	Crop Production, Consumer Education		The idea that instead of trying to make agriculture "less bad", we can actually have positive impacts on the environment by incorporating regenerative agriculture practices. Once consumers can understand that their purchases can help build topsoil, reduce atmospheric CO2, reduce flooding events through better water infiltration, and improve their health; consumer demand should increase dramatically, which would in turn provide the opportunity to turn more land into organic production	I would define innovation not as new technology, but rediscovering and refining old technologies that have been working with no human interference for thousands of years. Innovation would result in higher yields, lower pest and disease incidence without the need for synthetic inputs, improved topsoil and biodiversity and greater profitability for the farmer, while improving quality of life and improving rural communities.

Farmer or Rancher	lack of conversion of US farms to organic because of the next 2 challenges I am going to list	lack of research for organic - % of USDA money devoted to organic research is about 1% while sales of organic food in America is about 6%	lack of information i.e. through the county agencies in the US - because of lack of training on their part	Crop Production, Processed Food Manufacturing	getting organic into mainstream stores and processing companies	connection food and health	new focus, new angles
Farmer or Rancher, Consultant	Consumer misunderstanding and suspicion about what organic is and why it matters. (please fill in the blank)	Economic difficulties during transition to organic. (please fill in the blank)	For each crop or animal, a few difficult pests or diseases which increase risk enough to discourage successful conventional farmers to transition	Consumer Education, Crop Production	Risk reduction on the production and marketing such that large farms have put significant effort into their organic divisions	Effectively, scientifically, and quantitatively linking actual organic farm production practices to reducing the causes of climate change	Widespread practical adoption of a new or significantly improved idea
Farmer or Rancher, Consultant, Government Agency	Dilution of the organic label/confusion about organic v. other labels	Cost of certification/ barriers to entry	Enforcement of standards across border and products	Coexistence with Conventional Production, New Technologies	don't know if this qualifies as an innovation, but the wider recognition and mutual acceptance of organic labeling has been important for spreading the use/demand for the organic label.	While not unique to organic, better, cheaper ways to measure, track and communicate the positive environmental impact of organic methods should go a long way toward increasing adoption--helping people see the results, and enabling farmers to get paid for the results.	Personally, I am open to the use of new technologies, including some new breeding technologies, but also the use of technology to ease adoption, compliance and certification, and would consider those key areas of innovation for organic. But I also think we need social innovations to ensure to the hands-on knowledge, understanding and acceptance of organics can spread.
Farmer or Rancher, Consumer	Integrity	Variable interpretation of rules by certifiers	Industrial organic production	Certification, New Technologies, Consumer Education			

Farmer or Rancher, Consumer	Organic integrity	dependable markets		Consumer Education, New Technologies, NOP Standards	cover crops	improved crop rotations	solid measurement of organic quality in food
Farmer or Rancher, Consumer	(everyone following the same rules	animal welfares going too far	educating the consumer, (nutritional facts)	Consumer Education, NOP Standards, New Technologies	consumer growth - demand	getting everyone to follow and have the same interpretation of the intent of the rules	
Farmer or Rancher, Consumer	Consistent certification standards and transparency	Non-organic producers "green-washing" their products.	Lack of enforcement or punitive actions against violators of organic certifications and practices.	NOP Standards, Certification	Branding and consumer awareness.	Maintaining organic integrity (and trust) with consumers.	The scaling and scalability of organic practices.
Farmer or Rancher, Consumer	Greenwashing from competitive markets	Integrity of standards after manipulation by special interests	Sustainable pay price for family farms	Consumer Education, NOP Standards, Ecosystem Services	Nutritional and ecological assessment, analysis, and education for consumers	Develop a payment for ecosystem services program compensating producers for the multitude of services provided. Carbon sequestration, nutrient retention, water holding capacity, flood mitigation and pollinator habitat being priorities.	Advancement of the ideology of sustainability that was the foundational core of organics in the beginning.
Farmer or Rancher, Consumer, Academia	adhering to standards	growing the market substantially	keeping trust in the equation	Processed Food Manufacturing, Crop Production	Agroecology-addressing the food system as a whole	True cost accounting	it is not a technology, it is an approach
Farmer or Rancher, Consumer, Processer	Getting a fair price for our work)	Proper education what organic is REALLY about	Labor to farm	Consumer Education, Crop Production	Organic food is healthy!	Science showing organic food is healthier than conventional	Positive growth
Farmer or Rancher, Retailer	lack of government support	research to help farmers	research to link organic diets to better human health	Consumer Education, Crop Production, Livestock Production	better distribution systems that have come with scale	systems that would transform animal and vegetable waste to high quality compost for farmers	technology and systems that support the inherent natural processes in ag productions

I am farmer, consultant, academic and NGO	Climate chaos	Destruction of USDA agencies and need to rebuild	Organic Taliban	Crop Production, New Technologies, "Ecosystem Services" for lack of better term. Syntax of this question is ambiguous: "greatest opportunity" can mean "what's the easiest" vs. "most potential impact"	Private sector investment in Midwest grain infrastructure. USDA Biodiversity rule. Organic crop insurance. Organic Research and Extension grant funding.	Imperative retooling to remove all fossil fuel use from agriculture. Electrification of transportation, traction, diversification-engineering of farm tools (e.g. digital printing of farm machinery by regional cooperative manufacturers) and renewable-energy integration of ALL dimensions. Microbiofuel production from on-farm biomass.	I wouldn't. Innovation is an overused, wimpy word. Simply means doing the same thing in a novel or more "efficient" way, but usually with tunnel vision for unintended consequences. Invention and reinvention are more salient terms for organic ambition.
Manufacturer or Handler	Consumer understanding the benefits and willing to pay the premium for Organic	Increasing organic acreage in US	Fraud	Consumer Education, Crop Production, NOP Standards	OTA Fraud Prevention Program	Blockchain/ better electronic tracking of certs	Anything that improves organic... from regulations, seed breeding, on-farm practices and tools, ensuring organic integrity, and consumer education of organics complete value.
Manufacturer or Handler	Supply of raw materials.	Competitive pricing.	Handling efficiencies, in the supply chain.	New Technologies, Processed Food Manufacturing, Coexistence with Conventional Production	Using organic sources to replace synthetic alternatives (ingredients and excipients).	Broadening the supply chain / handling systems to meet the future demand. Thank of conventional agriculture in the 1950s, that is where organics are today. Strong demand, with young supply systems.	Applying proven Ag based supply systems to organic issues. Don't re-invent the wheel, look for best practices outside of organics and bring the knowledge into organics.
Manufacturer or Handler	Effects of supply chain disruption due to COVID-19	Not enough US acres to meet demand	Foreign imports	Crop Production, New Technologies, Consumer Education	Cover cropping, new biologicals for pest management and plant health, understanding soil health/soil microbiology	Better weed control	Innovation to create a climate smart, resilient holistic crop production system that is ecologically based and biointensive
Manufacturer or Handler	money	money	money	Livestock Production, Crop Production, Labeling	money	money	money
Manufacturer or Handler	Access	Consumer Education	Innovation	Crop Production, Consumer Education, New Technologies			Improvement from current practices. More cost effective, better yields, broader support.

Manufacturer or Handler	Lack of consumer willingness to pay more for organic made in the USA products.	Again, the lack of consumer willingness to pay more for organic made in the USA products.	The huge amount of false or misleading information consumers have to deal with when making their purchasing decisions.	Consumer Education, New Technologies, Labeling	Ustrive Manufacturing becoming the first GOTS and OCS apparel manufacture in N. America. Allowing brands for the first time to manufacture organic clothing in the USA.	Consumer awareness and education will transform the industry.	Innovation will happen only when consumer demand increases. Without market demand there is no reason for investment. Unless consumer demand and awareness increase the organic industry will continue to drag along.
Manufacturer or Handler	Differentiation within natural products industry	domestic supply chain constraints	inconsistent certification, inspection and enforcement at farm-level	Lowering pricing for all consumers, Certification, Labeling	Don't know	Creative financing to transition domestic acreage to organic	continuous improvement - not static standards. Organic needs to have newly defined narratives for modern consumers.
Manufacturer or Handler	Array	Array		NOP Standards, Certification, Consumer Education	Strong presence of the Organic Trade Association in Washington, DC. and the industry support to drive strong standards.	More organic acreage is needed to transform organics. We need our governmental leadership to understand and support organic farming in more ways than is currently being done.	Innovation is the ability to expand in new ways such as technology and other unique attributes.
Manufacturer or Handler	Array	Array		Crop Production, Consumer Education, Certification	I'm having a tough time with this question! I think the things that have had the biggest positive impact are simple addition of resources, at NOP for program oversight, additional funding for organic research, and growing consumer demand. I'm excited to see the impact of OTA's fraud prevention program and the SOE rule but those are TBD in terms of whether they will succeed.	Regional development grants that provide transition incentive payments and support both technical assistance (for existing and transitioning producers) and market & infrastructure development at the same time so transitioned farmers have more outlets for everything they are producing. Essentially let's jump start new organic hot spots by addressing the combination of factors that tend to be obstacles to organic production all at once in the defined areas.	Innovation in organics are breakthroughs that address chronic issues that make organic farming or organic certification difficult. Especially breakthroughs that help improve farm profitability and/or reduce risk for producers.

Manufacturer or Handler				Processed Food Manufacturing, Livestock Production, New Technologies	Not sure.	Due to public pressure I believe the chemical companies are being forced to focus more on biological controls. New biological controls will give organic producers more options and better choices which will benefit organic production greatly.	Not a definition, but we must not lose sight of doing what is right for the soil.
Manufacturer or Handler	fraud	supply chain continuity	consumer awareness of benefits	Livestock Production, Processed Food Manufacturing, Consumer Education	awareness and development of standards; clinical studies about the benefits of organic	tying crops to their origin at the store. would help with fraud + give consumers transparency.	innovation has been slow, but there is more and more interest from consumers.
Manufacturer or Handler	Consumer confusion	Funding for research	Innovation	New Technologies, Consumer Education		Open source organic seed breeding program	Bringing science, research, and new ways of thinking into organic production that are supportive of founding principles.
Manufacturer or Handler	Attribute based marketing claims – nonGMO, No Hormones, etc. without going all the way to organic	Big Ag trying to water down regs	lack of consumer understanding and therefore value	Consumer Education, Processed Food Manufacturing, New Technologies	not sure	deepening standards	enhancing standards
Manufacturer or Handler	Array	Array		NOP Standards, Consumer Education	Private label has been huge. Wholistic changes in crop production, not just looking at it as an input driven system.	An international recognized standard, or at least expanding equivalency arrangements to expand international market opportunities.	My first thought is advancements in science and technology. Often this progress is contradictory to the requirements of the standards.
Manufacturer or Handler	confusion on the variety of different "types" of organic labeling	pricing	science for consumers comparing organic to conventional	NOP Standards, Certification, Labeling			

Manufacturer or Handler	Maintaining integrity with growth	Downward Market pressure/un sustainable returns for true organic practices	Instability of US political system (esp. current administration)	NOP Standards, New Technologies	Organized engagement (organizations such as the OTA) and visibility as well as increased (i.e. more widespread) understanding of the role of biodiversity and soil biology	Labor. That is one area continually left behind, whether it's working conditions, shortage of hands, lack of visibility/recognition and poorly understood economics. Technology could play a role but the above mentioned economic visibility into who gains/loses in agriculture could play into "beyond organic" (consistent social innovation)	Organics is a system of agriculture designed to build sustainably rather than take/deplete. This takes on a far more inclusive meaning when looked at from a standpoint of true intent (why do movements such as the ROC and ROP pop up?) Holistic innovation that takes into account a systems approach to building vs. depleting across the board (from soil to the economics)
Manufacturer or Handler	Consumer perception	Dilution of standards	Aging farmers	Processed Food Manufacturing, Certification, Consumer Education			
Manufacturer or Handler	Integrity of the supply chain/anti-fraud	Spotlighting the organic "brand" amidst proliferation of other "certifications" & label claims	Supply of organic raw materials from legitimate certified producers	New Technologies, Crop Production, Consumer Education	Expansion of reciprocity among different country certification systems	Integrating fair trade principles into organics certification standards	New ideas, methods, technologies, etc. that enable to production of organic products to reach a wider number of consumers
Manufacturer or Handler	Cost of ingredients	Ability to transition more acres to organic without financial penalty to farmer	Greater prevalence at retail	Consumer Education, Crop Production, New Technologies	Ability to combine organic and conventional ingredients in order to hit a more accessible price point for consumers	Greater consumer education on the availability and benefits of organic	Breeding of higher-yielding varieties
Manufacturer or Handler							
Manufacturer or Handler, Consultant	affordability of certification	availability of processors in the US	willingness of cotton farmers to go organic	Consumer Education, Certification, Organic Fiber processing	The development of organic cotton thread for sewing.	Require all organic clothing and sewn housewares manufacturers to use organic thread and other notions in their products making them 100% organic.	Taking the industry to the next level - easier, faster, closer to home.

Manufacturer or Handler, Consumer	Determining its place in solving the impacts of climate change and environmental degradation. (please fill in the blank)	Determining whether it is capable of innovating and evolving, or a tightly defined approach that will only look for continuous improvement of approaches already well defined.	Resources	Crop Production, Livestock Production, NOP Standards		Allowing organic farmers to run production experiments that are outside of standards, but that do not create environmental or toxicity concerns, and that might advance definitions of organic. I see these as similar to access roads that run along a freeway.	More consequential than "continuous improvement". Truly new, not just a tweak to what already is. Solutions that are new, but that do not violate the essence of standards, though they might force us to move standards.
Manufacturer or Handler, Consumer	Consumer understanding of the farming/environmental impacts of organic	Supply - not enough farmers converting and staying organic	Technical assistance - need for more agronomic assistance on soil health, biodiversity, etc. practices	Consumer Education, Crop Production, NOP Standards	Increasing research dedicated to organic farming systems; increase in farmers' markets with access to organic; great distribution of organic in mainstream channels	An inclusive approach to integrate organic farming knowledge into mainstream agriculture - 'piecemeal' the back end so that farmers can see the benefits from organic (without having to do full certification). There is a lot of polarization among those who 'spray with poison' and those 'who till the soil'. What can be done to bring common ground?	Innovation brings creativity that allows organic to disrupt agriculture - that is what we need.
Manufacturer or Handler, Farmer or Rancher	NOP maintaining original integrity of organic			NOP Standards, Certification	More organic practitioners honing their skills	Make sure that the NOSB represents the organic consumer and that the USDA follows their mandate	Learning more about the complex interactions of soil, organisms, and the growing of crops without synthetic fertilizer and crop protectants
Manufacturer or Handler, Farmer or Rancher, Consumer	Economically viable paths to transition conventional land to certified organic land	Consumer trust in the organic label	Demonstrating the environmental and nutritional benefits of organic food	NOP Standards, Consumer Education	Mainstream retail acceptance and embrace of organic food		Innovation in field practices to improve yields, increase nutritional density of food, decrease costs of production

Manufacturer or Handler, Farmer or Rancher, Retailer	inability of standards to evolve with known consensus in the industry along with competitive harm created by inconsistent interpretation of the organic regulation among certifiers	insufficient resources to further validate the contributions of organic agriculture for public health and the natural environment ... pesticide exposure, climate change, etc...	an onslaught of food and product claims that pretend to be organic like	Consumer Education, NOP Standards, Certification	testing of organic dairy -- https://news.emory.edu/stories/2019/06/welsh_milk_study/index.html https://www.organicvalley.coop/resources/organic-grass-fed-milk-nutrition/the-growth-and-effectiveness-of-the-Organic-Trade-Association-expanded-penetration-into-more-mainstream-market-channels	how organic food consumption benefits public health	production - developing more resilient and better yielding systems; marketing - achieving greater understanding and value for consumers; regulatory - ensuring processes are better established to mitigate the ever present political risk of a federal/government standard and program; industry - to grow a more diverse and effective leadership core in the organic sector
Manufacturer or Handler, Retailer	Cost	Limited suppliers	Visibility to customers	Crop Production, Certification, Coexistence with Conventional Production	consumer education	increased production	increased availability
Manufacturer or Handler, Retailer, Consumer, NGO Organic Advocate	Fraud	Economics	Education	Consumer Education, Urban or other underserved community access to organic foods, Consumer Education		Certifier consumer protection marketing.	Creating a healthy lifestyle and protecting the next generation from associated health issues.
NGO Organic Advocate	USDA enacting NOSB rules.	Corporate economic model subsuming organic principles - (short range v. long range; commoditization of organic products; extracting value from rural communities and small businesses)	Erosion of federal environmental, business, and land access rules.	Crop Production, Livestock Production, Consumer Education	Online commerce.	Small scale, local, decentralized food processing.	Innovation that stays true to organic principles and strengthens organic rules. Used to support small businesses, innovation in marketing, distribution, production management, etc. can be a powerful tool.

NGO Organic Advocate	Fraud	Hydroponic certification - should not be certified under organic label	enforcement of outdoor access for organic livestock/withd rawal of OLPP	no-till organic systems and other climate-friendly farming techniques, Consumer Education, NOP Standards	no-till organic systems and other climate-friendly farming techniques		
NGO Organic Advocate	Standards and enforcement	Increasing and sustaining growth of the organic industry	Public education on organic	NOP Standards, Consumer Education, Certification	Adoption and advancement of certification technology to ease inspections and certification work	Block chain technology for inspection and enforcement actions	The creation or adaptation of systems to increase viability, enforcement, access, transparency, etc. of organic production
NGO Organic Advocate	ability to grow the domestic supply to meet the growing demand	delays in updating the National Organic Program regulations	critical impending need for organic inspectors, coupled with loss of human capital as experience exits the field	Crop Production	federal cost share for certification costs for organic producers; major retail chain marketing; remote inspections and inspection training in the pandemic; Organic Voices; international trade agreements and arrangements.	Government financial incentives for certified organic production.	Making organic food and products accessible and not elitist.
NGO Organic Advocate	Fraud, and therewith reputation	competing labels within organic and other non-organic schemes	weak and purposely unclear standards	Certification, NOP Standards, Consumer Education	agronomic innovations, communication innovations, marketing innovations	bottom up certification, peer to peer, supported by traceability	supportive innovations that do not distract from the core
NGO Organic Advocate	Array	Array		Consumer Education, Proof of impact, New Technologies	Focus on soils and regenerative practices.	Consumer Engagement and Education	Innovation is bringing solutions to challenges and barriers to growth. Could range from production issues, to getting consumer support and buy-in.

NGO Organic Advocate	Inadequate NOP organic enforcement: Fraud & Inconsistent interpretation of the organic standards	Pesticide and GMO drift	Lack of future market development and strategic thinking: For example: strategies and support to grow organic into new markets (organic beef, organic pork, etc.) and what is necessary to support that market growth within the U.S. More collaborative organic community planning for U.S. market growth & U.S. infrastructure.	Consumer Education		OTA concentrated community conversations about where U.S. organic production expansion can happen and needed consumer education to support that growth. For example: More conventional corn & soybeans (grains) to organic, supported by a growing U.S. organic pork and beef market. More desire for U.S. organic grass fed beef to support organic dairy farmers outside of a reducing U.S. milk consumption.	Innovation must uphold the organic principles and integrity as well as support a sustainable family farm system. Organic is scrappy and we need to figure out innovative solutions to conquer complicated problems within the food system that still uphold our organic values and bring the organic community together.
NGO Organic Advocate				Consumer Education, New Technologies			
NGO Organic Advocate				Crop Production, Livestock Production, Certification			
Non-profit trade organization, comprised of independent, integrity-based companies in the natural foods industry (food co-ops and natural grocers, manufacturers, , brokers, distributors, fair trade and	Corporate consolidation in the organic industry	watering down of organic standards (i.e., hydroponics and CAFO's)	Big Food dominating OTA board	Consumer Education, Crop Production	Regenerative organic movement	Regenerative Organic Certified - but only if it doesn't get "greenwashed" or watered down	Programs supporting small farmers and manufacturers instead of Big Food and Big Ag

organic non-profits).							
Retailer	Communicating the value of organic to consumers	Nuances across certification bodies make it challenging to streamline programs/operations	Weak oversight or enforcement of the ethos behind organic - conservation, biodiversity, soil health etc.	Livestock Production, NOP Standards, Consumer Education			

About the Authors

Katie Davis

Katie has spent her career supporting the development and commercialization of new food and agriculture technologies. She currently works as Apeel Sciences' Director of Regulatory Affairs, leading Apeel's global regulatory program focused on obtaining market access for Apeel's novel shelf life extension technology developed to reduce postharvest food loss and waste – from farm to retail shelf to home. Prior to joining Apeel, Katie worked for Syngenta as a Study Director in Syngenta's Product Safety Department focusing on protein quantification and analysis of genetically engineered crops. With a passion for sustainable agriculture, Katie later transitioned to Regulatory Affairs where she held various roles in global regulatory operations, regulatory program management, and regulatory policy advocacy. Katie received a BS in biochemistry and an MBA from North Carolina State University. She can usually be found hiking with her husband and dog in and around Santa Barbara, CA where she is currently based.

Brandee Kitzmiller

Brandee is the farm to school educator for the nonprofit Island Grown Schools on Martha's Vineyard, Massachusetts. She strives to teach and empower children to make healthy eating choices, learn to grow food and connect with local farms. She also works with schools, local farms and nonprofits to create a more equitable food system across the island. Before working with Island Grown Schools Brandee served as a service member with FoodCorps for two years in New London, CT. Brandee grew up in the Shenandoah Valley of Virginia and has a BS in public health and nutrition from George Mason University.

Paige Mollen

Paige Mollen is a life-long educator who has dedicated her career to making quality education accessible to all learners and empowering students to become leaders in their communities. She is co-founder and president of the Mollen Foundation, a nonprofit organization dedicated to the prevention of childhood obesity. In her role she focuses on integrating food education and physical activity into core curriculum in schools. Prior to starting the Mollen Foundation in 2008, Paige spent 22 years as an educator, national consultant and strategist facilitating innovative solutions for students with learning and behavioral challenges to learn and thrive in public schools. She currently serves as the education chair for the Arizona Farm to School Network. Paige holds a bachelor's degree in special education from Arizona State University and a master's degree in education from Northern Arizona University.

Joe Snowaert

Joe Snowaert is a program specialist with Fairfax County Public Schools Office of Food and Nutrition Services, where he works on integrating salad bars into the elementary school cafeterias. Prior to his current role, he completed two years of FoodCorps service. Joe first served in his home state of Michigan with the Crim Fitness Foundation in Flint and then as one of the first service members in Fairfax County, VA. Joe grew up in the Upper Peninsula of Michigan surrounded by water and a diversity of agricultural crops. He has a BS in horticulture from Michigan State University where he concentrated on sustainable and organic growing practices.



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