

An aerial photograph of a rural landscape. In the foreground, a large field of brown, tilled earth is visible. A road runs horizontally across the middle ground. In the background, there are green fields, a dense line of trees, and several farm buildings, including barns and silos. The sky is overcast.

MEETING REPORT AND RECOMMENDATIONS

FROM THE SUSTAINABLE FOOD FOR THE 21ST CENTURY ADVISORY PANEL

NOVEMBER 18, 2015





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WWF

About WWF: The world's leading conservation organization, WWF works in 100 countries and is supported by 1.2 million members in the United States and close to 5 million globally. WWF's unique way of working combines global reach with a foundation in science, involves action at every level from local to global, and ensures the delivery of innovative solutions that meet the needs of both people and nature.



About the Innovation Center for U.S. Dairy: The Innovation Center for U.S. Dairy provides a forum for the dairy industry to work precompetitively to address barriers to and opportunities for innovation and sales growth. The Innovation Center aligns the collective resources of the industry to offer consumers nutritious dairy products and ingredients and promote the health of people, communities, the planet and the industry.

SUSTAINABLE FOOD FOR THE 21ST CENTURY ADVISORY PANEL

By 2050, the world's population will exceed 9.7 billion people, and demand for food will double. Identifying and implementing environmentally sustainable ways to produce food is an ongoing effort in a constantly changing world. It requires collaboration across a diverse range of professions, disciplines, and geographies. In response to this challenge, World Wildlife Fund (WWF) launched the *Sustainable Food for the 21st Century* project in collaboration with the Innovation Center for U.S. Dairy. It is an interdisciplinary approach to identifying potential economic, technological, and practical solutions to develop more environmentally sustainable food systems.

This report is a summary of insights and recommendations from an advisory panel of 10 food and agriculture experts who met several times in the first half of 2015. While the panel focused primarily on opportunities within the U.S. dairy value chain, its work and recommendations are cross-cutting and, as such, can be applied to other agricultural sectors and countries.

The recommendations build on the insights shared by 52 food and agriculture experts who were interviewed to provide insights and approaches for addressing sustainable food production challenges for the 21st century. The interviewees represent industry (including 10 within the dairy industry), academia, government, NGOs, and others (grant foundations, consultancies, and retail).

The results from the interview process are discussed in a white paper titled *Facing the Challenge Together: Sustainable Food for the 21st Century*. A prominent and promising finding from the interviews was the high degree of agreement, the shared views, and the recurring themes that arose across diverse respondents. This result pointed to a number of opportunities that are ripe for collective action, including five specific issues identified (listed on the next page) that were discussed by the advisory panel and for which recommendations are offered in this report.

The Innovation Center for U.S. Dairy is already working on some of the opportunities identified in the white paper, as are others within the dairy and wider agricultural industries. Solutions regarding waste, metrics, and knowledge sharing are being explored and implemented to some degree, such as anaerobic digesters, the *Farm Smart* tool, and the *Stewardship and Sustainability Guide*. However, even for these solutions in progress, industry participants need to find ways to bring these solutions to scale to make long-term change happen.

WWF and the Innovation Center encourage readers of this report to take these opportunities to scale. If you are already working on some of these, or are aware of others working on solutions, please let us know by contacting Sandra Vijn at sandra.vijn@wwfus.org.

Note: This document reflects the recommendations emerging from a meeting of the Sustainable Food Advisory Panel; however, individual recommendations are not necessarily endorsed by WWF, the Innovation Center for U.S. Dairy, or individual panelists. All recommendations are designed for the U.S. dairy industry unless otherwise specified.

Goals of the Advisory Panel

The goals of the advisory panel are to expand on the key themes and opportunities identified during the 52 interviews—in particular, to

1. identify solutions, including technologies, practices, and platforms that have already demonstrated verifiable results, and provide recommendations to scale these solutions up in the marketplace, including early interventions and longer-term opportunities that may require more significant investments
2. identify and prioritize the research, piloting, and investment needed to fill gaps and/or address conflicting perspectives or technological solutions; and
3. engage stakeholders in the processes necessary to scale up these solutions, including the development of concrete, actionable steps

This report focuses mainly on Goals 1 and 2, which were core to the discussions of the first set of panel meetings. WWF, the Innovation Center for U.S. Dairy, and the advisory panel may continue to work on Goal 3 in 2015 and 2016 while tracking progress on and refining Goals 1 and 2.

We would like to thank Meridian Institute for their guidance and facilitation.

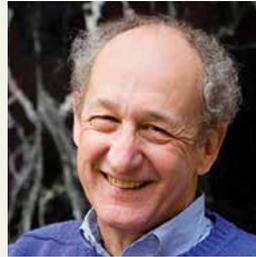
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Issues and Action Areas

The key themes and unique perspectives emerging from the structured interviews informed the selection of action areas for the advisory panel. The panel focused its discussions and the resulting insights and recommendations on how to achieve scalable, actionable solutions across the following five areas:

				
WATER MANAGEMENT	GENETICS	WASTE	METRICS	KNOWLEDGE SHARING
Identify ways for U.S. dairy and grain farmers to better conserve water and improve water quality.	Enhance understanding of the issues surrounding animal and crop genetics that considers the opportunities, barriers, and tradeoffs of various genetic solutions to establish acceptable solutions for crops and dairy cattle.	Identify concrete actions needed to reduce waste and maximize resource recovery, reuse, and recycling at all stages of the food chain.	Explore ways to incorporate environmental impacts and nutritional value into standard measures of sustainable production.	Identify the actions, stakeholders, and investments needed to leverage existing tools and expand knowledge sharing among producers and growers.

CROSS-CUTTING THEMES

The advisory panel identified a number of important cross-cutting themes and areas for action that provide potential opportunities for the dairy sector to contribute to a more sustainable food system:

1. The U.S. dairy industry should continue to advance environmental sustainability and share its advances with other sectors in the U.S. and abroad.
2. Sustainability should continue to be a pre-competitive pursuit.
3. Sustainability within the industry requires a holistic or “systems” approach to fully and accurately account for the complexity of agricultural systems and enable continuous improvement through best practices and data adapted to local contexts.
4. Providing the proper incentives is crucial to the pursuit of a sustainable dairy industry. Appropriate incentives will require, among several other aspects, economic and policy incentives to support and enable continuous improvement of sustainable on-farm practices and initiatives throughout the value chain.
5. Sustainability should continue to be integrated into existing dairy industry conversations and events; however, space should be maintained to engage in a stand-alone dairy sustainability dialogue as well.
6. Progress can be optimized through identifying leaders that are not only able to grasp the importance of the environmental sustainability story, but can credibly convey the story to key constituencies as well.
7. A more sustainable U.S. dairy industry requires more focused data collection and analysis to provide the information to support improving environmental outcomes.
8. The dairy industry should nurture working relationships with other sectors that can be partners in achieving ongoing sustainability gains across the agricultural sector.
9. Stakeholder education and engagement about environmental impacts and sustainability along the supply chain should continue to be a top priority.
10. Achieving environmental sustainability within the U.S. dairy industry requires clear and accessible communication that is tailored for unique audiences.



BETTER WATER MANAGEMENT PRACTICES AND TECHNOLOGY



Agriculture and water go hand in hand. As extreme weather events such as drought and flooding increase in severity and frequency, the need to improve water resource management has become increasingly clear. In addition, agriculture impacts water quality. The development and dissemination of solutions, including better management practices (BMPs) and technologies, is essential to increasing agricultural production and reducing environmental impacts, particularly as food producers adapt to a shifting climate. There are numerous existing practices and technologies that have been proven to help dairy and crop farmers conserve water that could be applied to U.S. farmers within the relevant context of their watershed, should they receive adequate support. Indeed, identifying the proven solutions that need to be scaled up through increased investment and broader adoption will be critical to accelerating effective water stewardship suited for a farmer's circumstances, both in the U.S. and globally. In particular, progress in the U.S. can help agriculture in developing countries mitigate and adapt to increasing climate variability.

KEY INSIGHTS

The panel emphasized the importance of considering the management of both the quantity and quality of water related to the U.S. dairy industry. Panelists agreed that the current approaches to the management of water resources do not currently include sufficient incentives—economic, environmental, or otherwise—to communicate the true value of water to producers and the public.

In addition, panelists discussed the opportunity to use the concepts of water resource efficiency and soil health to demonstrate tangible values—both environmental and economic—of managing water to stakeholders throughout the dairy value chain. Specifically, the panel believes that it is important to ensure that producers and the general public begin to connect the improvement of soil health with other essential environmental benefits such as reduced runoff due to better water retention. The development and implementation of incentives that change producer behavior to encourage the efficient use of water resources require political will and consumer demand. Additionally, panelists discussed the importance of considering local context when formulating solutions, noting that although water is an important resource everywhere, local context drives the specific policies and practices needed to address unique challenges. This will require strategies that draw on the power of markets and, when needed, government policy focused on setting standards and baselines. In some cases, corporations and government need to move in parallel to drive needed changes on farms. Lastly, panelists noted the clear and crucial link between developing and implementing better management practices and technology related to water and the other four action areas: genetics, waste, metrics, and knowledge sharing.





RECOMMENDATIONS

Emerging from this discussion, the panel agreed on the following list of recommendations:

1. Develop a holistic, systems understanding and approach to the design and implementation of technological and policy interventions that simultaneously increase efficiency and incentivize conservation in the allocation of water resources;
2. Conduct assessments of existing water management systems and water efficiency and conservation efforts within localized contexts to ensure that producers and others have a proper understanding of the current state of affairs. Research and identify the multiple benefits—economic, environmental, and social—of improved water management and compare the efficacy of existing and emerging water management practices and technologies in a way that is sensitive to local conditions. Document water management case studies (positive and negative) to provide the foundation for best practices to emerge and promote industry-wide learning opportunities;
 - The information compiled from the ongoing assessments should be used to design pilot programs that can explore enhanced approaches to addressing water use efficiency and conservation, water quality, and soil health;
 - Currently, the California crisis should be used as an opportunity for highlighting innovative approaches and a call to action to create political attention to these important issues. These efforts will help build the business case for action;
3. Integrate water resource management and conservation education into existing public and private sector crop advisory priorities;
4. Increase resources to incentivize new technological development as well as on-farm implementation of current best practices tailored to the local context (e.g., improved pivot irrigation) to increase overall impact;
5. Incentivize the development and adoption of context-appropriate and innovative methods for the collection and storage of existing water resources—for example, utilizing nutrient-rich water from tile drainage in the Midwest for on-farm use or other methods to preserve and repurpose water runoff during heavy rains;
6. Provide access to and support producers' adoption of practices and technology (e.g., plant breeding and composting) to improve plant uptake and soil retention of water; and
7. Identify ways to initiate conversations among producers and public officials about where crops are grown and animals are raised, specifically related to the context of projected water availability constraints, recognizing that water is only one dimension of the environmental impacts of agriculture and that circumstances may change over the years (e.g., weather patterns, new technologies, climate adapted crops, BMPs). Although the conversation will necessarily include immediate financial and political considerations, it is an important element of using a systems approach to the management of scarce water resources.





GENETICS

The advisory panel extended the conversation regarding genetics, which was a frequent point of interest during the interview phase of the project. There was substantial agreement regarding how genetic technology—whether through breeding, crossing, genomics, propagation, or genetic engineering—could contribute to several key sustainability objectives, namely increasing productivity; enhancing resiliency and adaptation; improving nutrient, water, and feed efficiency; and enhancing nutrition.

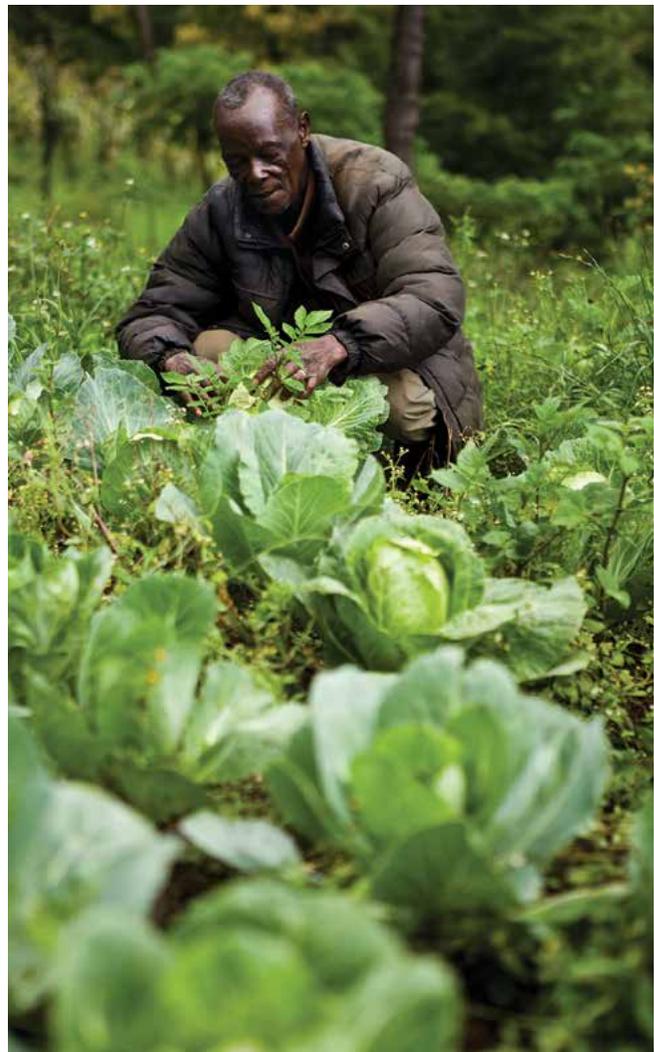
KEY INSIGHTS

There was no disagreement among the panelists about the important role that genetics plays in the overall discussion of the future sustainability of the U.S. dairy industry. It is important to understand dairy cattle genetics beyond current practices and how genetics influences the industry's environmental performance. In particular, the panelists agreed that the dairy industry should strive to restore a better balance between pursuing specific desired traits (e.g., productivity, resiliency, nutrition, and nutrient and feed efficiency) and the subsequent observable impacts on the overall dairy cattle population, specifically the acceleration of inbreeding within the United States herd, and the environment.

The panel agreed that the dialogue surrounding genetic engineering and genetically modified organisms (GMOs) between the broad communities of stakeholders has not progressed toward consensus and remains deadlocked, while noting that breeding remains an important component of the discussion on crop genetics as well. The national and international discourse related to emerging technology and business practices associated with genetics seems to focus primarily on disagreement between opponents and proponents of GMO technologies specifically, while the use of practices and technologies for improving genetics is significantly broader than GMOs. The conversation around the application of GMOs has turned into a “yes/no” conversation rather than a “where/how” conversation—where or how could emerging technologies and business practices be used and for what purpose, and how should these be managed and marketed. In short, the panel coalesced around the notion that if desired sustainability outcomes are to be sought through the use of genetic modification within the U.S. dairy industry and beyond, then the conversations around these practices need to originate from the “where/how” perspective.

Additionally, it should be noted that any dialogue related to genetic technologies is larger than just GMOs, and the conversation surrounding other technologies should be approached in a suitable manner as well. Lastly, the U.S.

dairy industry should identify appropriate ways to have the “where/how” discussion with its stakeholders, including consumers, to identify the best opportunities for dairy producers to utilize emerging agricultural practices to improve environmental outcomes.





RECOMMENDATIONS

The panel discussion related to the challenges and opportunities associated with dairy cattle and crop genetics in the U.S. produced the following list of recommendations for further investment, education, engagement, and action:

Cattle Genetics

1. Provide resources to increase understanding throughout the industry about the relationship between breeding patterns, animal welfare and productivity, life feed efficiency, animal health and human health (including use of hormones and antibiotics), and the associated environmental impacts. For example, research clearly documents the need to halt the continuous increase in skeletal size of dairy cattle in order to enhance production efficiency. A “systems biology”¹ approach should be pursued in order to fully understand the implications of individual decisions as well as the full suite of actions taken across the U.S. dairy industry;
2. Deliver to both seedstock breeders and commercial producers better educational opportunities related to the risks of continued reduction of genetic diversity within the U.S. breeds. Furthermore, the potential for enhanced production efficiency from hybrid vigor, the crossing of lines within breeds or distinct breeds, and a new business model to deliver them at scale should be explored and given greater consideration—as has been observed in poultry and swine, with substantial improvements;
3. Create a pre-competitive space to engage in the genetics conversation and increase the number of stakeholders involved in decision making and awareness raising around these important issues. In particular, identify trusted advisers and spokespeople for these challenges and ensure that these trusted voices are heard at existing industry fora; and
4. Conduct research on the full spectrum of inputs and outputs related to cattle production and the attendant genetic, environmental, and economic tradeoffs. Producers, consumers, and other stakeholders throughout the dairy value chain need these data to make more informed production and purchasing decisions.

Crop Genetics (Biotechnology and Breeding)



1. Establish credible and inclusive multi-stakeholder engagement platforms—to include government, consumers, the private sector, academia, and interest groups—that are led by trusted experts, thought leaders, and practitioners to ensure that the genetics debates of the future are more informative, constructive, and trusted than the conversations of the past;
2. Disaggregate the issues related to research, technological advancement, and evolving business practices associated with crop genetics. Leaders within the U.S. dairy community of stakeholders need to begin to discuss the sensitive issues related to crop genetics in an open, transparent, and productive manner that acknowledges the current relationships, moving the debate beyond a “yes/no” discussion to a more “where/how” conversation. The discussion should be framed in terms of technology, management practices, and science while acknowledging that some applications have cultural, economic, social, and/or environmental implications that are important to address; and
3. Connect the genetics discussion to other key conversations within the industry related to sustainability, with a distinct emphasis on the inclusion of farmers in this dialogue.

¹ From the Harvard University Department of System Biology: “Systems biology is the study of systems of biological components, which may be molecules, cells, organisms or entire species. Living systems are dynamic and complex, and their behavior may be hard to predict from the properties of individual parts. To study them, we use quantitative measurements of the behavior of groups of interacting components, systematic measurement technologies such as genomics, bioinformatics and proteomics, and mathematical and computational models to describe and predict dynamical behavior. Systems problems are emerging as central to all areas of biology and medicine.”





WASTE

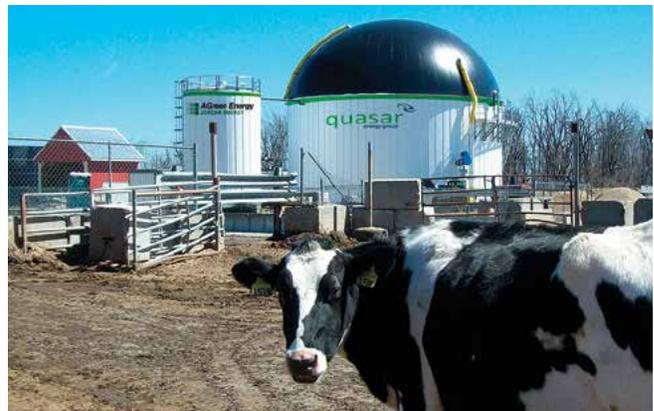
Responses during the structured interviews highlighted two main areas of focus in the waste discussion: the reduction of overall waste along agricultural supply chains and the optimization of its reuse, particularly of food waste and manure. The majority of the experts interviewed recognized that food waste is a core issue that must be addressed to meet growing food needs and to increase sustainability within the system. In addition, manure management is a key element of the overall waste discussion. Waste was identified as an immense and valuable resource that is created and all too often neglected throughout the agricultural value chain.

KEY INSIGHTS

Food Waste

Similar to the U.S. Environmental Protection Agency's Food Recovery Hierarchy, the U.S. dairy industry should apply a prioritized architecture when it comes to understanding how to manage this valuable resource in the following ways: reducing waste at the source, feeding people, feeding animals, exploring potential industrial uses, and feeding the soil or composting. As the hierarchy suggests and akin to the other four focus areas, food waste should be addressed using a systems approach, which requires a continuously improving understanding of the full life cycle of waste and its relationship with outcomes and efficiency opportunities related to other key resources (water, etc.). A key insight emerging from the panel was the need to develop improved systems to communicate to producers and consumers the amount of food waste that currently exists throughout the dairy value chain and how to change behavior to induce the production of less food waste. A particularly vivid image discussed was of a consumer exiting a supermarket with four bags of groceries and that same consumer immediately depositing one of those bags in the garbage. The idea behind this type of image is that it is something that is nearly universally relatable and, therefore, could be used to remind consumers and retailers that up to one-fourth of food that consumers buy in the United States is wasted (19% for dairy, in particular). As noted above, the term "waste" does not fully capture the potential of this resource or the diverse contexts within which the conversation must occur. Namely, by defining "waste" more broadly, it has the potential to include not only food waste but also other types of waste such as the loss of productivity due to poor human health outcomes. Lastly, the panel discussed the need to continue to look for lessons learned within the United States that may provide value when addressing similar challenges in developing countries.

Manure Management



Manure is rich in nutrients such as nitrogen and phosphorous, which, if handled properly, can be used to fertilize croplands and grasslands. However, if handled improperly, manure can pollute waterways used for drinking water, commercial fishing, tourism, or recreation. One solution to manage manure and its nutrient-rich content is by using anaerobic digesters; however, the scaling of digesters in the U.S. has been slow due to various barriers. It is important to understand whether these present challenges are more related to a deficiency in the necessary skills and capacity to operate digester facilities and in existing policies and resources, or whether the challenges are more due to insufficient science and technology. This may vary from site to site. Furthermore, panelists agreed that the industry should endeavor to create on-farm manure management systems that are most tailored to the local context, where possible. This would involve bringing more technology to waste-recovery systems and finding alternative uses and markets for waste products. The panel noted that there are existing and emerging opportunities to recover nutrients and other components of digestate for soil amendments and other products, thereby linking manure management and nutrient recovery to other on-farm sustainability practices and initiatives in addition to energy production.



RECOMMENDATIONS

The panel discussion related to the challenges and opportunities associated with waste within the U.S. dairy value chain produced the following list of recommendations for further investment, research, and action:

Food Waste

1. The U.S. dairy industry can and should be used as a pilot case to improve communication to consumers to engender a national ethic regarding the reduction of food waste;
2. The dairy industry should conduct a thorough review of waste production throughout its supply chain with the goal of developing a systems approach to waste reduction and prevention, including:
 - Strategies to be developed in accordance with the EPA's Food Recovery Hierarchy, as well as in consideration of the national food loss and waste goal of reducing food waste by 50% by the year 2030 announced by the U.S. Department of Agriculture (USDA) and the EPA <http://www.usda.gov/oce/foodwaste/>;
 - Reducing waste attributable to the inefficient use of best-by and sell-by dates. This approach should include an initiative to standardize and harmonize the definitions and labels associated with the quality and health implications of date labels at the consumer level;
 - Reducing waste in packaging, including redesign of packaging so that fewer food products are wasted; and
 - Reducing waste that is created due to inefficiencies in current retail pricing models;
3. Explore the potential to develop new dairy product options for the U.S. market that allow for a longer shelf life, or other options that reduce food waste at the production and consumer ends of the value chain;
4. Develop case studies that effectively illustrate existing, successful efforts to repurpose and recover food waste while maintaining food safety, to show that this type of transformation is possible; and
5. Conduct further research to develop accurate data (including baselines) to increase industry and consumer understanding of milk wastage in the U.S. versus other areas in the world to better understand the reasons behind any variance, and identify solutions based on these insights.

Manure Management



1. Create an integrated, systems approach to manure management that is tailored to the local circumstances and context in which a farm operates, which may include efforts such as on-site or off-site anaerobic digesters or additional initiatives to enable nutrient recovery;
2. The U.S. dairy industry should explore opportunities to develop markets for third-party implementers to manage on-farm digesters and take the subsequent resources to market. Such an approach could allow farmers to focus on their core operations while also improving manure management in certain locations as well as improving the allocation of these resources to other locations;
3. U.S. dairy stakeholders should continue to explore the potential to pursue specific policies or procedures to provide economic support, market demand, and the creation of markets that provide financial incentives to gradually and continuously improve manure management at the farm level;
4. Resources should be made available to conduct additional research and increase understanding of the multiple benefits of anaerobic digesters. These benefits may include soil health, energy production, water efficiency, and additional nutrient capture and repurposing; and
5. Create an "X-Prize" or similar initiative to incentivize the development of new technologies related to animal waste management or to create markets to repurpose animal waste. The X-Prize approach should explore different ways of designing and implementing the prize, including the relative benefits of awarding one large prize versus a number of smaller prizes.





METRICS

The initial interviews with the 52 experts pointed to a need for standardized metrics to inform decision making and evaluate overall progress that is tailored to communicate with diverse stakeholder groups—industry, consumers, and beyond. Shared measurements provide a baseline from which goals can be set and progress can be evaluated, such as improving yield or reducing environmental impacts. As such, metrics can be a powerful lever for innovation. The importance of including a food’s nutrient composition and security into measures of productivity, resource use, and environmental performance was identified as a key component to assess progress toward sustainable food systems.

KEY INSIGHTS

The advisory panel expanded on the topic and recommended that the dairy industry identify specific metrics that are tailored for different points in its supply chain, including for producers, consumers, and sustainability professionals from different sectors. In particular, the industry should work to identify the specific audiences and associated intent that are desired for any particular metric, to most effectively communicate the environmental and health outcomes that the metric is

designed to achieve. They noted that it is also important to be mindful that market prices or signals are an existing, powerful metric. The panelists made it clear that this identification and prioritization process should take place before adding new metrics to those already in place. Lastly, the development of specific metrics should begin with the following questions: What are you trying to communicate, to whom, and for what purpose?





RECOMMENDATIONS

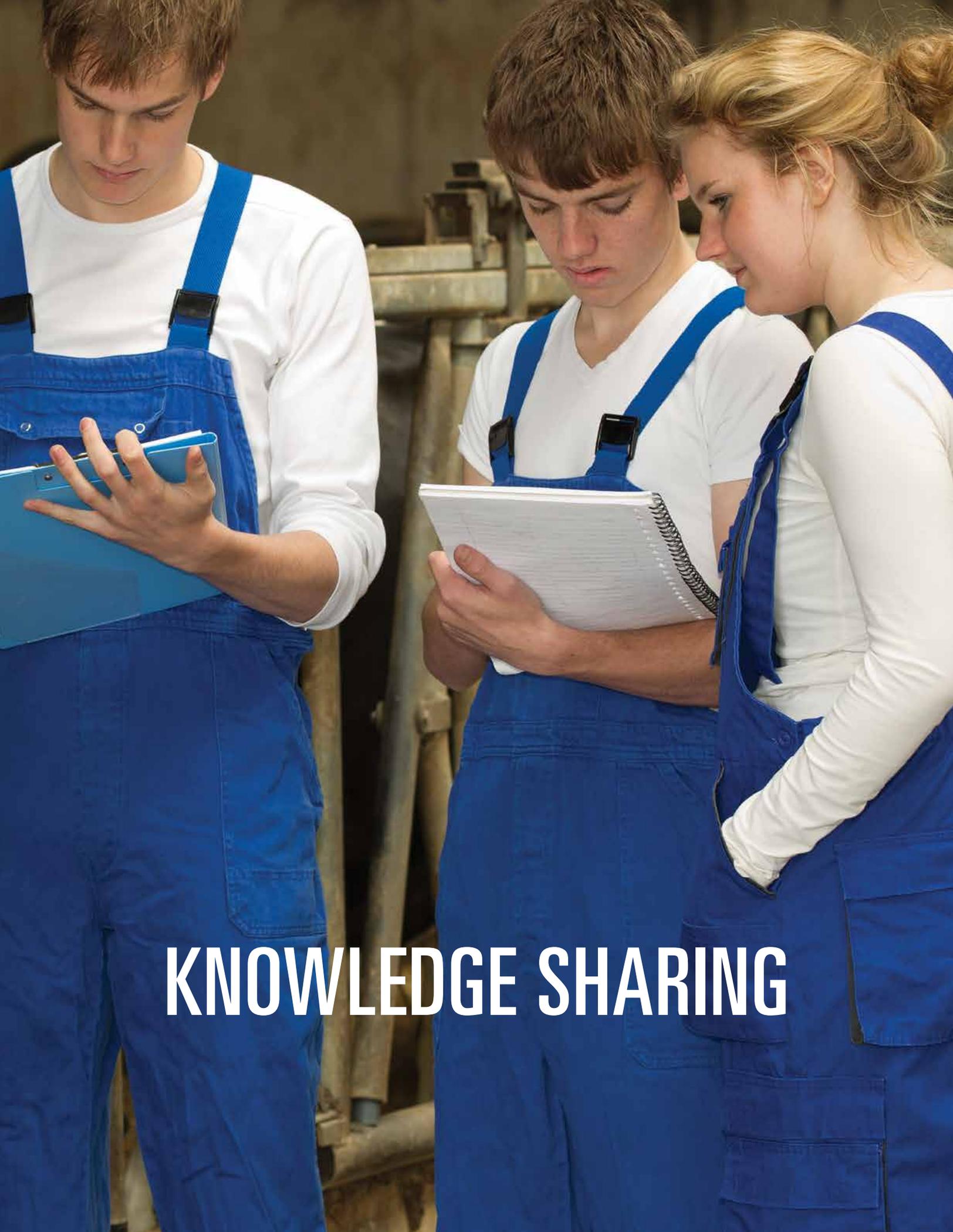
The panel discussion related to the challenges and opportunities associated with metrics related to the US dairy industry yielded the following list of recommendations for further investment, research, education, and action:

1. Develop and use evidence-based, scientific metrics to improve understanding of the inputs (e.g., feed, water, energy) and outputs that are included in any particular category of dairy production;
2. Approach the metrics conversation pre-competitively and include other protein sectors beyond dairy. This type of approach will contribute to the standardization of key metrics for the industry and for consumers. For example, the panelists discussed the potential for using protein inputs during production as a metric on food labels to contribute to a broader understanding of the appropriate amount of protein in the average diet;
3. Create smart food labels that are focused on a few key metrics to help simplify the existing system, which currently includes multiple, and at times confusing, metrics for consumers. The limited set of metrics should be supplemented with additional, optional metrics and data that may be of interest to some if they want to learn more about their food. To that end, the panelists recommend that the industry explore the use of a limited number of “sentinel indicators,” backed up with additional metrics and data in the event that consumers want to learn more about these indicators, which may provide an accessible consumer interface related to the sustainability of dairy products. Such information could be accessible through smartphone applications or through websites;



4. Tailor metrics in a collaborative manner to attain particular sustainability goals, address specific audiences, and highlight supporting supply chain elements. To accomplish this, the industry should convene relevant stakeholders to design an efficient system of metrics that serves multiple purposes and audiences. The design of appropriate metrics should utilize a systems approach that connects the various actors within and across supply chains to create a system that truly meets respective needs of the environment, producers, and consumers; and
5. Engage diverse authorities from the NGO community, the private sector, government, consumer groups, and academia to identify credible messengers that are able to promote standardized and simplified metrics within the dairy community.



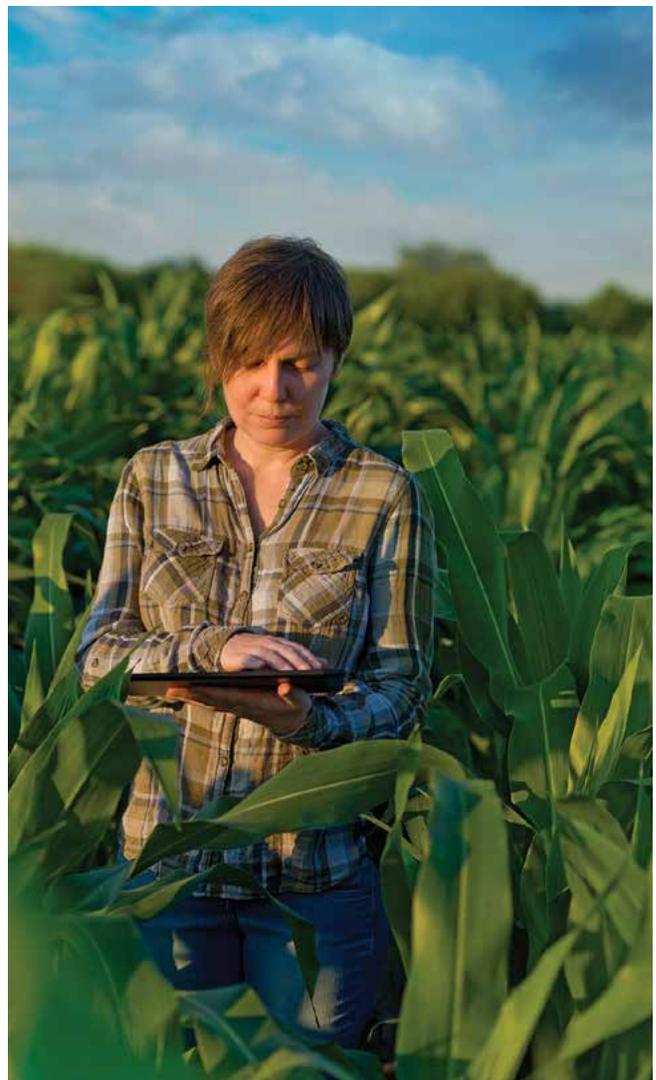


KNOWLEDGE SHARING

Experts across all sectors represented in the interviews—industry, NGOs, academia, and government— noted the need for “superefficient” production and increased yields to create environmentally sustainable 21st-century food production. Numerous technologies exist or are emerging today that are exceptionally useful for measuring, monitoring, and improving efficiency and production of sustainable foods. The experts agreed on the importance of increased research funding and recognition of the central role that education for producers plays to promote learning about better practices, technologies, and data and to share this learning with peers within the U.S. and abroad. Expanding education and access to information and data about the costs, benefits, and outcomes of sustainable on-farm practices regionally and globally is an important avenue to cultivate change.

KEY INSIGHTS

The advisory panel discussed the importance of considering various types of knowledge, the manner of knowledge sharing that occurs today, and the importance of ensuring that what is being shared is accurate and based on the best available science. It is also important to identify gaps in knowledge or emerging practices. Success in this pursuit will require trusted and credible opinion leaders that understand that this conversation should occur in a pre-competitive context to promote the sharing of knowledge specifically related to sustainability issues within the dairy industry. The leaders should recognize that knowledge sharing now and into the future is likely to be very different from traditional approaches, which could include nontraditional leaders (e.g., Silicon Valley) and may be communicated in nontraditional ways (e.g., social media), and engagement with nontraditional sources of financing may be appropriate. It is important to recognize that as the U.S. dairy industry evolves, so too should the ways in which the industry communicates both within the industry and with consumers.





RECOMMENDATIONS

The panel discussion related to the challenges and opportunities associated with knowledge sharing within the U.S. dairy industry generated the following list of recommendations for further investment, education, and action:

1. Convene discussions among thought leaders, producers, and consumers designed to gain a better understanding of the current needs within the industry—essentially, who needs what from whom in order to generate and share knowledge within the system. The result could be the identification of two or three knowledge-sharing priorities and strategies for taking action;
2. Create a venue to discuss the best approach to moving the sustainability conversation and knowledge sharing into the pre-competitive space. For example, the industry could discuss the tradeoffs associated with economies of scale and the potential impact these may have on animal welfare and overall sustainability. The industry may choose to communicate the role that various sizes of dairy operations can play in the overarching pursuit of a sustainable industry;
3. The industry should discuss ways to support universities in their search for additional resources to develop new knowledge and the human capital needed to support the sustainable dairy industry of the future;
4. Revitalize and expand the existing extension system, which is critical to effective knowledge sharing within the industry, and explore possibilities to include private finance as well;
5. Connect more effectively to social media and determine how to lead, not just monitor, the conversation on the dairy sustainability nexus;



6. Engage with existing nodes of communication and collaboration in order to leverage ongoing sustainability research, technology, and best practices in order to enter the broader national sustainability conversation to promote knowledge sharing and implementation of current best practices;
7. Explore opportunities to collaborate with big data aggregators, software developers, and others (e.g., Google) to unlock the potential in these systems to more effectively and accessibly share information across the dairy supply chain in the United States and beyond;
8. Engage a diverse range of producers at each stage within future dialogues related to building a sustainable dairy industry for the future; and
9. Incentivize a robust 4-H system within the U.S. that can serve as a model internationally as well. Reaching young and emerging farmers is a crucial step in ensuring the future sustainability of the dairy industry.

PUTTING RECOMMENDATIONS INTO ACTION

There are many ways to put the recommendations of the Sustainable Food for the 21st Century Advisory Panel into action, including

- working with dairy companies, customers, and organizations such as Field to Market: the Alliance for Sustainable Agriculture to encourage on-farm adoption of measurement tools, technologies, and techniques that promote more sustainable food production
- collaborating with dairy companies, co-ops, farm service providers, extension agents, and consultants to raise awareness among farmers about the environmental value of practices and technologies identified by the advisory panel
- educating consumers about the impact of food production on the environment and the value of practices that mitigate those impacts

The recommendations are at different stages of research, investment, testing, and implementation. Some of these recommendations are already being developed and applied by various groups, including the Innovation Center for U.S. Dairy. For example, the Innovation Center has developed tools and metrics that have informed environmental dairy farm management as well as laid the foundations for a growing number of farmers to collaborate with businesses and municipalities to generate energy from the waste produced on their farms and by industrial plants, consumers, and retailers within neighboring communities. The recommendations reinforce the potential opportunities related to these efforts to drive change. Now we need to find ways to take achieved or potential successes to scale and make them part of daily practices across the United States and, if applicable, elsewhere. Other recommendations, such as those related to food waste reduction through redesign of packaging or labeling, may need more research and investment before being able to scale up. We are encouraging readers of this report to act on these recommendations.

We invite readers to submit their thoughts on how we can integrate existing efforts, organizations, and other opportunities for collaboration into these recommendations. Please contact Sandra Vijn at sandra.vijn@wwfus.org to become involved or if you would like to discuss potential implementation activities and partnerships. We look forward to hearing from you and working together to build a more sustainable future.

To follow WWF's work on sustainable food, please visit www.worldwildlife.org/initiatives/food.



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