feeding the minds that feed the world

Building a Future-Ready Science Workforce to Address Food and Nutrition Security Challenges:

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About IFT

Since 1939, the Institute of Food Technologists (IFT) has served as the voice of the global food science community. IFT advocates for science, technology, and research to address the world's greatest food challenges, guiding our community of more than 200,000. IFT convenes professionals from around the world—from producers and product developers to innovators and researchers across food, nutrition, and public health—with a shared mission to help create a global food supply that is sustainable, safe, nutritious, and accessible to all. IFT provides its growing community spanning academia, industry, and government with the resources, connections, and opportunities necessary to stay ahead of a rapidly evolving food system as IFT helps feed the minds that feed the world.

Executive Summary

A skilled and adaptable workforce is essential for achieving global food and nutrition security. In an environment of rapid technological advancement and social change, preparing the scientific workforce for the future has become increasingly challenging while also creating a strategic opportunity for food science. To explore the skills and training needs for the future workforce, the Institute of Food Technologists (IFT) Food and Nutrition Security Steering Committee convened a multi-stakeholder workshop focused on four competency areas: artificial intelligence (AI), regulatory and policy literacy, systems thinking and leadership, and science communications and consumer understanding. Participants from academia, industry, government, and non-profit sectors discussed current gaps and potential solutions through focused presentations and breakout groups. A subsequent consultation with department heads from North American universities was conducted to validate the findings of the workshop and discuss implementation opportunities. Across all competencies the key needs identified were faculty training, interdisciplinary collaboration, applied learning with real-world case studies and projects, and accessible continuing education for professionals. Participants emphasized that these competencies can be embedded into current training and do not need stand-alone training. Critical thinking, empathy, and ethics were emphasized as foundational skills across all these areas. The findings reveal that preparing a future-ready food science workforce will require better alignment of curriculum and continuing professional development around technical and human skills. Multidisciplinary collaboration within universities, industry and professional societies will be critical for ensuring these competencies are embedded into training frameworks at all career stages. A workforce capable of applying and effectively communicating technical expertise with integrity across the food system will be essential to advancing food and nutrition security.

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A subsequent workshop was held with the Council of Food Science Administrators at IFT FIRST in July 2025.

Introduction

The food sector is undergoing rapid technological, environmental, and regulatory changes that require an adaptive food science workforce with broader, multidisciplinary skills and competencies. The field has expanded beyond traditional processing and safety techniques to now include digital technologies, biotechnology, and automation with an emphasis on sustainable, circular, weather-smart approaches. As food systems remain a critical component of economic stability and public health around the world, future food scientists, technologists, engineers, and other stakeholders must be prepared to address the complex and rapidly changing environment to develop sustainable and resilient food systems.

Despite these rapid advancements, there remains a gap between the skills needed and those developed through current training and education systems. This has been reviewed in several recent publications on the future of food [1-4]. Several authors emphasize key technical, engineering, or digital expertise needed for the future, while others stress a growing need for “soft skills” such as communication, collaboration, and systems thinking. Compounding these issues is the decline of individuals entering the food workforce over the past decade [5, 6].

The Food and Nutrition Security Steering Committee (FNSSC) of the Institute of Food Technologists (IFT) has consistently identified workforce training as both a barrier and an opportunity to advance the role of food science solutions for global food and nutrition security. Over the past four years, the FNSSC has held several roundtables, workshops, and drafted white papers on topics critical to food and nutrition security, including food waste reduction and valorization [7], processing innovations [8], enhanced use of biofortified and underutilized crops [9], and adaptation to extreme weather environments [10]. In each of these areas, workforce development emerged as a critical component to ensuring the future of food and nutrition security around the world.

As a result, the FNSSC developed a workshop with individuals from the food industry, government, academia, and non-governmental organizations—including students, early career, and senior scientists from around the world—to identify practical strategies and approaches to develop a future-ready food science workforce. Areas of emphasis included technical areas, such as artificial intelligence and data systems and regulatory and policy literacy, as well as softer skills such as science communication and consumer understanding, and systems thinking and leadership. The qualitative and quantitative insights and priorities developed during the workshop were further validated through consultation with academic department heads to better understand feasibility and ideate on opportunities to develop these skills and competencies within educational programs at universities. This report summarizes the outcomes of the workshop along with insights from academic leaders on the strategic and practical approaches to help develop the food science workforce of the future.

Approach

Prior to convening the workshop, the FNSSC reviewed white papers, notes, and recordings from previous roundtables on the topics of food waste, processing, underutilized and biofortified crops, and food production in extreme weather conditions to identify the key areas of workforce development needs. The four primary areas prioritized by the FNSSC were artificial intelligence and data systems, regulatory and policy literacy, science and communication skills, and systems thinking and leadership.

On May 28, 2025, an interdisciplinary, virtual workshop was held with more than 30 individuals from different areas of the food system including industry, government, academia, and nongovernmental organizations to discuss workforce needs and opportunities in the four core areas prioritized by the FNSSC. Brief presentations

to familiarize everyone with each topic area were followed by roundtable discussion, breakout sessions, and polling to obtain the perspectives of all participants.

Following the workshop, the data and feedback obtained was summarized by IFT and presented at the annual meeting of the Council of Food Science Administrators (CFSA) in July 2025 to obtain additional feedback and perspectives from approximately 50 university department heads and deans from around the US and Mexico. Following the presentation, table discussion with guided questions was facilitated and feedback collected and shared with the broader group. The FNSSC reviewed the feedback from the workshop and CFSA meeting and developed recommendations and priority areas for development of the future food workforce. The four key areas with feedback and recommendations are discussed below.

Artificial Intelligence and Data Systems

The ongoing digital transformation, commonly referred to as Industry 4.0, is changing how global production and supply chains operate with increasing automation, smart technologies, sensors, and connectivity that extends across the food system [11]. One of the key drivers of this digital transformation is artificial intelligence (AI), which has enabled rapid acceleration of automation and real-time data analysis. AI is also transforming food science and technology from product development to streamlining production to improving monitoring and response to food safety concerns. However, the food science workforce is unevenly prepared to engage with and utilize AI tools.

Both workshop participants and academic leaders emphasized the considerable differences in basic understanding of AI in education and industry. Many professionals and educators trained prior to the current digital era are inexperienced with AI systems application, how they operate, and how to effectively use AI tools. These misunderstandings often contribute to misconceptions that AI will replace rather than augment current food science and engineering expertise. Yet some participants with training in AI

based tools recognized the utility of AI to supplement human expertise while still needing critical thinking skills that only humans can provide.

Beyond basic AI literacy, there are additional barriers to adoption of AI in academic and industry settings, including time constraints, ethical barriers, bias, and confidentiality. Traditional curriculum at universities has little room to add new content related to the use of AI and many educators have limited exposure to AI tools that would be used in industrial environments. There is also a lack of understanding of the AI algorithms used to produce results, which was commonly referred to as the “black box” problem. In a field where clear explanations and justifications are needed for regulatory compliance and quality control, food scientists must be able to explain their decisions to ensure consumer trust and legal compliance. Further, AI systems and outputs are only as good as the data used to train them, and they will inherit any biases in the data or instructions provided, demonstrating the importance of critical thinking and evaluation of the data source as well as the AI model being used. There also remains considerable hesitancy around data sharing for AI applications in both academia and industry due to concerns around the loss of intellectual property or privacy issues with consumer data. While data sharing could make some AI systems more robust, concerns about trust continue to limit collaboration in this area.

These challenges also extend beyond academia into industry where companies are moving more toward AI driven technologies in production, often without corresponding training for personnel. Thus, employees do not often know how to evaluate or adjust the information they receive from AI tools. Overall, there was consensus that a future-ready food science workforce must be able to use AI tools as well as critically evaluate the inputs and outputs of the systems.

Opportunities for Integration

Despite the challenges identified, participants still viewed AI as essential for the next generation of food scientists and discussed potential ways to integrate it into food science curricula. Due to the limited capacity to add more classes, a recurring theme in the discussions was how to embed AI modules into existing classes and coursework, such as food engineering, product development, or sensory analysis to explore how these tools can help with formulation, quality control or shelf-life modeling.

> "If students can see how AI improves decision making, it becomes a skill rather than a theory."
>
> *Workshop Attendee*

Collaborations between industry and academia were also highlighted as a way to bring real-world examples to use for applied learning. Companies could provide anonymous data sets or simulated production data that students could use to learn error detection, validate models, and assess bias to strengthen analytical and critical thinking skills. There was also an emphasis on collaborative teaching models with data scientists and AI experts to combine food science knowledge with computational expertise to optimize the use of AI systems. Two models of this type of collaboration are described below.

The National University of Singapore

NUS National University of Singapore

Food Informatics and AI course integrates data science into food and nutrition education by blending AI modeling, nutrition informatics, and systems analysis to demonstrate how interdisciplinary training can prepare students for future roles in food science and nutrition

IFT Co-Developer

CoDeveloper Powered by IFT

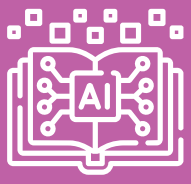
Demonstrates how AI specialists can collaborate effectively with food scientists to develop helpful tools for product development and innovation https://codeveloper.ift.org/

Several participants from academic institutions noted that the critical thinking and ethical issues surrounding AI are not limited to food science and suggested creating campus-wide, interdisciplinary, critical thinking initiatives to address these issues and provide training. This would enable food science to leverage the expertise of other disciplines, such as computer & data science and engineering, rather than trying to build trainings in isolation. There was also a suggestion for AI advisory councils at the university level or coordinated through IFT to provide guidance on the responsible and ethical use of AI within the food science field. Additionally, certification and training programs through a university or IFT would also enable rapid training for faculty with limited knowledge and experience with AI.

> "The students are ahead of us; we need to catch up fast."
>
> *Workshop Attendee*

Key Recommendations

From the discussions on AI and data systems within the workshop and with input from academic leaders the following recommendations emerged:



Build foundational AI literacy

Food science and engineering graduates should understand the basic principles of AI, the capabilities of various tools, and the assumptions and limitations.

Emphasize critical thinking and ethics

Students and professionals should be able to critically evaluate the inputs and outputs of AI systems to identify errors and bias and understand the ethical use of data. Human oversight will always be needed.

Invest in faculty/ personnel development

Universities, companies, and/or professional societies should provide training, shared resources, and collaborate with other disciplines to enable instructional capacity.

Integrate AI into existing curriculum

Rather than creating unique courses at the university level, the training and use of AI should be embedded into existing coursework using real world data when possible.

Overall, there was consensus that AI, as a tool for the future, will continue to require human expertise and input. The strength of the future workforce will rely upon the ability to integrate AI tools with critical thinking and ethical principles to fully leverage its capabilities for innovation.

> “AI won’t replace food scientists, but food scientists who know how to effectively use AI will replace those who don’t.”
>
> *Workshop Attendee*

Regulatory and Policy Literacy

Knowledge and application of regulations and policy regarding food is essential for responsible marketing and innovation but is an underdeveloped competency in food science education. Understanding regulations is essential not only for compliance, but also to ensure consumer trust, manage risk and inform science-based policymaking. However, most regulatory knowledge is acquired through professional experience and often through trial and error.

Current Landscape and Challenges

At the undergraduate level, most regulatory and policy instruction occurs within a broader food safety or processing course or through an introductory course to food law or food labeling. While helpful, this limited exposure does not prepare students for the realities of industry where understanding of federal and state regulations, ingredient safety evaluations, and global standards are critical for decision making. Most food scientists reported their learning in regulations and policy came informally through on-the-job experience, mentorship, or reliance on legal counsel. Several participants mentioned that regulatory and policy training at their universities were primarily in other disciplines, such as law, public health, or business, which they did not have exposure to within their food science curricula.

Industry participants also noted scientific advancement and innovation often outpaces regulatory readiness. Modern technologies have rapidly expanded knowledge about the relationship of food and human health in areas such as novel ingredients and personalized nutrition, but regulatory agencies around the world struggle to keep up. The growing number of startups and small businesses may face even greater challenges as they often lack access to regulatory guidance.

Opportunities for Integration

At the university level, participants suggested that foundational skills in food regulations and policy should be introduced at the undergraduate level and continue throughout graduate training and into continuing education programs. As students advance or move into the workforce, they could focus on specialized domains, such as international trade, ingredient safety, or labeling, creating an expertise that deepens over time.

Applied, case-based learning was stressed as one of the most effective methods of training, as most knowledge of regulatory comes through experience. The use of previous self-determinations for ingredients Generally Recognized as Safe (GRAS) was mentioned by several participants as excellent real-world training examples for data and safety analysis, as well as understanding the legal and ethical concerns within risk assessment. Additional examples included label development, evaluation of past food recalls, and infant formula oversight as practical examples to increase regulatory and policy literacy.

Interdisciplinary collaboration and training were also identified as essential for training, particularly in a university setting. Some academic leaders noted that they already partner with food law departments to provide education on regulations and policy for food scientists.

> “It’s not about teaching every student to be a regulatory expert—it’s about ensuring they know when and how to seek the right expertise.”
>
> *Workshop Attendee*

For professionals, societies like IFT could develop training resources, short courses, or online modules ccessible to food scientists as well as academic institutions and entrepreneurs. Also, professional organizations could establish mentorship networks to provide the advice and expertise needed for those with limited access to regulatory resources and expertise.

Finally, participants also discussed the importance of being able to accurately communicate science to help inform the development of science-based policies. Often policies and regulations around the globe are made without understanding of the implications to the food, its affordability, accessibility, and acceptance. Additionally, there are implications for the supply chain and sustainability (e.g., food waste, energy use) that also are not often considered if they are not included in the conversations when regulations are developed. Food professionals must understand and be prepared to communicate the implications of different regulatory pathways on the affordability, accessibility, and availability of foods as well as any downstream or upstream implications to help inform science-based regulations that support sustainable, realistic solutions for the health and well-being of consumers.

Key Recommendations

From the discussions on regulatory and policy literacy within the workshop and with input from academic leaders, the following recommendations emerged:

Integrate regulatory training early and repeat throughout education

Introduce regulatory principles through applied projects early at the undergraduate level and continue to reinforce throughout graduate education and with continuing education.

Emphasize practical skills

Teach students basic literacy skills, such as how to navigate the Code of Federal Regulations (US) or Codex Alimentarius as well as web portals and reliable locations to obtain regulatory updates.

Adopt case-based learning

Use real-world examples, such as GRAS determinations, recalls and labeling exercises to teach applied decision making.

Build cross-disciplinary partnerships for training

Collaborate with other university programs, such as law schools, public health departments, or business programs to avoid the need to create training in isolation.

Expand professional training

Encourage professional organizations, such as IFT, to develop short courses or training modules, as well as mentorship networks that are widely accessible to students and entrepreneurs.

Promote science-based communications to inform policy making

Train scientists to be able to accurately convey the scientific implications of regulations and policy on food development, affordability, accessibility, and availability, as well as upstream and downstream implications.

Regulatory and policy literacy is critical for every element of the food system, from innovation to safety to public health. A future-ready food science workforce should be able to navigate and understand global regulations and contribute to their formation. Interdisciplinary collaboration and real-world training opportunities can help make this a reality.

> “Regulation is where science meets society.”
>
> *Workshop Attendee*

Systems Thinking and Leadership

Systems thinking refers to recognizing the interconnectedness of a system (in this case the food system) to inform more holistic and sustainable solutions. It is a term commonly used but not well understood or defined by most in the food science field. For many participants it was an abstract concept reflecting a holistic awareness of the interconnectedness of the food system, but not necessarily influential to ways of working. For others it represented a framework by which scientists should approach the complexity of the modern food system; often contrasted with the "siloed" approach to training and education in most disciplines (e.g., chemistry, microbiology, engineering).

Current Challenges and Gaps

The lack of clear definitions along with the complexity of the food system leaves many overwhelmed and confused as to how they may be able to influence and act in that system accordingly. Additionally, terms like "systems thinking" are used differently in academia, industry and policy which can create communication barriers. Most participants agreed that the silo approach to training, education, and even employment limits the ability of students, faculty and professionals to see connectedness in a way that allows them to use their scientific expertise to solve complex problems that impact multiple stakeholders in the food system. Issues such as food waste, food security, consumer behavior, and supply chain resilience are not well understood or addressed because they are broad issues that do not fit within one area of training and expertise.

Some industry participants noted that sustainability is one of those issues that require "systems thinking" and is becoming increasingly integrated into their job responsibilities and performance indicators. However, other system wide issues, such as trade and economic growth, remain in the periphery. Similar to previous issues, such as AI, faculty that are unfamiliar with systems approaches to foods struggle to integrate training into their coursework or lack the time to develop a collaborative course that involves other disciplines.

Opportunities for Integration

Despite the conceptual barriers, participants agreed that systems thinking and approaches should be taught in theory and in practice. One proposed model was a "bookend model" where students are introduced to systems concepts in an introductory course and then apply their learnings to real-world problems in senior-level capstone courses. Tool-based learning, using visualization platforms like Kumu, was also suggested to help students and trainees see relationships among variables such as cost, waste, and consumer behavior. Applied

scenarios, such as analyzing food waste at a university dining center, would enable students to visualize feedback loops and trade-offs as certain components of the food system are modified.

Some participants suggested borrowing frameworks from other disciplines. Engineering, environmental sciences and public health have established systems methodologies they use that include scenario mapping and stakeholder analysis. Adapting these frameworks into food systems could enable better communication across disciplines and better recognition of the potential solutions and trade-offs.

Interdisciplinary teaching teams and partnerships were also seen as essential for promoting systems approaches in education and development. Farm-to-table short courses that bring together expertise from agriculture, nutrition, supply chain, logistics, retail, and consumer insights could demonstrate the diversity within the food system.

Projects that require students to connect the technical domains within the food system to solve multistakeholder issues can develop skill sets highly desirable to future employers. Many participants suggested connecting systems thinking to leadership development as it requires many attributes of good leaders, such as emotional intelligence, collaboration, and empathy.

One example of a program like this is the University of Florida's Systems Thinking in Food Systems course. In this class, students apply systems thinking to real-world food problems to map the issues and design solutions. Through tangible challenges and collaborative problem solving, students gain the skills they need to approach future problems with a systems thinking viewpoint. The leader of this course emphasized that systems thinking is best learned through experience and in collaboration with other students rather than theoretically through lecture, noting that, "when students see how agronomy connects to packaging or logistics, the system finally makes sense."

To assist faculty in developing more integrated systems coursework, development workshops, case studies, and teaching resources were proposed as practical ways to support educators. These tools could be curated or developed by professional organizations or through a mentorship network of professionals using systems approaches in their education models. Embedding training into accreditation standards would also advance it as a measurable competency. Continuing education that integrates real-world examples could also help individuals desiring to implement a systems approach.

Key Recommendations

From the discussions on regulatory and policy literacy within the workshop and with input from academic leaders, the following recommendations emerged:

Clarify and define systems thinking

Develop a shared terminology, framework, and tools that can take systems thinking from the abstract to something more concrete.

Embed into university curricula

Introduce systems thinking early and reinforce it in capstone courses.

Use tools and case studies

Systems mapping tools, modeling exercises, and real-world projects with food system challenges provide the best experience to teach students and professionals to think across the system.

Foster interdisciplinary collaboration

Encourage disciplines across departments to come together to teach courses on systems approaches and hear the different perspectives of multiple technical domains.

Support faculty development

Provide trainings, shared resources, and mentor networks to help integrate systems teaching across universities.

Establish system thinking as a leadership skill

Integrate technical skills with collaboration, emotional intelligence, and empathy.

Science Communication and Understanding

Effective communication is essential for the credibility and impact of food science on consumers, policymakers, and other stakeholders across the food system. Yet many participants acknowledged a lack of training and even discomfort with communicating scientific information to lay audiences. This can undermine public trust and limit the profession's influence within the food system. Scientific communication was recognized by many participants as one of the most urgent workforce development needs.

Current Challenges and Gaps

Participants consistently noted that many food scientists are not trained or comfortable communicating beyond a technical audience. Students are frequently trained in how to communicate with scientific audiences and often present their work at scientific conferences and within classrooms to develop this skill. However, communication with non-technical audiences is rarely integrated into curriculum and there are limited experiential opportunities for students to learn this skill. Food science programs typically lack coursework in sociology or consumer behavior, which could enable scientists to better understand how people interact and interpret information about food. Some academic leaders also noted a lack of confidence and motivation among food science students and faculty, as well as a lack of institutional support and academic reward for engaging the public or other stakeholders within the food system. In the current environment with heightened emphasis on food and public health, several scientists expressed a "fear of being misunderstood or judged" which further discourages them from engaging with lay audiences.

As a result, consumers continue to be disconnected from the science that provides them with the foods they consume. Culture and social media have a greater influence than scientific reasoning when making food choices and misinformation and mistrust of science causes further division. Food scientists must engage in a food dialogue that is often shaped by values and experience moreso than by evidence, which requires communication in a language and tone that reflects the audience's perspective rather than expecting audiences to think scientifically. This can prove challenging without training and practice.

Within the food industry, food scientists often learn through experience how to communicate with non-technical business partners, such as marketing, sales, legal, regulatory and consumer affairs. This helps to equip them to better engage with non-technical audiences and gives them a broader view of the food system, but these professionals are often constrained by corporate policies that limit external communication.

Opportunities for Integration

Most participants suggested that scientific communication should be treated as a core competency in food science education and continuing professional development. However, there was a proposition of a tiered approach whereby all students receive basic training to become competent at communicating within teams and across disciplines, but advanced training and specialized tracks be made available for those seeking careers involving public, media, or policy engagement.

Similar to other areas such as regulatory and systems thinking, embedding communication training into existing classes was a favored approach over stand-alone classes. Projects that require not just communication of scientific findings, but the application and explanation of the outcomes in lay language were encouraged. Establishing joint projects with other disciplines, such as marketing, business, or public policy could help students learn to explain scientific findings to multiple audiences as well as develop skills for integrating consumer input from other sources into the design of their research and/or product development.

Effective communication should also reflect cultural values, social context, and behavioral motivators. Food is personal and part of the cultural fabric and listening to others with empathy and understanding is often more important than speaking to establish effective and trustworthy communications. Storytelling was also identified as a trainable skill that can improve personal and scientific communication. Leading with relatable stories and following with science is one way to balance the personal with the technical.

Existing models of scientific communication, such as the Alan Alda Center for Communicating Science, could be implemented to strengthen communication training. Tuskegee University also includes a nutrition education and counseling course for nutrition students and could inspire similar offerings for food science departments. In fact, collaboration with nutrition departments was emphasized since they share a common goal of improving public understanding of food and health. IFT and universities could also consider short courses, workshops, or certifications to help train students, faculty, and professionals on effective communication. Institutional changes that recognize and reward faculty involved in communication and outreach activities to non-technical audiences would further elevate the importance of scientific communications.

Key Recommendations

From the discussions on regulatory and policy literacy within the workshop and with input from academic leaders, the following recommendations emerged:

Integrate communication skills and training across the curricula

Principles and practice of effective communication can be easily integrated into existing courses.

Consider a tiered training structure

All students should be provided with foundational skills in communication across disciplines, but advanced pathways could be made available for those wanting to focus on media or public policy engagement.

Emphasize effective listening skills along with speaking skills

Include empathy and cultural competence training to recognize diverse perspectives and motivations that drive consumer behavior.

Use storytelling as a communication tool

Teach scientists to develop relatable narratives to share facts and increase engagement.

Encourage interdisciplinary collaborations

Partner with other disciplines, such as communications, marketing, and business to develop projects and instruction.

Engage professional societies

Principles and practice of effective communication can be easily integrated into existing courses.

Reward communications within professional practice

Encourage universities and employers to recognize the importance of the food science voice in the public conversations around food and support outreach as a core element of leadership.

Overall, participants agreed that effective communication across disciplines and technical skills is a professional necessity for anyone working in food science. The ability to listen, empathize, explain, and translate scientific information builds public confidence in science and strengthens collaborations across the food system.

At the conclusion of the workshop, participants were asked “Of the solutions, approaches and frameworks discussed today, which do you think are the most important to pursue in the near term?” and were provided with an online poll that required each of them to force-rank the four competency areas. The results are shown in **Figure 1**. Overall, scientific communication competencies were most frequently ranked as the highest priority (46.2%), followed closely by AI (38.5%). However, almost 70% of the respondents included regulatory and policy literacy as one of their top two priority areas. Most participants ranked systems thinking and approaches as lower priority, perhaps due to the lack of clarity as discussed previously. These results can help prioritize the future areas to implement early.

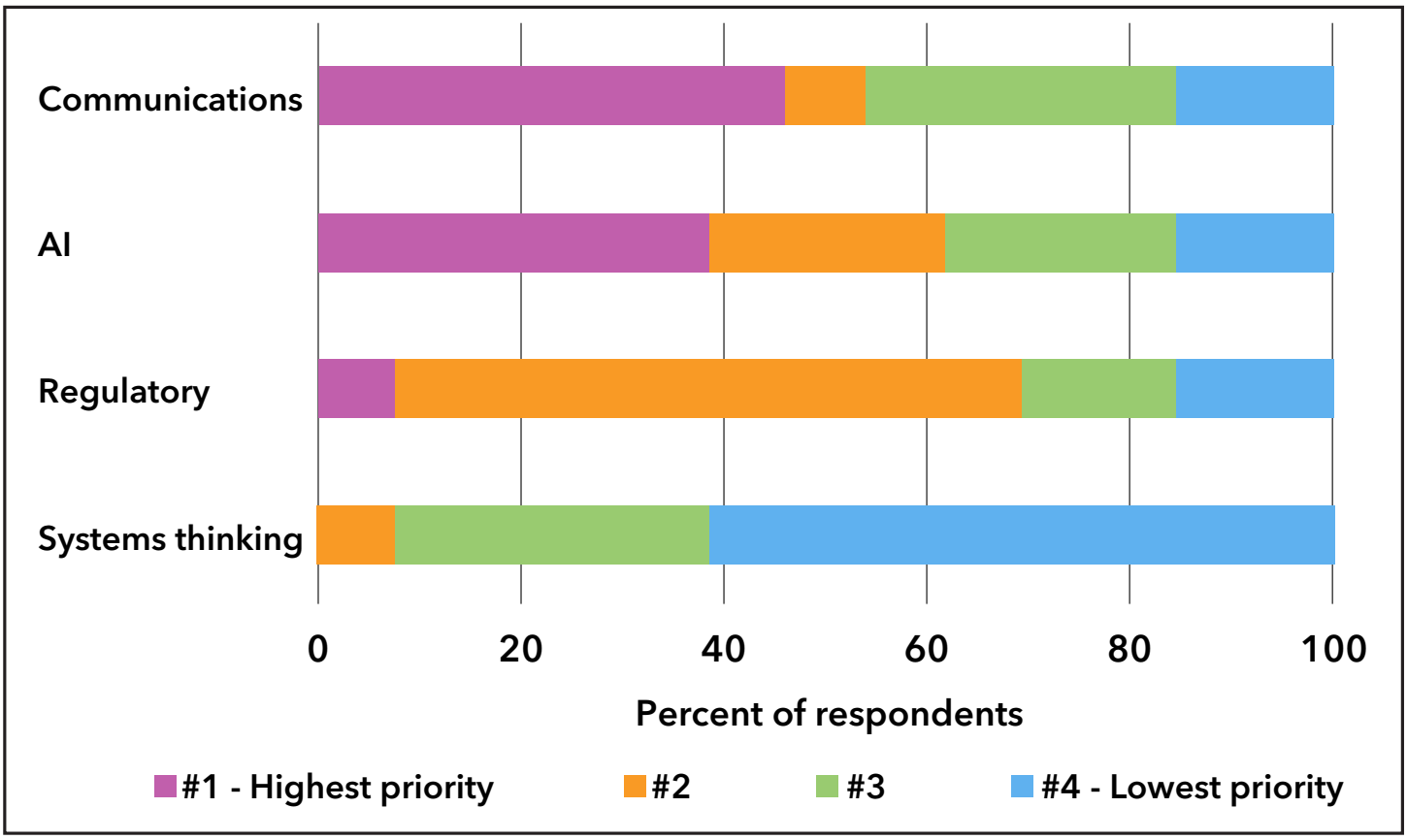


Figure 1. Results of workshop poll asking respondents to force-rank priority level for each competency area. AI = artificial intelligence

Summary

Throughout all discussions, participants agreed that the future of food science depends on a workforce that can integrate technical knowledge with ethical judgment, systems awareness, and effective communication. Scientific communications and consumer understanding were identified as the highest priority area where near-term implementation is needed. However, the competencies explored in these discussions, including AI, regulatory and policy literacy, systems thinking, and communications require similar skills of critical thinking and the ability to apply and communicate knowledge responsibly to a broader system and stakeholders. Thus, these competencies need not be discrete classes in an already full curriculum or workload but integrated into existing education and professional development. Applied projects, case studies, and interdisciplinary teaching were identified as some of the most effective ways to prepare the future workforce for real-world challenges.

> “It’s not just the what and the why that we need to learn, but the how.”
>
> *Workshop Attendee*

Faculty readiness and institutional support continue to be a barrier to implementation as many educators lack training in AI, communications and systems approaches and have limited time and resources to update coursework and integrate applied examples. Online trainings, resource sharing through professional organizations, like IFT, and mentoring networks were all identified as opportunities to help build capacity and support faculty in training the future food workforce. Institutional changes, such as integrating these competencies into accreditation frameworks and providing recognition and credit in professional evaluation systems, will ensure a continued emphasis on these areas of development into the future.

Workforce development also continues past the classroom and ongoing learning opportunities through continuing education, short courses, and professional mentoring were all emphasized as essential to ensure competence across a career in a constantly evolving food system. Programs should also serve non-traditional entrants from other fields, such as public health or business, or entrepreneurs in the food space that lack foundational knowledge of food regulation and food systems. The IFT course “Food Science for the Non-Food Scientist” is an example of this type of course that could be further enhanced to include competencies in AI, communications, and systems thinking.

Some limitations of the approach to the workshops and validation session should be acknowledged. Although there was broad participation, representation from universities and workforce in the Global South, as well as students and small enterprises was limited. Additionally, because the validation session was conducted with department heads of North American universities, the discussions tend to skew to more academic perspectives. There was also less discussion on how implementation of many of the details discussed may occur. Future follow-ups to these conversations should expand participation, include more global perspectives, and focus on implementation strategies.

Conclusion

In conclusion, the conversations with students, faculty, and industry professionals envisioned a future-ready food science workforce that is interdisciplinary, ethically grounded, and capable of applying and communicating scientific knowledge within food systems. Achieving this goal will require better integration of competencies in AI, regulatory and policy literacy, systems thinking and communications through training, mentorship and applied learning. This will result in professionals that are able to connect systems, interpret complexity and not just adapt, but lead changes to improve global food systems.

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