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Date: April 2, 2020

Scott Angle, PhD  
Director, National Institute of Food and Agriculture  
United States Department of Agriculture

Submitted via electronic mail: [Policy@usda.gov](mailto:Policy@usda.gov)

RE: Agriculture and Food Research Initiative Competitive Grants Program: 2019-2020 Foundational and Applied Science Program RFA

Dear Dr. Angle,

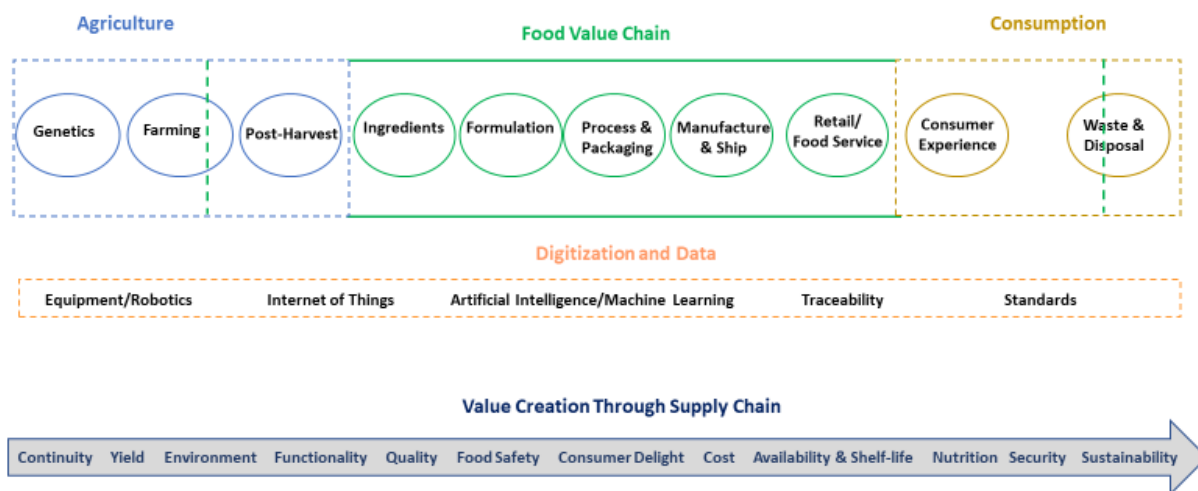
The Institute of Food Technologists (IFT) is pleased to provide input on the “Agriculture and Food Research Initiative Competitive Grants Program: 2019-2020 Foundational and Applied Science Program RFA” for your consideration in the development of future RFAs. IFT is a global organization of nearly 16,000 individual members from more than 100 countries. IFT brings together the brightest minds in food science, technology and related professions from academia, government, and industry to solve the world’s greatest food challenges. We believe that science is essential to ensuring a global food supply that is sustainable, safe, nutritious, and accessible to all.

IFT, along with members conducting research at universities and food companies, is very concerned about the continuous sharp decline in funding opportunities in areas considered highly important among food scientists and technologists to address the challenges faced by the food system. For nearly a decade, federal funding for research in the entire discipline of food science, and most of the sub-disciplines, with the exception of food safety, has diminished. Currently, in the U.S., the USDA is the only federal agency that funds fundamental basic and foundational research in food.

In the 2019-2020 Foundational and Applied Science Program RFA, we are pleased to see that the research areas under the “Novel Foods and Innovative Manufacturing Technologies” program area priority are focused on food science, technology, and processing versus previous RFAs which focused on nutrition and education. Given the refined focus, we trust that research in food science and technology will be rejuvenated, and future RFAs will include additional research areas identified by IFT members. In a 2019 IFT survey (Mohamedshah, Havlik, & Velissariou, 2020), members have identified several research areas in food science and technology (Tables 1, 2, and 3), including some interdisciplinary areas, that could help address challenges related to public health (Table 1), food safety and quality (Table 2), and food security and sustainability (Table 3). We believe that research in these areas is integral in providing solutions to the mounting global challenges, such as climate change, population growth, and limited natural resources, threatening the food system, which impacts public health, food safety and quality, food security and sustainability. Solutions obtained through research in food science

and technology would complement solutions provided by research conducted in areas both upstream and downstream of the food value supply chain (Figure 1). Greater success in resolving these complex, systemic challenges is possible by fostering collaboration between all disciplines to build comprehensive solutions. Research in food science and technology is critical to providing safe, nutritious, sustainable, and affordable food that is accessible to all socio-economic and age groups.

The current COVID-19 pandemic is exposing vulnerabilities of our food systems, which have been optimized for efficiency and cost. The disruption is affecting the food system from supply to demand, including decreased purchasing power and capacity to produce and distribute food within U.S. and globally. In addition to short- and medium-term impacts, long term implications on the food system are expected to affect food security and sustainability, particularly within the most vulnerable populations. We believe that the current COVID-19 crisis emphasizes the urgency and necessity for increased research in food science and technology to address food security and build resiliency toward future global crises.



**Figure 1:** The food value chain (Mohamedshah, Havlik, & Velissariou, 2020)

**Table 1:** Key research gaps related to public health (Mohamedshah, Havlik, & Velissariou, 2020)

<b>Public Health</b>
<p><u>Sensory and Nutrition</u></p> <ul style="list-style-type: none"> <li>• Conduct innovative research on crops, ingredients, formulation, and processing technologies to:                             <ul style="list-style-type: none"> <li>○ deliver to various age cohorts affordable and accessible foods with palatable attributes and superior nutrition. These could complement existing initiatives in mitigating childhood obesity or could be new initiatives.</li> </ul> </li> </ul>

<ul style="list-style-type: none"><li>○ achieve desirable sensory properties and enhance nutritional profiles by reducing the food components/nutrients to limit — saturated fat, sodium, and added sugars</li><li>• Scale technologies to increase nutrient density and bioavailability of nutrients</li><li>• Understand effects of food matrix on micronutrient bioavailability</li></ul> <p><u>Personalization</u></p> <ul style="list-style-type: none"><li>• Develop food and beverage products that have the potential to benefit the host through the gut microbiota</li><li>• Apply “foodomics” (e.g., metabolomics, genomics, proteomics) and related technologies, and computational biology for personalized nutrition</li></ul> <p><u>Consumer and Customer Awareness</u></p> <ul style="list-style-type: none"><li>• Develop educational tools to:<ul style="list-style-type: none"><li>○ enhance consumer awareness and understanding of traditional and innovative technologies used in food production and processing</li><li>○ enhance consumer awareness and understanding of healthy eating, such as portion size/control and use of nutrient claims and nutrition facts labels</li><li>○ train and educate food handlers and consumers about food safety through motivational learning methods about food preservation, food-borne illness, and personal hygiene</li></ul></li></ul>
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**Table 2:** Key research gaps related to food safety and quality (Mohamedshah, Havlik, & Velissariou, 2020)

<b>Food Safety and Quality</b>
<p><u>Interdisciplinary Food Safety</u></p> <ul style="list-style-type: none"><li>• Study of interactions between the gut microbiota and foodborne pathogens and virulence factors</li><li>• Evaluation of the impact of “greener” packaging on food safety</li><li>• Research on food safety training and associated behavioral outcomes</li></ul>
<p><u>Contamination Prevention and Control</u></p> <ul style="list-style-type: none"><li>• Pursuit of processing and ingredient technologies to control microbial growth and contamination that contributes to spoilage and foodborne illness</li><li>• Development of phages as biocontrol agents in food safety applications</li><li>• Expansion of detection methods for rapidity, sensitivity/specificity, and analytical capability</li><li>• Advancement of chemical and physical hazard detection and mitigation</li></ul>
<p><u>Data Analytics, Internet of Things (IoT), and Robotics for Prediction and Prevention</u></p> <ul style="list-style-type: none"><li>• Use of diverse data sources and big data modeling (e.g., Whole Genome Sequencing) to improve prevention of food borne outbreaks</li></ul>

- Understanding patterns of transmission of food pathogens in complex AgriFood systems in relation to outbreaks
- Research on the use of robotics/automation and Artificial Intelligence and Machine Learning in the food chain

#### Integrated Food Safety Systems

- Research on state-of-the-art E2E (End-to-End) traceability systems to enable chain of custody, food safety, product quality, and provenance authentication
- Advancements for rapid outbreak management
- Strengthening of food defense/protection

**Table 3:** Key research gaps related to food security and sustainability (Mohamedshah, Havlik, & Velissariou, 2020)

### **Food Security and Sustainability**

#### Security and Accessibility

- Foster interdisciplinary research and integrated practices to address food and nutrition security through:
  - innovative research on crops, ingredients, formulation, processing, and go-to-market technologies
  - innovative research on animal breeding and scaled aquaculture
  - innovative research on consumer preferred delivery of nutritious, affordable and accessible foods to various age sub-cohorts and demographics
- Develop integrated and efficient food supply models

#### Technology Breakthroughs to Reduce Food System Inefficiencies

- Develop and scale additional measures to address:
  - post-harvest food loss
  - food waste
- Conduct research into cloud-based sensors for bulk and packaged goods to predict food spoilage and shelf life, detect pathogens, and reduce loss/waste

#### Sustainability

- Develop technologies to provide convenience and portability without compromising quality and reduce the environmental impact of the food system
- Develop breakthrough preservation technologies to enable replacement of plastic packaging at scale and affordable cost

Foundational and basic research in food science and technology provides an opportunity to translate research to produce safe food at a scalable level. For example, in an attempt to provide a variety of

scalable protein sources, it is important to understand the functionality of new ingredients such as kelp flour or novel varieties of wheat with high protein content in food products, such as baked goods. Biodegradable packaging is another example that provides higher shelf-life, increased nutrient retention, and requires minimal effort to open, particularly for older adults, which would help improve the diet quality. Research efforts upstream and downstream of the food value chain will have limited impact in the absence of research in food science and technology, that is critical for successful outcomes. For example, upstream research to improve nutritional quality of crops and downstream behavioral change research to increase consumption of healthy foods could have limited success without research that will enable the development of food products using these crops that are safe, nutritious, palatable, affordable, and accessible to all.

Since 2008, U.S. public funding for research in food and agriculture has declined, while between 1990-2013, countries such as China and India have steadily increased their funding. Though public funding has declined, food companies have increased research funding. However, private research investments focus on product development, whereas public funding supports fundamental basic and foundational research which can spur transformational positive change to the food system. Privately funded research complements publicly funded research but is not a viable substitute. Lack of public funding in food science and technology will impact the next generation of food scientists and technologists, due to decreasing student enrollment in food science and related disciplines. This could have a devastating effect on future scientific talent and workforce in the U.S. and loss of competitive edge globally.

We believe that food scientists and technologists, working in collaboration with other disciplines, can make great contributions to address the many food system challenges. IFT urges NIFA to include the research areas in food science and technology identified by IFT members under the “Novel Foods and Innovative Manufacturing Technologies” program area priority in the future RFAs, starting with 2021. This will motivate food scientists and technologists to submit proposals in areas that align with NIFA priorities and prospects of rejuvenating the much-needed research in food science and technology.

IFT appreciates the opportunity to provide input on the 2019-2020 Foundational and Applied Science Program. IFT and members welcome the opportunity to further discuss these research priorities with you. Please contact Farida Mohamedshah, Director, Nutrition Science, Food Laws and Regulations ([fmohamedshah@ift.org](mailto:fmohamedshah@ift.org); 202-330-4986), if IFT may provide further assistance.

Sincerely,



Pam Coleman, MBA, CFS  
IFT President, 2019-2020



Christie Tarantino-Dean, FASAE, CAE  
IFT, Chief Executive Officer

#### Reference

Mohamedshah, F., Havlik, S., & Velissariou, M. (2020). Food research: Call to action on funding and priorities. Institute of Food Technologists. <https://www.ift.org/2020fundingwhitepaper>