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Economic Cooperation

Food Safety Cooperation Forum
Public-Private Innovation Dialogue

APEC Food Safety Cooperation Forum

SOM 2 Workshop

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APEC Project: *Food Safety Cooperation Forum Public-Private Innovation Dialogue*

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Acronyms

APEC	Asia-Pacific Economic Cooperation
FDA	Food and Drug Administration
FSCF	Food Safety Cooperation Forum
FSMA	Food Safety Modernization Act
GFSI	Global Food Safety Initiative
IDF	International Dairy Federation
IICA	Inter-American Institute for Cooperation on Agriculture
JIFSAN	Joint Institute for Food Safety and Applied Nutrition
MRL	Maximum Residue Limits
OIE	World Organization for Animal Health
PPFS	Policy Partnership on Food Security
USDA	United States Department of Agriculture
FTAAP	Free Trade Area of Asia-Pacific
WHO	World Health Organization
WTO	World Trade Organization
SME	Small-to-Medium Enterprises
SPS	Sanitary and Phytosanitary Measures
STDF	Standards and Trade Development Facility
STGs	Sustainable Development Goals
TBT	Technical Barriers to Trade
TPA	Voluntary Third-party Assurance

Foreword

Purpose of the Project

The Food Safety Cooperation Forum FSCF Public-Private Innovation Dialogue took place on May 18, 2023, as a part of the Senior Officials Meeting (SOM) 2 events. The event served as a platform to discuss the future of food safety through the application of innovative methodology, digital solutions, and new technologies. The event followed through with the FSCF goals of providing for food safety regulatory dialogue, priority-setting discussions for capacity building efforts, and information-sharing between industry, academia, development banks, and regulators, while achieving cross-sectoral participation from 18 APEC economies.

Presenters at the Dialogue provided examples for integration of innovative methods at the economy scale and development of ideas for future capacity building efforts, with a focus on strengthening stakeholder capacity to manage food safety systems. By discussing these concepts in relation to cross-cutting themes (traceability, outbreak response, public-private partnerships, climate change, and overall food safety culture), participants gained awareness of resources and options for application strategies that could best fit their economy's individual perspectives and needs.

After an introductory session providing background and context of prior FSCF work, the Dialogue organized the participant experience into three focused sessions: (1) innovative initiatives from the economy-level, industry, and academic perspectives; (2) the importance of public-private partnerships, building food safety capacity, and facilitating information sharing; and (3) sustainable solutions to priority food safety problem areas to contribute to supply chain efficiencies. The third session provided participants the opportunity to work in groups to apply subject matter from the previous sessions and to think critically about the food safety issues they face in their home economies. Continuing to build on capacity building strategies addressed within each session will allow APEC economies to both respond more quickly to foodborne outbreaks and to understand the ways in which foodborne contamination occurs, resulting in decreased loss of life and productivity due to foodborne illness, and increasing food trade; thus preserving economic livelihoods and contributing to food security.

About APEC PPFS

Food security has been a persistent concern in the APEC region for many years, given the volatility of food prices, supply chain disruptions, and issues with supply and demand for food. These issues are further exacerbated by climate change challenges and inequity in food security across populations. Food security has been an issue of particular concern for developing economies and for women, indigenous, and rural populations within those economies in particular, which together represent the demographics most adversely affected by changes in the global food system.

In response to the growing concerns related to food security in APEC, the PPFS was launched in 2011 to strengthen public-private cooperation to address these issues.[1] The current work of PPFS was built upon the Niigata Declaration on APEC Food Security, the first APEC plan for promoting food security in the region; and the Kazan Declaration, the Beijing Declaration, and Piura Declaration, which furthered APEC plan of action on food security.

In 2021, the PPFS forum, in collaboration with the APEC Food Security Ministers, developed the "Food Security Roadmap Towards 2030". The Roadmap is focused on setting out a path to ensure access to sufficient, safe, affordable, and nutritious food to meet the dietary needs and food preferences for an active and healthy life.[2] In 2022, the PPFS developed an implementation plan to carry out the Roadmap. In 2023, the PPFS, chaired by the United States during the U.S. APEC host year, focused on APEC 2023 theme

"*Creating a Resilient and Sustainable Future for All*, with specific focus on *interconnectedness, innovation* and *inclusivity*, and the agriculture sub-theme of *Together Achieving Sustainable, Equitable and Resilient Agri-Food Systems."*

[1] Policy Partnership on Food Security | APEC

[2] Policy Partnership on Food Security | APEC

Introduction

How to Use This Guide

This guide is designed to serve as a technical reference for PPFS member economies and their respective stakeholders to consider in their development, implementation, and monitoring of evidenced-based policies for sustainable agricultural water resources management and food security. The information presented in the guide is derived from a PPFS workshop on February 16, 2023, in Palm Springs, California where experts from across the PPFS economies convened, in-person and virtually, to network and exchange evidence about best practices and successful innovations in policymaking for sustainable agricultural water resources management. This guide aligns with the workshop objectives and agenda; however, it is not an exhaustive report of all the information and evidence generated at the workshop.

The chapters of this guide follow the SOM 1 workshop agenda (Annex 1), by session.

Chapter 1. Welcome and Remarks from FSCF Chair

The Opening Remarks were delivered by FSCF Chair and Director of U.S. FDA's Office of International Engagement Julie Moss. Against the backdrop of the 10-year anniversary of The United States' FDA Food Safety Modernization Act and FDA's New Era of Smarter Food Safety initiative, Dr. Moss highlighted the importance of leveraging technological tools and approaches to create a safer and more digital food system, traceable along the length of its supply chain. The address also emphasized the role of cooperation in achieving improved traceability, refining predictive analytics using innovative sources of data, accelerating mitigative responses to outbreaks, addressing new business models, reducing contamination of food, and fostering the development of stronger food safety cultures.

Chapter 2. Background and Context of Previous FSCF Work

Megan Crowe, Senior International Trade Specialist at the U.S. Department of Commerce's International Trade Administration, provided context for the Dialogue within 15 years history of previous FSCF activities. Ms. Crowe outlined FSCF goals of using international regulatory cooperation and public private partnership to support regional economic integration and innovation through alignment with science-based international standards and best practices. Established in 2007 by Australia and China, FSCF committee now brings together food safety regulators from all 21 of the APEC Member Economies, which together currently account for 48% of global trade and 60% of the world's GDP, in dialogue, information-sharing, and coordination of capacity-building efforts in adherence to WTO Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) obligations. FSCF terms of reference were endorsed in March 2023, making it an official APEC subgroup. FSCF will now meet annually in addition to holding its regular capacity-building events on the topics of food safety regulatory systems, inspection and certification harmonization, and technical skills in human resource capacity, among others. The work of FSCF will only become more important over the coming years, as world food systems face increasing environmental challenges and resulting stresses on agrifood systems.

Chapter 3. Introduction of APEC Host Year Agriculture Theme

The APEC Host Year Agricultural Theme of "Creating a Resilient and Sustainable Future for All" was introduced by Melissa Schmaedick, who serves as a Senior Trade Advisor at USDA's Foreign Agricultural Service. Ms. Schmaedick tied the theme's underlying call for cooperation on sustainable, equitable, and resilient agrifood systems with the three drivers of economic growth: trade and investment; innovation and digitalization; and strong balanced, secure, and inclusive growth. The 2023 Host Year accordingly focuses on the trifold interlocking concepts of interconnectedness, innovation, and inclusion. The Host Year ideal of Interconnectedness emphasizes the importance of strengthening supply chain resilience and related infrastructure, promoting cross-border travel and digital trade, as well as support for the FTAAP Agenda Workplan and the WTO in spurring equitable and sustainable growth. The theme of Innovation continues to pursue the Bangkok goals through the Mānoa Agenda by continuing the legacy of U.S.-APEC cooperation begun in 2011, which launched work in green growth and expansion of opportunities for women in the APEC region, as well as considering new aspirational activities in advancing APEC's sustainability goals, to enhance climate mitigation and disaster resilience, advance the region's digital economy and climate finance, and promote food security as well as agricultural biotechnology. The Host Year sub-theme of Inclusion recognizes the necessity of ensuring fair and equal opportunities for economic participation across all segments of Member Economies, which must include elevating the voices of women, promoting trade policy choices that expand the potential of SMEs, and investing in both infrastructure and historically underserved communities in achieving accelerated and equitable economic growth across the APEC region.

Under a broader Host Year Theme, USDA proposes an agricultural sub-theme for 2023 of “Together Achieving Sustainable, Equitable, and Resilient Agri-Food Systems,” representative of APEC aspirations toward achieving more resilient, climate-smart agricultural systems via science-based policies, innovation, innovation in sustainable growth, and a holistic approach to understanding relationships between agrifood systems, climate change, consumption, and food security.

Chapter 4. Innovative Initiatives: Economy

The first technical session addressed Innovative Initiatives from the Economy perspective. The session featured two speakers, representing Chile and The United States, who provided case study examples of public-private innovation from their own economies and their relevance to policy makers in the greater APEC region.

Constanza Vergara

Constanza Vergara, Advisor to Chile’s Ministry of Foreign Affairs, highlighted the increasing importance of adaptive food safety regulation to Chile’s international trade network: the economy presently benefits from 33 commercial agreements with 64 separate markets, which together comprise 63% of the world’s population. The National Food Control System (NFCS) is composed from different Ministers and Public Services Offices, one of them is the Chilean Food Safety Agency (ACHIPIA), which provides flexible coordination and synergies to solve and create new improvements to the NFCS between several economy-level food safety authorities: the Ministry of Agriculture, throughout the Agriculture and Livestock Service (SAG) regulates market compliance for livestock, fruits, vegetables; the Ministry of Health controls domestic consumption and production, as well as imports control; and the Ministry of Economy, via the National Fishery and Aquaculture Service (SERNAPESCA), targets market compliance for fish and fishery products.

Foodborne antimicrobial resistance (AMR) is a heightened challenge currently being addressed by Chilean food safety framework. Chilean authorities recognize that AMR represents an especially complex issue at the nexus of human, agricultural, and livestock health, and this is acknowledged under the slogan of “Together, One Health” at the vanguard of Chile’s anti-AMR campaign, which interweaves support from seven ministries including Education, Science & Technology, and Foreign Affairs to the already mentioned above. The campaign aims to maximize availability of AMR-related data to both public and private sector actors partly using an online system for compliance with veterinary medical prescription (PMV) issuances, each tagged with the diagnosis justifying them. The system also tags prescriptions with the unique identifying number of the issuing veterinarian and recipient farms or fisheries. Recipients are additionally required to produce and publish annual reports of their prescription usage, advancing transparency in the food production pipeline at the farm-by-farm level and promoting trust between industry and consumers. In 2018, authorities used this system to confirm that aquaculture incidences of AMR were most concentrated in the salmon farming process during the fattening stage at sea. This information was then passed on to academic, epidemiological, pharmacological, and microbiological research institutions to further explore the causes for this concentration. Investigative partnerships into this issue, frequently involving foreign institutions within the APEC regions, has been jointly financed by the Ministry of Economy (75%) and the private Salmon Industry Association of Chile (25%). Next steps for authorities will include developing an early alert system for antimicrobial use management and reduction in cooperation with the International Centre for Antimicrobial Resistance Solutions and in close communication with private salmon production industry actors.

The success of the veterinary online prescription system led to development of a full Veterinary Online Prescription Platform in 2021, beginning with an initial stage of tracking antimicrobials for food-producing terrestrial animals. The second and third stages of the Platform have begun to track antimicrobials for pets and antimicrobial use in medicated feed for terrestrial species, respectively, with each prescription associated to the

actors' unique identifying number. Stage 1 (food-producing animals) has so far received a high level of commitment from regulators to achieve buy-in from producers, with chicken and pig industries currently scheduled for low-risk trial periods in the program. Stage 2 (pets) has faced staunch resistance from market actors, which will require more education prior to productive engagement with the platform. Stage 3 (medicated feed) has largely been met with enthusiasm from regulators and feed companies, with a trial period scheduled for later in 2023.

The Online Veterinary Prescriptions system has provided a wealth of real and granular data on the providers and consumers of specific antimicrobial medications, allowing Chile's authorities to identifying needs for pharmaceutical dosage revision, developing alternative prevention measures, and conducting impact analyses for scenarios of banning specific antimicrobial medication usage. Mainly, the system also continues to improve transparency and the domestic image of antimicrobial medication use from the consumer perspective.

A second innovation, led by the Chilean Food Safety Agency and spurred by industry request, is the development of an Integrated Food Laboratories Platform (SILA). SILA addresses a previous lack of affordable and reliable food product testing for domestic SMEs by making available the combined efforts of several hundred laboratories across food production specialties. The Platform now provides one-stop information for food producers of all sizes, where laboratory analysis results are validated and can ultimately be trusted by buyers themselves. SILA's High Standards Laboratory Workgroup, a public-private initiative, also works to identify capacity-building needs and deliver training on an equitable basis to all levels of laboratories on an economy-scale. By innovatively integrating the diverse research powers of its domestic laboratories, Chile has fostered a composite food laboratory system fully capable of keeping pace with and accelerating Chilean food production sector and accompanying market requests.

Marc Allard

Marc Allard, Research Microbiologist at the U.S. Food and Drug Administration, discussed the benefits of promoting public-private partnership in the use and digitization of genomic data for more efficient characterization of pathogens. Genomics can be used not only for identification of viral or parasitic pathogens but can be applied to outbreak origin analysis and root-cause racking, allowing food safety authorities to better understand and pluck out sources of outbreak from the supply chain on a risk-management basis. Genomic technological advances achieved in response to the COVID-19 pandemic harness relatively untapped potential for food-borne pathogen tracking, to be activated by innovative partnership-building.

An increasingly integrated global food economy is witnessing increases of international foodborne illness clustering around specific food products and spreading across disparate geographic regions. When faced with such food-specific outbreaks, the tracing of the illness to its source becomes an imperative task rendered challenging without efficient communication between economy-level food safety regulators. Inter-economy agreements between food safety agencies, clearly outlining the conditions for genomic information-sharing in advance, can strengthen outbreak prevention measures and accelerate the exchanges of data necessary to track active outbreaks to their source and remove unsafe products from the global market in a timely fashion.

The whole genomic sequencing (WGS) process is ultimately a research investment of scale; although WGS is more expensive than conventional processing techniques (€340.95 vs. €198.60, respectively between 2016-2019), the average cost of WGS samples can fall considerably as the number of samples processed increases due to overhead personnel costs and consumable equipment comprising the primary drivers of higher WGS expenses. Modern non-disposable WGS equipment is frequently designed to process samples on a largely automated basis, further contributing to decreased laboratory per-sample costs when operating at scale. Break-even analysis against the economic cost of a sick economy participant, estimated between €12-13k per person, indicates that processing 300 isolates at current prices need spare only three individuals from illness annually to justify the associated monetary cost of research.

Even at below-scale prices, WGS provides a higher level of information that can balance its additional cost when applied effectively. Systematic and centralized consolidation of recorded sequencing, as the U.S. FDA has committed to via its WGS Library since 2014, provides deeper resources for regulators to draw on in identifying sources of new and evolving pathogens earlier in outbreaks and reducing of the burden of illness on participating economies in a proactive and timely fashion. In its first year, an economic evaluation revealed that FDA justified the full cost of establishing its WGS laboratory by averting $7.94 million in burden of illness from the U.S. public. By 2019, cumulative WGS research averted an estimated annual burden of $496.98 million across applications to pathogens listeria, E. coli, and salmonella. The estimated return on investment for WGS research stands at $10 in averted human health costs per $1 invested.

To realize its maximal benefit as a public health surveillance tool, WGS must be employed early in the pathogen analysis pipeline. Early detection of outbreaks facilitates rapid and cost-effective intervention, whereas delay in the use of WGS conversely reduces the efficiency of food safety authorities in interrupting and mitigating food safety crises as they develop.

Chapter 5. Innovative Initiatives: Industry

The second technical session addressed innovative initiatives from the perspective of industry actors. The session featured two speakers, representing Food Industry Asia and Food Digital Solutions, who provided case study examples of public-private innovation derived from their own organizations and technical areas of expertise.

Teresa Lo

Teresa Lo, Senior Manager for Regulatory Affairs for Food Industry Asia (FIA), focused on the potential for smart regulation to build regulatory resilience. Singapore-based Food Industry Asia is a trade association whose mandate is to forward the interests of the food producers, packagers, and retailers in the region with emphasis on the symbiotic interrelation of regulation, trade and safe food, health and nutrition and innovation, and sustainability and resilience. A 2018 survey of member organizations on key issues registered nutrition labelling, Halal certification, product registration, import and export certification, and contaminant limits among the highest priority barriers to their business in the region.

Amid rapidly changing consumer trends and recent challenges to supply chain dynamics, non-tariff trade barriers remain one of the most challenging issues for the APEC region’s food industry. Smart regulation, defined as a holistic, collaborative approach to continuously improve regulations to be agile and more effective in reducing the administrative burdens on commercial actors conducting trade while ensuring access to high-quality and sustainable food, is proposed as an approach to alleviate these industry concerns and react to external market changes. Smart regulations complement good regulatory practices with forward-looking principles based on social governance and trans-sectoral trust and emphasis on innovative use of technology in facilitating efficient trade regulatory practices.

In this spirit, FIA inaugurated its Asia Regulatory Forum in 2019 as a platform for leaders of regional food industry and regulatory policymakers to foment collaboration and explore emergent opportunities in the food sector moving forward. This annual event serves as a venue for these actors to collectively strategize new and innovative methods of reinforcing supply-chain resilience and food safety within the smart regulation ideal of trade promotion. Participants also continue to examine remaining and persistent challenges to supply chain security, including the reconciliation of data transparency with privacy and IP issues, harmonization with flexibility in the context of a complex global supply chain and between different markets, as well as assessing new hazards arising from changing operational environments and business models. The 4th Regulatory Form,

held in 2022, revealed that some of the areas standing to benefit most from collaboration are currently digital labelling, e-commerce, recycled food contact materials, and halal certification. Multi-stakeholder partnerships and bringing together academia, industry, and regulatory actors in the interest of regulatory co-creation and scientific risk-based approaches must be further promoted to enable data and knowledge transfer to these ends and to improve upon broader food security, consumer trust, and food-safety-related standards.

FIA's points of emphasis for advancing smart regulation in Asia comprises three major points of emphasis: (1) building awareness of regulation within the growing complexity of the global market and a science-based understanding how to translate it into a local context; (2) preparedness for new threats and opportunities via forward-looking and mechanisms and technical capacity-building; and (3) agility in approach, allowing room for flexibility as new evidence emerges coupled with appropriate and proportionate responses to emergent realities and changes.

Joseph Heinzelmann

Joseph Heinzelmann, Director of Food Safety Digital Solutions at Neogen Corporation, focused his presentation on laying the foundation for utilizing digitalization in the food industry in minimizing risk, including potential applications of artificial intelligence (AI) and machine learning. Over 90% of food safety data is currently trapped in either paper or spreadsheet form, contributing to a 16% loss in manufacturing capacity each year. By moving food safety and quality standards from paper and Excel to automation, digitalization of the food industry will contextualize existing raw data and thereby provide deeper insights in the interest of predictively and prescriptively improving food security.

Neogen is deploying products and services to digitalize and automate three key areas of food safety: the sample collection, corrective action, and subsequent chain of sample custody inherent to environmental monitoring; the data aggregation, creating workflows around data collection necessary for product testing; and sanitation management, to include master sanitation schedules and sanitation operation procedures. These environmental monitoring programs lead to more efficient management of testing costs by shifting the human workload from data management to analysis and further program improvement, while simultaneously mitigating unexpected production disruptions and reducing loss due to waste. Central and fully digitalized management of a master sanitation platform provides improved control and visibility over system adherence to sanitation parameters, including the instant recording of deviation from these parameters, in addition to automated scheduling of sanitation processes and chains of custody. Digitalized product testing processes allow producers to identify and address quality issues to meet both internal and customer standards in a transparent and verifiable fashion, reduce risks of human error creating incorrect results, and simplify preparatory processes for quality control audits in comparison to the process of collating paper-based data. A Neogen case study that standardized and analyzed 14 facilities demonstrated that automated data collection and subsequent analytics were effective in decreasing the ratio of testing to environmental monitoring positives from 7% to approximately 0-2% within a year of the program's implementation. The program was able to find and remediate issues and provide greater visibility while simultaneously offering lower risk and using fewer resources.

In defining their own digital roadmaps, suppliers must understand the sources of data available to them, which will in turn identify the first necessary investments to be made. Businesses must also identify where data collection efforts are currently focused and where they must be redirected, depending on their place along the curve of organizational maturity. Understanding the level of stakeholder engagement required for successful implementation and the time required to realize returns on investment for automation practices are also important determinants of success. When forming a personalized strategy for digitalization, businesses should prioritize their goals and in doing so recognize needs for improved efficiency and higher-level control over processes via automation of product quality control mechanisms, for instance, vs. reduction of costs and

operational risk by emphasizing automated data collection and testing programs (i.e., environmental monitoring).

Neogen finds that, dependent on an organization's maturity level, transitioning a fully paper or Excel-based environmental monitoring program into a digitized system can take approximately four weeks inclusive of adding the data points, tagging, and training for users necessary for effective use.

Chapter 6. Innovative Initiatives: Academia

The third technical session addressed innovative initiatives in public-private partnerships from the perspective of academia. The session featured two speakers, representing the International Food Safety Training Laboratory and Sunway University Malaysia, who discussed the role of academic institutions in these partnerships and approaches to microbial testing from their technical area of expertise.

Janie Dubois

Janie Dubois, Consultant for the International Food Safety Training Laboratory (IFSTL), discussed how public-private partnerships involving academia have succeeded in building capacity of emerging economies and developing productive technical relationships between them. International Food Safety Training Laboratory is a primarily virtual and volunteer-based laboratory which provides technical support to both public and labs as well as regulatory agencies across the world based on the shared sentiment that improved research regulatory integration represents an essential pillar of global food security.

Public-private partnerships allow the public sector to benefit from private sector funding, expertise and capacity while allowing the private sector to provide a critical public service and realize a reasonable return on investment for doing so. Each sector needs to be provided its own incentives and see benefit from these interactions.

The history of public-private partnerships began in the construction of traditional infrastructure, for instance ports and roads, and subsequently included development of information and communication technology such as single windows. Regulatory reform has since also become an arena for productive partnership, including development of risk-based rules and implementation strategies that marry priorities of ensuring food safety and quality assurance in international food commerce with the objective of streamlined and trade facilitative policy that enables the economic potential of the private sector.

The Center of Excellence for Regulatory Science in Agriculture (CERSA), based at University of North Carolina (UNC), draws funding from multiple public entities and brings academic expertise and project management to its work in the APEC region. A strength of CERSA's strengths in its work is its ability to hire expertise, which is typically a more cumbersome process for governments. CERSA currently provides technical assistance to rulemaking in the Latin American region, providing training for pilot import pesticide Maximum Residue Limits (MRLs) and curating a library of virtual training resources for developing risk-based pesticide regulatory systems. The Center is now working to populate its website with educational videos on the implementation of MRL regulations and coordinating with the Inter-American Institute for Cooperation on Agriculture (IICA) on pilot regulatory reform in leveraging APEC import MRL guidelines for trade facilitation in ASEAN.

IFSTL conducted capacity-building and laboratory testing with a focus on veterinary drug residue for participants in Chile at a dedicated training facility hosted by the University of Maryland private-public partnership with Waters Corp. Such training cannot be done without the expertise and relationship-building provided through private sector involvement, which will still be essential once these methods are fully implemented in the beneficiary economy. These experiences will also help vendors understand the needs and

future volumes of material demand from the region. CERSA saw similar results in cooperation with Malaysia on laboratory development.

Academica is a traditional leader in the realm of research, but it must be acknowledged that research has shifted toward increased applied research and an increased need of applied and follow-up research, which requires the establishment of functioning communities of practice. Modern research practices, necessary for building a pilot-scale food facility or working laboratories, require infrastructure. Regulators will form an important pillar of modern communities of practice. Once initial research results have been delivered, demonstration of domestic effectiveness in implementation also requires its own financing, and this will likely be best performed by local universities. Upfront public support is not sufficient for maintenance of many modern research endeavors or ongoing effectiveness assessment, while fully private financial support can lead to price increases for services or monopoly that can price out lower-income users.

Academia often plays a private sector role in public-private partnerships in contracting to deliver a service, whether that be research, training, or formal education within traditional development-type partnerships. Regulators consulting with individuals or organizations with the credibility of academic status can serve to mitigate any perceived of loss of regulatory independence. Academics from local institutions can offer accordingly local insights into conditions and practices in addition to that credibility and trust, and can look to an international network of peers for answers.

Academia can play an especially important role in three primary areas, especially when involved early and as implementation partners: data, where it can advise on risk assessment, monitoring, and crisis support; education and training, where it offers both degree programs in advancing the skill level of local workers and non-degree training; and domestication, in that academia can adapt research findings to local realities and help establish local communities of practice.

LC Chai

LC Chai, Professor at Sunway University Malaysia and microbiology specialist, focused her presentation on the updated findings of an ongoing next-generation sequencing (NGS) APEC project begun in 2022. The markets for probiotics are a combination of live beneficial bacteria or yeasts that live naturally in the human body, and can improve the recipients' immune system, aid in digestion, produce more vitamins and nutrients as well as ward off disease. The global market for these products is growing considerably, estimated at $105.05 billion in 2021 and is projected to reach $159.97 billion by 2025 – a compound annual growth rate of 9.7%.

Probiotics are naturally present in fermented foods and may be added to other food items in addition to availability as dietary supplements. In order to see tangible health benefits, however, users must ingest large numbers of living probiotics. According to recommendations, products should contain a minimum of 10^6 colony-forming units (CFU) of the active probiotic microorganism per ml. A decade ago, probiotic products used to typically contain a single strain of probiotic, but modern products frequently contain multiple strains. Multiple strains and the number of living organisms present in each product complicate testing and identifying strains, or combinations, of strains dangerous for consumption as well as confirming that the product contains the required number of living cells from each strain to be considered viable.

Current labeling regulations only require producers to list the total weight of microorganisms on probiotics products' Supplement facts labels, but the cellular mass can consist of both live and dead microorganisms and therefore has no functional relationship with the number of viable organisms in the product. The culture-dependent method (ISO6887, ISO15214; ISO20218; ISO27205), the current testing standard, is time-consuming, expensive, and can be inaccurate and inefficient. Novel products containing new probiotic strains require innovative and new testing methods.

Testing method ISO15214, designed for microbiology of food and animal feedstuffs, is a horizontal method for enumeration of mesophilic lactic acid bacteria and conducted after incubation at 30 degrees Celsius and at pH 5.7 for three days. This method is limited by the fact that lactic acid bacteria require temperatures higher or lower than 30 degrees Celsius, as well as at different pH levels. Method ISO20128, designed for milk products, is a colony-counting technique testing for *Lactobacillus acidophilus* at 37 degrees Celsius. ISO20128 is limited in that it can be rendered ineffective when *L. acidophilus* is substantially outnumbered by *L. reuteri* and *L. paracasei subsp. paracaseiin* the sample, and that it cannot distinguish *L. acidophilus* from three other *Lactobacillus* strains.

The fundamental challenges faced by probiotics lie in how to detect and isolate various separate strains in a product containing multiple strains and identify each strain level correctly, how to accurately enumerate different genus or strains and differentiate between live and dead cells of each in the same sample, and how to ensure that no unwanted strains are present in the product. Next-generation sequencing (NGS)-based microbial assay seeks to address these issues.

NGS is currently platformed on Illumina, Ion Torrent, PacBio, and Oxford Nanopore and explores several different approaches to sequencing, including RNA, Ribo-, Exome, and ATAC-sequencing, in addition to subsets of whole genome sequencing as well as developmental metagenomics techniques. Metagenomics is especially relevant to modern probiotic testing in that it ideally assembles genetic material in a community of microorganisms for the purpose of predicting microbial gene functions, ecological interaction within food products, and the dynamics of microbiomes under food storage conditions. NGS is currently seeking an affordable “shotgun” testing method to identify multiple strains within a single sample, producing extensive functional bioinformatics, for input into the NGS platform for analysis.

The NGS project continues its mandate to identify best practices and develop recommended guidelines for verification of probiotics strains, cell viability and contamination, as well as to build capacity in NGS application for probiotics testing and building a public-private support network in the APEC region consisting of field experts, food safety regulators, industrial participants, and researchers to enable cross-border communication and collaboration on probiotics management. It has successfully established an Expert Committee, consisting of specialists with backgrounds in microbiology and bioinformatics in food testing and featuring members from 8 APEC economies, and is currently analyzing a survey on probiotics testing earlier this year to draft a handbook on best practice and guidelines and implement a capacity-building workshop on its platform, which will occur in June of 2023. The NGS program will submit its final summary report by August 2023 and continue providing supporting its network for six months after submission.

The survey issued by NGS received 40 responses from commercial, government, in-house R&D, and academic labs in 16 economies, and found that not many economies have specific regulation for probiotic products. Economies that are currently regulating probiotic products have requirements for minimum number of viable cells that vary from 10^6 to 10^8 CFU/ml. It also confirmed that the culture-dependent method remains the most commonly used testing method. 19 labs were found to use NGS, but almost entirely for whole genome testing rather than metagenomics. The project hopes to promote best practice through education on application of NGS in probiotics testing and information sharing, providing instructions on setting up NGS labs and on bioinformatics analysis based on individualized resources availability and capacity, and NGS application for other areas of research.

The program’s Technical and Networking Workshop on Next Generation Sequencing Application for Probiotics Testing, to take place 6-8 June 2023 in Kuala Lumpur, will present the project’s findings, discuss how NGS is addressing the gaps in current probiotics testing methods as well as realistic limitations of NGS testing. Among other topics relating to the program’s ongoing work, the workshop will also provide demonstrative sessions of bioinformatics analysis, address considerations in establishing standards and integrated probiotics testing, and host a discussion on the way forward for genomic approaches to probiotic characterization, testing, and development.

Chapter 7. Importance of Public-Private Partnerships, Building Food Safety Capacity, & Facilitating Information Sharing

The session focused on the importance of public-private partnerships in building food safety capacity and facilitating information sharing. The session heard from seven speakers including members from the public sector, industry, and organization such as the World Trade Organization (WTO)'s Standards and Trade Development Facility (STDF), PBY Strategies, the Institute for Environmental Health Laboratories and Consulting Group (IEH), the World Bank Group's International Finance Corporation (IFC), the National Milk Producers Federation, the Inter-American Institute for Cooperation on Agriculture, and the University of Maryland's Joint Institute for Food Safety and Applied Nutrition (JIFSAN).

Marlynne Hopper

Marlynne Hopper is the Deputy Head and Lead on Monitoring, Evaluation and Learning of the WTO STDF, a global partnership to facilitate safe trade with over 220 projects in Africa, Asia-Pacific, Latin America, and the Caribbean. STDF is a multisectoral partnership to facilitate safe trade and to serve as a platform to bring together international organizations. The five founding partners include the Food and Agriculture Organization of the United Nations (FAO), World Organization for Animal Health (OIE), World Bank Group, World Health Organization, and WTO. The partnership includes the private sector, developing country experts, donors such as the United States Agency for International Development, Australian AID, European Union, UKAid, USDA, FDA, among others, as well as non-governmental organizations like the African Union, CABI, Enhanced Integration Framework, the Coalition of Action on Food Safety (GFSI), IICA, United Nations Conference on Trade and Development, United Nations Industrial Development Organization, the Organizations for Economic Co-operation and Development, International Trade Centre (ITC), among others. STDF helps economies develop standards for food safety, animal health, and plant health to gain access to markets and use market access to drive economic benefits, job creation, and sustainable development of the Sustainable Development Goals (SDGs).

STDF establishes global networks that bring together trade, health, and agricultural experts to address SPS challenges and drive joint solutions. STDF acts as a knowledge hub, sharing tools and best practices to build on existing work and create synergies with related initiatives to promote innovative cross-cutting approaches to capacity building. STDF's partnerships drive catalytic SPS improvements in developing economies by helping public and private sector stakeholders improve food safety and animal and plant health to facilitate trade. STDF promotes Public-Private Partnerships (PPPs), especially where governments can collaborate with the private sector and academia to encourage stronger and more sustainable results. STDF has supported over 220 projects (PGs) and project preparation grants (PPGs), including projects from APEC economies. STDF's knowledge of cross-cutting thematic topics includes public-private partnerships, electronic SPS certification, and good regulatory practices to identify and promote best practices to improve SPS capacity development.

An example of a successful STDF PG supported pesticide residue issues affecting exports in minor-use crops. STDF collaborated with USDA, ASEAN, and Rutgers University to set up a collaborative framework for pesticide residue trials for small-scale farmers needing help meeting pesticide MRLs. On a global scale, companies were developing plant protection and were less incentivized to invest in newer generation projects for specialty crops. STDF's collaborative framework with USDA, ASEAN, and Rutgers resulted in creating a new Codex MRL and registering new lower-risk plant protection products that lower-scale producers could utilize for better production and trade. This initiative established the creation of the Minor Use Foundation, which is scaling up this collaborative approach to tackle how projects exploring how biopesticides can improve compliance with pesticide MRLs.

Another STDF's PG was critical in promoting food safety and market access for the economies' peppercorn industry in SE Asia. STDF partnered with Ministries in Viet Nam, Cambodia, and Lao PDR to increase the financial returns, improve productivity, and safety and market access for smallholder pepper growers and producers by improving the economies' compliance to international high-value markets to restore the food industry's confidence in the region. Not only did the project promote South-South collaboration, but it utilized PPPs to help small scale farmers strengthen and roll out the use of good regulatory and agricultural practices to have greater market access as well as putting in place agreements to link them up to some of larger peppercorn buyers and exporters.

Another example of STDF's collaborations is their Voluntary Third-Party Assurance (vTPA) Partnership Platform. STDF-funded and UNIDO-assembled regional vTPA programs, linked to new Codex guidelines, bring together experts and resources to support programs in West Africa, East Africa, and Central America. The platform's public and private sector members join virtually and commit to sharing financial or other resources to contribute to project results. STDF has successfully piloted vTPA programs in the aforementioned regions, helping to modernize developing economy national food control systems and improving the risk-based regulatory framework for better and safer use of food systems.

STDF encourages the development of purpose-driven PPPs to improve food systems and trade by building on shared interests, ownership, and stakeholder commitment. For a PPP to be successful, it is essential to have clarity of purpose, clearly defined expectations, roles, responsibilities, transparency, good governance, and financing. Partnerships cost time and money to develop and sustain, so it is essential to ensure key stakeholders are convinced of the added value of being part of a PPP.

Paul Young

Dr. Paul Young, Principal at PBY Strategies, is responsible for helping companies plan and implement strategic engagement initiatives with governments and development organizations in support of business goals. Paul also shared his previous experience at the PPP, the Global Food Safety Partnership (GFSP).

Paul noted that in delivering food security and economic development, there needs to be a holistic food safety management approach that encompasses regulatory systems, enforceable standards, hazard control systems, and laboratory verification. PPPs provide collaborative capacity building, but success depends on creating shared values. A PPP's partners must accept that stakeholder groups may have different motivations within a shared initiative, each served by working towards a common goal. It is also important to note that shifting priorities can significantly impact the level of commitment (e.g., pandemics, changing economic circumstances). Therefore, establishing broad connections to multiple high-level goals is essential.

Paul provided an example of the PPP developed by the World Bank in 2012 with APEC called the GFSP, with the goal of supporting the promotion of global cooperation for food safety and capacity building by piloting food safety management training. The PPP was made up of the World Bank, FDA, and APEC to focus on (1) training on supply chain management, incident management, laboratory competency, risk analysis, food safety regulation system, and on-farm quality assurance, (2) global scaling up based on economy capacity building needs assessments, and (3) program facilitation which included learning platforms, food safety technology, communication, and monitoring and evaluation.

One of GFSP capacity building programs was held in China and aimed to elevate consumer confidence in food safety in China by leveraging GFSP's philosophy and approach in by building capacity for laboratory controls across multiple regions, thereby harmonizing food safety management in Chinese companies. GFSP worked with government, industry, and academia to advance food safety in China by training workers on state-of-the art analytical methods used in the United States that could be taken home and utilized. This method was scaled up as trainers would train groups in-country after returning from the United States. After training was

complete, GFSP followed up with proficiency testing by sending end user trainers tests to analyze trainee understanding. Those that underwent training were tested against individuals in the scheme that had not received formal training so that the data could be analyzed. The pass rate for training was 95-100% and for those that did not receive training, it was 58-60%. Results showed that individuals that underwent training scored in the 95-100% percentile indicating the success of the training.

GFSP's China capacity building pilot program's success was replicated in other countries with the intentioned to scale up but in 2020, GFSP ended its partnership after plans for programming changed on the ground activities shifted from the goal of delivering capacity building to focusing on mapping food safety. This transition led to GFSP staff disillusionment among some former partners. It is important to acknowledge that shifting priorities can significantly impact the level of commitment, so establishing broad connections to multiple high-level goals is crucial.

In conclusion, whilst safe food is in everyone's interest, Paul stressed the need to consider the goals of all stakeholders within a partnership. Like any initiative, the PPP will be judged against its most recent success. Therefore, a focus must be kept on implementation and on generating meaningful metrics of success. "Scope drift" needs to be watched very carefully as it can result in loss of faith among key constituents.

Robert Brackett,

Dr. Robert Brackett is Senior Vice President and Dean of the Food Safety Laboratories at the Institute for Environmental Health Laboratories and Consulting Group. Robert explained that all successful PPPs need (1) a leadership commitment, which means an expectation that all stakeholders involved will commit to the initiative and its deliverables, and (2) a willingness to share information. Each entity in a PPP must have skin in the game to sustain itself and contribute to objectives such as ongoing funding or staff contribution, etc. Dr. Brackett listed the Food Safety Cooperation Forum's Partnership Training Institute Network (FSCF-PTIN) established in 2008, as an example of a successful PPP to address the need to engage the food industry, academia, and regulators to strengthen capacity building in food safety among APEC members.

In 2011, the United States signed the Food Safety Modernization Act (FSMA) into law, which changed how regulators interacted with industry. Members of the food industry are responsible for getting the training they need to comply with FSMA. Still, the FDA recognized the importance of a role in facilitating the training, thus partnering with public, private, industry, and academia in the development and delivery of training. The FDA supported the development of three Alliances: The Produce Safety Alliance, Food Safety Preventive Controls Alliance, and Sprout Safety Alliance to develop training programs to help domestic and international foreign food businesses understand FSMA requirements. The Alliances are composed of representatives from the government, including FDA, USDA, state agencies, industry, and academia, as well as industry and academia. The key to the success of these alliances, or PPPs, was true buy-in from the government, educational community, and the food industry, and that they were offered at a fixed term which helped motivate those involved.

PPPs funded by the food industry are the Global Food Safety Initiative (GFSI), a business-driven initiative established to help the food industry standardize a uniform set of compliance in food safety. GFSI provides a passport to the global market by approving auditing platforms that verify that they meet the GFSI's benchmarking requirements, one of the world's most accepted benchmarks for food safety programs. The benchmarking requirements were established by a group of retailers trying to harmonize food safety standards across the global supply chain to ensure the industry met international food safety rules and regulations.

Dr. Brackett wrapped his presentation by highlighting the importance of PPPs in connecting government, industry, and experts in creating increased efficiency for regulatory compliance. Finally, developed and developing economies must collaborate in creating PPPs that ensure developing economies can keep abreast

of emerging technologies and regulations to ensure developing nations stay caught up in their technological ability to regulate and ensure food safety standards.

Kateryna Onul

Kateryna Onul is a Regulatory and Policy Lead of Global Food Safety, Food Loss Prevention Advisory at the International Finance Corporation (IFC). Kateryna talked about IFC's work in food safety. For over 15 years, IFC has offered professional services to help companies adapt food safety standards and support economies in strengthening food safety. IFC has provided food safety assessments on firm level, staff trainings for public and private sectors, develops guidance, on food safety management and on food safety policies and regulations. Today, IFC work in food safety is focused on providing support to clients in agro-processing and retail sectors to unlock new markets, reduce costs, mitigate risks, reduce waste, improve nutrition and contribute to better food security. The Global Food Safety, Food Loss Prevention Advisory conducts assessments of national policy, regulatory and institutional frameworks in food safety, food fortification, and food loss and waste areas. It provides advisory services to improve client performance and reduce supply chain risks. IFC Platform activities include raising awareness of the financial benefits of investments in food safety, food fortification and reduction of food waste, training local consultants to develop a pool of experts who can support agribusiness clients, and work with policymakers to ensure that policies and regulations related to food safety create a level playing field for the private sector and stimulate appropriate investments.

One of the major challenges for developing economies and local food industry is the lack of technical knowledge and best practices in the implementation of food safety standards. To strengthen the capacity in the private and public sector in economies globally, IFC created a number of tools that have included publications, learning courses, and awareness events. The IFC Food Safety Handbook, the IFC Scan Guide, Food Safety Case Study Learning: New Zealand, F2F and Virtual Courses, and IFC Food Safety Handbook Webinars are the most resent IFC products in food safety. All are available at www.ifc.org/foodsafety.

The IFC Scan Guide is a tool aimed to help to identify appropriate interventions to support the domestic food industry and to improve the framework in economies, including in APEC region, to enable and catalyze investments. The scan guide helps economies to understand how domestic food systems operate, identify ways to address issues they are facing, and develop recommendations for governments. The IFC Scan Guide is developed in a way that it can interact with other tools. The Scan Guide allows assessment of economy-level food safety policies and reflects basic principles that guide the development of domestic food safety laws and regulations. Kateryna noted that the assessment of food safety policies in the economy should be undertaken through the lens of the operation of the domestic food safety system. One of the major steps is the analysis of the consistency of the food safety policy with international treaty obligations. The Guide also assesses an economy's regulatory framework involving scrutinizing the complete body of legal texts on food legislation and food law, ideally to ensure a precise understanding of the legal texts, which should be examined by an expert with a legal background who knows how to read and analyze the texts. The economy's institutional framework is suggested to be assessed to identify stakeholders in the public and private sectors and in the international community who are involved in the public management of food safety in the economy, analyzing the efficiency of the structure and level of cooperation among stakeholders. This step helps to identify gaps in the current system and areas for improvement in the short- and long-term perspective.

The IFC Scan Guide is used by the World Health Organization as a primary resource for the development of an assessment tool for implementation of the new WHO Strategy for Food Safety.

The IFC Food Safety Handbook: A Practical Guide for Building a Robust Food Safety Management System is designed to help food companies establish, maintain, and enhance food safety. IFC Food Safety Handbook is also a good resource for Academia, as it helps to raise awareness about food safety issues, capacity building,

and improve knowledge on international food safety legislation. This publication shares numerous tools and practical steps that will be of help when developing, implementing, and maintaining food safety management systems on the firm level. It also has procedure templates, and ready-to-use worksheets. Recently, the handbook was recommended as one of the learning resources for the Viet Nam Agricultural Academy and Nairobi University.

Both the IFC Scan Guide and IFC Food Safety Handbook have been added to the WTO open e-library with WTO symbol (G/SPS/GEN/2063).

Lastly, the IFC provides trainings including the New Zealand Case Study Learning Course. This interactive training explains all levels of the food safety system based on examples from New Zealand, whose food safety system is one of the best in the world. The modules provide unique examples of New Zealand's food safety experience on specific areas that can be considered when upgrading and strengthening food safety systems in different economies.

All resources are open to the public on the IFC website: www.ifc.org/foodsafety.

In June 2023, the IFC is set to hold its 10th International Food Safety Forum in Dhaka, Bangladesh. For over a decade, the IFC has brought together private and public sector players in agribusiness interested in food safety. The Food Safety Forum serves as a platform for knowledge sharing and collaboration among food safety stakeholders and has been growing in attendance since its inception.

Jamie Jonker

Jamie Jonker serves as the Chief Science Officer and Vice President, Sustainability and Scientific Affairs at the National Milk Producers Federation and is Chair of the Science and Programme Coordination Committee of the International Dairy Federation where he currently oversees Committee technical work.

The International Dairy Federation (IDF) was established in 1903 and is currently made up of 39 economies which produce 75% of global milk production. The organization has over 1,200 technical experts in 17 standing committees and 3 task forces. What is unique about IDF is that it is accredited to several intergovernmental organizations like Codex, UNEP, ECOSOC, OIE, etc.

IDF is recognized as an international authority in the development of science-based standards for the dairy sector and plays a key role in the policies, standards, practices, and regulations of dairy products safety and sustainability. IDF has over 150 different projects in their scientific and technical portfolio, ranging from production to processed dairy products to consumers. It represents the entire dairy sector and is the global arm of the dairy industry, as its membership spectrum represents dairy processors, cooperatives, governmental organizations, suppliers, unions, and farmers. One billion people worldwide rely on the dairy sector for their livelihood, meaning 1 out of 8 people rely on the industry, a tremendously large sector which highlights the immense importance of handling its trade and safe commodities.

The partnership between IDF and Codex is important in understanding the two entities' role in ensuring safe dairy production and trade. IDF works around food standards, covering the work of Codex on international standards for dairy products. Since 1963, IDF has served as a technical advisor to Codex and serves as an observer participant meaning IDF cannot recommend new work that is left to economies, but it can provide comments on interventions at meetings and serve as expertise on working groups. IDF works on various Codex committees, such as food labeling, food hygiene, and milk products, among other working groups. Within the Codex framework, IDF members work with Codex, not on the Federation's personal position or even just for the US dairy industry's interests, but on IDF's consensus building.

There are committees within IDF that are highly technical and where IDF holds unique expertise. Sometimes within the Codex structure, IDF provides value to the technical process as it is one of many experts. Just recently, for the first time, IDF has served as co-chair of a group on water and dairy, where Codex recognized IDF holds particular subject area expertise.

IDF's work within Codex provides enhanced food safety and safe trade. For instance, IDF's technical expertise in Codex's general standard in the use of dairy terms (labeling) collaborates to streamline global product standards in labeling so that, for instance, when cheddar is produced, sold, and traded, you can ensure that the product is what it says it is. These terms allow for safe trade and an assurance that the products being traded meet specifications.

Another example is IDF's work on Codex's committee on food additives. The work of this committee has been important for the dairy sector because general standards are different than product standards, and this conflict can disrupt trade. IDF participates in the food additives committee to help harmonize general food additives standards with those previously within dairy standards. This is a long process that is well into its second decade but is moving forward. This alignment helps mitigate confusion because it closes discrepancies between product and general standards.

Jamie shared a third example of how IDF works within Codex to standardize the process related to veterinary drugs and foods. There are instances in which dairy animals get sick and need proper treatment, including antimicrobials. Sometimes these antimicrobials will show up in milk products which can be of concern to human health. This issue is related to MRLs set by Codex on the veterinary residue of drugs and food. In this instance, based on set MRLs, Codex and IDF work with one another to ensure that products meet specifications and can be safely traded.

In essence, the PPP between IDF and Codex has led to significant advances in the safety of dairy products and trade worldwide.

Ana Cordero

Ana Cordero works as an Agricultural Health and Food Safety Technical Specialist at the IICA, a specialized agency for agriculture of the inter-American system, with a mission to stimulate, promote, and support the efforts of its member states to achieve agricultural development and rural well-being through international technical cooperation and excellence. IICA is comprised of 34 member economies with technical cooperation delivered through seven technical concentration programs – economy, trade and integration, digital agriculture, territorial development, climate action, youth and gender, and agriculture health and food safety.

IICA’s agricultural health and food safety program’s objective is to promote agricultural sectors that are productive, competitive, and sustainable and that provide safe food to local, regional, and global markets through the creation, improvement, and application of agricultural health, food safety, and food quality policies. As part of their work in the last three years, IICA, with the support of members economies, has highlighted the importance of the contribution of the agriculture sector to global food and nutrition security, stressing the emphasis on producers, science, and agriculture as IICA’s three areas of focus in tackling agricultural food health and safety. First, agricultural producers should be adequately represented, and their leading role in the transformation of food systems should be fully recognized. Second, policies should be science-based. Third, agriculture and agrifood systems regarded as major challenges humanity should consider when looking into the future.

Regarding food safety capacity-building efforts, the IICA’s four main components support the work: (1) promote the implementation of a food safety culture, (2) the implementation of science-based standards through the organization of strategy sessions and dialogues of MRLs, etc. promote the development of regional positions and active participation in international meetings, (3) capacity building and support implementation of food practices through innovative solutions like training, consensus building programs, supporting and involving the

government and private representatives and also academia, and (4) the harmonization of guidelines and regulations in economies.

IICA's cooperative agreement with FDA has sought to raise awareness between growers, producers, government officials, and the public on all aspects of FSMA. The cooperative agreement is aimed at consolidation and strengthening of competencies for the implementation of FSMA in Latin America with four components: (1) training in produce safety rules, (2) training in the preventative controls for human food rules, (3) case studies on-farm readiness activities, and (4) FSMA webinars. Training includes developing digital platforms to provide training on the FSMA Food Safety Legislation and training for professionals on food safety standards and requirements for export food safety. The collaboration between IICA, the FDA, and the industry has constructed a model to support capacity-building efforts.

Finally, a lesson learned is that the strategic partnerships of PPPs have been vital in implementing continuous efforts, support, coordination, and alignment of capacity-building efforts to promote food safety.

Claire Narrod

Dr. Claire Narrod is a Research Scientist and Manager at the Joint Institute for Food Safety and Applied Nutrition (JIFSAN) at the University of Maryland. JIFSAN is one of the FDA's centers of excellence for training professionals internationally in methods to reduce food safety hazards in produce, aquaculture, and commercial sterile packaging through food inspection processes, food safety risk analysis techniques, and laboratory methods. The partnership between the FDA and the University of Maryland provides developing economies with JIFSAN instructors who are regulators abreast of food safety policy, the food industry, and experts involved in food safety alliances with access to a wide net of experts. Since 2000, JIFSAN has trained over 13,500 individuals. Under FSMA, Congress mandated FDA to develop both an international food safety capacity-building plan and an M&E plan associated with efforts to reduce foodborne disease in the US.

JIFSAN is involved in the Global Food Safety Collaborative Training Initiatives. The Global Food Safety Collaborative Training Initiatives are agreements between JIFSAN and economy partners to create sustainable relationships that result in scaled-up training on food safety. JIFSAN and economy partners work to identify and garner government, industry, and academia support to identify funding and individuals to train to become Trainer-of-Trainers (ToT). Once trained, the ToTs adapt training to their economy-specific needs and disseminate it throughout the country via multiplier training with the goal that the economy takes ownership of the training, and JIFSAN takes on an advisory role.

JIFSAN understood that people were interested in the numbers and immediate impacts of training on health and livelihoods, but there needed to be other steps in place to measure impact. Contextual factors such as infrastructure and institutions must be considered when measuring impact. In the short term, JIFSAN began measuring the immediate impacts on numbers, such as the change in knowledge, and in the medium term, on cost and benefits in productivity and reduction of incidents. Changing food safety culture in an economy takes time, so JIFSAN broke down the metrics to measure change more accurately.

The IICA-JIFSAN Collaborative Training Initiatives for the Americas work to deliver fresh produce capacity training. After developing the FSMA and creating the Collaborative Partnership Training Initiative, JIFSAN and IICA received FDA cooperative agreements to roll out training in the region. JIFSAN and IICA recognized synergies and worked together to roll out a monitor and evaluate PSA training. JIFSAN found the training showed significant food safety knowledge improvement. The data showed that participants did experience knowledge enhancement from undergoing the training across gender, education, work duties, and export destination. Where the training effect was negative, participants tended to have prior food safety-related experience. The M&E results suggested training had the potential to be scaled up.

Dr. Narrod mentioned the importance of PPPs in serving as a linchpin for investing in public health, helping the private sector show corporate responsibility, and helping the public sector collect trusted, quality-controlled data to inform policy and take regulatory approaches aimed at improving food safety to the next level and create a global public-private good.

Chapter 8. Sustainable Solutions to Priority Food Safety Problem Areas to Contribute to Supply Chain Efficiencies

Project overseers organized breakout groups to discuss and present on the following topics:

1. Top food safety problem areas in your economy;

2. Innovative and novel ideas to address these problem areas; and

3. Potential future relevant workstreams under APEC.

Group 1 discussed that safety problems in their economies included the need for better risk communication tools to deliver information. Beyond handbooks, risk strategies must be disseminated more effectively to economies. Additionally, ASEAN economies expressed their desire to focus on microbial risk assessments as a lot of time is spent on chemical risks. A way to tackle these issues is to focus on prioritization since economies differ in their safety area concerns.

Group 2 listed prioritization as their primary concern. Some economies are reactive rather than proactive and at different stages of food safety techniques and innovative solutions. Thus, there needs to be consideration of how economies may start addressing these issues. To do so, group 2 suggested a pilot program to test current tools in the market to develop a prioritization program mechanism including tools talked about at the workshop, including the IFC, STDF, and lab capacity tools on the market to pilot in economies to (1) to develop a mechanism to use the tools in some prioritization and organized fashion and (2) identify priorities in economies that volunteered to pilot and move on to application projects for particular priorities. They suggested that for the pilot economies that would volunteer, there would need regular meetings to involve all economies to track progress and involve academia and interested government entities interested in specific areas of work.

Group 3 agreed that the top food safety problem is bacterial pathogens. A novel idea would be to use the APEC mechanism for working more on unified methods and standards for specific commodities. At the same time, when looking at these foods in terms of a workstream, it would be beneficial to have a portal or communication to keep economies informed and allow them to be involved in whatever their economy finds most important.

Chapter 9. Closing Remarks

Julie Moss, FSCF Chair and Director, Office of International Engagement for the U.S. FDA provided closing remarks to the PPID Dialogue. Overall, the workshop provided a platform for economies to discuss future food safety in the APEC region through the application of innovative methodology, digital solutions, and new technologies.

The FSCF and PTIN have no shortage of additional ideas for future workstreams and need to dig into them. Based on the workshop discussion, possible ideas for future workstreams geared towards modernization and innovation include:

1. Application of APEC risk communications handbook, pilot dissemination strategies, and extra discussions on how to handle misinformation.
2. Similar discussion on IFC tools and taking a look at applying these to traditional markets as well as regional and formal markets.

3. Developing a series of innovative case studies on various topics that can be housed online and shared electronically that would lead readers through the process of how an economy adopts technology or innovative methods of which to follow.
4. Prioritization of required infrastructure for pathogen detection techniques. Pilot programs for the application of technology at the economy-level.
5. General prioritization of where to start within SPS systems to achieve food safety, and how to best identify mitigations strategies and solutions.
6. Create an inventory of needs and develop a guideline to address them using existing tools, and subsequently pilot them in APEC economies.
7. Address food waste concerns through communications tools.
8. Assess how to make data useful and how to better share it.

Annex 1. Workshop Agenda

APEC Food Safety Cooperation Forum (FSCF) Public-Private Innovation Dialogue

May 18, 2023: 8:30am - 5:35pm EST
Location: Westin Book Cadillac Hotel, Crystal Room, 1114 Washington Blvd, Detroit, Michigan, USA

8:30 am – 9:00 am	**Registration & Informal Introductions**
Session 1 9:00 am – 9:10 am	**Welcome and Remarks from FSCF Chair** Discuss themes on leveraging technology and use of tools and approaches to create a safer and more digital, traceable food system. Also noted will be the importance of working together toward the goals of enhanced traceability, improved predictive analytics, more rapid response to outbreaks, addressing new business models, reducing contamination of food, and fostering the development of stronger food safety cultures. **Julie Moss**, *FSCF Chair and Director, Office of International Engagement,* U.S. Food and Drug Administration (FDA)
9:10 am – 9:20 am	**Background and Context of Previous APEC FSCF Work** Discussion of FSCF background and goals, including use of international regulatory cooperation and public private partnership to support regional economic integration through alignment with science-based international standards and best practices. **Megan Crowe**, *Senior International Trade Specialist, International Trade Administration,* U.S. Department of Commerce
9:20 am – 9:30 am	**Introduction of APEC Host Year Agriculture Theme** Discussion of the US host year theme of working towards achieving sustainable, equitable, and resilient agri-food systems. **Melissa Schmaedick**, *Senior Trade Advisor, Foreign Agricultural Service,* U.S. Department of Agriculture

Session 2 9:30 am – 10:20 am	**Innovative Initiatives: Economy** ***Moderator: Kelly McCormick,*** *International Policy Analyst*, *Office of International Engagement,* U.S. Food and Drug Administration **Constanza Vergara**, *Advisor,* Ministry of Foreign Affairs, Chile (20 min) **Marc Allard**, *Research Microbiologist*, U.S. Food and Drug Administration (FDA) (20 min) *Q&A (10 min)*
10:20 am – 10:40 am	**Break (20 min)**
10:40 am – 11:30 am	**Innovative Initiatives: Industry** How can we respond to high priority food safety hazards and minimize food safety incidents through the use of novel and innovative means? ***Moderator: Kelly McCormick,*** *International Policy Analyst*, *Office of International Engagement,* U.S. Food and Drug Administration **Teresa Lo**, *Senior Manager, Regulatory Affairs*, Food Industry Asia (20 min) **Joseph Heinzelmann**, *Director, Food Safety Digital Solutions,* Neogen Corporation (20 min) *Q&A (10 min)*
11:30 pm – 12:20 pm	**Innovative Initiatives: Academia** ***Moderator: Kelly McCormick,*** *International Policy Analyst*, *Office of International Engagement,* U.S. Food and Drug Administration **Janie Dubois**, *Consultant*, International Food Safety Training Laboratory, (20 min) **LC Chai**, *Professor*, Sunway University Malaysia (20 min) *Q&A (10 min)*
12:20 pm – 1:50 pm	**Lunch (1 h 30 min)**

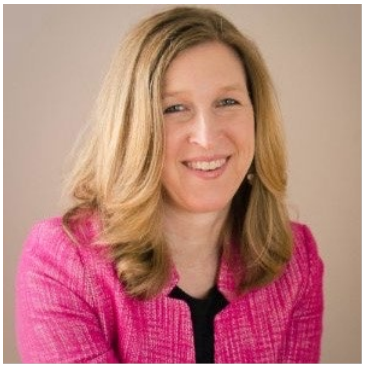
Session 3 1:50 pm – 3:30 pm	**Importance of Public-Private Partnerships, Building Food Safety Capacity, & Facilitating Information Sharing** ***Moderator: Kelly McCormick,*** *International Policy Analyst*, *Office of International Engagement,* U.S. Food and Drug Administration **Marlynne Hopper**, *Deputy Head of the Secretariat*, Standards and Trade Development Facility, World Trade Organization (20 min) **Paul Young**, *Principal,* PBY Strategies (20 min) **Robert Brackett**, *Senior Vice President and Dean, Food Safety Laboratories,* Institute for Environmental Health Laboratories and Consulting Group **Kateryna Onul**, *Policy Lead, IFC Global Food Safety and Food Loss Prevention Advisory,* International Finance Corporation, The World Bank Group (20 min) **Jamie Jonker**, *Chief Science Officer and Vice President, Sustainability & Scientific Affairs,* National Milk Producers Federation (20 min)
3:30 pm – 3:45 pm	**Break (15 min)**
Session 3, cont. 3:45 pm – 4:50 pm	**Session 3 continued** **Ana Cordero**, *Technical Specialist, Agricultural Health and Food Safety Specialist,* Inter-American Institute for Cooperation on Agriculture (20 min) **Clare Narrod**, *Research Scientist and Manager, Joint Institute for Food Safety and Applied Nutrition*, University of Maryland (20 min) **Q&A (20 min)**
Session 4 4:50 pm – 5:30 pm	**Sustainable solutions to priority food safety problem areas to contribute to supply chain efficiencies.** Project overseers will organize breakout groups on discussion topics for 25 minutes followed by group readouts and a roundtable discussion on outcomes, key takeaways, and field guide plans. (45 min) Breakout groups will discuss the following: 1. Top food safety problem areas in your economy; 2. Innovative and novel ideas to address these problem areas; and 3. Potential future relevant workstreams under APEC.
5:30 pm – 5:35 pm	**Closing Remarks** **Julie Moss***, FSCF Chair and Director, Office of International Engagement,* U.S. Food and Drug Administration (FDA) (5 min)

Annex 2. Speaker Biographies

Welcome and Remarks from FSCF Chair

Dr. Julie Moss joined the FDA in 2001 in the Center for Food Safety and Applied Nutrition (CFSAN). She began her FDA career in the Office of Plant, Dairy Foods and Beverages developing policy for the microbiological safety of fresh fruits and vegetables, coordinating, and instructing international training courses for produce safety related issues (e.g., good agricultural practices), and assisting in the development of FDA's bioterrorism regulations. Dr. Moss then moved to the Office of Nutrition, Labeling and Dietary Supplements working on nutrition policy involving trans fat, health claims, and other nutrition labeling issues. From 2009 to 2020, she has been the Deputy Director for the International Affairs Staff managing various international/trade aspects of food safety and nutrition. In this role, a significant focus was enhancing international strategic partnerships in global food safety. As of 2020, Dr. Moss is the Director for International Engagement. Prior to joining FDA, Dr. Moss was a practicing dietitian and taught collegiate nutrition and food science courses. Dr. Moss holds a bachelor's degree in nutrition from The Ohio State University, a master's degree in nutrition from the University of Cincinnati, and a doctorate in food science from the Florida State University.

Background and Context of Previous APEC FSCF Work

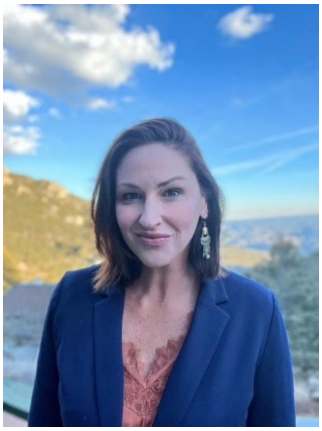


Ms. Megan Crowe is a Senior International Trade Specialist for the United States Department of Commerce, International Trade Administration, Office of Consumer Goods. She has worked at Commerce for 22 years focusing on trade policy, public private partnership, food safety, and standards issues in the processed food and beverages sector. Ms. Crowe leads public private partnership efforts in the Asia Pacific region to strengthen food safety systems and facilitate trade through capacity building. Ms. Crowe also works on Codex Alimentarius issues and World Health Organization issues and has represented the Department of Commerce as a member of the U.S. delegation at Codex and World Health Assembly meetings identifying issues of key importance to trade and providing input to U.S. positions. She has served as a Board Member for Women in International Trade. Prior to her work at the U.S. Department of Commerce Ms. Crowe held positions as a management consultant at Booz Allen and Hamilton and as an economist at the U.S. Department of Labor. Ms. Crowe earned a Bachelor of Arts in Economics from the University of Virginia and a Master of Arts in International Relations and Economics from the Johns Hopkins University, School of Advanced International Studies (SAIS).

Introduction of APEC Host Year Agriculture Theme

Ms. Melissa Schmaedick is a Senior Trade Policy Advisor with the U.S. Department of Agriculture's (USDA) Foreign Agricultural Service (FAS) and currently serves as the APEC Coordinator for her agency. Within her 25-year career with USDA, Melissa has worked closely with U.S. produce and specialty crop sectors through the Agricultural Marketing Service, focusing on market systems analysis, regulatory development, consensus-building, and government-industry relations. Her work with FAS has encompassed production, promotion, trade, and policy linkages assessment as both a commodity analyst and a trade policy specialist. Melissa served as a Rotary Ambassadorial Scholar in India where she focused on agriculture and banking cooperatives. She holds a Master's Degree in Development Economics from Portland State University, Portland, Oregon and is also a Harvard Kennedy School Senior Executive Service alumni.

Moderator



Ms. Kelly McCormick has worked at the intersection of public health, agriculture, and trade for over 18 years. Since 2015, she has represented FDA in various interagency and international strategic partnership initiatives, such as the Asia Pacific Economic Cooperation and the World Trade Organization's Standards and Trade Development Facility—serving as Chairperson for the latter in 2022. She also liaises with sister agencies to implement food safety capacity building programs as well as awareness efforts for the FDA's Food Safety Modernization Act, such as the Food Safety Network (a tri-agency agreement with USDA/Foreign Agricultural Service and the U.S. Agency for International Development). Additionally, she serves as co-lead for the International Committee for the Food Safety Preventive Controls Alliance. Prior to joining FDA, Ms. McCormick briefly conducted research related to intentional adulteration of the food supply with the National Center for Food Protection and Defense. Before that, she spent the better part of a decade as an International Trade Specialist with the USDA/FAS, where she developed and managed programs designed to promote trade through food safety, food security, and food defense capacity building and technical assistance; and later focused on strategic planning and special projects for global food safety and food defense programs. Additionally, Ms. McCormick served in the U.S. Peace Corps in Burkina Faso, West Africa, as a Public Health Extension Agent.

Innovative Initiatives: Economy

Ms. Constanza Vergara Escobar is a veterinarian and PhD candidate from University of Chile. Constanza works in the Trade Regulatory Affairs Division from the Ministry of Foreign Affairs where she is engaging on the negotiation and implementation of SPS measures on trade agreements, representation at multilateral for a, such as APEC and Monitoring and coordination of sanitary access of aquaculture and forestry products. Formerly, she works at the Chilean Food Safety and Quality Agency at the Ministry of Agriculture for 11 years, where she was an adviser in food microbiology, antimicrobial resistance and risk analysis for national regulation and international standards and coordinated the National initiatives on Biological Hazards, foodborne AMR, and participates in the elaboration and implementation of international technical cooperation project.

Dr. Marc W. Allard is a Senior Biomedical Research Services Officer in the Division of Microbiology in FDA's Office of Regulatory Science. Dr. Allard joined The US FDA in 2008 where he uses Whole Genome Sequencing (WGS) of foodborne pathogens to identify and characterize outbreaks of bacterial strains, particularly Salmonella, E. coli, and Listeria. Dr. Allard specializes in both phylogenetic analyses, as well as the biochemical laboratory methods which generate the WGS information. Dr. Allard helped develop the first distributed network of laboratories that utilize whole genome sequencing for pathogen identification and traceback called the GenomeTrakr database, which is part of the NCBI Pathogen Detection web site. These tools are used daily for outbreak investigations and compliance. Dr. Allard acts as senior scientist to advise the US FDA on both WGS and phylogenetic methods as they apply to public health.

Innovative Initiatives: Industry

Ms. Teresa Lo manages FIA's workstream on the harmonization of food trade standards, through the monitoring of regulatory developments and the facilitation of relevant research projects. She also leads the ASEAN Food and Beverage Alliance (AFBA), a network of food & beverage national associations in Southeast Asia with the core objective to facilitate intra- and extra-regional trade in ASEAN by supporting and accelerating the ASEAN harmonization process.

Joe Heinzelman began his career in nanotechnology. He joined Neogen in 2011. He started as the product manager for the Soleris platform, as well as the business lead for the development and deployment of food safety sequencing services at Neogen. He's HACCP and PCQI certified, as well taken various food safety training courses in genomic sequencing, and quantitative microbial risk assessments. Joe currently leads Neogen's digitalization efforts for food safety as the Director of Food Safety Digital Solutions, including Neogen Analytics. His undergraduate degree is from Albion College and has an MBA from Northwood University.

Innovative Initiatives: Academia

Dr. Janie Dubois is an independent consultant specialized in international capacity building and education on risk-based food safety systems and laboratory testing to verify compliance of food commodities with domestic and international regulations. She has taught students from some 60 countries and on the ground in 25 countries. Dr. Dubois is involved in international efforts to harmonize the food safety regulatory environment to support the production and trade of safe food globally, with an emphasis on the harmonization of requirements for pesticides. Dr. Dubois received her PhD in Food Science and Agricultural Chemistry from McGill University. She was a Research Officer at the National Research Council Canada, and a Research Associate posted at the U.S. FDA's Center for Food Safety and Applied Nutrition before moving to the private sector in 2004. She joined academia in 2011 as an Associate Clinical Professor of Food Safety at the University of Maryland for 8 years before starting her independent consulting. Dr. Dubois still teaches and volunteers to support the network of analysts of the International Food Safety Training Laboratory (IFSTL).

Dr. LC Chai is an accomplished microbiologist and professor at Sunway University, where she holds position of Pro Vice Chancellor (Education). As Chair of the Young Scientists Network-Academy of Sciences Malaysia (YSN-ASM), she leads the country's top young researchers committed to contributing to the national ecosystem beyond their individual research interests. In this role, she inspires and engages young academics to re-examine their role in shaping higher education for the future. Dr. Chai's research focuses on infectious microorganisms, food safety, and microbiological risk assessment. For her significant contributions to microbiological safety research, Dr. Chai was awarded the Malaspina International Award by the International Life Science Institute (ILSI) in 2017. She currently serves as the scientific advisor of ILSI South East Asia Region, providing guidance and advice on food safety risk assessment. Dr. Chai is a strong advocate for responsible research in Malaysia and ASEAN, actively promoting biosafety and biosecurity. Dr. Chai's awards and recognitions include the prestigious L'Oréal-UNESCO Women in Science Award in 2018, Marie Claire's Amazing Woman in Malaysia 2019, Prestige's 40 under 40 Malaysia 2019, and the Asian Women Entrepreneurs Leadership Award 2019.

Importance of Public-Private Partnerships, Building Food Safety Capacity, & Facilitating Information Sharing

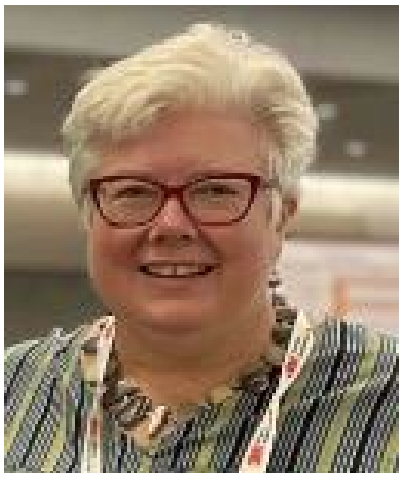
Ms. Marlynne Hopper is the Deputy Head and Lead on Monitoring, Evaluation and Learning of the Standards and Trade Development Facility (STDF), a global partnership to facilitate safe trade with over 220 projects in Africa, Asia-Pacific, Latin America and the Caribbean. With expertise in trade, development and agriculture, Marlynne leads STDF's knowledge work on topics from public-private partnerships to good regulatory practices. She has managed a US$14M portfolio of innovative STDF projects on food safety, animal and plant health. Prior to joining the STDF in 2008, Marlynne worked on agriculture policy analysis and capacity development, including with FAO, GIZ and the World Bank Group. She holds a Master's Degree in International Affairs from Georgetown University, Washington D.C.

Dr. Paul Young is currently an independent consultant involved in capacity building activities globally, with a focus on food and nutrition. He specializes in building stakeholder alignment in support of implementation of technical assistance projects, in particular, assisting the private sector in identifying opportunities for shared value in Public Private Partnerships. Formerly, he worked as a UK Government regulator ensuring compliance with EU food safety regulations and offering technical and regulatory assistance to third countries building capacity to meet EU trading requirements. In 2007 he moved to the US, joining Waters Corporation where he led their food and environmental business before transitioning to the role of Global Head of Government Affairs. During his time with Waters he testified in The US Senate on food safety regulation and engaged with governments, international organizations and multiple development bodies. He holds a bachelor's degree in Biochemistry from The University of Ulster and a PhD from The Queen's University Belfast.

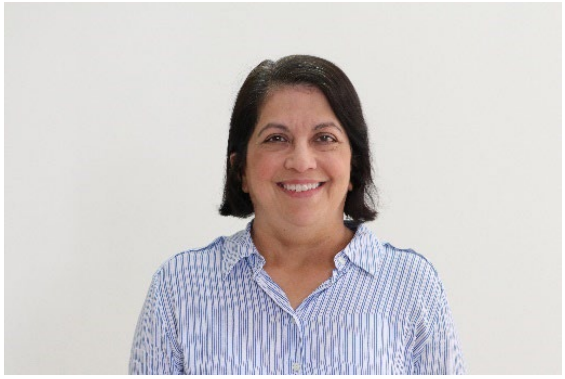
Dr. Bob Brackett currently serves as Senior Vice President and Dean of the IEH Academy. In this capacity, he leads a group of subject matter experts responsible for training and course development in food safety and food processing. In addition, he contributes to IEH Laboratory and Consulting Group as a subject matter expert in food safety and policy. Dr. Brackett has over 35 years of experience in food safety research, training, and policy. Dr. Brackett received his doctorate in food microbiology from the University of Wisconsin-Madison. Prior to coming to IEH, Dr. Brackett served as Executive Director and IIT Vice President of Illinois Institute's Institute for Food Safety and Health. Dr. Brackett has also served as Senior Vice President and Chief Science and Regulatory Officer for the Washington D.C. based Grocery Manufacturers Association (GMA, now called Consumer Brands Association). Before joining GMA, he served at the U.S. Food and Drug Administration's Center for Food Safety and Applied Nutrition (FDA CFSAN), where he started as a senior microbiologist in the Office of Plant and Dairy Foods and Beverages in 2000. After several promotions, Dr. Brackett was appointed CFSAN Director, where from 2004-2007 he provided executive leadership to CFSAN's development and implementation of programs and policies relative to the composition, quality, safety and labeling of foods, food and color additives, dietary supplements, and cosmetics. Earlier in his career, Dr. Brackett held professorial positions with North Carolina State University in Raleigh, and the University of Georgia.

Ms. Kateryna Onul is a Policy Lead in IFC Global Food Safety and Food Loss Prevention, Advisory based in Austria. She has been with the World Bank Group since 2007, providing support on food safety agenda to IFC and WB programs worldwide. Her main areas of expertise are policy, regulatory, institutional, and capacity building dimensions of national food systems. She is focused on assessing national food safety systems in different parts of the world from Eastern Europe to Asia and Africa, as well as on the development of regulatory solutions and learning resources for improvement of food safety in mentioned regions. Kateryna holds master's degrees in International Law and Public Administration (Ukraine) and an LLM degree in Food Law from De Montfort University (UK). She successfully completed Implementing Public Policy Executive Education in Harvard Kennedy School in 2020 and the Public Policy Analyses course taught by the London School of Economics in 2022.

Dr. Jamie Jonker has general responsibilities in sustainability and scientific affairs, including animal health and welfare, animal biotechnology, dairy farm bio-security, dairy farm air and water quality, dairy farm sustainability, and technical service issues. He is also involved in coordinating relations with the Federation's Animal Health & Wellbeing Committee and Environmental Issues Committee. Dr. Jonker is active representing the Federation on numerous national and international committees, including the U.S. Animal Health Association (USAHA), the International Dairy Federation (IDF), the World Animal Health Organization (WOAH), and Codex Alimentarius (Codex). In 2019, he was appointed to the USDA Secretary's Advisory Committee on Animal Health. He serves on the U.S. Animal Health Association Board of Directors. In 2020, he was elected as Chair of the IDF Science Program Coordinating Committee and serves on the IDF Board of Directors. Dr. Jonker has also served on the IDF Delegations to the Codex Committee on Residues of Veterinary Drugs, the Codex Ad Hoc Intergovernmental Task Force on Animal Feeding, and the Codex Ad Hoc Intergovernmental Task Force on Antimicrobial Resistance. In 2021, he was appointed as an ex officio member to the USDA APHIS Veterinary Services' National Animal Disease Preparedness and Response Program Consultation Board, and in 2023 to the Global Leaders Group on Antimicrobial Resistance. Dr. Jonker also serves as the Executive Director for the National Ice Cream Mix Association. Jamie received his B.S. degree and M.S. degree from Cornell University, and his Ph.D. from the University of Maryland. Prior to joining NMPF, his career included 6 years of experience in agricultural policy including service at the National Academy of Sciences, the U.S. Environmental Protection Agency, and the U.S. House of Representatives Committee on Agriculture.



Clare Narrod is the Director of the Risk Analysis program at JIFSAN and leads the monitoring and impact effort associated with the evaluation of JIFSAN's capacity building efforts. She received her Ph.D. in Energy Management and Environmental Policy in 1997 and a Master's Degree in International Development and Appropriate Technology, both from the University of Pennsylvania. From 1998-2000 she served as an American Association for the Advancement of Science Risk Analysis Fellow at USDA. She started her career in the government where she conducted and reviewed risk assessments and cost-benefit analyses of proposed and final rules for Agency clearance associated with reducing the risk of animal and plant diseases and improving food safety. Prior to coming to JIFSAN she worked at the International Food Policy Research Institute, the United States Department of Agriculture, and at the Food and Agriculture Organization. She has consulted for the World Bank and the Inter-American Institute for Cooperation on Agriculture. She has field experience in Brazil, China, Costa Rica, Ethiopia, Ghana, India, Indonesia, Kenya, Nigeria, Thailand, Mali, Mexico, Vietnam, and Zambia. She has taught in Colombia, China, India, Hong Kong, Malaysia, Russia, the US, and Zambia. Over the years she has conducted research on identifying cost-effective food safety and animal health risk reduction measures for different size producers so as to improve market access for LMIC's.



Ms. Ana Marisa Cordero has worked for the last seventeen years as an Agricultural Health and Food Safety Technical Specialist at the Inter American Institute of Cooperation on Agriculture (IICA). Extensive experience in the area of international agricultural health and food safety regulations specifically the Agreement on the Application of Sanitary and Phytosanitary Measures, the Agreement of Agriculture, and practical application of these guidelines; particularly corresponding national, regional and international regulations (Codex Alimentarius, FSMA, USDA/FSIS, APHIS, FDA, OIE, IPPC and other international standards). Experience in the area of management and implementation of projects with external resources and the promotion of international public-private partnerships in the area of agricultural health and food safety. As part of her responsibilities Ana is promoting the development and use of digital tools in the areas of animal, plant health and food safety to support the compliance of international, regional and local regulations and guidelines on these matters.

Annex 3. Additional Resources

Asia Pacific Economic Cooperation (June 2019). *Update of the APEC Baseline Study: Regulations of Products Derived from Innovative Agricultural Technologies and Identification of Ways to Promote Greater Efficiencies and Alignment.* Update of the APEC Baseline Study: Regulations of Products Derived from Innovative Agricultural Technologies and Identification of Ways to Promote Greater Efficiencies and Alignment | APEC

International Food Safety Training Laboratory (IFSTL): https://ifstl.org/

WTO Standards and Trade Development Facility (STDF): https://www.wto.org/english/tratop_e/dtt_e/dtt-stdf_e.htm

Food Safety Cooperation Forum's Partnership Training Institute Network (APEC FSCF PTIN): http://fscf-ptin.apec.org/

IFC Food Safety materials: www.ifc.org/foodsafety

Joint Institute for Food Safety and Applied Nutrition (University of Maryland): https://jifsan.umd.edu/

Inter-American Institute for Cooperation on Agriculture: https://www.iica.int/en/programs/agricultural-health