



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



FY2021 ANNUAL REPORT

FEED THE FUTURE INNOVATION LAB FOR FOOD SAFETY



Cornell University

Feed the Future Innovation Lab for Food Safety (FSIL)

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Management Entity

The Feed the Future Innovation Lab for Food Safety (FSIL) is jointly managed by Purdue and Cornell Universities. The management entity provides technical leadership that guides USAID’s food safety research agenda while ensuring effective management and implementation of all activities within the Food Safety Innovation Lab portfolio. FSIL’s management team and technical experts leverage extensive experience in international food safety research, education, and extension to develop and manage a portfolio of food safety and capacity development activities.

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Advisory Committee

The FSIL Advisory Committee is critical to meeting the Innovation Lab's goal of reducing the burden of foodborne disease and strengthening the food safety of nutrient dense foods through transformative partnerships across academic, public, and private sectors. The management entity relies on Advisory Committee members to counsel FSIL on research priorities, represent FSIL in various capacities, and serve as a resource and support for FSIL research subaward processes.

The Advisory Committee consists of private sector experts in food safety, government agency representatives, and experts in cross-cutting themes.

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Where the Innovation Lab Works



The Food Safety Innovation Lab targets a select group of focus countries for core activities in order to maximize impact and limit overhead while maintaining a global focus. The four focus countries are Bangladesh, Cambodia, Kenya, and Senegal. Additional activities were funded in Nepal during FY2021.

List of Program Partners

U.S.	Cornell University
	Kansas State University
	Penn State University
	Purdue University
	Texas State University
	The Ohio State University
	Tuskegee University
	University of Florida
	University of Georgia
Bangladesh	Bangladesh Agricultural University
	University of Dhaka
Cambodia	Center of Excellence on Sustainable Agricultural Intensification and Nutrition
	Institut Pasteur du Cambodge
	Institute of Technology Cambodia
	Royal University of Agriculture
	World Vegetable Center
Kenya	Kenya Medical Research Institute
	University of Nairobi
Nepal	Nepal Development Research Institute
Senegal	Conseil National du Développement de la Nutrition
	Institut de Technologie Alimentaire
	Institut Sénégalais de Recherches Agricoles

Acronyms

AANAPISI	Asian American and Native American Pacific Islander-Serving Institution
AoI	Area(s) of Inquiry
ANNH	Alaska Native and Native Hawaiian-Serving Institution
AOR	Agreement Officer’s Representative
CITI	Collaborative Institutional Training Initiative
COVID-19	Coronavirus Disease 2019
DEC	Development Experience Clearinghouse
DDL	Data Development Library
EMMP	Environmental Mitigation and Monitoring Plan
FAQ	Frequently Asked Questions
FS	Food Safety
FSIL	Innovation Lab for Food Safety
FY	Fiscal Year
GFSI	Global Food Safety Initiative
GFSS	Global Food Security Strategy
HBCUs	Historically Black Colleges and Universities
HSI	Hispanic-Serving Institution
IBC	Institutional Biosafety Committee
IL	Innovation Lab
IRB	Institutional Review Board
ITA	Institut de Technologie Alimentaire
MEL	Monitoring, Evaluation, and Learning
MSI	Minority Serving Institution
NASNTI	Native American Serving Non Tribal Institution
NGO	Non-governmental Organization
PBI	Predominantly Black Institution
PI	Principal Investigator
RFA	Request for Applications
RUA	Royal University of Agriculture, Cambodia
TOC	Theory of Change
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
VOH	Food Industry Virtual Office Hours
WP	Work Plan

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Executive Summary

FSIL QuickStart projects laid the groundwork for strengthening food safety in Bangladesh, Cambodia, Senegal, and the East Africa region through reports and landscape analyses which assessed the current status of food safety and identified key gaps, challenges, and opportunities. While most QuickStarts concluded in FY2020, reports from these activities were finalized and made available on the FSIL website in FY2021. These comprehensive analyses are a solid foundation for identifying strategic interventions, both practices and policies, to reduce the burden of foodborne illness and bolster food security and nutrition.

In FY2021, FSIL awarded \$2.9 million in funding for four new long-term research subawards to strengthen the food safety of nutrient dense foods in Bangladesh, Cambodia, Kenya, and Senegal. These research projects leverage strong partnerships between U.S. and in-country researchers with clear objectives to assess and intervene in essential value chains that support nutrition and food security. Initial activities for these projects included launch meetings, literature reviews, development of biosafety protocols and survey tools, and recruitment of graduate students. FSIL also initiated its Gender Working Group, comprised of gender specialists from each project, to amplify research strategies and findings that bridge the gender gap in food safety.

FSIL's one-year COVID-19 response project, which was implemented from July 2020 through June 2021, developed an international task force to support the food industries in Bangladesh, Cambodia, Kenya, Nepal, and Senegal as they faced challenges associated with the coronavirus pandemic. In this project, experts from the Institute for Food Safety at Cornell University partnered with in-country researchers and technical experts to provide science-based information to prevent supply chain disruptions which would jeopardize a safe food supply. They developed practical resources, such as FAQ videos in several languages, checklists and mitigation strategies for food businesses, and they held country-specific and regional Food Industry Virtual Office Hours.

FSIL is committed to elevating diversity, equity, inclusion, and accessibility (DEIA) throughout all programming and is a leader in promoting DEIA among Innovation Labs. As part of this commitment, FSIL released its second Request for Applications (RFA) in April 2021, which focused on Minority Serving Institution (MSI)-led partnerships for global food safety research. Thirty-eight researchers from 23 different MSIs were engaged in the RFA process. Projects selected through the RFA process will begin implementation in March 2022 and have a performance period of two years.

The FSIL management entity expanded communication and outreach efforts through a new website, e-newsletter, increased engagement on social media and Agrilinks, and a five-part webinar series. A workflow for sharing complete datasets from FSIL-funded research was established, and FSIL's first dataset was published in Harvard Dataverse and USAID's Data Development Library.

Research Program Overview and Structure

In 2019, USAID selected Purdue University, in partnership with Cornell University, to lead the first-ever Feed the Future Innovation Lab for Food Safety. FSIL's vision is to strengthen food security for developing nations through research and capacity development that increases the production of, and access to, safe and nutritious food. FSIL aims to generate and facilitate the dissemination of knowledge, practices, and technologies that improve and enhance climate resilient food safety systems for communities, households, and commercial value chains. To achieve its goal and those of the Global Food Security Strategy (GFSS), FSIL utilizes a competitive process to select and fund research and capacity building projects.

Alignment with the Global Food Security Strategy

Food safety intersects with three objectives of the GFSS (nutrition, resiliency, and economic growth), as it is necessary for food security. Therefore, there is a clear need to consider food safety challenges and opportunities when conducting and translating research designed within the strategy. FSIL's research portfolio is framed by three Areas of Inquiry (AoI), which closely align with the GFSS.

- AoI 1 - Improved Nutrition and Human Outcomes: Research under this AoI focuses on the consumption of safe and affordable food as a means of reducing undernutrition. The AoI emphasizes that nutritious foods can still result in illness or disease in the event they are unsafe due to contamination with biological or chemical hazards.
- AoI 2 - Reduce and Mitigate Risk for Enhanced Resilience: Research under this AoI focuses on food safety behavior, practices, and awareness that are closely tied to a population's resilience. One of the overarching aims of resiliency is to reduce the human and economic costs of recurrent crises, which are exemplified in endemic diarrheal diseases caused by contaminated food and water.
- AoI 3 - Advancing the Productivity Frontier through Economic Development: Research under this AoI focuses on developing opportunities for foods and commodities to reach new local and export market opportunities. Developing and implementing advanced food safety regulation and monitoring systems will ensure products meet the international food safety standards required for entry into global trade.

Overview and Objectives

To enhance food safety globally, FSIL pursues the following objectives:

- Increasing awareness of food safety
- Enhancing capacity to conduct food safety research
- Developing policies that enable conditions for food safety research, translation, and practice
- Accelerating translational research technologies and practices for households, communities, and the food industry

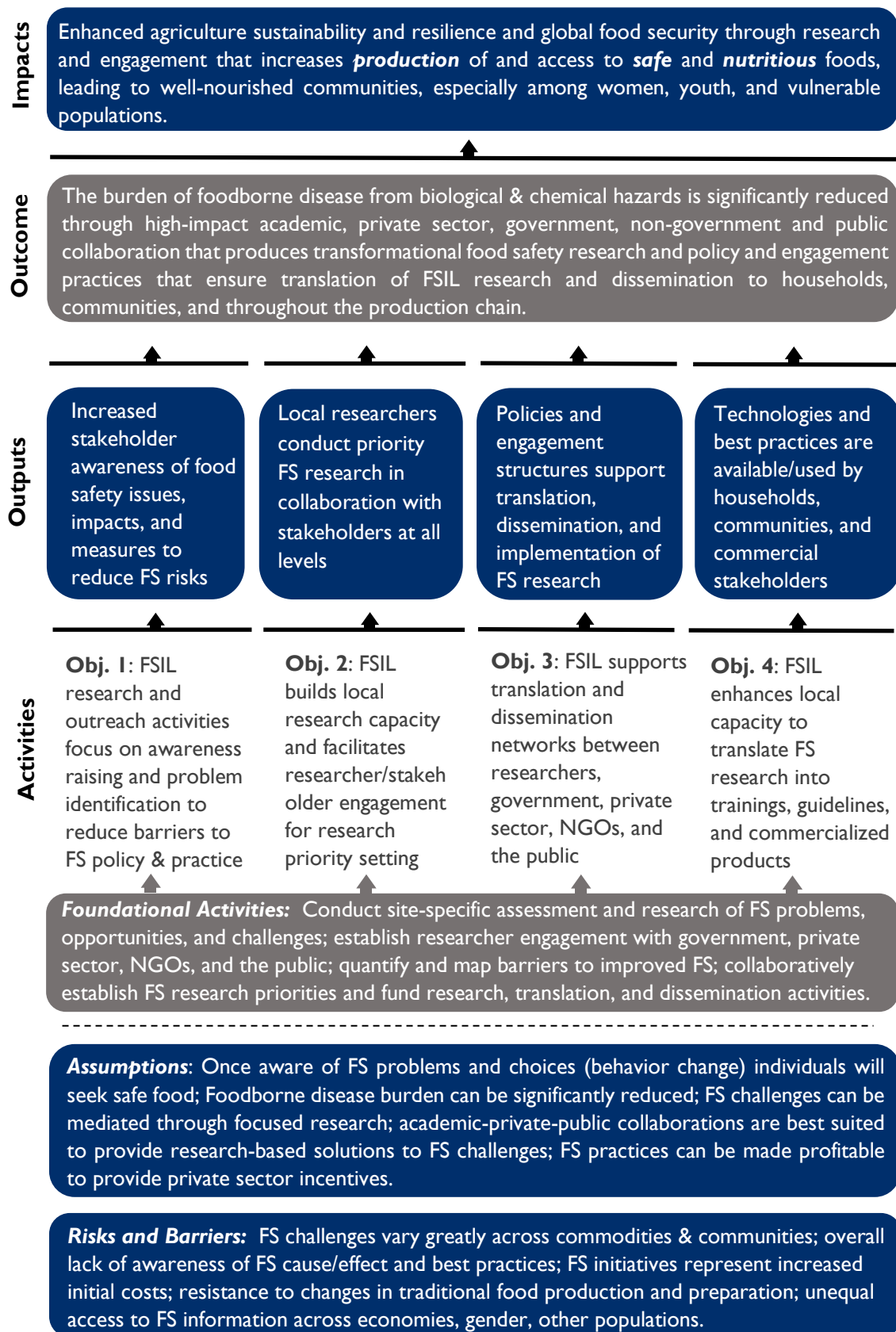
Research Portfolio Design

In FY2021, FSIL funded four new long-term subawards in Bangladesh, Cambodia, Kenya, and Senegal that build on the findings of FSIL's foundational research grants (QuickStarts). FSIL also released its second RFA in April 2021, focusing on Minority Serving Institution (MSI)-led partnerships for global food safety research. The RFA aims to fill technical gaps in the FSIL research portfolio. The final selection of funded projects is expected to occur in Q1 of FY2022, and projects will initiate activities in Q2 of FY2022.

Cross-Cutting Themes

Across the FSIL research portfolio, the cross-cutting themes addressed include gender equity, youth engagement, human and institutional capacity development, and food safety enabling environments.

Theory of Change (TOC) and Impact Pathway



Focus Country Key Accomplishments

Bangladesh

Fish and chicken are among the most important animal-based protein sources in the Bangladeshi diet. The rise in production of farmed fishes and convenient frozen chicken products has been accompanied by a strengthening of the country's food safety regulatory structure. However, for policies and practices to be efficient and effective, they must be shaped by data on food safety risks, grounded in the economics of safer food production for consumers and producers, and address the food safety training and education needs of farmers and consumers alike. In FY2021, FSIL initiated a three-and-a-half-year research project that addresses these needs by identifying areas in the fish and chicken value chains where food safety interventions can reduce foodborne illnesses.

Initial accomplishments of FSIL's long-term subaward in Bangladesh included the development and approval of research protocols, recruitment of graduate students, and stocking of ponds with targeted fish species. The Director General of the Bangladesh Fisheries Research Institute and other experts visited the ponds and provided their advice to fish farmers and local communities regarding safe fish farming. Through FSIL's COVID-19 rapid response project, three sessions of Food Industry Virtual Office Hours were held in Bangladesh to allow food system affiliates to pose questions about the coronavirus to a panel of experts. Seventy-six individuals were engaged across the three sessions. FSIL's QuickStart project in Bangladesh, which concluded activities in FY2020, also published its final report¹ on the FSIL website and Development Experience Clearinghouse (DEC) during the performance period. This assessment identifies key gaps, challenges, and possible interventions to strengthen food safety in Bangladesh.

FSIL's research aligns with the GFSS Bangladesh Country Plan² primarily through its program components of Food Safety and Sanitary and Phytosanitary Standards, Nutrition, and Agricultural Productivity and Diversity. Specifically, FSIL's planned analysis of antibiotic residues, bacterial pathogens, and heavy metals in fish and poultry supports the Country Plan's aim to implement preventative controls along food safety value chains. FSIL's focus on food safety in fish and poultry aligns with value chains prioritized by the Country Plan for their impact on nutrition enhancement and sustainable agriculture-led growth. The program component of Optimizing Economic Inclusion is also supported, as FSIL pursues research strategies that aim to identify food safety practices that help women overcome barriers to safer foods.

Cambodia

In recent years, Cambodia's commitment to reducing malnutrition has led to the increased promotion of high value, nutritionally rich foods—particularly vegetables — to consumers. However, the consumption of raw vegetables carries a risk of foodborne disease unless produce is consistently protected from cross-contamination with pathogens during production, processing, transport, sale, and meal preparation. In FY2021, FSIL initiated a three-and-a-half-year research project that addresses this challenge by identifying the bacterial pathogens that pose the greatest food safety risk and investigating critical control points within the food system to identify contributors to pathogen contamination, transmission, and persistence.

With leadership from the Center of Excellence on Sustainable Agricultural Intensification and Nutrition, the project is strengthening in-country research collaborations and building consensus among universities and the public and private sectors on the greatest food safety challenges. This creates a locally-led agenda of research priorities, which facilitates an environment of shared incentives among all partners. Cambodian-led research

¹ <https://ag.purdue.edu/food-safety-innovation-lab/projects/resources/food-safety-system-in-bangladesh-current-status-of-food-safety-scientific-capability-and-industry-preparedness/>

² <https://www.usaid.gov/documents/1867/global-food-security-strategy-gfss-bangladesh-country-plan>

and capacity development, using an experiential learning framework, creates an opportunity to apply new learning and technical skills to other current or emerging food safety threats in Cambodia. The tools and training methods developed by the project are also positioned for scaling regionally or globally.

Initial accomplishments of FSIL’s long-term subaward in Cambodia included the development and piloting of two survey instruments that will be used to identify gaps in food safety knowledge and attitudes among vegetable vendors and to assess conditions required for individuals or groups to adopt food safety practices. Results from a clinical questionnaire were combined with a desktop review to identify bacterial pathogens most strongly associated with diarrheal disease in Cambodia. From this activity, *Salmonella enterica* and pathogenic *Escherichia coli* were identified as targets for future intervention research. Researchers also designed a 10-session experiential learning course to teach quantitative survey development to university students. Eighty-six undergraduates from the Royal University of Agriculture and Institute of Technology Cambodia completed the course.

Through FSIL’s COVID-19 rapid response project, four sessions of Food Industry Virtual Office Hours were held in Cambodia to allow food system affiliates to pose questions about the coronavirus to a panel of experts. The Virtual Office Hours engaged 240 individuals across the four sessions. FSIL’s QuickStart project in Cambodia also published its final report³ on the FSIL website and DEC during the performance period. This landscape review of food safety efforts in Cambodia describes the current status of food safety governance, surveillance, research, partnerships, and opportunities.

Kenya

Foodborne disease causes an estimated 91 million illnesses and \$16.7 billion in economic losses in Africa each year. In Kenya, unsafe food affects the country’s human development and impacts economic growth. Poultry is a key dietary component for poor and middle-class Kenyan households and an important source of revenue for women and youth. However, since poultry is often produced and processed in informal settings which rarely include pathogen mitigation strategies, it remains a high-risk value chain. In FY2021, FSIL initiated a three-and-a-half-year research project that addresses this challenge by using a systems-based, risk-informed approach to ask and answer important food safety questions in partnership with small-scale women and youth poultry producers.

Initial accomplishments of FSIL’s long-term subaward in Kenya included the design and approval of survey protocols and the development of two literature review drafts. One literature review is focused on gender norms and food safety issues in the poultry value chain, and the other review synthesizes existing data on the prevalence and levels of *Salmonella enterica* and *Campylobacter* spp. in poultry products in Kenya. A stakeholder scoping workshop was also held at the end of FY2021 to define the scope for a future risk ranking of interventions for mitigating *Salmonella* and *Campylobacter* contamination in poultry value chains managed by women and youth in peri-urban Nairobi.

Through FSIL’s COVID-19 rapid response project, three sessions of Food Industry Virtual Office Hours were held in Kenya to allow food system affiliates to pose questions about the coronavirus to a panel of experts. The Virtual Office Hours engaged 158 individuals across the three sessions. FSIL’s QuickStart project in Kenya and the East Africa region, which concluded activities in FY2020, also published its final report⁴ on the FSIL

³ <https://ag.purdue.edu/food-safety-innovation-lab/projects/resources/food-safety-in-cambodia-current-programs-and-opportunities/>

⁴ <https://ag.purdue.edu/food-safety-innovation-lab/projects/resources/report-on-food-safety-investments-in-east-africa/>

website and DEC during the performance period. This landscape review of food safety programs and projects in East Africa highlights investment needs for reducing the burden of foodborne disease across the region.

FSIL's current emphasis on food safety in the poultry value chain aligns with the GFSS Kenya Country Plan⁵ and its recognition of poultry as a Tier 2 commodity to build resilience and expand income opportunities for youth and women. FSIL's work in Kenya supports the Country Plan's aim to improve the enabling environment for inclusive agriculture growth and increase the production and marketing of safe food through enhanced food safety research capacity and delivery of food safety data. Acknowledging the critical role of women in improving food safety and nutrition, FSIL also integrates gender considerations in its analysis of food safety interventions and dissemination of research results.

Senegal

Dairy production in Senegal is a rapidly growing sector, providing a domestic supply of nutritionally rich milk products and fostering economic opportunity in rural areas. However, the diverse and fragmented supply chain of small farms, aggregation sites, artisanal processing facilities, and transport from rural areas to urban centers creates challenges for protecting the microbial quality, safety, nutritional quality, and shelf life of dairy and dairy products. In FY2021, FSIL initiated a three-and-a-half-year research project that addresses these challenges across the dairy value chain by raising awareness of food safety issues and their impact on public health, conducting research-based food safety training programs, identifying practical food safety interventions, and coordinating comprehensive food safety regulations aligned with government policies.

Initial accomplishments of FSIL's long-term subaward in Senegal included site visits to the project's targeted geographical regions to meet with key stakeholders in the dairy value chain to introduce them to the project and collaboratively identify opportunities for future research. The visits included observations at small scale milk collection sites and a dairy processing facility to document existing gaps in food safety practices. The findings from the site visits will be paired with in-process literature reviews focused on processing, production, and gender and youth engagement to develop targeted research questions for subsequent years.

Through FSIL's COVID-19 rapid response project, three sessions of Food Industry Virtual Office Hours were held in Senegal to allow food system affiliates to pose questions about the coronavirus to a panel of experts. The Virtual Office Hours engaged 132 individuals across the four sessions. FSIL's QuickStart project in Senegal, which concluded activities in FY2020, also published its landscape analysis⁶ on the FSIL website and DEC during the performance period. This review highlights ongoing projects to increase food safety in Senegal and reviews the existing academic research on improving the safety of rice, maize, millet, groundnuts, and fish produced and consumed in Senegal.

FSIL's ongoing research aligns with the GFSS Senegal Country Plan⁷ and the specific objectives of achieving inclusive and sustainable agricultural-led growth and developing a well-nourished population. Specifically, FSIL supports the development of an evidence-based regulatory system through the generation of food safety data and enhanced food safety research capacity as it relates to the dairy value chain. By integrating gender-specific research objectives and intervention strategies, FSIL also aims to identify and mitigate women's barriers to adopting food safety practices and behaviors, contributing to improved food security and nutrition.

⁵ <https://www.usaid.gov/documents/1867/global-food-security-strategy-gfss-kenya-country-plan>

⁶ <https://ag.purdue.edu/food-safety-innovation-lab/projects/resources/food-safety-programs-and-academic-evidence-in-senegal/>

⁷ <https://www.usaid.gov/documents/1867/global-food-security-strategy-gfss-senegal-country-plan>

Research Project Reports

Theme A: QuickStart Activities

Bacterial Contamination in Fresh Vegetables: Focusing Interventions in Cambodia (Cambodia QuickStart)

Location: Phnom Penh and Battambang, Cambodia

Description: The Cambodia QuickStart project assessed pathogen transmission on vegetables at distribution levels in Cambodia. Environmental sampling identified both the specific organisms of concern and the key points where contamination was present. This analysis is being coupled with surveys to identify current practices and perceptions of food safety to inform the design and implementation of interventions to strengthen food safety in Cambodia. This work is enabling focused interventions in specific areas of the value chain where changes in food handling practices can lead to a measurable reduction in the risk of contamination of vegetables that reach consumers. Data from this project is being used to identify targeted interventions that are effective and scalable. In addition, a landscape analysis of food safety programs and opportunities characterized the current food safety challenges in a Cambodian context and is providing a baseline for future food safety efforts in the country.

Theory of Change and Impact Pathway: This project contributes towards Objectives 1 and 2 of the FSIL TOC.

Collaborators: Purdue University (U.S.), Kansas State University (U.S.), Royal University of Agriculture (Cambodia), Center of Excellence on Sustainable Agricultural Intensification and Nutrition (Cambodia)

Achievements (Aligned with Cambodia WP Activity 1.1): The Cambodia QuickStart concluded activities in the first half of FY2021. Thus, achievements remain the same as those documented in FSIL's semi-annual report. The longitudinal study measuring bacterial pathogen contamination rates in vegetables sold in Cambodian informal markets was completed. A manuscript on the state of food safety in Cambodia was also completed and submitted for peer review in the Journal of Global Food Security. Project leaders facilitated the certification of additional Royal University of Agriculture (RUA) undergraduate students to collect and analyze data from human subjects and act as enumerators in field research. They also developed a process to obtain ethical oversight of human subjects research taking place in-country and without the physical presence of Purdue personnel. The scope of the survey completed through the QuickStart project was modified due to COVID-19 restrictions on domestic travel within Cambodia. The project team administered the modified survey virtually to university undergraduate students to gauge food safety perceptions among students preparing for careers in food production/food technology. The original survey planned for this QuickStart project will be completed through the Cambodia long-term subaward.

Capacity Building : Capacity building activities for this project were completed in FY2020⁸.

Lessons Learned: Travel restrictions related to COVID-19 disrupted the traditional management of international human subjects research at Purdue. To overcome this barrier, the project team solidified a process to obtain in-country ethical oversight of human subjects research to allow research and data collection to take place without the physical presence of Purdue personnel. This will enable future research to take place more efficiently in a virtual or hybrid environment.

Publication:

Paul, E., Lyda, H., Thompson, L., & Vipham, J. (2021). Towards Improving Food Safety in Cambodia: Current Status and Emerging Opportunities (pp.1-8). *Journal of Global Food Security*, 31, Amsterdam, Netherlands. Advance online publication. <https://doi.org/10.1016/j.gfs.2021.100572>

⁸ The FSIL FY2020 Annual Report can be accessed at: https://pdf.usaid.gov/pdf_docs/PA00X62V.pdf

Theme B: Buy-Ins

Rapid Response Project to Manage the COVID-19 Pandemic Food Safety and Food Security Challenges in Developing Countries (Operating Unit Buy-In)

Location: Bangladesh, Cambodia, Kenya, Nepal, and Senegal

Description: The COVID-19 Rapid Response project was designed to mitigate food safety and food security challenges during the coronavirus pandemic in several low- and middle-income countries (Bangladesh, Cambodia, Kenya, Nepal, and Senegal). The goal was to provide the food industry in these countries with the tools and resources to implement technical, organizational, and personnel measures to reduce person-to-person coronavirus transmission in all parts of the food system. Project leaders at the Institute for Food Safety at Cornell University mentored a community of international food systems COVID-19 subject matter experts. These subject matter experts hosted live in-country Food Industry Virtual Office Hours (VOH), which allowed food system affiliates (e.g., farmers, processors, distributors, retailers, and consumers) to access a panel of experts and ask questions in real time. A centralized online hub was created to provide reliable, web-based resources that were customized and translated as appropriate for each target country.

Theory of Change and Impact Pathway(s): This project contributes towards Objectives 3 and 4 of the FSIL TOC.

Collaborators: Cornell University (U.S.), University of Dhaka (Bangladesh), Royal University of Agriculture (Cambodia), Nepal Development Research Institute (Nepal), Institut de Technologie Alimentaire (Senegal), University of Nairobi (Kenya)

Achievements (Aligned with COVID-19 Response WP Activity 1.1): The project supported the development and delivery of 16 sessions of VOH in the target countries of Bangladesh (3), Cambodia (4), Kenya (3), Nepal (3) and Senegal (3) and three regional VOH in Asia (1) and Africa (2), which in total engaged 1,027 participants. The regional VOH expanded the international food systems COVID-19 community through the inclusion of colleagues from neighboring countries as panelists to share their experiences and exchange COVID-19 control strategies. Project leaders developed and administered two surveys using a pre- and post-study design to measure the effectiveness of VOH. The analysis of the results concluded that the majority of respondents who attended VOH found the session moderately or very helpful (86%) and would not only recommend VOH to others (85%), but they would also plan to make changes to their current COVID-19 control strategies or implement new practices after receiving information from VOH (66%). New resources were also developed by partner subject matter experts, including translated Food Industry FAQs and presentations from VOH, posters on COVID-19 and how to handle fresh produce, food facility COVID-19 strategy checklists, infographics on how to prioritize COVID-19 control strategies, and video FAQs explaining why COVID-19 is not foodborne. These resources were also promoted and shared during each session of VOH.

Capacity Building: Capacity building activities included “train-the-trainer” sessions for partner subject matter experts, which focused on how to deliver food industry virtual office hours with a role-playing practice session. This gave each partner subject matter expert first-hand experience in addressing common questions about the coronavirus.

Lessons Learned: The political climate surrounding COVID-19 in each country affected if and how the project’s programming could occur. Activities were originally planned for Tanzania but were redirected to support regional VOH due to limited public dialogue about COVID-19. If the project model were scaled to other countries or adapted to future crises, this factor should be considered.

Presentations and Publications

- Bari, L., Demmings, E., Trmcic, A., & Wiedmann, M. (2020). COVID-19 FAQ in Bengali, French, Nepali. <https://www.youtube.com/watch?v=PcIYmbkjtqE>;
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- Webb, M., Trmcic, A., Wiedmann, M., Garris, A., & Demmings, E. (2021). International COVID-19 Rapid Response Project, Case study: supporting the food industry in Nepal. *Cornell University*. Publicly available on website.

Theme C: Long-Term Subawards

Enhancing Food Safety in Fish and Chicken Value Chains of Bangladesh (Bangladesh Long-Term Subaward)

Location: Bangladesh; Districts: Mymensingh, Bogura, Dhaka, Gazipur, Jashore, Khulna, Patuakhali, and Rajshahi

Description: The project is promoting informed decisions and actions to enhance the food safety of farmed fish and frozen uncooked chicken products. By identifying areas along the value chain which need improvement and developing tools to quantify the benefits of improved food safety, the project is fostering an enabling environment to support consumers' access to safe, nutritious food products.

Theory of Change and Impact Pathway(s): This project contributes towards Objectives 1-4 of the FSIL TOC.

Collaborators: Texas State University (U.S.), University of Dhaka (Bangladesh), Bangladesh Agricultural University (Bangladesh)

Achievements (Aligned with Bangladesh WP Activity 1.1): In FY2021, team members focused primarily on developing research methodologies for various components of the project. Bangladesh Agricultural University prepared research protocols for their Institutional Review Board (IRB) and Institutional Biosafety Committee (IBC) equivalents, and these protocols were approved by their institutional authorities. Subsequently, they were approved by the IRB and IBC committees of Texas State University.

As a component of the study of microbial contaminants and heavy metals in the fish value chain, three ponds in the Mymensingh District were stocked with three targeted fish species (rohu, tilapia and pangasius) in April 2021. As per project objectives, the fish feed is being prepared by a private feed company following a scientific and safe feed formula. Researchers and field staff have visited the ponds on a regular basis to monitor them and collect data on fish growth performance. The project team is also providing expert advice to farmers for growing fish in a safer environment. The Director General of the Bangladesh Fisheries Research Institute and other experts visited the ponds and provided their advice to fish farmers and local people regarding safe fish farming.

Capacity Building: Four M.S. students supported by the project at Bangladesh Agricultural University began their degree programs in FY2021. Their areas of study are listed under *Human and Institutional Capacity Development*. Two Ph.D. students, one in food microbiology and one in agricultural economics, were also selected by the project through a formal recruitment and interview process. They will begin their degree programs at Bangladesh Agricultural University in FY2022.

Lessons Learned: While not a primary objective of the project, community interest in the ponds stocked with targeted fish species has prompted the project team to incorporate extension and outreach activities for the local communities.

Presentation

Dey, M. (2021). Enhancing Food Safety in Fish and Chicken Value Chains of Bangladesh. *Introductory meeting with the Bangladesh Mission*. Virtual.

Reducing Foodborne Pathogen Contamination of Vegetables in Cambodia: Innovative Research, Targeted Interventions, and Impactful, Cambodian-Led Engagement (Cambodia Long-Term Subaward)

Location: Cambodia; Siem Reap and Battambang provinces, Phnom Penh municipality

Description: The overarching goal of the project is to safeguard the nutritional gains of a healthy diet for Cambodian children, households, and communities by strengthening food safety across the vegetable value chain. Project partners are bridging existing food safety gaps and solidifying shared food safety agendas across universities and the public and private sectors. Together, they are testing and implementing data-driven strategies to measurably reduce the incidence of foodborne pathogen contamination of vegetables consumed in Cambodia.

Theory of Change and Impact Pathway(s): This project contributes towards Objectives 1-4 of the FSIL TOC.

Collaborators: Kansas State University (U.S.), Purdue University (U.S.), Penn State University (U.S.), Royal University of Agriculture (Cambodia), Center of Excellence on Sustainable Agricultural Intensification and Nutrition (Cambodia), Institute of Technology Cambodia (Cambodia), Institut Pasteur du Cambodge (Cambodia), World Vegetable Center (Cambodia)

Achievements (Aligned with Cambodia WP Activity 1.2): A clinical questionnaire was administered to identify prominent bacterial pathogens most strongly associated with diarrheal disease. Data from the questionnaire were combined with results from the desktop review, resulting in the identification of *Salmonella enterica* and pathogenic *Escherichia coli* as targets for future intervention research. A survey instrument was also created to assess conditions (COM-B) that must be present for individuals or groups to adopt food safety practices. Data from pilot studies have been analyzed to increase both reliability and validity (factor analysis). This instrument will be used in concert with intervention research to ensure research products have a high likelihood of adoption.

Another survey instrument was developed to allow the team to identify gaps in food safety knowledge and attitudes among vegetable vendors which must be addressed prior to introducing new food safety practices. Researchers also measured perceptions of food safety among Cambodian undergraduates studying to become food producers or processors. These data will be submitted for peer-review in FY2022. Finally, the project has designed, in concert with World Veg, a lab-in-the-field study that will utilize auction-based methods to measure Cambodian's willingness to pay for "safe" or certified foods.

Capacity Building: Eighty-six RUA and Institute of Technology Cambodia undergraduates completed a 10-session course developed by the project team to teach quantitative survey development and design. Participants completing the course earned a Purdue/RUA certificate as well as certification to conduct social science through CITI/Purdue. The course took an experiential education approach, where students learned to create effective survey instruments by developing a survey that will be used in the field. In this iteration of the course, the students created the aforementioned COM-B survey. Students were involved in all facets of the process including creating research questions, developing frameworks, etc. The COM-B survey has since been piloted and the data analyzed for reliability and validity.

Lessons Learned: As the coronavirus continued to spread and in-person activities were suspended, the project team identified a strong pathway for procurement of laboratory supplies, as well as established a pipeline for the shipment of supplies both nationally (within Cambodia) and internationally (from the U.S.). This will support the project team in future project activities. Additionally, they developed a standard operating procedure that can be shared with all project teams and their institutions to create a sustainable program for the procurement of laboratory supplies in Cambodia.

Presentations

Vipham, J. (2021). Nutritious Food for All? The Role of Fresh Food Markets in Nutrition and Food Safety. *Kansas State University*. Virtual.

Vipham, J. & Ebner, P. D. (2021). Reducing Foodborne Pathogen Contamination of Vegetables in Cambodia: Innovative Research, Targeted Interventions, and Impactful, Cambodian-Led Engagement. *Introductory meeting with the Cambodia Mission*. Virtual.

Chakula Salama: A Risk-based Approach to Reducing Foodborne Disease and Increasing Production of Safe Foods in Kenya (Kenya Long-Term Subaward)

Location: Kenya; Kiambu County

Description: The overarching goal of Chakula Salama – which means “safe food” in Swahili – is to improve food security and nutrition in Kenya. Project leaders are developing the country’s capacity for systems-based, risk-informed approaches to food safety which can reduce the risk of foodborne disease, increase the production of safe food, and improve economic outcomes. To demonstrate this approach, they are focusing on small-scale poultry production by women and youth in peri-urban areas of Kenya.

Theory of Change and Impact Pathway(s): This project contributes towards Objectives 1-4 of the FSIL TOC.

Collaborators: The Ohio State University (U.S.), University of Florida (U.S.), Kenya Medical Research Institute (Kenya), University of Nairobi (Kenya)

Achievements (Aligned with Kenya WP Activity 1.1): During the first few months of the project, activities focused on establishing subawards and project planning. Poultry specialists and organizations working with smallholder poultry farmers (especially women and youth) in Kenya were contacted to determine their interest and willingness to participate in the gender analysis of the poultry value chain. The team conducted an extensive literature review on gender norms and food safety issues in the poultry value chain in Kenya to inform the development of survey instruments for use in the gender analysis, and a draft manuscript has been developed. The study plan for the gender analysis was developed, and initial IRB approvals were obtained.

A stakeholder scoping workshop was conducted in September 2021 to introduce the role of risk prioritization in risk-based food safety systems and provide a forum for stakeholders to work collaboratively on defining the risk prioritization scope. A literature review was conducted to identify and synthesize existing data on the prevalence and levels of *Salmonella enterica* and *Campylobacter* spp. in poultry products in Kenya. Draft protocols for the prevalence study were developed and sample sizes were calculated.

Capacity Building: Several graduate students which will be supported by the project have been recruited and will begin studies in FY2022 through the Kenya Medical Research Institute and the University of Nairobi. In addition, several U.S.-based students have been engaged in the project, utilizing non-FSIL funds. They have been conducting literature reviews, calculating sample sizes, and developing initial drafts of the IRB applications. A student group is being formed to encourage interaction and collaboration between the students in Kenya and the U.S., thus increasing human capacity in both countries. This student group will meet monthly to discuss their work, challenges they have experienced, and solutions they have developed for addressing those challenges.

Lessons Learned: Due to COVID-19-related restrictions on international travel, the project team adapted their plans for the stakeholder scoping workshop to reflect a hybrid format. Their experience hosting this event provided insight into how to improve the design and efficiency of future hybrid meetings.

Presentations

Kowalczyk, B. (2020). Chakula Salama: A Risk-based Approach to Reducing Foodborne Disease and Increasing Production of Safe Foods in Kenya. *The Ohio State University*. Virtual.

Kowalczyk, B. (2021). Chakula Salama: A Risk-based Approach to Reducing Foodborne Disease and Increasing Production of Safe Foods in Kenya. *Introductory meeting with the Kenya Mission*. Virtual.

Kowalczyk, B. (2021). Strengthening Food Safety Risk Management on the African Continent through International Collaboration. *International Association of Food Protection Annual Meeting*. Virtual.

Food Safety Capacity Building in Senegal: Enhancing Resilience of the Dairy Value Chain by Leveraging Public-Private Partnerships (Senegal Long-Term Subaward)

Location: Senegal; Louga, Matam, and Saint Louis regions

Description: The goal of the project is to transform the overall safety of dairy and dairy products produced in Senegal, which will improve the nutritional status and economic prospects for the women and youth who play critical roles in dairy production. Project partners are advancing data-driven safety practices, policies, and trainings to support the development of well-equipped food safety professionals in Senegal.

Theory of Change and Impact Pathway(s): This project contributes towards Objectives 1-4 of the FSIL TOC.

Collaborators: University of Georgia (U.S.), Tuskegee University (U.S.), Institut de Technologie Alimentaire (Senegal), Institut Sénégalais de Recherches Agricoles (Senegal), Conseil National du Développement de la Nutrition (Senegal)

Achievements (Aligned with Senegal WP Activity 1.1): A formal project launch meeting was held at ITA in Dakar with approximately 30 participants representing all technical partners and major stakeholders. In August 2021, the Senegal team conducted site visits to the project's zones of influence (ZOIs) and met with members of 15 key organizations (8 private sector, 7 public sector) involved in the dairy value chain to raise awareness of the project and identify opportunities for future research. This included visits to small scale milk collection sites and a dairy processor to understand gaps in food safety practices and needs to enhance the safety of the dairy value chain. Identified gaps and needs expressed from stakeholders in the three ZOIs include: (a) an updated guide for best practices related to hygienic practices in the dairy value chain; (b) training in hygienic practices in the dairy value chain, Good Manufacturing Practices, and marketing; (c) small processing equipment needs including fermentation for dairy products; (d) authorization to sell dairy products in the domestic markets including packaging and labeling; and (e) value addition of dairy products to counter the low price of milk.

The researchers formed three publication teams (Production, Processing, and Gender and Youth) charged with conducting literature reviews and gap analyses to inform future research and capacity building. The gender specialists in Senegal and the U.S. also initiated the design of the planned gender analysis. To promote knowledge sharing with other USAID-funded projects, the project PI completed iREACH training, and the lead co-PI in Senegal participated in the Feed the Future Innovation Lab coordination workshop in Senegal in February 2021 to present the project and its scope.

Capacity Building: As an initial activity, team members completed the LASER PULSE Gender Analysis in Research and Application course to ensure that gender is integrated within all project components. Researchers were beginning to recruit graduate students at the end of FY2021.

Lessons Learned: During the first few months of the project, the lack of information and data related to food safety within the dairy value chain in Senegal prompted the team to adjust initial project plans to include expanded literature reviews and gap analyses.

Presentation

Singh, M. (2021). Food Safety Capacity Building in Senegal: Enhancing Resilience of the Dairy Value Chain by Leveraging Public-Private Partnerships. *Introductory meeting with the Senegal Mission*. Virtual.

Human and Institutional Capacity Development

Short-term training

Country of Training	Brief Purpose of Training	Who was Trained	M	F	Total
Cambodia (virtual)	Trained student researchers to serve as survey enumerators, data compilers and analyzers, and presenters of results to stakeholders	Civil society	1	6	7
Cambodia (virtual)	Trained lab technicians and students on biosafety procedures and safe handling and shipping protocols for shipping of biological agents	Civil society	0	5	5
Cambodia (virtual)	Survey development course delivered to undergraduate students to learn the process of survey development, validity, and analysis.	Civil society	15	71	86
Bangladesh, Cambodia, Kenya, Nepal, Senegal (virtual)	Delivered train-the-trainer session on how to host food industry virtual office hours to address questions on COVID-19	Civil society	6	1	7
Bangladesh (virtual)	Session #1: Food Industry Virtual Office Hours held in Bangladesh to address questions on food safety and COVID-19	Producers, private sector, government, civil society	16	5	21
Bangladesh (virtual)	Session #2: Food Industry Virtual Office Hours held in Bangladesh to address questions on food safety and COVID-19	Producers, private sector, government, civil society	24	16	40
Bangladesh (virtual)	Session #3: Food Industry Virtual Office Hours held in Bangladesh to address questions on food safety and COVID-19	Producers, private sector, government, civil society	11	4	15
Cambodia (virtual)	Session #1: Food Industry Virtual Office Hours held in Cambodia to address questions on food safety and COVID-19	Producers, private sector, government, civil society	6	9	15
Cambodia (virtual)	Session #2: Food Industry Virtual Office Hours held in Cambodia to address questions on food safety and COVID-19	Producers, private sector, government, civil society	36	59	95

Cambodia (virtual)	Session #3: Food Industry Virtual Office Hours held in Cambodia to address questions on food safety and COVID-19	Producers, private sector, government, civil society	14	54	68
Cambodia (virtual)	Session #4: Food Industry Virtual Office Hours held in Cambodia to address questions on food safety and COVID-19	Producers, private sector, government, civil society	15	47	62
Kenya (virtual)	Session #1: Food Industry Virtual Office Hours held in Kenya to address questions on food safety and COVID-19	Producers, private sector, government, civil society	23	20	43
Kenya (virtual)	Session #2: Food Industry Virtual Office Hours held in Kenya to address questions on food safety and COVID-19	Producers, private sector, government, civil society	38	31	69
Kenya (virtual)	Session #3: Food Industry Virtual Office Hours held in Kenya to address questions on food safety and COVID-19	Producers, private sector, government, civil society	24	22	46
Nepal (virtual)	Session #1: Food Industry Virtual Office Hours held in Nepal to address questions on food safety and COVID-19	Producers, private sector, government, civil society	19	16	35
Nepal (virtual)	Session #2: Food Industry Virtual Office Hours held in Nepal to address questions on food safety and COVID-19	Producers, private sector, government, civil society	17	14	31
Nepal (virtual)	Session #3: Food Industry Virtual Office Hours held in Nepal to address questions on food safety and COVID-19	Producers, private sector, government, civil society	22	18	40
Senegal (virtual)	Session #1: Food Industry Virtual Office Hours held in Senegal to address questions on food safety and COVID-19	Producers, private sector, government, civil society	14	44	58
Senegal (virtual)	Session #2: Food Industry Virtual Office Hours held in Senegal to address questions on food safety and COVID-19	Producers, private sector, government, civil society	6	20	26
Senegal (virtual)	Session #3: Food Industry Virtual Office Hours held in Senegal to address questions on food safety and COVID-19	Producers, private sector, government, civil society	9	39	48

Pan-African: Kenya, South Africa, Ghana, Senegal, Cameroon, Tanzania, Uganda (virtual)	Session #1: Food Industry Virtual Office Hours held in Africa to address questions on food safety and COVID-19	Producers, private sector, government, civil society	63	59	122
Pan-African: Kenya, South Africa, Ghana, Senegal, Cameroon, Tanzania, Uganda (virtual)	Session #2: Food Industry Virtual Office Hours held in Africa to address questions on food safety and COVID-19	Producers, private sector, government, civil society	37	34	71
Pan-Asian: Nepal, Bangladesh, Bhutan, Cambodia, India, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand (virtual)	Session #1: Food Industry Virtual Office Hours held in Asia to address questions on food safety and COVID-19	Producers, private sector, government, civil society	63	59	122
Total			479	653	1,132

Note: While Virtual Office Hours are not classified as formal trainings per indicator definitions, the sessions are included in this section to illustrate the extent of engagement by country/region.

Long-term training

Trainee Number	Sex	University	Degree	Major	Program End Date (M/Y)	Degree Granted (Y/N)	Home Country
1*	F	Purdue University	Ph.D.	Agricultural Sciences Education and Communication	May 2023	N	United States
2*	M	Purdue University	Ph.D.	Agriculture Economics	May 2023	N	United States
3	M	Cornell University	Ph.D.	Food Science and Technology	May 2024	N	United States
4	F	Royal University of Agriculture	M.S.	Agro Industry (Food Microbiology)	June 2023	N	Cambodia
5	F	Royal University of Agriculture	M.S.	Agro Industry (Food Microbiology)	June 2023	N	Cambodia
6	F	Purdue University	M.S.	Animal Science	December 2022	N	U.S.
7	M	Purdue University	Ph.D.	Agricultural Sciences Education and Communication	June 2024	N	U.S.
8	F	Bangladesh Agricultural University	M.S.	Agricultural Economics	October 2021	N	Bangladesh
9	F	Bangladesh Agricultural University	M.S.	Food Technology and Rural Industries	October 2021	N	Bangladesh
10	F	Bangladesh Agricultural University	M.S.	Agricultural Finance and Banking	October 2021	N	Bangladesh
11	F	Bangladesh Agricultural University	M.S.	Microbiology and Hygiene	October 2021	N	Bangladesh

*Supported by FSIL for the fall 2020 semester.

Environmental Mitigation and Monitoring Plan (EMMP)

Per the FSIL EMMP, activities requiring specific mitigation and monitoring efforts include: 1) food safety research on raw food materials that are contaminated with biological and chemical contaminants, and 2) clinical (medical) evaluations and people-based surveys. During FY2021, FSIL subawards initiated processes to mitigate risks associated with these activities.

For laboratory-based research, each subaward PI is responsible for documenting laboratory protocols, training personnel, and conducting regular on-site or virtual monitoring of laboratory sites to ensure safety protocols are followed. In FY2021, PIs for the Bangladesh, Cambodia, and Kenya long-term subawards submitted initial documentation to FSIL for review by the Director and Associate Director. Once the documentation is approved by FSIL in early FY2022, it will be submitted to the AOR for review and approval. The Senegal long-term subaward will submit laboratory documentation in FY2022 prior to beginning laboratory-based activities.

For people-based surveys or human subjects research, each PI is responsible for utilizing their respective Institutional Review Board (IRB) to obtain approval or exemption of the proposed activities. In FY2021, PIs for the Cambodia and Bangladesh long-term subawards submitted initial documentation to FSIL for review by the Director and Associate Director. Once the documentation is approved by FSIL in early FY2022, it will be submitted to the AOR for review and approval. The Kenya and Senegal long-term subawards will submit IRB documentation in FY2022 prior to initiating human subjects research.

Open Data Management Plan

The FSIL management team maintains a partnership with Purdue University's Ag Data Services team to provide researchers and project teams with adequate technical support for data management and sharing. Ag Data Services is a team of data professionals which provides specialized expertise, tools, methodologies, and services to faculty, staff, and graduate students who work in agricultural research at Purdue. Purdue's Ag Data Services curates best practices for data stewardship that are specific to food safety research and maintains these resources on a publicly accessible wiki page⁹.

In FY2021, Ag Data Services and the FSIL management team hosted a data management work session with each new subaward. As part of the standard project onboarding process, these facilitated discussions identified planned datasets and data workflows. These foundational sessions allow Ag Data Services to monitor data collection, analysis, and sharing throughout the life of each project. In FY2022, Ag Data Services and the FSIL management team will host data management work sessions with the new MSI-led projects as part of their onboarding activities.

Ag Data Services also supported the Cambodia and Senegal QuickStart teams as they finalized their datasets and prepared them for publication and sharing. In FY2021, one dataset from the Senegal QuickStart was published in Harvard Dataverse¹⁰ and submitted to USAID's Data Development Library (DDL) for review. Two datasets from the Cambodia QuickStart were submitted as drafts to Harvard Dataverse and are anticipated for publication and DDL submission in FY2022.

⁹ <https://adslab.ag.purdue.edu/FSIL>

¹⁰ <https://dataverse.harvard.edu/dataverse/fsil>

Governance and Management Entity Activity

Create and maintain effective management structures and practices (Management Entity WP Activity 1.1)

In early FY2021, FSIL obtained USAID approval to issue subawards for four long-term subawards in Bangladesh, Cambodia, Kenya, and Senegal. Purdue University executed subcontracts with the lead institutions and provided guidance as they issued second tier subcontracts. FSIL supported the new subawards through onboarding presentations and individual Zoom calls with each team to review key USAID policies and communications strategies in addition to refining work plans and MEL plans. Guidance pertaining to human subjects research and biosafety protocols was provided to the subawards as they planned related activities.

After onboarding, the FSIL management team met monthly with all subawards to review research updates, provide feedback, and address issues. Many of the challenges faced by the subawards were related to the coronavirus pandemic. To ensure the cross-cutting theme of gender is well-integrated into project planning and execution, the FSIL Gender Working Group was launched in February 2021; a summary of gender-related activities is available in *Other Topics*. Near the end of FY2021, the FSIL management team met virtually to discuss achievements and challenges from the year as well as to set priorities for FY2022.

Engage FSIL Advisory Committee and Technical Experts in providing guidance and support to ongoing activities (Management Entity WP Activity 1.2)

Technical experts assisted in planning FSIL's five-part webinar series on food safety as it relates to food security, zoonotic disease/One Health, nutrition, policy, and private sector partnerships. The series launched in October 2020, and several technical experts and advisory committee members participated in the webinars as panelists or moderators. The webinar series garnered strong engagement from across academia, government, and the private sector, with more than 1,426 unique registrants from 72 countries.

In May 2021, a Virtual Project Exchange was held to foster interaction among the FSIL subawards and their engagement with the management team, advisory committee, technical experts, and USAID. Each subaward team shared progress towards their project objectives as well as plans for upcoming work, and attendees provided feedback in order to refine future activities. Discussion themes that emerged from the Virtual Project Exchange were embedded in the design and agenda for FSIL's upcoming annual meeting in November 2021.

Develop robust MEL, communication, and open data platforms (Management Entity WP Activity 1.3)

As part of the onboarding process, FSIL's Piestar DPx system was updated to reflect the long-term subawards' work plans and MEL plans. Data management was a key topic during onboarding, and related efforts are described in *Open Data Management Plan*. FSIL also held introductory meetings between each new long-term subaward and the respective country USAID Mission in January and February 2021.

Communication and knowledge sharing efforts expanded in FY2021 as QuickStarts documented their findings and new subawards initiated activities. In December 2020, an e-newsletter was launched to highlight project updates and activities. In February 2021, FSIL deployed a new website to showcase news stories, publications, and resources associated with each funded project, including country and regional landscape analyses of food safety and COVID-19 resources. Since launch, the website has had 3,894 visitors from 123 countries. Eleven Agrilinks posts on FSIL research and events were published in FY2021, and regular posts highlighting FSIL project updates, funding opportunities, and events as well as relevant food safety- and nutrition-related news and opportunities were shared on Twitter and LinkedIn.

Other Topics

RFA for Minority Serving Institution-Led Partnerships for Global Food Safety Research

Overview

In April 2021, FSIL issued a Request for Applications (RFA) for research to address foodborne illness, which remains a stubborn challenge to improving the nutrition and food security of households and communities around the world. This RFA was open to research partnerships led by Principal Investigators (PIs) at Minority Serving Institutions (MSIs) to address food safety economics, the burden of disease, and chemical food hazards in Africa, Asia, and the Caribbean.

Rationale

MSIs have a strong track record and documented success working in international engagement activities tied to global food, agriculture, and rural community issues. However, MSIs lead a limited portfolio of USAID-funded programs, including Feed the Future Innovation Lab projects. This RFA was created with the deliberate goal of creating transformational partnerships among MSIs for research for global development and strengthening MSI competitiveness for Feed the Future Innovation Lab projects. Early career faculty and researchers with limited experience in global development projects were encouraged to apply.

Outreach Strategy

FSIL contracted with the Center for Minority Serving Institutions at Rutgers University to develop a custom contact list for agriculture and public health programs at four-year MSIs. The types of MSIs represented in this list included:

- Alaska Native and Native Hawaiian-Serving Institutions (ANNHs)
- Native American-Serving Non-Tribal Institutions (NASNTIs)
- Hispanic-Serving Institutions (HSIs)
- Historically Black Colleges and Universities (HBCUs)
- Predominantly Black Institutions (PBIs)
- Asian American and Native American Pacific Islander-Serving Institution (AANAPISIs)

RFA Process

To support MSI-based researchers in developing strong proposals for this RFA, a multi-stage process was implemented.

Stage 1: Ideation. PIs who submitted ideation applications were invited to participate in a facilitated Ideation Session. The purpose of the session was to foster partnerships among MSI faculty and help applicants refine and strengthen their project ideas for the concept note stage. Ideation applications were a single page and required a Letter of Support from the MSI's administration.

Stage 2: Concept Note. All attendees of the Ideation Session were invited to submit concept notes delineating the proposed research teams (domestic and in-country partners), project objectives and scope, and preliminary budgets. Attendees were allowed to submit multiple concept notes and received written feedback on their proposals.

Stage 3: Full Proposals. Teams invited to submit full proposals met with the FSIL Management Entity and a relevant FSIL technical expert to strengthen their proposals. Two projects are anticipated to begin by spring 2022.

MSI Engagement

Throughout the RFA process, PIs from several types of MSIs were successfully engaged and included HBCUs, HSIs, dual status ANNAPISI/HSIs, and AANHs. At each stage, FSIL administered surveys to

gauge the effectiveness of the RFA process and design. Findings from these surveys will be summarized and shared with USAID and other Innovation Labs with the goal of strengthening MSI engagement across the Innovation Lab portfolio.

Stage	Ideation	Concept Note	Full Proposal
Applications	38	26	7*
PIs from HBCUs	25	21	4*
PIs from HSIs	9	3	1
PIs from dual status AANAPISI/HSIs	3	1	1
PIs from AANHs	1	1	1
Total MSIs represented	23	16	7*

**One of the seven full proposals did not meet the requirements outlined in the RFA and was deemed ineligible.*

Gender Working Group

Overview

A cross-cutting theme of FSIL projects is increasing women’s ability to influence food safety, nutrition, and hygiene decision-making in households, communities, and societies. All FSIL long-term subaward projects have a gender strategy for their research and include a gender expert on their team, positioning projects to identify and address gender gaps in food safety within their targeted value chains. In addition to supporting their respective projects, the gender experts engage with one another and the FSIL Management Entity gender advisor through the FSIL Gender Working Group. The group’s purpose is to amplify gender research strategies and findings that identify practical, feasible strategies to bridge the gender gap in food safety.

Objectives

- Convene gender experts across FSIL-funded research projects
- Inform and identify synergies among gender-based food safety research questions and outcomes
- Share research successes and challenges
- Amplify gender-related FSIL research findings

Updates

The FSIL Gender Working Group met quarterly to discuss project successes in and barriers to gender-related research activities. These quarterly dialogues offered a supportive environment for project gender experts to seek out assistance and share resources with one another. Gender experts associated with the Cambodia, Kenya, and Senegal projects have past and/or current engagement with other Innovation Labs, enabling collaboration and sharing of lessons learned beyond the FSIL community. In addition to the group meetings, FSIL’s gender advisor had individual meetings with each project’s gender expert to discuss their gender strategies and determine how best to support each project over the duration of the subaward.

FSIL’s gender advisor also developed a Gender Continuum for Food Safety Research rubric to evaluate how effectively gender is integrated into research plans and implementation. The continuum is divided into three major sections: methodology, deliverables, and integration, and it can be used to assess both proposals and

ongoing projects. For active projects, it will be utilized to track annual progress in gender activities. The rubric will also help researchers and gender specialists identify opportunities for more meaningful integration of gender throughout their research.

Management Entity and Past Subaward Publications and Presentations

Britton, B., Sarr, I., Oliver, H. (2021). Enterobacteriaceae, coliform, yeast, and mold contamination patterns in peanuts compared to production, storage, use practices, and knowledge of food safety among growers in Senegal. *International Journal of Food Microbiology*. Advance online publication. <https://doi.org/10.1016/j.ijfoodmicro.2021.109437>.

Oliver, H. (2021). Impacting Diets and Nutrition through Food Systems: New and Emerging Evidence. *USAID Multi-Sectoral Nutrition Global Learning and Evidence Exchange (MSN GLEE)*. Virtual.

Oliver, H. (2021). Cellular Agriculture: Techno-Socio-Economic Perspective. *Purdue University*. Virtual.

Oliver, H. (2021). Safely Feeding the Future: High Impact Food: Food Safety Research for Development. *Michigan State University*. Food Safety Short Course. Virtual.

Ricker-Gilbert, J., Bauchet, J., Ebner, P. D., Arias Granada, Y., & Neuhof, Z. (2021). Foodborne diseases and food safety in sub-Saharan Africa: Current situation of three representative countries and policy recommendations for the region (pp.169-179). *African Journal of Agricultural and Resource Economics*, 16(2), Nairobi, Kenya. https://afjare.org/media/articles/6_Arias-Granada_et_al.pdf.

Wang, H. & Nelson, B. (2021). Development of a Feminist Literature Supported Continuum for Food Safety Research in Developing Nations. *The American Association for Agricultural Education National Conference*. Virtual.

Worobo, R. W. (2021). Ask the Experts on Food Systems and Food Safety. *Cornell University*. Virtual.

Issues

COVID-19-Related Interruptions

All FSIL countries experienced significant COVID-19 outbreaks that introduced new or prolonged restrictions on face-to-face interactions and travel. All subawards delayed their domestic and international travel plans and either postponed or revised event plans. Project-specific impacts are documented below:

Bangladesh Long-Term Subaward

- Survey and sampling activities were delayed due to restrictions on local travel.
- The project's inception workshop was postponed to FY2022 due to restrictions on face-to-face interactions.

Cambodia Long-Term Subaward

- Due to community-spread of COVID-19 and travel restrictions within the country, the longitudinal study was delayed.
- Restricted travel between provinces delayed data collection for the two ongoing survey activities. Only pilot studies associated with these surveys could be completed in FY2021.

Kenya Long-Term Subaward

- The scoping workshop, which was originally planned to take place fully in-person with U.S. team members present, was delayed by a few months and subsequently redesigned as a hybrid format event.
- The gender analysis was postponed to FY2022 due to the inability of the U.S. gender specialist to travel to Kenya.

Senegal Long-Term Subaward

- The project's initial site visits and launch meeting were delayed to late FY2021 due to travel restrictions.
- The recruitment and selection of graduate students was postponed to FY2022, as plans include the U.S. team members being present to aid in onboarding of the students and assignment of research activities.

Other Issues

In Bangladesh, one of the project leaders was unable to work for approximately six months due to severe illness. This delayed their plans to host focus group discussions with value chain actors, including women consumers and traders from both supermarkets and wet markets, to study the gap between expressed norms and actual practices as well as purchase decisions. These activities are now planned for FY2022.

Future Directions

Management Entity

In FY2022, the FSIL management team will continue meeting monthly with subawards to monitor activities and troubleshoot issues. A two-day in-person meeting of FSIL project leaders, technical experts, advisory committee, and USAID will be held in November 2021 to promote collaboration and learning across the FSIL portfolio. Utilizing support and guidance from the advisory committee, a nutrition impacts mapping exercise will be conducted at the meeting to identify project linkages between food safety and nutrition. Similar to FY2021, a Virtual Project Exchange will be held in May or June 2022 to allow subawards to showcase mid-year updates.

FSIL will also manage the selection and implementation of subawards associated with the RFA for MSI-led partnerships for global food safety research. New subawards are anticipated to start their activities by March 2022. As part of their initial launch, FSIL will conduct onboarding activities and introduce the project teams to the respective USAID Missions in collaboration with the USAID AOR.

The FSIL management team plans a number of activities to promote knowledge and data sharing. A quarterly e-newsletter will be published to highlight project activities, updates, and publications. FSIL will continue to post regularly on Twitter, LinkedIn, and Agrilinks and will emphasize strategic communications related to FSIL's MSI engagement activities. A survey requesting feedback from past webinar attendees will also be conducted to inform 1-2 webinars that will be hosted on specific food safety issues in FY2022.

Bangladesh Long-Term Subaward

The project's inception workshop, which was delayed due to COVID-19, will be held in early FY2022 to promote the buy-in of local and government stakeholders. Sampling along the fish and chicken value chains will begin, followed by the analysis of the samples for antibiotic residues, bacterial pathogens, and heavy metals. Surveys and focus group discussions with consumers and value chain actors, including women-focused groups, will be conducted to study knowledge, attitudes, and practices regarding food safety and risk issues related to fish and selected frozen chicken products. An initial hedonic analysis will also be conducted through a survey of fish retail outlets. Finally, the first set of experimental auctions to assess consumers' willingness to pay for safer fish products will be held.

Cambodia Long-Term Subaward

Researchers will conduct sample collection for the longitudinal study measuring *Salmonella* and *E. coli* contamination of vegetables at farms, distribution centers, and vendors in Battambang and Siem Reap Provinces. As a component of this activity, they will deliver training programs on sampling collection plans, laboratory techniques, experimental design, and statistical analysis. Farm level food safety practices will be identified for demonstration in Siam Reap and Battambang Technology Parks. The team will also complete the two ongoing survey studies and their lab-in-field study. The results of each will be compiled and submitted for peer-review. Finally, a gender analysis and assessment of the impact of food safety on Cambodian women will be conducted.

Kenya Long-Term Subaward

In FY2022, a gender analysis will be conducted to determine the roles of men, women, and youth in the poultry value chain and who is most impacted by food safety risks. Leveraging outcomes of the scoping workshop conducted at the end of FY2021, a risk ranking workshop will be held to prioritize potential risk management interventions for mitigating *Salmonella* and *Campylobacter* in the poultry value chain. Following this workshop, study protocols and survey instruments will be designed for the intervention studies, and appropriate IRB approvals will be obtained. The researchers will also develop protocols and conduct microbiological trainings as part of their study to estimate the prevalence of *Salmonella* and *Campylobacter* in poultry products in Kiambu

County. Lastly, they will begin to compile Kenya-specific burden of disease data as part of their broader efforts to estimate the public health impact and evaluate the benefits and costs of selected intervention strategies.

Senegal Long-Term Subaward

Project partners will continue to work with industry partners and organizations to develop a comprehensive list of actors engaged in the production-processing-distribution continuum of the dairy value chain in Senegal. The team will conduct sensitization workshops that focus on basic food safety practices related to the dairy value chain and the importance of food safety to public health. These workshops will be conducted in coordination with gender experts to incorporate the roles of women and youth in implementing food safety practices in the dairy value chain. Building on the site visits conducted in FY2021 and the planned sensitization workshops, research activities will be designed to address identified food safety gaps in dairy production, processing, and distribution. Finally, graduate students will be recruited, enrolled in their degree programs, and engaged in research activities.

Appendix A – List of Awards to U.S. Partners

Project Name: Feed the Future Innovation Lab for Food Safety (Management Entity)

Project Dates: 06/25/2019 to 06/24/2024

Institution: Cornell University

Funding (FY2021 only): \$391,104

Project Name: Rapid Response Project to Manage the COVID-19 Pandemic Food Safety and Food Security Challenges in Developing Countries

Project Dates: 07/01/2020 to 06/30/2021

Institution: Cornell University

Funding: \$250,000

Project Name: Bacterial Contamination in Fresh Vegetables: Focusing Interventions in Cambodia (Cambodia QuickStart)

Project Dates: 10/01/2019 to 3/31/2021

Institution: Kansas State University

Funding: \$74,572

Project Name: Bacterial Contamination in Fresh Vegetables: Focusing Interventions in Cambodia (Cambodia QuickStart)

Project Dates: 10/01/2019 to 3/31/2021

Institution: Purdue University

Funding: \$24,819

Project Name: Enhancing Food Safety in Fish and Chicken Value Chains of Bangladesh (Bangladesh Long-Term Subaward)

Project Dates: 10/01/2020 to 3/31/2024

Institution: Texas State University

Funding: \$201,122

Project Name: Reducing Foodborne Pathogen Contamination of Vegetables in Cambodia: Innovative Research, Targeted Interventions, and Impactful, Cambodian-Led Engagement (Cambodia Long-Term Subaward)

Project Dates: 10/01/2020 to 3/31/2024

Institution: Kansas State University

Funding: \$216,955

Project Name: Reducing Foodborne Pathogen Contamination of Vegetables in Cambodia: Innovative Research, Targeted Interventions, and Impactful, Cambodian-Led Engagement (Cambodia Long-Term Subaward)

Project Dates: 10/01/2020 to 3/31/2024

Institution: Purdue University

Funding: \$13,045

Project Name: Chakula salama: a risk-based approach to reducing foodborne disease and increasing production of safe foods in Kenya (Kenya Long-Term Subaward)

Project Dates: 10/01/2020 to 3/31/2024

Institution: The Ohio State University

Funding: \$207,980

Project Name: Food Safety Capacity Building in Senegal: Enhancing Resilience of the Dairy Value Chain by Leveraging Public-Private Partnerships (Senegal Long-Term Subaward)

Project Dates: 10/01/2020 to 3/31/2024

Institution: University of Georgia

Funding: \$199,999

Appendix B – Success Stories

Success Story 1: Access to experts informs pandemic food industry practices

Global – October 29, 2021

During the pandemic, the food industry and consumers have faced a host of urgent concerns: Is COVID-19 a foodborne illness? If a worker falls ill, is the production line contaminated? While food is not a serious risk for coronavirus transmission, lack of access to science-based information and protocols to reduce person-to-person workplace transmission posed a true risk to global food security.

A one-year project funded by the [Feed the Future Innovation Lab for Food Safety](#) (FSIL) supported the food industry in FSIL's target countries of Bangladesh, Cambodia, Kenya, and Senegal, as well as Nepal, by establishing and mentoring an international task force of in-country experts. The team provided food system affiliates and consumers with timely answers, workplace and food handling guides, and real-time office hours to help reduce food system disruptions during the first phases of the pandemic.

“This emergency response project demonstrated the value of mobilizing a global network to address shared food system challenges,” said co-PI Elizabeth Demmings, program coordinator with the [Institute for Food Safety at Cornell](#) (IFS@CU).

In-country task force members were mentored by experts from IFS@CU, and together they created a centralized [online hub](#) for reliable, web-based resources. The 25 country-specific resources, in Bangla, French, Khmer, Nepali, and Swahili, include food facility coronavirus strategy checklists, a guide to prioritizing coronavirus control strategies, food industry FAQs, and a guide to handling fresh produce. Video FAQs provided a straightforward, science-based foundation on the most important coronavirus transmission pathways, why it is not transmitted through food, and how to reduce person-to-person spread.

In addition to the web-based resources, task force members hosted live virtual office hours in their home countries, inviting food system affiliates to pose questions to a panel of experts.

“Office hours represented a two-way street where useful information was flowing in both directions,” said co-PI Aljosa Trmcic, an extension associate at Cornell. “We had a chance to hear about the problems and concerns participants were having and were able to directly respond to them with solutions and new resources.”


In total, the team held 16 sessions of office hours, reaching over 700 attendees and fielding more than 200 questions. More than half the office hour's attendees were women, and the audience included the food industry, academia, government agencies, and the general public. Demmings noted that in surveys of participants, 66% of respondents indicated they would change their current strategies or implement new practices after attending office hours, and 85% would recommend virtual office hours to others.


By spring 2021, the team recognized a need to increase the reach of the project and strengthen the international task force's network with regional Pan-African and Pan-Asian office hours. The three additional sessions of office hours attracted more than 300 attendees and addressed more than 44 questions.

“This model for increasing the global food industry's access to food science expertise is scalable and sustainable,” said Martin Wiedmann, project PI and Gellert Family Professor in Food Safety at Cornell. “It's been valuable preparation for future food safety challenges.”

SELECTED SUBMITTED QUESTIONS

- हामी सबै कोभिड-१९को खोप यही वर्ष २०२१ मा आशा गरिरहेका छौं। यही समयमा बेलायतमा कोभिडको नयाँ प्रजातिको भाइरस देखिएको छ। के कोभिड-१९का बिरुद्ध बनेको यस खोप नयाँ प्रजाति बिरुद्ध प्रभावकारी छ? के ती खोपहरू प्रयोग गर्नेका लागि नेपालीहरू तत्पर/तयार र सुरक्षित छन् ?
- We are expecting the vaccine for COVID-19 probably in this year 2021. What about the efficiency of this vaccine against the new variety of COVID-19 recently found in the UK? What about safety and readiness of people using those vaccine in Nepal?














Photo caption: Live online office hours, such as this session in Nepal, connected food industry stakeholders with food safety experts who answered questions about coronavirus challenges, including vaccine safety and efficacy. (Photo credit: Elizabeth Demmings)

Success Story 2: Surveys lay groundwork for food safety interventions in Cambodia

Cambodia – October 29, 2021

Traditional Cambodian markets offer shoppers a variety of fresh produce to prepare nutritious meals. While vegetables are important for reducing malnutrition and stunting, when eaten raw they can carry a risk of foodborne disease which, in combination with diarrheal diseases, is estimated to cause [half of all disease outbreaks in Cambodia](#).

A project funded by the [Feed the Future Innovation Lab for Food Safety](#) and led by researchers at Kansas State University (KSU), Purdue University, and Cambodia's Royal University of Agriculture (RUA) is establishing a basis for science-led produce safety practices through surveys--of microbes and consumers.

“On a national level, Cambodia has committed numerous resources for improving nutrition outcomes,” said co-PI Jessie Vipham, an assistant professor of animal sciences and industry at KSU. “Food safety interventions can support and safeguard the positive nutritional outcomes of eating fresh vegetables, but to be effective they must address pathogens that are present, where contamination is occurring, and how it spreads within vegetable production and marketing environments.”

A typical route for produce in Cambodia includes transit from farms to aggregation centers, then redistribution to market vendors. Because of its position as a crossroads in the regional food system, a distribution center in Battambang Province was selected for assessment and monitoring of produce contamination levels over six months.

A survey of 384 vegetable samples indicated that prevalence of Enterobacteriaceae and coliforms--bacteria whose presence indicates a risk of fecal contamination--was high. The bacteria were present in 95% of lettuce samples, 84% of cucumber samples, and 62% of tomato samples, with highest concentration in lettuce. In contrast, the prevalence of *E. coli* was overall significantly lower, but lettuce still carried the highest levels.

“This initial survey suggests that practices to improve food safety at the distribution level are of strategic importance,” said Vipham. “It's the first step in a larger longitudinal study of the production chain to identify the critical control points where food safety interventions can impact public health.”

Vipham noted that creating change will require both rigorous microbiological evaluations and better understanding of human behavior as it relates to food safety. Understanding current food safety knowledge and attitudes across the food system among producers and consumers was the subject of a new course developed by project collaborators and held at RUA.

This summer, more than 80 students were trained and certified in conducting human subject research by co-PI Paul Ebner and Sabrina Mosimann (Purdue) and Koerimy Ouk and Malyheng Chhoeun (RUA Center of Excellence on Sustainable Agricultural Intensification and Nutrition). Students learned the theory and practice of developing surveys by creating an actual survey to measure food safety knowledge and practices and conducting a pilot survey with vegetable vendors in Phnom Penh.

“Influencing changes in behavior through effective education programs is essential to improving food safety,” said Ebner, a professor of animal sciences at Purdue. “This cohort of students is well-prepared to contribute to research that will shape food safety education programs to reach actors across the food chain.”



Photo caption left: Samples of lettuce collected for testing for microbial indicators of poor sanitation practices. Developing the technical skills of young Cambodian scientists is a major capacity development goal for the project team. (Photo credit: Jessie Vipham)

Photo caption, right: Traditional markets provide consumers with access to a wide array of nutritious vegetables, but gaps in food safety can compromise their dietary benefits. (Photo credit: FSIL/Andrew Ball)

Success Story 3: Assessing peanut contamination risk and food safety awareness in Senegal's peanut basin

Senegal – October 29, 2021

In production quantity and market value, peanuts are one of Senegal's most important crops. According to a [2017 World Bank report](#), peanuts account for 45-60% of the nation's total crop area and are grown by more than half of all rural households. Both a nutrient-dense staple food and a source of income, peanuts are vulnerable to contamination with pathogenic microbes and aflatoxins-producing fungi which can cause foodborne illness and lower their market value. A project supported by the [Feed the Future Innovation Lab for Food Safety](#) assessed the scope of the problem and identified priorities for developing impactful practices and policies in the peanut basin in central and western Senegal.

Led by Jonathan Bauchet, associate professor of consumer science at Purdue University, and Ibrahima Sarr, director of the National Agricultural Research Center at the Institut Sénégalais de Recherches Agricoles, the team quantified contamination levels in farmers' stored peanuts, conducted surveys of farming practices, and gauged farmer knowledge of foodborne pathogens.

“Contamination with microbial and fungal microorganisms was found to be widespread across households: More than 80% of samples contained bacterial indicators of fecal contamination, including coliforms and Enterobacteriaceae,” said Brianna Britton, a project collaborator and Ph.D. candidate at Purdue. “Additionally, only one sample was free of yeast and mold contamination.”

In contrast to the widespread presence of bacteria, most samples fell into two categories for aflatoxins contamination: low values considered safe (below 4 ppb) and very high, unsafe values above the maximum detectable value (100 ppb). Approximately 12% of the 308 samples exceeded E.U. safety standards.

“Higher temperatures prior to harvest and labor shortages were positively associated with mold and aflatoxins contamination, respectively,” said Yurani Arias-Granada, a project collaborator and Ph.D. candidate at Purdue. “Moreover, farmers with adequate storage infrastructure showed lower contamination levels. These results suggest that integrated management strategies that provide information to smallholder farmers about appropriate pre- and post-harvest practices can help reduce mold and aflatoxins contamination.”

In surveys of 250 smallholder farmers, less than a quarter of producers were aware of pathogenic bacteria or aflatoxins, but contamination levels showed no relationship with farmers' prior knowledge about microbial contamination. Subsequent surveys of farmers' production processes – planting, harvesting, drying, sorting, and storing— identified strong potential to increase the food safety of peanuts and other crops through greater adoption of recommended practices. For example, few farmers were sorting peanuts before storage, checking storage sites for mold, keeping insects away, and using hermetic storage containers placed off the bare ground.

“Contamination with microbial pathogens and aflatoxins is a significant concern for peanut production in Senegal because smallholder farmers cannot sell contaminated crops to high-value supply chains--which test for contaminants and reject contaminated crops--and they also consume an important share of the groundnuts they produce,” said Arias-Granada. “It's also clear there are many opportunities to design holistic strategies to strengthen the food safety of the crop through consumer and grower awareness, promoting food safety-enhancing technologies and better production practices, and creating production incentives and consumer demand for safer food.”



Photo caption: Ibrahima Sarr, director of the National Agricultural Research Center at the Institut Sénégalais de Recherches Agricoles, examines field-dried peanuts grown in the peanut basin of central and western Senegal. Contamination of the crop with microbial pathogens and aflatoxins is a risk to consumer health and nutrition. (Photo credit: Yurani Arias-Granada)