

Lessons from JIFSAN's Collaborative Training Initiatives Promoting Country-Driven Food Safety Capacity Building in Bangladesh and India¹

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OVERVIEW

This report describes the Joint Institute for Food Safety and Applied Nutrition's (JIFSAN) efforts to create collaborative food safety training centers in Bangladesh and India. Two case studies, the Bangladesh Aquatic and Aquaculture Food Safety Center (AAFSC) and the India Supply Chain Management of Spices and Botanicals Ingredients (SCMSBI), are discussed in terms of the importance of the sector to the country, the food safety problems encountered in exports, and the development of the Collaborative Training Initiative.

JIFSAN's Collaborative Training Initiatives are agreements between JIFSAN and country partners to work together to provide a sustainable partnership that results in scaled-up food safety training. JIFSAN works with countries to identify and obtain support from local partners from government, industry, academia, and local institutions. The local partners are responsible for utilizing existing resources and developing a business plan that includes fundraising with other entities. They are also responsible for identifying individuals who JIFSAN will train to become Trainers-of-Trainers (ToT). The ToT then adapt the training material to the needs of their supply chains and help disseminate it throughout the country via 'multiplier' trainings. After ToT are trained, JIFSAN instructors may return to the country to assist in the delivery of multiplier trainings, but the goal is for the country to take ownership. Over time, as the teaching role of JIFSAN instructor's declines, JIFSAN serves in more of an advisory capacity role. Currently, the Collaborative Training Initiatives are virtual centers housed within the partner institutes.

For countries in need of food safety capacity building, partnering with JIFSAN has many advantages. Jointly administered by the FDA and the University of Maryland, a land-grant research institution, JIFSAN is a rich pool of resources for developing countries. JIFSAN instructors include regulators who stay abreast of food policy changes in the U.S. and experts who work actively with the industry. Many of the instructors also serve in various food safety alliances (e.g. Seafood HACCP Alliance and Produce Safety Alliance) and have access to the wider network of experts.

The establishment and operation of a Collaborative Training Initiative follows a three-phased Train-the-Trainers (TTT) approach, with small variations by country. In Phase I, JIFSAN goes to the host country to train a group of potential ToT. The in-country partner identifies eight to ten individuals from that group to become future ToT. In Phase II, the selected individuals come to JIFSAN to participate in an intensive two-week internship. During the internship, the participants develop an action plan on how to promulgate the training to industry, government, primary producers, and other value chain actors. The action plan also includes a monitoring and evaluation (M&E) plan to measure the impact of future trainings. Phase III involves having the ToT develop country- or region-specific training materials that they use to train local food market players and implementing M&E activities including pre- and post-training factual tests as well as follow-up self-assessment a year after the initial training to understand the multiplier effect.

By following the TTT approach, the in-country training partners have the capacity to train a much larger group of participants and reach small producers in rural areas. The multiplier effect is measured by the total number of people trained as a result of the collaborative effort. As of December 2017, close to 20 thousand Bangladeshi individuals have been trained to help ensure the safety of Bangladesh fish and aquaculture products. As of December 2017, close to eight thousand Indian individuals have been trained to help ensure the safety of Indian spices and botanicals being produced.

CASE STUDY I: BANGLADESH'S AQUACULTURE INDUSTRY

Background

Shrimp and fish aquaculture are Bangladesh's main industries. Between 2005 and 2014, incomes from fisheries constitute 3.69% of the country's total GDP and 23.12% of agricultural GDP (Thimphu, 2016). Bangladesh's shrimp aquaculture industry has been growing from about 20,000 ha in 1980 to 244,000 ha in 2014 (Abdullah et al., 2016). Most (94%) of Bangladesh aquaculture is for domestic consumption (Hernandez et al., 2017) and constitutes about 60% of the country's animal protein supply (Thimphu, 2016). In 2015, the industries employed 17.8 million people, which is about 11% of total population. In addition, about 8.5% of the sector's employment is women (Thimphu, 2016).

The Government of Bangladesh seeks to develop the shrimp aquaculture industries for higher foreign earnings, and the adoption of Hazards Analysis Critical Control Point (HACCP) is listed as a strategy to improve farm productivity (plan, 2014). The Bangladesh Shrimp and Fish Foundation (BSFF) was tasked to develop and promote Bangladesh aquaculture for export and the industry has expanded very fast over the last decade (Hassan et al., 2013). In 2015, Bangladesh exported fish and fishery products in the amount of 565.6 million US dollars,² 1.4% of total export value. According to the Plan, the shrimp, fish, and fish product export should reach 800 million US dollars by the end of 2020.

The Bangladesh aquaculture has suffered from food safety issues, which harms both the health of domestic consumers and the country's access to the international market. Some of the most serious issues were reflected by the country's trade records. The recorded incidents also showed that food safety issues can be effectively mitigated by adopting modern food safety practices such as HACCP and Good Aquaculture Practices (GAqP). In 1997, the EU banned imports from Bangladesh after an inspection of seafood processing plants that revealed serious deficiencies in the infrastructure and the sanitary standards and unsatisfactory quality control by the government (Taslim et al., 2016). Bangladesh shrimp processors invested \$17.6 million to upgrade plant infrastructure, and the Government, together with external donors, invested around \$450,000 in employee training and laboratory upgrades to meet HACCP requirements (Cato and Subasinge, 2003). Bangladesh's fish and shrimp industry implemented HACCP and traceability plans. After implementing these measures, at the end of 1997, the EU began to lift the ban. In 2009, the EU Rapid Alert System for Food and Feed and the FDA import refusal system found nitrofurans, a class of unapproved antibiotics, in Bangladeshi shrimp. It is suspected that many farmers were trying to control and eliminate a new bacterial disease, Early Mortality Syndrome (EMS), through the use of nitrofurans, while GAqP is a safe and effective alternative to antibiotics. Exports of Bangladesh shrimp and prawn to the EU were resumed in 2010, after the

² All money amounts are in current value US dollars unless stated otherwise.

government agreed to set up an accredited laboratory facility to detect such contaminants (Belton et al., 2011).

The U.S., as shown in Figure 1, was also experiencing problems of microbiological pathogens and filth in imported Bangladesh fish, fish products, and shrimp, leading to the product being rejected at port of entry. In addition, the use of pesticides, antibiotics, and hormones in aquaculture production has been a challenge for imported Bangladeshi aquacultural products. In 2009, during an inspection review in Bangladesh, a FDA inspector mentioned JIFSAN's GAqP training program aimed at improving the safety of fish and fish products. After that, BSFF reached out to FDA and JIFSAN for support. Over the course of 2009, meetings were held with BSFF representatives, Bangladesh government officials, JIFSAN, FDA, and U.S. Embassy staff, and the idea of establishing the Aquatic and Aquacultural Food Safety Center (AAFSC), a Collaborative Training Initiative, was hatched.

The Aquatic and Aquacultural Food Safety Center (AAFSC)

As part of the Initiative's Phase I of development, JIFSAN delivered its standard GAqP training program in Kuhlina, Bangladesh in 2009. During this program, a small group of participants were selected to become the initial cadre of ToT. In 2010, a formal Memorandum of Understanding between JIFSAN and BSFF was signed, establishing the AAFSC under the Collaborative Training Initiative. Since then, JIFSAN has helped BSFF develop GAqPs and Good Fishing Vessel Practices (GFVP) (and later HACCP) training modules for the aquaculture industry. AAFSC operates based on the TTT approach. It aims to offer food safety training to everyone involved in the industry. Some of the trainings have been partially funded by FDA, but the majority of the funding has come from USDA-FAS or USAID, as USDA-FAS was interested in promoting the use of U.S. sourced feed and USAID has identified Bangladesh as priority country under Feed the Future.

During Phase II in 2002, the selected ToT came to JIFSAN at the University of Maryland and Virginia Tech for training. During the training, the participants worked with JIFSAN instructors to identify components of the existing GAqP program that they could use in their trainings and additional areas that were specifically relevant to the Bangladesh industry.

During Phase III, JIFSAN offered its GAqP program in Bangladesh in December 2011, with a third of the program presented by the Bangladesh AAFSC ToT. Started in 2014, the curriculum was extended to include a two-day HACCP training. In 2014 and 2015, JIFSAN instructors went back and delivered trainings on GAqP + HACCP and GFVP + HACCP. In June 2016, they delivered the Association of Food and Drug Officials (AFDO) / Alliance Training on Seafood HACCP. While this training is not mandated, it is recommended by the FDA to use in combination with their 'Fish and Fishery Products Hazards and Controls Guidance'. After the training, 25 individuals from Bangladesh were certified in International HACCP by AFDO. However, other participants were not certified due to difficult in accessing the online course and the fund in US dollars to pay for the certification process³. BSFF have been discussing with JIFSAN instructors, who are also on the Executive Committee of AFDO about helping more Bangladesh participants getting AFDO certification. One proposed solution is to have AFDO-recognized Lead Trainers at AAFSC, which allows AAFSC to issue AFDO certifications and reduce the required payment.

³ Seafood HACCP certification requires three payments: \$75 to register and complete online courses; \$25 for training material; and \$50 for the certificate.

Table A in the appendix presents AAFSC's activities involving JIFSAN trainers, the number of participants, and the cost-sharing partners. JIFSAN typically pays the JIFSAN trainers and their expenses to the border of the country, which is roughly \$40,000, and the partners pay the in-country costs of participants and trainers. The BSFF sought funding from donor agencies like USAID, USDA-FAS, EU, UNIDO, etc. to expand training efforts after the initial trainings with JIFSAN.

JIFSAN instructors have continued to work in an advisory capacity role with the AAFSC. With the new Bangladeshi ToT, the capacity of the training program has greatly expanded and the quality of the program is maintained by continuous interaction with JIFSAN and FDA. AAFSC has been highly successful in reaching out to both small aquaculture producers in rural areas and to larger companies. These small producers would not have had access to GAqP training without the availability of native AAFSC trainers to conduct local programs.

Since the initial training of ToT, AAFSC has had over 130 training events and 5,550 participants in GAqP, Code of Conducts and Codex, HACCP, GFVP, and Risk Management. In 2015, AAFSC developed a set of training booklets on GAqP and Codes of Conduct for Fish / Shrimp Processing Plants to promote aquacultural production that meets international food safety standards and is sustainable, ecologically sound, and socially responsible.

AAFSC has diversified its training to reach more people through the establishment of a GAqP School, where the head priests of Mosques, field-level government officials, and university teachers are trained. Table B in the appendix shows the Phase III trainings that occurred after the establishment of AAFSC up until 2017 that AAFSC conducted without involving JIFSAN faculty.

BSFF with AAFSC has continued to build capacity to improve the safety of aquaculture and fish and make GAqP part of the educational experience of Bangladeshi university students. In addition, the Department of Fisheries (DoF) and Marine Bioscience in Jessore Science and Technology University developed and is offering two new courses for which students receive academic credit in GAqP. BSFF has also provided GAqPs and Seafood HACCP trainings with the Center's ToT in the major shrimp farming areas. They have also supported the establishment of 25 GAqP-based demo-farms as models in 8 major shrimp districts. The initial lead national trainers trained all 29 Upazila Fisheries Officers in GAqP and Seafood HACCP. BFSS has developed local / Union Level Trainers (ULTs) in each of the Upazilas, where GAqP-based demo-farms are to be established as well as developed refresher training for the trained ULTs and farmers.

Efforts by Other Institutions

AAFSC was successful because it involved many partners as well as the Government of Bangladesh (GoB). The GoB included AAFSC's establishment as a part of the aquaculture development strategy under the Economic Growth Program of the Ministry of Commerce (MoC). AAFSC was initially supported by USAID, the DoF, and the Bangladesh Aquaculture Alliance. It is also working closely with each sector of the aquaculture industry's value chain and the relevant public sector organizations, in particular, the DoF, Bangladesh Fisheries Research Institute (BFRI), Bangladesh Livestock Research Institute (BLRI), Department of Livestock Services (DoLS), Ministry of Fisheries and Livestock (MoFL), Ministry of Commerce, Ministry of the Environment, Ministry of Labor and Employments and Ministry of Health. AAFSC is also working with the appropriate NGOs.

AAFSC's initial business plan called for a five-year funding of 340 million Bangladeshi Taka (BDT) or 5 million US dollars. AAFSC obtained from the MoC 139.6 million BDT (US\$2M) and worked to raise the remaining \$3M from other donors. Since the establishment of AAFSC, BSFF has continued to leverage resources from a number of organizations such as the EU, USAID, UNIDO, FAO, World Fish, and the STDF to expand trainings in GAqP and GFVP and has raised much more funds than laid out in their initial plan. Table C in the appendix summarizes some of the work done in these projects, which collectively have resulted in the improved safety of aquaculture products from Bangladesh. As can be seen, the BSFF has raised far more than the planned \$5 million. Table D summarizes additional food safety capacity building efforts within those projects. The BSFF has worked hard to achieve the goal of AAFSC and leverage a number of resources which is in line with the FDA's International Food Safety Capacity Building Plan.

Collectively under these projects, BSFF has developed a core team of ToT to train in GAqP - Seafood HACCP-based inspection, monitoring, and auditing system for the DoF, the Bangladesh Frozen Foods Exporters' Association, the Bangladesh Economic Growth Program Project, and BSFF. BSFF has promoted the implementation of Seafood HACCP in Bangladesh with skippers of industrial and artisanal trawlers to develop core trainers and provided Seafood HACCP training to aquaculture establishments. BSFF has also developed a TTT program for Food Testing Laboratory Operations. In addition, BSFF has developed a number of programs to improve inputs into shrimp production including Closed System Aquaculture using White Spot Syndrome Virus (WSSV)-negative post larvae, introduction of One-Mother-One-Tank facilities at shrimp hatcheries to produce WSSV-free post larvae, assisted in improving the quality of feed. They have implemented a number of capacity building measures to improve the labor in factories on: best handling, grading, peeling, deveining, processing, and packaging practices of shrimp product by maintaining Sanitation Standard Operating Procedures (SSOPs) for descaling, filleting, and processing of fin fish products by maintaining SSOPs for the preparation and processing of value-added products. Further, they have developed a core set of trainers on E-traceability and paper-based traceability.

CASE STUDY II: INDIA'S SPICE INDUSTRY

Background

The world spice trade currently is estimated at 1.1 million tons per year, of which India produces 48% (Rushing et al, 2015). In 2016, the value of spices export from India is \$917 million, about 22% of total world export (UN COMTRADE). Research and Markets (2017) reported that the Indian spices market is projected to reach approximately US\$18 billion by 2020 with growth in the sector being led by branded spices and spice mixes. As Indian has been one of the largest origin of spices imported to the U.S. (UN COMTRADE), food safety concerns associated with spice imports from India led to FDA initiating capacity building efforts through JIFSAN.

India has experienced multiple regulatory challenges, especially as the international spice market has been paying increasing attention to food hygiene and safety. Jaffee (2004) documented major food safety incidents associated with Indian spices export from mid-1980's to mid-2000's. In most of the cases, food safety hazards were discovered in export to developed countries like the U.S., European countries, and Australia and in different types of spices like black pepper, chilies, and curry powder. The documented food safety hazards ranged from hygiene problems, banned chemical residues, microbial contamination, and illegal food additives. The Indian Spices Board, in an effort to commercialize the spice industry, has been promoting food safety practices. There has also been an increasing effort by Indian companies to adopt HACCP, ISO 90000, and other food safety practices and standards.

In 1987, FDA blacklisted Indian black pepper on the account of filth in 20 out of 60 shipment samples (from December 1986 to May 1987). As the U.S. was India's largest export destination India agreed to introduce compulsory pre-shipment inspections to control the quality of pepper. The Export Inspection Agency was given the responsibility of improving quality control and the Spices Board of India, under the Ministry of Commerce and Industry, was given the responsibilities of educating the farmers, intermediary merchants, and exporters on the scientific post-harvest handling of pepper to avoid contamination. On the basis of these activities, the U.S. lifted its ban on the importation of pepper from India.

However, Jaffee (2004) observes that as the food safety standards in the international market continue to evolve, not all firms are able to keep up with the regulatory requirements. In 2010, 300 shipments of spices to the U.S. were rejected due to microbial contamination; in 2011, the number peaked at 350. Historically it has been difficult to link outbreaks to spices due to their long shelf life and the reality that people rarely think about a spice when they get sick. The use of DNA sequencing of *Salmonella* types has allowed food officials to pinpoint spices as a cause of repeated outbreaks. A review of foodborne illness outbreaks from microbial contaminants in spices from 1973-2010 identified 14 spice-associated illnesses (Van Doren et al, 2013). In every case where it could be determined (9 out of 14), the spices were imported. Spices from India were identified as the source of 3 of the outbreaks (ibid). Outbreaks traced to imported spices fueled the U.S.' concern about the safety of spices coming from India and increased attention to improving product quality.

In 2013, FDA released a draft spice risk profile. The report found that spice adulteration in sampled imported products was larger than the average for all other FDA-regulated foods and that *Salmonella*, which can survive for years in the low moisture environment, was found in most types of spices. FDA conducted site visits in India and reported that many spice producers had insufficient food safety control and prevention strategies. Widespread implementation of Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP) and, when appropriate, Hazard Analysis and Critical Control Points (HACCP) would be an effective way to reduce the risk.

The Supply Chain Management of Spices and Botanicals Ingredients (SCMSBI)

Due to the large number of rejections and India being a priority country for FDA, in 2012 FDA asked JIFSAN to reach out to the Spices Board and the Confederation of Indian Industries - Food and Agriculture Center of Excellence (CII-FACE) to establish a Collaborative Training Center. With the help of the local public sector, the Center is expected to reach producers and handlers. The Center focuses on training in supply chain management in spices using GAP principles and helping the public and private sectors to develop and implement their own capacity building programs in safe practices for spices.

The first workshop, under Phase I, was held in Cochin, Kerala, India in September 2012, with 50 participants. Participants included representatives from the Spices Board of India, CII-FACE, Indian government, academia, spice processors, spice growers, and private organizations. Then, nine of the Phase I participants were selected to become ToT and they came to JIFSAN and the University of Mississippi National Centre for National Products Research for the Phase II internship. During the internship, they participated in more advanced training and worked on tailoring the training material to the needs of their supply chains.

In Phase III, SCMSBI delivered a series of trainings for different segments and stake holders of the supply chain in various spice producing states. In mid-2013, SCMSBI held a series of meetings with National/State Horticulture Mission officials, where the ToT sensitized Mission officials to food safety issues and encouraged them to join the newly formed Initiative. In October 2013, three two-day TTT programs were delivered to a total of 218 participants. These participants were expected to branch out and deliver training programs to constituents in their regions. In 2014, requested by the state agricultural and horticultural departments, SCMSBI provided trainings to 11 government groups and four industry programs in different states, reaching a total of over 500 participants. Six more sessions took place in 2015 to train state agricultural department officials and four in 2016.

Additionally, in 2016, SCMSBI's ToT collaborated with JIFSAN's instructors, provided four two-day training programs in GAP and GMP and invited the participants to lay out future plans. The participants included exporters, progressive farmers, NGOs, and officials from the Spices Board and the state agriculture and horticulture departments. They agreed to form training cells including local training centers for farmers, information sharing platforms, technical consultancy, quality control assurance systems, and hygiene and food safety management systems. Some groups were also interested in identifying opportunities for community infrastructure development that would include processing facilities and laboratories for testing the safety of spices. Officials from the Spices Board organized the local leadership to formally establish a regional GAP training cell with representation from all sectors. Subsequently, between 2016 and 2017, a number of trainings were held in the various regions of India, which trained 7,800 participants. Please see Appendix Table E for more details. JIFSAN in 2017 also developed low literacy training material for spice growers in India.

For 2018, SCMSBI is proposing to conduct Industry-specific training programs for supply chain actors. They are planning to have a training program for packhouse workers. Under the scheme of Agricultural Skill Council of India, they are planning to develop and conduct TTT programs on food safety at the material receipt, process, storage, and transportation stages. Floor level managers, extension workers (procurement and handling), machine operators, and technical personnel in quality control laboratories will be trained under this program.

Efforts by the Spices Board of India

To improve the regulatory infrastructure, the Spices Board has also been in the process of establishing laboratories, most of which are now certified in major spice growing areas, to analyze all samples collected under the Compulsory Inspection Scheme and to monitor the quality of spices. In 2013, the Food Safety and Standards Authority of India destroyed 900 tons of pepper unfit for human consumption, to help ensure the good health of the consumers and to improve India's credibility in trade.

In 2017, the Spices Board conducted two trainings on Food Safety and Product Quality Testing for technical personnel from the spice industry in their Kochi laboratories. Through the Agricultural Skill Council of India, the Spices Board has charted out a training plan on food safety at the packhouse worker level and the spices industry has welcomed the proposal. They will be conducting more such programs in 2018. They are in the process of preparing basic training tools such as posters and GAP 'Do's & Don'ts' for major spice crops.

In addition to their capacity building efforts, the Spices Board has also established crop-specific Spice Parks in nine major producing or market centers to facilitate export market access. These are public private partnerships through which the Spices Board leases out land in the Spice Park to private entrepreneurs to develop their own processing plants for value-added and high-end processing. The land is leased initially for 30 years but can be extended based on mutually agreed conditions. The grower community can make use of these facilities to sell their product directly to exporters. The idea behind the Spice Parks is to provide a common infrastructure for both post-harvest and processing operations of spice and spice products. Spice Parks also provide training on GAP, post-harvest operations, advanced processing practices, global food safety and quality standards, etc. These Spice Parks enable farmers to sell their products directly to exporters, eliminating the need for intermediate distributors. These parks are envisioned to benefit exporters as well. They can develop a link with reliable farming community for an uninterrupted supply of fresh raw material.

The Spices Board had submitted a preparatory project grant proposal to the Standards and Trade Development Facility (STDF) under WTO, for assistance on capacity building and knowledge sharing to address SPS issues. They were awarded the project in March 2016. They have now developed a full-fledged project with the help of a WTO- approved consultant and the full proposal has recently been submitted for consideration to the STDF secretariat. The project would provide financial assistance to comprehensively address SPS issues focused on six important spices – chilies, pepper, coriander, cumin, fennel, and nutmeg including mace – throughout India.

LESSONS

As detailed in the case studies, there are steps that led to the success of both Collaborative Training Initiatives. First, both Collaborative Training Initiatives were successful because they implemented important steps regarding the organization of the Initiatives and maintaining their operation. Both Initiatives sought to: (1) set up "mini centers" locally (training cells or clusters), which helped to establish and sustain a capacity building network; (2) establish partnership with industry groups and national and local governments to have a solid local foundation to support training efforts; (3) obtain funding from outside organizations and STDF to facilitate the active expansion of the training. In addition, in terms of operation, both initiatives found resources for translating the material into local languages and adapting training material to their own supply chains. As a result both Initiatives have advantages over one-off trainings by taking advantage of economies of scale. The higher initial cost of a three-phased training allows the in-country partners and JIFSAN to set long-term plans to expand and provide repeated training.

One advantage of such Initiative is that it specifies designated persons and funds for capacity building purposes. The on-going relationship with JIFSAN motivates in-country partners to sustain the training effort. The in-country partners and ToT participants show their commitment to the Initiative by participating in the three-phased TTT program. Although the Initiative imposes a higher initial cost than a one-off training approach, the cost is justified through the sustainable operation of the virtual training centers and expanding effort through local training cells and clusters. By building a long-term capacity building network in the countries, the Initiatives can reach various actors in the food market.

This experience is especially valuable to designing capacity building strategies to fulfil requirements by the U.S. Food Safety Modernization Act (FSMA). According to FSMA, all producers⁴, domestic and abroad, are required to participate in trainings to learn about the new rules. For example, Bangladeshi aqua cultural producers are bound by the new Foreign Supplier rule and Indian spice producers are required to complete produce safety training. The same requirements also apply to other developing countries that are commercializing their agricultural sector and exporting food products to the U.S. Establishing similar Collaborative Training Initiatives in these countries could reach food market players of various sizes, facilitate a smooth transition under the new rules, and stabilize supply in the international food market.

JIFSAN can improve its involvement in Collaborative Training Initiatives in the future by maintaining a more active connection with in-country partners. A potential benefit from this more active role is to be able to carry out the monitoring and evaluation (M&E) program on a more consistent basis. Previously, the in-country partners did not report back on their implementation the M&E program introduced by JIFSAN, which includes in-class evaluations and follow-up questionnaires. The JIFSAN M&E program might have been difficult to implement because the in-country trainings face a wider range of participants and trainings are carried out in various formats or venues. With active involvement of both JIFSAN and in-country partners, alternative measurements could be used to evaluate training outcomes. First, the effectiveness of a TTT program can be measured by the multiplier effect, i.e. the number of all participants trained under the program, including participants and trainers taught by JIFSAN instructors, and participants taught in all subsequent trainings (see Figure 2). With timely updates about multiplier trainings, JIFSAN can report back to donors. In the case of FDA-funded training, the report would go to the U.S. Congress.

In addition, data could be collected to measure the spillover effect, i.e. the change in livelihood of all the participants brought about by the trainings through improved health and higher incomes. Measuring spillover effects also helps to address a problem in current food safety studies, i.e. the reliance on trade data for justifying food safety investment. Currently, the effect of improved food safety is mostly reflected by changes in import bans and trade volumes and captures only a small part of the total benefit. This is especially true for aquaculture in Bangladesh and spices in India, where most of the outputs are for domestic consumption. Measuring the benefit domestically would paint a clearer picture of the importance of food safety, raise the awareness of governments in both developing and developed countries, and point to where resources should be directed in the future.

Going forward, JIFSAN is looking to pursue research that can measure the impact of different types of international food safety capacity building training programs on the livelihoods of those trained so as to capture the spillover effects. Getting sustained behavioral change is difficult. If changes in food safety practices resulted in improved livelihoods, demonstrating such changes associated with food safety and quality trainings would not only inform the policy dialogue but also could encourage other supply chain actors involved in food production to change their behavior.

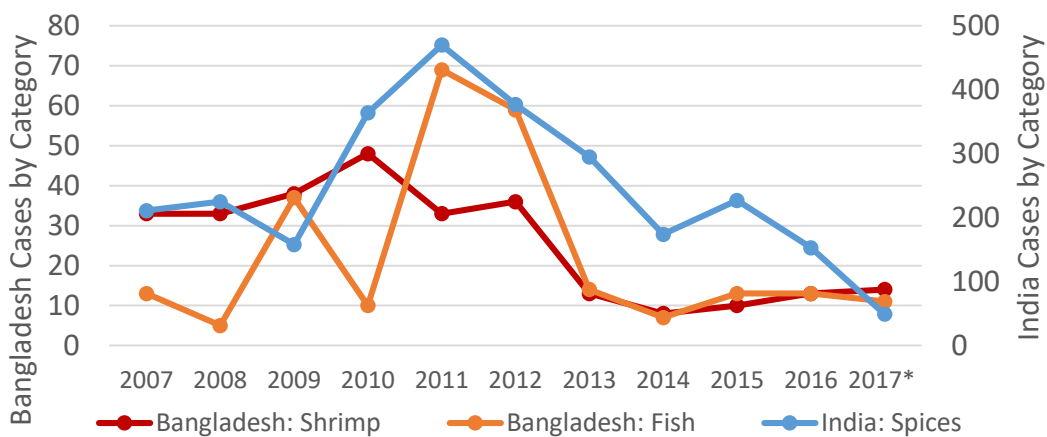
Proposed Activities:

- Identify local partner to be responsible for data collection, hiring enumerators, coordinating data collection effort, and collaborating with us on the analysis,

⁴ Very small producers could be exempt from the requirement.

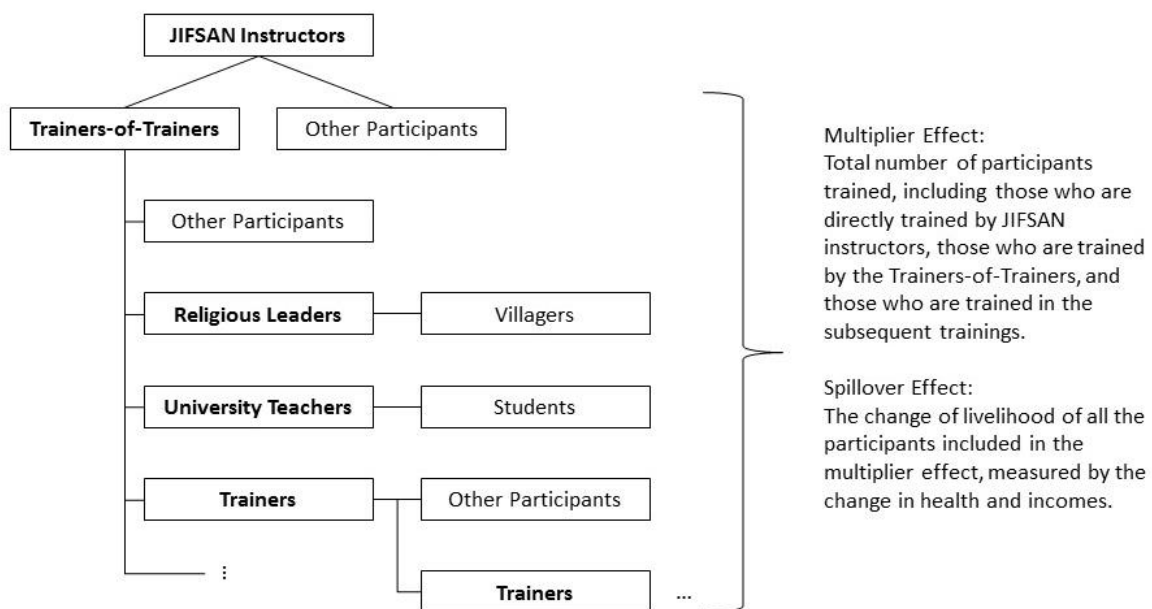
- Develop a set of survey instruments to evaluate the impact of food safety and quality on livelihoods on supply chain actors involved in the trainings vs those who are not.
- Identify similar villages with similar socio-economic status who were not trained to create a counterfactual analysis);
- Conduct household surveys on livelihood factors
- Clean data and data analysis
- Report on findings and subsequent journal articles
- Develop a process for the Center to continue monitoring the impact of the Collaborative Centers

Figure 1 Number of Refusals of Selected Food Import Categories (2007-2017)



Data Source: FDA Import Refusal Report. Retrieved from <https://www.accessdata.fda.gov/scripts/importrefusals/>
 * Data from 2017 includes cases from January to June.

Figure 2 Measuring Effects of a TTT Program



Appendix

Table A: Trainings at Bangladesh's AAFSC with JIFSAN Involvement

	Year	Location	Number of Participants	Funding
Phase I	2009	Khulna, Bangladesh- GAqP	47	Cooperative Agreement - BSFF & Dept. of Fisheries - USAID/Price - Katalyst
Phase II	2010	Bangladesh (in Maryland) - GAqP	9	Cooperative Agreement - BSFF
Phase III	2010	Cox's Bazar, Bangladesh - GAqP	38	Cooperative Agreement - BSFF & Dept. of Fisheries
	2011	Khulna, Bangladesh - GAqP	20	Cooperative Agreement - BSFF & Dept. of Fisheries
	2014	Khulna, Bangladesh, GAqP	36	Cooperative Agreement - USDA FAS - BSFF & Dept. of Fisheries
	2015	Bangladesh - GFVP + HACCP	38	Cooperative Agreement - USDA FAS - BSFF & Dept. of Fisheries
	2016	Bangladesh - HACCP ToT	25	Cooperative Agreement - USDA FAS - GFSP, Responsible Aquaculture Foundation and AFDO
			Total	213

Data from JIFSAN's Program officers

Table B: Additional AAFSC Phase III trainings

Name of the topic	Events	Participants trained	Institutions	Districts covered
AAFSC accomplishments in food security, 2009 - 2014				
Organized TTT on GAqP (Development of Core Trainers)	17	600	15	24
Organized field-level training on GAqP, Code of Conducts and Codex, Seafood HACCP	54	2120		32
Training diversification to reach mass community				
GAqP to school teacher & Imam (Head Priest of Mosques)	4	200	65	4
GAqP to field-level government officials	3	100	9	3
GAqP to university teachers	5	160	16	
GFVP	1	40	16	
Seafood HACCP by SHA (Seafood HACCP AFDO) and Cornell University	1	30	7	
GAqP on dry fish	1	50	26	1
List of training programs conducted by BSFF with support from JIFSAN, 2014 - 2016				
HACCP	16	800		
GAqP	18	900		
GAqP + HACCP	1	50		
GAqP + HACCP + CODEX	1	50		
CODEX	6	300		
GFVP	1	50		
Risk Management	1	50		
HACCP/CODEX	1	50		
Total		5500		

Table C: Other Projects Aimed at Improving the Safety of Bangladesh Aquaculture

Program	Goal	Program Details
Better Works and Standards Program - Better Fisheries Quality	Strengthen the national quality infrastructure for fish and fish products to meet safety and quality requirements in export markets, improve competitiveness, and exploit international market opportunities especially in the EU.	<ul style="list-style-type: none"> - Date: July 2010 to December 2014 - Donors: EU, UNIDO, NORAD, and the Government of Bangladesh - Fund: €23,329, 500 (US\$29,861,760 at 2012 exchange rate)
Building Trade Capacity of Small-Scale Shrimp and Prawn Farmers in Bangladesh: Investing in the Bottom of the Pyramid	<p>Develop clusters of shrimp farmers in selected areas of Khulna District with backward linkages to input suppliers and forward linkages with processors under a contract mechanism.</p> <p>Activities include:</p> <ul style="list-style-type: none"> i) development of a database for the project, including baseline data analysis; ii) registration of farms, and distribution of farmer identification cards (with bar codes) for cluster members; iii) organization of initial and refresher training sessions on GAP and HACCP, 	<ul style="list-style-type: none"> - Donors: BSFF, DoF, World Fish and FAO - Fund: US\$637,000
Bangladesh Economic Growth Program Project	Promote training on GAqP, Seafood HACCP, and CODEX Standards. Provide trainings to the industry stakeholders and extension officials at DoF. Provide training to primary school teachers, representatives from Union Parishad (local government body), university teachers, government officials, and the imams (Muslim priests) in selected areas to raise awareness about the basic principles of GAqP among the students and common masses. Conduct workshops at fisheries universities, develop syllabus that incorporates GAqP, and implement internship programs so that graduates know the updated concepts and can prescribe drugs for aquaculture establishments.	<ul style="list-style-type: none"> - Donors: DoF, the Bangladesh Aquaculture Alliance (BAA), USAID, and BSFF
Agribusiness for Trade Competitiveness Project	Assist export companies to meet compliance standards in importing countries. Deliver training on market linkage and compliance with international export regulations (e.g. GAqP, Codes of Conducts, and traceability). Introduced contract farming for products with export potential. Improve stakeholder access to quality inputs. Improve capacity of laboratory facilities for pre-export testing of fish and strengthen the network between the laboratories.	<p>BSFF is also working with the Ministry of Commerce in the implementation of the Agribusiness for Trade Competitiveness Project with Katalyst which is a market development project, implemented by Swisscontact.</p> <p>The Fishery Product Business Promotion Council is implementing the aquaculture component of the project.</p>

Sustainable Agriculture, Food security and Linkages	Improve market access through chain development and better livelihoods. Focus on farmers involved in Aquaculture, horticulture, and dairy production.	<ul style="list-style-type: none"> - Date: November 1, 2012 – October 31, 2016 - Donor: Embassy of the Kingdom of the Netherlands (EKN) - Implementing Partners: Solidaridad Asia Network Ltd - Fund: €12 million (US\$15,960,000 at 2014 exchange rate)
USAID - Aquaculture for Income and Nutrition (AIN) Project	Increase aquacultural productivity through the development and dissemination of improved fish and shrimp seed, improved household and commercial aquaculture, policy reform, and institutional capacity building.	<ul style="list-style-type: none"> - Date: September 2011- December 2016 - Donors: USAID, Community Development Center, Society for People's Education, Empowerment and Development Trust, BSFF, BFRI, and DoF - Implementing Partner: World Fish - Fund: US\$25 million
FAO-TCP /BGD/3501 Ensuring Sustainable Expansion of Aquaculture in Bangladesh	Improve seed and feed production and management. Pilot on brood bank development, selective breeding program, hatchery management, fish and animal feed act, feed quality analytical laboratory, inventory of feed additives etc.	<ul style="list-style-type: none"> - Date: February 2014 – February 2017 - Donors: DoF, Ministry of Fisheries and Livestock, Government of the People's Republic of Bangladesh - US\$451,000

Data compiled by JIFSAN from various project documents

Table D: Additional Food Safety Capacity Building Trainings Collaborating with BSFF

Training/Program	No. of Training	Total No. of Participants	Projects
CODEX	44	2200	BEGP, BPC
Farmers Field Program	3	120	FAO Food Safety Project
Food Control Guideline	3	87	FAO Food Safety Project
Food Control Guidelines in Fish Value chain	1	32	FAO Food Safety Project
Good Aquaculture Practices (GAqP)	86	4300	FAO Food Safety Project
HACCP	24	1200	BEGP, BPC
Safe Fish Production	192	6278	FAO Food Safety Project and Agri-Business for Trade Competitiveness (ACT-P)
Food Control Guidelines in Aquaculture Value chain	3	72	FAO Food Safety Project
Grand Total	356	14289	

Data provided by the Bangladesh Shrimp and Fish Foundation, Dec, 2017

Table E: Trainings at the India's SCMSBI

	Year	Number of Programs; taught by	Participants	Funding
Phase I (5 day)	2012	1; five days, taught by JIFSAN instructors	50 officials from government and private organizations	Cooperative Agreement, the Spices Board, and CII-FACE
Phase II (6 day)	2013	1; nine days, taught by JIFSAN instructors, FDA, and industry professionals	9 Selected individuals came to JIFSAN and the University of Mississippi National Centre for National Products Research	Cooperative Agreement, the Spices Board, and CII-FACE
Phase III	2013	3; taught by SCMSBI ToT	State Agriculture Department officials	The Spices Board and CII-FACE
	2014	6; taught by SCMSBI ToT	Members from the spice industry	The Spices Board and CII-FACE
	2015	7; taught by SCMSBI ToT	State Agriculture Department Officials	The Spices Board and CII-FACE
	2016	4; taught by SCMSBI ToT	State Agriculture Department Officials (on GAP GHP)	The Spices Board and CII-FACE
		4; two days by SCMSBI ToT and JIFSAN instructors	Exporters, progressive farmers, officers of the State Agriculture and Horticulture Department Spices Board, and NGOs participated and the trainings	Cooperative Agreement, the Spices Board, and CII-FACE
Food safety programs (under the Quality Improvement Training Program) conducted by the Spices Board of India, 2016-2017 *				
Grower level	2016-2017	92; 1 day by SCMSBI ToT	4975	The Spices Board
Grower; woman		2; 1 day by SCMSBI ToT	185	The Spices Board
Master		25; 1 day by SCMSBI ToT	1446	The Spices Board
Processors		3; 1 day by SCMSBI ToT	161	The Spices Board
Regional seminar		23; 1 day by SCMSBI ToT	1033	The Spices Board

Data provided by Spice Board, December 2017

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