

Preliminary Findings from JIFSAN's International GAP Training Program Monitoring and Evaluation (2013- 2017)¹

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Background

The International GAP training program is a collaborative capacity building effort between the U.S. (FDA, JIFSAN) and host countries. The U.S. benefits from supporting food safety capacity building because it imports a lot of food from developing countries. Host countries benefit from the program because they can export more produce and enhance domestic food safety.

The U.S. Interest as a Produce Importer

Between 2000 and 2014, the average annual growth rate of food coming to the U.S. from abroad was 7.5 percent. Mike Taylor, the Deputy Commissioner of the Food and Drug Administration (FDA), reported in 2013 that "15 percent of U.S. food supply is imported, including 50% of fresh fruit, 20% of fresh vegetables, and 80% of seafood" (FDA, 2013). Many imported high value-added (HVA) foods are susceptible to foodborne hazards which can cause disease. Foodborne diseases are costly but often preventable health problems that can be zoonotic, microbial, chemical, parasitical, or viral in nature. FDA inspects only about three percent of all FDA-regulated imports coming into the U.S., but this subset is (FDA, 2011), which is insufficient to prevent foodborne diseases from the increasing quantity of imported food products.

Capacity building is a non-regulatory tool that FDA has available to help strengthen its efforts to prevent food safety problems in both domestically produced and imported food. This is especially true as the food market has been relying on an increasingly intricate global supply chain. The lack of food safety capacity in developing countries can go beyond the suppliers and exporters. Some of the food safety issues resulting from the lack of government regulatory capacity and technological capacity. The public sector in the U.S. is in a good position to address these issues through the provision of international training.

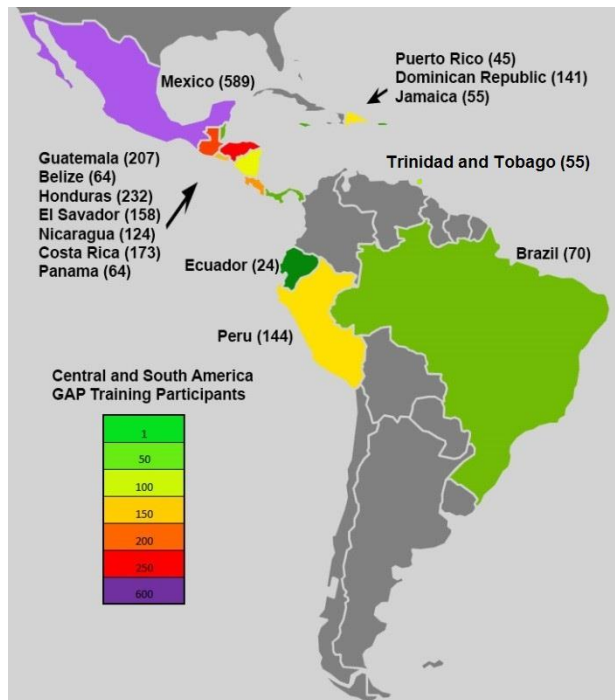
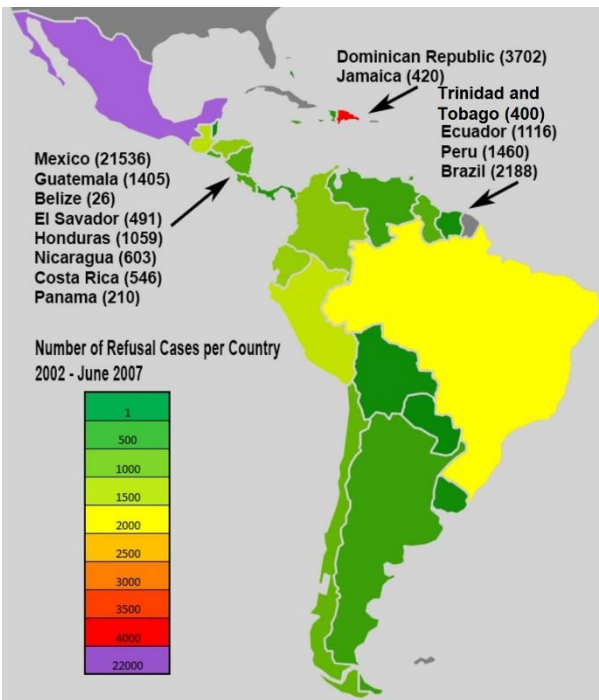
In 1998, FDA published formal guidelines for the microbial safety of fresh produce, suggesting that Good Agricultural Practices (GAP) and Good Manufacturing Practices (GMP) for producers are ways public and private sector entities can ensure the safety of produce (Rushing and Walsh, 2006). Later in 1999, the National GAP training program was established at Cornell University. The program was about developing course material that addressed the principles in the 1998 FDA guidelines and rolling out this information to the fresh produce industry through USDA land grant extension programs. Although these domestic training programs were effective in the U.S., FDA recognized that they did not address the needs of foreign produce suppliers. FDA thus tasked the Joint Institute of Food Safety and Applied Nutrition (JIFSAN), one of FDA's Centers of Excellence, to alter the material to the needs of foreign producers and roll out the training internationally.

In 2000, JIFSAN began teaching guidance training material on Good Agricultural Practices (GAP). Between then and 2017, the course was held 46 times throughout the world and 2,192 individuals were trained. Much of JIFSAN's capacity building on GAP took place in Latin America and was funded through an FDA Cooperative Agreement with support for specific country programs from the private sector, FDA, USDA-Foreign Agricultural Service (USDA-FAS) and the Food Safety Inspection Service (USDA-FSIS), the U.S. Agency for International Development (USAID), and Inter-American Institute for Cooperation on

Agriculture (IICA). Most of the trainings were initiated by FDA, who identified countries based on previous import refusals and trade volume data. Countries can also reach out to JIFSAN directly and request to host trainings. Figure 1 shows the number of refusals for produce imported from Latin American countries between 2002 and June 2017. Figure 2 shows the number of participants JIFSAN trained between 2000 and 2017. The two figures show that most of the countries that have hosted trainings have had large numbers of refusals. Table 1 further shows that most of the refusals were due to chemical, microbial, and insanitary contamination charges -- which can be prevented by applying GAP -- as opposed to other problems such as misbranding, permit issues, and economic adulteration. JIFSAN's GAP training program material covers ways to minimize the food safety hazards and is needed in countries that have a high rate of rejections. JIFSAN's GAP program is based on the Train-the-Trainer (TTT) approach, which posits that the most effective way to scale up training is to teach others how to lead their own trainings.

Figure 1 Import Refusal at U.S. Boarder (2002- June 2017)

Figure 2 Number of Participants in JIFSAN Latin American GAP Trainings (2000-2017)



Data: FDA Import Refusal Report (<https://www.accessdata.fda.gov/scripts/importrefusals/>).
Food import refusal data from 2002 to June 2017, accessed in July 2017.

Table 1: FDA Refusals and Charges for Selected Countries (2002-June 2017)

Country	Number of Refusals	Rank*	Type of Contamination (% of charges)		
			Chemical	Microbial	Unsanitary
Mexico	21536	1	28.13%	11.05%	24.07%
Dominican Republic	3702	13	77.53%	2.32%	9.62%
Brazil	2188	16	6.72%	9.08%	38.17%
Peru	1460	22	22.61%	2.56%	38.78%
Guatemala	1405	23	32.44%	4.08%	10.88%
Ecuador	1116	29	24.05%	10.57%	44.53%
Honduras	1059	30	10.66%	17.44%	21.71%
Nicaragua	603	42	7.12%	6.13%	30.89%
Costa Rica	546	43	29.12%	5.00%	26.76%
El Salvador	491	46	13.16%	5.86%	17.46%
Jamaica	420	52	21.93%	7.37%	28.95%
Trinidad and Tobago	400	55	20.00%	12.12%	23.85%
Panama	210	68	3.07%	13.79%	59.39%
Belize	26	115	10.00%	12.50%	35.00%

Data Source: FDA Import Refusal Report (<https://www.accessdata.fda.gov/scripts/importrefusals/>). Food import refusal data from 2002 to June 2017, accessed in July 2017.

* Rank reports the produce import refusal rankings of the countries among all U.S. trading partners.

Organizing the GAP trainings is a collaborative effort between FDA, JIFSAN, and the host countries. If FDA identifies that training for a specific country is a priority, JIFSAN reaches out to key local stakeholders to secure their buy-in. Since 2002, the host countries have been required to share the cost of the trainings with JIFSAN. JIFSAN funds the training up to the port of entry of the host country. The host country and other partners then provide funding for training activities inside the country. Some governments have also reached out directly to JIFSAN to request trainings for their food safety specialists; these governments self-fund the trainings or seek funding from donor agencies like the World Bank, USDA/FAS, etc. For all trainings, the host countries are responsible for identifying the participants who will become future lead trainers in GAP.

Latin American Countries' Interests as Exporters and for Domestic Food Safety

Many Latin American countries are large exporters of fruits and vegetables. According to the Food and Agriculture Organization (FAO), between 2002 and 2013; Costa Rica, Belize, Ecuador, Guatemala, Panama, and Honduras exported more than half of their annual fruit production. Nicaragua and El Salvador also started exporting more than half of their fruit production in the 2010s. Costa Rica, Nicaragua, and Panama exported more than half of their vegetable production between 2002 and 2013 (FAOSTAT, 2017)².

For these countries, the U.S. can be a highly valuable trading partner. Between 2002 and 2016, El Salvador, Guatemala, Honduras, and Mexico shipped 80% to 95% of their fruits and vegetables export to the U.S. Costa Rica, Jamaica, Nicaragua, and Peru shipped between 40% and 60% of their produce to the U.S. (COMTRADE, 2017)³. By adopting better agricultural practices, these countries can improve the

² FAOSTAT Food Balance Sheet estimates the weight of fruit and vegetable production and the weight of produce export in these countries.

³ COMTRADE measures the value of produce export from Latin American countries to the U.S. and their total produce export to the world.

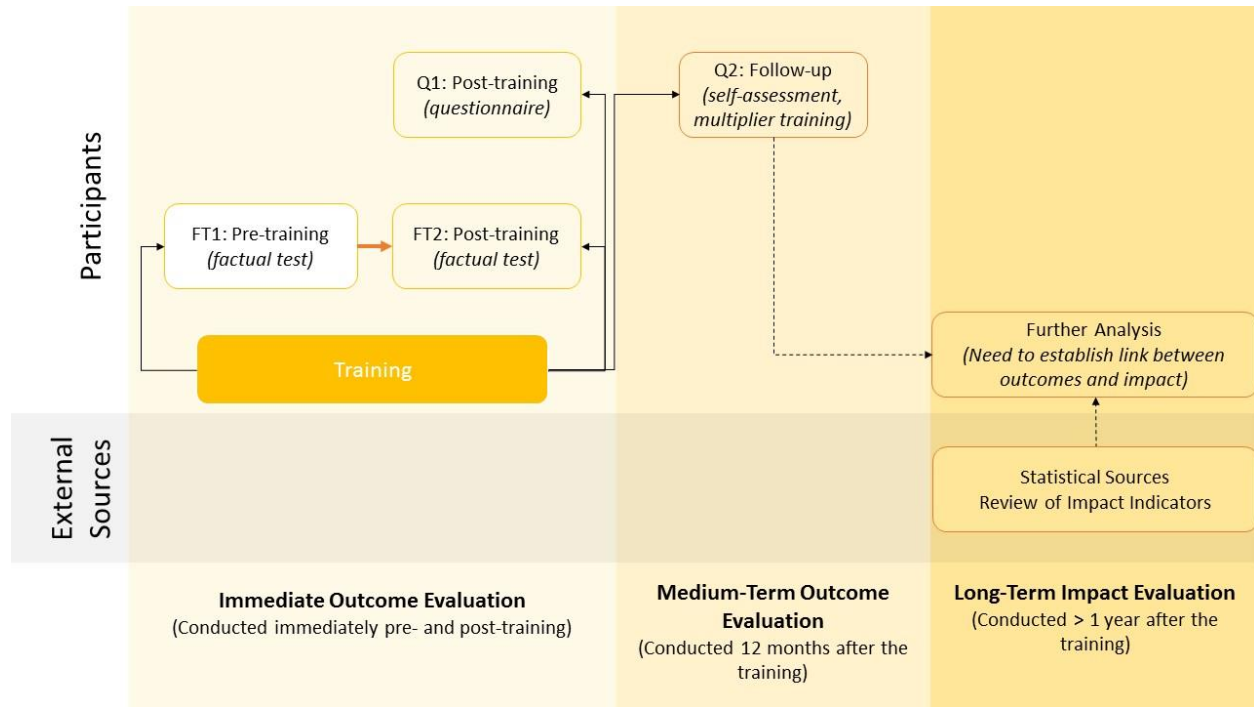
quality of their fruit and vegetable output, reduce refusal cases, and increase export to the U.S. Some Latin American countries export mostly to non-U.S. countries. For example, Brazil, Belize, Ecuador, and Panama shipped only 10% to 30% of their produce export to the U.S. between 2002 and 2016. The Dominican Republic and Trinidad and Tobago used to ship about half of their produce to the U.S. in the early 2000s but switched to other exporting destinations in the mid-2000s. We do not know exactly why there has been such a dramatic decline. Over the past couple of years, both countries had shipments stopped to the U.S. due to phytosanitary problems which they have now overcome. These data indicate that there are still opportunities for Latin American countries to benefit from trainings that can increase their produce quality and product competitiveness in the global market.

Some Latin American countries have been producing fruits and vegetables mainly for domestic consumption. Peru, the Dominican Republic, El Salvador, Belize, Brazil, and Jamaica consumed over 80% of their vegetable output between 2002 and 2013. Jamaica, Mexico, the Dominican Republic, and Peru consumed over 80% of their fruit output in the same period (FAOSTAT, 2017). These countries can use GAP to improve the safety of their domestic food supply or create opportunities for export. As GAP has been increasingly adopted by global food market players (exporters to developed countries or multinationals that sell in both developed and developing countries), producers in developing countries can attract and retain buyers by implementing GAP having their farms certified by third-party standards.

Metrics of International GAP

In 2011 FDA's International Program asked JIFSAN to develop and pilot a set of evaluation tools to measure the effectiveness and impact of these trainings. JIFSAN's approach (see Figure 3) uses a modification of Kirkpatrick's "Hierarchical Model of Training Outcomes" (Kirkpatrick, 1975), one of the most popular methods for assessing behavioral change in a training evaluation. The tools were piloted in 2012 and primary data were subsequently collected at each international training session. Questionnaires were used to collect participant feedback and pre- and post-training factual tests were administered to provide a quantitative measure of knowledge gained during the training. The data enabled JIFSAN to evaluate the immediate training effects and improve future trainings (Kirkpatrick levels 1 and 2). Approximately a year after the training, a follow-up survey was disseminated to collect information on the medium-term effects of the training (Kirkpatrick level 3). Several years after the training has taken place, secondary data sources, including FDA refusal and inspection data, trade data, and Center of Disease Control traceback data, are used to determine if there have been any long-term changes associated with rejections of a product or in trade patterns from a country in which training has occurred (Kirkpatrick level 4).

Figure 3 JIFSAN's Metrics Approach



What follows is a summary of the preliminary findings from eight international GAP training sessions that took place between 2013 and 2017 where we collected metrics data. These eight sessions took place in eight Latin American countries. The countries can be divided into two groups. The first group includes Belize and Jamaica. Both countries requested training directly from JIFSAN and are English speaking countries. They paid directly for the training through country funds (their own, or through grants from the World Bank, IICA, etc.). The second group includes Costa Rica, Ecuador, Guatemala, Honduras, Mexico, and Peru. These countries were chosen by FDA based largely on their trade volumes with the U.S. and repeated instances of import refusals due to food safety hazards, misbranding, etc. For these countries, the training costs were shared between the country and JIFSAN through FDA's Cooperative Agreement. There is no record of total costs. For the trainings supported through the Cooperative Agreement, JIFSAN provides approximately \$40,000 per training to pay for the trainers and their flights. The host country or their collaborator are required to provide local travel, housing, the training venue, and logistical support at an estimated cost of \$30,000 per program. While the shared funding policy was implemented well before FSMA, it is based on several of the principles in the FDA International Capacity Building Plan and ensures the host country's commitment to the effort while leveraging JIFSAN's resources. .

Immediate Training Effect

The measurement of immediate training impact showed positive training results. Of the 282 feedbacks collected through questionnaires, 95 percent of the respondents were satisfied with the training. According to the factual test results, participants earned higher average scores in post-tests than in pre-tests, indicating an overall improvement in their factual knowledge. The post score standard deviation was also lower than that of the pre score, indicating participants' factual knowledge became more aligned with less variation amongst participants between the two groups after the training.

In addition, the statistical analysis of the test scores and score improvements after training addressed some of the concerns about adapting trainings to international participants and points to potential improvement and training emphasis in the future.

Language Barrier

It is of interest whether trainings in teaching effectiveness differs across countries with official languages different than the language of instruction since the need for translation could undermine the quality of communication in lectures and hinder instructor-student interaction. The analysis indicated that there is no evidence that language was a barrier to learning. Preparing bilingual visual aid materials and having some bilingual instructors might have facilitated this.

All the Spanish-speaking countries were selected by the FDA and the English-speaking countries took the initiative and requested training, participants from the latter might have been more motivated. Finding no evidence of difference between the training effects of the two groups of countries also indicate there is no significant difference between participants' motivation in these two groups of countries.

Male and female difference

Female participants scored better than male participants on the pre-tests; they also improved more than their male counterparts on the post-tests. When asked to rank their knowledge before and after the training, female participants gave lower estimates of their knowledge level than male participants. It is possible that those who are already less confident in their knowledge are more willing to take in new information and correct their outdated information than those who already are confident of their knowledge on the topics taught. Changing their attitude towards learning could help to improve the immediate outcome. There is however currently insufficient evidence to link self-confidence with test performance. Further, there might not be a direct link between the content of test questions and the list of topics that were used in the self-ranking section.

Experience in profession

There is weak evidence that participants with more experience in food safety professions benefited more from the training. The participants were categorized into three groups according to their years of experience in the current profession. The findings suggest that the more experienced groups (3-10 years and over 11 years) did worse than the least experienced group (less than 2 years) in the pre-tests, but that the most experienced group improved more than the two less experienced groups after the training. Among the latter, the moderately experienced group improved more than the least experienced group, but the evidence statistically is not as strong. The evidence suggests that work experience could be a factor in future trainee enrollment by participating countries.

Involvement in food export

Since the host countries were responsible for selecting their own participants, FDA did not restrict participants to be involved in food export to the U.S. Participants' involvement in food export at the time of training varied between involvement in export to both the U.S. and other countries, involvement in export to only the U.S., involvement in export to only non-U.S. countries, and no involvement in food export. Two possible reasons for choosing someone who is not currently involved in export are 1) the participating countries want to improve their food safety in general, for their own consumers, and take advantage of this opportunity to learn from a developed country 2) the participants will move to

positions involved in export after the training, they have no current involvement because they lack the expertise.

We found that Involvement in food export did not appear to affect test performance. Participants with involvement in food export to only the U.S. did not perform better than participants with no involvement in food export in either pre-tests or post-tests. Participants with involvement in export to both the U.S. and other countries in the region performed similarly to those without export involvement in the pre-tests, but they showed significantly less improvement than their counterparts after the training. Participants in the private sector with involvement in export to non-U.S. countries had significantly lower scores in the pre-tests. Those who were in the public sector and involved in food export to non-U.S. countries performed similarly to participants with no export involvement. It is possible that harmonizing standards and requirements across countries or having food export personnel specialized by countries and regions can help reduce confusion and improve performance.

Public sector employment

There is evidence that when sector of employment (public vs. private sector) interacts with other participant characteristics, it becomes a significant determinant of participant test performance. For example, higher educational attainment (i.e. post-graduate degrees) had a positive effect on score improvement among private sector participants, but this effect was canceled out among the public sector participants. There is similar evidence that export involvement means different things in the public sector and private sector. Private sector participants who were not involved in export to the U.S., had lower pre scores than those who were involved in export to the U.S, while this was not observed with public sector participants. In the future when conducting training evaluation research, it would be worth examining how certain participant characteristics affect public and private sector participants differently.

Currently, the sample size is small. In addition, we are using test results and changes in that as a metric. Test taking is not the only measure of learning. Continual monitoring and evaluation are needed to provide more evidence to the above-mentioned results and to other questions such as if different country selection mechanisms affect training effectiveness through trainee motivation.

Medium-Term and Long-Term Effects

Efforts in following up with past participants to measure medium-term effects and gathering secondary data to estimate long-term impacts are also required to improve understanding of the effectiveness of international training.

One measurement of medium-term effects JIFSAN adopt is the multiplier effect, i.e. the number of participants trained in all subsequent trainings delivered by JIFSAN participants and their trainees. JIFSAN collects this information through follow-up surveys. Some information has been collected in Honduras, Jamaica, Ecuador, Mexico, and Belize. Surveys were sent to all the participants and 70 responses have returned. Of those who trained, 37 reported that they had held one or more formal or informal training in 12 months since their initial training, 18 reported holding six or more trainings, and 15 reported holding no trainings. Eighteen reported holding six or more trainings. Thirty-one instructor's reports having 10 or more participants in their classes.

The multiplier effect is reported to be limited for two reasons. First, the response rate to follow-up surveys is low. To collect information, JIFSAN sends individual participants online surveys through email

or fax them hard copies. Then, in-country coordinators follow up with the participants and help to collect the hard copies of the surveys and send them back to JIFSAN. Participants and in-country coordinators may not be motivated to complete the surveys one year after the training. Second, only a small percentage of participants had experience as trainers or teachers prior to taking part in the Train-the-Trainer program. We do not know if participants have committed to capacity building efforts in the countries after the training. To improve the multiplier effect and the accuracy of measurement, JIFSAN should maintain more active connection with in-country coordinators and participants.

Going Forward

With the implementation of FSMA, JIFSAN is now focusing its produce training on the new Produce Safety Rule, which is mandatory to both domestic suppliers and those abroad. The Produce Safety Alliance (PSA) and JIFSAN have created the Produce International Partnership for Education and Outreach (PIP) to roll out the Produce Safety Rule training and capacity building in international locations. They use the sanctioned training from the PSA and augment it with some of the guidance material in their regular GAP trainings. The participants trained on the produce rule receive JIFSAN's GAP guidance training material as well as the PSA training material. In 2017, FDA partnered with USDA-FAS and IICA to roll out 5 trainings internationally.

What differed in the rollout of the PSA trainings from the previous trainings was that USDA-FAS and IICA screened participants prior to enrolling them so as to identify appropriate lead trainers, who agree to do multiplier trainings. Having IICA involved in this effort has the added advantage that IICA has offices in all the countries in the Americas and, thus, can leverage existing relationships with the Ministries in the Latin American countries. A similar survey instrument as described above was used in conjunction with the new program for which the data are being analyzed. Initial feedback from the instructors indicates that screening individuals to be lead trainers has been beneficial in getting the right people to the training and it is anticipated that there will be a larger multiplier effect in the future. IICA has recently received a Cooperative Agreement with FDA to roll out additional FSMA-related training. It is envisioned that JIFSAN will be working with IICA to continue rolling out the produce safety training material and to conduct monitoring and impact evaluations of the capacity building efforts.

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