TECHNOSERVE
BUSINESS SOLUTIONS TO POVERTY

Improving the Productivity and Sustainability of Smallholder Coffee Farmers in Guatemala

A Case Study of TechnoServe's coffee project in Sololá, Chimaltenango, and Socatepéquez
2012 – 2017

LETTER FROM THE REGIONAL VICE PRESIDENT

TechnoServe is pleased to present the case study on **Improving the Productivity and Sustainability of Smallholder Coffee Farmers in Guatemala,** a five-year project funded by McDonald's USA, McDonald's Canada, and their franchisees ("McDnonald's") to increase smallholder coffee farmers' productivity and income.

In partnership with McDonald's, TechnoServe implemented the project in the regions of Sololá, Chimaltenago, and Socatepéquez, from 2012 to 2017. We worked to improve farms' productivity and farmer adoption of sustainable and good agronomic practices.

The project trained 15,129 participating farmers, mostly from indigenous highland communities, enabling them to increase their coffee yields by up to 45 percent and increase their coffee income by 35 percent. The project achieved an 82-percent adoption rate for good agronomic practices and generated $12.1 million of financial benefits for farmers over the life of the project. We also trained local staff as the project's community trainers, who have now become local leaders with the knowledge and technical skills to continue to support coffee farmers in these communities.

This case study discusses the project background and context, documents the intervention framework, and analyzes insights and lessons learned. TechnoServe believes that the training model implemented has strong potential to be scaled up in Guatemala and in other coffee-producing countries. This document is intended as a tool for other organizations considering similar interventions.

Sincerely,

Andrei Belyi
Vice President, Latin America and the Caribbean
TechnoServe

CONTENT

I. EXECUTIVE SUMMARY

Guatemala's coffee sector is unique. A reputation for high quality, strong global demand for its output, fierce competition between private wet mills, and geographic concentration help ensure that the country's coffee farmers typically receive higher prices than their counterparts in other countries. Nevertheless, most of the 120,000 smallholder coffee growers in the country remain mired in poverty. One of the primary reasons for this is that producers not only have comparatively small plots, but their yields are 60 percent lower than the global average. This low productivity is driven by poor farming practices and is exacerbated by the effects of climate change.

In December 2011, TechnoServe and McDonald's partnered to deliver a training project that would help smallholder farmers adopt better farming practices and sustainably increase their yields. The project was designed as a cost-efficient, high-impact intervention with an annual average cost per participating farmer of $155. By the time the project was completed in August 2017, it had reached 15,129 farmers – more than 12 percent of the country's total coffee producers. Even as they battled outbreaks of leaf rust, infestations from coffee borer beetles, and erratic weather, these farmers saw their coffee yields grow by an average of 45 percent and their coffee incomes increase by 35 percent.

To achieve this impact, TechnoServe recruited a team of farmer trainers drawn from the local community and fluent in the local languages. It also adopted TechnoServe's Farm College curriculum, an approach that has been used to successfully train coffee growers in East Africa, but which had never before been implemented in Latin America. The training embraced adult-learning methodologies and the use of demonstration plots to provide practical, visual lessons.

One of the most important challenges facing the coffee sector in Guatemala and across Latin America was the spread of leaf rust and other crop disease. This case study provides insights into how farmers reacted to the outbreak of leaf rust on their farms; how gender imbalances hampered initial efforts to combat this outbreak; and what types of approaches proved effective and affordable for smallholder farmers. It also shares lessons about what made the project successful as a whole. It explains why it was so important to recruit trainers from local communities, even if they did not have technical knowledge about coffee, and how the cohort model allowed the project to reach scale.

Finally, this case study provides recommendations for future coffee assistance programs in the Guatemalan coffee sector to improve the livelihoods of coffee farmers. First, trainings similar to the Farm College should be offered more broadly to Guatemalan coffee growers. Second, an effort should be made to build upon the informal producer groups formed during the project and to promote formal associations. These organizations could help strengthen the position of smallholders in the value chain and would facilitate the delivery of technical assistance. Third, efforts should be made to help smallholders acquire new seedlings to progressively replace their older trees; this would further improve the productivity and resilience of the coffee farms.

Project Impact Overview

15,129 farmers reached

57% female participation

45% average yield increase

35% average income increase

$12.1m financial benefits* over life of project
(new revenue attributable to the project)

*"Financial benefits over life of project" refers only to the new revenue that project participants earn as a result of TechnoServe's work. New revenue was calculated by comparing the participant's earnings before joining the program with their earnings in subsequent years. The portion of this new revenue that is attributable to TechnoServe was calculated by comparing the participating farmer's change in revenue with that of a similar, non-participating farmer over the same year.

II. COFFEE SECTOR OVERVIEW

THE GLOBAL COFFEE MARKET

In 2016, the global coffee sector produced a total of 152 million[1] bags of coffee (each weighing 60 kilograms) on 10.5 million hectares, which represents nearly 1 percent of the world's arable land. While coffee is grown in more than 60 countries, almost two-thirds of all production is concentrated in just four countries: Brazil, Vietnam, Colombia, and Indonesia.

A number of challenges confront the global coffee sector: variability in yields and prices; an aging farmer population and a lack of economic incentives for younger generations to stay on farms; increasing production costs and scarce labor supplies; insufficient processing infrastructure; the effects of climate change on weather variability and crop diseases; and environmental issues related to water use, contamination, and deforestation.

As a result, the profitability of coffee farming is at risk in many producing countries, which threatens the livelihoods of coffee growers. Worldwide, approximately 20-25 million farmers cultivate coffee, 80 percent of whom are smallholder farmers.[2] Generally, these coffee growers are not well organized and must contend with a highly fragmented value chain, poor access to market information, and limited bargaining power.

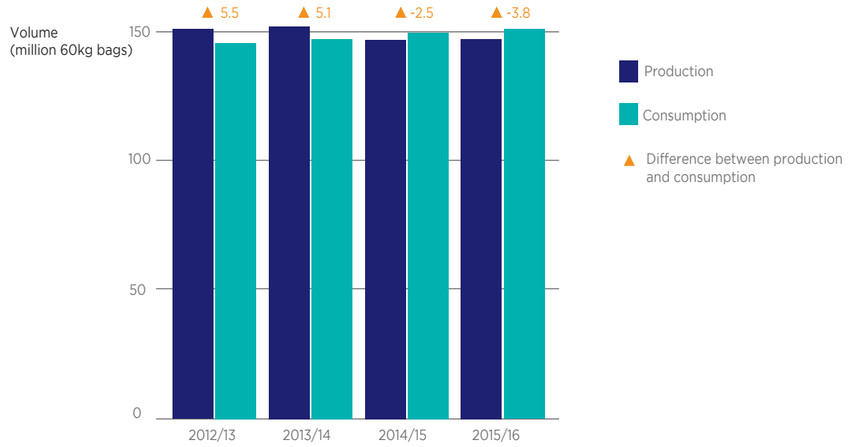
Farmers receive an average of less than 10 percent of the final market value of their green coffee, which creates a disincentive for smallholder farmers to make the necessary long-term investments on their farms or to adopt good agricultural practices. These practices directly affect productivity and incomes. Consequently, production per hectare differs greatly between countries and farm size. The global average productivity of green coffee for small producers is around 0.55 metric tons (MT) per hectare (ha), while those with more than 10 hectares have yields of 0.87 MT/ha and larger producers (> 20 ha) produce an average of 1.2 MT/ha.

On the other hand, there is growing demand that may drive the necessary changes in the sector. The average annual consumption growth rate over the last four years remains at a healthy 2 percent. Total annual consumption in major importing countries is estimated at 104.9 million bags,[3] with the European Union, the Unites States, and Japan as the leading buyers.

Nearly all of the world's commercially produced coffee comes from two species: Arabica and Ro-

Global Coffee Supply and Demand

Growing demand for coffee has the potential to drive necessary changes in the sector.



Source: "Coffee Market Outlook," 117th International Coffee Council, September 2016

busta. Arabica is cultivated at altitudes ranging from 900 to 2,200 meters above sea level and requires more rigorous care, while Robusta is more resistant to infestation and diseases and can be grown at lower altitudes. Arabica is preferred by consumers – in 2015 it accounted for 59 percent of global market volume.

The best Arabica beans are sold in the specialty coffee market, which offers farmers higher prices through quality premiums. This market currently represents about 3 percent of global production, but it is growing at a 20 percent annual rate. A new generation of consumers between 25 and 45 years of age is increasingly interested in the stories that lie behind coffee, the origin of each cup they drink, and the sustainability of practices along the value chain. These consumers are more sophisticated, environmentally and socially responsible, and highly connected to social networks, with the power to catalyze change.[4]

COFFEE PRODUCTION IN GUATEMALA

Guatemala has produced coffee since the 19th century, and today it ranks 10th in global output. The 3.5 million bags its farmers produced in 2016[5] accounted for 2.3 percent of global production. Coffee contributes about 3 percent of the country's GDP, and over 20 percent of Guatemala's total export income.[6] Just 10 percent of the harvest is consumed domestically.

Guatemala's coffee has a distinctive taste and rich flavor influenced by the characteristics of the microclimates where it is grown. The National Coffee Association of Guatemala has identified eight regions for origin-based branding purposes: Antigua, Acatenango, Atitlan, San Marcos, Huehue, Coban, Nuevo Oriente, and Fraijanes. Antigua and Acatenango also have origin denominations. Eighty percent of the coffee is cultivated at altitudes above 1,370 meters, where the slower maturation process yields high-quality Arabica coffee that qualifies as "strictly hard beans" (SHB). The country's competitiveness strategy has focused on promoting washed Arabica coffee as a specialty product, rather than a commodity. The United States, Japan, and Canada are the top export markets.

More than 125,000 farmers are involved in coffee production, of whom roughly 120,000 are smallholder producers growing less than 3 hectares of coffee.[7] These small farms collectively account for around 90 percent of the country's total planted area of coffee. The value chain is highly fragmented. Generally, smallholder producers sell individually to intermediaries who collect coffee cherries close to the plots, rather than to cooperatives/associations or directly to private wet mills for processing, as medium-sized producers do. Large farms usually have their own wet mills and use direct marketing and sales to eliminate intermediaries along the whole value chain.

Due to issues of trust, history, and culture, cooperatives and producer associations are not as strong or popular in Guatemala as they are in other coffee-producing countries in Central America. However, Guatemalan farmers selling via intermediaries still receive a relatively good price for their crop, estimated at around 70 and 85 percent of export price depending on the region and season. There are several reasons for this: the strong global demand for Guatemalan coffee, especially in the specialty market and for use in high-value blends; the large number of private wet mills competing for a limited supply of coffee; and efficient logistics that result in a lag of just two months between harvest and export.

Saving the Family Farm

"Having coffee is what we wish for."

The leaf rust epidemic provided Hilda Maria with the opportunity to contribute to her family farm. The information she learned through the project helped her family farm's productivity to increase by 29 percent.

Hilda Maria Ixcaya Ujpan was never allowed to help much on the family coffee farm. Her father tended to the coffee plants himself and, except for the harvest season, did not let his children play an active role on the farm. But that changed with the outbreak of the leaf rust on his farm.

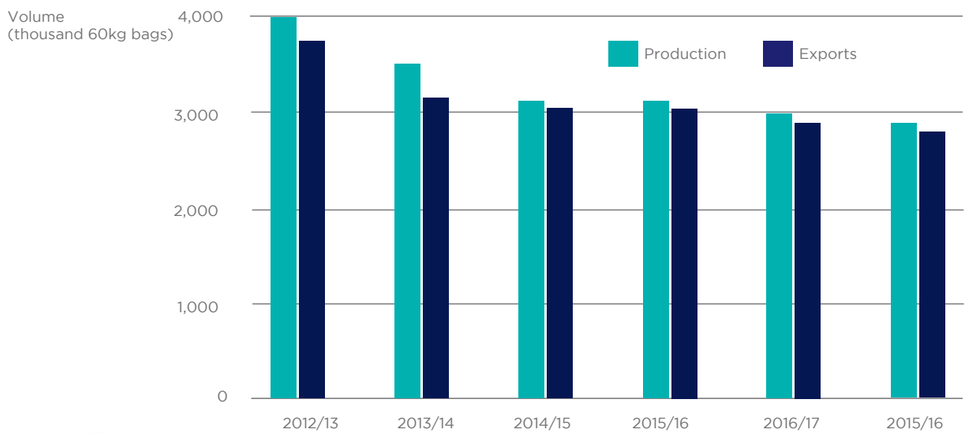
When Hilda heard about TechnoServe's training project, she begged her father to let her attend. Because he was terrified of the fungus, which he had never seen on his farm before and did not know how to stop, he accepted her request. Every month, she went to the sessions at the project's demonstration plot and went back to share the recommended practices with her father. He saw the farm's productivity increase by 29 percent after he adopted around half of the practices, but he did not adopt the rest – which is a source of frustration for Hilda. She understands that all of the practices work together, and that it is an integrated system. "One has to believe and to practice. Without practice, there are no results," she said.

Meanwhile, Hilda became such a good student that she sometimes helped the community trainer deliver the lessons during the second year of the project. She became a positive example in her community, and other farmers came to see her when they had questions.

The 28-year-old single mother is saving money she has earned from making baskets, in order to achieve her dream of having her own plot and applying everything she has learned there. Although she understands the challenges and the hard work required, coffee means wealth for her and her 9-year-old daughter. "I can do everything, just teach me, give me the chance, and I will do it," she said.

Arabica Coffee Production in Guatemala

For the last five years, leaf rust and other diseases have contributed to the decreased coffee production in Guatemala



Source: USDA

Nevertheless, the country's smallholder coffee farmers are in a vulnerable position. Farmers rely on a single annual harvest (October/November to February/March, peaking around December/January). The country average of 0.86 MT of green coffee/ha[8] for small producers is 11 percent lower than the global average. Formalized training on basic farmer skills has rarely been available for smallholders. Instead, practices have been transferred through generations of family members and between neighbors, and in some cases have been influenced by practices learned while working on large farms.

Coffee farming families pursue other sources of income as well, like growing beans, corn, and fruit; producing honey, wood, crafts, and weaving; or providing labor on farms and in urban centers. However, they still derive nearly 60 percent of their earnings from coffee.

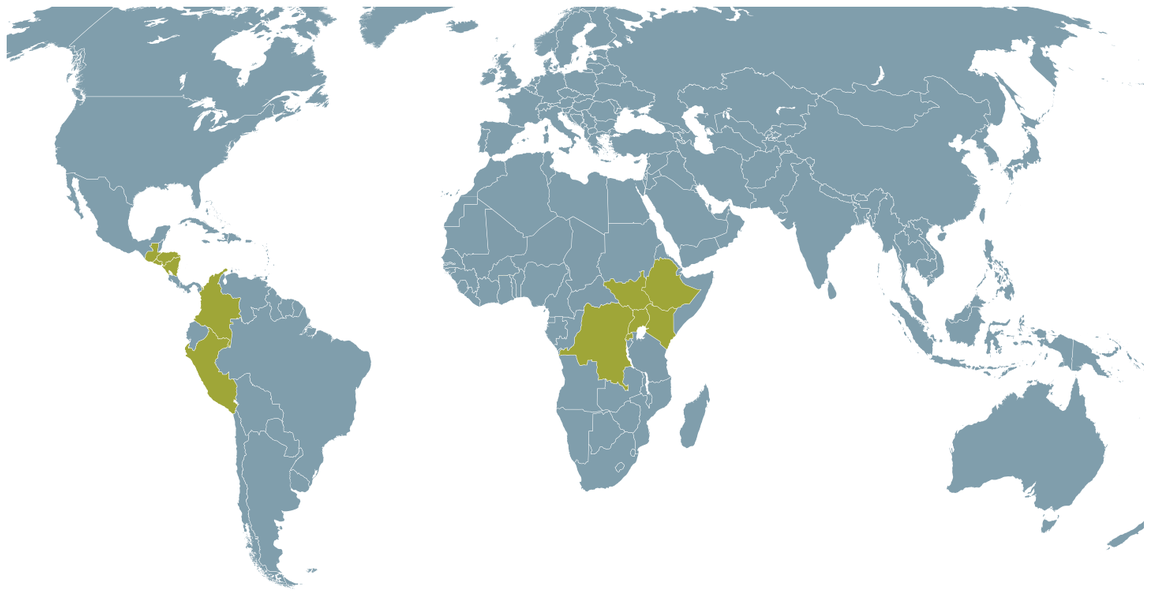
That source of income has recently come under increasing pressure. For the last five years, leaf rust and other diseases like borer beetle have posed major challenges for Guatemala's coffee farmers. In 2012, there was a large leaf rust outbreak, resulting in a 20-percent reduction in the country's coffee harvest relative to the previous year. Severe effects continued and further reduced production by 45 percent between 2013-2014.[9] Since then, production has decreased around 3 percent annually due to the sector's general challenges, such as the decline in the area planted and harvested since 2013.[10] Finally, a countrywide drought from October 2016 to February 2017 is estimated to have resulted in a 7 percent decrease in production (3.16 million bags for the 2016/2017 harvest).

Guatemala's small producers are poorly equipped to combat the effects of climate change and the spread of crop disease, due to their limited access to extension services and information about agricultural best practices, and their reliance on two non-resistant varieties of Arabica coffee, which make up 99 percent of the country's coffee production. As a result, farmers continue to be threatened with reduced yields, lower quality, diminished resilience, and increased production costs.

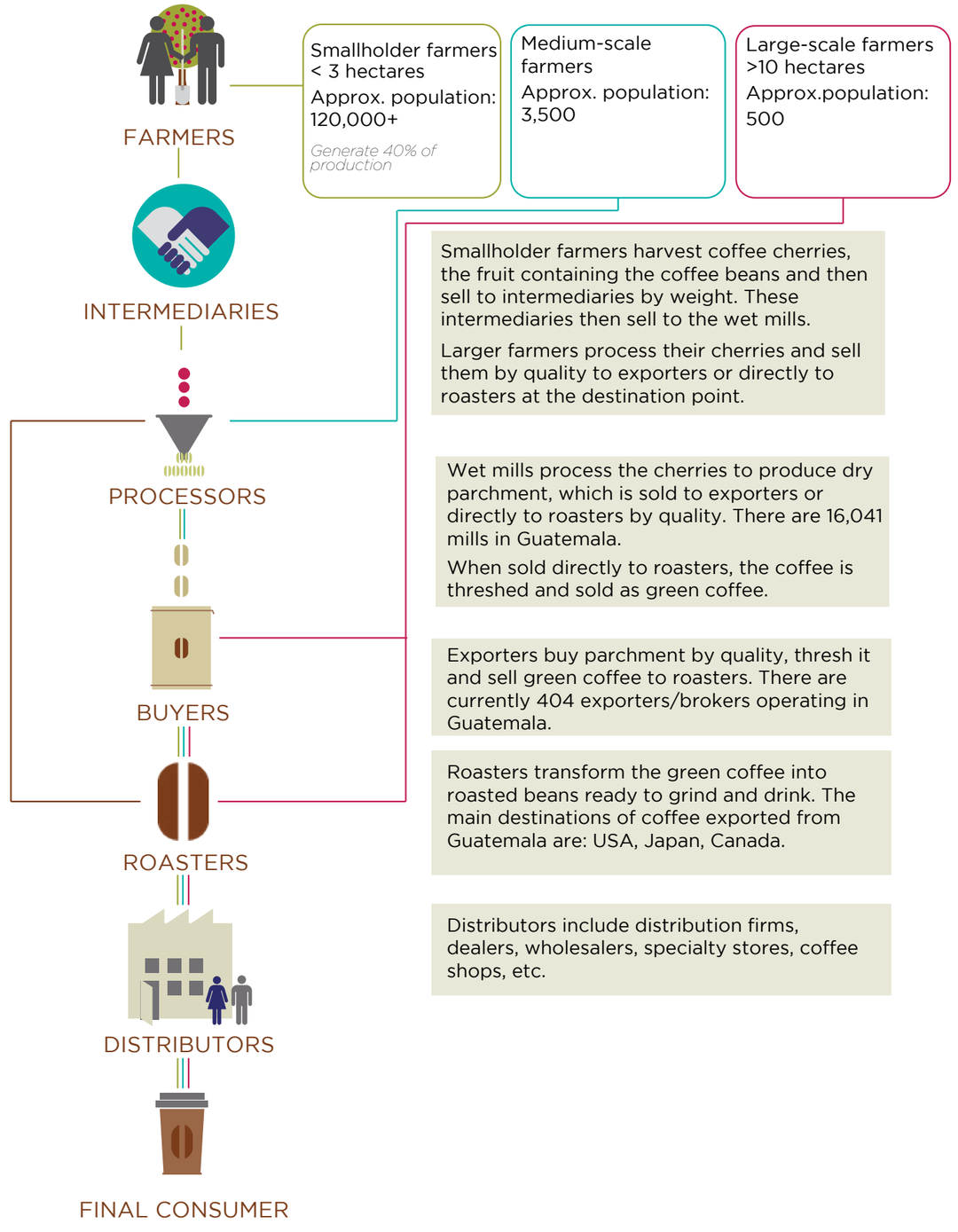
In this context, McDonald's and TechnoServe identified the opportunity to work with smallholder coffee farmers to increase their income by augmenting yields through the adoption of sustainable, good agricultural practices (GAP).

TechnoServe's Global Coffee Work

Seeking to build a sustainable global coffee industry that can lift millions of farming families out of poverty, TechnoServe has applied market-based solutions to communities in 12 countries across Africa and Latin America.



GUATEMALA'S COFFEE VALUE CHAIN



III. PROJECT OVERVIEW

McDonald's Corporation's goal is to sustainably source 100 percent of its coffee by 2020. To achieve this objective, the company not only buys coffee already verified as sustainable, but also invests locally to improve farmers' capabilities to implement sustainable, good agricultural practices. In this way, the company aims to help producers in the regions from which it buys coffee to meet the economic, social, and environmental standards it promotes. Because Guatemala is an important origin for McDonald's blend, the company partnered with TechnoServe at the end of 2011 to implement a five-year initiative in the country.

The project trained 15,129 farmers, reaching more than 12 percent of all coffee producers in the country and exceeding its original producer target by 25 percent. At baseline, these smallholder farmers' yields were 15-30 percent below the national average; the project therefore aimed to increase their coffee income by improving their productivity through training on sustainable, good agricultural practices. The coffee training was supplemented by a component designed to help the farmers increase the productivity of other key crops they depend upon, namely maize and beans.

The results from an initial assessment showed that productivity increase would bring the most benefits to smallholder farmers in Guatemala. Therefore, McDonald's and TechnoServe made a decision to focus the project solely on agronomic training, departing from TechnoServe's usual and more complex program design approach of including access to markets and finance. Through this simple and powerful model, the partners believed Guatemala's coffee smallholders had the potential to overcome their productivity challenges. By improving their agricultural practices and becoming more aware of coffee production's links to social and environmental conditions, smallholders would be able to increase yields, reduce cost inefficiencies, increase their income, and become more resilient to climate change.

Trainings covered sustainable agricultural practices and promoted the adoption of simple, low- or no-cost changes that have a positive, lasting impact on the producers and their families. The results were significant: despite changing climatic conditions and widespread leaf rust disease, participating farmers saw their yields increase by an average of 45 percent[11] and their incomes grow by 35 percent. This has had a tangible impact on the lives of many of the farmers – for instance, allowing them to send an additional child to school, acquire more land, or invest more in their existing landholdings.

"Working on your own coffee plot is freedom."

– Reginaldo Pérez, farmer, 59

GEOGRAPHIC FOCUS

Over six years, the project worked in three Guatemalan departments, selected because of their production of high-quality SHB coffee, their biodiversity, and the prevalence of poverty. In the department of Sololá, the project worked in the communities of San Lucas Tolimán, San Juan La Laguna, and San Pablo La Laguna; in the department of Chimaltenango, it was active in the communities of San Jose Poaquil, El Tesoro, and San Martin; and in the department of Sacatepéquez, it was active in the communities of Alotenango, San Lorenzo, and Dueñas Antigua.

The 15,129 farmers who participated in the project grow coffee on an average of 0.32 hectares, which is significantly less than the average coffee holding for producers in the Latin American region. The comparable figure in Colombia, for instance, is 1.3 hectares.

The departments covered by the project have a 20 percent[12] average illiteracy rate for people over age 15. In addition, 24 percent of people who speak a Mayan language, such as Tzutujil and Cakchiquel, do not speak Spanish. Illiteracy and the monolingual use of indigenous languages were also common within the project's target population, which had an average age of 43 years and was characterized by vulnerable socioeconomic conditions. The project's training modules were designed and adapted to these demographic characteristics.

The project worked with coffee farmers in three departments of Guatemala

Project Results Exceeded Original Targets

Indicator	Project Goal	Actual Results
Farmers reached	12,000	**15,129**
Participation by women	35%	**57%**
Average increase in yield	25%	**45%**
Average increase in net coffee income	25%	**35%**
Adoption of best practices	75%	**82%**
Farmers complying with mandatory practices on TechnoServe's Sustainability Scorecard	60%	**91%**
Attendance at least 50% of training sessions	70%	**84%**
Increase in food crop yields	25%	**30%**

IV. PROJECT IMPLEMENTATION

Before the implementation of the project, TechnoServe conducted additional research and defined critical assumptions, in order to inform and refine the project's key intervention lines. First, in keeping with McDonald's sustainable sourcing objectives, project staff applied TechnoServe's sustainability scorecard to a representative sampling of producers and wet mills, in order to determine the level of compliance with minimum standards on issues such as safe working environment, ethical employment practices, and responsible use of environmental resources, among others. This research confirmed that farmers' gaps could be covered through the project's training curriculum and that no additional modules had to be added. Wet mills were already compliant with the sustainability standards, so there was no need to include a specific component to address them in the project. Therefore, the focus was on training smallholder coffee farmers on good agricultural practices to increase their sustainability, productivity, and coffee income. Trainings were based on TechnoServe's Farm College model and were delivered by community trainers at demonstration plots.

Second, a farmer baseline study and soil/leaf analysis was conducted to understand current yields, production costs and agronomy practices. This baseline, together with the selection of a control group, was key to assure the relevance of the training project and the accuracy of the monitoring and impact measurement processes.

Third, TechnoServe targeted producers directly – not through cooperatives, as is usually done in similar projects. That is because only 5-10 percent of smallholders in the target regions are members of producer groups. Cooperatives are not as popular in Guatemala as in other coffee-producing countries, because the registration of cooperatives is complicated in Guatemala and many active cooperatives are not well run, with a suboptimal reputation in business and financial management.

Finally, to reach the desired scale, project beneficiaries were broken down in three cohorts, or groups: cohort 1, with 2,431 producers, started trainings in 2012; cohort 2, with 10,179 producers, began in 2013; and cohort 3, with 5,444 producers, began activities in 2014. The cohort model allowed the project to generate learnings at a small scale and provided the flexibility to refine activities and to adapt the strategy before scaling up. A total of 18,054 producers participated, of whom 84 percent attended more than half of the trainings over a period of two years. An additional year of follow-up reinforcement was provided to a group of 2,392 farmers.

Sustainability Scorecard

TechnoServe has worked with buyers and farmers to develop a sustainability scorecard that facilitates quick assessment of a supply chain's compliance across the major certification standards. The scorecard provides each supplier a summary of its performance against minimum requirements and best practices for each certification.

TECHNOSERVE SUSTAINABILITY SCORECARD	
Production and Farm Management	•Sustainable agronomic, social, and environmental practices that maximize yield and quality while protecting producers, environmental resources, and surrounding communities
Social Responsibility and Ethics	•Fair and ethical employment practices
Occupational Health and Safety	•Practices to ensure safe working environment
Environmental Responsibility	•Management of all resources and landscapes in the coffee production process in a manner that protects the local environment, producers, workers, and the community
Economic Transparency	•Consistent and complete record-keeping and transparent financial management •Remuneration of producers in a transparent and equitable manner

Each sustainability category is divided into Mandatory Practices and Best Practices
•Manadtory Practices require 100 percent compliance
•Best Practices should be implemented through a process of continuous improvement

IMPACT MEASUREMENT ACCURACY

In order to have more rigorous estimates of the quantitative effects of the agronomy training project, TechnoServe measured the adoption of best practices and productivity before and after the trainings, using a randomly selected sample of participating farmers in each region and comparing those results with those of control groups. The control groups are farmers with the same characteristics as those in the project, but who did not receive technical assistance from TechnoServe.

The control group farmers were selected under the following criteria, as compared to participating farmers:

- farming at the same altitude and in the same geographic region;
- located at a far enough distance so as to avoid indirect learning from project participants;
- similar farm size, coffee varieties, and maintenance techniques; and
- same level of organization/association; and
- similar average family size and ethnicity.

"Having more coffee means having a better future. We now have a better future."

– Walter Marroquin, farmer, 37

"Coffee is what is important, the rest are just drops that help fill the glass."

– Nazario Luis, farmer, 47

THE FARM COLLEGE MODEL

To provide farmers with the skills they need to improve their productivity, the project implemented TechnoServe's Farm College training project for the first time in Latin America, after it had proved successful in East Africa.[13] The training techniques are based on adult-education methodologies and combine small-group instruction with hands-on demonstration.

The Farm College curriculum comprises monthly sessions that address specific best practices, and are aligned with the crop cycle and delivered on demonstration plots, including:

- Pruning and rejuvenation
- Shade management
- Coffee nutrition
- Fertilizer application
- Integrated pest management (including leaf rust control and treatment)
- Weed control
- Composting
- Mulching
- Safe use of pesticides
- Erosion control and environmental protection
- Harvesting

For one full-year training cycle, there are twelve sessions, each lasting 1.5-2 hours. The monthly lessons were designed to coincide with the coffee-tree growing cycle in Guatemala, local growing cultural conditions and producer profile. For example, recommendations on how to choose the right pesticides and apply the appropriate quantity for coffee were tailored to each region. In the second year, farmers receive a refresher training each month.

At the end of the two-year training, producers received a diploma on GAP. Having this recognition helps the farmers when soliciting certification from organizations or applying for work as laborers at nearby coffee farms.

By demonstrating on the ground that small changes in production practices can lead to dramatic results, many times without short-term sacrifices in income (e.g. avoiding uprooting and planting new varieties of coffee), the Farm College approach encourages the adoption of best practices that lead to yield increases.

PROJECT STRUCTURE

3	departments
9	municipalities
8	agronomists
61	community trainers
625	demonstration plots
1-2	hour trainings (no written material, only graphic representations and "learning by doing")
1	training per month
12	training modules over 12 months
2	years of training provided to each cohort

"It takes time, but you can change people's culture. When they see the results, they change."

– Alfredo Cabrera, agronomist

"Thank you for taking the trouble of feeding our brains, teaching us by doing."

– Nazario Luis, farmer, 47

Community Leader

"People relate to me differently, they respect me more and I feel a stronger responsibility towards them."

Blanca Rosa Álvarez was the only woman trainer to train all-male groups of farmers. The income from the trainings allowed her to expand her farm in addition to helping her community.

Blanca Rosa Álvarez doesn't just look after her two young children; she has always cared for her neighbors, too. So when leaf rust started infesting everyone's coffee farms, she was worried that they were going to lose everything. The first year with leaf rust, production was close to zero in the community. She asked the government for help, but there was no response. One day, an agronomist from TechnoServe paid her a visit and asked her to join the team. Someone from the local government had sung her praises to the TechnoServe team. "I needed to help, and by agreeing to be a trainer, I was gaining the knowledge to do it right. It was my dream job: I was being paid to do good," she said.

Blanca Rosa was the only woman trainer to train all-male groups of farmers. She was successful and gained their respect by being active, motivated, and knowledgeable. She studied the modules thoroughly, practiced in Tzutujil (as the farmers did not speak Spanish), and paid close attention to the explanations that the supervising agronomist gave for all the questions the farmers could ask. "Every time I started a new subject, I did a quick oral quiz on what we had seen the previous month to make sure everyone was on board," she said.

Her main motivation was to see the changes in how the farmers worked their land. "Their participation and commitment made me happy. With all the troubles and difficulties they have, they still participated, which means that what we were teaching them was useful," she said.

The project had a limited supply of tools to lend to farmers, so she was happy to see that farmers were bringing their own tools and sharing them with the other participants. Now the farmers know how to manage their farms and are better off. "They spray *quequesque* [an organic plant-based fungicide], have traps, and manage shade. The silver lining of the leaf rust outbreak was that it created an incentive for farmers to attend training, since they did not know how to address the problem on their own. As a result, the farmers grew to have more productive and better-managed coffee plants and, as the leaf rust problem was so big, community members were putting aside much of the sexism," she said.

Blanca's life changed dramatically as a result of her work as a community trainer. With her salary, she was able to buy 6 new *cuerdas,* or approximately 0.4 hectares (see page 31 for more about cuerdas as a unit of measurement). She planted additional coffee trees on her new land, and now works alongside her husband to apply everything she has taught others.

Blanca felt empowered as a community leader. Once she became aware of the communities' problems, she could not look the other way. For example, she noticed that the children whom mothers brought to training were often skinny and pale, signs of critical child malnutrition in the mountain villages. Blanca reached out to an organization and asked for materials and an instructor to teach the mothers how to use nourishing vegetables and herbs, which they grew in their yards, to better feed their children. After one of the coffee sessions, she also taught the women to bake cakes and bread. "I visited them about three months ago, and now they are selling enchiladas, and other foods. It started as a project to improve children's nutrition, but now women are contributing to the family income," she said.

COMMUNITY TRAINERS

TechnoServe recruited members of each community to deliver the trainings. There was a total of 61 community trainers in the project, 18 percent of whom were women, and two-thirds of whom were under age 35. They were all well known by their neighbors, with the ability to communicate both in Spanish and the respective local indigenous language. No prior coffee experience was required: community trainers were chosen based on their social and people skills, rather than on their technical knowledge. Seventeen were school teachers.

Eight professional agronomists covered technical coffee experience and knowledge. These agronomists led teams of community trainers, teaching them both the technical concepts and the methodology for transferring knowledge and mentoring farmers during farm visits. The agronomists were also responsible for monitoring and evaluating the implementation of the project in each region.

The community trainers' role was key from the start of the project. There were no available lists of coffee farmers in any of the regions, so it was through the community trainers' knowledge of their communities and invitations to their neighbors and acquaintances that potential participants were identified and recruited. Farmers came to the initial trainings mainly because they knew and trusted the community trainers.

Community trainers received lessons on TechnoServe's adult teaching methodology, CREATE, and on technical coffee topics. Each training module had a corresponding booklet laying out very clear steps, like a "recipe" to use for each session, ensuring that all trainees received the same detailed information. At the beginning of the project, community trainers received an initial week of training, and then, just before delivering the month's corresponding module, agronomists provided a refresher training on the specific subject to be taught. During these workshops, community trainers had practice runs where they rehearsed module content, how to deliver it, and how to answer the questions they might receive.

Each community trainer was responsible for training up to 10 groups of 25-30 farmers. The community trainers also conducted farm visits to each participant, in order to resolve individual questions, verify adoption, and monitor progress. Trainers and trainees forged a relationship based on trust, continuous learning, and improvement.

Sometimes, TechnoServe loaned farmers new tools, so that they could try them out before deciding whether to purchase them. In the case of inputs, farmers were taught about organic alternatives that could serve as complements when they did not have enough money to buy the recommended four annual applications of chemical fertilizers. Also, in some areas, the project forged alliances with input providers so that farmers could purchase the products in more accessible smaller quantities, rather than the usual bulk quantities. These initiatives helped to smooth the decision-making process and facilitated the adoption of those practices that required some kind of investment.

One of the most important impacts of the project – and an unintended one – was the empowerment and increased leadership of community trainers. At the start of the project, the community trainers' profile was very similar to that of many beneficiaries, and their lives and social status changed through the project. Many did not grow coffee before the project, but after learning and teaching coffee GAP, they bought land and planted their own plots. Some purchased motorcycles or became input sellers who now supply farmers with affordable fertilizer. Moreover, the project's community trainers gained recognition in their communities as technical experts and leaders. Even after the conclusion of the project, the communities will continue to benefit from this enhanced human capital, which is fundamental for the communities' well-being.

“CREATE” ADULT LEARNING METHODOLOGY

Giving community trainers the skill set to teach adults is fundamental to the success of TechnoServe’s projects. Adult education methodologies are an important part of this approach. The CREATE method assures that every concept is seen, heard and done by all participants so that each person receives all of the information in the format in which they work best. CREATE stands for: Connect, Reflect, Engage, Activate, Try and Test Out, and Encourage. Every session begins with an icebreaker to help participants get in the mood to interact and learn.

Employing local community trainers instead of extension workers improved the cost efficiency of the project and fostered lasting impact by building capacity in the community.

“Now I’m someone respected. I learned a lot. Now I have a broader vocabulary and communication skills, and I think I express myself better. I’m more motivated. I feel happy, because everywhere I go, people know me, and they know me for a good thing I did for them.”

– Victor Quiñonez, community trainer

DEMONSTRATION PLOTS

In each training group, a volunteer farmer was selected to host a demonstration plot on his or her land, where the farmers would attend each session. Demonstration plots were selected based on the owner’s interest and willingness, as well as the relative distance of the land from the rest of the trainees. The project also tried to place demonstration plots on farms belonging to people who were leaders in the community, as this helped to improve attendance. By having all trainings at the demonstration plots, farmers could see and understand the best practices firsthand, even if they were unable to read and write. In addition, all handouts were graphic representations with nothing in writing.

During the sessions, all farmers had the chance to practice what their trainers were teaching and to have a hands-on experience. They could then go directly to their plots to apply the technique, as the training calendar aligned with the needs of the coffee farm at any given time. By working on the same demonstration plot for the whole year, the training groups could see for themselves how different techniques affect coffee trees, which encouraged adoption of best practices.

Because more than 90 percent of the farmers in the project were not part of a cooperative or farmer group, the two years of training and working together at a demonstration plot changed their social dynamics, by creating informal, trust-based groups.

Farmers were invited to trainings through mobile phone text messaging. Because many of them were illiterate, their sons and daughters were often the ones to read the messages. Also, farmers with demonstration plots became the project’s spokespeople, helping to organize trainings and showcasing results to promote the adoption of best practices. Even these farmers, however, often needed to see the results on their demonstration plot before replicating actions on the rest of their land.

The project team started by setting the schedules according to the dates and times that worked best for the staff, but farmers did not always come – not because they were uninterested, but because the times did not work for them. In Sololá, for example, where the majority of trainees were women, no one came in the mornings. They had to cook, take care of the children, and engage in other domestic responsibilities. Attendance rates improved once the team began to set up schedules according to the farmers’ preferences.

The project staff came to understand the communities’ needs and interests and looked for ways to help ensure that farmers would be able to attend training. For example, in Chimaltenango, many women could not attend trainings because they had to gather wood every day to use in their limited cooking facilities. TechnoServe contacted Habitat for Humanity, which facilitated clean cooking stoves for around 1,000 families that invested their own money and time to buy the concrete and build the blocks. The families then cut down fewer trees, cooked under better health conditions, and had more time to attend trainings.

In other areas, agronomists had to update their knowledge of food crops or farm animals in order to help farmers with their other income streams. As farmers had never received formal training on these subjects, they wanted to benefit as much as possible when the agronomist accompanied the community trainers on farm visits. Answering these questions built the farmers’ trust with the project and kept them engaged.

“At the demonstration plots, we learn and pay attention, while in closed spaces, we get bored and distracted. It is key to see how it is done in actual practice.”

– Walter A. Marroquin, farmer, 45

WOMEN'S PARTICIPATION

Women represented 57 percent of the total farmers trained, and led more than half of the project's demonstration plots.

Traditionally, women in Guatemala have limited participation in coffee production activities. In departments like Sololá and Socatepéquez, coffee plots are regularly located a distance away from the home, which means that women with significant domestic responsibilities are involved with the crop only during harvest season. In Chimaltenango, it is more likely that the plot is close to the household, and women therefore get more involved in coffee farming. However, their participation is still marginal.

Women represented 57 percent of the total farmers trained in GAP during the project. Women also led 53 percent of the demonstration plots. Because coffee represents a little more than half of an average coffee smallholder's income, men usually have other commitments (such as cultivating other crops or working at larger farms, in local tourism, or in the city) and often preferred that their wives attend trainings.

Although women had less coffee experience than men prior to the project, the sex of the trainee had no significant effect on the rates of adoption and productivity increase. However, many women say that this training improved their communication with their husbands, and their participation in decisions related to their livelihood. Women who led demonstration plots felt proud to be recognized as coffee growers and to have people learn at their farmers. "After our husbands started seeing results, the relationship changed. Now they ask for our opinion, we talk about coffee. I think they see us differently," Rosa Faustina Sisímit, a 41-year-old farmer, said.

"Together [with my wife], we are stronger, we go in the same direction, and that gave me the enthusiasm to plant 200 new plants."

– Brigido Catá, farmer, 51

V. IMPACT

Over the course of the project, 15,129 farmers were trained in good agricultural practices (GAP), with an average productivity increase of 45 percent attributable to the project. This was a sustained result, supported by an 82-percent average adoption rate of GAP, including a 91-percent compliance rate for basic sustainability practices. TechnoServe estimates that the average farmer saw his or her annual coffee net income increase by 35 percent after implementing the best practices, and that increased productivity generated $12.1 million in total financial benefits. This impact is projected to continue after the project closes, with total financial benefits of $21.5 million forecasted for the period 2014-2019. The return on investment of the project was $4.6 for every dollar invested in training.

As a result of their participation in the project, coffee growers improved the sustainability and productivity of their coffee crops. As adoption rates were maintained throughout the period of implementation, the project demonstrated the potential for long-term impact.

PROJECT RESULTS

45% productivity increase

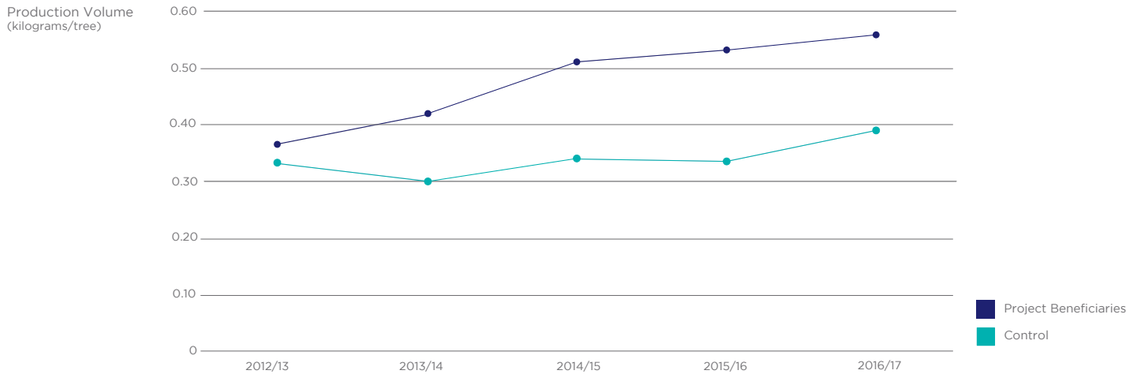
82% adoption of GAP

35% coffee income increase

91% compliance with minimum sustainability practices

Productivity Gains

Total productivity of participating farmers was 43 percent higher than that of the control group for the 2016/2017 season



RETURN ON TECHNOSERVE INVESTMENT (ROTI)

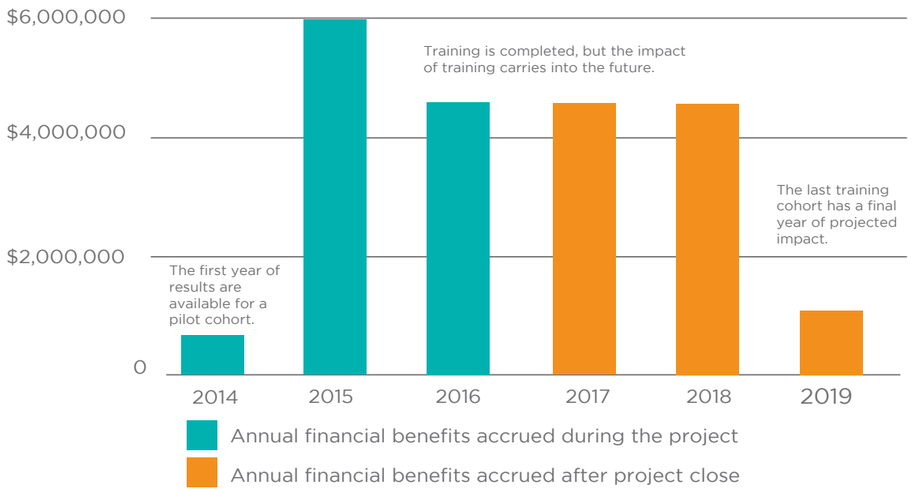
TechnoServe seeks to ensure that the value of our work is greater than the cost of implementation. We calculate a "return on TechnoServe investment" (ROTI) score for completed projects as a measure of their cost-effectiveness. ROTI is the sum of financial benefits accrued during the project and projected financial benefits for three years after project intervention, divided by the cost of implementation. Scores greater than 1 indicate that we have delivered more value to beneficiaries than was invested in the project.

The ROTI for this project is: $\frac{\$12.1 \text{ million} + 9.4 \text{ million}}{\$4.7 \text{ million}} = 4.6$

- financial benefits realized through 2016
- financial benefits projected for 2017-2019

Lasting Impact

The financial benefits that farmers gained through the program are sustained well after project close.



THE IMPACT OF INCREASED INCOME

Before the project, most farmers did not prioritize investing in their farms – especially when the practices they knew about were considered either a luxury or discretionary, rather than fundamental to good results. Now, the first priority for most is setting apart money for fertilizer; if they have children, that investment is followed by purchasing uniforms and supplies so that the children can go to school; if they don't have children, the second priority is usually other key inputs.

> When we we get the money from the harvest in January, my son says, 'Let's do the numbers, Dad. Then he sees how much we got, how many kilograms of fertilizer we will need, what inputs and foliar we need to use, and how much we have left to eat."
>
> – Antonio Marroquin, farmer, 59

Weathering Change

"I dream of giving my children a good future…I hope they will harvest tomorrow the benefits from what I'm planting today."

Reinaldo Pérez was able to revive his coffee farm from a drought with proper fertilizer applicaiton and other best practices.

Extreme weather is a serious threat to smallholder farmers like 59-year-old Reinaldo Pérez, who lives with his wife in San Martin, Chimaltenango, and works 3.5 cuerdas of coffee in the hills around the community. At the end of 2016, his farm was hit by a serious drought. The rain came at the wrong time, the coffee plants did not flower, there was little coffee, and the crop did not mature properly, with reduced weight.

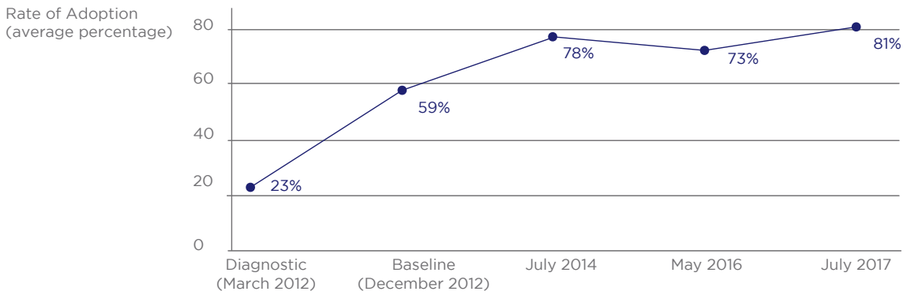
Fortunately, Reinaldo had enrolled in the training project five years earlier, shortly after he inherited the coffee plots from his father and retired from his work as a security guard. In the training sessions, he received all of the technical knowledge he'd lacked. "I learned that [some of] the trees were too old. I cut them and started from scratch, replanting with some savings and applying – from the start – everything that I was learning," he said. Because prices for chemical fertilizer are often high relative to the potential earnings from coffee in the region, Reinaldo learned to supplement his semi-annual fertilizer application with organic products; it takes longer to strengthen the coffee, but the effects last for two to three years. After two years in the project, the plants started producing great coffee, providing evidence of the practices' usefulness.

Those best practices helped Reinaldo weather the drought. "The climate is unpredictable. But if you do the work, at least you give your plants the strength to pull through," he said.He could see that while his farm was suffering, it was doing much better than those of his neighbors who had not attended the trainings. He tried to help them by sharing what he knew, though the farmers were reluctant to do things differently.

Reinaldo sees coffee growing as a good way of life; he hopes to continue expanding and to leave more for his kids. He understands that, as with everything else in life, there are ups and downs, and that you need to be resilient if you want to see the fruits of your work. "My trees survived and you can see in the stems that the 2018 harvest is going to be great. Everything that is resting will bloom in 2018," he said.

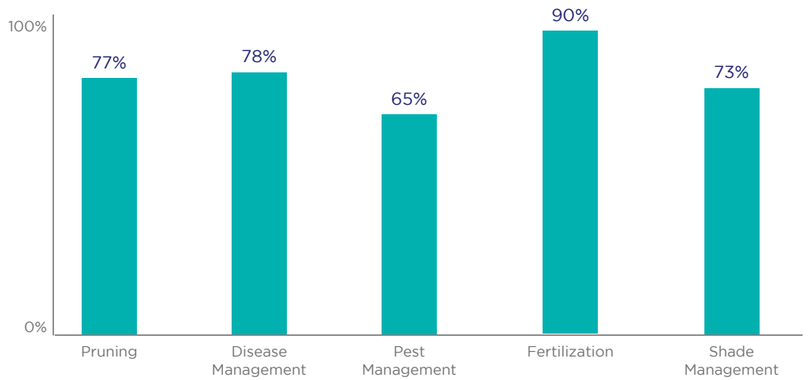
Adoption Rates Increased Over Time

Average adoption rates between 2012 and 2017



Adoption Rates Varied By Practice

Average adoption rates for key practices over life of project



"The first year of the project, almost no one adopted the techniques. They were waiting to see the results on the demonstration plots. The second year, once the practices proved useful, they started to change and even asked for personal assistance, beyond the usual monitoring visits."

– Mario Penelu, Agronomist, 24

PRUNING AND REJUVENATION

Prior to the project, many of the smallholders were reluctant to adopt pruning, fearing that it would be tantamount to killing the tree and ending its entire production. They preferred having tall, skinny trees with scattered cherries, rather than risking productivity losses from pruning. As a result, selective pruning was one of the most important practices taught in the project. Farmers learned to choose just three branches to prune at a time, so that the tree continues to produce. Once the farmers saw the short, leafy, and healthy trees that had been pruned at the demonstration plots, they overcame their reluctance and started pruning.

The project achieved a 77 percent adoption rate for pruning practices.

"My husband didn't want to prune, because he thought we would have no money for a while. After he saw the results of the selective pruning at the demonstration plots, he did it, and then was more open to listening to me and doing everything else."

–Vitalina Ohichali, farmer, 36

INTEGRATED PEST AND DISEASE MANAGEMENT: LEAF RUST AND COFFEE BORER

A few months into the project, the leaf rust epidemic reached a critical stage in the target communities. The fungus was new for these regions; producers had never seen it, as it was usually present only at lower altitudes. Fortunately, a module on disease management had been provided to the first training group before the epidemic took hold, and many farmers were able to take some preventive actions. But later groups began training at the peak of the leaf rust infestation. Unfortunately, once leaf rust is present, it is difficult to eradicate – it can only be contained. On many farms, coffee borer infestations had also become serious, and when farmers started to take steps to manage the leaf rust epidemic, they also noted the other infestation. The coffee borer beetle was affecting the crop in many regions, but the farmers could only see that the coffee had no weight when they sold it.

A specific module on leaf rust management was provided and information about the fungus was added to other modules. In the case of coffee borer, the use of traps was important, as it gave the farmers the ability to see the insects.

The information about leaf rust was new and useful, even for the most advanced farmers, like Armando Alvarez. The former agronomist at the San Pedro cooperative said, “All the techniques to manage leaf rust were so surprising and effective.” The trainings showed the farmers a number of alternative techniques, including the application of chemical fungicides and natural methods. One natural preparation was made with *quequesque*, a pungent plant that grows all over local communities; its roots can be squeezed and mixed with water to form a compound to prevent and manage leaf rust, though it takes longer to do so than chemical products do. The strong focus on developing natural fungicides allowed farmers to continue to manage pests and diseases even when they didn’t have enough money to buy chemical products.

However, practices related to the prevention of leaf rust were not accepted right away in all regions. In Chimaltenango, and particularly in the community of Poaquil, these were the most difficult practices to adopt. Farmers were reluctant to fumigate because they believed it ruined coffee, viewing the fungicide as a kind of poison. They were more open to organic alternatives, especially because these required little monetary investment. But leaf rust struck hard in this region, and there was no time to wait for natural methods to act. Generally, it was women who attended trainings in this department, sent there by men who did not have time to attend themselves. When women came back with solutions, the men were resistant to adopting these new practices, as they were not accustomed to working with women on these issues. Nonetheless, women asked them to go and see the results on the demonstration plots for themselves, after which they were more open to implementing the techniques.

Incidentally, the leaf rust epidemic may have made it easier to recruit farmers to participate in the project. Though it was harvest season, the project had no difficulty finding or encouraging farmers to attend trainings: they didn’t know what to do to combat the epidemic and were anxious to receive training.

The project achieved a 78 percent adoption rate for disease management practices, and a 65 percent adoption rate for pest management.

LEAF RUST AND CLIMATE CHANGE

Coffee leaf rust is a fungus that has been affecting farms in Guatemala since the 1980s, especially at lower altitudes. It appears as small, yellowish, oily spots on the upper leaf surface that expand into larger round spots that turn bright orange or red and finally brown, with a yellow border. Rusted trees lose their leaves, have significantly lower coffee yields, and usually die within a few years. The disease can be managed by planting Robusta or resistant hybrid varieties, and by using specific fungicides, but the preferred Arabica varieties are particularly vulnerable to the fungus. Arabica, cultivated at higher altitudes, was long protected by the fungus’s cold sensitivity; however, global warming has changed climatic conditions, and leaf rust is now affecting farms in higher regions. Central America has seen many farms lose their entire crop or the ability to produce coffee of the quality required by buyers. This means that those farmers who continue to plant less resistant coffee, despite potential market price premiums, assume a large disease risk.

“When leaf rust struck, we didn’t know what to do. That is why we decided to attend the first meeting, and then we continued, because sessions were practical and gave us the type of knowledge we needed to manage the crisis. Many were desperate to save the coffee…it is our main source of income.”

– VICENTE EZEQUEL, FARMER, 26

Combating Pests

“My major challenge was coffee borer, and the methods taught were powerful.”

Juan Carlos used to fertilize whenever he had some spare money. After training through the project, he implemented best fertilizing practices, increasing his production and saving him money.

Juan Carlos Cholotio has been around coffee most of his life, as a worker on a large coffee farm and then as a smallholder coffee grower himself. But in 2013, when his coffee cherries began to lose weight – and therefore value – he did not understand what was happening. It turns out that it was an infestation of the coffee borer, and the young farmer turned to the TechnoServe training program to learn how to fight it.

Through the training sessions and support from the project’s agronomist and community trainer, Juan Carlos received the information he needed to fight the coffee borer. By applying the practices he had learned, he quickly saw positive results, which convinced him to continue attending each monthly session. The training model itself helped, as well: “The method was great, because they always started with a game that helped clear the mind from its daily worries, and set it in a more attentive mode. It was all very dynamic, didn’t take up too much time, and each session was aligned with the crop’s cycle, so we could go straight to practice on our plots,” he said.

The training profoundly affected the way Juan Carlos approached his farm. Using techniques he had learned by watching his neighbors, he used to fertilize whenever he had some spare money – he knew it was important but didn’t know how often, how much or what type of fertilizer to apply.

Now, Juan Carlos is a star farmer who diligently applies best practices on time: pruning, fertilization, borders, traps, etc. Despite the effects of the drought at the end of 2016, his average productivity has increased by around 40 percent. “Everything is relevant and has a purpose. You need to do it all and just at the right time, if you want to see the results. I have the [coffee borer beetles] under control, and the cherries are coming in fat and heavy,” he said.

In addition to the work he does on his own 5-cuerda farm, Juan Carlos provides labor on other farms in order to support his five children. However, he dreams of getting to a point where he can dedicate himself full-time to his coffee farm, selling premium coffee directly to the wet mill. That dream is coming closer to becoming reality: his trees are more productive, and he is saving his additional earnings to buy more plots and plant new coffee.

FERTILIZATION

Before the project, many farmers did not know how to properly fertilize their coffee trees. Farmers who fertilized before the project typically did so without knowing the type and doses to be applied, often using inappropriate varieties and excessive quantities.

To provide farmers with accurate recommendations on fertilizers, TechnoServe conducted soil analyses to determine the necessary fertilizer formulations and quantities for each region. These recommendations were shared in training sessions focused on the cost-effective use of fertilizers and the use of organic alternatives.

In regions like San Martin, where some farmers already used a generic fertilizer, project staff showed coffee growers that there were specific formulas for coffee.

Additionally, illiteracy made it difficult for some farmers to identify which agrochemicals to buy, since they could not read the labels. Community trainers taught these farmers how to recognize the products by the color of the tags.

There is still an opportunity to increase the benefits of fertilization. Producers were not enthusiastic about building terraces and dead barriers, as many of the farmers work the plots by themselves and that kind of construction is hard work. However, these are important practices to prevent fertilizer from sliding downhill before they can benefit the plants.

The project achieved an impressive 90 percent adoption rate for fertilization.

It was interesting to learn the right doses of fertilizer. Before, we were not only losing money, but poisoning our trees.

– Felipe Ismael Piy Ujpan, farmer, 22

Coffee farmer Julio Segura displays his worm casting fertilizer.

SHADE MANAGEMENT

Shade management was the practice that took the most time for farmers to adopt. Many farmers had *jocote* trees, which yield wood that can be used in stoves and for other purposes, making it a good source of income. Some farmers also considered the jocote to be a shade tree, but it grows foliage when it rains and loses leaves in summer – exactly the opposite of what coffee plants require. Understanding the farmers' needs, project staff suggested it as a hedge and recommended alternatives like gravilea and fruit trees for shade.

Improvements in productivity simultaneously help protect the environment and mitigate the effects of climate change. Agricultural best practices, such as shade and mulching, help to lower temperatures, maintain moisture levels, and increase available nutrients during a drought. Best-practice adoption also protects coffee trees, reduces the severity of soil erosion, and limits flooding during tropical storms. Shade-grown coffee promotes biodiversity and is highly protective of the landscape, compared to many other land uses, such as cattle farming. Proper shade management can also help increase resilience of coffee producers to the effects of climate change. In our experience, farmers are most likely to improve their environmental stewardship if changes are implemented incrementally and accompanied by economic gains, even if such gains are modest ones.

The project saw 73 percent of farmers adopt shade management practices.

"After implementing what I learned, productivity has increased, even though the climate is crazy. The plants show that next year's harvest is going to be a good one. They show me the future."

–Reinaldo Pérez farmer, 59

"We don't like shade management we need the wood. I don't think I'm going to do that practice."

– Cecilia Matazar, farmer, 40

VI. INSIGHTS AND LESSONS LEARNED

Breaking down targets is key to reaching scale.

In this region of the world, it is uncommon for technical assistance projects aimed at smallholder farmers to be implemented at the scale of this project. TechnoServe's Guatemala team was worried about its ability to effectively reach the 12,000-farmer target. One of TechnoServe's global coffee experts suggested breaking down that number into three cohorts. In this way, attention is focused on each cohort until the target is reached. Also, and most importantly, given a project's learning curve, mistakes are not committed at scale. Instead, there is space to learn and adjust, and for methodologies to be tested and then refined. The farmer target was broken down as follows: 2,431 farmers recruited in 2012, 10,179 farmers in 2013, and 5,444 in 2014. The first group of farmers was difficult to reach: the staff did not know how to inform the farmers about the existence of the project, where to locate them, how to invite them, and who the best local allies for the project would be. Once they learned about the project and the community trainers that were being recruited from their communities, the farmers started to join the project – especially in response to the leaf rust outbreak.

Working with community trainers boosts impact.

Agricultural assistance projects in Latin America often have a large team of local (when possible) agronomists and technical experts, and perhaps a few people from the community for non-technical training. This project, however, was implemented in the same manner as TechnoServe's projects in East Africa: with a small expert/technical staff and a large base of community trainers. The decision was based on cost efficiencies, but we learned that this approach is not only more cost-effective, but simply more effective, too. Without the community trainers reaching out to farmers, the project would have faced enormous challenges. For example, community trainers spoke the farmers' languages. There are five Mayan languages spoken by participating farmers – many of whom do not speak any Spanish – therefore only someone from the area would be able to communicate with them and translate the curriculum.

Having local trainers as part of the team also helped the project impart confidence. When people are convened for the first time by someone they know and trust, they are much more willing to attend. Once they see the methodology is dynamic and the content is useful, the farmers continue to attend.

> "We don't know how to write or read, it is just what gets stuck in our minds, but you believed in us. We learned by doing, and it has stuck."
>
> – Esteban Mizason, farmer, 48

Demonstration plots provide visual evidence and promote attendance in trainings.

At the beginning, farmer attendance was difficult to maintain. However, the visible improvements observed on demonstration plots motivated attendance. TechnoServe identified group leaders and set the demonstration plots on their land. This empowered them, and these farmers became key allies in inviting people to see the results and in encouraging farmers to adopt GAP. Likewise, farm visits build human connection and trust, generating commitment to attend trainings and adopt practices.

Adapting indicator measurement can improve accuracy.

Farmers in Guatemala use cuerdas as area units instead of hectares, but TechnoServe found that cuerdas are not of equal size in all regions: one cuerda is 676 square meters in Sololá, 900 square meters in Alotenango, and 441 square meters in other regions. Also, different regions have different planting densities – which did not become standardized, as the project did not include planting or farm renovation components. Not having unified area units and "standard" planting densities increased a probability of error in the impact measurement process. Generally, TechnoServe measures these indicators by hectare and makes recommendations based on area, but given the differences, the staff had to adjust and provide the recommendations at the tree level. Yield and net income data were measured and expressed on a "coffee plant" basis (pounds/plant and quintals[14]/plant, respectively) rather than on an "area" basis (pounds/hectare and quintals/hectare). This strategy keeps the different planting densities from affecting the results and eliminates the complexity of the divergent area units.

Robust monitoring and evaluation can be achieved while adapting to security challenges.

The use of tablets for monitoring and evaluation (M&E) purposes has become popular in development projects, as it facilitates data gathering, increases efficiency, and improves accuracy. However, the wisdom of bringing that sort of gear into the field depends on the local context. The M&E system for this project was initially designed for tablets, but community trainers did not want to use them, because they feared being the victims of robbery. Instead, they gathered the information on paper and then, when at home, transferred it to the tablets and submitted it to the project's M&E manager whenever they had access to the internet. Therefore, because the project could not take full advantage of the benefits of using tablets, it had to adapt the system to a more traditional approach, as well as strengthen the data-cleaning and verification processes.

VII. THE WAY FORWARD

Guatemala has the bio-climatic conditions needed to grow the coffee sector, particularly the specialty market segment. However, around 50 percent of production depends on smallholder farmers who lack the information required to improve their yields, adopt best practices, enhance sustainability and cost-effectiveness, or increase their resilience to climate change. Addressing this challenge takes time and requires a capacity to reach scale, which national coffee institutions currently lack, especially since there are relatively few cooperatives and producer groups. During the project, 15,129 producers were trained and achieved an average of 45 percent increase in productivity and 35 percent in coffee net income. The model has been proven successful and should continue. TechnoServe recommends the following next steps to build on the project's work.

Scale Up

The project reached more than 12 percent of Guatemala's coffee smallholders. To secure the sector's long-term sustainability, however, many more farmers need to increase their productivity and income. TechnoServe believes that training on agricultural best practices should be scaled up throughout Guatemala. Furthermore, the project produced strong evidence that an approach like the Farm College has the potential to address the most significant vulnerabilities in the Guatemalan coffee sector and in other coffee-growing countries of Latin America.

In three departments, TechnoServe has brought together essential local actors: agronomists, community trainers, and producers. This enables public or multilateral organizations to continue, reinforce or build on the work already done. In San Martin, for example, Fair Trade is working with agronomists and community trainers to implement a certification project with 4,000 farmers who graduated from the project.

Promote, Formalize and Support Producer Groups and Cooperatives

Through the project, 15,129 coffee farmers were organized into informal groups of 25-30 which, for at least two years, learned together, shared experiences, and built trust. As a result, around 200 informal groups now exist per department – a potentially important foundation for formalizing more producer organizations.

While intermediaries today may offer producers a higher price than central mills (because of high demand and competition between mills), joining formal producer groups would nonetheless increase the bargaining power of smallholders, open up the opportunity to have a more direct link to markets, help farmers to be paid by coffee quality instead of by weight, create stronger incentives to improve productivity, and expand access to currently unavailable resources. For coffee institutions and development organizations, it would facilitate the delivery of technical assistance at scale.

Promote Plant Renovation and Resistant Varieties

Project beneficiaries still have the potential to increase their productivity by further renovating their farms with new seedlings and introducing resistant varieties. Particularly in areas with long coffee traditions like Sololá and Sacatepéquez, farms have many coffee trees that are 40 to 60 years old. This means that although farmers are implementing all of the best practices, their productivity is hindered by the current potential of the trees.

Any renovation project should include resistant and adapted varieties. Although national efforts are underway to develop more high-quality, rust-tolerant varieties – by planting more disease-resistant varieties such as Robusta and Timor hybrids in the lowlands – traditional Arabica varieties average $5,000 per hectare to plant, compared to $8,000 for rust-tolerant hybrids. The investment can pay off after a few years, but small coffee farmers are unable to take on this kind of economic burden, especially outside of the structure of a cooperative or producer group. Many farmers face a complex challenge: their trees are getting older, they have little or no money to replant, they rely on their coffee income, and cutting trees would mean that they would be receiving no income from coffee for at least two years. Therefore, although farmers have relatively few trees per capita, any replanting project would need to be gradual. If farmers were to pay for the new seedlings, the first step would be to formalize the groups formed by the project, in order to develop a strategy for access to finance.

Model Farmer

"The coffee was dying, and it was all I had to survive."

Elena Bizarro, a 57-year-old coffee grower in San Pedro, Alotenango, knew she needed help. Her husband had passed away, and her six adult children had moved to the city, leaving her alone to run a three-cuerda coffee farm. Although she had been familiar with the crop since she was a child and had helped her husband with some of the activities on the farm, she felt there was so much that she didn't know. She hired workers for the farm, but she didn't know what they should do exactly. She reached out for advice to a local cooperative, but once they learned that she had so little coffee, the agronomist stopped supporting her. She had little hope that things would turn out well.

When Elena heard about TechnoServe's project, she felt that it was her last chance; nevertheless, she was afraid that she would not be accepted, since she only had three cuerdas of coffee, and because she had never attended school, does not read or write, and speaks only Tzutujil. However, TechnoServe invited her to participate and, sensing her strong spirit and will, offered her the opportunity to host a demonstration plot on her land. "I felt so proud, having people come and learn at my place," she said.

Having a demonstration plot helped Elena see the results and teach her workers to replicate the best practices on her other scattered plots. She was cautious about implementing some of the practices, however: "After pruning, you could see the coffee revive, but I needed to see the full results before taking the risk with the rest of the plants," she said. Following the first year, once the difference in the productivity of the demonstration plot was clear, she replicated the practices on the other lots. "Plants had more cherries, they were fat and heavy. The coffee was happy, and so was I," she said.

Elena has applied all 12 practices on all her coffee since 2013, and she has seen a doubling or tripling of production. She now not only sells her crop to the intermediaries, but saves around 100 pounds of it to dry, roast in a bread oven, and grind in a maize mill. She sells this coffee to neighbors who don't have their own for $4 per pound, more than four times the price per pound offered by intermediaries for coffee cherry. "I would process more, but people have their own coffee, so I have studied carefully who would be interested," she said.

By starting a demonstration plot on her land, Elena and her community were able to prove the benefits of methods like pruning, convincing them to implement the practices on all of their land.

VIII. REFERENCES

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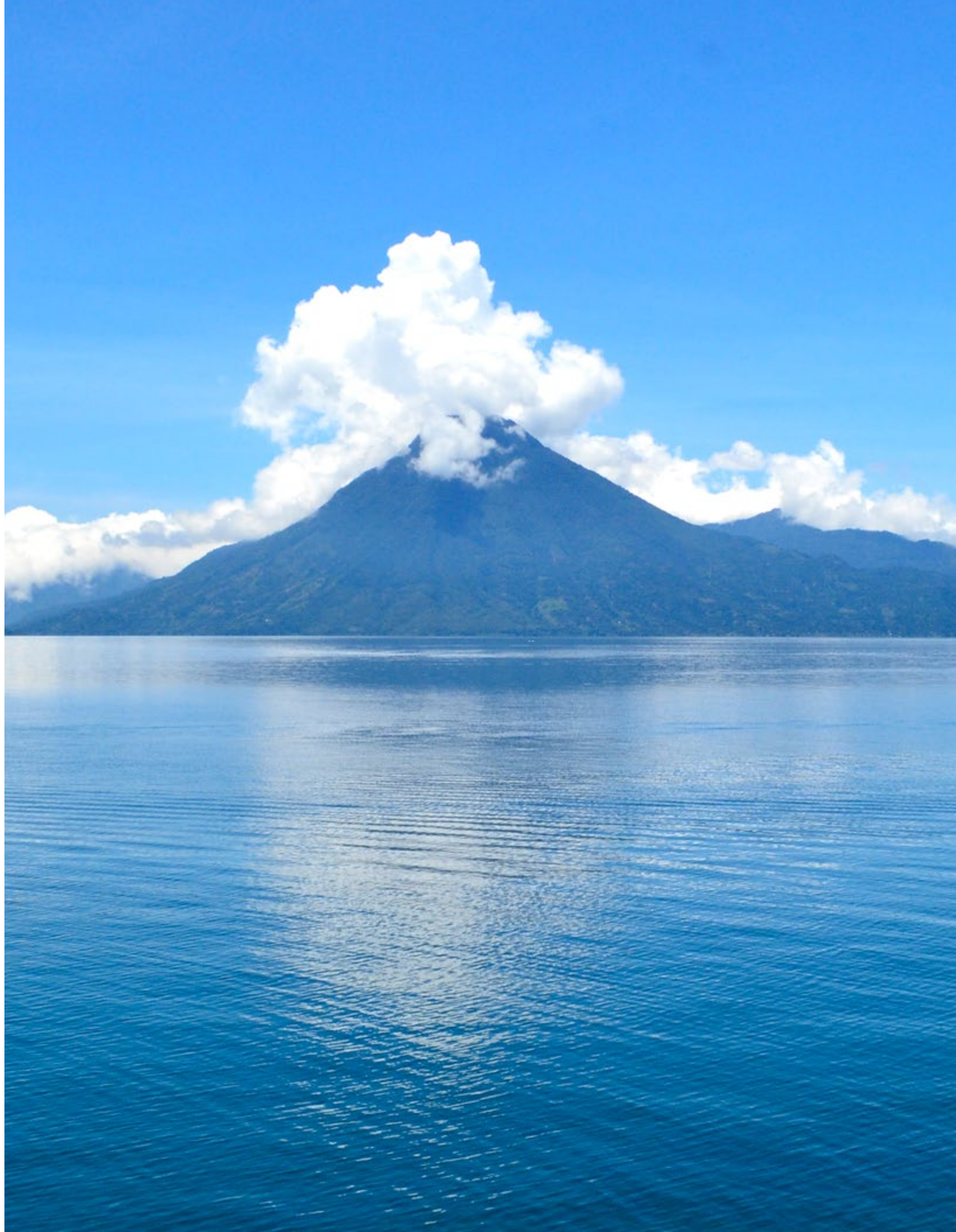
14. 1 quintal = 45 kilograms



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