



IMPACT STUDY

Evaluating How Root Capital's Client Businesses Impact Smallholder Livelihoods: Cocoa Cooperatives in Peru



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ACKNOWLEDGMENTS

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EXECUTIVE SUMMARY

Root Capital

Root Capital invests in the growth of agricultural enterprises so they can transform rural communities. These businesses purchase crops such as coffee, cocoa, or grains from smallholder farmers. With growth, they become engines of impact that can raise incomes, create jobs, empower women and young people, sustain peace, and preserve vulnerable ecosystems. We supply these businesses with vital resources: access to capital, trade and technical partners, financial training, and conservation practices. We work in hard-to-serve geographies where others don't. To date, we've distributed \$1.4 billion to improve the lives of seven million people in farming communities.

Purpose of the Study

This study assesses the impact of Root Capital-financed businesses in the Peruvian cocoa sector in two areas: farmer livelihoods and gender inclusion. It focuses on members of three Root Capital clients: Cooperativa Agraria Cafetalera Pangoa Ltda (Pangoa), a cocoa and coffee cooperative that sources from nearly 700 cocoa and coffee farmers in Peru's Junin region; Cooperativa Central Cacao Aroma de Tocache (Cacao Aroma), a secondary cocoa cooperative sourcing from 730 farmers across six primary cooperatives in San Martín; and Cooperativa de Servicios Múltiples – APROCAM (APROCAM), a 270-member cocoa cooperative located in Amazonas.

Study Approach

In October 2018, we collected household survey data from more than 300 members of these cooperatives, as well as 250 unaffiliated cocoa farmers in the same regions. We asked farmers about their demographics, farm characteristics, agricultural practices, cocoa production and income, services they receive from the cooperative and other buyers, and overall quality of life. Surveys also included retrospective questions about farmer livelihoods prior to joining the cooperative, or five years prior (for unaffiliated farmers). We matched Root Capital client members to non-members on this retrospective data using a statistical matching algorithm, and used the matched sample to generate quantitative estimates of the business' impact.¹ We also

¹ For the purposes of this report, the term 'non-members' refers to individuals who are not members of a Root Capital client. These non-members form our study's comparison group. However, it should be noted that these individuals may be members of cooperatives that are not affiliated with Root Capital.

conducted focus groups and interviews with cooperative members and staff to obtain a more holistic picture of gender relations at each cooperative, key benefits of cooperative membership, and each cooperative's experience as a Root Capital client. This quasi-experimental study design represents one of our most rigorous to date.

Main Findings

We found that farmers affiliated with Root Capital clients earned 29% more income from cocoa production in 2018, relative to comparable, unaffiliated farmers in the region. Farmer-members also produced and sold more cocoa than did non-members, on more hectares of cocoa trees. Findings on the relationship between cooperative membership and total household income (from all sources) were inconclusive.

Cocoa farmers affiliated with Root Capital clients were also more likely to hold farm certifications, receive technical assistance for cocoa production, and have access to input assistance programs than were non-members. This benefit was particularly true of female members, who accessed the above services at similar rates as male members—unlike women not affiliated with Root Capital clients.

Farmer-members reported receiving a wider variety of services and benefits from their cooperatives relative to those available to non-members from other buyers. Cooperative employees, meanwhile, indicated a high degree of satisfaction in their relationship with Root Capital, indicating that Root Capital's loans and advisory services have helped them grow their businesses and strengthen the capacity of their teams and their operations. The businesses are committed to supporting their farmer-members and hope to continue to grow with Root Capital's support.

INTRODUCTION

The Cocoa Industry in Peru

Peru is the world's second largest producer of organic cocoa.² Cocoa production occurs in 10 regions throughout the country, with the main growing regions located in the Eastern Andes.³ In 2015, cocoa production represented 1.4% of Peru's agricultural GDP and incorporated 50,000 smallholder farmers, 20% of whom belonged to some type of producer association.⁴ Investments in the Peruvian cocoa sector accelerated in the early 2000s as development practitioners, government actors, and private enterprises implemented initiatives to replace coca—a crop often grown illegally and purchased by drug traffickers to make cocaine—with cocoa. The industry has since grown dramatically; cocoa hectares under cultivation increased by 231% between 1995 and 2015.⁵ Today, rather than compete with major West African players in the volatile market for conventional cocoa, the Peruvian cocoa industry has found a niche in organic cocoa and the “fine/flower” market.⁶

Cocoa production represents a safe and sustainable pathway out of poverty for rural communities in Peru. The sector has the support of numerous public-private partnerships and significant international investment.⁷ However, Peruvian cocoa farmers face challenges, including fluctuating prices, thin profit margins, and climate change. Cocoa production also presents a threat to environmental conservation in Peru. In the Selva region, agricultural expansion—and with it, deforestation—is dominated by smallholder coffee and cocoa farmers.⁸ Since 2004, Root Capital has disbursed more than \$16 million in loans to 16 cocoa enterprises who seek to promote climate-smart agricultural practices, boost the global profile of the Peruvian cocoa industry, and bolster the livelihoods of small-scale cocoa farmers. As illustrated by Table 1, this study focused on three of those clients.

² World Bank Group, *Gaining Momentum in Peruvian Agriculture: Opportunities to Increase Productivity and Enhance Competitiveness* (Washington, DC: World Bank Group, 2017).

³ Prom Peru, *Cacao in Peru: A Rising Star* (Lima: Prom Peru, 2013).

⁴ World Bank Group, 2017.

⁵ Ibid.

⁶ Ibid.

⁷ Amanda Fernandez and Jose Iturrios Padilla, “Transforming Peruvian Cocoa for Producers and Buyers,” *World Cocoa Foundation*, September 17, 2018, <https://www.worldcocoafoundation.org/blog/transforming-peruvian-cocoa-for-producers-and-buyers/>.

⁸ World Bank Group, 2017.

Box 1: Cocoa Cooperatives in Peru

In 2005, the Peruvian cocoa sector began a period of expansive growth, driven by a conducive domestic economic climate and political turmoil in Cote d'Ivoire—the world's largest cocoa producer. This market opportunity, alongside “growing urgency” among domestic and international actors to encourage producers to convert from coca production, led to large-scale investment in cocoa by the Peruvian government, the United Nations, and bilateral donors.⁹

These actors began to found and invest in cocoa cooperatives as cocoa production expanded throughout the 1990s and 2000s.

Today, hundreds of cocoa cooperatives operate throughout Peru. These enterprises organize thousands of cocoa farmers as members, who sell their produce to the cooperative and have a vote in key organizational initiatives and leadership decisions. Cooperatives sometimes operate in a tiered structure, in which several smaller cooperatives aggregate under a secondary cooperative that organizes contracts with larger buyers.

These organizations do much more than collect and market members' cocoa. In response to unmet needs in their communities, many cooperatives evolved from simple aggregators into multi-service providers, introducing complementary services designed to increase farm productivity and profitability and improve member quality of life. While the specifics vary from cooperative to cooperative, we find mature cocoa cooperatives often perform the following core services:

Price Premiums

Cooperatives often offer a price premium relative to the local market by negotiating advance contracts on behalf of their members. Certification, origin, and direct trade relationships drive cooperative premiums. Two cooperatives in this study—Pangoa and Cacao Aroma—provide premiums according to our data.

Internal Credit

Many cooperatives manage microloan portfolios to meet the credit needs of members, often excluded from traditional financial markets. Cooperatives may provide small, short-

⁹ Jason Donovan, Trent Blare, and Nigel Poole, “Stuck in a Rut: Emerging Cocoa Cooperatives in Peru and the Factors that Influence their Performance,” *International Journal of Agricultural Sustainability* 15 (2), 2017.

term loans (with a tenor of 12 months or less) designed to help members invest in their farms or cover household expenses between coffee harvests. A minority also offer multi-year loans for larger investments, such as the purchase of new land or renovation of existing farmland. Two cooperatives in this study offer internal credit funds to their members.

Technical Assistance

Technical assistance, also called agronomic training or extension, refers to “all the different activities that provide the information and services needed and demanded by farmers and other actors in rural settings, to assist them in improving their livelihoods by developing their technical, organizational, and management skills and practices.”¹⁰ Common examples include training on production and processing techniques and fertilizer distribution programs. In this study, the three cooperatives all provide technical assistance to members. All cooperatives in this study offer individual and group training. Most also provide access to free or subsidized inputs, such as fertilizer or fungicide; to demonstration plots; or to equipment, such as fungicide sprayers.¹¹

Client Businesses in the Study

This study focuses on members of three Root Capital client enterprises: Pangoa; APROCAM; and Cacao Aroma.

PANGO

Pangoa is a coffee and cocoa cooperative located in Peru’s Junin region. It was founded in 1977 as part of an antidrug community development project. At that time, many farmers in the area had been killed in drug-related conflicts or forced to flee their lands. Today, Pangoa serves as an important driver of environmental conservation and economic growth in the community.

Pangoa sources and sells coffee and cocoa from 680 producers that comply with Fair Trade, organic, Utz, and Rainforest Alliance certifications. Sixty-five percent of Pangoa’s income revenue is derived from contracts with five international buyers. It is a gender-inclusive

¹⁰ GFRAS, “Producer Organizations in Rural Advisory Services: Evidence and Experiences,” Position Paper, February 2015.

¹¹ Root Capital, *The Coffee Farmer Resilience Initiative: A Study of Eight Coffee Cooperatives Participating in Root Capital’s Coffee Farmer Resilience Initiative* (Cambridge: Root Capital, 2017).

business, employing 21% female farmers and employees and a female general manager.¹² Most Pangoa farmers receive on-farm technical assistance and centralized agronomic trainings. Pangoa also provides numerous benefits to employees and member farmers, including an internal credit fund, alternative income generation programs, health insurance, a pension fund, a women's committee that offers microcredits to female producers, and career development training for young people.

Root Capital has financed Pangoa since 2006, primarily for general working capital, and has provided advisory services to the cooperative since 2012. In 2018, at the time of this study, Pangoa held a \$1 million loan for general working capital. The cooperative also received 12 distinct advisory services engagements from Root Capital in 2018—on enterprise-level financial management, internal credit, digital business intelligence, and other topics.



Source: Ezilon Maps

APROCAM

APROCAM is a coffee and cocoa cooperative located in Amazonas, Peru. It was founded in 2003 and is primarily comprised of members who belong to the Awajún indigenous group. Having experienced decades of systemic discrimination and violence at the hands of the government and private companies, many Awajún farmers saw APROCAM as an opportunity to gain economic power and autonomy, alongside technical assistance and other benefits they had previously been denied.

APROCAM sources coffee and cocoa from 269 producers that comply with Fair Trade and organic certifications. To maintain quality standards, APROCAM purchases cocoa pods from suppliers and conducts its own processing. The cooperative primarily contracts with one international buyer—ICAM—in its cocoa sales. The majority of APROCAM farmers receive on-farm technical assistance, centralized agronomic trainings, and input assistance programs.

Root Capital has financed APROCAM since 2014, primarily for working capital, and has provided advisory services to the cooperative since 2015. In 2018, APROCAM held a \$150,000 loan for general working capital and a \$350,000 loan for seasonal working capital.

¹² Root Capital defines a gender-inclusive business as one with 30% or more female employees or members, or one that is women-led and has 20% or more female employees or members.

The cooperative also received 10 advisory services engagements from Root Capital in 2018—on enterprise-level financial management, digital business intelligence, and other topics.

CACAO AROMA

Cacao Aroma is a cocoa cooperative located in Tocache, San Martín. It was founded by a consortium of six cooperatives, with support from the Tocache Municipal Government and USAID. Cacao Aroma serves as a secondary cooperative, organizing the production of the six primary cooperatives for sale on international markets.

Cacao Aroma sources cocoa from 737 producers that comply with Fair Trade and organic certifications. The cooperative's principal buyers are ICAM, an international exporter, and Villa Andina, a Peruvian firm. The majority of Cacao Aroma farmers receive on-farm technical assistance, centralized agronomic trainings, and access to inputs and processing equipment. Cacao Aroma also manages an internal credit fund for employees and producers.

Root Capital has financed Cacao Aroma since 2014, primarily through working capital, and has provided advisory services to the cooperative since 2016. In 2018, Cacao Aroma held a \$400,000 loan for general working capital. The cooperative also received nine advisory services engagements from Root Capital in 2018, on enterprise-level financial management and other topics.

Table 1: Client Businesses in the Study

| Name | Type of Business | Value Chain | # of Members or Suppliers | Year Founded | First Loan from Root Capital | Root Capital services received at the time of the study |
|-------------|-----------------------|---------------|---------------------------|--------------|------------------------------|---|
| Pangoa | Cooperative | Cocoa, Coffee | 680 | 1977 | 2006 | <ul style="list-style-type: none"> • Lending • Advisory (Enterprise-Level Finances, Internal Credit, Digital Business Intelligence) |
| APROCAM | Cooperative | Cocoa, Coffee | 269 | 2003 | 2014 | <ul style="list-style-type: none"> • Lending • Advisory (Lending Support, Enterprise-Level Finances, Digital Business Intelligence) |
| Cacao Aroma | Secondary Cooperative | Cocoa | 737 | 2014 | 2017 | <ul style="list-style-type: none"> • Lending • Advisory (Enterprise-Level Finances) |

Study Objectives

The focus of this study was twofold:

1. Estimate the impact of our clients on the incremental income of farmer-members.

We sought to understand whether cocoa farmers affiliated with Root Capital businesses earn higher income from cocoa production, and higher overall income, relative to comparable farmers who are not cooperative members. We explored the basic components of income—production and price—as well as a number of additional factors, including productivity, land size, and technical assistance, to identify the mechanisms through which any income gains could take place.

We also set out to understand the services and benefits offered to farmers by our client businesses, their relative contribution to income and productivity, and their comparability to services offered by other buyers or agricultural service providers in the region.

2. Explore gender-related barriers to productivity, cooperative participation, and other key outcomes.

A second and critically important focus of this study was to understand whether and why female smallholder farmers experience different outcomes related to income, production, and agricultural productivity than men. We examined demographic, legal, economic, health, and productivity differences between men and women who belong to Root Capital cocoa cooperatives, as well as any differences in gendered trends between members and non-members. We also explored disparities in cooperative service provision by gender, as well as differences in cooperative participation and membership eligibility.

METHODOLOGY

This study employed a mixed-methods approach to assess how affiliation with the studied cocoa cooperatives impacts farmer livelihoods and gendered barriers to agricultural productivity.

In October 2018, we collected quantitative data from 306 farmers who belonged to each of the studied cooperatives, as well as a group of 253 comparable farmers who were not members of a Root Capital client. Surveys contained questions about farmer demographics, household characteristics, health and quality of life, farm and production characteristics, cocoa buyers, prices farmers receive for the sale of their cocoa, income, services offered by buyers, and aspirations in cocoa production. We also asked respondents about a set of key demographic and production characteristics in the year prior to joining their cooperative (or five years prior, for non-member respondents), in order to construct recalled baseline data to match treatment farmers to similar comparison farmers.

To identify the impact of affiliation with a Root Capital business on individual farmer outcomes, we employed a retrospective comparison group matching technique. We matched treatment and comparison farmers based on our recalled baseline data—a process that approximates randomization and reduces bias in study results. The final, matched sample included 452 respondents: 226 treatment respondents and 226 comparison individuals. Matching produced treatment and comparison groups that were statistically similar on a variety of characteristics. We used this matched sample to generate quantitative impact estimates on a variety of outcomes related to cocoa production, income, and well-being.

We also collected qualitative data—through focus groups and individual interviews—that allowed us to establish context for our quantitative results in the words of farmers and enterprise staff. While we encountered some challenges in data collection, this study represents one of our most rigorous to date. For a more detailed overview of the study methodology, data collection processes, and limitations of the study, see Technical Appendix Sections 1-3.

FINDINGS

Summary Statistics

The matched treatment and comparison farmers are similar on most demographic characteristics. Table 2 contains summary statistics on respondent demographics in the matched sample.

The proportion of men and women in each group is balanced: 71% of treatment farmers are male, as are 70% of comparison farmers. Treatment farmers are an average of 53 years old; comparison farmers are an average of 48 years. Treatment farmers live in households with an average 3.7 members; 88% of treatment farmers report that they are the household head. Comparison households contain an average 3.6 members, and 85% of comparison farmers report household headship.

Educational attainment for the two groups was similar, though the comparison group has fewer individuals with no education. The most common level of educational attainment among treatment farmers is completion of primary school (35%); 25% have completed some primary school, 27% have completed secondary school, 7% have completed university, and 6% have not received any education. In the comparison group, equal proportions of respondents have completed primary and secondary school (31%). 28% have completed some primary school, 8% have completed university, and 3% have no education—nearly half the proportion of treatment farmers that reported no education.

Marital status was also very similar between the two groups: 79% of treatment farmers are married, and 13% are single. In the comparison group, 80% of farmers are married, and 15% are single. A lower proportion of treatment women (75%) are married relative to treatment men (81%). In the comparison group, more women (84%) are married than men (78%).

Treatment farmers have been producing cocoa for an average 14.6 years, whereas comparison farmers have worked in the sector for an average 12.12 years. Treatment farmers have been members of their enterprises for an average 9.94 years. Comparison farmers are primarily unaffiliated with any cooperative, though 16% of comparison respondents report that they are part of some cocoa farmer association.

Table 2: Demographic Characteristics

| Variable | Treatment | | Comparison | |
|---|--------------|-----------|--------------|-----------|
| | Observations | Mean | Observations | Mean |
| Male | 226 | 0.7123894 | 226 | 0.699115 |
| Age | 226 | 53.47788 | 226 | 48.4823 |
| Household Size | 226 | 3.738938 | 226 | 3.584071 |
| Household Head | 226 | 0.8761062 | 226 | 0.8539823 |
| Primary School Incomplete | 226 | 0.2522124 | 226 | 0.2831858 |
| Primary School Complete | 226 | 0.3495575 | 226 | 0.3053097 |
| Secondary School Complete | 226 | 0.2699115 | 226 | 0.3053097 |
| University Complete | 226 | 0.0707965 | 226 | 0.079646 |
| No Education | 226 | 0.0575221 | 226 | 0.0265487 |
| Single | 226 | 0.1283 | 226 | 0.1504 |
| Married | 226 | 0.792 | 226 | 0.8009 |
| Divorced | 226 | 0.0133 | 226 | 0.0177 |
| Widowed | 226 | 0.0664 | 226 | 0.031 |
| Years in Cocoa Production | 226 | 14.57965 | 225 | 12.12 |
| Years in Coop (Treatment Only) | 226 | 9.946903 | | |
| Participation in Alternative Coop (Comparison Only) | | | 226 | .1637168 |

Farmer-Level Impacts

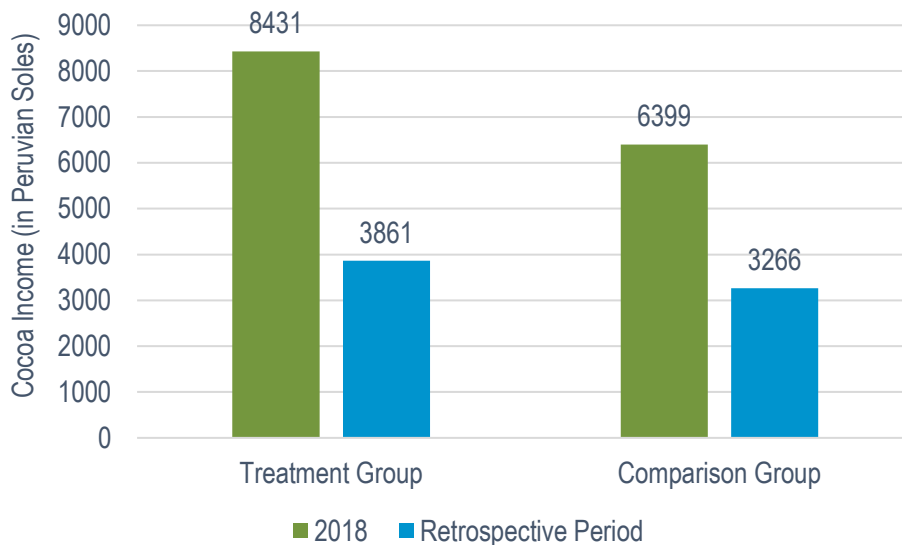
We identified several positive associations between membership with a Root Capital client and farmer-level outcomes. The sections below describe our findings on farmer income, production, agricultural practices, buyer services, and quality of life. Farmer-level impacts were estimated using OLS regressions of individual outcome variables on membership in the matched sample. More information on our regression specifications, as well as regression output tables, are located in Technical Appendix Section 4.

FINDING 1: Members earn higher income from cocoa production than non-members, but findings on members' overall household income were inconclusive.

Before presenting our results on income, it is important to note the complexity of income calculation among rural and low-income households. Numerous research institutions caution that values reported for income in household surveys are likely to be underestimates. It is difficult for individuals in such settings to remember the correct prices and quantities of sales of multiple crops over long periods. Respondents may also purposefully misstate their income so as not to alert neighbors or other community members as to their income level, or to conceal informal employment.¹³ As a result, our measures for income may contain some errors, biasing our results.

With these caveats in mind, we found that members of Root Capital client businesses earned 29% more income from cocoa production (the equivalent of \$532) in 2018 than did comparison farmers. This result is statistically different from zero at 95% confidence and controls for cocoa income earned in the retrospective period; the effect holds for both men and women. The positive association of membership and cocoa income appears to be driven primarily by higher cocoa production and sales among members, and, secondarily, by higher prices—as described in Finding 2.

Figure 1: Cocoa Income (in Peruvian soles) by Treatment Status



¹³ World Bank Group, “Measuring Poverty,” in *Introduction to Poverty Analysis* (Washington, DC: World Bank Group, 2005).

Although we found a positive association between total annual household income and membership, the result was not statistically significant. As a result, we cannot definitively conclude a positive effect of membership on total income, nor rule out that the increase in total income is the same as the observed increase in cocoa income. This inconclusive result is likely due to the large variation we saw in farmer-reported household income, which could reflect the difficulties in collecting annual household income data for farming families.

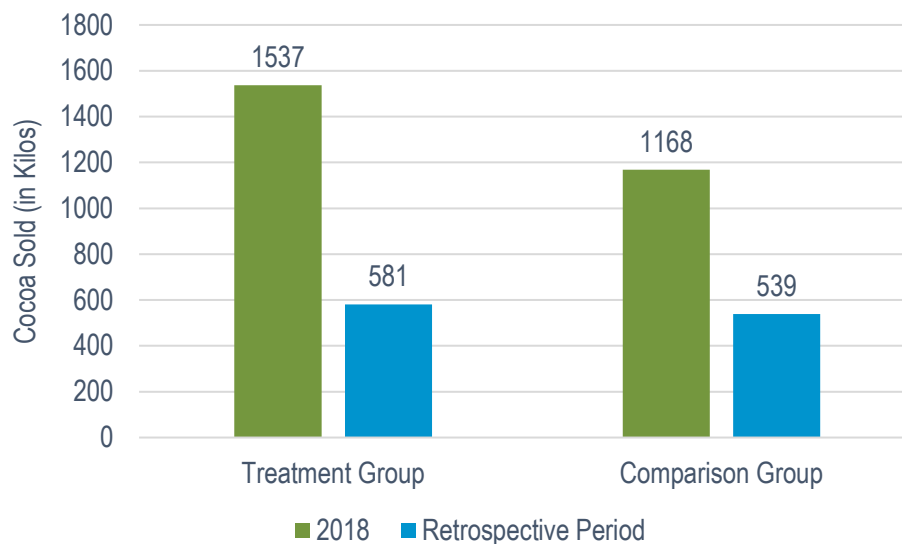
Given that cocoa production is the primary source of income for the majority of farmers in our sample, it would be sensible to assume that members with higher cocoa income could also have higher household income. However, if cooperative membership does result in greater capacity to produce cocoa, cooperative members could be choosing to substitute into cocoa production and away from other income-generating activities. In this case, members could be earning more income from cocoa production than non-members, while non-members still participate in other employment that generates a similar overall income to that earned by members. We found some support for this explanation in the data, as the share of cocoa income in total income has increased over time in the treatment group relative to the comparison group. A greater proportion of treatment farmers (63%) reported that cocoa currently represents the majority of their total income relative to comparison farmers (50%). In the retrospective period, by contrast, the proportion of farmers in the treatment and comparison groups who reported that cocoa represented their primary source of income was equal (40%). That being said, we cannot determine the true effect of membership on household income from the data available.

FINDING 2: Members have more cocoa land, more cocoa trees, higher production, and higher sales than non-members. Results on the relationship between membership and productivity were inconclusive.

We found that, in 2018, members of Root Capital client businesses produced 30% more cocoa (370 kilos) than did non-members, controlling for cocoa production in the retrospective period. As a result, members sold 30% more cocoa than did non-members, statistically different from zero at 99% confidence. Neither of these associations differed by gender.

In 2018, members of Root Capital clients held 28% more hectares of cocoa land than did non-members. Though members had more cocoa trees than nonmembers, we found no effect of membership on cocoa tree density per hectare. Importantly, we found no effect of membership on total farm size—though members have, on average, nearly one more hectare of land than do non-members, this difference was true of the treatment and comparison groups before members joined their respective cooperatives.

Figure 2: Cocoa Sold (in Kilos) by Treatment Status



We also found no statistically significant association between membership and productivity per hectare or productivity per tree. Although we saw positive associations between productivity and membership, because they were not statistically significant, we cannot conclude whether membership has a positive impact on productivity. This result could be due to difficulties in measuring productivity. More likely, it indicates that the higher production observed among members is not due to productivity, but the fact that members hold more cocoa land relative to non-members.

FINDING 3: Pangoa and Cacao Aroma farmers earn a higher price for their cocoa than that available on the local market, though APROCAM farmers do not.

Cacao Aroma and Pangoa farmers earned higher prices for dried cocoa from their cooperatives than they did from other buyers, on average. The average prices paid by Cacao Aroma and Pangoa also exceeded the average price received by comparison farmers for dried cocoa, by 2% and 15%, respectively. APROCAM farmers, on the other hand, earned an average price from the cooperative that was 9% less than that earned by comparison farmers for cocoa pods. We found some evidence to support this price differential in focus groups; APROCAM farmers noted that it is possible that outside buyers offer higher prices, and that the organization should work to increase compensation to farmers. The majority of treatment farmers sell only to their cooperative: 13% of Cacao Aroma farmers, 44% of Pangoa farmers, and 25% of APROCAM farmers also sold to other buyers.

Box 2: Side Selling

Side-selling occurs when farmers engaged in formal or informal purchase agreements with a cooperative or other enterprise sell to alternative buyers—often middlemen. Farmers generally side-sell due to a lack of liquidity. Farmers face a cash crunch during the harvest season: they incur most of their production costs during the harvest months, yet they have little savings remaining from the last coffee season. If a local intermediary offers a higher price upon delivery than their cooperative, farmers may opt for immediate cash over the higher future price provided by the cooperative. Transportation costs, loyalty to the cooperative, and product quality also influence side-selling behaviors.¹⁴ In this study, 13-44% of cooperative members sold to other buyers, instead of or in addition to their cooperative.

Table 3 illustrates the average price received by respondents from the cooperatives and other buyers. It is important to note that APROCAM farmers sell entire cocoa pods to their cooperative, as APROCAM conducts its own cocoa processing.

Table 3: Price by Buyer¹⁵

| | Cocoa Pods | | Dried Cocoa | |
|------------------|-------------------|-------------------------|-------------------|-------------------------|
| | Cooperative Price | Price from Other Buyers | Cooperative Price | Price from Other Buyers |
| APROCAM | \$0.78/kilo | | | \$1.67/kilo |
| Pangoa | | | \$1.97/kilo | \$1.57/kilo |
| Cacao Aroma | | | \$1.74/kilo | \$1.73/kilo |
| Comparison Group | | \$0.86/kilo | | \$1.71/kilo |

Most buyers on this market—including Pangoa and Cacao Aroma—purchase dried cocoa, which is priced higher as it is lower in weight and already processed. As a result, we did not conduct regressions on price using the full sample, given the inconsistencies in sale units between cooperatives.

¹⁴ Root Capital, 2017.

¹⁵ We did not ask farmers to report the type of cocoa (pod vs. dry) they sold to their buyers. We categorized prices by type of cocoa based on ranges for pod and dry cocoa prices provided by our Peru staff.

Box 3: Cocoa Processing

Cocoa beans grow inside cocoa pods, which farmers hand-pick from cocoa trees when ripe. To harvest cocoa beans from the pods, farmers or processors break the cocoa pods and inspect the pulp and beans inside. The cocoa beans undergo a lengthy fermentation process to remove pulp, and are then dried and aged to enhance flavor.¹⁶

Some cooperatives—Pangoa and Cacao Aroma included—purchase dried cocoa beans from farmer members, who conduct their own processing. Others, like APROCAM, purchase unprocessed cocoa pods from farmers; the cooperative then handles all fermenting and drying, which allows a uniform standard in quality control. These products are priced quite differently given that they reflect different stages of processing and labor—in our sample, a kilo of dried cocoa beans was valued nearly three times as high as a kilo of cocoa pods. Some farmers may choose to sell different forms of cocoa—either in pod or dried form—to multiple buyers, depending on their income needs and processing capacity.

Across our portfolio, we sometimes observe that cooperatives purchase unprocessed products, whereas buyers on the local market purchase processed products from farmers. Further research is needed to determine whether selling unprocessed products to cooperatives is cost-effective for farmers (i.e. if the time they save outweighs any income lost by selling an unprocessed product).

FINDING 4: Members are not significantly different from non-members in their application of many agricultural practices, though members use more labor on their cocoa farms and are more likely to hold farm certifications.

On-Farm Practices

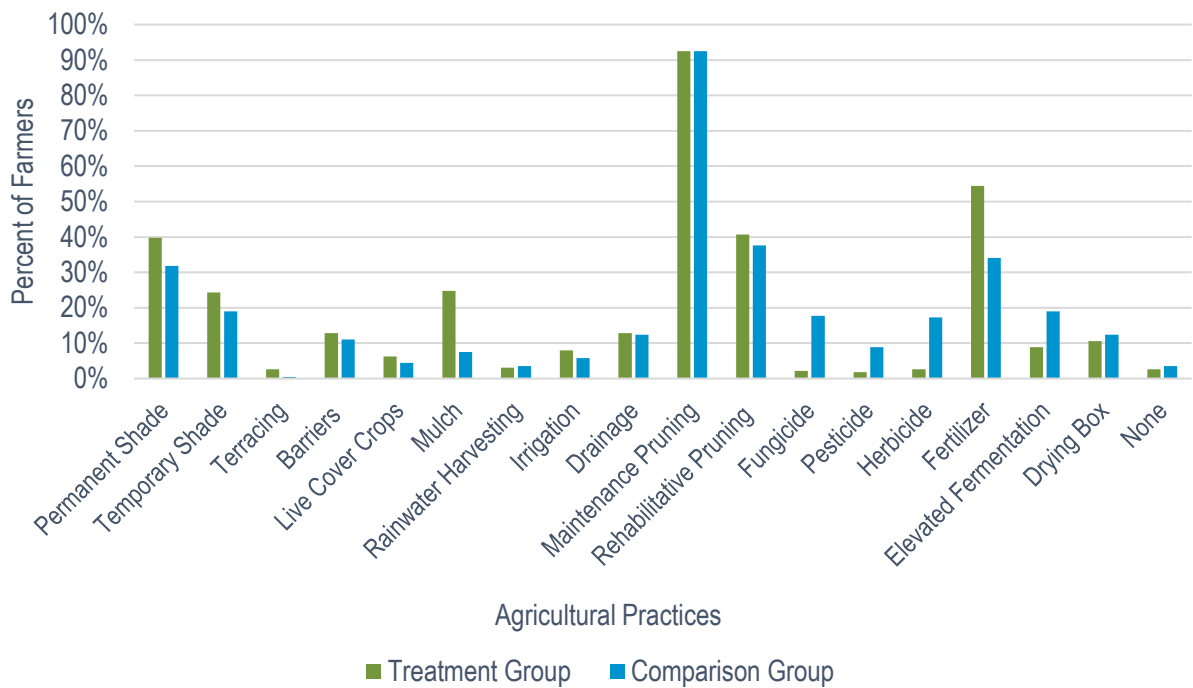
We asked farmers about their use of numerous agricultural practices on their cocoa farms. As illustrated in Figure 3, the use of optimal agricultural practices was low across the sample, with less than 50% of members and non-members employing the majority of listed practices. There were also few differences in the use of practices by membership, except in the case of fertilizer and agrochemical use. Members were also more likely than non-members to employ elevated fermentation in their cocoa processing, though less than 20% of respondents across the sample made use of this practice.

Regressions indicated that members were 15 percentage points more likely to have used any type of fertilizer than non-members, and 13 percentage points more likely to have used mulch,

¹⁶ Perfect Daily Grind, “A Step-by-Step Explanation of Cacao Harvesting & Processing,” last updated February 6, 2018, <https://www.perfectdailygrind.com/2018/02/step-step-explanation-cacao-harvesting-processing/>.

both statistically different from zero at 99% confidence. Meanwhile, members were much less likely than comparison farmers to use chemical pest and disease control. Members were 5 percentage points less likely to have used pesticides, 9 percentage points less likely to have used herbicides, and 13 percentage points less likely to have used fungicides than non-members (though the survey did not specify whether these compounds were inorganic). Overall, less than 3% of members reported the use of any of these substances. These results are encouraging given that the majority of cocoa sold to Pangoa, APROCAM, and Cacao Aroma should comply with the requirements of organic certification.

Figure 3: Use of Agricultural Practices by Membership Status



Box 4: Surveyed Agricultural Practices

We asked farmers about their use of agricultural practices designed to conserve soil and water, maximize agricultural yield, and improve crop quality. These practices and their definitions are listed below, organized by category:

Soil Conservation Practices

- **Cover Crops:** any crops grown alongside, or in rotation with, a primary cash crop to protect the soil surface, thereby increasing organic matter in soil, improving soil structure, and reducing erosion.¹⁷
- **Live Barriers:** strips of trees, shrubs, or stiff grasses planted perpendicular to a slope in order to reduce surface water runoff and soil erosion.
- **Mulch:** a protective layer of organic material spread on top of soil that reduces soil erosion, maintains soil moisture, and suppresses weed growth.¹⁸
- **Terracing:** the construction of “steps” or flattened surfaces that cut across the slope reduce sediment transport from surface runoff.

Water Conservation Practices

- **Drainage Canals:** channels that divert excess water from crops
- **Irrigation:** the artificial application of water to land for crop production
- **Rainwater Harvesting:** the process of capturing rainwater for use in irrigation or other agricultural needs.
- **Shade trees** are important for maintaining maximum soil moisture, as well as improving soil health, supporting biodiversity, and controlling pests and diseases.¹⁹
 - **Permanent shade trees** form a canopy over mature cocoa plants.
 - **Temporary shade trees** provide shade for immature cocoa plants until permanent shade structures are established. Banana trees (or other food crops) are often used for temporary shade to provide income while cocoa trees are maturing.²⁰

¹⁷ Agricultural Sustainability Institute, “Cover Crops,” last accessed March 12, 2020, <https://agriculture.gov.tt/wp-content/uploads/2017/11/Shade-Management-In-Cocoa-Production.pdf>.

¹⁸ Natural Resources Conservation Service, “Mulching,” last accessed March 12, 2020, https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ny/home/?cid=nrcs143_023585.

¹⁹ Ministry of Agriculture, Land, and Fisheries, Government of the Republic of Trinidad & Tobago, “Shade Management in Cocoa,” last accessed March 12, 2020, <https://agriculture.gov.tt/wp-content/uploads/2017/11/Shade-Management-In-Cocoa-Production.pdf>.

²⁰ Ibid.

Productivity and Pest Control

- **Fertilizer:** organic or inorganic compounds that supplement nutrients needed for crop growth. Fertilizers can improve soil fertility but their long-term effects on soil health depend on organic status.²¹
- **Fungicides:** organic or inorganic substances that kill unwanted fungi around crops
- **Herbicides:** organic or inorganic substances that control unwanted plant growth around crops
- **Pesticides:** organic or inorganic substances that kill unwanted insects or other organisms harmful to crops
- **Pruning:** Pruning involves the removal of branches and old or dead stems from cocoa trees to increase pod production, reduce pest and disease problems, and facilitate spraying and harvest.
 - **Maintenance pruning** is carried out throughout the year.
 - **Rehabilitative pruning** is heavier pruning, carried out after harvest and before the rainy season begins.²²

Optimal Processing for Quality

- **Drying Box:** a wooden box used to dry cacao after fermentation.
- **Elevated Fermentation:** the process of fermenting cacao in elevated boxes, enabling greater aeration and moisture control.

Household and Hired Labor

Though smallholder farmers rely primarily on family members to produce crops, they may hire some permanent or temporary workers to assist with farm activities. Members were no more likely than non-members to report sufficient access to labor for cocoa production during the last production season. However, members reported that, on average, 0.26 more members of the household worked on the family cocoa farm that season than reported by non-members (statistically different from zero at 99% confidence). Figure 4 demonstrates the number of household men and women allocated to a variety of cocoa farm tasks, by membership status. Though household women participate in farm tasks in lower proportions than do men, they engage in similar activities. Focus groups confirmed that men and women primarily share on-

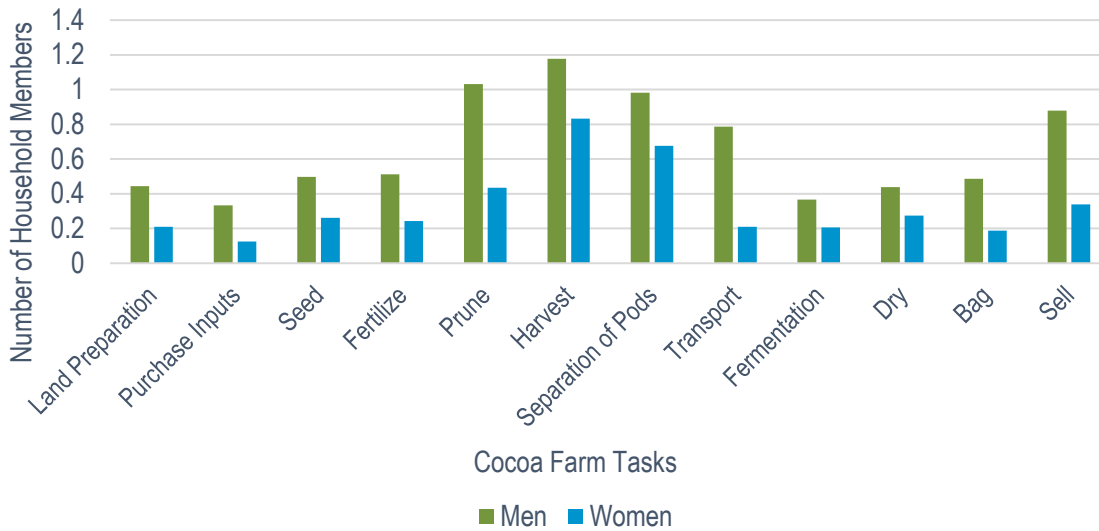
²¹ Root Capital, *Improving Rural Livelihoods: A Study of Four Guatemalan Coffee Cooperatives* (Cambridge: Root Capital, 2014).

²² Janny G. M. Vox, Barbara J. Ritchie, and Julie Flood, *Discovery Learning about Cocoa* (Washington, DC: World Cocoa Foundation, 2003).

farm tasks. However, it appears that men predominantly take responsibility for pruning and transport.

We found no difference in the number of temporary or full-time workers hired to assist with cocoa production by treatment status.

Figure 4: Household Labor Allocation by Membership



Land Tenure and Certification

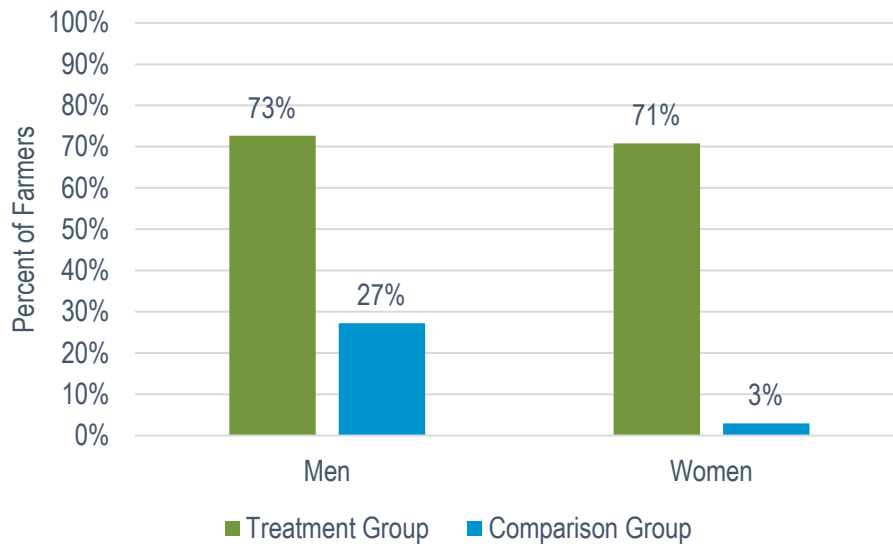
Land ownership was high across the sample, with 94% of respondents reporting that they owned their entire farm. However, men in both the treatment and comparison groups were nine percentage points more likely to report owning their entire farms than were women (statistically different from zero at 99% confidence).

We found striking differences by membership on certification status. Members were 48 percentage points more likely to report holding any type of farm certification than were non-members (statistically different from zero at 99% confidence and controlling for certification status in the retrospective period). Certified members predominantly reported that they hold organic and Fair Trade certifications.

Importantly, the association between membership and certification was more profound for women than it is for men. Controlling for past certification status, female members were 58 percentage points more likely to hold certifications than female non-members. In comparison, male members were just 43 percentage points more likely than male non-members to hold certifications.

As illustrated by Figure 5, female members held certifications at a rate on par with male members, while female non-members lagged behind male non-members. To the extent that cooperatives encourage members to produce under certified standards and provide resources to assist farmers in meeting certification requirements, they may also be helping to level the playing field for women in obtaining or maintaining certifications.

Figure 5: Certification Status by Gender and Membership



Box 5: Certification

Cooperatives will often pursue certifications indicating that members employ organic, fair trade, or other sustainable practices. These certifications can be useful in attracting buyers that operate in a market for sustainable products, as well as higher prices. Cooperatives may transfer these price premiums directly to farmers when they buy their produce; they also may hold price premiums in a 'premium fund,' which is then used to purchase inputs or provide other services to farmers.

Studies from organizations including the Committee on Sustainability Assessment and Rainforest Alliance have found that certified farmers are more likely to employ soil and water conservation practices on their farms, and that they see higher incomes from both price premiums and higher productivity attributable to their certifications.²³

In our study, we found that some members with certification obtained a higher price than did members without certification, though this trend did not hold true for members of APROCAM or comparison farmers; we also did not identify a clear pattern with respect to certification and productivity. However, it is possible that some farmers misreported their certification status in our data. For treatment farmers in particular, there may be confusion over certification status as many certifications are administered at the cooperative level. In these cases, cooperative staff are primarily responsible for certification maintenance and internal, with third-party auditors only visiting a subset of certified producers during annual inspections. If cooperative staff do not clearly communicate the purpose of their internal on-farm inspections, some farmers could be left unaware of their certification status. Further research is necessary to determine whether there is misinformation among members of Pangoa, APROCAM, and Cacao Aroma with regard to certification.

Cocoa Costs

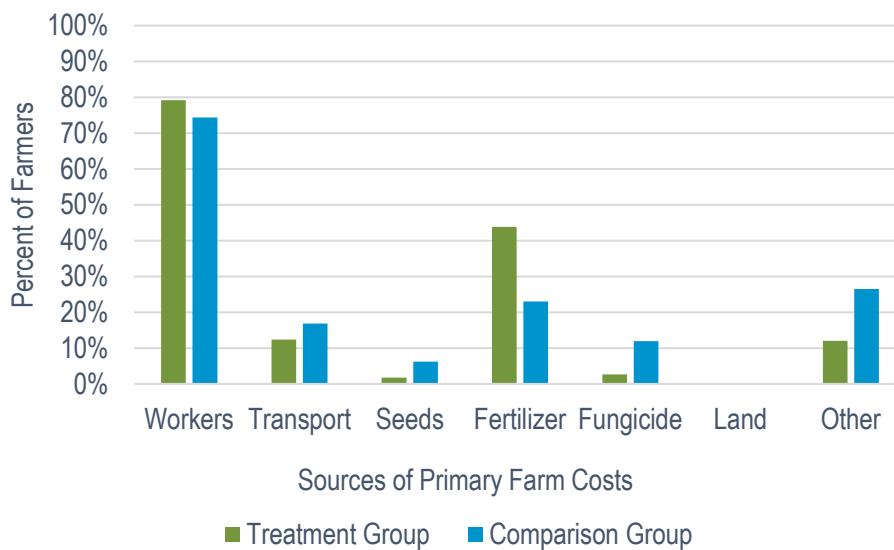
We found that treatment farmers spent 38% more on their cocoa farms in 2018 relative to comparison farmers (statistically different from zero at 95% confidence). We did not collect data on costs in the retrospective period, so we cannot be certain that this result is not reflective of historical trends, rather than any change in costs due to membership. Cocoa costs were also observed with significant error. However, if we take this result as valid, higher costs

²³ Dianna Newsom and Jeffrey C. Milder, *2018 Rainforest Alliance Impacts Report* (New York: Rainforest Alliance, 2018); Committee on Sustainable Agriculture, *The COSA Measuring Sustainability Report: Coffee and Cocoa in 12 Countries*, (Philadelphia; COSA, 2013).

among members are likely driven by higher cocoa production (Finding 2), which requires additional labor and farm inputs.

As detailed in Figure 6, the majority of farmers rated labor as a primary farm cost. Given that treatment farmers hired more labor than nonmembers, it is likely that this additional labor would result in a significant cost to treatment farmers. Additionally, members were more likely than nonmembers to apply fertilizer—another primary farm cost per Figure 6.

Figure 6: Primary Costs by Treatment Status



Regardless of higher costs among members, 60% of members reported that their income from cocoa was greater than their cocoa costs, compared to 51% of nonmembers. It appears that members’ additional income from cocoa outweighs their extra cocoa farm expenditures in terms of net income—regression results on net income indicated that members saw net income that was 24% higher than nonmembers (statistically different from zero at 90%).

FINDING 5: The studied cooperatives offer members numerous services to which comparison farmers do not have access.

Technical Assistance

We found that members were 43 percentage points more likely than non-members to report having received a visit from a cocoa technician in the past year (statistically significant at 99% confidence). However, among treatment and comparison farmers who did receive technical assistance, there was no difference in the number of visits received.

As with certification status, the effect of membership on the receipt of technical assistance was larger for women than it was for men. Female members were 58 percentage points more likely to have received technical assistance in the last production season than female non-members, whereas male members were only 37 percentage points more likely than male non-members to have received assistance. As illustrated in Figure 7, female members were more likely than male members to have received technical assistance, whereas female non-members received visits at lesser rates than comparison men.

Here again, it appears that cooperative membership could be helpful in connecting women with services to which they might not otherwise have access—and at similar or higher rates as men.

Figure 7: Probability of Receiving Technical Assistance, by Gender and Membership

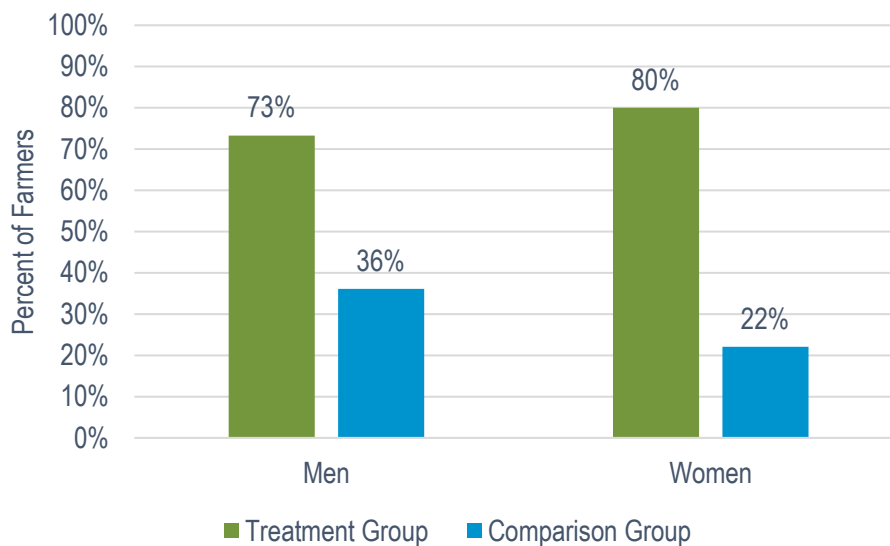
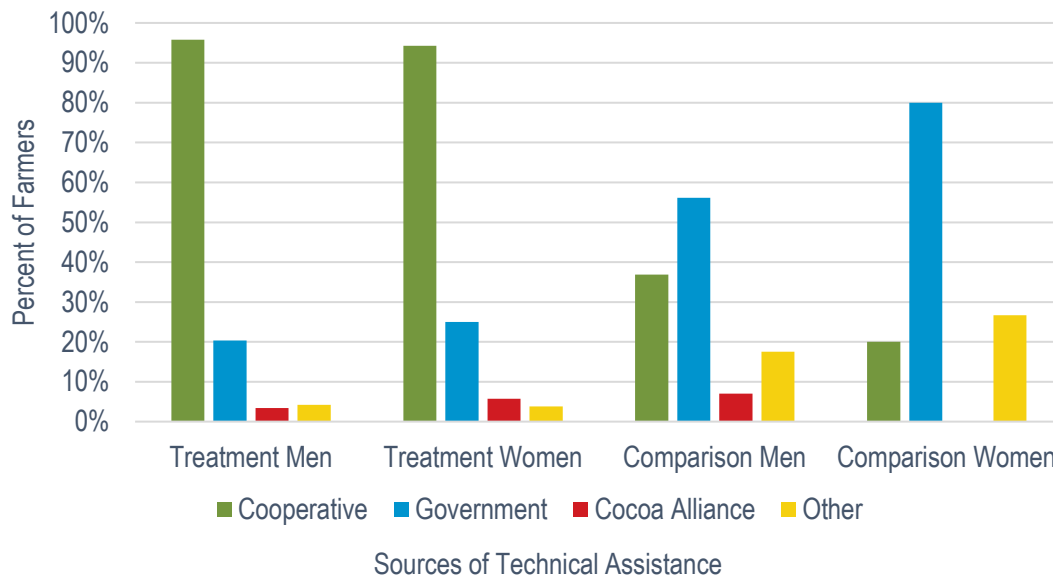


Figure 8 details the technical assistance provider(s) to men and women in the treatment and comparison groups who reported receiving a technical assistance visit. Nearly 100% of treatment respondents who received technical assistance reported that it came from their cooperative; treatment respondents also received some visits from the government, Cocoa Alliance, and other sources. The majority of comparison respondents, meanwhile, received technical assistance from government actors.

Figure 8: Source of Technical Assistance, by Gender and Membership



Importantly, while members were more likely than non-members to receive technical assistance, these services did not seem to significantly impact their agricultural practices (other than those related to chemical use, as described in Finding 4). The low adoption rate of the sustainable agricultural practices discussed above could be the result of the quality or frequency of cooperative technical assistance, or the perceived cost of implementing additional agricultural practices. Further exploration with the studied cooperatives is necessary to determine if this is the case, and if so, how technical assistance could be reoriented to better target gaps in farmer knowledge or in the resources required to implement such practices.

Additionally, as we did not collect data on receipt of technical assistance in the retrospective period, we cannot say with certainty that treatment group members were not receiving technical assistance at higher rates than comparison farmers prior to joining a Root Capital client business. Given that technical assistance appears to be available in these regions from government and other sources, comparison farmers may have access to similar technical assistance as do treatment farmers, but choose not to make use of these services as widely. Nevertheless, it is encouraging to see that members of Root Capital clients receive the majority of their technical assistance from their cooperatives, despite the availability of training from other sources. This finding could indicate that cooperatives offer technical assistance to more farmers or at greater frequency than other sources, or that farmers prefer the technical assistance provided by their cooperatives to that of other sources. However, it may also be the case that government or other technical service providers target services to producers who are not part of a cooperative.

Credit

We found no difference by cooperative membership status in the likelihood of taking out a loan in the past year; however, women in the treatment and comparison groups were 16 percentage points more likely than men to have obtained a loan in the previous year (statistically different from zero at 99% confidence). As evidenced in Figure 9, this result is primarily driven by credit access among comparison women. It is not immediately clear whether this result indicates greater vulnerability (i.e., greater need for funds) or a stronger financial position (i.e., greater ability to take on debt for new business ventures or other growth) among women. However, a Pangoa representative noted in interviews that they prefer lending to female members, as they are more likely than men to pay loans back on time. If this trend is common within the studied communities, it could be that women have better access to community lending sources than men as a result of their more reliable lending behavior.

Figure 9: Credit Access by Treatment Status and Gender

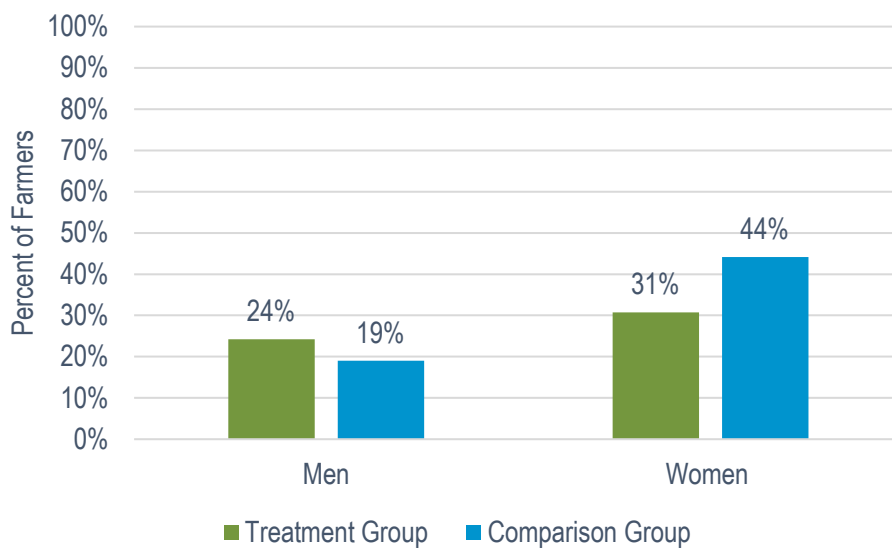


Figure 10 depicts the purpose of loans taken out by respondents in the previous year. Men were most likely to have obtained loans for investments in non-cocoa crops, laborers, and other reasons; women were most likely to have obtained loans for laborers, cocoa farm renovation, and non-cocoa crop investment. Figure 11 illustrates the source of loans by gender and membership. Treatment men and women were most likely to obtain loans from a rural credit scheme or their cooperative. Comparison women most often used a rural credit scheme or commercial bank for their loans, while comparison men sought loans from rural credit schemes or a non-Root Capital cooperative.

Figure 10: Motivation for Loans by Gender

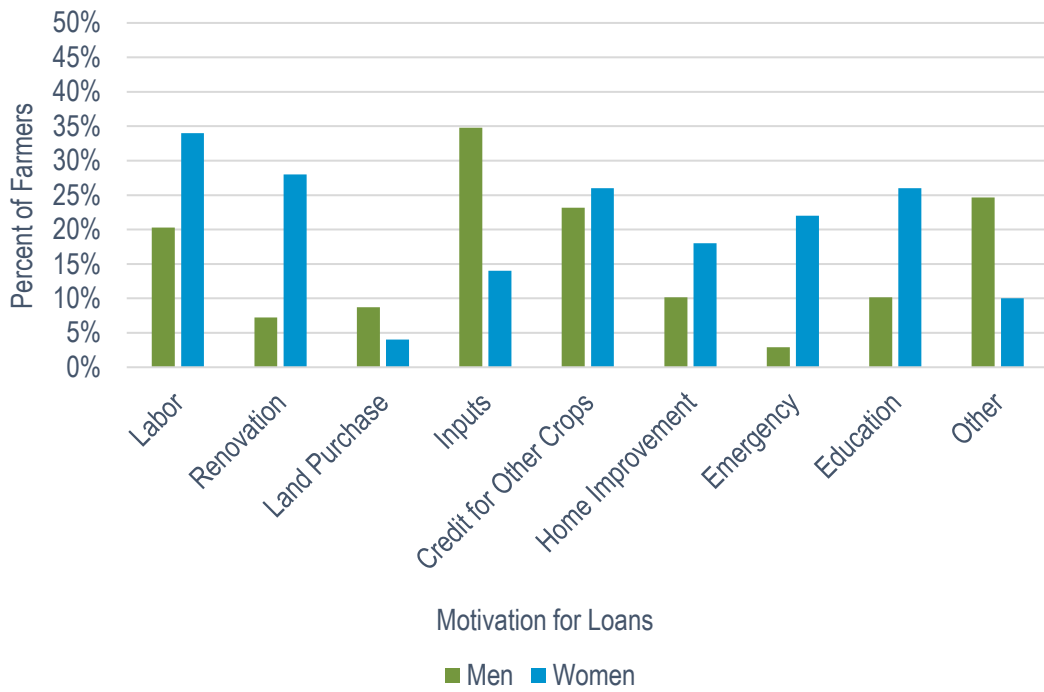
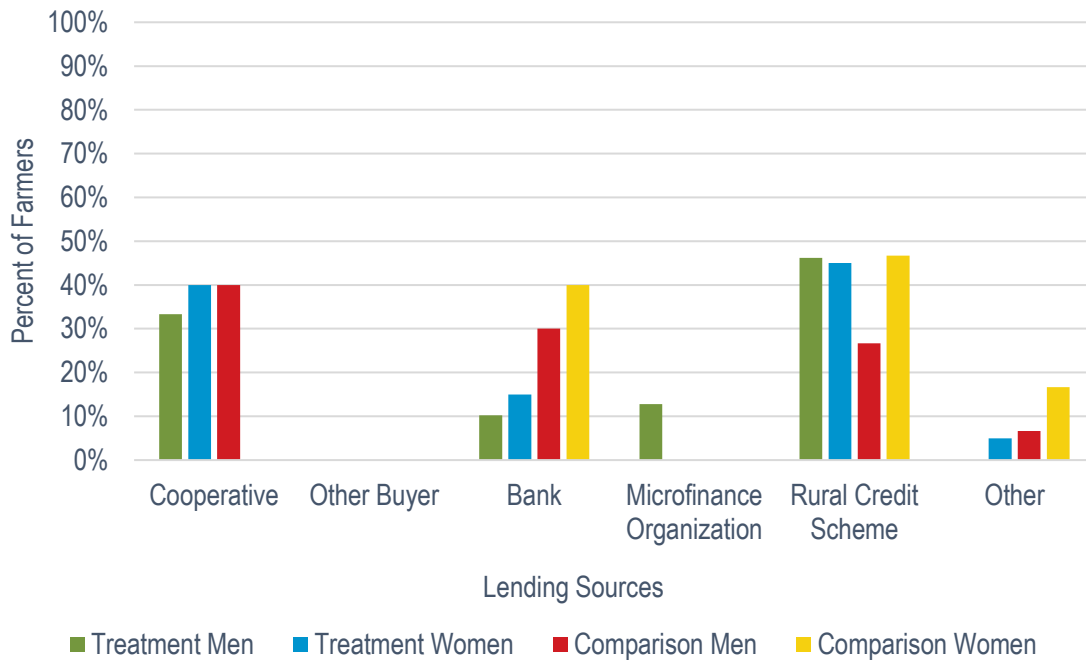


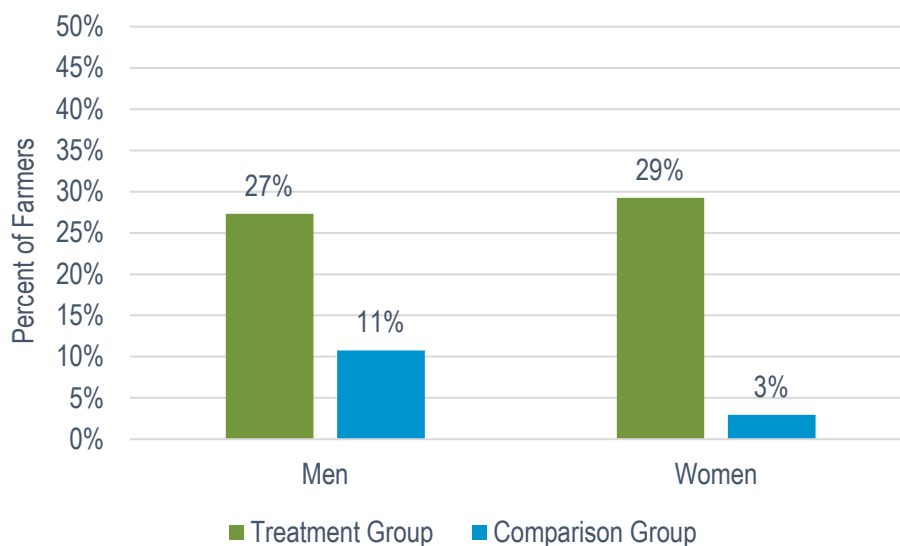
Figure 11: Loan Source by Gender and Membership



Inputs

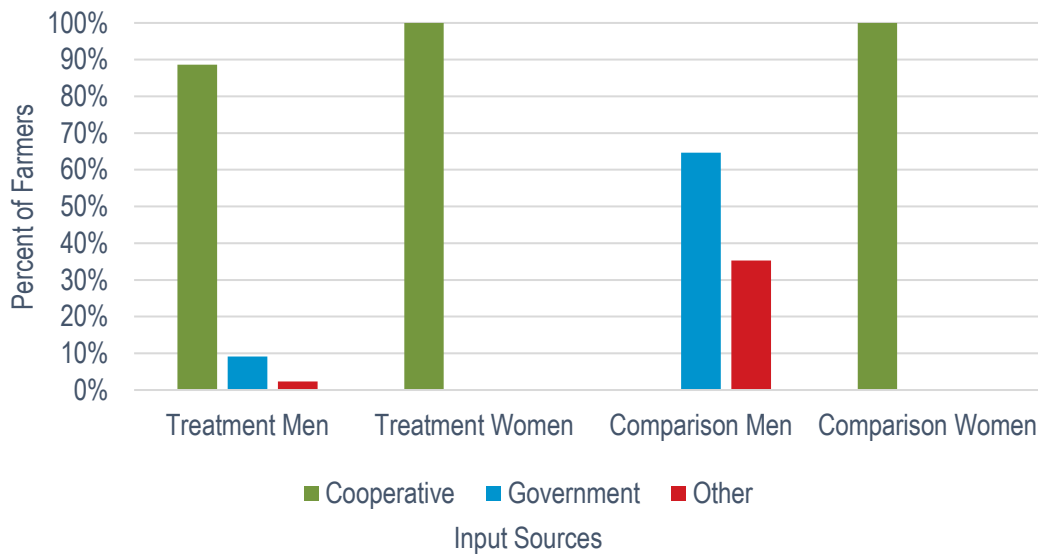
We found that members were 20 percentage points more likely than non-members to have received subsidized or easily accessible inputs for cocoa production (such as seeds or fertilizer) in the past production season (statistically different from zero at 99% confidence). The treatment effect for women was larger than that for men: female members were 26 percentage points more likely than female non-members to have received inputs, whereas male members were 16 percentage points more likely to have received inputs than male non-members. Figure 12 illustrates the scale of this difference. As with technical assistance, it appears that women in the treatment group received inputs at a comparable rate with men, unlike women in the comparison group. Interviews with enterprise staff indicated that fertilizer is one of the inputs provided by the cooperatives; recall that members were more likely to apply fertilizer on their cocoa farmers than were nonmembers.

Figure 12: Likelihood of Receiving Farm Input Assistance by Gender and Membership



Again, due to a lack of retrospective data on input availability, we cannot claim with certainty that the observed effect is attributable to cooperative membership, and not a historical difference between the treatment and comparison groups that is rooted in other factors. However, as illustrated by Figure 13, cooperative members received the majority of their inputs from their cooperatives, despite the apparent availability of outside options—particularly for men. This finding could indicate that cooperatives offer inputs to more farmers or at greater frequency than other sources, or that farmers prefer the input programs provided by their cooperatives to those of other sources.

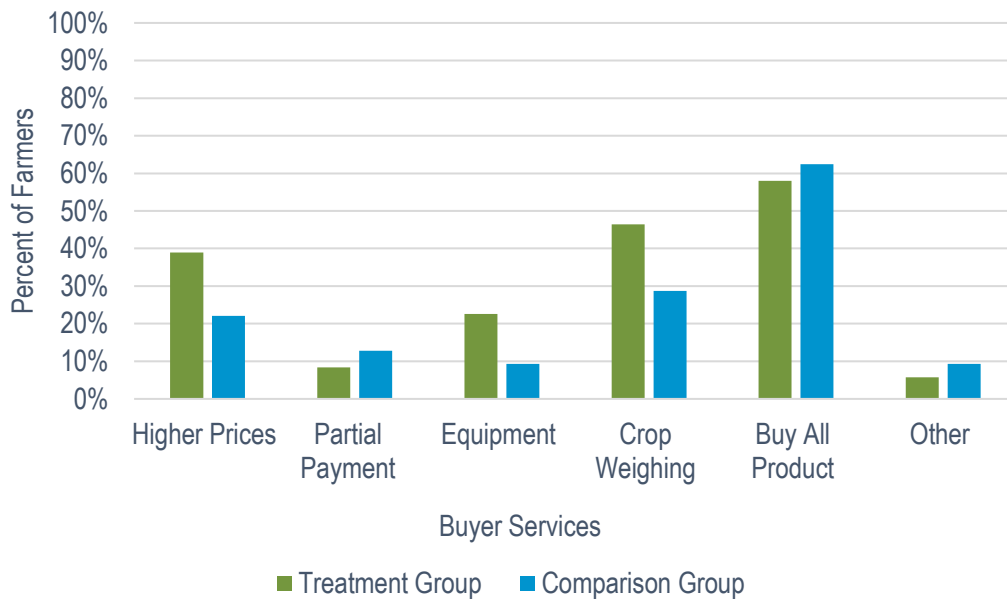
Figure 13: Farm Input Sources by Gender and Membership



Other Services

In addition to the services detailed above, respondents reported on other services offered to them by their cooperatives (in the case of the treatment group) or their primary buyers (for the comparison group). Note that 90% of comparison group farmers sold to local aggregators, and 10% sold to other cooperatives in the region. As demonstrated in Figure 14, treatment group members were over 10 percentage points more likely to list higher prices, equipment provision, and proper crop weighing as services offered by their primary buyer than comparison group members. There was no statistical difference between treatment and comparison groups in terms of whether the primary buyer is willing to purchase the farmer’s entire crop, or whether the buyer provides partial payment at the time of crop delivery.

Figure 14: Other Buyer Services by Membership

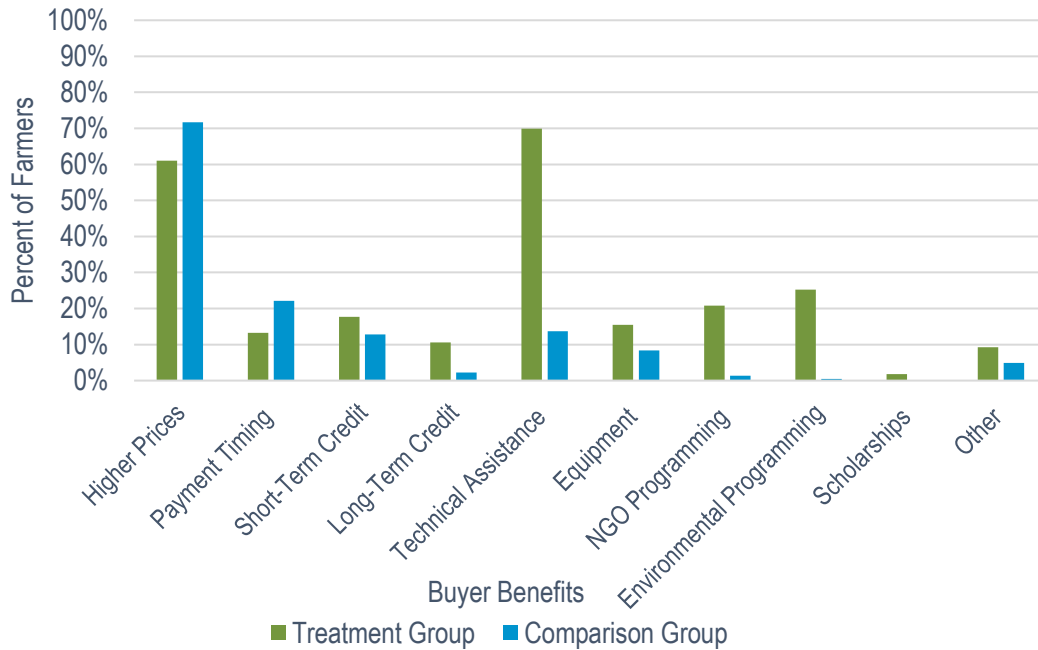


Primary Benefits

We asked farmers to list the primary benefits of working with their cooperative (for the treatment group) or their typical buyers (the comparison group). As per Figure 15, more than 70% of comparison group farmers listed price as the primary benefit of their buyer; 22% listed payment timing. Treatment farmers listed a wider variety of services as key benefits of the cooperatives. Chief among these was technical assistance; 70% of treatment farmers listed technical assistance as a primary benefit in the household data, as did numerous focus group respondents. In focus group discussions, both male and female respondents expressed enthusiasm about the breadth, quality, and applicability of trainings offered by their cooperatives.

Returning to Figure 15, 61% of treatment farmers listed higher prices, 25% listed environmental programming, and 21% listed access to NGO programming as benefits of working with their cooperatives. It appears that the cooperatives offer a wider variety of services than do alternative buyers in the region, and that members see value in these services—including more value in technical assistance than in higher prices.

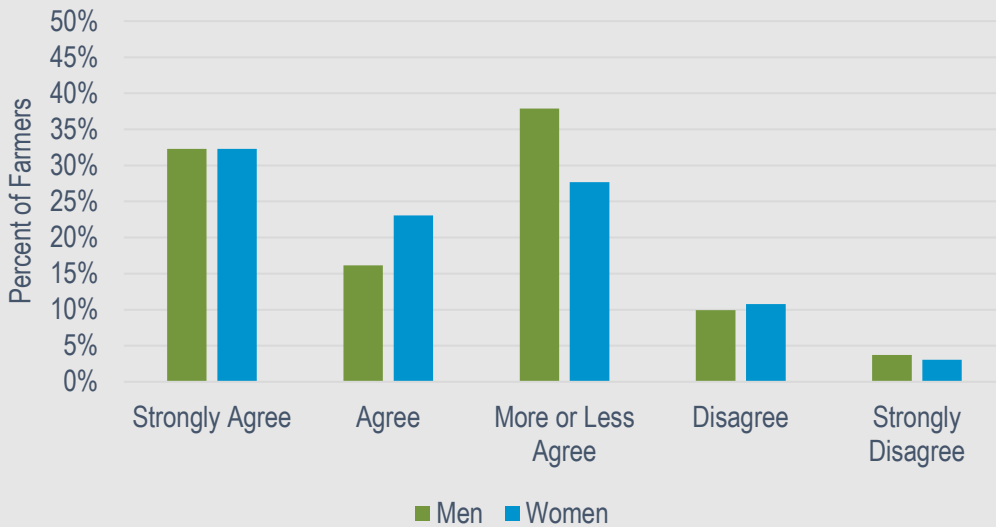
Figure 15: Primary Benefits Farmers Reported Receiving from Cooperatives or other Buyers



Box 6: Cooperative Engagement (members only)

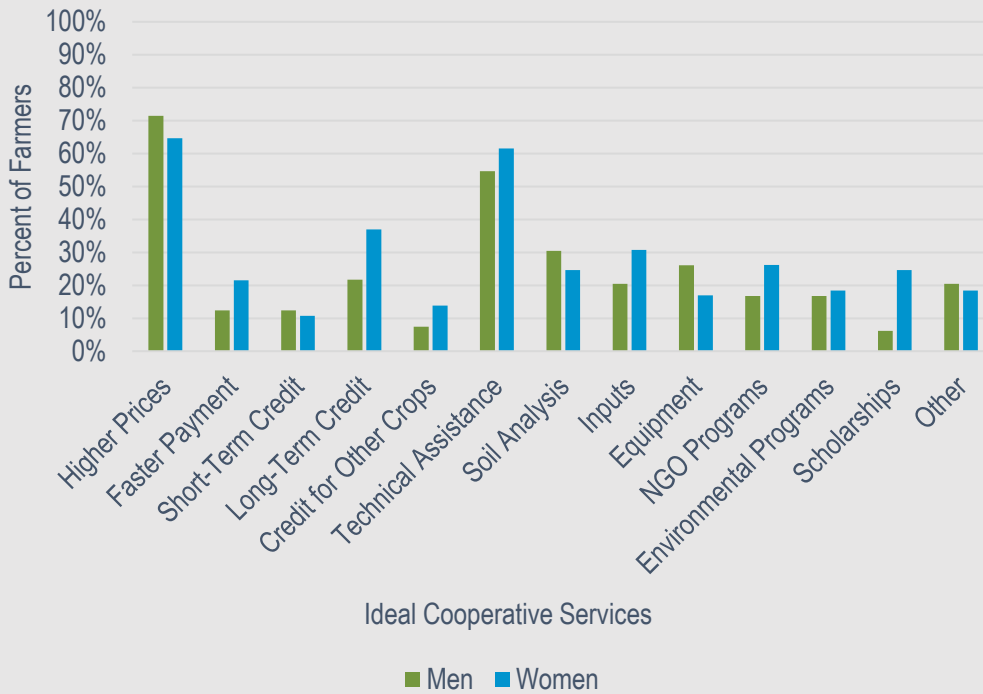
We asked treatment farmers to report on their overall satisfaction with their cooperatives, and to provide suggestions for services that their cooperatives should provide. As per Figure 16, 85% of treatment farmers strongly agreed, agreed, or more or less agreed that their cooperative makes decisions that support their wellbeing.

Figure 16: Does your cooperative make decisions that support your wellbeing?



Farmers also provided numerous suggestions for their cooperatives. As per Figure 17, farmer-members were interested in a variety of additional or improved services. The majority would prefer to receive higher prices and more technical assistance.

Figure 17: Ideal Cooperative Services by Gender



This trend held true in focus groups, where participants offered many ideas for cooperatives to improve their services. Many offered suggestions for trainings, stating that they would like more frequent and predictable trainings, as well as greater applied learning opportunities and higher standardization in the trainings they receive. Participants noted topics of interest, including value-add processing, leadership, business and home administration, and financial management. Some indicated that they would be interested in more training for women in business administration and chocolate-making (or other finished-product production).

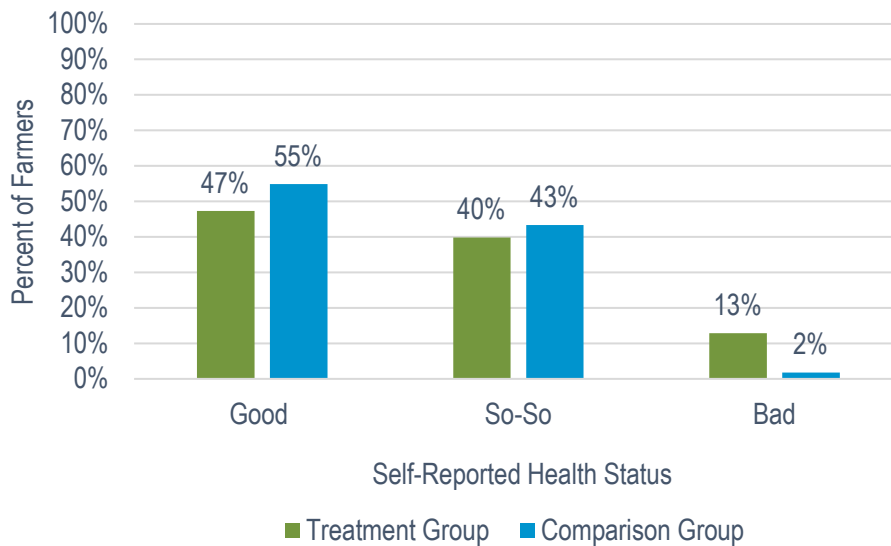
Another suggestion offered by cooperative members was for programs that would provide working capital for harvest and other funds for farmers to use for emergency or other financial needs. In this vein, many participants noted that they would like their cooperatives to offer social protection schemes, including emergency support funds for illness or accidents, health or life insurance, or pension/retirement funding. Others would like to see their cooperatives offer household support programming, including programs for education, health, daycare, and household construction.

FINDING 6: Members experience poorer health than non-members, though there are no differences in overall quality of life by membership status.

Health and Nutrition

Members appear to experience poorer health than non-members. When asked to rate their overall health, members were 11 percentage points more likely than non-members to rate their health as “bad.” Figure 18 demonstrates the results of these ratings.

Figure 18: Health Status by Membership

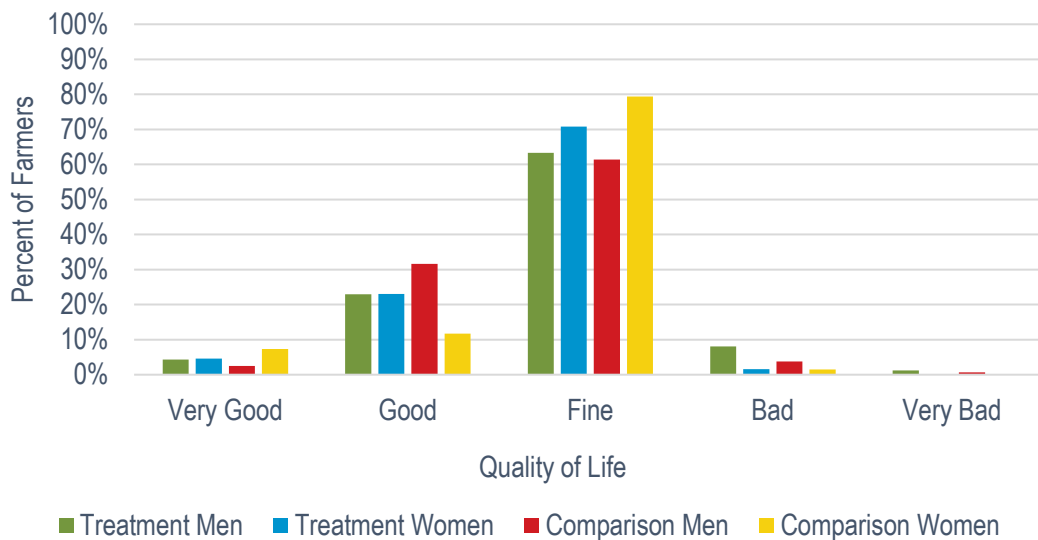


Members were 8 percentage points more likely than non-members to report experiencing an injury in the past month, though we found no difference in the likelihood of recent illness. Treatment farmers were also 10 percentage points more likely than comparison farmers to report that they had insufficient food to feed their families at some point in the past year. This finding is concerning, given that members have greater shares of their land devoted to grain and horticultural production than do non-members—which should make more food available for household consumption. Some members also specifically cited improved food availability as a result of the increased income they’ve derived from cooperative participation. While we cannot reach a conclusion from our data that explains the higher prevalence of food insecurity among members, it is clear from focus groups and enterprise interviews that hunger is widespread throughout the studied communities during the off season. Further research is needed to identify alternative-income generation activities that farmers can pursue during the cocoa low season to avoid this issue.

Quality of Life

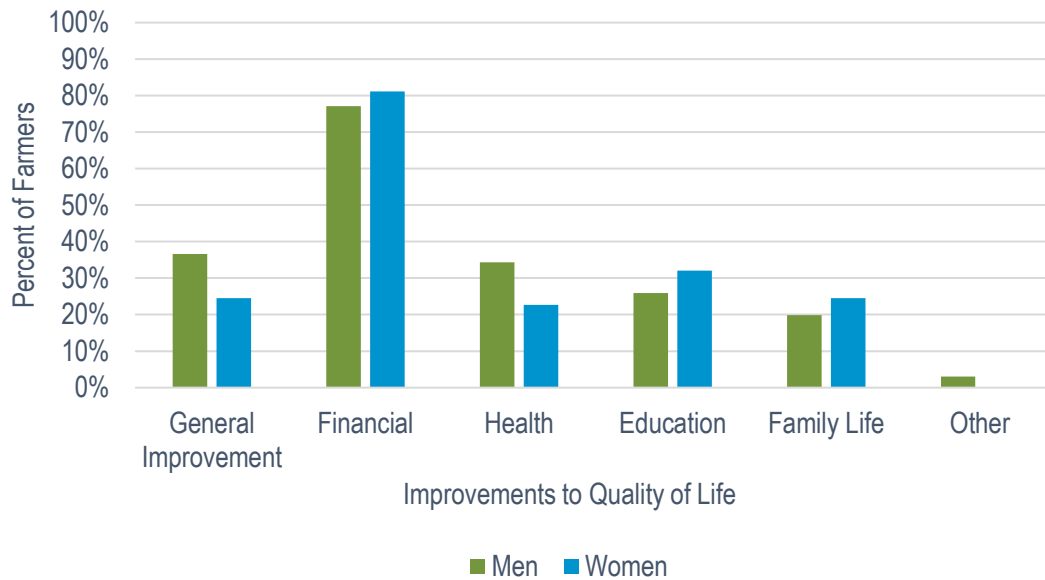
Despite the above results on health and nutrition, we found little difference in self-reported quality of life by membership or gender. As illustrated by Figure 19, approximately 60% of treatment respondents (male and female) reported their quality of life as “fine,” while 23% rated it as “good.” There was slightly more variation by gender among non-members: 70% of male comparison respondents and 80% of female comparison respondents rated their quality of life as “fine,” while 32% of men and 12% of women rated their quality of life as “good.”

Figure 19: Quality of Life by Gender and Membership



We also asked treatment farmers whether their quality of life had changed as a result of membership with their cooperatives. Eighty-three percent of both male and female cooperative members agreed with this statement; of these, 98% indicated that their quality life has improved. As per Figure 20, members primarily reported that their lives have improved in financial terms since joining their cooperatives, though more than 20% of male and female members also reported improvements in health, education, family life, and in general.

Figure 20: Reported Improvements to Quality of Life since Joining Cooperative among Members



Focus group discussions lent greater specificity to the mechanisms by which cooperative affiliation had improved members' lives. Some focus group participants reported that the cooperatives promote economic solvency, by which members have more disposable income, can pay off their debts, and can purchase more food. Others noted that they were able to provide better opportunities for their children as a result of their participation in the cooperative—particularly in terms of educational attainment. Many respondents cited more comfortable living—that they could purchase more furniture, access cable television, and make other home improvements—due to their additional income from the cooperative.

Aspirations

Treatment farmers were seven percentage points more likely to report that they would still like to be farming cocoa in five years than were comparison farmers. Some focus group participants noted that they hold this preference out of necessity—because they lack other skills or expertise, or because their region does not support other crop production. Others noted that, while they would like to continue producing cocoa, they would like to diversify their crop production to improve the stability of their incomes or expand their cocoa business (through a chocolate business, producing products for export, or producing a higher quality cocoa variety).

Treatment farmers were also nine percentage points more likely to report that they would like their children to continue farming in cocoa as a career path. Again, some focus group participants offered a caveat to this finding: that they would like their children to farm cocoa

only if they can earn a sustainable livelihood, and that today's cocoa farmers need to demonstrate greater incentive for children to get involved in the sector. Others noted that they would be proud for their children to continue in cocoa production, or in agriculture, which they feel is "fundamental to the existence of the human race."

Summary of Farmer-Level Impacts by Gender

A key objective of this study was to examine the impacts of cooperative membership by gender, and to understand the barriers and opportunities faced by women in cocoa-producing communities. While we mentioned many of these findings in the sections above, this section offers additional context for these results drawn from focus groups and interviews with cooperative members and staff. Overall, the cooperatives in the study help level the playing field for women cocoa producers in important ways. However, gender inequities persist and inhibit the full participation of women farmers in the cocoa value chain in Peru.

Box 7: Root Capital's Women in Agriculture Initiative (WAI)

In 2012, Root Capital launched our Women in Agriculture Initiative (WAI) to recognize and promote gender-equitable practices among our client enterprises. Through the WAI, Root Capital strengthens gender equity in agricultural businesses, and the agricultural sector more broadly, through our lending and advisory services, the creation of women-designed products and services, and by generating and sharing evidence to close gender gaps in agriculture. More specifically, we:

- Seek out and unlock the potential of businesses committed to inclusion of women;
- Build women's financial and agricultural knowledge so they can thrive, personally and professionally;
- Encourage and support women-led design of new products and services that benefit the whole community, and;
- Demonstrate a model for investing in women to help catalyze gender-smart changes in policy and practice.**Error! Bookmark not defined.**

FINDING 7: Treatment women have better access to many agricultural services relative to comparison women, and they derive personal and professional benefits from these services.

We found differences by gender in several key services offered by cooperatives and other buyers: namely, technical assistance, input programs, and farm certification. Both quantitative and qualitative data indicated that women affiliated with Root Capital businesses have access to these services at a rate on par with male members. Non-members report receiving these

services at a much lower rate, with unaffiliated women lagging behind unaffiliated men. Women in the treatment group were nearly 60 percentage points more likely than comparison women to hold certifications and have received technical assistance in the past year, and nearly 30 percentage points more likely to have received farm inputs, as compared to women in the comparison group. We also found evidence that women in both the treatment and comparison groups were more likely than men to have accessed a loan in 2018. Comparison women surpassed treatment women in their loan access, and it is unclear from our data whether having obtained a loan is indicative of financial strength. Overall, it appears that cooperatives play a crucial role in connecting women with farm services they might otherwise lack.

Female focus group participants confirmed the value of cooperative-sponsored services; in particular, they emphasized the role of technical assistance and training in improving their farm knowledge, production practices, and household decision-making skills. Women were more likely than men to cite training as their primary motivation for joining the cooperative. Respondents reported that the cooperatives were visibly expanding women's knowledge base and on-farm expertise through trainings. Women also reported feeling more empowered, with more control over their businesses, more skill as farmers, and more freedom.

“With the workshops and trainings [the cooperative] has provided, I would be able to assume a leadership position in the organization.”

– Female Pangoa member

Women, in particular, cited personal development as a benefit of their involvement in the cooperatives. In focus groups, women reported that they have achieved more trust in their relationships with their spouses—they are leaving the house more frequently (for trainings and other activities), and sharing decision-making and finances with husbands. Some women noted that they were developing as mothers as a result of their membership in the cooperatives. Men, meanwhile, felt that the trainings encourage women's critical thinking skills. When asked to suggest new or expanded services that their cooperatives could provide, women were more likely than men to request technical assistance, NGO programming, and scholarship programming. Women were also more likely than men to agree that the cooperatives make decisions that support their wellbeing. These findings could indicate that women recognize the potential of cooperatives to provide personal and social benefits in addition to farm-related services.

Despite these benefits, the treatment effect on cocoa land, production, and income did not differ by gender as it did on technical assistance, certification status, or input programs. It may

be that these services do not directly translate to better production or higher incomes. As noted above, these results call into question the efficacy of technical assistance services offered by the cooperatives; more research is needed to explore why certain services may be more effective than others in securing quantifiable benefits for farmers in terms of production and income.

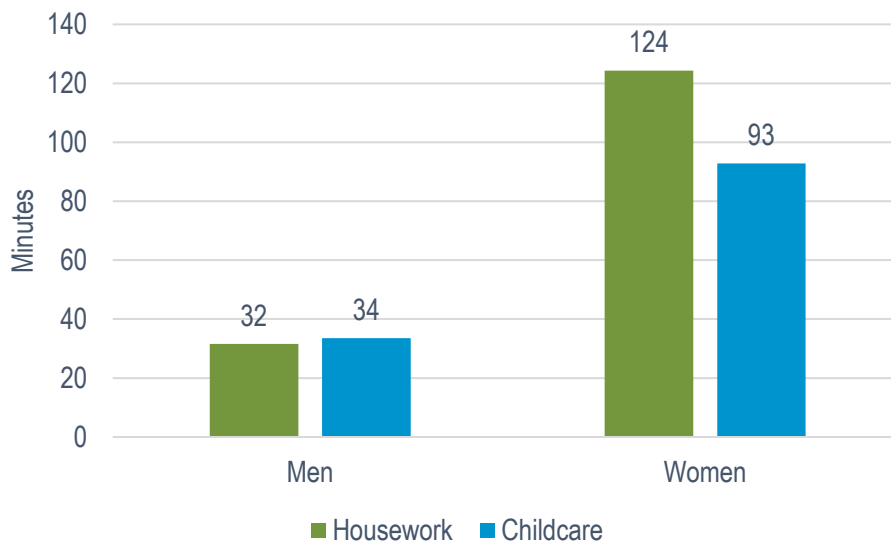
FINDING 8: Gender inequities persist—in cooperative representation and household responsibilities—that hamper women’s full participation in cocoa production.

Encouragingly, focus group participants reported that machismo is on the decline in their communities and that women are taking on more expansive roles as cooperative members, businesswomen, and wives. Focus group participants and cooperative representatives also noted that trainings and other services are available not just for female members, but also for the wives of male members.

However, several key inequities remain that could hamper women’s agricultural productivity and wellbeing. Women in the studied communities were less likely to own land than were men. Women were also less likely than men to engage in certain farm tasks, indicating that they do not participate fully in farm management, and that women managing farms alone may require additional labor to complete such tasks. Even where cooperative members’ wives may participate equitably in on-farm tasks and benefit from certain services, these women are not awarded full rights as cooperative members (as their husbands are officially registered to the cooperatives). A focus group participant from Pangoa noted that these wives have neither “a voice nor vote” in cooperative decision making and cannot participate actively in cooperative assemblies.

Female members and members’ wives also retain full responsibility over household tasks—such as cooking, cleaning, and childcare—despite the fact that they are taking on increasingly expansive roles in their household cocoa production. We found that women across our sample spent 90 more minutes per day on housework and 60 more minutes per day on childcare than did men, illustrated by Figure 21.

Figure 21: Daily Minutes of Housework and Childcare by Gender



Male and female focus group and enterprise interview respondents noted that homemaking responsibilities prevent women from participating in trainings and other cooperative responsibilities. A representative from Pangoa noted that cocoa farms are run as a family business, and that they perform better when women are involved in farm management and other income generation. As a result, cooperatives and the studied households may benefit from efforts to increase women’s participation in farm activities while simultaneously encouraging men to take on additional household responsibilities.

Business-Level Impacts

As mentioned earlier, the main focus of this study is the farmer-level impact of affiliation with a Root Capital client business. However, we also collected information from participating businesses about the challenges and opportunities they face, as well as their perceptions of Root Capital’s impact. This section covers our findings related to this data.

FINDING 9: Despite the numerous challenges faced by cooperatives and their members, the studied cooperatives remain committed to their suppliers and to the success of their businesses.

Farmers and cooperative employees alike noted that cocoa farmers face numerous vulnerabilities. Cocoa prices are variable and often insufficient to sustain entire families. Farmers suffer crop losses due to climate change, a lack of water, and crop disease; require more financing; and work in a physically demanding industry. They can also experience food

insecurity during the low season, and must often search for temporary employment to fill gaps in their income.

The cooperatives themselves also face numerous constraints. Cooperative managers reported needing more field staff, processing facilities, and other infrastructure, as well as a larger asset base. Despite these challenges, each cooperative is motivated to grow. Employees described numerous organizational goals designed to confront farmer vulnerabilities and strengthen the cooperatives' business prospects. The cooperatives are committed to increasing farmer productivity and crop quality, and see training as the primary method by which they can achieve this goal. They aim to promote techniques such as appropriate fertilizer use, pest management, disease control, and plant renovation. Many cooperative representatives also noted that they hope to engage their farmers in projects to generate alternative sources of income, such as chocolate making. The cooperatives hope to expand their membership base—especially among young people—as well as their export potential.

FINDING 10: According to cooperative employees, Root Capital financing and training has enabled each organization to meet its business goals.

Enterprise interviews indicated that Root Capital is “fundamental” to the function of the studied businesses. Interviewees—from managerial, accounting, and technical assistance teams at each cooperative—noted that Root Capital financing helps their businesses reach key sales goals. They also reported that Root Capital financing allows for prompt payment to producers, reduces farmer costs, and provides farmers access to better prices. Some noted that they appreciated the simplicity and transparency of Root Capital's financing model, as well as the easy communication facilitated by Root Capital loan officers.

Root Capital has provided increasingly large amounts of capital to each business over the course of our relationships to meet expanding capital requirements. As demonstrated in Table 4, year-to-year credit amounts present an upward, though not consistently linear, trend. It is important to note that several factors could influence the amount of a loan, including global cocoa prices, environmental or production-related shocks, and business contraction.

Table 4. Root Capital lending to each client business

| Root Capital Loan Amount by Year (USD) | | | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
| Pangoa | 150K | 200K | 300K | 300K | 400K | 800K | 900K | 1.3M | - | 1M | 700K | 1M | 1M |
| APROCAM | | | | | | | | | 200K | 300K | 350K | 400K | 500K |
| Cacao | | | | | | | | | | | | 150K | 400K |
| Aroma | | | | | | | | | | | | | |

Interviewees also reported receiving advisory services from Root Capital on a variety of topics, including leadership, financing, capitalization, marketing, management, and digital business intelligence. Both employees and cooperative members have participated in these trainings. The cooperatives reported that Root Capital’s training has substantially improved the capacity of their teams by providing them with important tools and information. Cooperatives listed numerous ways in which Root Capital’s advisory services have helped their businesses, from accounting and financial analysis to internal inspections.

“The financial analysis tool [from Root Capital] has been especially useful because it helps us make decisions like what price we are able to provide our producers”

– APROCAM leadership

FINDING 11: The studied cooperatives see Root Capital as a key partner in their continued growth.

Cooperative employees see Root Capital as a key partner in achieving their organizational goals. Many interviewees noted that Root Capital is not just a lender, but also a strategic partner. They reported that Root Capital’s lending, advisory services, and support have produced tangible financial outcomes and helped empower their member bases. These businesses intend to continue growing and develop greater self-sufficiency, with Root Capital as an ally.

“Root Capital has been key to what we are and what we hope to become, to continue growing”

– Cacao Aroma leadership

FINDING 12: Cooperatives requested lower interest rates and more training from Root Capital.

Although the cooperatives noted that Root Capital provides better interest rates than other lenders that offer them financing, two of the three businesses—APROCAM and Pangoa— noted that they would like to see Root Capital offer a lower interest rate. One client also requested larger working capital loans.

All cooperatives requested more training from Root Capital on topics including financial management, identifying and applying for other financing, strengthened “cooperativism” (the systems and values that define cooperatives), and ways to more deeply involve youth in the businesses’ operations. One cooperative noted the need for more training to help its team operate more independently.

CONCLUSION

This study reveals promising findings as to the impacts of Root Capital-supported businesses on farmer livelihoods in the Peruvian cocoa sector. We found that members of Root Capital client cooperatives had more cocoa land and higher cocoa production, sales, and income. We also found that members of Root Capital client businesses received more technical assistance, input assistance, and farm certification than do non-members. Importantly, these benefits of membership appear to be particularly advantageous to women.

Farmers affiliated with Root Capital clients reported in focus groups that cooperative membership has had numerous positive impacts on their incomes and quality of life. Most focus group participants also expressed enthusiasm about the breadth and quality of trainings offered by their cooperatives, noting that they feel trainings have led to improvements in their agricultural practices. For women, trainings appear to have been particularly transformative—men and women note that trainings have allowed women to develop their agricultural knowledge, critical thinking, and household management skills. They've also encouraged women to take on greater autonomy, as they leave their homes more frequently to participate in training and other cooperative activities.

Cooperative employees, meanwhile, noted that their partnerships with Root Capital have allowed them to develop stronger relationships with their farmer bases. Root Capital loans have enabled faster payments to farmers and reduced on-farm costs. Our advisory services have also provided helpful training to clients on financial analysis, mobile technology, management, and commercialization.

The study also exposed numerous areas for further attention and research. Though members were more likely to receive technical assistance, overall uptake of advanced agricultural practices in the study sample—for both members and nonmembers—was low, and members did not employ most practices with greater frequency than non-members. Further exploration is necessary to clarify the quality of technical assistance offered by the cooperatives, and how training can be leveraged, expanded, or improved to facilitate the adoption of optimal agricultural practices.

Our findings on food security are potentially troubling; it is unclear why members might be experiencing poorer food security or report poorer health than do non-members. This result warrants further research into the determinants of food insecurity among members, as well as any initiatives underway by the cooperatives to address this issue.

It is also evident that while gender inclusion has improved over time in many of our studied communities, women still face barriers that impede their full participation in the cooperatives. These businesses could find success in programs that encourage more homemaking among male members, to complement the increased farm/business responsibilities of women. Cooperatives could also reconsider rules around membership and familial engagement that prevent members' wives from participating actively in cooperative decision-making.

The studied cooperatives all indicated that Root Capital has been an instrumental partner in helping them overcome challenges, grow and strengthen. The cooperatives reported that Root Capital's financing helps them generate more sales, pay producers higher prices, pay farmers more promptly, and reduce farmer costs. They reported that Root Capital's advisory services have provided them information and tools to improve their staffs' capacity and business operations. Although all businesses reported that Root Capital provides transparent and efficient loan process and provides competitive interest rates, two businesses would like lower interest rates and one business would like larger loans from Root Capital. In addition, all businesses would like to receive more Root Capital advisory services.

Overall, this study largely validates the key premise of Root Capital's model—that agricultural enterprises can generate positive outcomes for rural communities with the right investment and targeted training. We hope to deepen our relationships with these organizations in the years to come, as they confront the challenges and opportunities that affect their businesses and the lives of their members.

TECHNICAL APPENDIX

Section 1: Quantitative Approach

To identify the impact of affiliation with a Root Capital business on individual farmer outcomes—such as cocoa farm size, production, and income—we employed a retrospective comparison group matching technique. This quasi-experimental approach allowed us to match unaffiliated farmers (the comparison group) to Root Capital farmers (the treatment group) based on their characteristics prior to the intervention. We used the matched sample of farmers to measure the association between membership with a Root Capital client and our outcomes of interest.

Data Collection Strategy

In October 2018, we collected household survey data from Root Capital client members and from a group of non-member cocoa farmers working in nearby communities. In the case of unaffiliated farmers, we interviewed the household member primarily responsible for cocoa production. Surveys contained questions about farmer demographics, household characteristics, health and quality of life, farm and production characteristics, cocoa buyers, prices farmers receive for the sale of their cocoa, income, services offered by buyers, and aspirations in cocoa production. Comparison farmers responded to screening questions to ensure that they were smallholder cocoa farmers, and to gauge their interest in joining a cocoa cooperative should the opportunity arise (to mitigate self-selection bias). We also asked respondents about a set of key demographic and production characteristics in the year prior to joining their cooperative (or five years prior, for non-member respondents), in order to construct baseline data to match treatment farmers to similar comparison farmers.

We surveyed 101 APROCAM farmers, 89 Pangoa farmers, and 116 Cacao Aroma farmers—a total of 306 client members. We also surveyed 253 cocoa farmers who lived and farmed cocoa in nearby communities, but did not belong to a Root Capital client business. Data collection was overseen in the field by a Root Capital consultant and carried out by three teams of enumerators identified and trained at each client site.

For client farmers, survey participants were selected randomly from each client's member database. We substituted replacement respondents in the event that originally selected participants could not be located, rejected participation, had passed away, or did not meet the selection criteria (i.e., no longer produced cacao). Replacements were selected randomly; where feasible, replacement participants were selected to match the original participant in gender and locality.

During the study period, we needed to drop and replace respondents from certain districts. Two such cases involved excessive distance—some randomly selected respondents lived 10–12 hours away from the cooperative headquarters, and our limited window for data collection did not allow for this travel time. In two other cases, we dropped districts due to limited cocoa production and a military-sponsored coca eradication exercise. This approach—dropping entire communities that were unreachable by data collectors—could potentially introduce bias into our final impact estimates, as remote communities and their inhabitants could be fundamentally different from more centrally located respondents.

Analytical Approach

Accurate impact estimation relies on the assumption that the comparison group represents the outcomes of farmers in the treatment group had they not joined a cooperative. We provide validation for this assumption by choosing comparison farmers who were statistically similar to treatment farmers prior to intervention—for our purposes, prior to the point at which treatment group farmers joined Root Capital-financed cooperatives. Under such an assumption, the only difference between the treatment and comparison groups is the intervention; as a result, any difference in eventual outcomes between the two groups can be attributed to the intervention.

Rigorous impact evaluations typically rely on randomization to fulfill this assumption. Individuals are randomly assigned a treatment or control status, which should result in two statistically indistinct groups, one of which receives the intervention. Outcome measures are then collected after a certain intervention period has elapsed. However, the nature of Root Capital's business model is such that randomization is not a sensible methodological tool to employ for the purpose of impact evaluation. We devote significant resources to the process of vetting clients for loan approval. Moreover, contacting farmers at multiple points in time—before and after intervention—is costly. Finally, we have limited access to client members before we begin lending to a given enterprise, let alone before members decide to join these enterprises.

Therefore, for this study, we employed a *retrospective comparison group methodology* to assess impacts on members of Peruvian cocoa clients. We collected data from farmers at one point in time (after treatment farmers had been working with a Root Capital business for a number of years). We asked farmers to recall information about their farm characteristics and cocoa production prior to intervention (for treatment respondents, in the year prior to joining the cooperative, and for comparison respondents, five years prior). These retrospective characteristics—which included total farm size, cocoa farm size, cocoa production and quantity sold, cocoa income, total income, agricultural practices, organic certification status, and motivation for joining a cooperative—are predictive of cooperative membership. We also collected data on current-time cocoa income, our primary outcome of interest. We then matched treatment and comparison respondents on these characteristics, dropping

participants with no close matches, and used the matched sample to conduct regression analyses and generate impact estimates.

This quasi-experimental research design allowed us to loosely approximate the results of a randomized experiment in a cost-effective manner. It produced treatment and comparison samples that were largely comparable on recalled retrospective data. Where possible, we also incorporated retrospective data as controls in our regression models. These features of the methodology lend greater certainty that our impact estimates more closely reflect the true impact of affiliation with Root Capital businesses—and that results are not biased by systemic or historical differences between treatment and comparison farmers.

Section 2: Matching Methodology

We matched treatment and comparison respondents using nearest-neighbor matching. For each treatment individual, this process selects a comparison respondent that falls the shortest distance (aggregated over a group of characteristics chosen for matching) from that individual. Comparison respondents who are not selected as matches, as well as treatment respondents for whom a suitable match is not available, are dropped from the sample.

We imposed a caliper, or a maximum acceptable level of difference between a treatment individual and their selected comparison respondent, to avoid poor quality matches; the caliper was set at 0.25 standard deviations of the distance function. We also matched with replacement to preserve sample size. As indicated in the report, we matched on respondent age, farm size, cocoa farm size, whether cocoa represented the majority of an individual's income, cocoa quantity sold, and organic certification status in the retrospective period. We also considered number of cocoa trees, cocoa production, cocoa income, household income, agricultural practices, and whether the respondent reported that they have or would join a cooperative due to an existing relationship with cooperative staff or members (all in the retrospective period) when assessing balance.

The final, matched sample included 452 respondents: 226 treatment respondents and 226 comparison individuals. We matched with replacement, meaning that if a comparison farmer was a close match to more than one treatment farmer, he or she could be matched multiple times. Table 5 details the number of participants and proportion of women in the matched sample, relative to the total number of members in each cooperative. We oversampled women where possible to produce a sufficient sample size for sub-analysis by gender.

Table 5: Matched Sample Size vs. Producer Population

| | Sample Size (% women) | Total Number of Producer Members (% women) |
|--------------------|-----------------------|--|
| Treatment Group | 226 (29%) | 1,706 (21%) |
| <i>Pangoa</i> | 73 (40%) | 680 (20%) |
| <i>APROCAM</i> | 85 (15%) | 289 (19%) |
| <i>Cacao Aroma</i> | 68 (34%) | 737 (24%) |
| Comparison Group | 226 (30%) | N/A |

Table 6 demonstrates the results of matching, and illustrates the differences in balance (the level of similarity between treatment and comparison groups) between the raw and matched samples. The standardized differences (ideally zero) decreased in absolute value on most variables in the matched sample relative to the raw. In the matched sample, standardized differences on whether cocoa represented a majority share of total income in the past period, past organic certification, past age, and past cocoa trees were very low (<0.5). We also achieved acceptable balance on past cocoa farm size, past agricultural practices, past quantity sold, past cocoa income, and past total income in terms of standardized differences in the matched sample. Variance ratios (ideally 1) improved in the matched sample relative to the raw on past farm size, whether cocoa represented a majority share of total income in the past period, past organic certification, past cocoa trees, past agricultural practices, and motivation to join.

Table 6: Balance on Matching Covariates

| | Standardized Differences | | Variance Ratio | |
|--|--------------------------|---------|----------------|---------|
| | Raw | Matched | Raw | Matched |
| Past Farm Size | 0.318 | 0.167 | 1.887 | 1.492 |
| Past Cocoa Farm Size | -0.069 | 0.068 | 0.945 | 1.322 |
| Past Quantity Sold | -0.053 | 0.059 | 1.019 | 1.378 |
| Past Cocoa Majority Share of Income | -0.057 | -0.018 | 0.968 | 0.989 |
| Past Organic Certification | 0.268 | 0 | 2.727 | 1 |
| Past Age | 0.084 | 0.004 | 0.957 | 1.087 |
| Past Cocoa Trees | -0.099 | -0.015 | 0.181 | 0.236 |
| Past Cocoa Production | 0.111 | 0.191 | 3.914 | 6.277 |
| Past Cocoa Income | -0.185 | -0.132 | 0.6 | 0.496 |
| Past Income | -0.033 | -0.097 | 0.667 | 0.6 |
| Past Relationship as Motivation to Join Coop | 0.38 | 0.356 | 1.695 | 1.618 |
| Past Agricultural Practices | -0.177 | -0.059 | 0.677 | 0.866 |

Quantitative Methodological Challenges

Though the retrospective comparison group design lends more confidence to our results than a simple comparison group design or pre-post analysis, this methodology is not without drawbacks. The validity of our results rests on the assumption that we have included all covariates that could influence both treatment status (joining a cooperative) and our key outcomes of interest (cocoa income) in our matching and regression models. It is likely that a variable exists for which we have not accounted, which could bias our impact estimates.

A limitation specific to the *retrospective* nature of our study design, meanwhile, is the difficulty of accurately recalling retrospective data. Treatment farmers belonged to their cooperatives for an average of nine years at the time of data collection (50% of farmers had been members 6.5 years or less). It is likely that some farmers incorrectly estimated crucial information, such as income or cocoa production in the year prior to joining the cooperative. In some instances, respondents simply could not recall information. As they could not be matched without that data, these respondents were dropped from the analysis, limiting our final sample size.

We also had to select a common timeframe for retrospective questions asked of comparison farmers, potentially creating misalignment in the response timelines of treatment and comparison participants. Based on the guidance of cooperative leadership as to the typical length of their current membership tenure, we asked comparison farmers to report retrospective data from five years prior. It is likely that, in some cases, treatment farmers and their comparison matches did not report retrospective data from the same year.

Finally, though this model improves the overall balance of our treatment and comparison samples on retrospective characteristics relative to our raw data, we still observe poor balance on certain variables in the matched sample, including cooperative membership motivation, past farm size, and past cocoa production. These imbalances could indicate systemic differences between the treatment and comparison samples that may bias results. Cocoa income, for example, was lower in the treatment group in the retrospective period than in the comparison group, indicating that our impact estimates could be underestimating the impact of cooperative membership on cocoa income. Despite these challenges, our matching model improved the overall balance between the treatment and comparison groups, increasing our confidence in the results relative to what we would have achieved using a simple comparison group methodology.

Section 3: Qualitative Approach

To complement our quantitative data, we conducted focus groups with farmer-members and interviews with cooperative staff. These conversations allowed us to collect detailed narratives on key outcomes of interest—particularly gendered trends in cocoa production or individual

outcomes. They also provided an opportunity for Root Capital to solicit direct feedback about the cooperatives and our own services in a neutral environment. Finally, they helped us develop a stronger understanding of the social and economic context in which these clients and their members operate.

Data Collection Strategy

Focus Groups

Focus groups were primarily intended to collect data on men's and women's experiences as cocoa producers and members of their enterprises; understand barriers to women's agricultural productivity and enterprise participation; and identify methods through which enterprises or members themselves could better support female producers. They included discussion questions on individuals' motivation for becoming cocoa farmers and cooperative members; changes over time to cocoa production and income; services and benefits derived from cooperative membership; vulnerabilities and future aspirations; and gender dynamics in their households, cooperatives, and communities.

Focus groups were disaggregated by gender; a focus group was conducted with women and with men belonging to each cooperative, for a total of six discussions groups. Focus groups contained 5-12 members each and were carried out by the Root Capital impact study consultant or by a survey enumerator who received additional training to lead focus groups. Participants were selected randomly for focus group discussions; however, in some cases, when randomly selected participants did not present themselves for the discussions, the consultant replaced them with non-randomly selected cooperative members of the appropriate gender. Discussions took place at the homes or workspaces of members; in the case of Cacao Aroma, focus group discussions took place at a secondary cooperative office.

Enterprise Interviews

We conducted enterprise-level interviews to collect data on cooperative's financial status; successes and challenges experienced by the cooperative; services the cooperative provides to farmers; and the cooperative's goals. Enterprise interviews also included questions about the features of the cocoa market in which each cooperative operates, as well as their experiences with, and suggestions for, Root Capital.

Interviews were carried out by the Root Capital consultant at each cooperative site. Seven employees from Pangoa representing numerous departments, including the general manager, participated in interviews. Our consultant also interviewed three Cacao Aroma employees, as well as the general manager for APROCAM.

Analytical Approach

Interview transcripts were coded using keyword analysis, by which participant quotes were assigned keywords summarizing the intention or theme behind each statement. Keywords were ranked into hierarchies describing the relationships between common themes. We also documented any repetition or dissent among participants, and how patterns in language differed by gender. Based on this analysis, we crafted narratives illustrating the representative opinions of focus group participants on the target topics.

Qualitative Methodological Challenges

Focus groups provide a cost-effective method of obtaining qualitative data from a large number of participants. However, focus groups do not always allow respondents to provide detailed responses, as facilitators are tasked to hear from multiple people in a limited timeframe. Additionally, the presence of others can bias individual responses. To limit this kind of bias, we separated focus groups by gender. Facilitators were also instructed to limit the exposure of the focus group to non-participant observation or input. However, in at least one focus group conversation with women, a man was documented to be present for and interjected into the discussion, which may have impacted women's comfort or the validity of their responses to sensitive questions about gender.

Section 4: Regression Output

Table 7: Regression Output on Income, Production, Sales, Land, and Productivity

| VARIABLES | (1) Cocoa Income | (2) Household Income | (3) Cocoa Production | (4) Quantity Sold | (5) Cocoa Land | (6) Cocoa Trees | (7) Total Land | (8) Prod per Hectare | (9) Prod per Tree |
|--|------------------------|----------------------------|----------------------------|-------------------------|----------------------|-----------------------|----------------------|----------------------------|-------------------------|
| Member | 1.883** (731.5) | 966.5 (730.1) | 375.3** (160.2) | 339.7*** (127.7) | 0.58*** (0.131) | 761.7*** (283.0) | 0.260 (0.371) | 86.40 (57.12) | 7.108 (5.743) |
| Male | -761.2 (821.0) | 689.5 (802.4) | -197.4 (204.2) | -25.64 (139.8) | -0.105 (0.143) | 239.1 (215.4) | 0.273 (0.366) | -62.25 (58.79) | -8.294 (9.622) |
| Cocoa Inc (R) | 0.779*** (0.132) | | | | | | | | |
| Total Inc (R) | | 0.836*** (0.0585) | | | | | | | |
| Cocoa Prod (R) | | | 0.261 (0.189) | | | | | | |
| Quant Sold (R) | | | | 0.698*** (0.120) | | | | | |
| Cocoa Land (R) | | | | | 0.62*** (0.058) | | | | |
| Cocoa Trees (R) | | | | | | 0.335 (0.209) | | | |
| Total Land (R) | | | | | | | 0.77*** (0.05) | | |
| Prod per Hect. (R) | | | | | | | | 0.0894 (0.0674) | |
| Prod per Tree (R) | | | | | | | | | -0.182 (0.273) |
| Constant | 3,900*** (741.9) | 2,771*** (787.6) | 1,255*** (200.8) | 809.6*** (126.9) | 1.27*** (0.147) | 1,224*** (355.6) | 2.2*** (0.386) | 634.2*** (58.98) | 6.986 (7.064) |
| Observations | 347 | 373 | 394 | 452 | 452 | 408 | 452 | 368 | 384 |
| R-squared | 0.161 | 0.471 | 0.088 | 0.130 | 0.2697 | 0.083 | 0.498 | 0.065 | 0.009 |
| Robust standard errors in parentheses | | | | | | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | | | | | | |
| All regressions are OLS, employ robust standard errors, and include a frequency weight used to construct the matched sample. "Member" is a dummy variable indicating treatment status; "Male" is a dummy variable indicating whether the respondent was male. All variables noted with (R) reflect retrospective data. | | | | | | | | | |

Table 8: Regression Output on Agricultural Practices

| VARIABLES | Perm. Shade | Temp. Shade | Terracing | Barriers | Cover Crops | Mulch | Rainwater | Irrigation | Drainage |
|--|-----------------------|----------------------|-----------------------|---------------------|---------------------|----------------------|----------------------|----------------------|----------------------|
| Member | 0.0595 (0.0409) | 0.0584 (0.0375) | 0.0140 (0.0104) | 0.0251 (0.0296) | 0.00699 (0.0208) | 0.131*** (0.0332) | -0.00717 (0.0150) | 0.0213 (0.0177) | -0.0228 (0.0308) |
| Male | -0.145*** (0.0485) | -0.16*** (0.0452) | 0.00598 (0.0113) | 0.0493 (0.0319) | 0.0171 (0.0199) | -0.0518 (0.0381) | -0.0150 (0.0195) | 0.0192 (0.0215) | 0.0246 (0.0316) |
| Perm. Shade (R) | 0.456*** (0.0419) | | | | | | | | |
| Temp. Shade (R) | | 0.34*** (0.0489) | | | | | | | |
| Terracing (R) | | | 0.189 (0.178) | | | | | | |
| Barriers (R) | | | | 0.49*** (0.0867) | | | | | |
| Cover Crops (R) | | | | | 0.461*** (0.147) | | | | |
| Mulch (R) | | | | | | 0.542*** (0.0727) | | | |
| Rainwater (R) | | | | | | | 0.635*** (0.195) | | |
| Irrigation (R) | | | | | | | | 0.839*** (0.0715) | |
| Drainage (R) | | | | | | | | | 0.512*** (0.0851) |
| Constant | 0.215*** (0.0503) | 0.21*** (0.0466) | -0.00138 (0.00894) | 0.0358 (0.0289) | 0.0238 (0.0151) | 0.0822** (0.0338) | 0.0364 (0.0232) | 0.00392 (0.0183) | 0.087*** (0.0263) |
| Observations | 416 | 416 | 416 | 416 | 416 | 416 | 416 | 416 | 416 |
| R-squared | 0.250 | 0.159 | 0.041 | 0.171 | 0.120 | 0.262 | 0.197 | 0.539 | 0.169 |
| Robust standard errors in parentheses | | | | | | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | | | | | | |
| All regressions are OLS, employ robust standard errors, and include a frequency weight used to construct the matched sample. "Member" is a dummy variable indicating treatment status; "Male" is a dummy variable indicating whether the respondent was male. All variables noted with (R) reflect retrospective data. | | | | | | | | | |

Table 9: Regression Output on Agricultural Practices (cont.)

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|--|----------------------|---------------------|-----------------------|-----------------------|-----------------------|---------------------|------------------------|--------------------|-------------------|
| VARIABLES | Maint. Pruning | Rehab Pruning | Fungicide | Pesticide | Herbicide | Fertilizer | Fermentation | Dry Box | None |
| Member | -0.00151 (0.0275) | 0.0317 (0.0384) | -0.132*** (0.0241) | -0.0476** (0.0184) | -0.092*** (0.0233) | 0.15*** (0.0456) | -0.0732*** (0.0282) | -0.0015 (0.024) | -0.008 (0.018) |
| Male | 0.00290 (0.0297) | 0.13*** (0.0433) | 0.0224 (0.0268) | 0.065*** (0.0191) | 0.0676** (0.0291) | -0.0294 (0.0533) | -0.0888** (0.0362) | -0.0374 (0.026) | -0.013 (0.022) |
| Maint. Pruning (R) | 0.0464 (0.0325) | | | | | | | | |
| Rehab Pruning (R) | | 0.6*** (0.0407) | | | | | | | |
| Fungicide (R) | | | 0.457*** (0.0710) | | | | | | |
| Pesticide (R) | | | | 0.253*** (0.0638) | | | | | |
| Herbicide (R) | | | | | 0.229*** (0.0429) | | | | |
| Fertilizer (R) | | | | | | 0.39*** (0.0518) | | | |
| Fermentation (R) | | | | | | | 0.473*** (0.0704) | | |
| Drying Box (R) | | | | | | | | 0.54*** (0.071) | |
| None (R) | | | | | | | | | 0.0085 (0.032) |
| Constant | 0.884*** (0.0421) | 0.0656 (0.0424) | 0.095*** (0.0279) | -0.00562 (0.0142) | 0.0271 (0.0272) | 0.29*** (0.0540) | 0.168*** (0.0369) | 0.06*** (0.021) | 0.05** (0.021) |
| Observations | 416 | 416 | 416 | 416 | 416 | 416 | 416 | 416 | 416 |
| R-squared | 0.006 | 0.360 | 0.289 | 0.164 | 0.171 | 0.143 | 0.242 | 0.350 | 0.002 |
| Robust standard errors in parentheses | | | | | | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | | | | | | |
| All regressions are OLS, employ robust standard errors, and include a frequency weight used to construct the matched sample. "Member" is a dummy variable indicating treatment status; "Male" is a dummy variable indicating whether the respondent was male. All variables noted with (R) reflect retrospective data. | | | | | | | | | |

Table 10: Regression Output on Labor, Land Ownership, and Certification Status

| VARIABLES | (1) Household Laborers | (2) Temporary | (3) Full Time | (4) Land Own | (5) Certification | (6) Certification | (7) Cocoa Costs | (8) Net Income |
|--|------------------------------|---------------------|----------------------|-----------------------|----------------------|----------------------|-----------------------|---------------------|
| Member | 0.259** (0.106) | 0.686 (0.705) | 0.11429 (0.0885) | 0.0298 (0.0211) | 0.476*** (0.0374) | 0.577*** (0.0677) | 842.7** (329.7) | 979.96* (575.48) |
| Male | -0.207* (0.122) | 0.974 (0.624) | -0.04212 (0.1153) | 0.0916*** (0.0297) | 0.0563 (0.0412) | 0.125*** (0.0320) | -380.5 (349.7) | -675.08 (592.41) |
| Member*Male | | | | | | -0.140* (0.0798) | | |
| Certification (R) | | | | | 0.570*** (0.0440) | 0.564*** (0.0433) | | |
| Constant | 2.264*** (0.108) | 2.319*** (0.484) | 0.1622 (0.0811) | 0.865*** (0.0315) | 0.0718** (0.0294) | 0.0239 (0.0180) | 2,498*** (314.9) | 4,579*** (463) |
| Observations | 452 | 452 | 449 | 452 | 414 | 414 | 415 | 415 |
| R-squared | 0.020 | 0.006 | 0.0042 | 0.038 | 0.444 | 0.447 | 0.018 | 0.010 |
| Robust standard errors in parentheses | | | | | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | | | | | |
| All regressions are OLS, employ robust standard errors, and include a frequency weight used to construct the matched sample. "Member" is a dummy variable indicating treatment status; "Male" is a dummy variable indicating whether the respondent was male. All variables noted with (R) reflect retrospective data. "Member*Male" is an interaction term which indicates the additional effect of being a male RC cooperative member. | | | | | | | | |

Table 11: Regression Output on Technical Assistance, Credit, and Input Assistance

| VARIABLES | (1) Tech Visit | (2) Tech Visit | (3) # Tech Visit | (4) Loan | (5) Inputs | (6) Inputs |
|---|----------------------|----------------------|---------------------|-----------------------|----------------------|----------------------|
| Member | 0.433*** (0.0424) | 0.579*** (0.0710) | 0.161 (0.191) | -0.00231 (0.0410) | 0.194*** (0.0352) | 0.263*** (0.0603) |
| Male | 0.0379 (0.0444) | 0.140** (0.0634) | 0.462** (0.192) | -0.160*** (0.0480) | 0.0302 (0.0368) | 0.0782** (0.0322) |
| Member*Male | | -0.207** (0.0879) | | | | -0.0972 (0.0741) |
| Constant | 0.292*** (0.0419) | 0.221*** (0.0505) | 2.412*** (0.204) | 0.377*** (0.0474) | 0.0629** (0.0282) | 0.0294 (0.0206) |
| Observations | 452 | 452 | 242 | 452 | 452 | 452 |
| R-squared | 0.190 | 0.199 | 0.023 | 0.027 | 0.065 | 0.068 |
| Robust standard errors in parentheses | | | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | | | |
| All regressions are OLS, employ robust standard errors, and include a frequency weight used to construct the matched sample. "Member" is a dummy variable indicating treatment status; "Male" is a dummy variable indicating whether the respondent was male. "Member*Male" is an interaction term which indicates the additional effect of being a male RC cooperative member. | | | | | | |

Table 12: Regression Output on Health Status, Food Insecurity, and Aspirations

| VARIABLES | (1) Poor Health | (2) Illness | (3) Injury | (4) Food Insecurity | (5) Aspirations | (6) Aspirations for Child | (7) Time Housework | (8) Time Childcare |
|---|----------------------|---------------------|---------------------|------------------------|------------------------|------------------------------|-----------------------|-----------------------|
| Member | 0.111*** (0.0240) | 0.0712 (0.0446) | 0.0520* (0.0293) | 0.0983** (0.0402) | 0.0718*** (0.0246) | 0.0917* (0.0476) | -5.254 (6.347) | 17.91* (9.446) |
| Male | -0.0262 (0.0278) | -0.0298 (0.0490) | 0.08*** (0.0272) | -0.0722 (0.0451) | -0.0758*** (0.0216) | 0.0838 (0.0535) | -92.68*** (9.535) | -59.63*** (13.23) |
| Constant | 0.0360* (0.0210) | 0.33*** (0.0451) | 0.0272 (0.0220) | 0.245*** (0.0399) | 0.942*** (0.0154) | 0.559*** (0.0520) | 126.9*** (10.09) | 84.11*** (11.01) |
| Observations | 452 | 452 | 452 | 452 | 452 | 391 | 452 | 452 |
| R-squared | 0.047 | 0.006 | 0.021 | 0.019 | 0.035 | 0.016 | 0.283 | 0.076 |
| Robust standard errors in parentheses | | | | | | | | |
| *** p<0.01, ** p<0.05, * p<0.1 | | | | | | | | |
| All regressions are OLS, employ robust standard errors, and include a frequency weight used to construct the matched sample. "Member" is a dummy variable indicating treatment status; "Male" is a dummy variable indicating whether the respondent was male. | | | | | | | | |