

Assessing the impacts of COVID-19 on the Coffee Value Chain in Guatemala: Evidence from coffee growers in the Midwest and East

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Introduction

Coffee is a growth market. Current estimates indicate that global coffee production (in volume) has increased by more than 60% since the 1990s. Coffee is produced by around 25 million farmers, which are mainly smallholders in developing and least developed countries, and over 70% of the coffee produced is exported, resulting in about 20 billion US dollars annual foreign exchange earnings (ICO, 2020).

COVID-19 represented a severe joint supply and demand shock to the global coffee sector, particularly during the first months after the start of the pandemic. As noted by Hernandez et al. (2020), the coffee industry experienced important disruptions downstream the value chain, including the functioning of key export infrastructure and international shipping, which combined with local currency devaluations and volatile coffee prices, which resulted in significant challenges for coffee growers, farm workers, and traders.

In this study, we focus on the case of Guatemala, which ranks eleventh among coffee producers economies worldwide and third in Central America.¹ Guatemala is a low-income country with a poverty rate of 59.3% (INE, 2015) and a stunting rate of 46.5% (MSPAS, 2017). The geographic diversity in weather, altitude, and soil types allows for coffee production in 20 departments.² The largest share of the production concentrates in the Western Highlands, Pacifico-Bocacosta, and Verapaces regions, and Arabica coffee is the main variety grown in the country. Along with maize and beans, coffee plays an important role in Guatemala's economy, with an 2011 harvested area of 252,415 hectares and estimated production of 245,752 metric tons in 2013 (MAGA, 2011;

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¹ Guatemalan coffee exports account for 2.7 percent of the international market (USDA, 2020).

² The coffee harvest period in Guatemala is between September and April, with its high harvest cycle from September to February.

MAGA, 2013). Coffee is a principal source of employment in the agricultural sector, employing more than 300,000 families, equivalent to 18% of the total agricultural employment (MAGA, 2011). Furthermore, coffee represents around 2% of the national gross domestic product and 8.5% of total exports, which places it as the second most important commodity in the country after textiles (USDA, 2018).

Coffee is produced mainly by small-sized farmers in Guatemala. Small-sized coffee farmers (up to 100 pounds in production) comprise around 96.8% of the producers and 47% of the total coffee production in the country (USDA, 2020; USDA, 2021). Medium-sized coffee farmers (between 101 to 1,600 pounds in production) represent, in turn, 2.9% of the producers and explain 31% of total production, while large-sized coffee farmers (from 1,601 to up pounds in production) represent the remaining 0.3% of producers and 22% of production. Small farmers, however, face strong productivity and competitiveness challenges (compared to large-sized coffee farmers), which are partially reduced by selling their coffee to their cooperatives; these cooperatives or farmer associations can exploit economies of scale and help providing technical assistance, improve quality, reduce production, processing, and commercialization costs, and aid accessing credit. Cooperatives can join and associate with any federation, which acts as a second-level cooperative to obtain Fair Trade certification for coffee exportation. In turn, large cooperatives export directly to the international market, where a premium is paid for higher quality coffee.

In early 2020, the national government imposed strict social and economic measures to prevent and contain the spread of COVID-19, such as a temporary halt of economic activities, prohibition of agglomerations of people, and restrictions in public transportation and overall mobility.³ To put these measures in perspective, the government response stringency index (as estimated by Roser et al., 2020) reached 96.3 out of 100 from April 17 to July 25, 2020, placing Guatemala among the countries with strictest responses in the region.⁴ Although food industry and agricultural activities were exempted from these restrictions, some studies indicate that these measures affected agricultural and food supply chains by limiting the mobility of people and goods (FAO-ECLAC, 2020a and 2020b).

This study evaluates the effects of COVID-19 on smallholder coffee farmers in Guatemala. We rely on data collected through a phone survey in May 2021 to producers located in two different regions: Chimaltenango in the Midwest near the Western Highlands and Chiquimula in the Dry Corridor and eastern side of the country. We focus on potential changes in production and commercialization outcomes and the factors correlated with these variations. The analysis also takes into account direct exposure to COVID-19 and to the two last tropical storms (ETA and IOTA) that hit the country in late November 2020.⁵ We similarly explore changes in other outcomes of interest at the household level, such as income, food security, migration, and individual perceptions.

To date, few studies have assessed the specific impacts of this global shock on coffee value chains, especially among actors upstream the value chain. Based on surveys among coffee

³ The beginning of the progressive de-confinement started on July 12th (OECD, 2020).

⁴ The stringency index dropped to 87 in August 2020 and has remained around 50 since October 2020.

⁵ Guatemala ranks among the top five countries in the world most affected by climate shocks (World Bank, 2021).

exporters in Rwanda, Apell and Morjaria (2021) find that aggregate export revenue remained relatively stable. Similarly, Manwaring and Morjaria (2021) show that Uganda's coffee sector appears to have been relatively resilient to the COVID-19 global shock. To our knowledge, only two studies are available for the Latin American region. Martinez-Salgado et al. (2021) assess the impacts of contention measures on Guatemalan coffee producers, based on interviews with extension technicians from the Ministry of Agriculture across nine departments, and find that producers faced certain issues related to input access, while no major production and commercialization problems. Vargas et al. (2021) discuss the immediate effects of quarantine measures implemented in Peru among potato and coffee producers, based on interviews to smallholders in one department, and find that although the mobilization restrictions affected the product commercialization, pre-established commercial agreements of coffee producers allowed them to maintain their pre-pandemic sales levels.

More generally, our study contributes to the literature on the impact of COVID-19 on agri-food value chains. Recent studies include Ogada et al. (2021) and Nchanji et al. (2021) who find that COVID-19 and government restrictions negatively impacted vegetable and bean production and commercialization in sub-Saharan Africa. Hirvonen et al. (2021) describe larger changes in farm prices compared to consumer prices for different vegetables in Ethiopia, due to pandemic-related trade disruptions. Van Hoyweghen et al. (2021) explore the differences in impacts of COVID-19 between export-oriented supply chains (few large agro-industrial companies) and traditional domestic-oriented supply chains (larger number of smallholder farmers and informal traders) for fresh fruit and vegetables in Senegal, and find that modern supply chains have been more resilient than their more traditional counterpart to this shock.

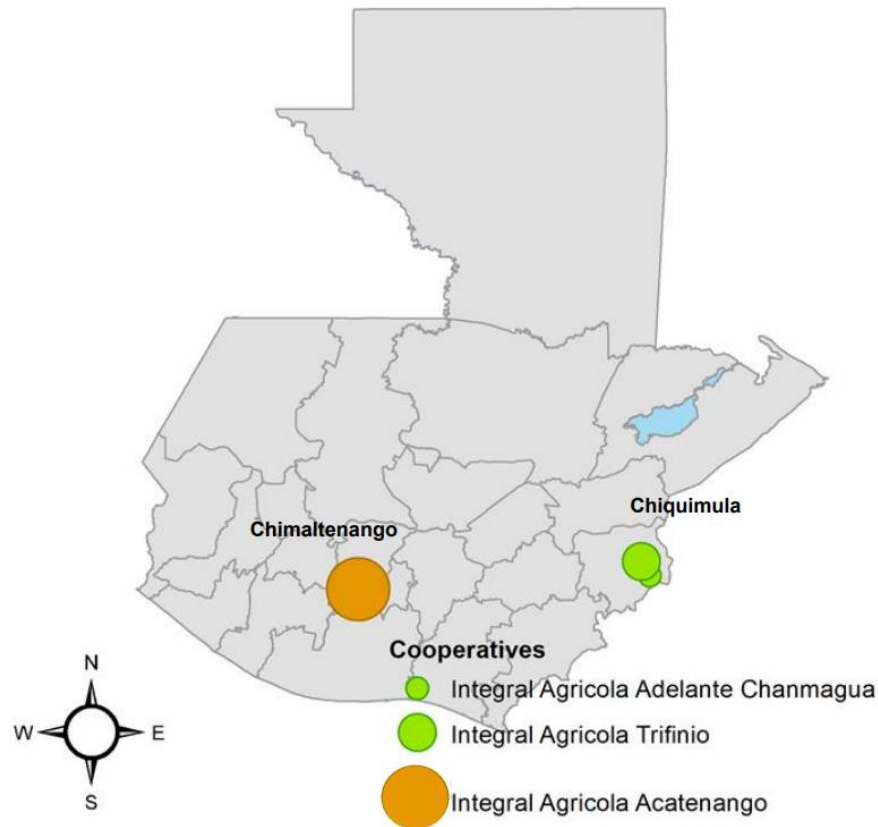
The remainder of this note is organized as follows. Section 2 describes the data and methodology followed to assess the potential effects of COVID-19 on coffee producers in Guatemala. Section 3 presents and discusses the results, including before-after comparisons in key indicators related to coffee production and commercialization and possible supply and demand factors associated with these changes. Section 4 provides some concluding remarks.

Data and methodology

1. Data

The study relies on a representative sample of coffee producers from three cooperatives affiliated to the Federacion de Cooperativas Agricolas de Productores de Cafe en Guatemala (FEDECOCAGUA), which operate in the departments of Chimaltenango and Chiquimula (see Figure 1). The three cooperatives, one in located in Acatenango (Chimaltenango) and two located in Esquipulas (Chiquimula), were selected in coordination with FEDECOCAGUA who facilitated the participation of the cooperatives and their members in the study. Our working sample comprises a total of 496 producers that were interviewed in May 2021.

Figure 1: Location of cooperatives



Note: The size of each circle is proportional to the number of interviewed coffee producers from each cooperativ.

The surveys were conducted exclusively over the phone by a local team of female enumerators and collected information on basic producer and household socioeconomic characteristics, coffee production and commercialization, access to inputs and credit, direct exposure to COVID-19 and climate shocks, coping mechanisms and aid received, household income, food insecurity experiences, migration, and perceptions.⁶ The survey included questions about the 2019-20 season, which runs from April 2019 through March 2020, and 2020-21 season, which runs from April 2020 through March 2021. Considering that the government of Guatemala imposed a nationwide lockdown on March 21, 2020 (eight days after the first reported case in the country and ten days after COVID-19 was declared a global pandemic by the World Health Organization), the comparison in responses across seasons permits to assess potential effects of COVID-19 on coffee production, commercialization, and other indicators of interest.⁷

Table 1 presents summary statistics for a wide set of socioeconomic characteristics in our sample. Producers are mostly male, over 50 years old, Spanish speaking, and 64% have completed

⁶ Each interviewed producer received a small airtime top-up equivalent to 1.33 US dollars in gratitude for their time in responding the survey.

⁷ Due to the small overlap between the start of the pandemic and the 2019-20 coffee season, we additionally inquired for impacts on pre-negotiated prices during the end of the past season, which are discussed below.

elementary education. On average, they work more than four hectares of total agricultural land but do not have an irrigation system. More than 50% owns livestock, close to 90% owns agricultural equipment, and more than two thirds owns a vehicle. Similarly, over 46% also produce parchment coffee while 20% produce golden coffee.⁸ Of the 496 surveyed coffee producers, 239 (48%) belong to Cooperativa Integral Agrícola Acatenango in Chimaltenango, and 174 (35%) and 83 (17%) to Cooperativa El Trifinio de Esquipulas and Cooperativa Chanmagua R.L., respectively, in Chiquimula.

Table 1: Producer's characteristics

Variable	Mean	Standard Deviation	Minimum	Maximum
Producer age	50.627	14.839	20.000	89.000
If producer is male	0.800	0.400	0.000	1.000
If producer main language spoken is Spanish	0.966	0.182	0.000	1.000
If producer completed elementary education or above	0.641	0.480	0.000	1.000
Household size	4.774	1.991	1.000	13.000
If dwelling is connected to electricity	0.964	0.187	0.000	1.000
If dwelling is connected to water system	0.974	0.160	0.000	1.000
If dwelling is connected to drainage network	0.758	0.429	0.000	1.000
Total agricultural land size (in hectares)	4.389	5.993	0.044	63.000
If agricultural land has irrigation system	0.032	0.177	0.000	1.000
If household owns livestock	0.526	0.500	0.000	1.000
If producer owns agricultural equipment	0.883	0.322	0.000	1.000
If household owns a vehicle	0.681	0.466	0.000	1.000
If producer produces parchment coffee	0.464	0.499	0.000	1.000
If producer produces golden coffee	0.200	0.400	0.000	1.000
If producer belongs to Cooperativa Chanmagua R.L.	0.167	0.374	0.000	1.000
If producer belongs to Cooperativa El Trifinio de Esquipulas	0.351	0.478	0.000	1.000
If producer belongs to Cooperativa Integral Agrícola Acatenango	0.482	0.500	0.000	1.000

Note: The statistics are based on the full sample of 496 producers.

⁸ Parchment coffee is the coffee bean that remains after removing the outer layers (except the parchment) of the coffee cherry and washing it to then leave it resting for a couple of weeks; it is an intermediate stage in processing coffee beans. Golden coffee results from grinding or peeling the parchment coffee to remove its last layer.

It is worth noting that collecting both current and past data at the same time could be subject to potential anchoring bias where respondents tend to use their outcomes for the most recent period as a cognitive heuristic when recalling past outcomes, and that this may be aggravated when facing a negative event (Baumeister et al., 2001; Godlonton et al., 2018; Godlonton et al., 2021).⁹ To attenuate this eventual anchoring (negativity) bias due to the pandemic, we follow Godlonton et al. (2021) and ask first about the past 2019-20 season and then about the most recent 2020-21 season. However, we acknowledge that we cannot fully discard this source of bias, which is inherent in self-reported retrospective data, and our results should thereby be viewed with caution in this regard.

2. Methodology

The statistical analyses carried out in this study are divided into three subsections. In Section 3.1 we present simple before-after comparisons of various outcome variables linked to coffee production and commercialization. These include cultivated land, volume of production and sales (per hectare), selling price, local commercialization dynamics and terms of sale, usage of inputs, type of labor, and access to credit. We also discuss financial problems reported by farmers, coping mechanisms, direct exposure to COVID-19 and ETA and IOTA tropical storms that hit Guatemala in November 2020, and aid received.

In Section 3.2 we examine whether the decrease in cultivated land, volume of production, and sales can be associated to demand- and supply-side indicators. We accordingly estimate the following linear probability model by ordinary least squares:

$$D_{ij} = \alpha + I_{ij}\delta + X_{ij}\beta + c_j + u_{ij} \quad (1)$$

where the dependent variable D_{ij} is an indicator variable capturing whether producer i from cooperative j reports a decrease in cultivated land under coffee, volume of production, or sales between the 2019-20 and 2020-21 seasons; I_{ij} is a vector of multiple demand- and supply-side factors such as whether the producer reported COVID-19 cases at home and/or her community, being affected by ETA and IOTA tropical storms, having to adjust (decrease) the pre-agreed selling price at the beginning of the pandemic, facing a price drop between seasons, and experiencing financial problems (liquidity constraints, difficulties transporting the harvest, difficulties in access to credit, restrictions for buying inputs or selling coffee, labor shortages, difficulties in protecting from COVID-19, and overcosts to continue operating, i.e., cost overruns); X_{ij} is a vector of producer and household characteristics that include age, gender, primary spoken language, and level of education of producer, household size, dwelling characteristics, access to public services, land holding size, irrigation system, livestock, asset ownership, and whether the producer engages in processing to parchment and golden coffee; c_j is a cooperative fixed effects component that controls for cooperative-level heterogeneity that could be correlated with the observed outcomes (e.g., market development and accessibility, social and cultural

⁹ Godlonton et al. (2018) document this anchoring bias among smallholder farmers in four countries in Central America, including Guatemala.

context, access to services); and u_{ij} is an idiosyncratic error term. We use robust standard errors to account for heteroskedasticity.

The parameters of interest in equation (1) are captured in vector δ , which measure the partial correlations between the demand- and supply-side variables and the likelihood of reporting a decrease in cultivated area under coffee, volume of production, and sales. The producer and household characteristics included in the regression help to control for potential differences across producers that could be confounded with the modelled relationships.¹⁰

Lastly, in Section 3.3 we discuss variations in other indicators of interest after the start of the pandemic. These other outcomes comprise qualitative changes in household income by source (agricultural, non-agricultural, and remittances), food insecurity experiences, migration, and perceptions about the present and future.

Results

This section presents the available evidence on the effects of the COVID-19 pandemic on Guatemalan coffee producers. The first subsection focuses on quantitative comparisons of key coffee production and sales indicators between the 2019-20 and 2020-21 growing seasons. The second subsection relates any observed changes to different supply and demand factors. The final subsection describes qualitative changes in a range of socioeconomic and other indicators between the last two seasons.

1. Before-after comparisons on key indicators

Next, we present comparisons of key quantitative indicators between the 2019-20 and 2020-21 coffee growing seasons. We focus on outcomes related to coffee production and sales, commercialization and terms of sale, and direct exposure to COVID-19 and the ETA and IOTA tropical storms.

1.1. Coffee production and sales

Between the 2019-20, pre-COVID season and the 2020-21 season, coffee producers in our sample seem to have maintained the same amount of cultivated land under coffee, together with production levels and sales to their cooperatives, which constitute their main buyer (Table 2).¹¹ In particular, the average extension of land dedicated to coffee was 4.14 hectares during the pre-COVID season (2019-20) and 4.21 hectares post-COVID (2020-21), but the change is not statistically significant at conventional levels. In distributional terms, nine out of ten producers reported planting the same number of hectares in 2020-21 as in 2019-20. Despite this increase in cultivated area, the average volume of coffee production and sales decreased slightly between seasons and the variations are also not statistically significant. Farmer's report producing 148 versus 134 quintals per hectare across seasons and selling 120 versus 108 quintals per hectare

¹⁰ For instance, liquidity constraints, access to credit, and cost overruns may vary across producers with different characteristics, which may, in turn, affect production and commercialization decisions.

¹¹ In 2019-20, the sampled producers sold about 83% of their harvest to their cooperative.

to their cooperatives. By individual, four out of ten producers report a decrease in both production and sales, while another two out of ten-report producing and selling similar amounts. The marginal decrease in sales to the cooperative are also observed in sales to other local traders, although only 20% of producers sold part of their coffee production outside the cooperative.

Regarding prices, we observe a significant increase from 169.9 Quetzales to 180.5 Quetzales (approximately from 22 to 23.37 US dollars). As coffee sales to the cooperative and thereby FEDECOCAGUA are normally oriented to external markets, this price increase is in line with the upward trend in international prices post-COVID. In fact, international coffee prices had fallen to a historic low in mid-2019, which coincided with price negotiations for the 2019-20 season in Guatemala; and began to rebound in November of 2019 , achieving peak levels at the beginning of 2020. During the subsequent 2020-21 season, price levels remained above those of season 2019-20 (Food Security Portal, 2021). According to the International Coffee Organization (ICO) historical online data, the price of Arabica coffee increased by 10.4% from March 2020 to March 2021.

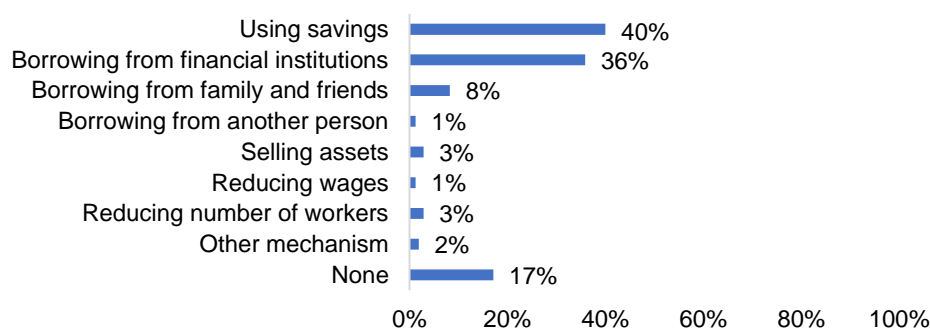
Table 2: Before and after comparison of cultivated land, production, and coffee sales

	Season 2019-20	Season 2020-21	Difference p-value
Coffee cultivated land (in hectares)	4.14 (5.73)	4.21 (6.18)	0.852
Coffee production (in quintals per hectare)	147.55 (221.80)	133.88 (129.38)	0.236
Coffee sales to cooperative (in quintals per hectare)	120.09 (220.98)	108.25 (128.20)	0.302
Sale price to cooperative (in Quetzales per quintal)	169.88 (51.70)	180.48 (35.17)	0.000

Note: This table reports the average and standard deviation (in parentheses) of coffee cultivated land, volume of production and sales, and sale price, before and after COVID-19. The column “Difference p-value” report the p-value that results from the mean-comparison t-test between the two seasons (assuming unequal variances); a value larger than 0.05 indicates that the average difference in each indicator across the two periods is not statistically different at a 95% confidence level. Cultivated land is represented by the number of hectares that the producer dedicated to coffee, whereas production and sales are represented by the total number of quintals of coffee produced or sold divided by the number of hectares assigned to coffee. The sale price to the cooperative is the price that producers agreed to sell their coffee to the association. Sample size = 496 producers except for the sale price that is equal to 476 producers. One quintal is equivalent to 100 pounds or 46 kilograms

Despite the price increase and marginal decrease in sales volume between years, over two thirds of coffee producers reported a reduction of profits after the start of the pandemic. Figure 2 illustrates how producers reported dealing with these losses. Four out of ten reported using their own savings to cope with the crisis while 36% reported borrowing from financial institutions. Almost two out of ten respondents, however, indicated that they did not resort to any strategy to cope with their revenue decline.

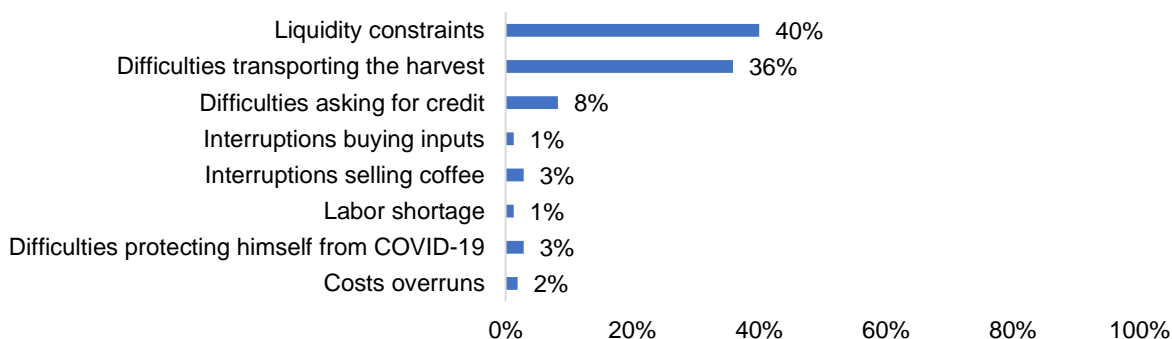
Figure 2: Reported coping mechanisms for profit decline



Note: This figure shows the percentage of interviewed producers that report using different coping mechanisms because of a reduction in their profits. Sample size = 315 producers that report experiencing a decrease in their profits.

The survey also inquired about other possible problems faced during the pandemic. As observed in Figure 3 below, more than two thirds reported liquidity constraints and almost half of the producers indicated shortage of workers. In addition, close to one third reported difficulties finding supplies to protect themselves from COVID-19 and transporting their produce.

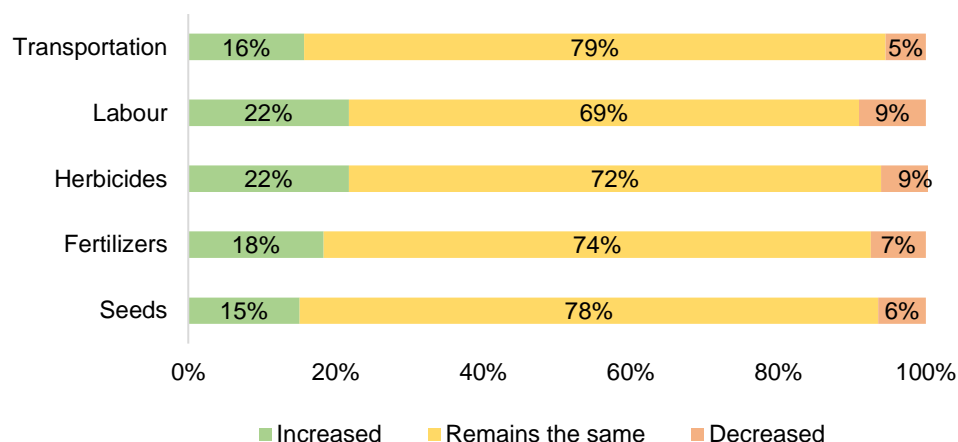
Figure 3: Additional problems reported



Note: This figure shows the percentage of interviewed producers that report other financial problems due to COVID-19. Sample size = 496 producers.

Input usage remained relatively constant between seasons. As shown in Figure 4, between the 2019-20 and 2020-21 seasons, fertilizer, herbicides and pesticides, labor, and transportation were used in the same amount by most coffee producers. Almost eight out of ten producers reported using the same amount of seeds and level of transportation between the two seasons, while seven out of ten producers reported using the same amount of fertilizer, herbicides, and labor. Among the relatively few producers (less than 10% for each input) reporting using less inputs in 2020-21, two major common factors explaining the decrease in usage were higher input costs and additional entry/exist restrictions imposed by their community due to the pandemic.

Figure 4: Change in usage of inputs



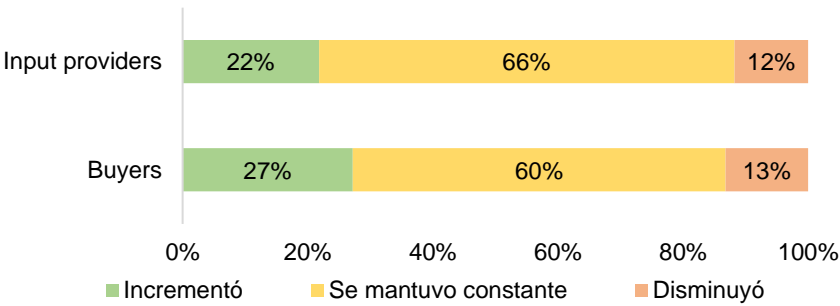
Note: This figure shows the percentage of interviewed households that report decreases or increases in their usage of seeds, fertilizers, herbicides, labor, and transportation. Answer categories in the questionnaire were symmetric, with producers being able to declare that their usage had increased or decreased either a lot or a little; however, these are lumped together in the “Increased” and “Decreased” categories for clarity of exposition. Sample size = 496 producers.

Although not presented, producers further reported no significant changes in the number of temporal, permanent, and non-remunerated (family) labor. On average, coffee producers hired around seven temporal, one permanent, and one non-remunerated full-day worker equivalent in each season. Similarly, access to credit remained stable, with around one third of producers indicating having accessed credit in each season. The main source of credit reported was a formal financial institution, followed by credit from traders and processors. Finally, the easiness to obtain credit did not change between seasons.

1.2. Local commercialization dynamics and terms of sale

Commercialization dynamics in the studied coffee value chain also appear to have remained stable between 2019-20 and 2020-21. Two thirds of producers indicated that the number of input providers in their local markets did not change between seasons and another 22% reported an increase. Likewise, 60% of producers indicated that the number of buyers in their immediate markets remained the same and another 27% reported an increase. It is worth noting, however, that roughly one third of the interviewed producers reported that at least one farmer in their community stopped producing coffee (whether temporally or permanently) due to the pandemic, suggesting a decrease in local competition.

Figure 5: Change in number of input providers and buyers



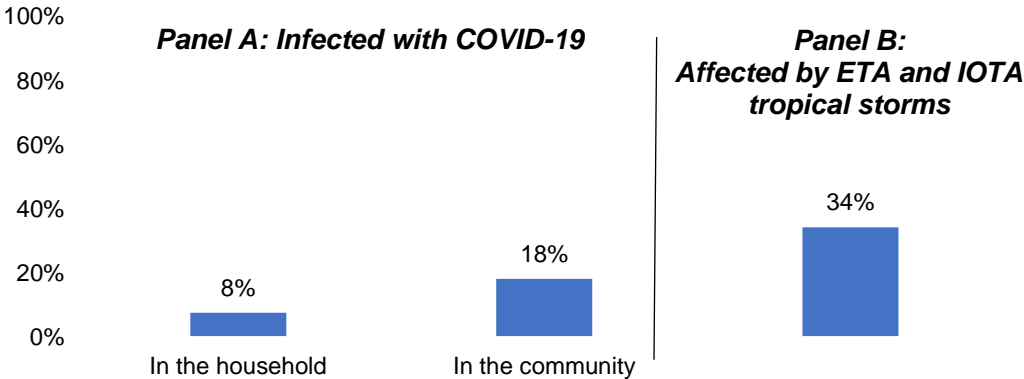
Note: This figure shows the percentage of interviewed producers that report decreases or increases in the number of input providers and buyers in their local market. Answer categories in the questionnaire were symmetric, with producers being able to declare that the number of input providers and buyers had increased or decreased either a lot or a little; however, these are lumped together in the “Increased” and “Decreased” categories for clarity of exposition. Sample size = 496 producers.

Regarding the terms of sale to cooperatives, there was no major change between seasons. Eight out of ten producers indicated that their terms of sale remained the same and only one out of ten report worse terms during the 2020-21 season. As the cooperatives purchase around 80% of producers’ coffee production and sales agreements with cooperatives are typically conducted at the beginning of the season, farmers are less susceptible to market fluctuations (aside from variations in international prices). Still, 10% of producers reported having to adjust (decrease) their sale price with the cooperative at the end of the 2019-20 season due to the COVID-19 outbreak.

1.3. Exposure to COVID-19 and climate shocks

A small share of coffee producers reported being directly exposed to COVID-19. About 15 percent of respondents reported knowing someone infected with COVID-19 in their community, while only 8 percent reported having had a family member infected with the virus. In addition, around one third of producers reported having been affected by ETA and/or IOTA tropical storms, which hit several regions across Guatemala towards the end of November 2020. Many of the interviewed producers indicated suffering crop losses because of these extreme weather events, although in most cases the losses were relatively small.

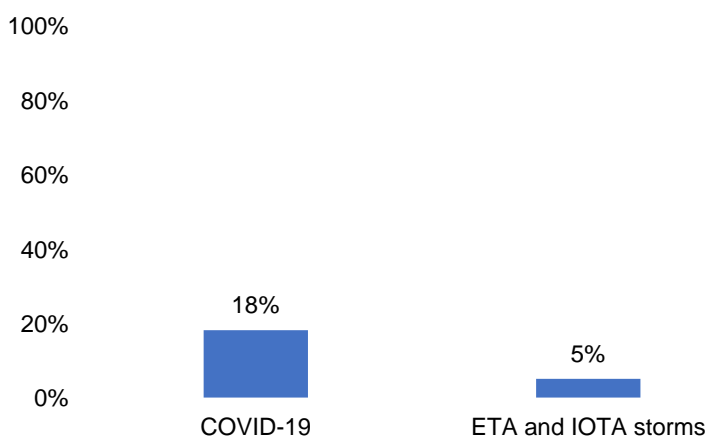
Figure 6: Reported exposure to COVID-19 and climate shocks



Note: Panel A shows the percentage of interviewed producers that report having someone at their home or community infected by COVID-19. Panel B reports the share of producers that report being affected by ETA and IOTA storms. Sample size in both panels = 496 producers.

About 18 percent of producers reported receiving some form of assistance in response to COVID-19. In most cases, producers received cash transfers from their cooperatives as well as from the government. In the case of producers reporting being affected by ETA and/or IOTA tropical storms, less than 5% reported receiving some form of assistance, mainly from the government. This could be related to the fact that the storm hit harder in other regions of the country (Izabal, Verapaces, and some regions from the Western Highlands) where most of the emergency aid was focused. Producers indicate using savings (35%) and borrowing money from financial institutions (28%) to cope with their losses.

Figure 7: Reported assistance received due to COVID-19 and climate shocks



Note: The figure shows the percentage of interviewed producers that report receiving any source of aid due to COVID-19 or ETA and IOTA storms. Sample size in the case of COVID-19 assistance = 496 producers, and in the case of climate shocks assistance = 170 producers.

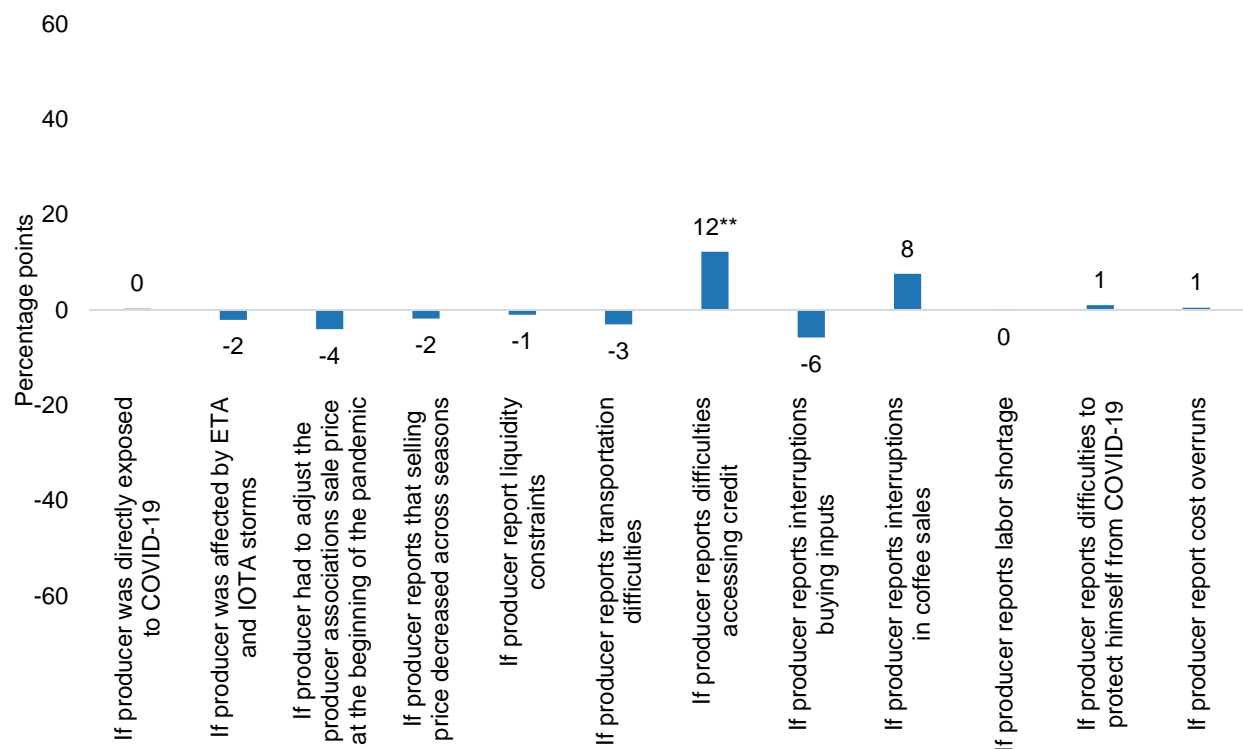
2. Association between a decrease in coffee production and sales and demand and supply factors

We now turn to examine whether the small observed declines in coffee production and sales between 2019-20 and 2020-21 can be associated with specific demand and/or supply factors. These factors include direct exposure to COVID-19 and tropical storms, price adjustments, liquidity constraints, difficulties for transporting the harvest and accessing credit, difficulties in buying inputs or selling coffee, labor shortages, difficulties protecting from COVID-19, and cost overruns.

Figure 8 presents partial regression coefficients from modelling a decrease in cultivated land under coffee and all demand- and supply-side indicators, as described in equation (1). The regressions additionally control for various producer and household characteristics and include cooperative fixed effects. We only observe a statistically significant association between reporting difficulties in obtaining credit and a decrease in the amount of cultivated land under coffee

between seasons. All else being equal, these producers show a 12 percentage points (pp) higher probability of reporting a decrease in the amount of land dedicated to coffee, compared to those who do not report difficulties accessing credit.

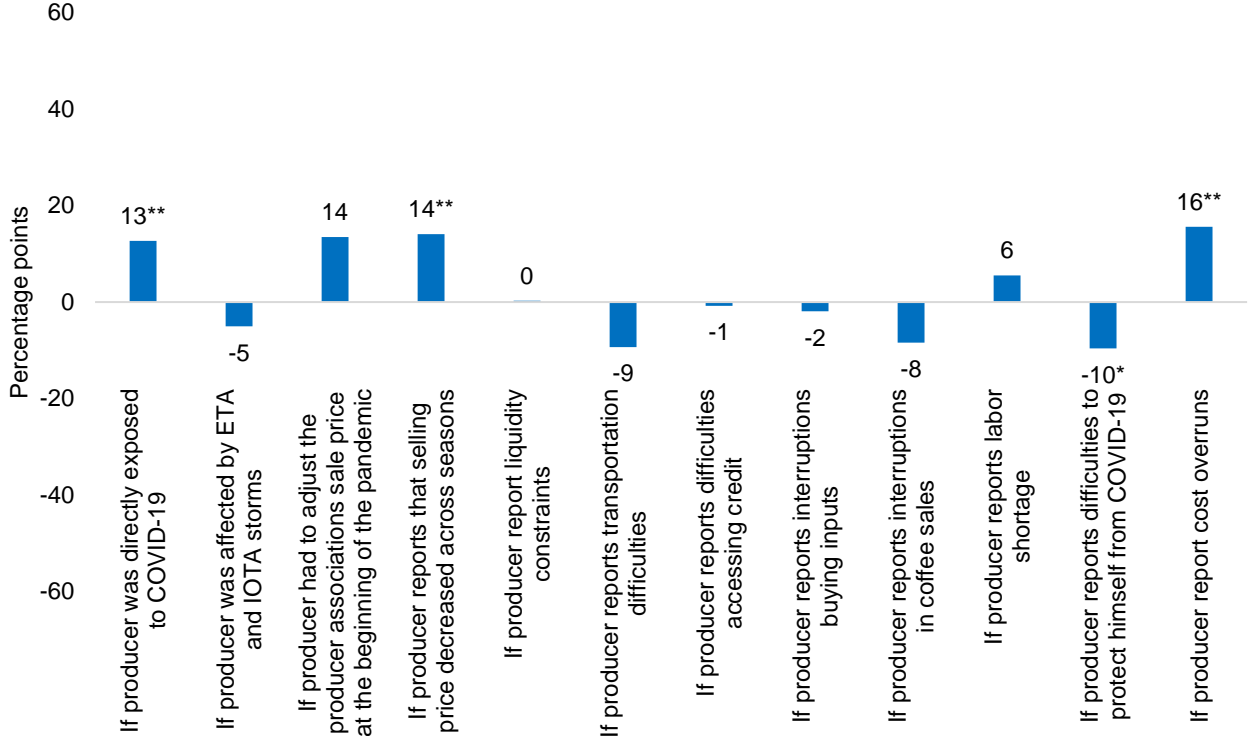
Figure 8: Partial regression coefficients between a decrease in cultivated land under coffee and demand and supply factors



Note: This figure shows the partial correlations (in percentage points) of regressing if the cultivated land for coffee decreased across seasons on demand and supply factors, controlling for producer and household characteristics and cooperative fixed effects. The correlations are based on 496 producers. Cultivated land is represented by the number of hectares that the producer dedicated to coffee.

Figure 9 illustrates the estimated partial correlations between a decrease in coffee yields (per hectare) and the modelled supply- and demand-side indicators. We observe that a decrease in coffee production per hectare is positively associated with direct exposure to COVID-19. Producers with a member of their household or community who contracted the virus, together with those who experienced a decrease in the selling price between seasons, were, respectively 13 and 14 pp more likely to report a decline in production during the 2020-2021 growing season. This could be related to a decrease in the amount of effort spent in coffee production activities. In addition, producers who reported suffering cost overruns were 10 pp more likely to have reduced their production. Finally, a puzzling result is that producers who reported encountering difficulties in protecting themselves against COVID-19 were less likely to decrease their yields; this finding, however, could be related to other factors not included in the regression such as a higher degree of connection to markets (and thereby higher exposure and more difficulties to protect against the virus).

Figure 9: Partial regression coefficients between a decrease in coffee yields (per hectare) and demand and supply factors

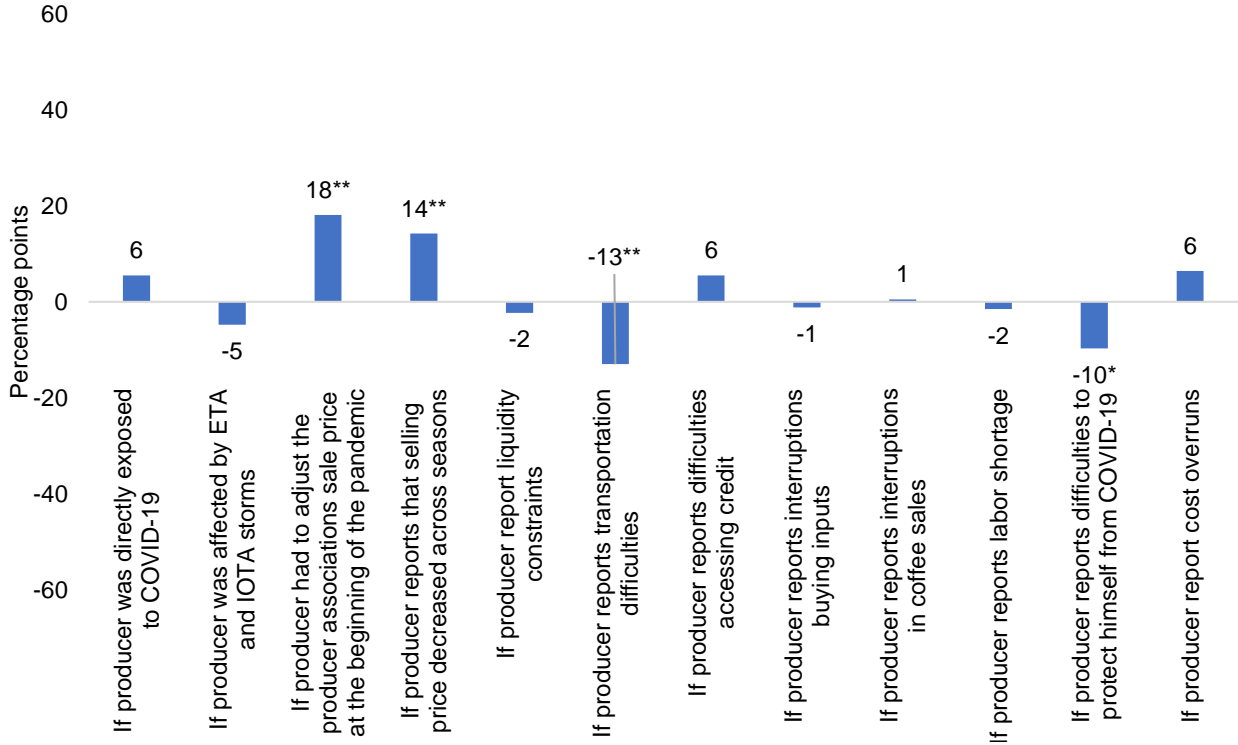


Note: This figure shows the partial correlations (in percentage points) of regressing if coffee yields decreased across seasons on demand and supply factors, controlling for producer and household characteristics and cooperative fixed effects. The correlations are based on 496 producers. Coffee yields are equivalent to the total number of quintals of coffee produced divided by the number of hectares dedicated to coffee.

Figure 10, in turn, depicts partial correlations between a decrease in the volume of sales (per hectare) to the cooperative and the modelled demand and supply factors. Producers who had to accept a lower sale price from the cooperative at the beginning of the pandemic were 18 pp more likely to report a decrease in sales between seasons, compared to those who did not see a price adjustment. In the same vein, and similar to the findings around coffee yields, farmers who experienced a decrease in the selling price were more likely to report a decrease in sales volume (14 pp more likely than those who do not report a price decrease). Echoing the coffee yields results, producers who experienced difficulties protecting themselves against COVID-19 were 10 pp less likely to report a decrease in their sales relative to those not reporting such difficulties. A similar relationship is further observed among producers who reported difficulties transporting their production, which were 13 pp less likely to report a decrease in their sales relative to those not reporting transportation difficulties.¹² As noted above, these relationships could be explained by other factors not controlled for in the regressions, particularly the degree of connection to markets.

¹² Most of the surveyed producers received help from FEDECOCOCAGUA to transport their coffee harvest.

Figure 10: Partial regression coefficients between a decrease in the volume of coffee sales (per hectare) and demand and supply factors



Note: This figure shows the partial correlations (in percentage points) of regressing if the volume of coffee sales decreased across seasons on demand and supply factors, controlling for producer and household characteristics and cooperative fixed effects. The correlations are based on 496 producers. The volume of coffee sales is equivalent to the total number of quintals of coffee sold divided by the number of hectares dedicated to coffee.

3. Before-after comparisons on other indicators of interest

This final section presents comparisons of qualitative outcomes between the 2019-20, pre-COVID coffee growing season and the 2020-21 season. We report different indicators around household income, food insecurity, migration, and individual perceptions about the present and the future.

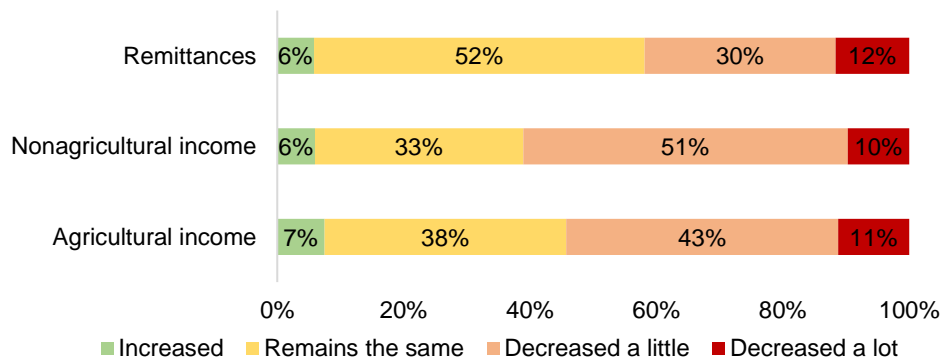
3.1. Household income

Almost two thirds of coffee producers reported a decrease in their household income between seasons. In particular, 55% of producers reported a decline in agricultural income activities, while 61% reported a decline in non-agricultural income. Similarly, only four out of ten producers reported a decrease in the amount of remittances received, while five out of ten producers reported no change. Surprisingly, though, this remittances’ pattern, however, is opposite to the upward national trend.¹³ Overall, non-agricultural activities appear to have been more adversely affected than agricultural activities and remittances, in line with the findings in Ceballos et al.

¹³ Reports from the Central Bank of Guatemala, 2021 indicate that, after an initial drop with the start of the pandemic on March-April 2020, remittances have been consistently increasing since May 2020 (in March 2021, the total amount of remittances was 1,286 million US dollars, more than 1.7 times the amount in March 2020).

(2021) who study the impact of COVID-19 on smallholder farmers, mainly coffee producers, in the Western Highlands.

Figure 11. Reported changes in income sources

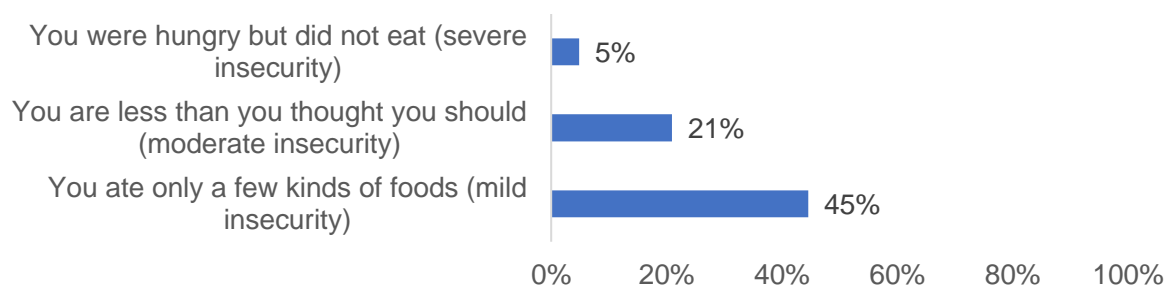


Note: This figure shows the percentage of interviewed producers that report decreases or increases in their agricultural, nonagricultural, and remittances income at the household level after COVID-19. Answer categories in the questionnaire were symmetric, with producers being able to declare that their income had increased either a lot or a little; however, these are lumped together in a single “Increased” category for clarity of exposition. Sample size for agricultural income = 481 producers; sample size for non-agricultural income = 185 producers; and sample size for remittances = 86 producers. The subsamples used for the analysis vary since producers must receive each source of income in at least one of the seasons.

3.2. Food insecurity

During the survey, we inquired about potential food insecurity experiences that farmers’ households could have experienced over the previous 12 months. We consider three situations (questions) from a subset of eight possible situations considered in the Food Insecurity Experience Scale (FIES) proposed by Ballard et al., 2013. Each food insecurity question corresponds to a mild, moderate, and severe experience of food insecurity. As reported in Figure 12 below, about half of the coffee producers experienced some degree of food insecurity in the past year. About 45 percent reported having eaten only a few kinds of foods because of a lack of money or other resources (mild food insecurity), 21 percent reported having eaten less than they thought they should (moderate food insecurity), and five percent reported having not eaten despite feeling hungry (severe food insecurity). While this prevalence of food insecure experiences is still lower than those observed among coffee producers in the Western Highlands (see Ceballos et al., 2021), these figures suggest that farmers in the study sample not only experienced profit losses and a decrease in household income in 2020-21, but that these translated to some extent into some levels of food insecurity, arguably related to the limited coping mechanisms available as reported above.

Figure 12: Food insecurity experiences

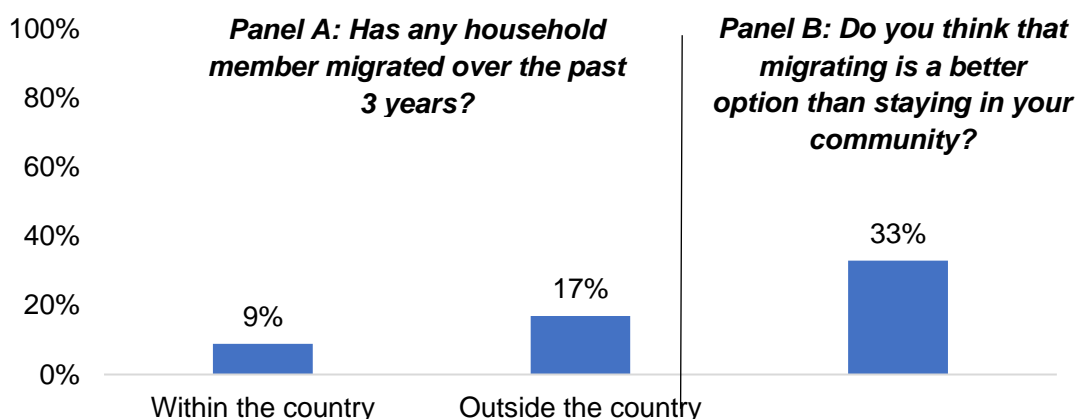


Note: This figure shows the percentage interviewed producers that report having experienced the situations described above (over 12 months prior to the survey). These situations are part of the eight Food Insecurity Experience Scale (FIES) items proposed by Ballard et al. (2013) and are linked to a mild, moderate, and severe level of food insecurity. Sample size = 496 producers.

3.3. Migration

Considering the high level of migration in Guatemala, we also inquired about recent migration experiences at the household level as well as producers' current perception about migrating, which could have been affected by the pandemic. We observe in the figure below that a small percentage of producers reported having a relative who had migrated during the previous three years, with 9 percent reporting internal migration and 17 percent reporting external migration. Interestingly, one third of producers considered that migrating is currently a better option than staying in their community.

Figure 13: Migration and intention to migrate



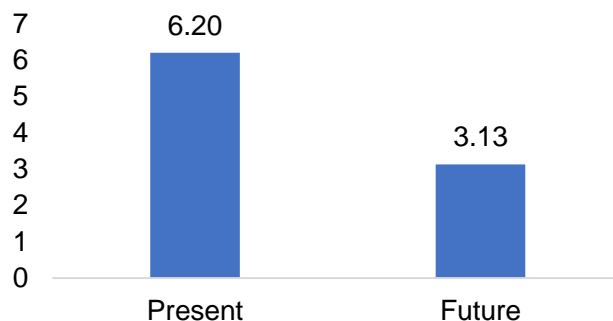
Note: Sample size in Panel A = 496 producers and sample size in Panel B = 471 producers.

3.4. Perceptions

Lastly, we asked about producers' perception (level of pessimism) about the present and the future regarding the ongoing pandemic. We find that farmers seem to be more pessimistic about their current economic situation relative to their future situation. On a scale of 0 to 10, where 0 is

most optimistic and 10 more pessimistic, the average reported values were 6.4 for their current situation versus 3.5 for their future situation.

Figure 14: Level of pessimism about the present and future



Note: The figure shows the average score on a scale of 0 to 10 of the level of pessimism towards today and the future regarding the COVID-19 pandemic. The specific questions in survey were: “How concerned are you about the economic situation of your household. In a scale from 0 (I am not concerned at all) to 10 (I am very concerned), in which number are you?”, and “How optimistic/pessimistic do you feel about your household’s economic situation in the future (in 2022)? In a scale from 0 (I am not pessimistic) to 10 (I am very pessimistic)”. Sample size = 496 producers.

Concluding Remarks

This note examines the impact of COVID-19 on coffee value chains in the departments of Chimaltenango and Chiquimula in Guatemala. Overall, we do not find large direct effects from COVID-19 on the large majority of producers between the pre-COVID, 2019-20 season and the 2020-21 season, after the start of the pandemic. In particular, we observe small but insignificant changes in cultivated area for coffee, yields, or sales. However, we find a significant increase in selling prices, in line with increases in international coffee prices.

In terms of other aspects of coffee production and marketing, input use and credit access suffered little changes, together with commercialization dynamics and terms of sale. Most producers, however, reported a decrease in profits and a lack of liquidity due to the pandemic, handling these through borrowing and savings. The cooperatives could have played a key role on this regard by facilitating credit access, providing cash transfers (when necessary), and facilitating coffee commercialization, including transportation.

In sum, the study illustrates the resiliency of relatively well-developed agricultural value chains linked to international markets in the face of the COVID-19 pandemic. Despite the range of government measures to curb the spread of the coronavirus, including mobility restrictions and resulting disruptions to labor and supply chains, coffee producers were able to generally maintain their levels of productions and sales, and even witnessed a price increase closely linked to the sustained growth in international demand and prices for coffee. Similarly, despite over one third of producers reported being affected (to some degree) by the tropical storms that hit the country in late November 2020, we do not observe significant impacts on their coffee production and sales. Lastly, we acknowledge that we cannot fully rule out any observed factors affecting the results as we are still constrained to before-after comparisons.

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