Implications of Specialty Coffee Farming Costs in Colombia

A project submitted in partial fulfillment of the requirements for the Degree of Master of Science in Environment and Sustainability

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Abstract

The specialty coffee industry is rapidly growing with rise of third wave coffee roasters changing and growing the way consumers experience the product. Specialty coffee differs from traditional commodity coffee crops by being a higher quality product, grown on smaller farms throughout the globe. While this product is growing in demand, the production is at risk due to increasing impacts of climate change, inconsistent financing, rural migration, and volatile global pricing markets. To best address the risks to the industry, this research aims to tackle the issue of price volatility by exploring sustainable pricing models for industry adoption. With consideration of the implications in the global market, this research focuses on unpacking the costs of specialty coffee farming in Colombia through a redesigned cost accounting model that more accurately reflects the true costs of production, as well as incorporation of farmer opportunity costs. All of the research was done in collaboration with Coffee Manufactory, a specialty coffee roaster in Los Angeles, California. Although it was studied through the lens of their business, it considers the entire coffee supply chain and advocates for continued vertical integration as well as an increase in lateral partnerships throughout the industry. Finally, while the research seeks to better understand and develop a market driven, farmer focused approach to pricing that can ensure long-term farm sustainability and continued industry profitability, it also builds on the current dialogue in the coffee industry and presents questions for consideration and further research.

Background and Introduction

Traditionally, coffee – an economically important agricultural product both in terms of volume and value – has been traded as an international commodity product. Largely interchangeable and undifferentiated across origins and practices, coffee became an internationally traded commodity in the late 1800s.[1] Nearly 220 years later, coffee is one of the most sought-after commodities in the world, second only to crude oil,[2] yet the industry has unsurprisingly experienced dramatic shifts. In particular, the last decade has brought tremendous change in terms of coffee quality, flavor, and differentiation, giving rise to the specialty coffee industry.[3]

The growth of the specialty market has created economic opportunities for the small-scale producers who produce an estimated 80% of the world's coffee.[4] These smallholder producers – defined as farmers working on land plots smaller than two hectares[5] – are often part of the specialty coffee value chain, cultivating high-quality coffee that yields higher prices through quality premiums.[6] However, despite these price premiums, more than four million smallholder coffee producers around the globe still live below the poverty line,[7] exacerbating issues of vulnerability and environmental degradation.

Today, producers at the base of the specialty coffee value chain are facing myriad challenges that threaten the sustainability of coffee; chief among them are climate change, lack of financing opportunities, rural migration, and low and volatile prices that exacerbate and underpin the rest. These challenges are discussed in detail, below.

Challenges of Global Pricing and Sourcing in Specialty Coffee Industry

Climate Change

Extreme and increasingly frequent weather events like droughts and floods, heat waves, and tropical storms are threatening the yields of crops – and livelihoods of farmers – all around the world. In particular, coffee farmers, especially those throughout Latin America, have been acutely affected by a devastating fungal outbreak called coffee leaf rust, correlated with insidiously rising temperatures. Due to fungal outbreaks and shrinking

[1] The History of Coffee
[2] Ibid.
[3] Borrella, I., Mataix, C., & Carrasco-Gallego, R. (2015)
[4] Technoserve (2017)
[5] Rapsomanikis, G. (2015)
[6] Technoserve (2017)
[7] Abramovich, J., & Zook, D. (2015, March 18)

production zones, scientists predict that coffee production, especially for sensitive Arabica varieties, will be dramatically impacted in years to come.[8]

There are several ways that producers can build resilience to a warming climate. For example, adopting climate-smart practices and renovating and rehabilitating diseased or vulnerable coffee plants can mitigate the impact of climate shocks when they occur. However, with average renovation costs in Latin America ranging from $3,000 to $5,000 per hectare,[9] the cost of climate resilience for the average smallholder is prohibitive.

Lack of Financing Opportunities

Similarly, smallholder farmers often lack access to financing that would help them increase yields and farm productivity. Without important on-farm investments facilitated by smallholder financing, quality and productivity suffer, leading to lower farmer revenues and competitiveness. The increasing cost of fertilizer is particularly problematic in Latin America, where the productivity of farms continues to decrease.[10] This in turn becomes a vicious cycle, as low-yielding farmers are less attractive candidates for financing.

Rural Migration

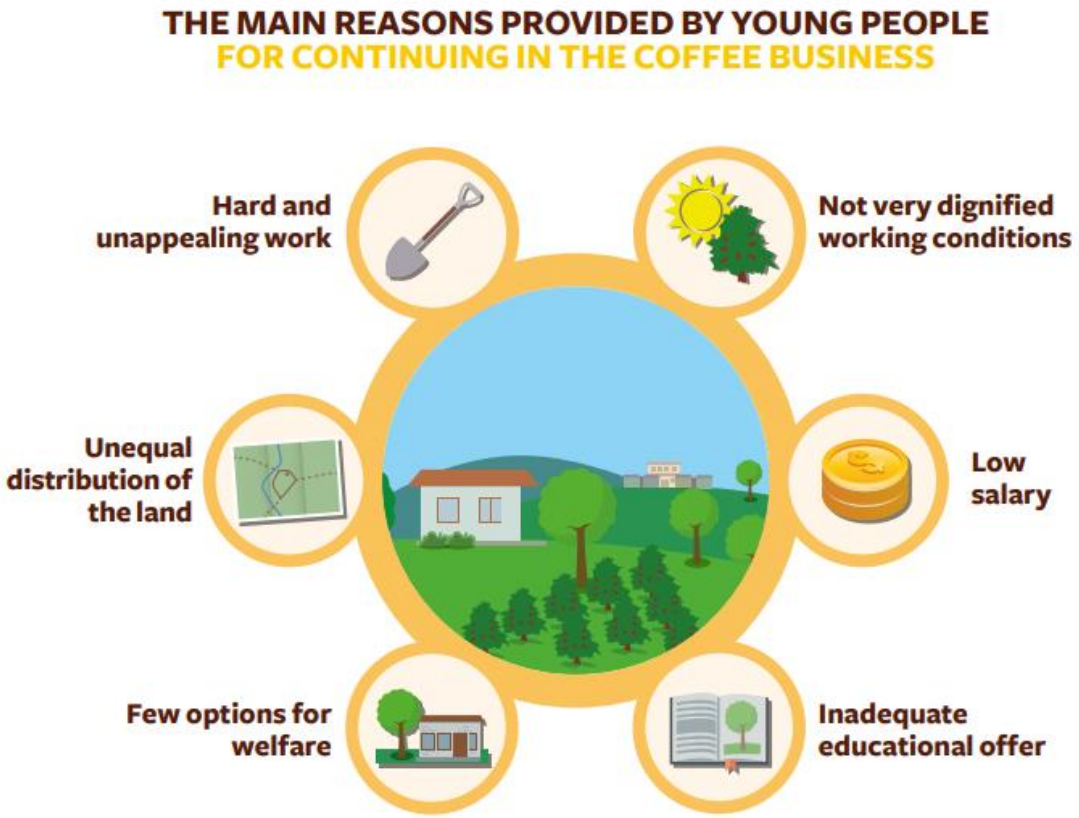
Rural coffee-producing regions around the world are typically remote, isolated, and disconnected locales marked by widespread poverty. Of the 2.7 million coffee producers in Colombia for example, 45 percent live below the poverty line.[11] Subpar livelihoods and dire economic conditions in the coffee lands have spurred two major interrelated trends connected to rural migration: 1) shortage of labor, and 2) an aging farmer population. Low and unsustainable wages have prompted pickers and other day laborers to look for work elsewhere, often in cities where job security is stronger and livelihoods are higher.[12]

Similarly, as interest in coffee farming dwindles due to the increasing insecurity of coffee (see Figure 1), youth have increasingly opted to pursue other professions, seeking more attractive opportunities for their future.[13] Therefore, as the average age of coffee farmers continues to rise (the average age of coffee producers in Colombia is 55 years old[14]), the future of coffee becomes more and more precarious. With the entire industry attuned to what this might mean for farmers, supply chains, and the $100 billion coffee industry;

[8] Bunn, C., Läderach, P., Rivera, O. O., & Kirschke, D. (2014)
[9] Root Capital (2016)
[10] Technoserve (2017)
[11] CIAT (2018)
[12] Axelson, G. (2017, March 07)
[13] Archer, C., Fischersworring, V., Furgiuele, J. & Von Enden, J. (2018)
[14] Borrella, et al.

NGOs, roasters/buyers and multinationals have devised numerous initiatives to increase the appeal of farming, invest more in rural communities, and increase farmer profitability. Few, however, have taken a systemic view and focused on the root cause of the issue: a fair and sustainable price for a specialty product.[15]

Figure 1. The Succession of Coffee Farming in Colombia, Solidaidad 2016



Low and Volatile Prices

Perhaps the biggest threat and challenge for coffee farmers around the globe is the volatility of the coffee market itself. While coffee prices have always fluctuated throughout the year, commodity prices have dropped precipitously since November 2016 and, at the time of this writing, are hovering at historically low levels (see Table 1).

In August 2018, the commodity price for coffee (C-Price) fell below $1.00/lb for the first time in more than a decade,[16] jeopardizing the livelihoods of the 20-25 million coffee producers around the world.[17] For specialty producers whose high-quality coffee requires

[15] Freund, K. (2018, February 26)
[16] C is for Commodity, Crisis, and Cost – 25 Magazine: Issue 7. (n.d.)
[17] Technoserve (2017)

substantial investment in maintenance and care, these low prices are especially devastating. Many academics and organizations have examined the cost of specialty coffee production, with almost all estimating cost estimates between $1.05 - $1.50/lb.[18] Although there is significant variation in these cost estimates, they all underscore the impact and profitability implications associated with current historically low prices.

According to the International Coffee Organization (ICO) and others, the current crisis could prompt farmers to abandon coffee production in favor of other, potentially illicit crops like coca, exploit labor through even lower wages and excessive hours, resort to poor, short-term and destructive environmental management decisions, exacerbate vulnerability to climate change, and aggravate migration flows out of rural areas.[19] Juan Francisco González, the General Manager at FECCEG, a coffee cooperative in Guatemala, summarized the interconnected issues of low coffee price and the overall tenuous sustainability of the coffee industry well:

> *"For years now, smallholder farmers and their cooperatives have been making efforts to revitalize coffee production as a sustainable way of life for producers and their families. All our efforts are minimized in the face of the threats of climate change, the effects of international prices and the ownership of land, among other externalities that make producers look for new forms of survival. One of them is internal and external migration. Current prices do not encourage young people to continue in agriculture. This will affect coffee production in 20 years, when current generations leave coffee growing as the main economic activity."*

Efforts to Promote a More Sustainable Industry

Fair Trade

The booms and busts of the coffee market over the last several decades have encouraged various responses from the industry and the enabling environment in which it operates. During similar price crises throughout the 1990s, the fair-trade movement began building niches for fairly procured and traded products like coffee, imposing a price floor that currently stands at $1.40 free on board (FOB) for washed Arabica or the C-price, whichever is highest.[20]

[18] Fair Trade USA Supply Chain Research (2017); This Is How Much It Costs to Produce Coffee Across Latin America. (2019, March 14)
[19] Global Coffee Report. (n.d.); Bacon, C. (2005)
[20] Fair Trade USA Supply Chain Research (2017)

Similarly, other hands-off governance mechanisms to increase sustainability, such as other sustainability certifications, began to take root during the same period. While imposed to "change unfair structures of international trade" the benefit of Fair Trade over conventional trade has been difficult to establish. Questions remain related to the sustainability of prices paid,[21] as well as with the differences in farm-gate prices between fair and conventional trade.[22] Overall, as many studies have explored, and concluded, the Fair Trade movement's pricing mechanisms have not yielded the kind of farmer livelihood benefits that keep coffee a sustainable and viable product at scale.

Direct Trade

A relatively new concept, direct trade has been popularized by the specialty coffee industry to promote a coffee value chain wherein roasters and farmers know each other and build long-term relationships. Importantly, the business practices of direct trade are distinct from conventional coffee trade where roasters center their interactions on the importer, never requiring a conversation or relationship with the producer that's grown and harvested the beans.[23] Under a direct trade model, producers are able to better understand market needs and roasters are able to direct payments in a more transparent way to producers.

The direct trade movement has come of age at a time when there is increasingly less homogeneity in coffee, both in terms of quality and sustainability. Many roasters that espouse direct trade are seeking to transform coffee into an artisanal product as highly differentiated as wine.[24] As such, these actors, mostly roasters, are vocal advocates of the de-commoditization of coffee. Dr. Peter Roberts, a professor at Emory University's Goizueta School of Business deeply involved in the topic through Emory's Transparent Trade Coffee initiative, captured this sentiment at the 2018 Specialty Coffee Expo:

> *"Why does a conversation about specialty coffee start with a sentence about the commodity price? That's like Maserati saying they're basing their pricing on the pricing for Kia's. This is a specialty product, and as such should be entirely separate from the commodity price."*

Roberts and his team have partnered with a variety of actors throughout the specialty coffee value chain (producers, roasters, exporters, importers, etc.) to produce The Specialty Coffee Transaction Guide, a summary of free on board (FOB) coffee prices paid via more

[21] Blowfield, M., A. Malins, B. Maynard, and V. Nelson. (1999)
[22] Bedford, A., M. Blowfield, D. Burnett and P. Greenhalgh (2002)
[23] Borrella, et al., (2015)
[24] Ibid.

than 10,000 contracts for almost 150 million pounds of green specialty coffee between 2016-2018.[25] The International Chamber of Commerce defines FOB prices as the price "paid for coffees that are delivered and placed onto the ship at the port in the country of embarkation." These prices do not typically include overseas shipping, insurance, and/or transportation/freight costs incurred at the port of arrival.

In an effort to separate the specialty coffee market from an exclusive reliance on commodity indices, the Transaction Guide provides aggregate pricing data that would allow buyers to anchor on relevant peer data, rather than the commodity price. An adaptation of data from the Transaction Guide is presented in Table 1.

Table 1. FOB Prices ($/lb) Across Growing Regions, as Adapted from Transparent Trade Coffee Specialty Coffee Transaction Guide

	Contracts*	Lower End	Middle	Upper End
South America	4,534	$1.71	$3.02	$5.15
Central America	3,648	$1.90	$2.85	$4.65
Africa	1,332	$2.20	$3.30	$5.52

*Because adjustments for quality and quantity rely on a regression technique, Transparent Trade Coffee set aside 'outlier' contracts with the lowest and highest 5% of reported FOB prices.

Several coffee roasters have devised their own transparent pricing models and guarantees to dislodge their own pricing from commodity markets. In early 2017, Wisconsin-based Kickapoo Coffee, for example, set a minimum price guarantee of $2.75 – a price many in the industry have lauded as an "unprecedented" move.[26] Yet, while $2.75 is the highest published minimum price in specialty coffee, the Kickapoo co-owner, Caleb Nicholes, describes the somewhat arbitrary methodology devised to arrive at it:[27]

> *"We read everything we could about the actual cost of production for coffee producers, but honestly there's not a ton of data out there. We're very integrated with our producing partners—as a company we focus on purchasing mostly from smallholder farmers—so we had a lot of conversations with groups like the SPP (Simbolo de Pequeños Productores), a certification focused on smallholder producers. We also took into*

[25] Transparent Trade Coffee (2018)
[26] Kickapoo Co-Owner Discusses New Price Guarantee. (2017, March 07)
[27] Ibid.

consideration that we don't buy just any coffees—we have very rigorous quality demands, and most of what we buy is organic. So $2.75 was a realistic number we could work with, but it also feels like it still isn't enough. In my heart of hearts I would have loved to have made it $3. But the reality for us is that we're competing against a lot of other roasters who will continue to purchase coffee for $2 or $2.20. We don't want to pay prices that ultimately result in us losing a part of our market share. So $2.75 is where we landed."

Project Origins

In January 2018, the University of Michigan research team came into partnership with Coffee Manufactory, a Los Angeles based coffee roaster. Coffee Manufactory was born in 2016 as the coffee roasting partner to Tartine Bakery, a renowned bakery that originated in San Francisco. The two companies entered a long term partnership based on a mutual philosophy that sustainable supply chains are built on deep and powerful relationships. Coffee Manufactory is considered to be a "third wave" coffee roaster. Other third wave roasters include Los Angeles and Chicago-based roaster, Intelligentsia, and Portland-based leader in specialty coffee, Stumptown. Each wave of coffee is defined by key priorities described below.

- First wave: Growing coffee consumption exponentially
- Second wave: Defining specialty coffee and its key benefits
- Third wave: Purchasing coffee based on origin characteristics and artisan production[28]

Coffee Manufactory currently has three roasting facilities in Oakland, CA, Los Angeles, CA (this is the flagship roastery), and Itaewon, Seoul, Korea. Aside from roasting for wholesale distribution at Tartine Bakery, cafes, Whole Foods Markets, and direct online, Coffee Manufactory also provides sourcing expertise to the rapidly growing beverage company, Califia Farms. Sourcing strategy has become a key differentiator for Coffee Manufactory. The company's sourcing model can be characterized by four key elements: direct relationships, price setting with producers, producer sustainability, and quality (See Figure 02). [29]

[28] The History of First, Second, and Third Wave Coffee. (2016, April 17)

[29] Coffee Manufactory Sourcing Deck

The focus of this project was an area concern for Coffee Manufactory: how to establish a sustainable price with producers. This mission involved determining what a sustainable price should be at the farmgate level, as well as what the proper methodology should be to arrive at that sustainable price. The scope of this research is with one origin that Coffee Manufactory currently sources from: the Caldas department of Manizales, Colombia.

Figure 02. Coffee Manufactory Sourcing Strategy

Initial Hypothesis

Before formulating a hypothesis as to which pricing methodology was most sustainable for farmers, the team first looked at existing pricing methodologies in the coffee industry, as well as in adjacent and comparable agricultural commodities such as cocoa. There are several distinct ways to look at pricing models in the commodity landscape. The first is through the lens of a buyer: in this case, Coffee Manufactory. The second is through the lens of a producer: in this case, farmers in Colombia. For the purpose of formulating a hypothesis, we focused on buyer-led pricing models. We assumed that a pricing model dictated entirely by the farmer, although the least paternalistic of all methodologies, was highly aspirational at this point in time.

Cost-Plus Model

A buyer has a few tools to utilize in determining a pricing methodology. The options vary in terms of how much to follow the market price of coffee and how much the buyer wants to dictate what a decent living looks like for the farmer. Figure 3 shows a range of pricing options that span across those two dimensions. Different pricing methodologies will address different buyer concerns. A cost plus model will require a buyer to understand the

true cost of product of the farmer, as well as the farmer's cost of living. Cost plus is extremely thorough and could potentially allow the farmer to capture more value. Buyers who are skeptical of the commodity market price, have full transparency into their supply chain, and are willing to dedicate the resource to understanding producer costs at this level of granularity will select this option.

However, a cost plus methodology does not rely on the market price of what is a commodity crop, which could result in market distortion. A study done by Aidenvironment on the cocoa industry states that "price management options... should not be considered in isolation as pricing is one part of the larger pictures of competitiveness and depends on capacity and resources of the organization to effectively manage that mechanism within complex and dynamic markets."[30] A buyer will find it difficult to sustain higher prices based on a cost plus methodology if their customers are not willing to pay a premium for high quality, sustainable coffee.

Additionally, since the buyer is dictating what a farmer's livelihood should look like, a cost-plus model is inherently paternalistic. Oftentimes, the "plus" part of the model is determined by a living wage calculation. There are a few sources that exist to help buyers calculate what a livable wage should be for farmers in a particular region. For example, in 2019, Fairtrade developed a Living Income Reference Price, which has been utilized to set a new minimum price for cocoa.[31] The Global Living Wage Coalition (GLWC) also published a series of living wage calculations for various regions based on their established methodology.[32] These calculations are done using the Anker methodology, which calculates expenses related food, housing, and other expense categories. It is based on the principle of workers living a "basic but decent lifestyle."[33] Appendix A is an infographic that depicts how GLWC will come to a living wage estimate for the rural central region of Guatemala.

Comparison to Other Cost Models

In addition to the cost plus model, a coffee buyer could also consider establishing a price to the producer based on a set % of wholesale or retail price. This notion was thought to be more market driven, since the price paid by a consumer for a bag of roasted coffee will likely be driven by demand and supply. This methodology would also be more simple and scalable across context and geographies. However, it does not guarantee a "sustainable price." In other words, it does not guarantee healthy margins for coffee producers to continue to grow high quality specialty coffee.

[30] Pricing mechanisms in the cocoa sector: Options to reduce price volatility and promote farmer value capture. (2018)
[31] Freund, K. (2018, December 4)
[32] Voorend, K. (2016, September)
[33] Anker, R., & Anker, M. (2017)

Figure 3. Various Pricing Options for Coffee Commodity

	Pros	Cons
Cost Plus (using living wage methodologies)	• Very thorough • Farmers capture most value	• Chance of market distortion • Resource intensive • Not scalable across geographies • Insensitive to changes in demand • Inherently paternalistic
% of Wholesale/Retail Price	• Simple and scalable across contexts and geographies	• May not guarantee "sustainable price" • Puts more power in hands of retailer
% of Wholesale/Retail Price + Floor	• Scalable across contexts and geographies	• Floor needs to be frequently revisited • Can be complex to calculate depending on what the basis is
Farmer Dictated	• Least paternalistic • Lessens complexity for rest of the value chain	• Many farmers don't have sophisticated financial accounting systems • Highly aspirational

Finally, there is the concept of implementing a price floor. The idea of a price floor is to protect producers against extremely low market prices. It is typically determined by evaluating cost of production to some extent. However, the price floor amount is ultimately subject to the buyer and can end up being a complicated calculation as well. Figure 04 illustrates how various chocolate brands have utilized permutations of these pricing methodologies in their own daily practice.

Figure 4. Pricing Mechanisms in the Cocoa Sector

Company	Cocoa type	Mechanisms	Prices and Premiums (2015/16/17)
Tony's Chocolonely	Bulk	Market price + Fairtrade Premium + Premium to close the Living Income gap	Ghana: government price + $375 Ivory Coast: government price + $600
Theo	Fine flavor	Fixed price	$3,500 fixed price
Ritter Sport	Fine flavor	Variable price + minimum price + fixed premium	Nicaragua: New York market (min. price at $2,000) + $300 quality premium + $200 certification + $100 infrastructure bonus
Taza	Fine flavor	Market price + minimum price + negotiated premium with a minimum value	New York market (min. price $2,300) + >$500 premium

Believing a tailored approach could best capture the goals of individual roasters, as the research team engaged with Coffee Manufactory, they evaluated the company's pricing philosophy on five dimensions, outlined below. These five dimensions, and the key

questions associated with each, were designed to understand which pricing methodology would be appropriate for Coffee Manufactory.

1. How much to anchor on C-price
    - To what extent does the market price reflect true costs?
    - Are you willing to share the risk of this price volatility with the producer?
2. How much to anchor on retail price of coffee
    - How much control do you have of retail price?
3. How much to invest into understanding costs
    - Do you know cost of production, post-harvest, export, import, cost of living, cost of savings, cost of insurance, etc.
4. How complex should your pricing model be
    - Are you willing to take on greater complexity in order to have levers to pull?
5. How much should the farmer dictate the price

Upon diving into each of these dimensions with Coffee Manufactory, we discovered the following about their pricing philosophy.

1. *Coffee Manufactory believes that the C-price is not reflective of true costs and should not be an anchor when determining a price to the producer.*

2. *Coffee Manufactory has the ability to leverage wholesale price (currently $10) & suggested retail price as benchmarks to back into a price to the producer, but as a roaster, there is little control over retail price.*

3. *Furthermore, Coffee Manufactory is willing invest all it takes to understand the details of cost of production and other important costs to the producer. Specifically, they are interested in understanding the cost of living, savings, and insurance for producers.*

4. *It is believed that more levers would allow a greater opportunity to provide a fair price to farmers, so complexity is not a concern.*

5. *Finally, Coffee Manufactory believes that in an ideal world, the farmer would dictate their own price and want to understand how to get to that place. However, this does not seem to be a feasible option at this time.*

Based on these initial conversations, it was determined that the following pricing methodology would be most appropriate to utilize as a starting point for research. The idea was that **Cost of production + Cost of living + Savings + Insurance** would allow a sustainable livelihood for farmers because these factors exhaust past, present, and future costs for farmers. The next section will discuss how the team approached data collection and research to actualize this pricing methodology at origin.

Research Collection

The findings and conclusions drawn throughout the course of this engagement are based on primary and secondary research. The team aggregated and analyzed a comprehensive list of cost of production and farm-level production research, as well as transparency reports and individual company white papers. In addition, the team conducted over a dozen interviews with coffee industry professionals, including coffee buyers, sustainability directors, importers, and exporters.

In October 2018, the team traveled to Caldas, Colombia to collect primary research, interviewing coffee producers, cooperative managers, cooperative accountants, and agronomists about cost of production and cost of living expenses. Colombia was chosen as an apt research site due to several factors: 1) Coffee Manufactory had identified it as a strategic and high-priority sourcing origin, and 2) the team had access to Coffee Manufactory's Colombian-based exporter, Siruma Coffee Lab. Siruma Coffee Lab provided invaluable support during the master's team trip, arranging meetings with farmers, coop managers, providing technical insights into coffee production, and assisting with preparing the farmer survey.

The team concentrated its research in Anserma and Manizales, small cities within the Colombian Department of Caldas that would provide representative data on specialty coffee farming in Colombia. Over the course of a four-day period in Anserma and Manizales, the team spoke at length with three farmers, one agronomist, and one accountant. Additional aggregate farm-level data was provided by managers from Cooperativa de Caficultores de Anserma in Anserma and Cooperativa de Caficultores de Manizales in Manizales, as well as from a survey conducted of 2,000 coffee farmers by the Federación Nacional de Cafeteros de Colombia (FNC) in Colombia.[34]

Though a small sample size of primary research participants, the farmers interviewed represented three distinct farm size groups. The first farm was 1.55 hectares in size and representative of the smallholder farms that comprise the majority of Colombia's coffee farming. The second farm was 6.5 hectares and slightly larger than the average Colombian coffee farm (4.5 hectares). The third farm was very large, over 80 hectares, and more representative of large plantation-style farms.

[34] Tras decisión del Gobierno sobre el programa de apoyo Incentivo Gubernamental para la Equidad Cafetera. (2019).

To supplement the farm interviews, the team also interviewed Valentina Duque—the founder and CEO of Siruma Coffee Labs—about the coffee value chain in Colombia and export/import costs associated with Coffee Manufactory coffee. While the conversations with Siruma and coop managers were informal and did not follow a standardized survey structure, the team did develop and deploy a formal survey for farmer interviews in order to standardize data collection.

Survey Development

The survey that the team developed was based on the notion that an appropriate cost model would include a deep understanding of the producer's cost of production, costs of living, an adequate amount of savings, and any desired types of insurance. The complete survey can be found in Appendix B. Below is a description of the major survey sections.

General

The intention of this section is to understand the past and present ownership of the farm, as well as to develop a basic understanding of the farmer's family size.

Cost of Production

This section seeks to collect inputs for the cost of production model. This includes understanding the size and productivity of the farm, the units by which the farmer typically thinks about production and costs, and the cost of production itself. Each farmer was asked about their pre-harvest, harvest, and post-harvest costs. Pre-harvest costs included seedling or seed costs, planting, fertilizer, pesticides, weeding, pruning, tools, equipment, and labor. Harvest costs were primarily the labor costs associated with picking the cherry coffee beans. Post-harvest costs included processes such as cleaning, de-pulping, drying, and transportation of the final product to market, as well as associated labor costs. The team decided to take a semi-structured approach to this section in order to give the farmers flexibility to included costs that were not part of the survey.

Cost of Living

The cost of living section of the survey is influenced by existing living wage calculations. The team begins by confirming how large the household is and how many sources of income the household has. Then, the survey begins to dive into each major category of living expense: food/water, housing, clothing, healthcare, education, energy, and transportation. The section concludes by asking whether the farmer feels that their current earnings sufficiently cover their cost of living. Although not officially part of the survey, the research team included a probing question at the end of this section to identify what the farmer would do

if he or she was not a specialty coffee farmer. This question is meant to understand what the opportunity cost of specialty coffee is for these farmers.

Savings
Questions in this section are designed to understand farmer's saving habits. The team wanted to determine whether farmers are interested or able to save money, what types of purchases farmers save or don't save for, and what their desired amount of savings would be.

Insurance
Questions in this section are designed to understand why farmers do or do not have certain types of insurance, how much insurance costs are, and whether additional types of insurance are desired.

Cost of Production

Initial Findings

The cost of coffee production can be roughly broken out into three segments: harvest costs, which include everything from planting through harvest and which comprises the majority of costs for nearly all farmers; post-harvest, which includes all post-harvest processing and transportation; and overhead, which accounts for other fixed and variable expenses not included in harvest and post-harvest. While all farms incur harvest, post-harvest, and overhead costs, many of the smaller, less sophisticated farms do not actually delineate between these segments in practice. Instead, these farms consider nearly all costs incurred in a given period of time (typically a year) as part of their total cost of production.

Labor costs account for the majority of the cost of production, with picking accounting for the majority of labor costs. Most labor on coffee farms comes from either family members or migrant day-laborers, many of whom are immigrants from other countries who live on the fringes and distrust outsiders. These laborers are typically paid in a prorated minimum wage based on the days of work they provide or the kilograms of cherry coffee they pick. During our time in Colombia, we were not granted access to any of these workers and frequently told that they would not be willing to participate in the survey or interview process.

Harvest Costs

Harvest costs include everything from planting to harvesting of cherry coffee. Planting can come in the form of seeds or seedlings. Seeds are often provided by coops to small holder farmers for free, whereas seedlings may be more expensive but have a higher likelihood of survival and shorter time to production. Both seeds and seedlings require labor costs to plant, labor costs for weeding, as well as fertilizer product and application costs. Seedlings may also incur pesticides product and application costs at non-organic farms. As the plants mature, they will continue to incur weeding, fertilizer, and pesticide costs for the duration of their lives. Coffee trees in Colombia are required to be pruned down every five years to help keep the plants resilient and to stave off various blights. This means that most years farmers incur labor costs associated with pruning and clearing some portion of their farm, and for that season, those trees are unable to produce cherry. The majority of the labor costs at Colombian farms come in the way of jornales, which are effectively a monthly minimum wage rate broken into a day's worth of labor.

The largest single cost-contributor for most farmers is labor associated with harvesting cherry coffee. Unlike the labor associated with most other farming activities, which are paid in jornales (more on jornales below), harvesting is paid on a per kilogram picked basis. We found these costs ranged from $400-$600 pesos per kilogram (roughly $0.13 to $0.20 USD per kg), and could vary between peak harvesting season and non-peak. Peak harvest occurs once a year (in the fall) and typically accounts for 80% of a farm's annual production. The non-peak season occurs in the spring and is significantly smaller in yield (20% of annual production). As a result, pickers are sometimes paid a higher rate per kilogram for spring harvest to help incentivize them to stay on the farm and to ensure that farmers are paying roughly the minimum wage. The farms we interviewed ranged in annual production from 176 arrobas (2200 kgs) to 18,000 arrobas (225,000 kgs) of green coffee, which equates to roughly 10,500 kgs and 1,080,000 kgs of cherry, respectively. Translated to picking costs, we found our smallest farm (1.5 hectares) paid $5,280,000 pesos ($1,777 USD) per season in picking costs while our largest farm (80 hectares) paid $464,400,000 pesos ($156,363 USD) per season. This equated to 37% of total harvesting costs for the small farm and 55% of harvesting costs for the large farm.

Jornales

In Colombian coffee production, almost all non-picking related labor is calculated in terms of jornales. A jornal roughly equates to the equivalent of Colombia's monthly minimum wage broken down to a per-workday basis. For example, in 2018, Colombia's minimum wage was $781,242 pesos per month, so assuming a five day work week equates to 22 work days in a 30-day month, then a jornal is roughly $781,242 ÷ 22 = $35,500 pesos per day. In

fact, the jornal rate at the farms we interviewed ranged from $34,000 to $36,400 pesos per day.

For Colombian coffee farmers, jornales provide both a means to quantify labor costs and a measure of the amount of work to be done. Most farmers track their labor in terms of the number of jornales a process requires. For example, a farmer may track and calculate weeding, fertilizer and pesticide application, pruning, and planting in terms of the number of jornales each requires per season. Table 2 demonstrates how the large farmer calculated their jornal totals for some common tasks.

Table 2. Jornal Counts and Costs for a Large Colombian Coffee Farm

Task	Jornales	Jornal Rate	Total Cost (Pesos)
Fertilizer Application	700	x $36,400	$25,480,000
Pesticide Application	750	x $36,400	$27,300,000
Weeding	1700	x $36,400	$61,880,000
Other	1350	x $36,400	$49,140,000
Total	4500	x $36,400	$163,800,000

Post-Harvest Costs

Post-harvest costs vary from farmer to farmer depending on what aspects of processing a farmer may choose to do. Post-harvesting costs typically include things like de-pulping, drying, milling, and transportation to market. Post-harvesting costs also include fuel and equipment maintenance, as well as labor for all of the aforementioned processes. Not all farmers process their coffee to the same level prior to selling it, and therefore post-harvest costs can vary wildly as a percent of total production costs. For instance, farmers may sell their coffee to coops in the cheaper and less processed parchment form, and therefore do not incur milling costs. Some smaller and less sophisticated farms lack equipment for certain process and their post-harvest costs reflect cheaper, slower alternatives. For instance, many small farms dry their cherry coffee on the ground or on roofs instead of using wet milling machines to remove the cherry pulp. In our interviews, post-harvest costs ranged from 2% to 8% of total cost of production.

Overhead

As with post-harvest costs, overhead can vary dramatically from farm to farm and tends to

be more significant for larger, more sophisticated farms. For our purposes, overhead includes certain fixed costs, such as property taxes, rent, and insurance. It also includes variable costs such as income tax, energy expenses, payroll, and banking or coop fees. As expected, larger farms that operate closer to a traditional business incur significantly more overhead costs. In our interviews, the largest farm had by far the most overhead costs, accounting for 36% of cost of production. By contrast, overhead only accounted for 10% of cost of production for the smaller farms (less than 7 hectares) in our survey.

Cost of Production Estimates

In our detailed surveys and interviews, we asked farmers to provide as much detail as possible on their harvest, post-harvest, and overhead costs. Based on the information provided, we arrived at a final cost of production of $1.24 per pound of green coffee for our smallest farm (1.55 hectares), $1.01 for our medium-sized farm (6.5 hectares), and $1.38 for our largest farm (80.6 hectares of coffee). It is important to note that these amounts represent how these farmers calculate their own costs based on the information they provided. Later, to paint a more complete picture in instances where we lacked information on costs that could be reasonably assumed a farmer would incur, our team extrapolated from farm to farm based on the ratio of farm sizes. For example, we lacked property tax information for our smallest farm, but had tax information for our largest farm. Knowing that the smallest farm was 1% of the size of the largest, we simply took 1% of the property tax of the largest farm as an estimate. Table 3 below summarizes our initial findings for production costs based on the farmer's own estimates.

Table 3. Farmer's Estimated Cost of Production.

Farm	Size	Farmer's Total Cost Estimate (per lb. of green coffee)
1	1.55 hectares	$1.24
2	6.5 hectares	$1.01
3	80.6 hectares	$1.38

Current Model of Accounting

In our interviews with the small and medium-holder farmers, as well as in conversations with the coop managers, it became clear that most farmers calculate their costs in a method akin to measuring cash flow over a certain period. For example, a farmer may think

of his costs in a yearly or harvest-season basis. The farmer tracks the costs he/she incurs during that period of time, sums them up, and then divides them by the coffee yielded during the same period. For instance, for the 1.55 hectare farm we interviewed, the farmer estimated his annual costs to be $14,252,000 pesos, or roughly $4,530 dollars. He also estimated his production to be 176 arrobas of parchment (an arroba is a common measurement in Colombia equal to 12.5 kgs). Conducting some simple conversions and applying a standard parchment to green coffee ratio of 0.754 (92.8 kgs of parchment is needed to produce 70 kgs of green coffee, which is the standard bag size), we arrive at a cost of $1.24 per pound. Table 4 displays this farmer's associated harvest costs and conversions.

Table 4. Farmer 1's Production Costs and Conversions

	Total Cost (Pesos)	Total Cost (Dollars)	Pesos Per Arroba	Pesos Per Lb	Dollars Per Arroba	Dollars Per Lb (Parchment)	Dollas Per Lb (Green)
Picking	5,280,000.00	1,679.44	30,000.00	1,090.91	9.54	0.35	0.46
Fertilizer	2,250,000.00	715.67	12,784.09	464.88	4.07	0.15	0.20
Fertilizer Application	315,000.00	100.19	1,789.77	65.08	0.57	0.02	0.03
Pesticides	-	-	-	-	-	-	-
Cleaning/Weeding	5,775,000.00	1,836.88	32,812.50	1,193.18	10.44	0.38	0.50
Pruning	302,000.00	96.06	1,715.91	62.40	0.55	0.02	0.03
Transportation of Coffee	330,000.00	104.96	1,875.00	68.18	0.60	0.02	0.03
Silo/Drying Machine	-	-	-	-	-	-	-
Shears/Machete		-	-	-	-	-	-
TOTALS	14,252,000.00	4,533.21	81,168.53	2,944.63	25.76	0.94	1.24

Assets-Based Approach

This cash-flow style approach for calculating costs is not surprising for most smallholder farmers. Many are surviving from season to season and running out of money is a constant threat. However, this cash-flow approach only represents a snapshot in time (typically either a year or a harvesting season) and does not fully depict the total costs and investments made into every coffee farmer's long term assets--coffee trees. Unlike perennial crops that are planted, produce, and die every season, coffee trees are long term assets. In Colombia, they are expected to last 20 years or more. Significant costs are incurred to grow trees to maturity, care for them, fend off disease and predation, and harvest their crops. These costs are not constant over time, nor are they always aligned with a trees production. By focusing on the cash outflows of any given season, a farmer may under account for costs incurred in previous years or over account abnormal costs incurred in the current year.

It can be assumed, to a certain extent, that different portions of a farm are in different stages of a tree's life cycle and therefore represent different expenditures at any given time. For instance, most farms in Colombia are required to prune their trees down every five years, with the plants typically removed permanently on the forth cycle (20 years). It also

typically takes three-four years for the trees to mature enough to yield quality cherry. Farmers will segment their farms to minimize the impact of these cycles. This means that roughly one-fifth (20%) of the farm area at any given time is not actively producing crops because it has been freshly pruned or planted. Therefore, any snapshot view of the farm's costs over a year or season should reasonably include some costs incurred at the various stages of a tree's life. Yet this cash-flow method still does not truly capture the costs associated with coffee production.

The Tree as a Machine

Given the issues outlined above, a more accurate approach to cost of production is to think of the coffee tree as, what it truly is, a long term asset. With this in mind, an appropriate analogy for the tree is a piece of machinery in a traditional manufacturing setting. Much like a machine on a plant floor, a coffee tree requires initial capital investment, installation costs, maintenance, downtime, and the cost of removal/retirement. Figure 5. depicts the analogy.

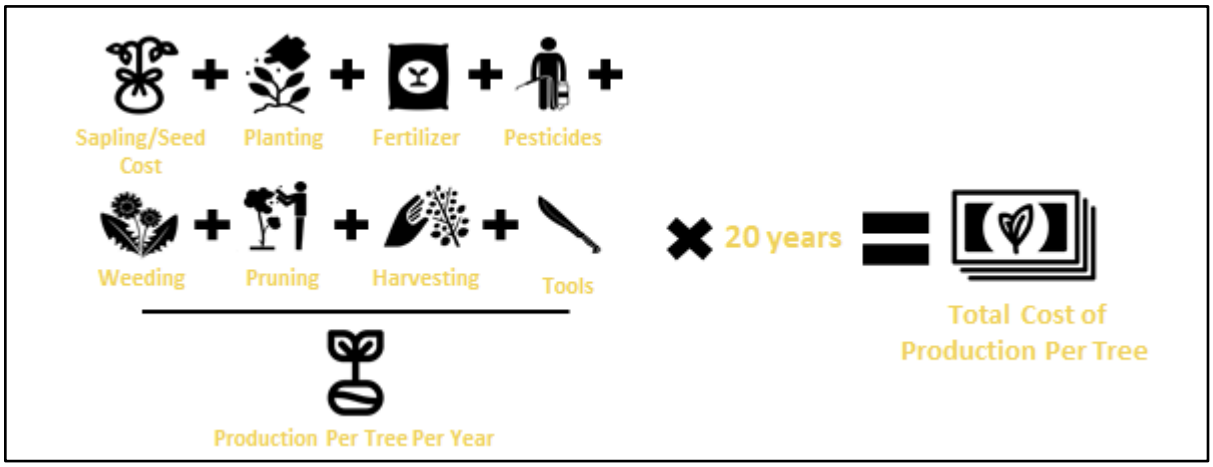
Figure 5. The Tree as a Machine.

With this approach in mind, we can think of costs of production not as a horizontal cross section of costs and yield incurred over a discrete period of time but as a vertical line of costs and crop yields that stretches over the tree's entire life. This approach captures the notion that the tree is an asset and that that asset will have different costs associated with its maintenance and production throughout its lifecycle.

Calculating cost in this manner is relatively straight forward. The first step was to convert all production and costs to a per tree basis by dividing these totals by the number of trees at each farm. Then, assuming a 20 year lifespan for a typical coffee tree, we calculated the costs incurred at a per tree basis in every year throughout the tree's life cycle. Similarly, we calculated the production that each individual tree has at every year over its lifespan.

Different years will have different costs and levels of production. The first year of the tree will include the costs of a seedling or seed, planting costs, fertilizer, possibly pesticides, etc., but there will be no production or associated costs. Later years will have harvesting costs and production amounts, while every fifth year will have the costs of pruning a tree and no production. Summing the net of these costs and the net of the tree's production over 20 years and diving the two returns a cost of production at a per tree basis. This, in turn, can be extrapolated to the entire farm given the density of trees per hectare or an absolute count of trees on the farm. Figure 6 depicts a generalization of this process. Appendix C depicts the actual cost model for the 1.55 hectare farm studied.

Figure 6. Calculating Cost of Production Over a Tree's Lifespan



New Cost Model Results

Using the above tree as a machine model, our team arrived at a new cost of production for each farmer. These costs were once again broken down into harvest, post-harvest, and overheard segments. As mentioned above, we also extrapolated some costs from one farm to another where information was lacking, adjusting for the respective size of the farms. With this new model, our total cost of production for the small farm (1.55 hectares) was $1.48 per pound of green coffee, $1.10 for the medium-sized farm (6.5 hectares), and $1.32 for the large farm (80.6 hectares). These new amounts represent a 19% increase in cost for the small farm, a 9% increase for the medium-sized farm, and a 4% decrease for the largest farm. This is largely in line with what we expected: the smaller farmers who calculate their costs as cash flows each year and do not make sophisticated estimates of their overhead or other long-term costs underestimate their cost of production, while the larger farm with more resources was more accurate. Table 5 shows the next costs of production broken down into the harvest, post-harvest, and overhead segments for each farm size, as well as the change relative to the original cost of production estimation based on our surveys.

Table 5. Tree as a Machine Cost of Production Estimates

	Farm 1 (1.55 Ha)		Farm 2 (6.5 Ha)		Farm 3 (80.6 Ha)	
	Total Cost	% of Total Cost	Total Cost	% of Total Cost	Total Cost	% of Total Cost
Harvest	$1.29	87%	$0.90	82%	$0.77	59%
Post-Harvest	$0.04	2%	$0.09	8%	$0.08	6%
Overhead	$0.15	10%	$0.11	10%	$0.47	36%
Total	$1.48	100%	$1.10	100%	$1.32	100%
Original Cost	$1.24		$1.01		$1.38	
% Difference	19%		9%		-4%	

New Cost Model Implications

Cost of production is the basis of economic reality for farmers. From the farmer's perspective, having accurate cost data is fundamental to making better economic decisions. Similarly, from a buyer's perspective, understanding costs is critical to ensuring farmers are paid a living wage. Our analysis shows that farmers, particularly small to medium holder farm owners, may be undervaluing their true costs by as much as 20% in some instances. This is primarily because these farmers are often in "survival mode". They are concerned primarily with their cash flow from year to year, which can overlook the long-term investment aspects of a coffee tree with a 20+ year lifespan. While it is critical for farmers to understand their cash flow year to year, as this translates to their ability to meet immediate needs, it is still important for farmers to consider their longer term returns. Arming farmers with a more accurate depiction of the investment they've made into their farms allows them to make better economic decisions for themselves and their families.

Cost-Plus Findings

In considering the initial pricing model's two pronged approach, once the cost of production inputs were captured and synthesized, it was important to use qualitative research through primary interviews to determine the best plus model. As previously outlined, the initial hypothesis was that cost of production + cost of living + cost savings + cost of insurance

would yield the most sustainable price for farmers. After interviewing farmers, farm families, and industry experts it was clear that this model was unsustainable, paternalistic, and difficult to replicate. The following findings show the limitations of each part of the plus model.

Cost of Living

In interviewing farmers about the cost of living, it was difficult to determine any specific numbers. This is unsurprising when one takes a step back and tries to consider their own cost of living. While some things like rent and utilities may be regularly tracked, others like average grocery bills and clothing expenditures are less commonly accounted for. Most of the farmer respondents didn't have an answer to these questions and while they described types of things they spent money on, there were no concrete numbers associated with their responses. While incredible work is being done in the industry to consider the cost of living, and a more comprehensive study could potentially begin to uncover these numbers, regardless of limitations, our interviews revealed that cost of living was likely not the right question to be asking. From a philosophical standpoint, an industry of coffee roasters determining the cost of living of farmers appears overly paternalistic. The pricing model frames farmers as dependent on the industry's charity. Not only does this diminish farmer autonomy, it also is unsustainable. The pricing as determined by cost of living is not market based and not driven by demand for the product. Dr. Peter Roberts of Emory University illustrated the issue with this model in an interview:

> *"'Give me your total cost of production and I will give you a decent return'...this is what it means to have a really good livelihood. Where in your world do you know people like you and I that price that way?"*

In other words, pricing a commodity on what it costs one to live is variable and unstable. These findings showed that the best cost model would need to be more market driven and standardized across regions. To be adopted, it require more objectivity than living wage calculations allow and to be effective it needed to be more focused on farmer autonomy.

Cost of Insurance

The interviews illuminated the lack of conversation happening around cost of insurance in the Colombian farming region. While farm insurance does exist, farmers are not interested in purchasing it. Farmers said that insurance was not trustworthy and that it was not reliable for the problems they faced on the farm. Any plus model that included cost of insurance would not be taking into account the cultural mistrust and misunderstanding of the insurance industry as well as the systemic corruption within the systems in place.

Cost of Savings

Most cost models considered the total cost of living and then added a percentage increase to capture cost of savings. While savings are fundamentally the sign of a more sustainable business, being tied to cost of living, revisits the issues listed above. Additionally, in interviews, savings were considered a luxury with interview respondents answering that they would want, "as much saving as possible". When asked what they would do with savings, most farmers claimed they would reinvest the money in the farm to grow the operation. In the unstable coffee economy, farmers said they are more focused on maintaining their business day to day and do not have luxury to set aside money for future non-farm expenditures.

Reframing the Problem

While the interviews highlighted fundamental issues with the initial plus model, there was also a consistent theme throughout each interview about the future of farming. Farmers were invested in creating a better livelihood for their children and wanted to see their children pursue something more sustainable and more profitable than farming. Farmer's showed great pride in wanting their children to pursue higher education and get jobs in the city. This desire was largely driven by a desire for more stable jobs for their children—recognizing that the current state of farming was hard work, with variable pay, that was only getting more challenging with climate change.

This finding is consistent with findings of farming communities across the globe. Farmer's across industries are leaving generational family farms in pursuit of other opportunities. This farm flight, if not addressed, will create a farm crisis that could severely impact the industry, decreasing supply of specialty coffee despite continued rise in demand. Rather than building a pricing model to address cost of living, savings, and insurance, the interviews highlighted the need to create a pricing model that incorporated the opportunities farmers have outside of farming. Rather than meeting minimum requirements, the price floor should be built on an incentive structure for farmers to want to remain in the farming industry and more so, want to pass the farm on to their children.

New Pricing Strategy: Cost of Production + Opportunity Costs

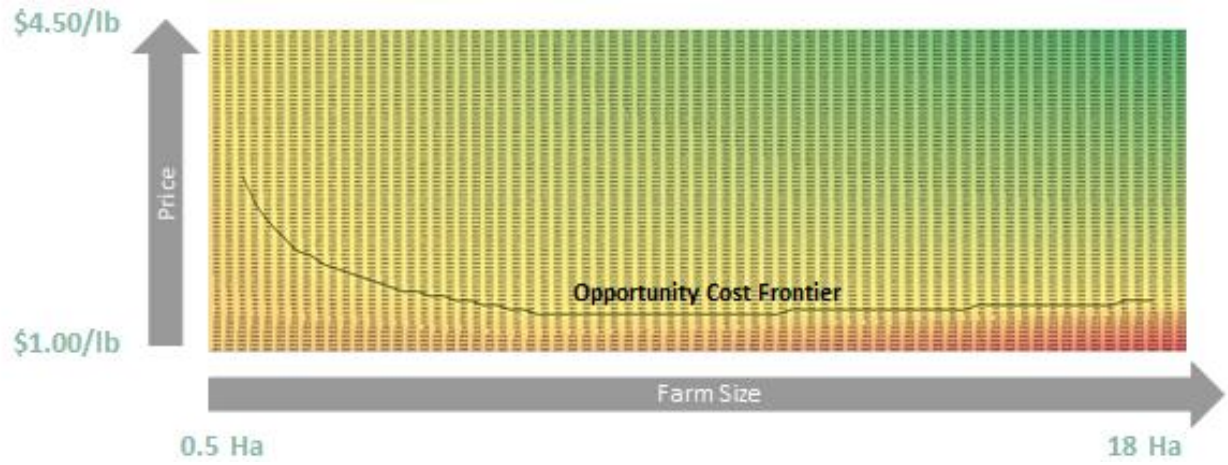
The interviews showed that the best cost model needed to be market driven and at a baseline cover the full cost of farmers. Any less than the full cost and the farmer could not justify staying in the business. However, this full price goes beyond cost of production and includes farmer opportunity costs. This the money farmers could get from other job

opportunities but forgo in their decision to stay farming. While the model has limitations, it is a good tool for industry leaders to use to rethink how they are approaching their pricing methodology. It does not capture all the nuances of coffee pricing, such as quality premiums, however it does give a more accurate price floor from which to add. It also reframes the farmer from being dependent on the industry to keep buying, to the industry being dependent on the farmer to keep farming. The goal is to reach a mutualistic relationship where both can be true, but with current power being held within the industry, this model aims to give a price target for buyers as well as create dialogue within the industry about the importance of moving beyond charity and into future realities about supply and demand. This model uses farmer flight as a market signal for change in the industry and aims to avoid continued farmer surveys and interviews that take up valuable farmer time and result in incremental change for farmers.

Explanation of Opportunity Cost and Farm Size

The opportunity cost model depicts the relationship between coffee price, cost, and farm size. To illustrate this relationship, we built a model that calculates take-home profit for farmers as price and farm size change, given a certain cost per pound and capacity utilization of a farm. Once profit is calculated, the model can be used to understand the line at which a certain desired profitability is met, similar to a pareto frontier, or what we termed the "opportunity cost frontier". Figure 7 depicts this concept for an illustrative $7,300 USD per year opportunity cost.

Figure 7. Opportunity Cost Frontier for $7,300 USD Income



In the above graph, the X-axis depicts the size of the farm, ranging from 0.5 hectares to 18 hectares. The Y-axis depicts the farm gate price of green coffee, ranging from $1,000 per

pound to $4.50 per pound. Other variable inputs include the cost of green coffee per pound, the number of trees per hectare, the average yield per free per year, and the income representing the target opportunity costs. For the above graph, we used a cost of $1.17 per pound of green coffee, representing the average cost per pound in Colombia based on a coop survey of 2000 farmers.[35] We also used industry averages of approximately 5500 trees per hectare and 0.9 pounds per tree in yield.[36] A target price of $7,300 USD was chosen for illustrative purposes. It is roughly based on the upper bound of the per capita middle class income range in Bogota according to *InvestinBogota.org* ($64,813 COP daily per capita income ≈$20 USD per day x 365 days = $7,300).[37] This target income also roughly equates with the average of Colombia's upper middle class income of $8,197 USD/yr and the overall country gross national income of $5,890 USD/yr in 2017 according to the World Bank.[38]

The graph also incorporates a lever to adjust cost of production for changing economies of scale and overhead. Starting at 6.5 hectares to represent the middle-sized farm we interviewed, the graph applies a 20% premium to costs that spread across and compounded for each 0.25 hectare increment. For example, at the start point of 6.5 hectares there is no cost of production adjustment, but at 6.25 hectares, the model applies a cost multiplier of of 1+ (20% ÷ the count of 0.25 increments from 6.5 ha to 0.5 ha). For 6.25 hectares, this equates to a multiplier of 1+ (20%÷24)) = 1.0083. At 6.0 hectares, the multiplier becomes 1.0083 + (20% ÷24) = 1.0167, and so forth. This accounts for loss of economies of scale in the cost of production as the farms decrease in size. A similar concept is applied as the farms increase in size to account for increases in overhead costs. The 20% premium was chosen because it roughly represents the difference in cost of production we observed between the small, medium, and large farm, but this lever can easily be adjusted.

Within each cell of the model is a simple formula that captures the unit margin of coffee times the yield. In practice, this equates to (price - costs) x (# hectares x tree density x tree yield). Figure 8 depicts this equation for required price that equates to $7,300 target annual salary, given the aforementioned capacity utilization assumptions. For visualization purposes, a red, yellow, green color scale conditional format was applied with yellow representing $7,300 and red representing decreasing values less than $7,300 and green representing increasing values greater than $7,300. Similarly, a black line was applied to

35 Tras decisión del Gobierno sobre el programa de apoyo Incentivo Gubernamental para la Equidad Cafetera. (2019)

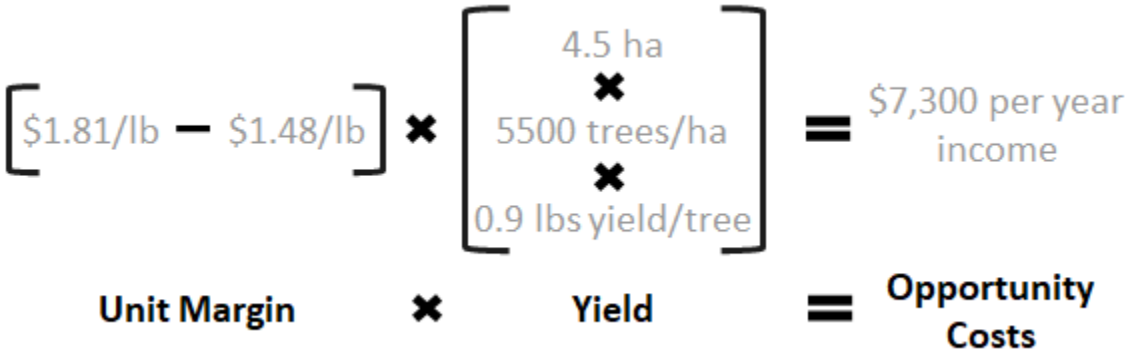
36 *85 Congreso Nacional De Cafeteros*. (2017)

37 Bogota's middle class now represents more than 50% of the city's population. (2019)

38 GNI per capita, Atlas method (current US$). (2019)

denote the smallest number greater than the target of $7,300. This represents the opportunity cost frontier.

Figure 8. Example Opportunity Cost Equation.



It is important to note that all of the aforementioned prices, costs, target income, and yield assumptions are purely illustrative. They represent only the concept of identifying a target income and charting the opportunity cost frontier of that target income based on the relationship between farm size and price. The desired takeaway is that coffee buyers can work with farmers to understand their opportunity costs and then use a similar model to determine the necessary price given the farm size and yield constraints of the farmer.

Benefits of Model

An opportunity cost approach to coffee pricing has several key benefits. First, it is a market driven solution that attempts to directly address one of the most existential risks facing coffee farming: farmer flight. The opportunity cost approach borrows logic from traditional job markets. To attract and retain talent, companies must pay their employees at a competitive rate with what they could otherwise make in regional job market. If employers fail to be competitive with salary and benefits, they will inevitably lose talent. The opportunity cost model approach assumes the same for the coffee industry, and the growing migration of farmers to other careers in urban centers is a strong market signal that coffee pricing is failing to compete with alternative opportunities on the market.

Another major benefit of the opportunity cost model is its simplicity, replicability, and potential to be extrapolated to other regions. Cost plus cost of living models require significant amounts of research and survey data to calculate cost of living, and as previously mentioned, can be inherently paternalistic in nature. Even when done accurately and fairly,

cost of living is not easily replicated from farmer to farmer due to variability across localities, family structures, living conditions, etc. The opportunity cost model assumes that the market has effectively defined a “fair” salary that represents what an employee is capable of earning and willing to accept as pay for their work. It is far simpler to identify the average salary for a comparable education/skill set in a nearby urban center than it is to calculate fair cost of living for individual farmers. This makes it faster and easier to replicate the opportunity cost model from region to region or extrapolate it to other countries entirely.

Finally, the opportunity cost model identifies a fundamental industry pain point. A large farmer’s cost of living as captured by survey may be quite different than a smaller farmer’s cost of living. The perhaps higher cost of living of the large farmer can be offset by the greater farm production. However, both farmers have a similar opportunity to abandon farming and move to urban centers for more stable employment. Thus, the opportunity cost model identifies a need to pay smaller farmers, who lack economies of scale, a higher price per pound, to reach the same opportunity cost frontier. With much of the specialty coffee industry focused on driving value back to smallholder farmers, dealing with this tension is instrumental in building a more sustainable price. Implications of this discovery will be considered in the discussion section.

Discussion

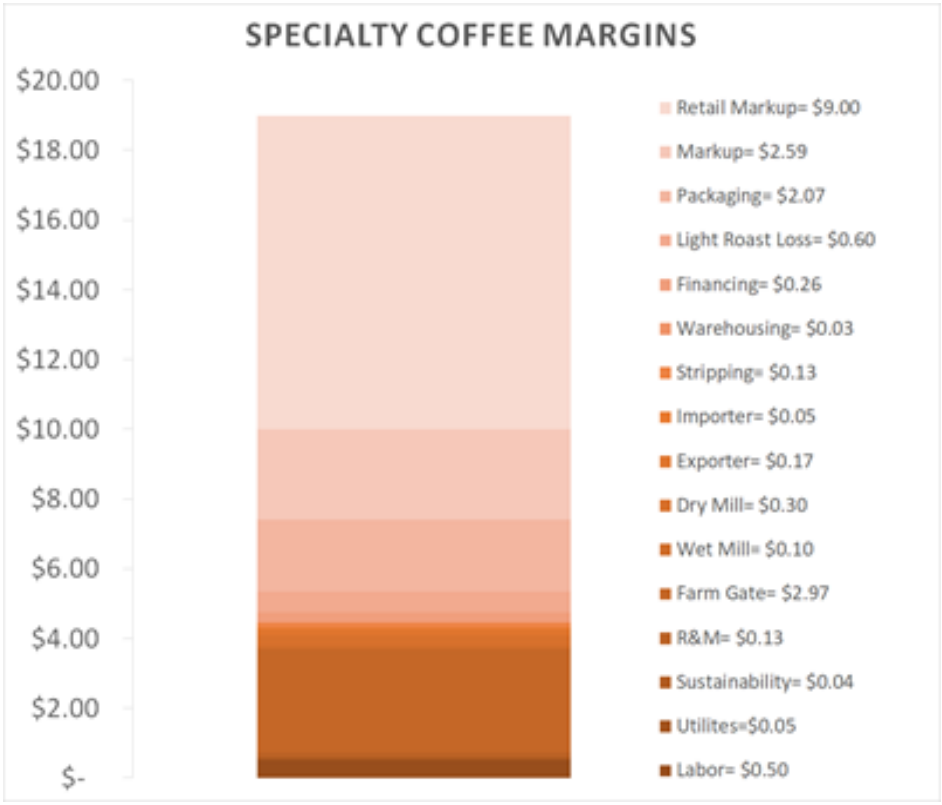
Research Implications for Specialty Coffee Industry

In considering the research holistically, the new pricing philosophy and target price model better encompasses farmer needs and better ensures a future of sustainable farming. But is it feasible? The opportunity cost model showed that there was a bigger disconnect with pricing feasibility for small farms that lacked economies of scale. With a majority of specialty coffee being produced on smallholder farms, can the industry match the pricing needs of these famers or will they abandon the rural coffee trade for more stable work in urban environments? To understand the feasibility of the prices, the team first explored Coffee Manufactory margins to unlock opportunities to increase farm gate coffee prices. This analysis uncovered that small roasters are limited by the same economies of scale as small farmers creating an inherent friction in the coffee buying process. Small roaster’s missions of driving value back to small farmers is misaligned with economic realities. To overcome these issues, coffee roasters need to expand collaboration laterally in the supply chain and search for shared cost savings through strategic partnerships.

Comparing Margins

In exploring Coffee Manufactory's margins (see Figure 9) we found that the small roasters have similar issues of economies of scale as small farmers. Roasters are limited in the short term by consumer's willingness to pay. While efforts can be made to try and educate consumers to increase this willingness to pay, these are costly and slow moving to change across the industry. With this limitation in mind, roasters trying to drive value back to farmers should have price in place based on opportunity cost model, and then move backward from the consumer willingness to pay (roughly $22 per pound) to see which costs in the supply chain can be reduced—leaving more money to go back to the farmer. This is easier said than done. As shown in Figure 9, costs between the willingness to pay and the farm gate price of coffee are necessary steps in the supply chain. Without squeezing or giving unfair margins to the importers and exporters in the industry or taking away the quality packaging and retail experience that helps justify the consumer's willingness to pay for products, the feasibility of reaching sustainable pricing for farmers is difficult for small roasters.

Figure 9: Example specialty coffee margins courtesy of Coffee Manufactory 2018



Need for Shared Cost Models

Most conversations in the industry about sustainable pricing have looked at vertical integration of supply chains with roasters aiming to increase transparency through more direct partnerships. While these efforts are effective, they need to be matched by increased focused on lateral partnerships. Our analysis showed that the best way to get more money back to farmers and avoid the crisis of farmers abandoned farming, is to achieve better economies of scale—thereby reducing costs throughout the supply chain. This highlights two main opportunities. One opportunity is for small roasters to call upon medium size roasters that benefit from economies of scale in packaging, retail, and transportation fees to take on the call to action to address the needs of small holder farmers. This is currently happening in the industry but could be amplified to create more rippling impacts in coffee communities around the world. The second call to action is for small roasters to work together and share supply chains—collaborating on sourcing and reducing costs of imports and exports by guaranteeing larger order quantities. There are examples of these partnership as well as partnership with small and large roasters, but the trend needs to continue. Without a focus on lateral collaboration, the realities of coffee costs will not be covered, jeopardizing the future of the industry.

Limitations of Study

Primary Research

In conducting primary research, the team faced time and sample size limitations. Each survey took approximately two hours, and towards the end of each survey, the interviewers and interviewees were often rushed to get through all of the questions. This could have led to incomplete or imprecise information. As the team thinks about scaling this type of research to other origins, the amount of time that each interview requires must not be underestimated. Since the team was only able to conduct three producer interviews, the collected data is certainly not a statistically significant sample set, nor was this survey designed to be a scientific experiment as there were no independent, dependent, or control variables.

Additionally, with regards to the survey design and deployment, there was certainly opportunity for biased responses. The farmers that the team interviewed were selected to be interviewed by their associated cooperative managers and the exporter. While they are believed to be representative of their broader specialty coffee farming communities, it is possible that they were selected for motivated reasons. Furthermore, for two of the

interviews that were conducted, the cooperative manager was present, which could have skewed how farmers respond to questions.

Finally, while the survey aims to understand the circumstances that drive a farmer's costs and livelihoods, the team's primary research largely ignores changes in regulation. This can be problematic in contexts where regulation drives costs in a very salient manner.

Cost of Production Analysis

There are a number of limitations to our cost of production analysis. The most obvious is our very limited sample size of farmers. Because of our limited resources and time in country, we were only able to complete three full interviews with farmers. We made efforts to offset our limited sample size with information from and interviews with coop managers, as well as data from a large FNC study, all of which corroborated much of our cost findings. Nevertheless, our limited sample size raises serious questions about the representativeness of our results.

Our limited sample size also raises questions about our ability to extrapolate our results to other coffee growing regions in other countries, or even in other regions of Colombia. As with many crops, cost of production can vary wildly based on geography. Colombia has several unique aspects of its coffee growing industry that may make extrapolation to other countries difficult, including but not limited to: (1) a strong and robust FNC that controls quality of exports and provides financial support and farming expertise to farmers; (2) the jornal system of labor and a generally accepted minimum wage; and (3) a widely accepted and almost universally used coop system.

Finally, we made a number of assumptions in our model calculations. In several instances, our farmers did not have or could not provide certain cost information. To make comparisons as alike as possible we made several extrapolations from one farm to another when data was lacking. To do this, we used the relative size of each farm as the basis of making these extrapolations. However, this straight line extrapolation based on farm size is overly simplistic and does not take into account things such as economies of scale. Moreover, in some instances we made assumptions that farmers would incur like costs at all when lacking data to verify such assumptions.

Opportunity Cost Model

The opportunity cost model is based on a number of assumptions, and while these assumptions are designed to manipulate levers, there are nevertheless several limitations to this model. The first limitation is that the model is fundamentally reliant on accurate cost data and other potentially difficult to quantify inputs. As our research has demonstrated, arriving at an accurate cost of production figure can be difficult, time consuming, and is not easily replicated from farm to farm. Similarly, the model requires knowledge of a number of other farm yield and capacity utilization numbers, including tree density and yield per tree. As with all models, inaccurate inputs will yield inaccurate outputs. Garbage in, garbage out.

At its core, the opportunity cost model is a variant of traditional "cost plus" models and therefore faces many of the same potential limitations. Defining the opportunity cost is one such challenge. It may not always be clear what other career opportunities farmers or their children may have, making defining an alternative salary difficult. If not done carefully, choosing an opportunity cost can have many of the same paternalistic effects that traditional "cost plus cost of living" models have. Similarly, the opportunity cost model focuses exclusively on the salary aspects of a career decision and does not consider other non-quantitative benefits, such as social networks, job security, or career satisfaction. Finally, the opportunity cost model assumes that farmers or their children have access to career alternatives. Financial, familial, geographic, or other constraints may make career switching difficult for farmers, and the opportunity cost model does not account for the investments necessary to make overcoming these hurdles possible.

Conclusion

We began our journey investigating a hypothesis that cost of production plus cost of living, savings, and insurance could define a sustainable price for coffee because these elements collectively exhaust past, present, and future costs that farmers face. Through our research and interviews we arrived at the conclusion that this cost plus model was insufficient for defining a sustainable price. Determining cost of living is difficult, time consuming, not scalable, and ultimately paternalistic. No other industry defines the price of its good based on the livelihood needs of its employees. Similarly, savings was a nebulous concept for coffee farmers in Colombia—a country with a history of political and currency upheaval that has bred distrust for banks and saving. And insurance was a non-factor. Neither available nor desired for farmers in Colombia. Moving from our cost plus hypothesis, we arrived at a

number of insights that we felt could add value and perspective to the coffee pricing debate.

Coffee Trees are Long-Term Assets

The realities that many coffee farmers face force them to think in terms of short-term cash flows. When they calculate their costs, they take their expenses from that year and compare it to their revenue for the same period. This approach, however, overlooks the nature of their farms. Coffee trees are long-term assets, requiring years of investment and work before they yield their first coffee bean. While year to year survival will always be paramount for farmers, they must also consider these long-term costs associated with their farms. Doing so enables farmers to make economically-informed decisions.

Farmers are Leaving the Industry

Another major takeaway from our time in Colombia and through our conversations with those in the industry was that the future of smallholder farming is in doubt. Farmers who have had farms in their families for generations are leaving the industry or encouraging their children to seek other opportunities. There are several reason for this: the challenging work of farming, price volatility, the draw of urban life, but what it ultimately comes down to is that the income farmers make coffee farming does not compete with the opportunities they (or their children) can find elsewhere. This brought us to the notion of opportunity costs.

Opportunity Cost Must be Front of Mind

Farmer flight is a market signal that coffee pricing does not reflect the talent that farmers have or the value they create. If buyers want to retain the talent they see in smallholder coffee farmers, they must account for the alternative opportunities these farmers have and pay them accordingly. What would it take for farmers to stay in the industry? For farmers to want their children to stay in the industry? Answering these questions offer an interesting way to think about pricing that could have a profound impact on the longevity of the industry.

Sharing Costs Creates Opportunities for Roasters and Farmers

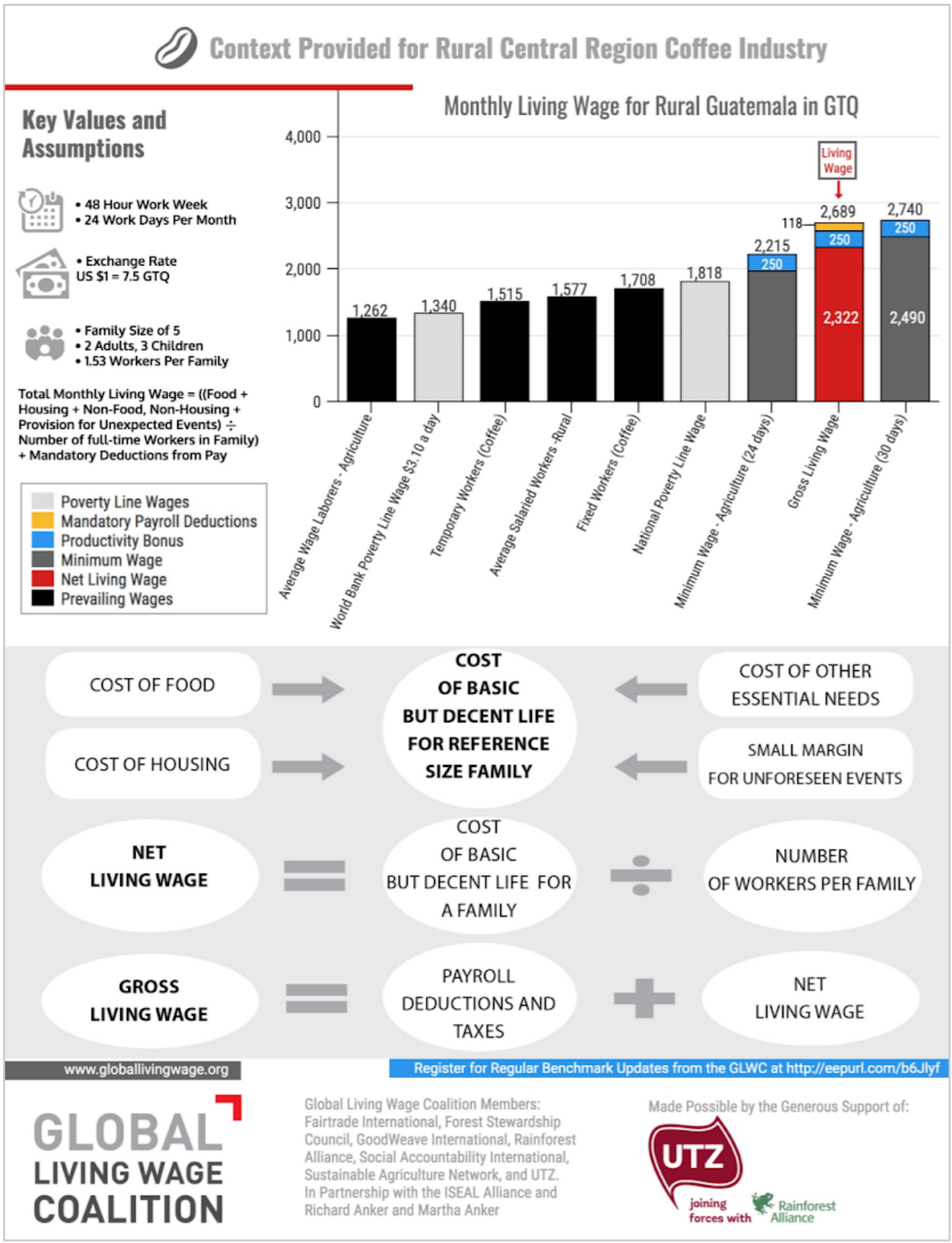
To drive the most value back to farmers while maintaining a profitable and equitable business throughout the supply chain, roasters should collaborate laterally across the supply chain to partner with peers and reduce costs through combined economies of scale. These partnerships will not only ensure a more sustainable price is paid to farmers, it also reduces competition and incentivizes transparency.

Redefining the Question

Our research and interviews confirmed what we suspected from the beginning: there is no single sustainable price for coffee. Instead, there are a number of theories and philosophies for coffee pricing, each with their own benefits and limitations. What we set out to do was explore these theories, ask questions as industry outsiders, provide insights where we could, and ultimately build on the efforts of others. In this, we did not find the exact solution for the industry, but rather worked to redefine the global conversation. We hope for this research to be replicated and expanded upon in other regions to ultimately move closer to the constant moving target of pricing sustainability.

Appendix

Appendix A: Example of Living Wage Calculation


Context Provided for Rural Central Region Coffee Industry
Key Values and Assumptions
• 48 Hour Work Week
• 24 Work Days Per Month
• Exchange Rate
US $1 = 7.5 GTQ
• Family Size of 5
• 2 Adults, 3 Children
• 1.53 Workers Per Family
Total Monthly Living Wage = ((Food + Housing + Non-Food, Non-Housing + Provision for Unexpected Events) ÷ Number of full-time Workers in Family) + Mandatory Deductions from Pay
Poverty Line Wages
Mandatory Payroll Deductions
Productivity Bonus
Minimum Wage
Net Living Wage
Prevailing Wages
Monthly Living Wage for Rural Guatemala in GTQ
4,000
3,000
2,000
1,000
0
Living Wage
1,262
1,340
1,515
1,577
1,708
1,818
2,215
118
250
2,689
250
2,322
2,740
250
2,490
Average Wage Laborers - Agriculture
World Bank Poverty Line Wage $3.10 a day
Temporary Workers (Coffee)
Average Salaried Workers - Rural
Fixed Workers (Coffee)
National Poverty Line Wage
Minimum Wage - Agriculture (24 days)
Gross Living Wage
Minimum Wage - Agriculture (30 days)
COST OF FOOD
COST OF HOUSING
COST OF BASIC BUT DECENT LIFE FOR REFERENCE SIZE FAMILY
COST OF OTHER ESSENTIAL NEEDS
SMALL MARGIN FOR UNFORESEEN EVENTS
NET LIVING WAGE
=
COST OF BASIC BUT DECENT LIFE FOR A FAMILY
÷
NUMBER OF WORKERS PER FAMILY
GROSS LIVING WAGE
=
PAYROLL DEDUCTIONS AND TAXES
+
NET LIVING WAGE
www.globallivingwage.org
Register for Regular Benchmark Updates from the GLWC at http://eepurl.com/b6Jlyf
GLOBAL LIVING WAGE COALITION
Global Living Wage Coalition Members: Fairtrade International, Forest Stewardship Council, GoodWeave International, Rainforest Alliance, Social Accountability International, Sustainable Agriculture Network, and UTZ. In Partnership with the ISEAL Alliance and Richard Anker and Martha Anker
Made Possible by the Generous Support of:
UTZ
joining forces with
Rainforest Alliance

Appendix B: Interview Questions

Interview # _____

Time: _____

Date: _____

Location: _____

General

- Do you own your own farm or work on another person's farm?
- Usted tiene su propia finca o trabaja en la finca de alguien más?
- How long have you worked as a farmer?
- Cuánto tiempo lleva usted trabajando en Agricultura?
- How long have you worked at this farm?
- Cuánto tiempo lleva trabajando en esta finca?
- What would you change about working at this farm?
- Qué cambiaría usted en el trabajo de esta finca?
- How many members of your family work as farmers?
- Cuántas personas de su familia trabajan en fincas o en Agricultura?
- If you have children, do you wish for them to someday work at this farm?
- Si tuviera un hijo, le gustaría que éste trabajara en algún momento de su vida en esta finca ?

Cost of Production

- How large (in area) is the farm you work on?
- Cuanto mide esta finca?
- What is the average annual production at this farm in KG cherry?
- Cuánto café produce aproximadamente al año?
- Do you hire people to work on your farm?
- Usted contrata personas para trabajar en esta finca?
    - If so, for how many days per season?
    - Cuántas personas por cosecha?
    - How much do you pay them per day? (clarify unit of currency)
    - Cuánto le paga el jornal?
    - How many hours per day do they work on average?
    - Cuántas horas diarias trabajan aproximadamente?
    - Are there other non-monetary benefits you provide to them (living quarters, meals, etc)?
    - Hay algún otro tipo de beneficios que usted les ofrezca, por ejemplo, alimentación, dormitorios, etc?
- Last season, on how many days did members of your household cultivate (weed, prune, mulch, plant, etc) your coffee fields?
- En la cosecha pasada, cuántos días trabajó alguien de su familia en el cultivo?

    - On those days, how many hours per day (on average) were dedicated to cultivation by members of your household?
    - En esos días que trabajó algún miembro de la familia, cuántas horas trabajó aproximadamente?
- How much do you get paid to work here?
- Cuanto le pagan por trabajar acá?
- Does this farm use purchased fertilizer or pesticides?
- Usa esta finca pesticidas y fertilizantes comprados en el mercado?
    - If so, how much per season do you/your household spend on these items? (unit of currency)
    - Cuanta plata se gasto en estas compras?
- When you think about all the costs requiring cash of growing/harvesting/selling coffee, what is the most expensive item? (consider clarifying whether participants should include hired labor as a cost item.)
- Cuando usted está pensando en costos que es lo que significa mayor gasto, la plantación, la recolección o la venta del pergamino?
- Are there other income-earning options you have considered? If so, do you believe coffee farming compensates you for your time better?
- Do you own and use any of the following farming equipment? If so, how many and what was the cost?
- Posee y usa usted los siguientes artículos, si es así cuales son los costos de estos?

        - prayer Aspersor (Cacorra), Mask Tapabocas, Drying mat, Drying table, Barrel (for soaking), Bucket (for harvesting) Coco de recolección, Sacks Estopas, Baskets, Pruning shears Machetes o podadoras, Drying mats, Ropes (for harvest and pruning) Ganchos recolección, Other

Cost of living

- How many individuals are in your family?
- Cuántas personas conforman su familia?
- Are you the sole provider for your family?
- Es usted el único que soporta económicamente a su familia?
    - If not, how much income/support do you get from other family members?
    - Si no, cuántos ingresos adicionales recibe por parte de algún miembro de su familia?

Food/Water

- How do you primarily acquire food and water (purchase, grow food, communal well, etc?)
- Cómo obtiene usted agua potable y comida, lo compra en el pueblo más cercano, lo cultiva, etc?
- Can you describe your daily consumption habits?
- Nos puede describir como son sus hábitos de consumo de alimentos en el día?
    - How many meals do you eat per day?
    - Cuántas comidas consume durante el dia?
    - How frequently do your meals include protein?
    - Qué tan frecuente estas comidas incluyen algún tipo de proteína?
    - How much do you spend on food per day?

    - Cuánto gasta mas o menos al día en comida?
    - How much do you spend on water per day?
    - Cuánto gasta en agua más o menos al dia?
    - Are you content with you and your family's daily food/water consumption?
    - Está usted satisfecho con lo que consume usted y su familia en el día?
- In the past 12 months, were there times where you did not have enough food to meet you or your family's needs?
- Durante los últimos doce meses, existió algún momento donde no pudo proveer la cantidad de comida que usted y su familia necesitaba?
    - If so, how many times did this occur?
    - Si esto pasó, cuántas veces más ocurrió?
    - Is food harder to come by during specific times of year?
    - Hay algún momento del año que se le dificulta más la compra de alimentos?

Housing

- Where do you currently live?
- Dónde vive usted actualmente?
    - Is this your permanent residence? If not, how long do you plan to live there?
    - Es esa su residencia permanente, si no lo es, cuánto planea vivir donde está viviendo actualmente?
    - Do you incur costs (rent/housing payments) to live there? If so, how much do you spend per day/week/month?
    - Incurre usted en algún gasto como arriendo o algún otro tipo de pago en su vivienda actual? Si es así cuánto gasta al día, mes o año?
- Does your family live with you at your current location?
- Su familia vive en este momento con usted en su residencia?
    - If separate: Does your family incur any housing costs (rent/housing payments) where they are staying currently?
    - Si vive separado de su familia, ellos están incurriendo en otro tipo de gasto en la vivienda donde se encuentran?

Clothing

- How much do you spend on clothing for yourself annually?
- Cuánto dinero gasta usted anualmente en ropa?
- How much does your family spend on clothing annually?
- Cuánto gasta su familia anualmente en ropa?
- Do you feel that the clothing you provide for yourself and your family is adequate?
- Cree usted que la cantidad de ropa que provee para su familia y para usted es adecuada?

Health Care (including maternity and child care)

- I am going to go through a list of various health care costs. Can you estimate how much you have spent on each of these items over the last year?
- Puede usted darnos un estimado de gastos del año pasado en los siguientes ítems?
    - Health insurance
    - Medicina (EPS o Prepagada)

- Maternity/childbirth costs
- Maternidad o costos de parto?
- Child care
- Cuidado de los niños
- Care for accident, injury or illness
- Routine doctor visits

Education

- Does anyone in your family attend school (including professional development, grade school, university, other)?
- Hay alguien de su familia que esté en el colegio, escuela, universidad, etc?
  - If so, how much does your family spend on school and supplies?
  - Si la respuesta es positiva, Cuánto gasta la familia en los pagos de estudio y los artículos escolares?
  - If not, do you wish that you or members of your family attended school?
  - Si la respuesta es negativa, le hubiera gustado que algún miembro de su familia hubiera asistido?
  - What are the primary reasons for not attending school? Lack of access? Too expensive? Not interested? Other?
  - Cual es la primera razón por no asistir al colegio? Poco acceso, muy costoso, no hay interés, etc?

Energy

- What is the primary source of energy/fuel at your home?
- Cual es la fuente de energía de su casa?
- How much do you spend on energy per day/week/month to power your home?
- Cuanto consume de energía diariamente/semanalmente/mensualmente en toda la casa?
  - Do you encounter any challenges with access to energy?
  - Ha encontrado alguna dificultad para obtener energía en su casa?

Transportation

- What are your weekly transportation needs?
- Cuales son sus necesidades de transporte semanales?
  - Do you own/need a car?
  - Posee usted un carro? O cree que lo necesita?
  - If so, how much do you spend on fuel per week or month?
  - Si tiene carro o moto, cuánto se gasta en gasolina semanal o mensual?
  - Do you regularly take public transportation?
  - Utiliza regularmente el transporte público?
  - If so, how much do you spend on public transportation per day/week/month?
  - Si lo utiliza regularmente, cuando gasta usted en este tipo de transporte al día/semana/mes?

Final Thought of Cost of Living

- Do you feel that the money you currently earn at this farm sufficiently covers your cost of living?
- Cree usted que actualmente sus ingresos son suficientes para cubrir los costos de vivienda?

Insurance

- (If owner) Do you use insurance to protect your crops against unforeseen circumstances?
- Posee algún tipo de póliza de seguros para asegurar sus cultivos en caso de algún tipo de incidente?
- (If owner) Do you feel that the money you currently earn for your crops is sufficient to purchase crop insurance?
- Cree usted que el dinero obtenido de los cultivos es suficiente para adquirir algún tipo de póliza de seguros?
- If yes, how much do you currently spend on insurance?
- Si tiene póliza, cuánto está pagando actualmente por este seguro?
    - Do you feel that this is a good value for the protection you receive?
    - Cree usted que la inversión es directamente proporcional a la protección recibida por la póliza?
- If no, is insurance available to you to purchase?
- Si no tiene seguro, existen opciones para usted adquirir el producto?
- What are the major reasons you choose to buy or not buy insurance?
- Cual es la razón para elegir comprar o no una póliza de seguros?
- How much would you be willing to pay for insurance if it provided full repayment for lost crops?
- Cuánto estaría usted dispuesto a pagar por una póliza si ésta respondiera por la pérdida total de los cultivos?
-

S**avings**

- How do you use your annual earnings?
- Cómo utiliza usted los ingresos anuales?
- Are they institutions (such as banks) available to you where you can save your money?
- Existen instituciones como bancos, disponibles o cerca donde pueda depositar su dinero?
- Do you regularly save money?
- Usted ahorra dinero normalmente?
- If so…
    - What types of things/purchases do you save for?
    - Para qué tipo de cosas ahorra usted?
    - How much do you set aside after each season?
    - Cuanto dinero aproximadamente destina para ahorros después de la cosecha?
    - Are you satisfied with your ability to save money?
    - Está satisfecho con su capacidad para ahorrar su dinero?
- If not…
    - What is the reason you do not save money regularly?
    - Cual es la razón principal por la cual no ahorra dinero regularmente?
    - What type of things/purchases would you like to save money for?
    - Para qué tipo de cosas quisiera usted poder ahorrar dinero?
    - How much would you like to be able save from each season?
    - Cuanto desearía usted poder ahorrar después de cada cosecha?
- Do you feel that the money you currently earn at this farm allows you to save money most seasons?
- Cree usted que los ingresos de esta finca son suficientes y le permiten ahorrar dinero en casi todas las cosechas?

Appendix C - Tree as a Machine Cost Model (1.55 Ha Farmer)

	Year											
Cost (Per Tree)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Sapling Cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Planting	300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fertilizer (Product)	434.61	434.61	434.61	434.61	434.61	434.61	434.61	434.61	434.61	434.61	434.61	434.61
Fertilizing (Application)	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85
Pesticides (Product)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pesticides (Application)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pesticides Equipment - Stationary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pesticide Equipment - Transportable	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tools	34.92	34.92	34.92	34.92	0.00	34.92	34.92	34.92	34.92	0.00	34.92	34.92
Pruning	0.00	0.00	0.00	0.00	58.00	0.00	0.00	0.00	0.00	58.00	0.00	0.00
Cleaning (Labor)	1115.51	1115.51	1115.51	1115.51	1115.51	1115.51	1115.51	1115.51	1115.51	1115.51	1115.51	1115.51
Cleaning (Product)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Picking (Harvest)	0.00	0.00	0.00	1019.90	1019.90	1019.90	1019.90	1019.90	0.00	1019.90	1019.90	1019.90
Picking (Non-Harvest)	0.00	0.00	0.00	254.97	254.97	254.97	254.97	254.97	0.00	254.97	254.97	254.97
Other Labor	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85
Tree Removal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Production (Arroba/Tree)	**-**	**-**	**-**	**0.0425**	**0.0425**	**0.0425**	**0.0425**	**0.0425**	**-**	**0.0425**	**0.0425**	**0.0425**
Total Cost Each Year (Pesos Per Tree)	**2,006.74**	**1,706.74**	**1,706.74**	**2,981.61**	**3,004.69**	**2,981.61**	**2,981.61**	**2,981.61**	**1,706.74**	**3,004.69**	**2,981.61**	**2,981.61**
Total Cost Each Total Farm	**10,388,869.23**	**8,835,769.23**	**8,835,769.23**	**15,435,769.23**	**15,555,266.00**	**15,435,769.23**	**15,435,769.23**	**15,435,769.23**	**8,835,769.23**	**15,555,266.00**	**15,435,769.23**	**15,435,769.23**

Year											Totals	
12	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Total**	**% of Total**		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.0%	**Total Arroba Production/Tree (Parchment)**	**0.64**
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**300.00**	0.6%	**Total KG Production/Tree (Parchment)**	**7.97**
434.61	434.61	434.61	434.61	434.61	434.61	434.61	434.61	434.61	**8,692.29**	16.2%	**Total Lb Production/Tree (Parchment)**	**17.53**
60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	**1,216.92**	2.3%		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.0%		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.0%	**Total 20-Year Pesos Per Tree**	**53,762.00**
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.0%	**Total 20-Year USD Per Tree**	**17.10**
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.0%		
34.92	34.92	34.92	0.00	34.92	34.92	34.92	34.92	34.92	**593.60**	1.1%		
0.00	0.00	0.00	58.00	0.00	0.00	0.00	0.00	0.00	**174.00**	0.3%	**Total 20-Year Pesos Per Farm**	**278,325,869.92**
1115.51	1115.51	1115.51	1115.51	1115.51	1115.51	1115.51	1115.51	1115.51	**22,310.22**	41.5%	**Total 20-Year Production Per Farm (Arr. Parch)**	**3,300.00**
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.0%	**Total 20- Year Production Per Farm (Lbs Parch)**	**90,750.00**
1019.90	1019.90	1019.90	0.00	1019.90	1019.90	1019.90	1019.90	1019.90	**15,298.44**	28.5%	**Total Production Per Year (Lbs Parchment)**	**4537.5**
254.97	254.97	254.97	0.00	254.97	254.97	254.97	254.97	254.97	**3,824.61**	7.1%	**Total Production Per Year (Lbs Green)**	**3422.68**
60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	60.85	**1,216.92**	2.3%		
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	135.00	**135.00**	0.3%	**Total 20-Year Pesos Per Arroba**	**84,341.17**
0.0425	**0.0425**	**0.0425**	**-**	**0.0425**	**0.0425**	**0.0425**	**0.0425**	**0.0425**	**0.64**		**Total 20-Year Pesos Per Lb (Parchment)**	**3,066.95**
2,981.61	**2,981.61**	**2,981.61**	**1,729.82**	**2,981.61**	**2,981.61**	**2,981.61**	**2,981.61**	**3,116.61**	**53,762.00**		**Total 20-Year Dollars Per Lb (Parchment)**	**$0.98**
15,435,769.23	**15,435,769.23**	**15,435,769.23**	**8,955,266.00**	**15,435,769.23**	**15,435,769.23**	**15,435,769.23**	**15,435,769.23**	**16,134,664.23**	**278,325,870**			

Post Harvest (annual)

	Total Cost (Pesos)	Total Cost (Dollars)	Pesos Per Arroba (parchment)	Pesos Per Lb (parchment)	Dollars Per Arroba (parchment)	Dollars Per Lb (parchment)	Dollars Per Lb Green
Transportation (Assets)	488.89	0.16	2.78	0.10	0.00	0.00	0.00
Transportation (Fuel)	234,177.78	74.49	1,330.56	48.38	0.42	0.02	0.02
Transportation (Driver)	12,711.11	4.04	72.22	2.63	0.02	0.00	0.00
Transportation (Maintenance)	-	-	-	-	-	-	0.00
De-pulping Machine (Asset)	-	-	-	-	-	-	0.00
De-pulping (Maintenance)	-	-	-	-	-	-	0.00
Silo/Drying Machine (Asset)	-	-	-	-	-	-	0.00
Silo/Drying (Maintenance)	-	-	-	-	-	-	0.00
Silo/Drying (Fuel)	-	-	-	-	-	-	0.00
Load/Unload	-	-	-	-	-	-	0.00
Road Maintenance	-	-	-	-	-	-	0.00
Labor	-	-	-	-	-	-	0.00
Energy	174,044.44	55.36	988.89	35.96	0.31	0.01	0.02
Total	**421,422.22**	**134.04**	**2,394.44**	**87.07**	**0.76**	**0.03**	**0.04**

Overhead (annual)

	Total Cost (Pesos)	Total Cost (Dollars)	Pesos Per Arroba (parchment)	Pesos Per Lb (parchment)	Dollars Per Arroba (parchment)	Dollars Per Lb (parchment)	Dollars Per Lb Green
Dormitory	-	-	-	-	-	-	-
Property Tax	563,200.00	179.14	3,200.00	116.36	1.02	0.04	0.05
Income Tax	609,996.44	194.02	3,465.89	126.03	1.10	0.04	0.05
Withheld Tax	329,706.67	104.87	1,873.33	68.12	0.60	0.02	0.03
Payroll (farm)	-	-	-	-	-	-	-
Payroll (HQS)	-	-	-	-	-	-	-
Owner Income	-	-	-	-	-	-	-
Auditor	-	-	-	-	-	-	-
Accounting	-	-	-	-	-	-	-
Building Admin Fees	-	-	-	-	-	-	-
Energy (HQS)	-	-	-	-	-	-	-
Utilities (HQS)	-	-	-	-	-	-	-
Insurance (HQS Building)	-	-	-	-	-	-	-
Insurance (Transport to Sell)	-	-	-	-	-	-	-
Insurance (Money Theft)	-	-	-	-	-	-	-
Insurance (Production)	-	-	-	-	-	-	-
Banking Transfer Fees (4p/1000p)	-	-	-	-	-	-	-
Banking Fees (vat, interests, commissions)	-	-	-	-	-	-	-
Co-op Fees	758.80	0.24	4.31	0.16	0.00	0.00	0.00
Other	234,666.67	74.64	1,333.33	48.48	0.42	0.02	0.02
Total	**1,738,328.58**	**552.92**	**9,876.87**	**359.16**	**3.14**	**0.11**	**0.15**

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