

A CASE STUDY FOR THE USE OF BLOCKCHAIN TECHNOLOGY FOR PHILIPPINE COFFEE GROWERS

KAI CHANG, SCOTT TUPPER, CARMEL LAURINO & LACY AUDRY



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ABOUT THE ASIA PACIFIC FOUNDATION OF CANADA

THE ASIA PACIFIC FOUNDATION OF CANADA is dedicated to strengthening ties between Canada and Asia with a focus on expanding economic relations through trade, investment, and innovation; promoting Canada's expertise in offering solutions to Asia's climate change, energy, food security, and natural resource management challenges; building Asia skills and competencies among Canadians, including young Canadians; and improving Canadians' general understanding of Asia and its growing global influence.

The Foundation is well known for its annual national opinion polls of Canadian attitudes regarding relations with Asia, including Asian foreign investment in Canada and Canada's trade with Asia. The Foundation places an emphasis on China, India, Japan, and South Korea while also developing expertise in emerging markets in the region, particularly economies within ASEAN.

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The **APEC-Canada Growing Business Partnership** is a four-year initiative jointly implemented by the Asia Pacific Foundation of Canada (APF Canada) and the Asia Pacific Economic Cooperation (APEC) Secretariat. Funded by Global Affairs Canada, this initiative helps build the potential of micro, small, and medium enterprises (MSMEs) to promote poverty reduction and sustainable economic growth in the APEC region. The Partnership offers best practice tools, ideas, knowledge and critical connections derived from Canadian experience, tailored to the local markets of APEC countries. The countries currently identified as economies of focus are: Vietnam, Indonesia, the Philippines, and Peru. The focus areas of the Partnership aim to address key challenges faced by MSMEs and aspiring entrepreneurs from APEC developing economies in the areas of technology and innovation, market access, human capital, and social entrepreneurship, with an emphasis on the cross-cutting themes of women, youth, governance and the environment.

Visit the APEC-Canada Business Partnership at <https://apfcanada-msme.ca/>

ABOUT THE AUTHORS

Kai Chang is the founder of Kai Analytics (www.kaianalytics.com) and co-founder of Yave.io. Kai Analytics is a cloud-based research firm specializing in data visualization, survey research, and process automation. In the past he led a business intelligence team for university research. Kai was born in Taipei, Taiwan, but grew up in Vancouver, Canada. He holds a Bachelor of Arts in Economics from the University of British Columbia and a Master's of Science in Agricultural Economics from the University of Guelph. He currently divides his time between Vancouver and Matsumoto City, Japan. His hobbies include making pop-up cards and co-hosting the computer programming podcast, Python Out Loud (www.pythonoutloud.com).

Scott Tupper is the founder and CEO of Yave.io and Onda Origins Coffee. Onda Origins Coffee is a roasting company specializing in coffee sourced directly from farmers using best practices in sustainability, conservation, and social justice. Scott's career started in anthropology and international development in Western Samoa. Following this experience, he founded a coffee roasting company in Seattle, Wash., coordinated coffee trade shows, published in industry trade journals and became a licensed importer. He has expertise in specialty markets and is involved in applied blockchain think-tanks for the coffee industry spanning three continents.

Carmel Laurino is an entrepreneur currently based in the Philippines, but also calls Seattle home. After graduating from the University of Washington with a Bachelor of Arts in International Studies and Political Science, Carmel spent time in Seattle involved in arts, design, community organizing and social justice initiatives. While pursuing her Master's in Strategic Design and Management at Parsons The New School for Design four years ago, she founded Kalsada Coffee, a social purpose company partnering with small-scale coffee producers to provide them access to the international specialty coffee market. Kalsada Coffee currently supports 75 such coffee producers. Carmel is also a founding member of ILAW – a social enterprise that aims to spotlight Filipino food and beverage professionals in the Pacific Northwest.

Lacy Audry has been a coffee geek since 2010. Lacy learned to roast while writing her master's thesis on the coffee industry in Vietnam. She has more than five years in coffee and roasting experience and graduated with a Master's degree in International Affairs from the American University of Paris. When she is not roasting or cupping coffee, she is probably topping out boulders in Fontainebleau, France.

EXECUTIVE SUMMARY

With funding from the Asia Pacific Foundation of Canada's APEC-Canada Growing Business Partnership, the authors examined how blockchain tracking technology can be applied to coffee grown and marketed by micro, small, and medium-size enterprises (MSMEs) in APEC's developing economies.

Blockchain technology can create a digital record of the origin of a coffee crop and follow that batch through processing, export and roasting. The system is resistant to tampering and is visible to everyone in the chain.

The niche market for high-grade, specialty coffee is lucrative and relies on buyers knowing exactly where the coffee is grown. Entering the specialty market can boost incomes of small-scale farmers who have not experienced the benefits of a spike in the global retail price of coffee in the past decade.

Accurate information is an untapped driver of value for these farmers. Blockchain technology could help address three problems in the sector:

- Improving data quality and transparency;
- Increasing financial literacy for farmers; and,
- Improving access to bank loans for MSMEs.

The authors themselves are involved in MSME's working in the areas of data analytics, Philippine coffee production and export, and traceability software for the coffee supply chain. Respectively, these ventures are Kai Analytics (Canada), Kalsada Coffee (Philippines), and Yave Incorporated (U.S.A.).

The paper will offer an overview of the Philippine coffee industry, a case study of an MSME in the Philippine coffee farming and exporting industry, and an emerging technology company attempting to bring trade transparency and efficiency to the coffee industry.

INTRODUCTION

Coffee possesses a unique niche in global development. It is seated at the intersections of developed and developing, international commerce and smallholder farming, commodity and luxury, land rights and environmental change.

The Philippine coffee farmers studied in this report are considered micro enterprises. According to the Philippines Republic Act No. 9501, MSMEs are “defined as any business activity or enterprise engaged in industry, agribusiness and/or services ... whose total assets, inclusive of those arising from loans but exclusive of the land on which the particular business entity's office, plant and equipment are situated. [And] must have value falling under the following categories:”¹

- Micro - No more than 3 million PHP (Philippine pesos);
- Small - 3 million to 15 million PHP;
- Medium - 15 million to 100 million PHP; and,
- Large - More than 100 million PHP.

The mission of our partner in the Philippines, the Kalsada Coffee Company, is to provide both local and export markets to Filipino smallholder coffee growers. The initial farming community they engaged had access only to a local market, sometimes selling at volatile prices to middlemen. Before working with Kalsada, these growers could not provide a consistent quality of coffee to buyers.

Using Kalsada as a model, we can see how a socially responsible, privately held company can build vertical integration across the supply chain, opening doors for micro farmers and connecting them with coffee consumers. It is this vertical integration that makes it an ideal candidate for blockchain technology.

Yave, a blockchain trading application startup, worked with Kalsada to understand how blockchain can be used throughout the coffee production and export process to provide transparency, improve trade, and ultimately greater market access for MSMEs.

This report will first introduce the current state of the Philippine coffee industry, its challenges, and growth potential. This will include both secondary and public data sources as well as an industry survey to gauge the sentiment of various coffee stakeholders in the Philippines.

¹ "Republic Act No. 9501," *Government of the Philippines Official Gazette*, May 23, 2008. <http://www.officialgazette.gov.ph/2008/05/23/republic-act-no-9501/>.

Secondly, we will talk about Kalsada's business model, its accomplishments and challenges, and the difference they continue to make in a farming community.

Thirdly, we will introduce Yave, a start-up tech company that is building a blockchain solution for the supply chain of Kalsada and how the partnership would work. This includes proof-of-concept, lessons learned and directions for future collaboration.

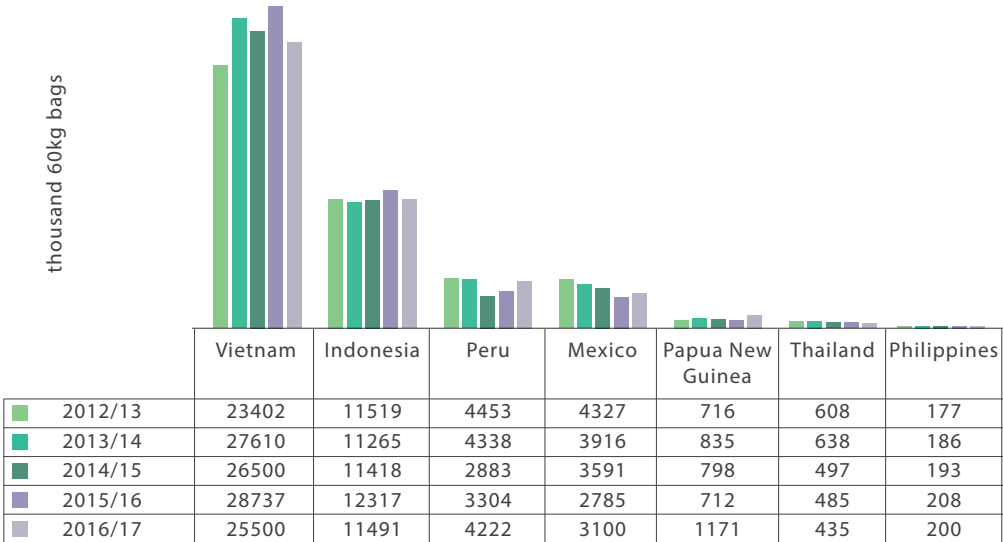
We will end with four recommendations on how to maintain and grow MSMEs in the Philippines, with a focus on the coffee-growing industry. This will include data gathering and stewardship; supporting streamlined export requirements; continued education promoting financial literacy for farmers, further research on incentives for commercial banks to make loans to MSMEs; and development of internet and communication technology in the Philippines.

COFFEE INDUSTRY IN THE PHILIPPINES

The Philippine Coffee Board, a private-sector group promoting the country’s coffee industry, says the Spanish introduced the first coffee trees in the 18th century, planting the seeds for the Philippines to become the world’s fourth-largest coffee exporter in the late 19th century before it collapsed due to crop disease and insects. Today the Philippines is a net importer of coffee.

Based on data from the International Coffee Organization (ICO), coffee production in the Philippines is among the smallest compared to other APEC coffee-producing nations. The Department of Trade and Investment (DTI) also reports that the Philippines is currently the fifth largest importer of coffee in the world and the largest for instant coffee ².

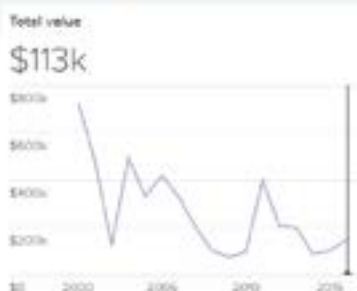
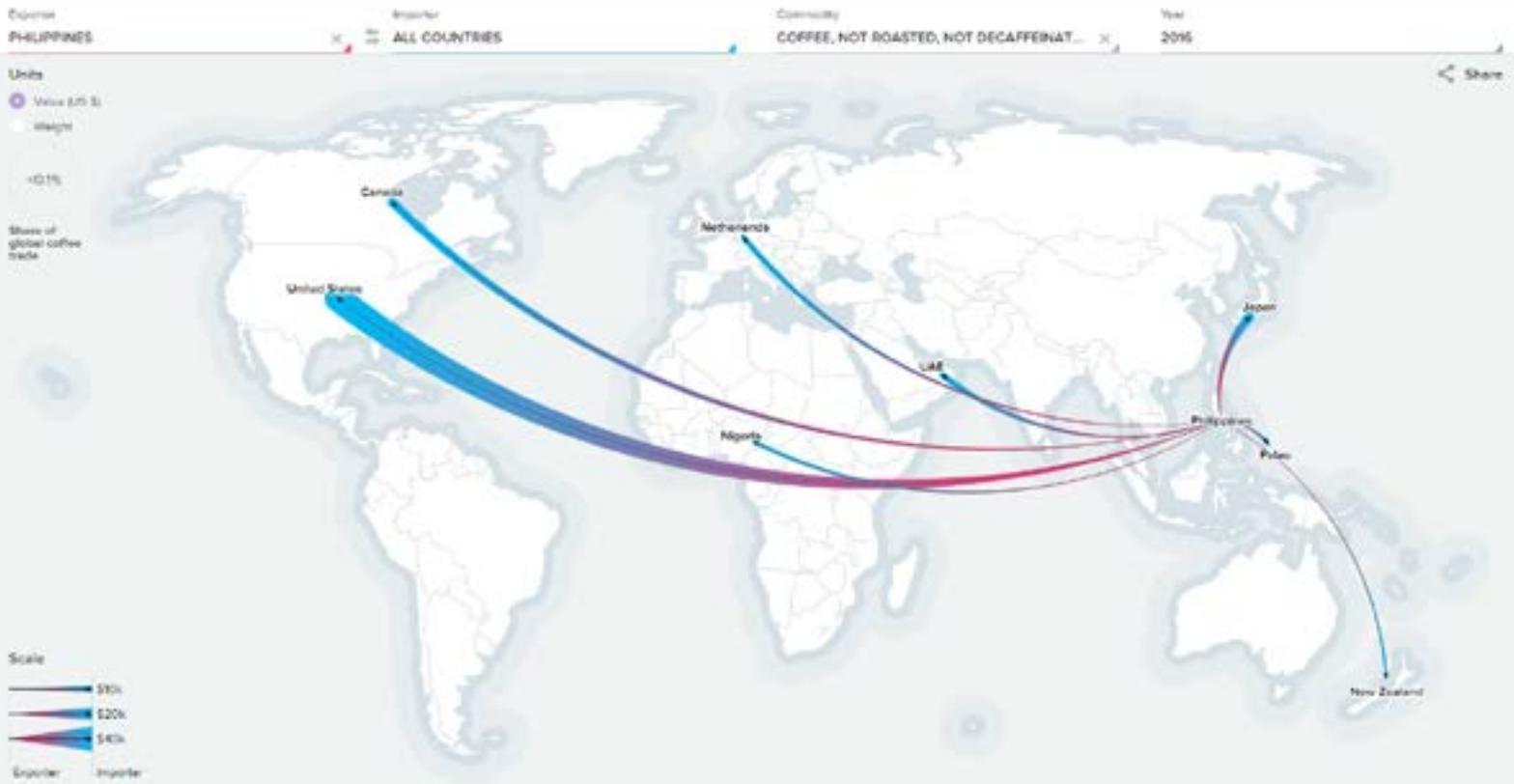
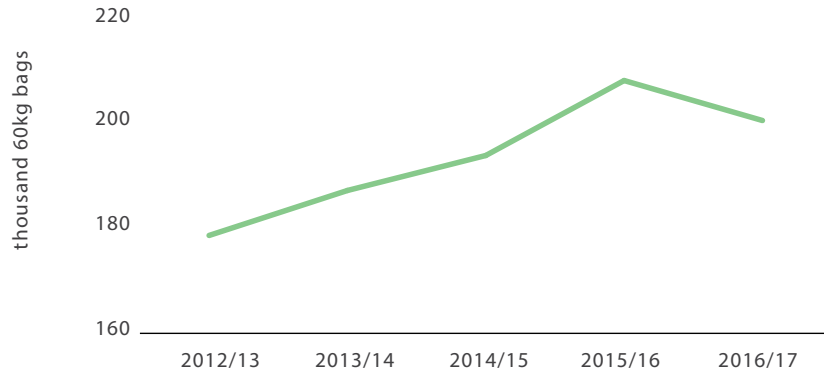
Coffee Production Amongst Coffee Producing APEC Nations



Despite being a net importer of coffee, the Philippines has experienced an overall growth in coffee production from 2012 to 2017. The United Nations Comrade Database on international trade statistics reported Philippine coffee was sold in the U.S., Canada, Japan, New Zealand, Palau, the Netherlands, United Arab Emirates and Nigeria in 2016³.

² “Briefing Kit from the Third Philippine Coffee Conference,” Department of Trade and Industry, March 20-21, 2018, Baguio City, Philippines
³ “Philippine unroasted coffee exports 2016,” ResourceTrade.Earth, accessed 2018, <https://resourcetrade.earth/data?year=2016&exporter=608&category=904&units=value>.

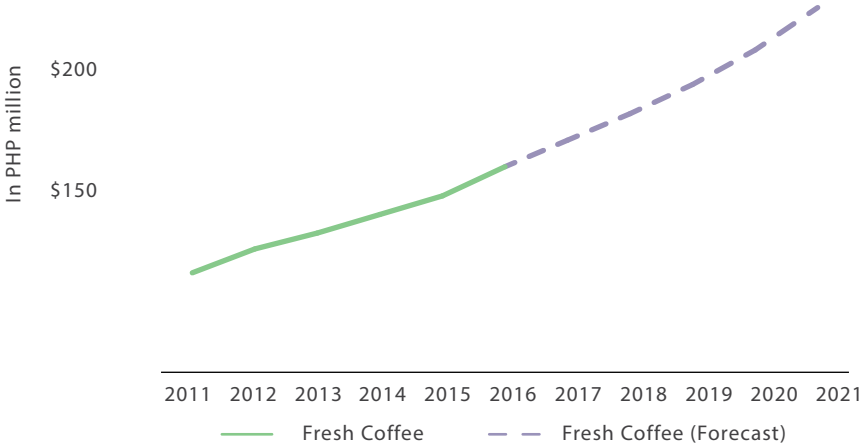
Total Coffee Production in the Philippines



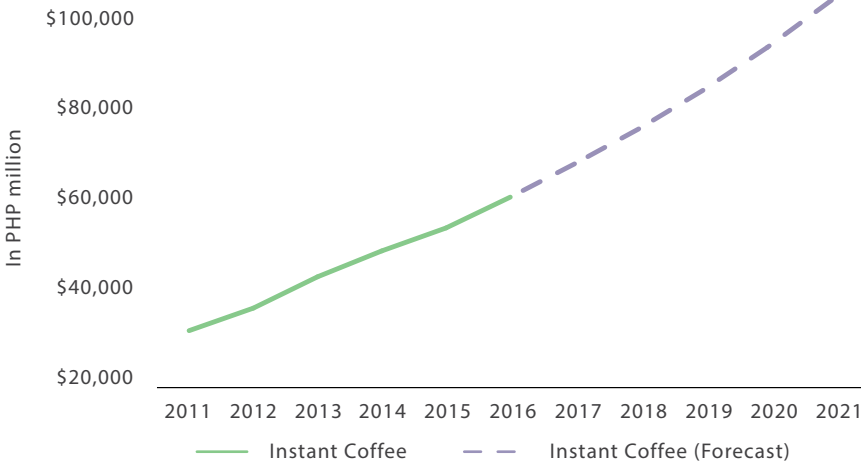
Trade flows	Commodities	Exporters	Importers	Footprints
<p>TOP 5</p> <p>1 Philippines to United States \$43.7k</p> <p>2 Philippines to Japan \$15.4k</p> <p>3 Philippines to Canada \$14.4k</p> <p>4 Philippines to United Arab Emirates \$9.9k</p> <p>5 Philippines to Netherlands \$9.4k</p>				
<p>FASTEST GROWING 2015-2016</p> <p>1 Philippines to United States +22%</p> <p>2 Philippines to Canada +20%</p> <p>3 Philippines to Japan +19%</p> <p>4 Philippines to Palau +11%</p>				
<p>FASTEST DECLINING 2015-2016</p> <p>1 Philippines to Korea, Republic -9%</p>				

There is plenty of room for growth. According to Euromonitor International, the Philippine coffee sector is forecast to expand by a compound annual growth rate of 11% between 2016 and 2021⁴. The Duterte administration has signed a new “Philippine Coffee Industry Roadmap 2017-2022” with the purpose of boosting the country’s annual domestic coffee output from 37,000 metric tons (MT) a year to 214,626 MT by 2022. According to the roadmap, this will bring the country’s coffee self-sufficiency level to 161% from the current 41.6%⁵.

Retail Sales of Fresh Coffee: Value 2011 - 2021



Retail Sales of Instant Coffee: Value 2011 - 2021



⁴ "Coffee in the Philippines", Euromonitor International, 2017.
⁵ "DTI sees bright prospects ahead for Philippine coffee industry," Department of Trade and Infrastructure, April 25, 2018, <https://www.dti.gov.ph/region1/27-main-content/emb-news/11964-dti-sees-bright-prospects-ahead-for-philippine-coffee-industry>.

It's important to note that fresh coffee and instant coffee cater to different consumer groups, but the two can concomitantly grow over the forecast period. In this report, however, we focus on the market for specialty coffee. In the next section, we will discuss what specialty coffee is and why it's important to the MSMEs.

SPECIALTY COFFEE

Specialty coffee is defined by the rating it receives from trained tasters using a 100-point scale. Arabica coffee rated between 80 and 100 is considered specialty coffee. While it comprises a small portion of the total annual world coffee output, it is a high-value product, with average market price between US\$3 and US\$6 per pound.

Compared to the current New York Stock Exchange global coffee price, which has hovered between \$1.07 and \$1.40 per pound for the last two years, specialty coffee can earn double the price per pound⁶.

To put this price increase in perspective, let's take a look at two types of production systems to understand how specialty coffee is produced.

In historical coffee-producing countries that have had enormous investment in the industry over centuries (Brazil, Colombia, Kenya, Costa Rica), large-scale landowners hire labourers and pickers to maintain their farms and harvest coffee which grows on shrubs in the form of a fruit, called cherry for its red colour when ripe. This fruit is then brought to the landowner's mill for processing such as depulping — in which the outer flesh of the fruit is removed — fermenting, and drying. At this point, the coffee bean is still covered in a skin called parchment.

It is then taken to a dry mill usually in the community, but owned by a third party, where the protective layer of parchment is removed and the beans sorted by size and quality using up to ten different machines and several rounds of hand sorting. To picture this, imagine a warehouse filled with women sorting one bean at a time.

An alternate process is wet milling which uses water to sort the fruit and beans.

At both the wet mill and the dry mill, high-grade coffees are separated from the rest on the basis of ripeness, shape, size, and colour. The best of the best are separated into lots which are treated with the utmost care, packed in vacuum-sealed bags and boxes. Lots can also be used to distinguish coffee from one area of farm, a certain growing altitude, or method of processing. Superior lots, which

⁶ "Niche Markets for Coffee: Specialty, Environment and Social Aspects," International Trade Centre, 2012, <http://intracen.org/niche-markets-for-coffee-pdf/>.

can fetch up to US\$25 per pound, are shipped via airplane to ensure quality is not lost at sea where coffee may be exposed to the weather.

Smallholder farmers typically do not have their own machinery so they must pay high prices to have their coffees processed. This can mean earning just enough to survive until the following year, but producing specialty coffee is a way to boost profits.

Once the coffee is picked, it can never gain quality. Inherent flavour characteristics can only be lost through processing, but when done correctly, proper fermentation and drying methods can make a radical difference in preserving the unique terroir of the coffee. The differences would be noticeable even to an amateur coffee drinker.

The second production system occurs in countries that do not have a history of coffee production, lack investments in wet mill and dry mill processing facilities, and, therefore, a lack of options to bring coffee to market. The Philippines, Cuba, and Haiti are among emerging coffee producing countries where farmers practice subsistence farming, cultivating coffee and a variety of other crops to earn a basic living. This makes them more resilient, as they are often producing other crops beside of coffee, but it is extremely labour intensive. Processing freshly picked coffee cherries into green coffee beans is often accomplished within the family. Farmers also have to transport their coffee to market or find suitable buyers every year.

In a later section of this report we will learn how Kalsada works with these subsistence coffee farmers, helping them to understand the specialty coffee market — previously unattainable to them — and take away the stress of finding a buyer for their coffee each harvest season.

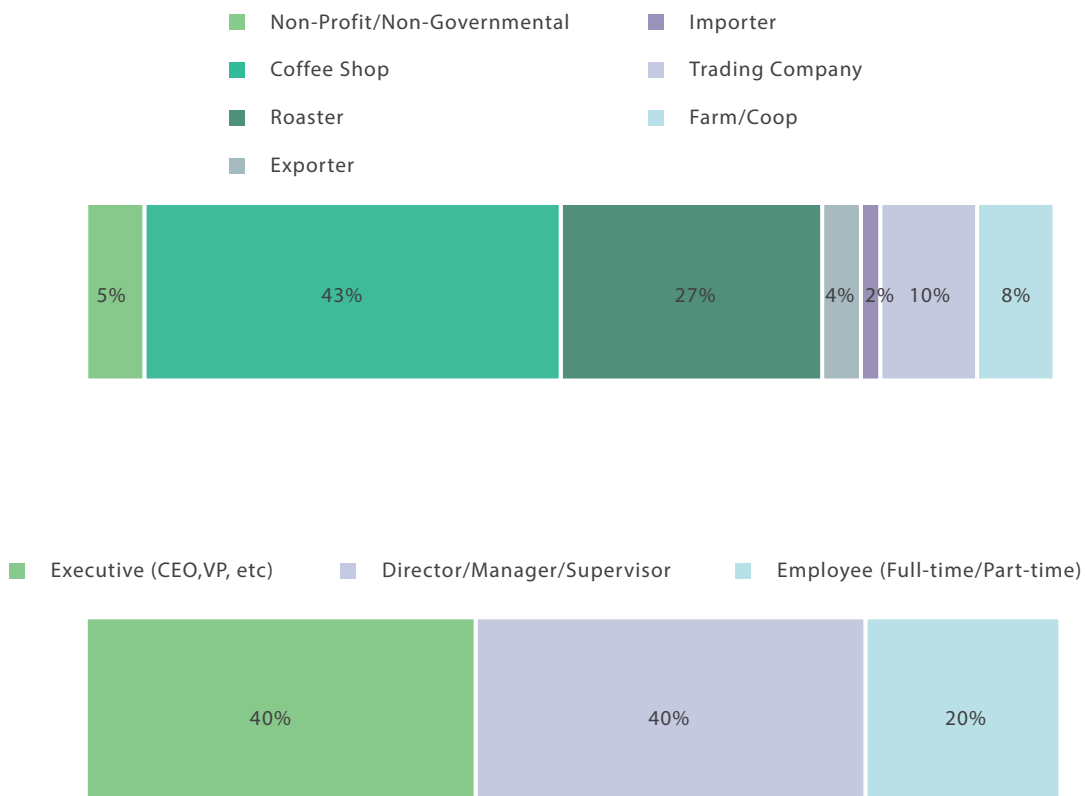
PHILIPPINE COFFEE INDUSTRY SURVEY

Survey Purpose and Methodology

To complement secondary data sources, the authors administered a survey to gauge optimism in the coffee industry. An invitation to complete the survey was sent to the closed Facebook group, Philippine Coffee Industry Stakeholders. At the time of the survey, the group consisted of 189 members. Ultimately, 50 responses were collected — a response rate of approximately 26%. When generalizing the findings in this survey to the industry as a whole, the expected margin of error was approximately +/- 12%. The survey was sent out in May 2018 and ran for a full month. The next section highlights some of the major findings.

Survey Results

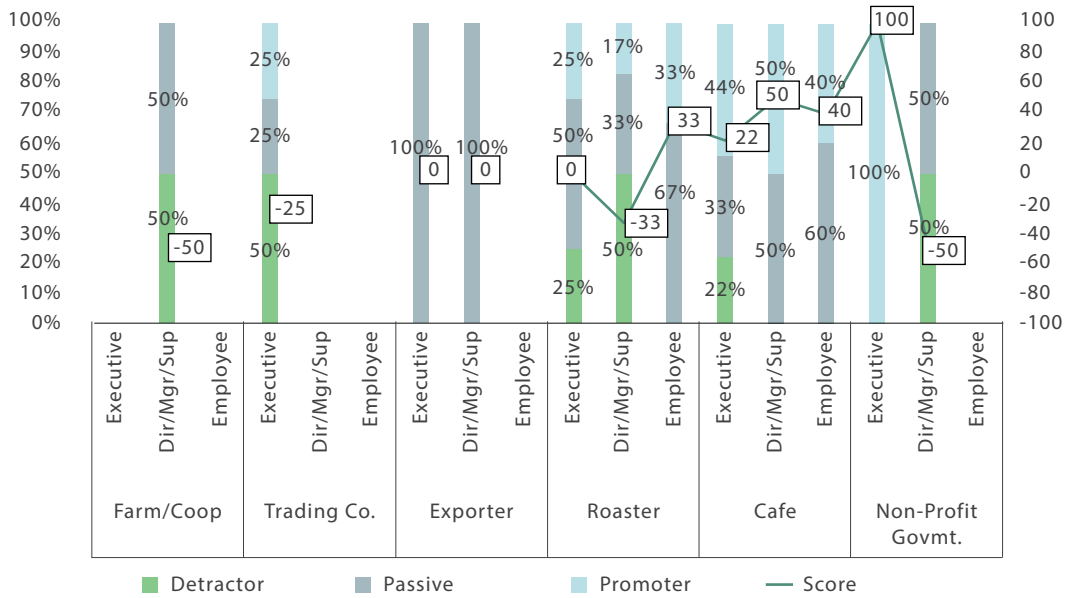
The chart below shows the distribution of survey respondents by role in the supply chain.



The first question asked, “On a scale from 0 to 10, how optimistic are you with the direction the Philippine coffee industry is heading?” We applied the net promoter score (NPS) methodology to categorize responses by detractor (0 to 6), passive (7 and 8), and promoters (9 and 10). The NPS score is determined by subtracting the percentage of detractors from the percentage of promoters. This way, it is possible to score anywhere between -100 to +100 points.⁷ Based on the results, we observed a gradual increase in optimism as we worked up the supply chain with respondents working at the retail level more optimistic than those in farms and co-ops.

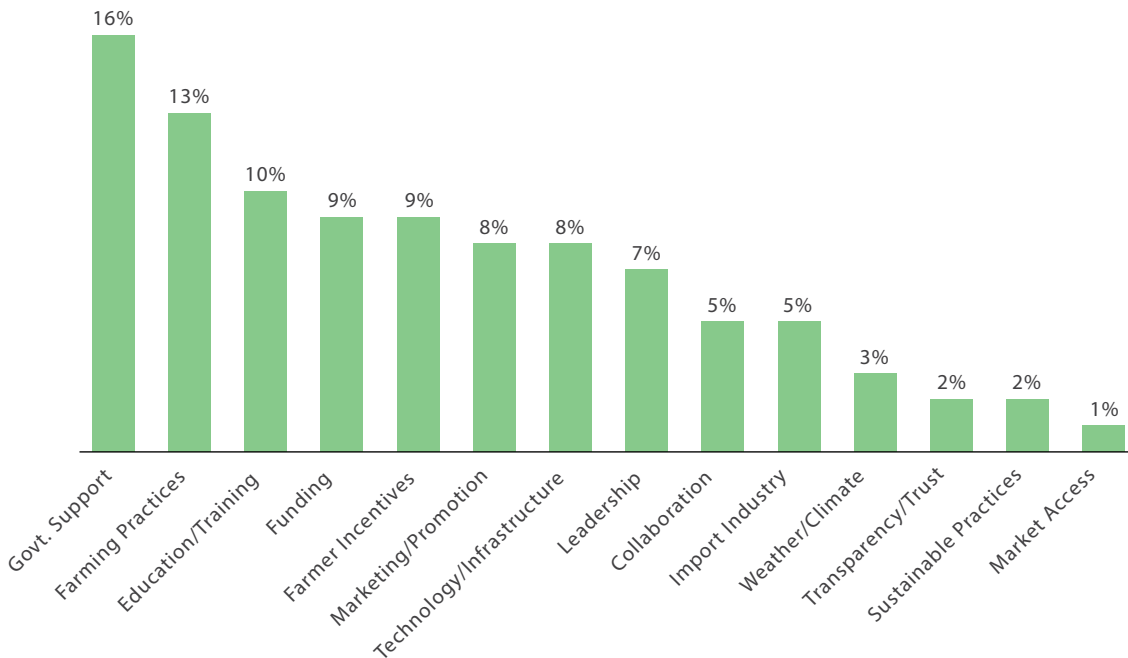
⁷ ‘What is Net Promoter,’ NICE Satmetrix, Last updated 2017, <https://www.netpromoter.com/know>.

“On a scale from 0 to 10, how optimistic are you with the direction the Philippine coffee industry is heading?”



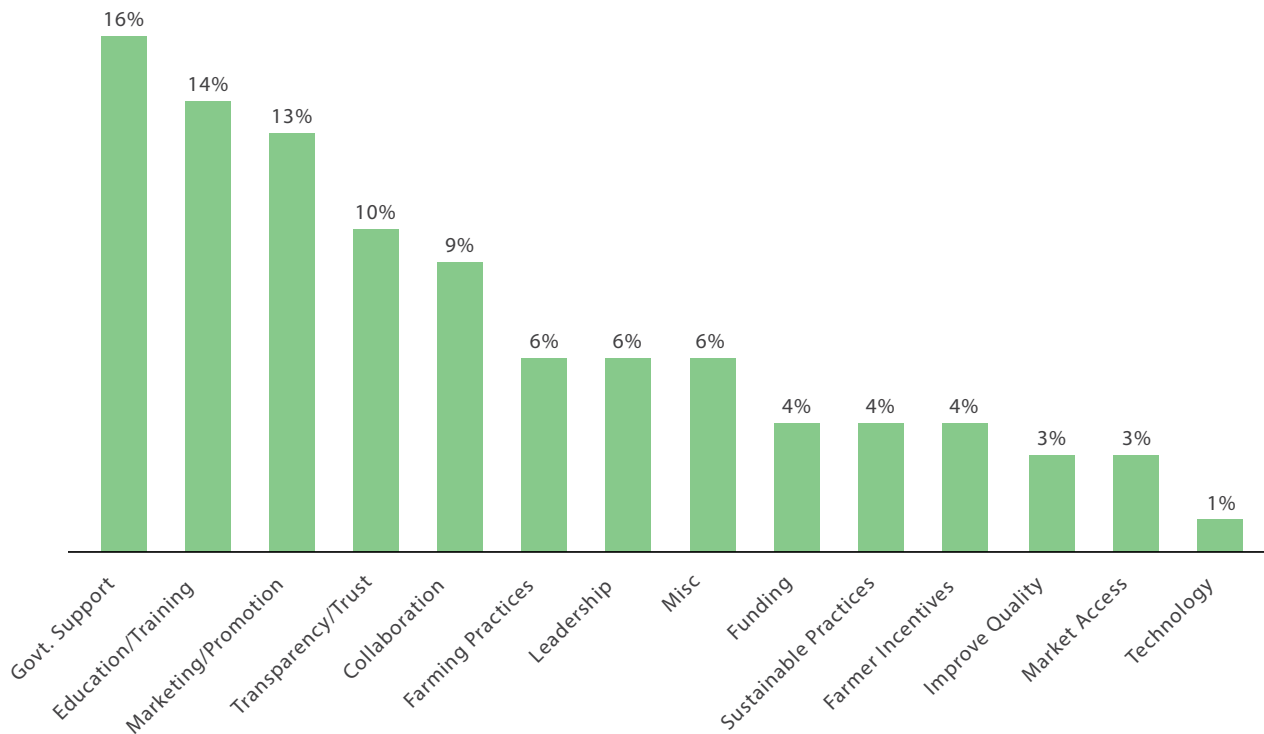
The following two questions were open-ended questions about the perceived obstacles to growth in the Philippine coffee industry and how to overcome these obstacles. We analyzed the comments and grouped them into major themes.

“What do you feel is/are obstacle(s) currently facing the Philippines coffee industry?”



Major obstacles are lack of government support, poor farming practices, and a lack of training for coffee farmers.

How can the industry overcome this/these obstacle(s)?



When asked about ways to overcome these obstacles, the results were consistent regarding government support and education/training. However, the need for better national marketing of Philippines coffee was also noted. As was the need for more transparency, trust, and collaboration among industry leaders. This theme is particularly interesting because, for a young and growing industry, two national coffee associations now currently exist: the Philippine Coffee Board (private) and the Philippine Coffee Council (public).

KALSADA COFFEE COMPANY

ABOUT

A for-profit social enterprise, Kalsada employs a team of five. The company is registered in both the Philippines (as a for-profit) and in the State of Washington (as a social purpose company). Staff currently operate from headquarters in Manila and spend much of the harvest season in two of the main Arabica producing regions in the Philippines: Cordillera Mountains and Bukidnon.



The all-female team has built a sustainable supply chain for specialty coffee over the last three years. Currently, there is high demand for this hard-to-produce coffee among roasters seeking a closer relationship to producers and their unique coffee stories⁸.

⁸ Rinehart, Ric, "Supply and Demand: Vastly Different Specialty Coffee Outlooks," Specialty Coffee Association, 2016, <http://www.scaa.org/chronicle/2016/04/27/supply-and-demand-vastly-different-specialty-coffee-outlooks/>.



Team Kalsada

Kalsada is the brainchild of Carmel Laurino, a Filipina American who was born in Cebu and immigrated to the Pacific Northwest with her family when she was seven. She was raised in a small town in the Cascade Mountains and until she went to Seattle for college, she felt that her Filipina identity had been completely severed from her life.

Much of her undergraduate career was spent finding ways to reconnect with her heritage. While researching a paper about Filipino history in the Pacific Northwest, she came across a photograph of Philippine coffee in Seattle's Pike Place Market in 1909. In the photo, two white men are selling traditional wares from the Philippines including brooms from the Baguio region of Northern Luzon and freshly roasted Arabica coffee beans.



Filipino Coffee Co., Seattle Pike Place Market 1909. Photograph courtesy of Museum of History and Industry, PEMCO Webster & Stevens Coll.

It fascinated her that Filipino coffee had once been sold in Seattle and raised the question: Why is Philippine coffee no longer sold in the U.S.?

Several years later, this memory sparked a vision to bring Philippine coffee to Seattle and elevate that coffee to specialty standards. Carmel and her team began a year-long investigation of the Philippine coffee industry, interviewing government officials, local industry players, and other organizations championing little-known coffee growers.

In the Cordillera Mountains on the northern island of Luzon, the team built relationships with a community of coffee and vegetable farmers near Baguio. They raised money to build facilities to process specialty coffee through a Kickstarter campaign, family, and friends. It marked the start of building a vertically integrated international supply chain.

Kalsada in Filipino means “road” or “street.”

Kalsada represents a path to bringing higher incomes to smallholder farmers, a process of building community among producers and consumers, and it is the road through which we are continuously exploring the coffee industry.

SUCSESSES AND CHALLENGES ABROAD

Carmel met co-founders Lacy Audry and Tere Domine in 2013 when all three were enrolled in master's degree programs. The long-term vision of the company was to create a name for Philippines specialty coffee in the international market.

The first hurdle was to find farmers who had delicious coffee. This was no easy task, and it required extensive travel, sample roasting, buying sub-par coffee, and hoping for better coffee the following year. Finally, in 2015, Tere stumbled upon a community in Sitio Belis, one-hour north of Baguio in Northern Luzon. She had an instant connection with the Pias family, who invited her in for coffee. Over time, she built a relationship with them and finally asked them if they would be interested in hosting a wet mill processing centre on their land. Unlike so many others that Kalsada had asked before, the family said yes without hesitation. It is because of their dedication and hard work that Kalsada has seen a major transformation in the flavour profile of Philippine coffee.

During the same time period, they began planning to export one ton of coffee to the U.S. arm of Kalsada. The fundraising to buy the coffee was beyond their capacity in terms of financial skills. However, just in time for harvest, they managed to raise \$50,000, much of which was used to purchase raw coffee cherry from farmers.

From the time they purchased the cherry in December 2015, until the following December, the coffee was stuck in Manila waiting export authorization. Hundreds of pages of paperwork were required and every week when they returned to the Department of Trade and Industry (DTI), they were given new requirements. One of these unforeseen requirements was 25 signatures from neighbours swearing that Kalsada exists. Their team hustled to get signatures from anyone they could find on the street of their main office. When they returned the list to DTI, officials said some of those people lived too far away from the office, but it was eventually accepted as sufficient.

For many months, they waited to hear from officials who wanted to do a site inspection. The Kalsada team based in Manila finally managed to schedule a visit to the warehouse for officials to inspect the single pallet of coffee before exportation. After an awkward meeting among officials who had no questions to pose, export authority was not granted.

Finally, the team called a competitor in the domestic coffee industry that had a history shipping to Indonesia and other countries in Asia. Using their name on the paperwork, export authority was granted in the span of a few weeks. Their first batch of coffee managed to arrive one year after harvest. Coffee is a seasonal product and for optimum flavour it should be consumed within six to nine months after harvest.

From a cash perspective, this put an enormous strain on the young company. In December 2016, their coffee was just landing in the U.S., while in the Philippines, farmers were already at the mill with a new crop. Farmers were expecting cash payment for the new crop, while the company hadn't received payment for the previous year's crop from U.S. buyers.

With a bit of luck and hard work, they found a way to purchase more coffee the next year. During the 2014-2015 harvest, they purchased and processed three tons of green coffee (most of which was kept in the Philippines to be sold to local roasters). The following year, they purchased four tons and in 2016-2017 they purchased 5.5 tons of coffee.

While Kalsada is now able to export under its own name, it takes up to four months for coffees to leave the country. At the time of writing this paper in August, 20 bags meant to be shipped to France in June are still waiting authorization. Kalsada is optimistic that the sale, valued at US\$21,000, will still take place, but coffees lose quality with every day that passes.

The founders agreed that lack of capital to buy coffee and slow export approvals are the most significant barriers to growth for their small company.

Another barrier is efficient accounting at the wet mill. More than 100 farmers arrive a few times per week with cherry, expecting to be paid in cash. The coffee is sorted and the portion of ripe cherry is noted because the team pays farmers a bonus for higher quality cherry. The fruit is then taken for processing by a team of apprentice farmers, most of whom are women. At the end of the day, these women are also paid. Then any material or equipment that may need to be purchased or leased (as often happens when their equipment breaks down) must also be covered from the company's cash at hand.

Carrying cash creates the risk of robbery while on traveling on public transit or when staying in accommodation outside of the safety of the farming community. A cashless payment system would minimize this risk.

Although Kalsada is successful from several perspectives and the demand for their coffee is high, there is a strong possibility that their company will struggle in the future. Currently, their ability to pay cash for each successive harvest is becoming more difficult because they have underestimated costs during the last two years and came up short each harvest. This means they have to turn away some farmers and buyers of their coffee because they do not have access to the capital in a timely manner.

Since Kalsada began, most of the founders have not received dividends. The management team has been forced to take other jobs, and therefore they have limited time to raise funds, find new loans, work on training in new communities, and build relationships with new buyers. They are optimistic, but fatigued by the many barriers they have faced to make the company work.

YAVE

ABOUT

Yave Incorporated (yave.io) is a technology company based in Seattle with business partnerships in Guatemala, United States, Laos, and the Philippines. Yave was formed by brothers Paul and Scott Tupper in 2017 to resolve supply chain challenges for their coffee roasting brand, Onda Origins. As a business, Yave commercializes software and business intelligence. Yave now has grown to a team of five, with contract support networks in both technology and coffee

Yave's core competency is facilitating trade and traceability in the coffee supply chain through the use of blockchain technology. Yave's three product modules are: farmer/field communications application; an enterprise trading platform; and a consumer-facing application. Respectively, the Yave apps bring market access to the bottom-of-the-pyramid in coffee's supply chain, transform siloed enterprise databases into communicative systems, and connect consumers to the people and provenance behind their products.

Yave has ongoing pilot projects in several coffee-producing countries where they are executing end-to-end, tech-enabled, verifiable trade using blockchain tracing. They are also in the beta testing stage for electronic payments.

ONDA ORIGINS

The creation of Yave can be traced directly to Onda Origins, a Seattle coffee roasting company.

Onda Origins was founded to connect coffee farmers and consumers in order to drive positive social and environmental progress. Onda enables this by selling coffee to consumers and businesses through a unique revenue-sharing model: Each purchase of Onda coffee directly initiates a bonus payment for the farmers behind the coffee. Onda's revenue-sharing model increases farmer earnings by 40% or more. It also requires that Onda identifies, sources, and distributes its coffee with full supply chain visibility and traceability.

The Microlot Dilemma:

When Onda was founded, it roasted primarily high-value "microlots" because these were quality coffees whose origin Onda could guarantee. Microlots are small batches of artisanally grown specialty coffee which retain their identity throughout their journey in the supply chain. Microlot coffees are highly sought after because they perform well on the "cupping table," a testing area for smelling, tasting and rating coffee on the 100-point "cup score" scale.

Growing premium quality microlots requires special attention. At a minimum, a farmer must have an excellent selection of seedlings, favourable growing conditions, the ability to selectively pick only ripe fruit during harvest, controlled depulping of coffee cherry to its parchment stage, carefully monitored drying, effective dehusking of parchment to create green coffee, and precise sorting of defective beans.

Then there are the transport and market connections required for a discreet lot of coffee to make it down from a tropical mountainside, through various middle actors, into bags, onto boats, and across the sea into the hands of the roaster.

This illustrates the perils of identity preservation in coffee's long supply chain. Countless "things gone right" must coalesce in order to produce microlot coffee so it's no surprise that larger, wealthier farmers are better able to navigate this complex path.

Onda's team observed barriers facing small farmers in its own supply chain. A year into their business, Onda's founders felt that the very farmers who could benefit most were precluded from participation. Driven by a desire to democratize market access to their coffee business, Onda embarked on an investigation into traceability.

Supply Chain Audit: Guatemala 2017

FECCEG (Federacion Comercializadora de Cafe Especial de Guatemala) is a member-owned, co-operative in the Western Highlands of Guatemala which aggregates and dry mills coffee from 12 co-ops representing 2,100 smallholder farmers. FECCEG privately owns Exportadora de Café Especialidad de Guatemala in order to export its coffee. In 2017, Onda Origins founder Scott Tupper was sent by a government-funded program to perform a supply chain audit and traceability report on FECCEG.

His observations were as follows:

1. FECCEG, Exportadora de Café Especialidad de Guatemala, a fair trade subsidiary named Kishe, and a honey division together employ 26 people. Four of these employees are in the field collecting farm data and training farmers. The records are on paper, cannot be updated, and are stored in binders. Approximately one-quarter of a field agents' time each year is spent filling out paperwork, often with little change from the previous year's paperwork.
2. When coffee harvest arrives at FECCEG, it undergoes a change of custody, an evaluation for quality and defects, and an entry into a database stored either on Google Sheets or Microsoft Excel. The data collected by field agents is not transferred automatically at this stage, and is normally not referenced again except to confirm certifications such as fair trade and organic (FTO).
3. When harvest ends, a team of two warehouse managers, roughly five

Exportadora employees, and two quality control technicians are responsible for sales, inventory management, and profiling of that year's crop. Using only FTO marketing, the sales team is ill prepared to empower smallholder owners to commercialize unique products.

4. Using Excel and Google Sheets, the inventory management team is unable to precisely identify and track real-time supply availability, and unable to create accountability systems for data entry. Last year their data management was off by seven containers, a volume of 280,000 pounds of coffee (127 MT) or roughly \$US600,000 of misplaced inventory. Nobody could identify how the error was made.

5. Lastly, and potentially the area of greatest unrealized value, FECCEG's traceability doesn't flow forward with their supply. That means Exportadora often sells to brokers based on demand for FTO coffee, but does not know the identity of the final buyer. Dealing directly with the end commercial roaster is a tactic deployed by coffee producers the world over to gain higher prices and committed buyers through what is called "relationship coffee".

Upon the completion of his audit, Scott's recommendations included:

- Focus sales on clients rather than FTO certification; and,
- Invest in digital technology for tracing products and explore blockchain for trading.

Scott's recommendation around data systems garnered widespread support and enthusiasm from FECCEG workers, but died at the board of directors level for the co-op. Scott's findings became the building blocks for yave.io — a platform devised to address the challenges of the coffee supply chain by enabling traceable trade through blockchain technology.

BLOCKCHAIN BASICS

What is Blockchain?

Blockchain is a decentralized digital database. It creates an immutable ledger by executing transactions through a process that establishes consensus on peer-to-peer networks.

According to Angus Hervey, political economist and co-founder of Future Crunch, blockchain is arguably the biggest innovation in finance since the invention of double-entry bookkeeping during the Renaissance. That solved the problem of merchants knowing whether they could trust their own books, and allowed entrepreneurs and investors to form corporations, paving the way for modern capitalism. However, a third, trusted party was still needed to verify that the

information in the books was correct. Five hundred years later, blockchain adds another entry to the ledger: a verifiable cryptographic receipt of any transaction, paving the way for a fairer, safer and more transparent global financial system.”

Yave is developing its membership-based coffee supply chain products on the open-sourced IBM blockchain framework, Hyperledger.

YAVE PILOT PROJECT AND LESSONS LEARNED

From Guatemala

In the first half of 2018, Yave developed a pilot project for their technology in Guatemala. Yave identified one value chain and analyzed data-flow processes for each stakeholder in the chain. Yave then create a basic trading interface on Hyperledger which successfully catalogued the journey of coffee across the following supply chain: producer, mill, co-operative, broker, exporter, importer, roaster, and end client.

The coffee farmer involved earned payments 56% higher than current market rates. This figure shows the incredible promise of improving supply chain intelligence for export partners. Not to mention the positive press and client response for the roasting partner.



Seattle's Onda Origins Unlocks Traceability with Blockchain Platform Yave
Daily Coffee News
May 15, 2018

[Read More](#)



Blockchain in Action: A Case Study in Coffee
Seattle Business Magazine
May 31, 2018

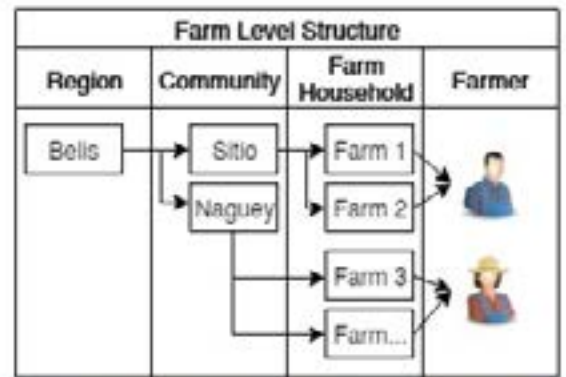
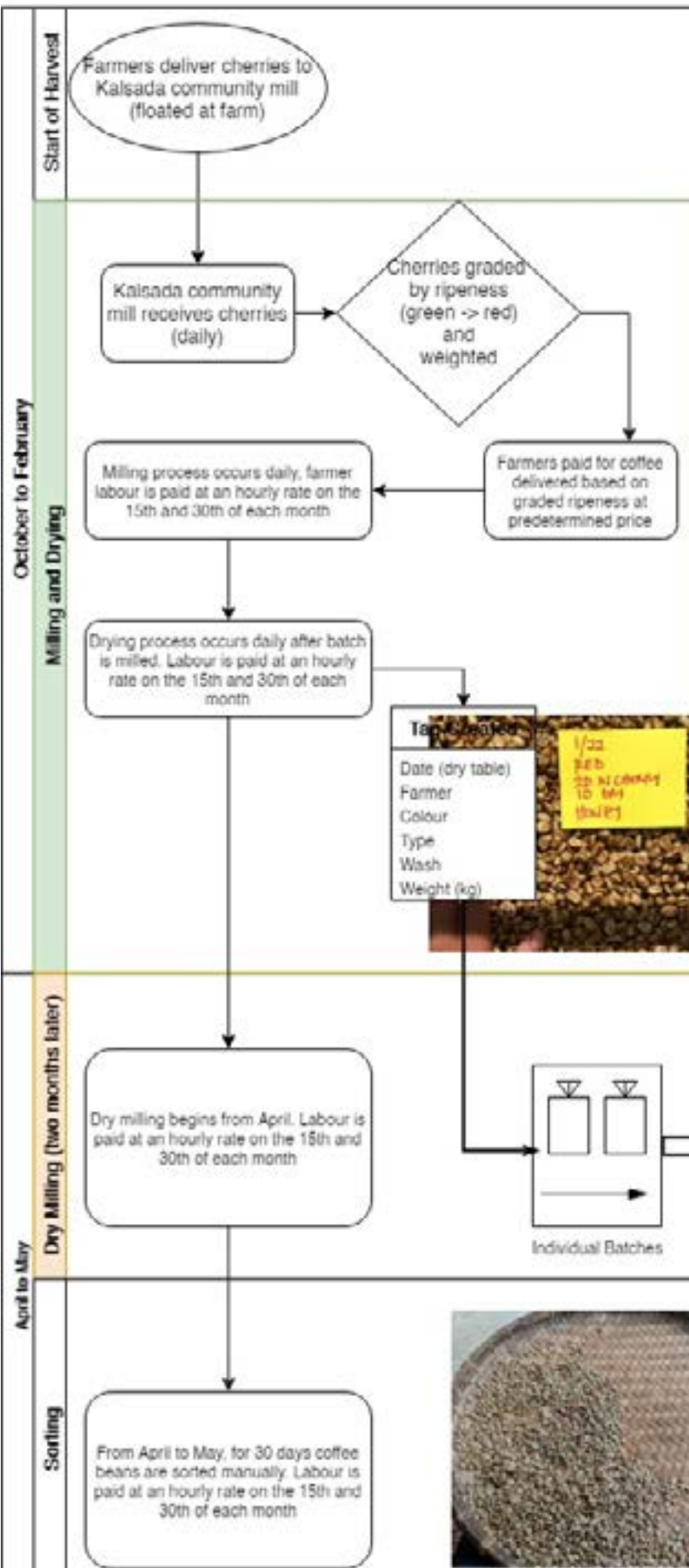
[Read more](#)

To the Philippines

The lessons learned in the Guatemalan process informed Kai Chang's assessment of Kalsada's operations in the Philippines. The existing process flow was documented through on-site visits to Kalsada's partner farming community in Sitio Belis. This also gave the team the opportunity to explore similarities and differences in how microlots are handled in different parts of the world.

Kalsada Coffee Process (1/3)

This diagram maps the coffee process at Kalsada from Farm to Cup



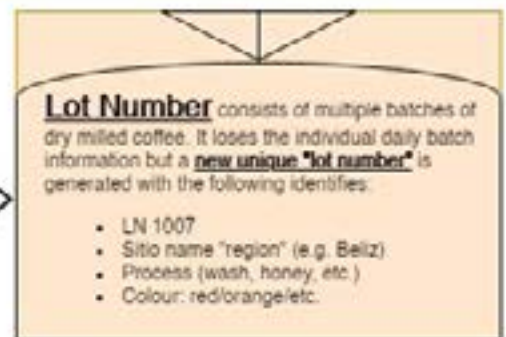
Monthly sheet, by farm, by ripeness



Paper receipt used to remunerate farmers for cherries/labour



Manual ledger is also kept for every transaction with farmer



Sorted coffee is packed into 60 kg bags



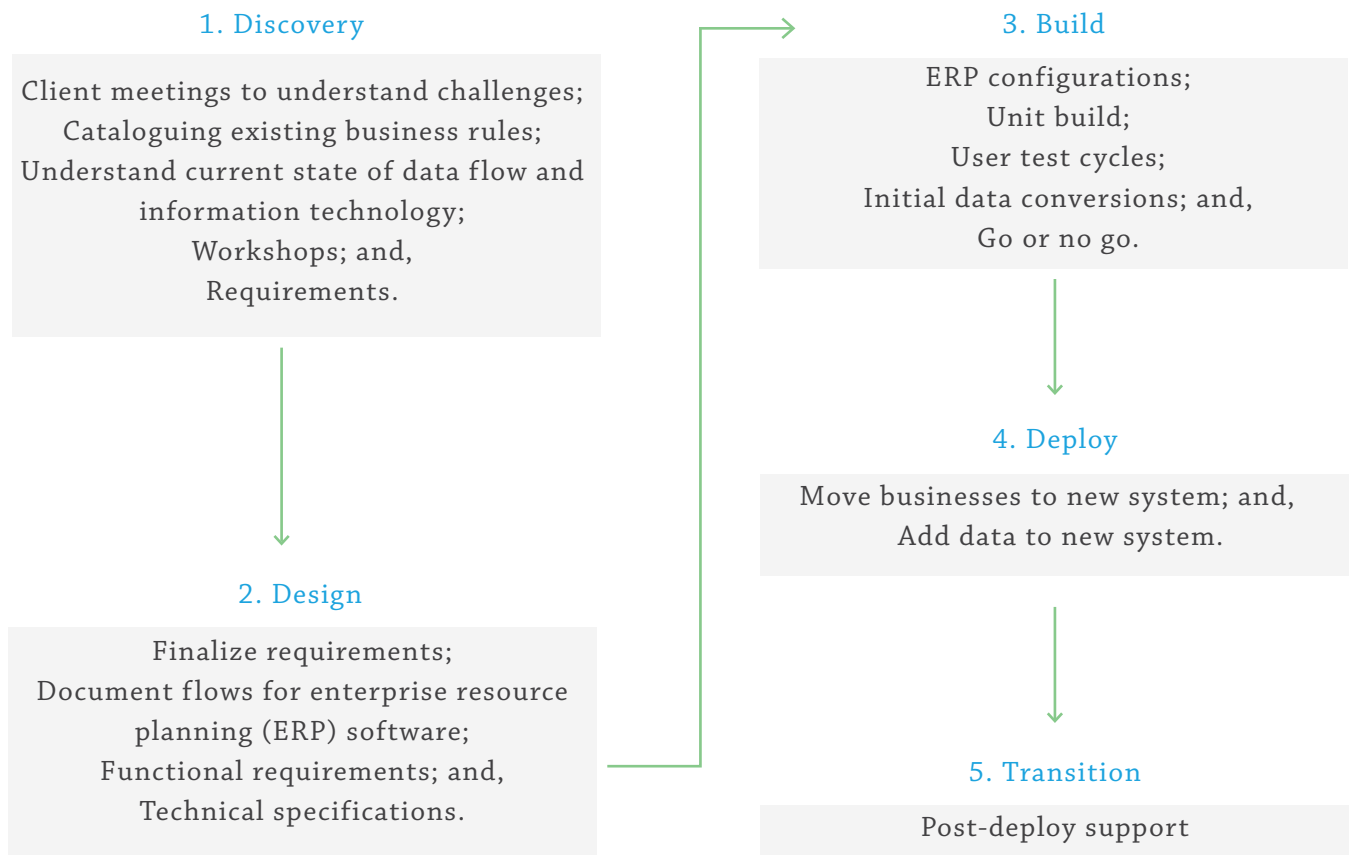
In mapping the above process flow, we found that one of the biggest hurdles from a business standpoint is collecting data in one place.

Furthermore, knowing that there can be an aversion to technology in the sector and difficulty in properly documenting microlots, Yave came up with the idea of building modules. Different product modules enable us to solve unique problems for unique stakeholders.

PROCESS AND PRODUCT

Yave used a problem-solving process to create supply chain software. Listening to clients enables us to customize product design for each client's needs.

Process



Product

Yave created three modules, each developed to rely on blockchain technology to record coffee identification and trades:

- [Module 1: Field Communications and Farmer Application](#);
- [Module 2: Enterprise Trading Solution](#); and,
- [Module 3: Roaster and Consumer App](#).

The breakthrough of MSMEs into the global marketplace is a challenge no single technology can resolve. It requires widespread adoption, harmonization, and infrastructure buildout to the benefit of all stakeholders in the value chain. It requires bypassing service providers in the chain who don't add value. Getting rid of these intermediaries can be driven by vertical integration, education, and technology. For these reasons, organizations like Kalsada and Yave are ideally suited to experiment with MSME breakthroughs in emerging markets.

These factors are behind Yave's three product modules.

Module 1: Field Communications and Farmer App

"First Mile" data collection is critical to the success of the Yave platform. "First Mile" denotes the initial collection and sale of coffee — usually in the cherry or parchment stage — from farmer to its first purchaser. It is not a geographic term and can extend as far as need to mark the first transaction in the supply chain.

Field Comms Apps can track the physical journey of product through a digital ledger of all transactions. Transactions will be logged on the Yave platform including but not limited to: verifiable identity of transactors, volume and/or weight of product, time and location of transaction, pricing and terms, variety of coffee sold, location and elevation of farm of provenance, quality score of product adhering to CQI (Coffee Quality Institute) official cupping scores, post-purchase blending and aggregation by new asset owner.

Field Comms Apps are responsible for cataloguing diverse sets of data and may use different communications technologies including:

- [The development of a Facebook Messenger plugin for logging "farmer to coyote" \(intermediaries\) transactions](#);
- [The development of an SMS receipt protocol through Twilio or like services for "farmer to coyote" transactions](#);
- [The integration of weigh-scale IOT \(internet of things\) apps at mills and cooperatives](#); and,
- [The integration of barcoded or QR-coded assets](#).

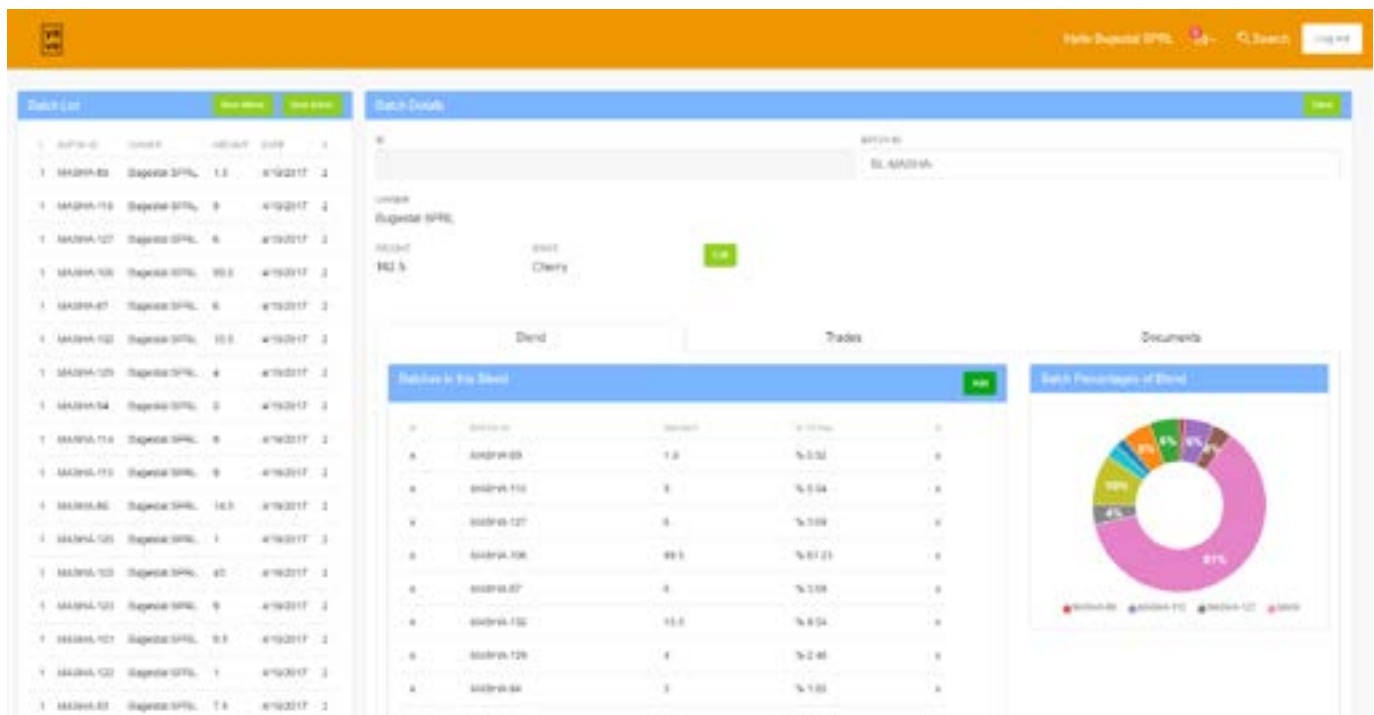
Module 2: Enterprise Trading Platform

Solving the Microlot Dilemma

Yave's initial pilot project encountered success with tracing discreet lots of coffee from a farmer, Ivonne Herrera, in Guatemala. However, this success reinforced the market access dilemma faced by smallholder farmers by only being able to trace unblended microlots of coffee which inherently favoured better resourced farmers. So Yave has changed the Enterprise Trading Platform to accommodate for blending of lots.

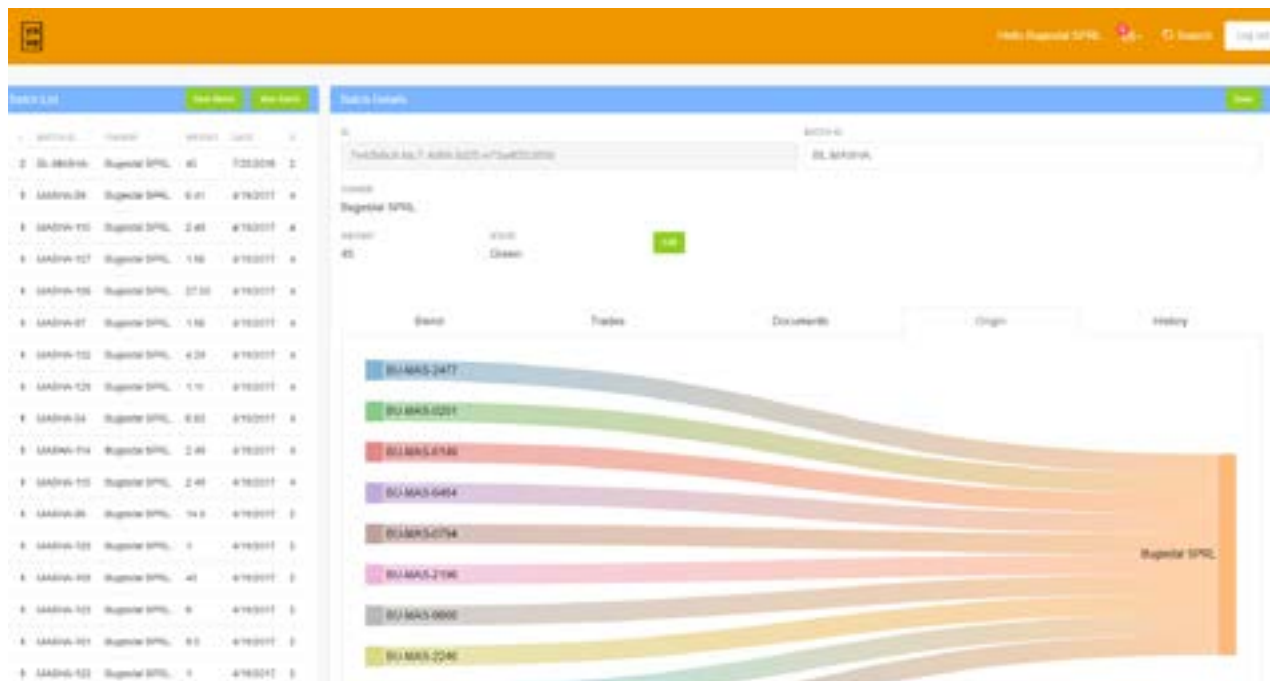
Blending Screen One:

This trade screen shows the user how to select multiple batches and create new assets on the blockchain allowing traders to accurately communicate the provenance of any blend of coffee.



Blending Screen Two:

Citing a need for data visualization and supply chain intelligence, Yave's team deployed Sankey diagrams to demonstrate "supply chain ancestry" of any possible combination of coffees. The width of the bands in the diagram indicates the amount of coffee contributed by any given producer, enabling greater insight about quality, blending, and customer preference.



Module 3: Roaster and Consumer App

Consumer interest in interacting with verifiable supply chains is well documented in the area of ethical consumerism. Nielsen’s 2014 Global Survey on Corporate Social Responsibility found more than 50% of millennials buy products from companies that support the causes they care about, and a staggering 62% of respondents cite ‘trust of brand’ as a major purchasing driver when evaluating choices⁹. With this in mind, Yave is working on a third module, Roaster and Consumer App. This app is yet to be developed, but it will enable end businesses and consumers to interact with their coffee supply chains through Yave’s blockchain layer.

Further development of the Yave platform offers the promise of market access to MSMEs in the coffee sectors of Guatemala, the Philippines, and beyond. The secondary benefits for MSMEs are challenging to predict, but a solid partnership approach could yield a formalized role in national economies, farmers moving from being unbanked to banked, greater access to insurance and other financial support, and cutting out useless or malicious actors in the supply chain. 2018-2019 for Yave includes raising capital for further team and product development, expanding its networks, and coordinating auctions in Guatemala.

⁹ Rayapura, A., “New Nielsen Study Says Consumers Are Ready to Pay More for Social Responsibility,” Sustainable Brands, 2014, https://www.sustainablebrands.com/news_and_views/stakeholder_trends_insights/aarathi_rayapura/new_nielsen_study_says_consumers_are_read.

RECOMMENDATIONS

The Philippine coffee industry is still undeveloped and as such confronts growth challenges that established players have navigated over years of applied business logic. We believe addressing these issues has the potential to grow the industry and allow MSMEs to thrive.

1. Improve Data Quality and Transparency

During our research into coffee production metrics, we came across significant discrepancies with secondary public data on production counts. In particular, data from the Philippines Statistics Authority (PSA), were suspect when the total quantity reported in the Benguet region (where Kalsada's major farming partners are located) are much higher than expected. As a follow-up on the inconsistency, we reached out to the PSA for a response.

The PSA said coffee figures are estimated based on surveys in each region by the Department of Trade and Industry (DTI) officials. The weights are then applied to the regions and aggregated up. Considering the cost of data collection, this may be the best option, however this can easily lead to over- or under-estimation (in the case of Benguet it is the former).

Based on these inaccuracies, we proposed that the government begin evaluating blockchain technology to improve data on coffee and other agricultural crops. The additional benefit is that data entered into an immutable ledger is secure and tamper-proof.

2. Financial Literacy and Continued Training

Through community financial literacy and continued farm training, Kalsada hopes to build better supply chains. Providing farmers with basic training on money management is a step toward supporting farmers to use simple tools that allow them to be in better control of their finances.

As income increases through the Kalsada model, there needs to be an educational component for the farmers to better equip themselves in making appropriate decisions for their well-being.

Having farmers account for their expenditures creates an opportunity to make informed decisions for future expenses. Looking after the farmers' welfare through financial literacy programs creates a bridge to sustainable practices for all stakeholders involved. In other words, it sets up a foundation for the producers and the direct buyers (i.e. Kalsada) to progress and grow collectively.

3. Efficiencies in Supporting MSMEs in Funding and Market Access

As highlighted earlier, two of Kalsada's biggest challenges continue to be access to a stable cash flow and bureaucratic barriers to export. The nature of the coffee industry requires cash upfront in return for a future delivery.

While the Philippine government has made increased efforts to provide loans to SME's, including implementing a law requiring commercial banks to set aside 10% of their loan portfolio for MSMEs, research from the 2014 SME finance monitor revealed that most of them have not met this goal¹⁰. And while newer research on the loan compliance requirements was limited at the time of this report, we learned from APEC-Canada Growing Business Partnership workshop attendees that this continues to be the case. Specifically, several attendees said commercial banks prefer to pay financial penalties than to meet the 10% loan obligation.

4. Telecommunication Infrastructure

Modern technologies rely on telecommunication networks for optimal functionality. Based on the experiences from this project, we identified this area for further policy research.

A 3G network was available on the farms near Sitio Belis, but it was spotty. That makes real-time data collection challenging. Weak cellular networks will also make data collection via SMS systems a challenge. Interestingly, at least one farm had satellite television, suggesting that broadband internet might be possible.

At the same time, we learned the telecommunications industry is not particularly competitive with only two major providers: Smart and Globe. The current regulation on telecommunication also appears to be outdated. (The Republic Act No.1995 doesn't contain any reference to the words "internet" or "mobile phones"). While discussions about amending act have come up as recently as 2017, there doesn't appear to be any further action at this time.

We therefore recommend that further research and investment is made in telecommunication infrastructure and access with particular focus on the rural regions of the Philippines.

¹⁰ "Asia SME Finance Monitor 2014," Asia Development Bank, 2015, <https://www.adb.org/sites/default/files/publication/173205/asia-sme-finance-monitor2014.pdf>

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