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El Ordeño: Implementing Blockchain

We want to help the small farmer; we want, once and for all, to attack and eliminate rural poverty.¹
Xavier Lazo, Former Minister of Agriculture and Livestock, Ecuador

The situation of small milk producers of the mountains of Ecuador is a story of continuous poverty.²
Juan Pablo Grijalva Cobo, CEO El Ordeño

In January 2021, two years post-launch of the first blockchain initiative in Ecuador, Juan Pablo Grijalva Cobo and his executive team had to decide whether their company, El Ordeño³, should strengthen blockchain or abandon it. Despite the scarcity of this technology in Latin America, both believed that blockchain had enormous potential to trace dairy products. As such, it could help the company in two ways. First, to communicate the social impact of its business model. Second, to allow all processes around the production chain to be transparent, strengthening the company's quality systems by simplifying identification of potential failures or improvements in the chain.

El Ordeño was a privately held company which operated with an inclusive developmental business model that had defended the interests of small milk farmers. In a highly competitive and fragmented market, some larger intermediaries had taken advantage of their bargaining power and causing harm to small producers. The company had put various mechanisms in place to mitigate this reality. Implementing blockchain in its production chain would put a spotlight on the experiences of more than 6,000 small dairy producers and demonstrate how El Ordeño contributed to their growth. However, collecting fine-grained data proved to be arduous. With such a vast network of dairy farmers, most of them owning less than five cows and milking twice a day, what information should be collected to demonstrate El Ordeño's social footprint? How would it be collected? Could the company take advantage of this information to make its production chain more transparent?

Strengthening the initiative would mean doubling the initial investment in the blockchain solution and finding creative ways to collect information at the small-farmer level. Abandoning it would mean considering the investment as an irrecoverable expense and freeing up funds to find other ways to communicate the economic impact of El Ordeño's business model and improve its ability to make its value chain processes more transparent.

The Dairy Industry in Ecuador

Ecuador, a country of 17.4 million inhabitants located in northwestern South America, is bordered by Colombia and Peru (see Exhibit 1). Ecuador also includes the Galápagos Islands in the Pacific, about 621 miles west of the continent. Its land area of 176,197 square miles is about twice the size of Florida. It is governed as a democratic presidential republic. Its capital is Quito.⁴

The country is highly dependent on commodities, namely petroleum and agricultural products. During 2020, the GDP per capita was 5,600 USD. The COVID-19 health crisis triggered a deep recession that led to a rebound in poverty. This crisis amplified the macroeconomic imbalances that the country had been working to correct since the oil price boom ended around 2016. The crisis also revealed structural weaknesses such as a poorly prepared healthcare system, substantial gaps in public service access, a high level of informality, and a hard-to-manage public debt.⁵

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The Industry

Some historians believe that cows were already present in Ecuador in 1540, possibly introduced by the Spaniards during colonization. As they adapted to the climatic conditions of the country's different land elevations, cattle proliferated throughout the country and began to supply leather, meat, and, of course, milk. After some time, milk products, such as butter and cheese, began to be traded.⁶

As cities grew, the demand for milk increased, forcing the colony's traditional practices to improve. In 1896, the country imported cattle for dairy products from The Netherlands. Over time, they interbred with the Creole cattle of the colonial era. Similarly, in 1902 the first Holstein bulls were introduced from the United States, opening the door to later introductions across the country.

In 1948, the Quito health department carried out a study of the quality of fresh milk from the Ecuadorian mountains, the main center of national dairy production, and recommended the immediate acquisition of a pasteurizing plant to protect the health of consumers accustomed to raw, unprocessed milk. The first bottle of pasteurized milk went on the market in 1961, initiating modern marketing of dairy products in Ecuador.⁷ Since then, the dairy industry has involved five basic steps for its products to reach the final consumer: milking, transportation, processing, packaging, and distribution.

Milking

In 2019, the country produced approximately five million liters of milk per day.⁸ Milking productivity depended on many factors, such as the genetics of the cows, their diet, sanitary practices, and the technology used, among other variables. The Ecuadorian national average was around six liters per cow per day, well below the 25 liters per cow per day expected in the industry worldwide.⁹ Milk was produced in the country at altitudes of 2,500 to 3,500 meters above sea level and at temperatures varying from 4 to 28 degrees Celsius, conditions very different from those in Europe, Australia, or North America, that showed higher productivity levels.

Several breeds of cows were present in Ecuador, resulting from cross-breeding of the original Spanish cattle with imported breeds. Ranchers chose cows according to their line of business since their productivity varied for meat and milk production. The Andean region was the national leader in milk production with 77% of the total, followed by the Coastal region with 15%, and the Amazon region with 8%. Due to the combination of a moderate climate and green pastures, the Andean (mountainous) region was more productive, with some cattle ranches even managing to produce 25 liters of milk per cow per day. In the Coastal region, dairy breeds adapted slowly to the tropics, where pastures required more care. Finally, a combination of high humidity and frequent rains generated low-quality soils in the Amazon region, significantly complicating dairy activity there.¹⁰

Milk producers were classified according to the number of hectares used to feed their cows or by their productive capacity. Thus, for example, small producers had areas of between 1 and 19.9 hectares, medium producers from 20 to 99.9 hectares, and large producers 100 hectares or more. Ecuador had more small producers, but medium and large cattle ranchers had a greater share of the amount of milk produced (see Exhibit 2).

At this stage, 62% of production costs came from purchasing food, nutritional supplements, and drugs for the cattle, hence the importance of having enough quality pastures. The remaining costs came from labor, equipment, facilities, and other administrative expenses. In general, the greater the number of hectares available, the more sophisticated the sanitary practices the rancher had to implement, and the more technical the process.¹¹

Of the total milk produced, 53% went to the formal industry, while the remainder was used in the informal market and for self-consumption.¹²

Transport

Raw or fresh milk was delivered through milk collection centers and intermediaries. In the process, it was vital to ensure the quality of the product, controlling aspects such as temperature and levels of acidity, fat, and protein.

Medium and large milk producers sold their product directly to large milk processing companies, which had their tankers collect it directly from the ranches. Small producers, on the other hand, sold their product mostly through intermediaries or delivered it to collection centers. The intermediaries collected the milk from the farms and took it to popular markets or processors for industrialization. The milk collection centers were in the district community center to make it easier for the ranchers to deliver their products and then sell to the processing companies.¹³

In 2019, there were more than 100 milk collection centers nationwide, equipped with modern cooling tanks to ensure the ideal temperature for the product. Small producers, on average, made two deliveries, once in the morning and once in the afternoon, according to the practice of milking twice a day to achieve higher productivity. They delivered up to 20 liters per day per producer.¹⁴

Certain unscrupulous tanker operators diluted the milk with water to increase the volume. Because they gathered milk from different collection centers in the same tank, the intention was to avoid being identified as responsible for variations in volume. Hence, the industry made efforts to enforce pre-established sanitary control procedures, such as putting the milk through a hydrometer to check whether it had been altered or not. These controls also ensured that the milk did not contain harmful microorganisms.

Since 2010, the price of raw milk in Ecuador had been set by the Ministry of Agriculture and Livestock. To avoid abuses, all those purchasing raw milk from producers were forced to pay a minimum reference value based on retail price, plus premiums for levels of fat, protein, and hygiene. However, given the perishable nature of the product, some intermediaries paid lower prices when they bought directly from small dairy producers.¹⁵ In 2020, the value was 42 cents per liter of raw milk.

Processing, Packaging, and Distribution

In 2019, 69 companies manufactured dairy products in Ecuador. They could accept more than three million liters of milk per day and process 2.9 million.¹⁶ The industry had 15% idle capacity daily. Of the total milk received, 44% went to milk in bags, cartons, and powder form; the remainder was used to produce cheese, yogurt, and other dairy products.¹⁷

The industrialization of raw milk in the country had to go through a series of filters to ensure a quality product for the final consumer. These filters began when a plant received the raw material and followed delivery by the collection truck. Multiple tests were performed at both points to measure the acidity level of the milk, its freezing point, its bacterial content, milk solids, fat, protein, lactose, antibiotics, sweeteners, preservatives, and any altering substance. If the milk did not meet established standards, it was not accepted.

Once received, the milk was homogenized, pasteurized, and packaged. The most common packaging formats were Tetra Pak and long-life multilayer polyethylene bags, which did not require a cold chain. Then, the milk manufacturing companies distributed it throughout the country to the main points of sale. At the end of 2020, 58% of the milk was purchased in supermarkets, hypermarkets, and convenience stores, 40% in small neighborhood stores, and the remainder in other retail outlets.¹⁸

The dairy market was highly fragmented and lacked a clear leader. In 2020, the two largest companies, Pasteurizadora Quito and Nestlé, captured less than 28% of the market, leaving the remainder in the hands of hundreds of local and international companies (see Exhibit 3). Both companies offered a broad product portfolio, ergonomic packaging, a good perception of quality, competitive prices, and strong communication and marketing support for their leading brands, Vita Leche and La Lechera, respectively. Exhibit 4 shows the average final prices paid by consumers for the major competing brands. The total market for the country in 2020 closed with final product sales at slightly below 500 million dollars. It was the third consecutive year with a dollar value decline despite a slight increase in sales volume.

The Company

Sociedad Industrial Ganadera El Ordeño started up as the operational arm of the Asociación de Ganaderos de la Sierra y Oriente (AGSO) cattlemen association. “We have always sought to build a sustainable model in the country’s dairy sector, that is, an ecosystem that functions permanently, in a balanced way over time. The situation of small milk producers of the mountains of Ecuador is a story of continuous poverty. We have always sought to improve the lives of rural people,” stated Juan Pablo Grijalva Cobo, CEO of El Ordeño.¹⁹

The Years at the Helm of AGSO

From 1992, when he was appointed AGSO CEO, Juan Pablo was able to get a feel for what life was like in Ecuador’s livestock sector. The AGSO association was founded in 1964 to help the small farmer’s subsistence.²⁰ “I saw that the sector was full of structural problems that prevented it from developing. For example, the milk market system harmed small farmers and benefited certain intermediaries who paid the lowest price for their product,” he explained. “At times, certain companies with high bargaining power would set the terms for buying milk from the farmer: if there were surpluses, they would apply pressure to force prices down; if there was a shortage, they would import powdered milk, ensuring they got what suited them best. In the long term, the small farmer could not escape from the cycle of poverty and preferred to emigrate to the big cities,” he concluded.

As the head of the AGSO, Juan Pablo tried to replicate the models he had seen at work in New Zealand. Thus, the association began to give more attention to rural people and promote their growth. Consequently, it designed financial, technical, and technological training initiatives that allowed small farmers to double their production in a short time, “simply because they learned to feed their cows better,” said Juan Pablo. Similarly, for years, AGSO acted as a moderator of prices paid for milk to small farmers, looking for creative mechanisms to ensure the purchase of their milk at a price above the average in the sector. These mechanisms included, among others, signing agreements to use installed capacity from big companies, setting up milk collection centers with delivery in cold tanks to rural communities, and converting occasional dairy surpluses into powdered milk.

El Ordeño

With all the experience gained as the head of AGSO, Juan Pablo decided to form El Ordeño in 2002, with a group of people who believed in the project and became shareholders in the cattlemen association: to act as a regulator of prices at the ranch, eliminate intermediaries, and buy milk from small farmers. The company started with five collection centers through its innovative business model in five communities with around 200 small dairy farmers. El Ordeño committed to purchasing all the milk available at its milk collection centers and pulverized it for sale as powdered milk. It began operations with a plant purchased in Chile to provide powdered milk to manufacturers of confectionery, cookies, chocolates, and ice cream, among others, which until then had met their requirements through imports or, sometimes, by buying from Nestlé. A few years later, the company decided to manufacture private labels for supermarkets and international competitors.

In 2005, the government signed a decree giving preference to local products for supplying school meal programs promoted by the Ministry of Education. El Ordeño became one of the suppliers for these initiatives, previously covered by imports. This commitment meant supplying 7,800 schools, with 1.3 million students, most of them located in rural areas with difficult access. Sometimes, it was necessary to send the milk by air or even canoes. For many schoolchildren in these areas, milk could be their only food of the day. For everyone who collaborated in El Ordeño, this purpose provided additional motivation. Finally, in 2012, the company started the production of ultra-pasteurized liquid milk by investing in the construction of the most modern plant in the country, with Tetra Pak technology and eight packaging lines.

Operations

To collect the milk produced in different communities by small dairy farmers, El Ordeño had 72 community centers located in the main provinces in the Andean region and in eastern Ecuador: Carchi, Pichincha, Cotopaxi, Tungurahua, Bolívar, Chimborazo, Sucumbíos, Napo, Orellana, Pastaza, and Morona Santiago. More than 6,000 small and medium producers arrived at these places to deliver their milk twice daily. These producers belonged to approximately 180 associations. In these centers, payments were biweekly.

This daily production was then transported to the El Ordeño plant, located in Machachi, one hour by road from the capital city of Quito. Specialized companies were subcontracted for this, creating routes that allowed them to fill the capacity of their tankers efficiently and ensure the preservation of the product. During milk collection at the center and its delivery to the plant, the usual quality controls were performed. Finally, the milk received at the plant was processed, packaged, and distributed to all national points of sale.

Applying Blockchain

“Around 2017, we started a series of internal conversations to find the best way to tell our story. El Ordeño changes the lives of Ecuador’s small dairy farmers through milk, with a model of association that prevents the small producer from being harmed by the intermediary. At the same time, we reach the end customer with healthy and environmentally friendly products,” explained Juan Pablo Grijalva Cobo’s son, Juan Pablo Grijalva Moreano, Manager of Organizational Development.

As a result of these conversations, the company launched into the market Trü, a brand that aimed to bring closer consumers to the DNA and spirit of El Ordeño. Trü emphasized the company’s commitment to the environment, using, for example, planet-friendly packaging with more than 77% of the materials from renewable sources and a disposable lid made from sugar cane. At the same time, aware of the global demand for greater transparency and traceability of food, the company decided to implement a blockchain solution.

Building the Solution

Before designing a traceability solution through blockchain, El Ordeño organized itself in-house. According to Alvaro Céleri, Raw Material Supply Manager, “We decided to develop the ability to capture all the necessary information.”²¹ A multidisciplinary team was organized to establish a detailed strategy according to the vision of senior management.

One of the team’s first decisions was to use a permissioned blockchain through the IBM Food Trust, a private network that made it possible to connect food supply participants through an authorized, permanent, shared data registry. The solution could be adjusted to any players’ specific needs, seeking, among other things, to multiply the efficiency of the supply chain, minimize waste, and improve the reputation of its brand.²² IBM had no experience in applications of this type in the dairy industry in Latin America.

Before connecting El Ordeño’s data with the IBM Food Trust platform, it was necessary to standardize all the company departments’ data processing practices. Earlier, the company had already begun implementing an enterprise resource planning (ERP) system. It simplified the subsequent uploading of the information to the IBM Food Trust blockchain. In addition, an open-source code application program interface (API) was designed to send data to the platform, associating information from all operating processes with batches and a daily production code. The data collection, standardization, and integration with the platform took four months. A team of three people integrated the data into Amazon Web Services’ cloud environment to validate IBM’s security.

Simultaneously, the process of “digitizing the field” also began. To facilitate moving from manual to digital registration, the company provided tablet PCs to the tanker operators and collection centers. The first step was to assign a QR code to all milk collection centers and transporters.²³ Then, to capture the data at each stage of the production chain, El Ordeño developed an application that read the QR code and uploaded the information to the cloud. Due to poor internet coverage in some areas, this transmission was done when those involved could connect to the network.

The QR code made it possible to identify the collection center that supplied the milk, the quantity, and all its relevant quality variables. It also captured the transporter name, the delivery time at the plant, and the milk’s quantity and quality at this point. Here, the information was uploaded again to the platform.

Parts of this data were shared through barcodes printed on the Trü milk packages. End consumers could scan the code with their device, enter the production batch information and learn about their purchase (see images in **Exhibit 5**). El Ordeño officially launched the initiative in early 2019.

The Challenges

“When we made the decision to implement blockchain,” said Alvaro, “we realized that better traceability would help us on two fronts. First, it would generate specific information on the company’s economic footprint and social impact. Second, it would help the company generate evidence of our food safety processes.”

However, being a relatively new technology, international experts disagreed about the true potential of blockchain to offer traceability to physical goods, including farm products. For example, some argued that the technology could help increase consumer confidence in the dairy sector, weakened by recent contaminated milk scandals whose origin took time to identify.²⁴ Blockchain could potentially trace the origin of any source of contamination in a few minutes if it had captured all the information from the supply chain. Similarly, in some markets there was a greater willingness to pay for products that were manufactured respecting the environment and ensuring a fair price to the first link in the chain.²⁵ By making this information visible to the end consumer, companies using blockchain solutions could position themselves favorably in the market.

Others argued that blockchain worked very well for exchanging fully digital assets. The agri-food supply chain, on the other hand, was physical and so forced physical assets to be translated into digital information for it to be loaded into a blockchain solution. This translation was made possible through serial numbers, QR codes, RFID, or other labeling methods, allowing consumers to interact with the label and discover the full history of the food they had in their hands. However, some experts argued that it was very easy to lie when originating information about physical goods. For example, a producer could claim it was feeding healthy products to its cows, but that could be false and blockchain actors would be unable to discern it. Translating physical assets to digital assets meant the information could be corrupted.²⁶

Be that as it may, El Ordeño believed that a blockchain application would make it possible to show the footprint of the company’s inclusive, developmental business model. It could show the monetary benefit that the 6,000 small milk producers received when they sold their milk to the company, and how this economic activity helped lift their families out of poverty. However, “digitizing the field” and collecting data at this level proved to be demanding, and the company did not implement specific actions in this direction during the first two years of the project.

On the other hand, as the local industry developed, the controls imposed by government agencies to ensure milk quality increased. These became tedious and repetitive, involving all the stages the milk went through to reach the final consumer. Companies that wanted to maintain their dairy exporter certificate had to ensure that even their milk suppliers had their certificate of good livestock practices. Every month, El Ordeño sent around 100 physical and electronic reports on its food safety practices to the control bodies, a task that required the exclusive hiring of three people. A blockchain solution could substantially simplify the search for information to prepare these reports. In addition to this complexity, El Ordeño had to deal with the extra complication arising from serving almost 1.3 million school breakfasts every day and producing over 100 SKUs of both own-brand and third-party dairy products. Blockchain would allow all processes around the production chain to be transparent, strengthening the company’s quality systems by simplifying identification of potential failures or improvements in the chain. The milk delivery to collection centers, transfer and entry to the plant, and final production and delivery to consumers could all be monitored.

The Decision

In January 2021, El Ordeño’s senior management thought it was time to decide whether to strengthen or abandon its blockchain initiative. There were a lot of questions around this decision: Were two years enough to judge the potential of a blockchain solution to trace farm products? Was it the best way to communicate the social impact of the company’s business model? Was it the best way to strengthen its quality systems by simplifying the identification of potential failures or improvements in the chain?

If the company decided to strengthen the solution, what information should be collected to show El Ordeño’s social footprint? How would it be collected? Would the company use this information to make its production chain more transparent? If the decision were to abandon blockchain, what alternatives exist to help the company achieve its two objectives?

Juan Pablo Grijalva Cobo did not want to prioritize financial criteria over social impact when making this decision. For him, the profitability of any business initiative was decisive but not as much as the ability to change unsustainable social situations. “I am sure that if we had looked only at short-term economic results, we would not exist now. In the past, we had to decide between the results of an investment or the trust of our suppliers. I think that decision marked the life of this company. We chose people’s trust, which is worth gold. I would rather lose an investment than someone’s trust.”

Endnotes

- ¹ <https://twitter.com/AgriculturaEc/status/1106250867467055104?s=20&t=5mfBzweMycn7T2c7KcEzwQ>
- ² Interview with Juan Pablo Grijalva Cobo in December 2020.
- ³ Spanish for the milking of dairy cows.
- ⁴ <https://www.cia.gov/the-world-factbook/countries/ecuador/>
- ⁵ <https://www.worldbank.org/en/country/ecuador/overview#1>
- ⁶ Ecuadorian Dairy Industry Center. 2015. Milk in Ecuador—The history of the Ecuadorian dairy industry, Quito, Ecuador.
- ⁷ Ibid.
- ⁸ Ecuadorian Dairy Industry Center. 2019. Dairy Sector Data Ecuador 2018, Quito, Ecuador.
- ⁹ Requielme, N., & N. Bonifaz. 2012. Characteristics of dairy production systems in Ecuador. *La Granja*. Vol. 15(1): 55-69. ISSN: 1390-3799
- ¹⁰ Ecuadorian Dairy Industry Center. 2015. Milk in Ecuador—The history of the Ecuadorian dairy industry, Quito, Ecuador.
- ¹¹ Market Power Control Superintendence in Ecuador. 2015. Report of the Dairy Sector in Ecuador, Quito, Ecuador.
- ¹² Ecuadorian Dairy Industry Center. 2019. Dairy Sector Data Ecuador 2018, Quito, Ecuador.
- ¹³ Landázuri, A. 2003. Analysis of Ecuador’s Dairy Sector, its loss of competitiveness and its vulnerability to the FTAA. Work presented to obtain a degree in Commercial Engineering from the University of the Americas—UDLA. Quito, Ecuador.
- ¹⁴ Ecuadorian Dairy Industry Center. 2015. Milk in Ecuador—The history of the Ecuadorian dairy industry, Quito, Ecuador.
- ¹⁵ Oñate, J. M. 2018. Agrifood chain of cow’s milk in Ecuador and its export potential. Period: 2008-2015. Dissertation prior to obtaining a degree in Economics from the Pontifical Catholic University of Ecuador—PUCE. Quito, Ecuador.
- ¹⁶ Ibid.
- ¹⁷ Ecuadorian Dairy Industry Center. 2019. Dairy Sector Data Ecuador 2018, Quito, Ecuador.
- ¹⁸ Passport, Drinking Milk Products in Ecuador, Euromonitor International, October 2020.
- ¹⁹ Interviews with Juan Pablo Grijalva Cobo and Juan Pablo Grijalva Moreano in December 2020. All information on the company’s history and business model is taken from these interviews, unless otherwise noted.
- ²⁰ Ecuadorian Dairy Industry Center. 2015. Milk in Ecuador—The history of the Ecuadorian dairy industry, Quito, Ecuador.
- ²¹ Interview in January 2021 with Alvaro Céleri, Raw Material Supply Manager and Business Transformation Manager at El Ordeño. All information about the company’s blockchain initiative is taken from this interview unless otherwise noted.
- ²² <https://www.ibm.com/blockchain/solutions/food-trust>
- ²³ A QR code (Quick Response code) is a development of the barcode. It is a module for storing information in a dot matrix or two-dimensional barcode.
- ²⁴ For example, the Lactalis case in France: Kim Willsher, “Lactalis to withdraw 12m boxes of baby milk in salmonella scandal,” *The Guardian*, June 14, 2018. <https://www.theguardian.com/world/2018/jan/14/lactalis-baby-milk-salmonella-scandal-affects-83-countries-ceo-says>
- ²⁵ Alexandre Lopez, *World Milk Day: Blockchain is Thriving in the Dairy Sector*, Connecting Food, May 31, 2020 (connecting-food.com)
- ²⁶ Silvia Lazaris, *Is Blockchain the Solution to Traceability? Ask the Expert*, Food Unfolded, November 25, 2020, <https://www.foodunfolded.com/article/is-blockchain-the-solution-to-traceability-ask-the-expert>

Exhibit 1. Map of Ecuador



Source: Peter Fitzgerald, CC BY 3.0, <https://creativecommons.org/licenses/by/3.0> and Addicted04, CC BY-SA 3.0, <https://creativecommons.org/licenses/by-sa/3.0>

Exhibit 2. Milk Producers in Ecuador

Size	Hectares	Production liters/day	Number	Share of national milk production
Small	0–19,9	Less than 200	649	45,3%
Medium	20–99,9	200 to 500	174	32,4%
Big	100 or more	More than 500	120	22,3%

Source: Prepared by the author based on information from Market Power Control Superintendence in Ecuador. 2016. Market Study: The Milk Sector in Ecuador.

Exhibit 3. Dairy Products in Ecuador: Market Share by Sales

Company	2018	2019	2020
Pasteurizadora Quito SA	16.4%	16.6%	16.2%
Nestlé Ecuador SA	11.6%	11.3%	11.4%
Industrias Lácteas Toni SA	9.9%	9.9%	9.7%
Lácteos San Antonio CA	9.1%	9.1%	9.2%
Reybanpac CA	6.9%	7.0%	7.2%
Sociedad Industrial Ganadera El Ordeño SA	5.1%	5.2%	5.7%
Lechera Andina SA	5.1%	5.3%	5.5%
Private label	3.0%	3.1%	3.2%
Others	32.9%	32.5%	31.9%

Source: Prepared by the author based on information from Passport, Drinking Milk Products in Ecuador, Euromonitor International, October 2020.

Exhibit 4. Average Price to the Final Consumer of a Liter of Whole Milk in Tetra Pak in the Main National Supermarket Chain (2020)

Company	Brand	Price
Pasteurizadora Quito SA	Vita Leche	\$1.03
Nestlé Ecuador SA	La Lechera	\$1.31
Industrias Lácteas Toni SA	Toni	\$1.23
Lácteos San Antonio CA	Nutri Leche	\$1.21
Reybanpac CA	Reyleche	\$1.22
Sociedad Industrial Ganadera El Ordeño SA	Trü	\$0.96
Lechera Andina SA	Not offered	

Source: Prepared by the author based on direct observation, May 2020.

Exhibit 5. More Relevant Information Received by the Consumer on Scanning the Code on the Final Product

Conoce el camino de la leche TRÚ

CON EL RESPALDO Y TECNOLOGÍA DE **IBM**

TRÚ, proviene de la primera empresa del Ecuador en poner en marcha un sistema de trazabilidad alimentaria blockchain con lo cual podrás seguir el rastro de nuestros productos en cada una de las etapas de producción hasta llegar a tus manos.

1 Selecciona tu empaque

2 Número de lote

Envíar

1 Producción de leche.

Tu leche TRÚ, a más de ser 100% pura de vaca, es producida por más de 6.000 pequeños y medianos productores que, en su gran mayoría, la entregan junto a sus familias en diversos centros de acopio alrededor del país.

+6000 pequeños y medianos productores de leche.

72 centros de acopio consultorios incorporados.

Mapa de Ecuador mostrando la recolección de leche.

2 Recolección de leche.

Una vez que la leche es receptada en los centros de acopio, nuestro personal calificado realiza una primera inspección de calidad, asegurándose que sea apta para ser transportada por uno de nuestros tanqueros.

Acidez: ✓

Densidad: ✓

Antibiótico: NEGATIVO

Temperatura: ✓

Fecha de recolección: 2021-02-13

3 Transporte de leche.

Todos nuestros tanqueros cuentan con un registro de Agrocalidad, el cual garantiza que la leche cruda es transportada de forma segura e higiénica a nuestra planta en Machachi.

El Ordeno

4 Ingreso a planta

Al llegar la leche a nuestra planta, realizamos nuevamente diversas pruebas de calidad para asegurar que el producto se encuentre en óptimas condiciones al llegar a la planta hacia el proceso de UHT.

Fecha de recepción y liberación: 2021-02-13

5 Proceso UHT.

A diferencia de la pausterización tradicional, nosotros llevamos a la leche a un proceso térmico de ultrapasteurización, mediante este proceso, aplicamos altas temperaturas en un rango de tiempo corto para reducir la mayor cantidad de microorganismos que puedan estar presentes en la leche.

6 Certificaciones.

Como parte de nuestro compromiso con la salud y nutrición de nuestros consumidores, hemos obtenido diversos certificados nacionales e internacionales que garantizan los más altos estándares de calidad de todos nuestros productos.

Source: www.trualimentos/trazabilidad.