Kuit: An Enterprise's Commitment to Sustainability through Technological Development

Kuit: el compromiso de una empresa con la sostenibilidad a través del desarrollo tecnológico

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This article is a case study that aims to show how Kuit, a social enterprise, addresses the challenge of technological management while meeting its social, environmental and economic business objectives.

The study examines innovation through technological development as part of a business strategy to promote ethical and sustainable business practices, which are focused on the health and well-being of people through the production and distribution of kombucha.

The relevance of the case study lies in showing the technological management strategy implemented by the founders of Kuit, which has led them to a process innovation and a patent application. This innovation has been recognized by the Secretariat of Innovation, Science and Technology of the State of Jalisco, with Kuit being one of the five finalists for the 2021 Jalisco Innovation Award. Innovation has allowed Kuit to be a sustainable company both technically and financially, fulfilling its social and environmental mission.

Keywords: technological development, social enterprises, triple impact, innovation, sustainable business development

Este artículo es un caso de estudio que tiene como propósito mostrar cómo Kuit, una empresa social, aborda el desafío de la gestión tecnológica y simultáneamente cumple con los objetivos sociales, ambientales y económicos de su negocio.

A lo largo del caso de estudio se examina la innovación mediante el desarrollo tecnológico como parte de una estrategia empresarial para promover prácticas comerciales éticas y sostenibles, enfocadas en la salud y el bienestar de las personas a través de la producción y distribución de kombucha.

La relevancia del caso de estudio radica en mostrar la estrategia de gestión tecnológica que los fundadores de Kuit han implementado, que los ha llevado a una innovación de proceso con una solicitud de patente. Esta innovación ha sido reconocida por la Secretaría de Innovación, Ciencia y Tecnología del Estado de Jalisco, siendo Kuit uno de los cinco finalistas del premio de Innovación Jalisco 2021. La innovación ha permitido a Kuit ser una empresa sostenible tanto técnica como financieramente, cumpliendo su misión social y ambiental.

Palabras clave: desarrollo tecnológico, empresas sociales, innovación, triple impacto, desarrollo empresarial sostenible

1. Introduction

In Mexico, the consumption of sodas and sugary beverages has become pervasive and excessive. The result of this is that 75 % of the population over the age of 20 is affected by obesity, as shown by data from the latest National Health and Nutrition Survey (INEGI et al., 2019). Kuit Kombucha (Kuit) emerged as a realistic alternative to help mitigate this health issue among Mexicans by offering a healthy beverage.

Kombucha is a functional, beneficial and refreshing drink made from green and black tea through a fermentation process that produces a fungus. This beverage has a history dating back approximately 2,000 years, when a Chinese alchemist named Kombu experimented with different fermentations and discovered that tea fermentation has medicinal benefits for the digestive system. Kombucha's popularity rose when people who tried Kombu's fermentations experienced health improvements, and it surged in the year 415 when the mortally ill Emperor Inkyo of Japan recovered after being treated with it, which led people to call it the "elixir of life."

For over a thousand years, the Chinese valued kombucha for its ability to balance chi, the intangible energy flow of all living beings. However, during World War II, there was a shortage of tea and sugar, causing the beverage to nearly disappear. Nonetheless, due to its health benefits, the drink continued to be valued and was named kombucha in honor of Kombu, with "chá" meaning "tea" in Chinese.

According to the National Center for Biotechnology Information (NCBI), consuming kombucha supports the immune system due to its antioxidant, anti-inflammatory and cholesterol-reducing properties (Kahraman-Ilıkkan, 2023). Additionally, studies on the kombucha fungus SCOBY have shown that it helps produce various bacteria that enable the bio-assimilation of nutrients in humans (Harrison & Curtin, 2021).

Given the obesity epidemic and the enduring legacy of a millennia-old beverage, this case study aims to elucidate how a micro-enterprise addresses the challenge of innovation and technological development while fulfilling its social, environmental, and economic objectives. Since Kuit's technological development has led to an innovative solution, the company has been able to sustain itself technically and financially while achieving its mission. Therefore, the research question for this study is: How does a social micro-enterprise fulfill its triple-impact mission? In this case, the question can be answered by exploring technological development as a critical aspect of the technology management process.

Kuit, though still a relatively young and small business, owes much of its success to its innovation called STMBEC, which stands for Low Shear Effort Mass Transfer System in Spanish. STMBEC is a product of technological development that has allowed Kuit to harness the best of traditional kombucha production processes and merge them with biotechnological advances, scaling the production process from the 8 liters obtained when using traditional methods to 7,000 liters, positively impacting the kombucha industry. Furthermore, STMBEC has helped systematize the process and standardize the organic acid parameters in kombucha to enhance the quality of its product and, consequently, the health of its consumers.

This case study first briefly narrates the history of Kuit as a social enterprise. Second, it describes the landscape of kombucha in Mexico. Third, it presents the theoretical framework of social enterprise, technology management and technological development to innovate. Fourth, it addresses Kuit's technology management and technological development to innovate as the driving forces behind its market differentiation. Fifth, it identifies the economic, social, and environmental impacts of Kuit as a social enterprise. Finally, the case study concludes with the findings.

2. The Kuit Social Enterprise

A social enterprise can have various interpretations (Nicholls, 2006; Defourny & Nyssens, 2012). However, it is generally characterized by its social mission, as it aims to achieve a positive impact by conducting economic activities in a competitive market and thereby generate positive social or environmental externalities (Santos, 2012). Its primary distinction from a traditional enterprise lies in its focus on addressing a social or environmental problem as part of its mission (Nyssens, 2006).

In this context, Kuit Innovación en Bioprocesos S.A.P.I. de C.V. (Kuit), as a company committed to social, environmental, and economic objectives, qualifies as a social enterprise. Its mission is "to produce the best kombucha to help people live healthier and happier lives while promoting sustainability and respect for the environment." The core of its business model tackles the challenge of obesity in Mexico by offering a functional beverage as an alternative to high-sugar carbonated drinks (sodas).

Soda consumption is one of the roots of obesity in Mexico. The National Autonomous University of Mexico (UNAM) identified soda intake as one of the leading causes of obesity in 2019, noting its significant economic impact on Mexican households, where the average expenditure on soda represents 10 % of a family's total income (Dirección General de Comunicación Social de la UNAM, 2019). Additionally, the National Institute of Public Health of Mexico attributes 7 % of annual deaths to the consumption of sugary beverages (INSP, 2018).

Against this backdrop, Kuit strives to be a social enterprise with a triple impact. Its business model seeks to promote health and well-being by offering Kuit Kombucha, a high-quality, functional beverage beneficial to the body. Furthermore, Kuit is dedicated to minimizing its environmental footprint through its "Kuit para todos" program, which implements sustainable practices in its production and distribution processes. This program not only ensures social and environmental impact but also secures the company's economic viability.

From 2018 to 2020, Kuit experienced organic growth focused on research and the development of STMBEC and the bioreactors used for kombucha production. Funding during these years came from FFF (family, friends, and fans), which provided the basic infrastructure and capital for production. By the end of 2020, by which the bioreactor was operational, Kuit managed to systematize the kombucha manufacturing process. Then, the founders turned their attention to social and environmental impact strategies.

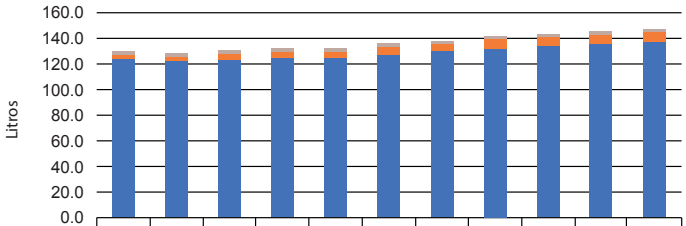
During the pandemic (2021-2022), Kuit saw significant growth as more people became concerned about their diet and health, positioning Kuit as a genuine alternative in

the market. Consequently, the company decided to expand through pre-seed investment, which facilitated process automation and the establishment of Kuit Distribution Centers (CEDIS) in Mexico City, León, Querétaro and Aguascalientes. In 2023, Kuit launched Drop, a spin-off which functions as a logistics integrator for last-mile delivery.

3. Kombucha in Mexico

In Mexico, the RTD (Ready-to-Drink) tea market, to which kombucha belongs, is still in its early stages compared to the carbonated beverages market. According to Euromonitor Passport GMID, the per capita consumption of carbonated beverages in 2023 was 133.2 liters, while the per capita consumption of RTD tea was 1.7 liters. This shows that the RTD tea market is 78 times smaller than the carbonated beverages market. Figure 1 illustrates the difference in per capita consumption of carbonated beverages and RTD tea.

Figure 1. Per capita consumption of carbonated beverages vs. RTD tea in Mexico



Año	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
RTD Tea	1.6	1.6	1.6	1.5	1.7	1.7	1.7	1.8	1.8	1.8	1.8
Reduced Sugar Carbonates	4.4	5.5	5.6	5.6	5.8	6.0	6.3	6.6	6.8	7.2	7.5
Regular Carbonates	123.1	121.7	122.4	124.8	124.1	127.1	129.6	131.7	133.6	135.3	137.0

Source: Own elaboration with data from Passport Euromonitor, collected on 2 March 2024.

Per capita consumption translates into total sales volumes in 2023 of 16,136.7 million liters of regular carbonated beverages (high sugar content) and 764.7 million liters of low-sugar carbonated beverages. In contrast, the RTD tea sector, which includes kombucha, sold only 217.5 million liters in Mexico (Euromonitor Passport GMID, 2024), representing just 1.27 % of the non-alcoholic beverage market.

Despite the emerging status of the kombucha market, as shown in Figure 1, there are encouraging signs. According to a report by Mordor Intelligence (2024), the kombucha market in Mexico is expected to grow at an annual rate of 20 % during the 2024-2027 period.

However, the kombucha market in Mexico faces the challenge of limited consumer awareness about this functional beverage. A report by Mordor Intelligence (2024) indicates that the lack of education about the product is a significant barrier to its widespread adoption. The literature highlights kombucha's popularity and various health benefits—factors that drove sales during the pandemic (Mordor Intelligence, 2024)—but

states that raising awareness of the beverage's health and nutritional properties, such as its high probiotic and antioxidant content, is crucial (Troitino, 2017). Therefore, ongoing market education is essential.

4. Theoretical Framework–Key Concepts

4.1. Technological Development and Technology Management

Technological development refers to the process of advancing and refining technologies to meet emerging needs and solve specific problems. This concept is central to innovation, as it involves the creation of new technologies and the improvement of existing ones to enhance performance, efficiency, and applicability. As Giones and Brem (2019) highlight, technological development is a dynamic process that requires continuous investment in research and development (R&D) to stay competitive in rapidly changing markets. Through this development, organizations can introduce cutting-edge solutions that address market gaps, and respond to evolving consumer demands. Technological development is not just about the invention of novel products or services, but about the strategic enhancement of technological capabilities to sustain innovation over time (Dodgson et al., 2020).

In contrast, technology management encompasses the strategic activities necessary to align technological capabilities with business goals. This includes identifying, acquiring, applying, and protecting technology to maximize its impact on organizational performance. Technology management is not only about overseeing technological assets but also about integrating them into the broader business strategy to create value and maintain a competitive edge (Tidd & Bessant, 2020). Whereas technological development focuses on the creation and refinement of technology, technology management is concerned with effectively deploying and commercializing these technologies within an organizational context. Through effective technology management, companies can ensure that technological advancements are not just theoretical achievements but practical tools that drive business success (Dodgson et al., 2020).

In the case of Kuit, the distinction between technological development and technology management is evident in its approach to innovation. Kuit's investment in the STMBEC system, developed through a partnership with a university that provided access to specialized laboratories, exemplifies technological development. This collaboration enabled the company to test and refine its fermentation process, leading to a patented technology that significantly enhanced production capabilities. However, it is through technology management strategies—such as the decision to patent the STMBEC system and the integration of this technology into the company's broader business model—that Kuit has been able to translate technological innovation into a sustainable competitive advantage. This synergy between technological development and technology management has been crucial in allowing Kuit to scale its operations while maintaining a focus on social and environmental impact (Giones & Brem, 2019; Tidd & Bessant, 2020).

4.2. Technological Development to Innovate

One approach to technological development is through frugal innovation. According to Bhatti and Ventresca (2013), frugal innovation refers to the creation of affordable and sustainable products and services that meet the needs of organizations. It responds to the growing demand for access to essential goods and services, particularly in developing countries, where most businesses are micro or small enterprises with limited resources for technological investment.

Frugal innovation focuses on simplicity, efficiency and affordability, often involving the adaptation of existing technologies to new contexts (Montoya et al., 2018). The social dimension of frugal innovation is significant, as it aims to address inequality and improve the well-being of marginalized communities. According to Knorringa et al. (2016), frugal innovation can promote social entrepreneurship and community empowerment by involving local communities in designing and implementing new products and services. In this sense, frugal innovation represents a promising approach to sustainable development that emphasizes innovation's social, economic, and environmental dimensions.

In the case of Kuit Kombucha, technological development was based on frugal innovation. One of the founders, a biotechnology engineer, utilized his specialized knowledge to design bioreactors that optimized the fermentation parameters of kombucha. This enabled the transition from a batch fermentation process to a semi-continuous one, maintaining optimal conditions to preserve the health of probiotics and produce high-quality kombucha.

Kuit's technological development is an example of frugal innovation because the founder leveraged the university ecosystem instead of establishing an expensive research and development department. He utilized his professors' guidance and the university's laboratories' infrastructure to conduct tests and develop the STMBEC technology. This approach allowed Kuit to avoid prohibitive investments in biotechnology laboratories, which would be unfeasible for most SMEs in Mexico.

5. Methodology

Adhering to qualitative methodologies, a rigorous approach was employed to ensure the credibility and reliability of the findings in this investigation of Kuit Kombucha. The research was carried out as a case study, which, as Yin (2018) outlined, is particularly effective for exploring complex phenomena within real-life contexts. This approach was chosen to deeply understand the technological development and management strategies employed by Kuit, a small yet innovative company, and how these strategies contribute to its sustainability and triple impact, allowing it to be a social enterprise.

Data collection for this study involved multiple sources to ensure a comprehensive understanding of the case. According to Creswell and Poth (2018), triangulation of data sources is essential for enhancing the validity of qualitative research. Thus, the study employed the following methods:

- Interviews: Semi-structured interviews were conducted with key stakeholders at Kuit, including the founders, technical staff, external collaborators and customers. These interviews provided insights into the company's technological development processes, the challenges faced, and

the strategies implemented to overcome these challenges.

- Document Analysis: Internal documents, such as business reports, patents, and strategic plans, were analyzed to complement the interview data. These documents provided factual evidence of the company's technological advancements, such as the development of the STMBEC system and its alignment with Kuit's social, environmental, and economic objectives.
- Observations: Site visits to Kuit's production facilities were conducted to observe the technological processes in action. This method allowed for a direct understanding of how the company has integrated its technological developments into daily operations, ensuring that the data collected were grounded in the reality of the company's practices.

The data were analyzed using thematic analysis following the guidelines of Braun and Clarke (2019). Thematic analysis involves identifying, analyzing, and reporting patterns, or themes, within the data. In this study, themes such as "technological innovation", "technological development" and "technology management" emerged and were critical for understanding Kuit's strategic approach.

This process ensured that the themes were deeply rooted in the data and not imposed by the researcher. Furthermore, cross-case analysis was employed to compare Kuit's strategies with those of other similar companies, providing a broader context and strengthening the validity of the findings.

6. Result of Technological Development and Technology Management in Kuit

Technology management involves identifying, acquiring, developing, and commercializing technology to achieve a competitive advantage and create value for the organization (Zoltán, 1993; Rivera, 1995; Ferraro & Lerch, as cited in Castellanos, 2008). In this context, it is relevant to highlight the professions and expertise of Kuit's founding partners: a biotechnology engineer, a financial engineer, an ac-countant and an architect who serves as a digital marketing designer. These indi-viduals brought together the necessary capabilities to develop, produce and com-mercialize their products. Their combined experience and vision effectively merged technology and creativity, laying the foundation for a company committed to health, sustainability and the environment.

Kuit's innovation strategies are based on analyzing the traditional kombucha manu-facturing process, which involves low-capacity fermentation (8 liters), making the systematization of production expensive and resulting in kombucha being a relative-ly inaccessible functional beverage. The market price ranges between 60 and 90 pesos per 355 milliliter bottle, making the probiotics' benefits mainly accessible to those with higher purchasing power.

In response, Kuit developed a Low Shear Mass Transfer System (STMBEC) to in-corporate into their manufacturing process, designing high-capacity bioreactors (7,000 liters), reducing production costs by 34 %. This innovation led to a patent application and recognition from the Secretariat of Innovation, Science, and Tech-nology of the State of Jalisco, with Kuit being one of the five finalists for the 2021 Jalisco Innovation award.

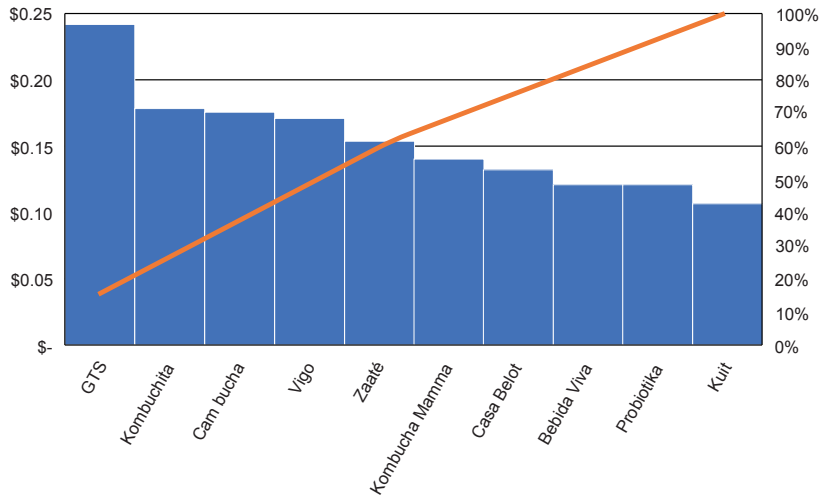
STMBEC exemplifies innovation as it focuses on simplicity, efficiency and affordabil-ity, which are in line with Kuit's resources. It allowed Kuit to scale up kombucha fermentation, leveraging one of the founder's specialized knowledge in biotechnology to innovate the fermentation process. Before STMBEC, kombucha in the Mexi-can market was produced without any mass transfer mechanism, resulting in tiny batches with a discontinuous fermentation process which made the product expen-sive and less accessible.

Moreover, large companies that use certain mass transfer systems typically employ propellers that damage the biofilm, complicate fermentation and cause an imbalance between carbon dioxide and oxygen, thereby reducing kombucha's nutritional quality. Through its technological development, Kuit developed STMBEC, which produces a cellulose biofilm that acts as a protective barrier and ensures optimal conditions for the probiotics.

Technological development has enabled Kuit to become the first microenterprise in Mexico capable of scaling its kombucha fermentation process to over 7,000 liters per batch thanks to its frugal innovation. This results in a semi-continuous fermenta-tion process, reducing costs and offering a highly beneficial functional beverage at a price accessible to middle-income individuals, not just those with high incomes. This allows Kuit to fulfill its social mission of providing a health-beneficial product to a broader audience.

Kuit offers a competitive product in terms of quality and price within the Mexican RTD tea industry, as illustrated in Figure 2.

Figure 2. Comparison of kombucha prices in Mexico (price per milliliter)



Source: Own elaboration with data collected from the websites of various kombucha brands in January 2024.

As a result, Kuit contributes to addressing one of Mexico's most significant social problems by conducting its economic activity in a competitive market and, thanks to its positive externalities, has additional social, environmental and economic impacts.

To overcome the challenge of balancing medium and long term social and

environmental objectives with short term economic goals, Kuit has been willing to invest in technology management, especially developing STMBEC and specialized bioreactors for kombucha. This investment contributes immediately to economic outcomes by enabling a shift from a batch fermentation process to a continuous one, thereby addressing one of the main challenges kombucha manufacturers face: production in line with demand. Additionally, it addresses environmental challenges in its production process by reusing bottles. As Tidd and Bessant (2020) note, effective technological development can lead to significant improvements in resource efficiency and environmental sustainability, further reinforcing the alignment of economic and environmental goals.

7. The Triple Impact of Kuit

In its business model, Kuit has the "Kuit para todos" program as a business strategy, enabling social, environmental, and economic impact

7.1. The Social Impact of Kuit

The social impact of Kuit Kombucha lies in its positive health qualities which contribute to the solution of overweight and obesity, critical problems affecting the majority of the Mexican population. The economic impact of these issues is an annual public health expenditure of 863 billion dollars on the treatment of diseases related to them (INSP, 2018).

Additionally, Kuit's social impact mainly focuses on women and children. Research shows that women who consume one or more sugary drinks per day nearly double their risk of developing diabetes, while, in children, the daily consumption of sugary drinks increases the risk of obesity by 60 %. Taking this into account, Kuit has the potential to generate a positive social impact on 3,750,041 women and the lives of 2,862,144 girls and boys in Jalisco alone by offering a healthy alternative to soft drinks and improving their health, thus promoting healthier habits. Currently, Kuit has directly impacted over 171,000 people, in addition to donating 4 % of its production to individuals with obesity-related conditions and providing them with health habit workshops as part of its "Kuit para todos" program.

7.2. The Economic Impact of Kuit

The economic impact of Kuit is primarily the result of the work and research of young individuals from Jalisco, Mexico, driving a new industry in the state of Jalisco and incorporating frugal innovation to make kombucha competitive in the RTD tea beverage sector. As explained previously on this article, the RTD beverage market is currently experiencing growth and is forecasted to grow by 19.7 % (Mordor Intelligence, 2024), with its economic impact potentially reaching 8.3 billion pesos annually.

Furthermore, in order to benefit as many people as possible, Kuit prioritizes the management of its supply chain locally, which also translates into an economic impact by supporting local businesses and enterprises, strengthening the Mexican domestic market. Additionally, it prioritizes expanding its infrastructure by sourcing all equipment and inputs for its production processes from local suppliers, utilizing proprietary and fully Mexican

technology

7.3. The Environmental Impact of Kuit

Kuit seeks processes and production models that promote responsible consumption. Among these processes is the reuse of bottles and crates. On the other hand, organic waste is used for composting, and in the case of the produced cellulose, a project is underway to utilize this material to create synthetic leather and a biomaterial for packaging boxes. All these efforts are aimed at achieving zero waste. Additionally, by reusing bottles up to 13 times, they manage to reduce costs, allowing them to donate 4 % of production.

In this sense, Kuit is a sustainable 3.0 company according to the typology proposed by Thomas Dyllick and Katrin Muff (2015), who explain that a Truly Sustainable Business 3.0 (BST 3.0) is one that

> shifts its perspective from seeking to minimize its negative impacts to understanding how it can create a significant positive impact in critical and relevant areas for society and the planet. A Business Sustainability 3.0 firm looks first at the external environment within which it operates and then asks itself what it can do to help overcome critical challenges that demand the resources and competencies it has at its disposal.

Kuit exemplifies a Business Sustainability 3.0 firm through its "Kuit para todos" program, which embodies a shift from merely minimizing negative impacts to actively creating significant positive impacts in critical societal areas. By focusing on providing affordable, health-enhancing kombucha, Kuit addresses pressing public health issues such as obesity and diabetes, prevalent in Mexico. The program goes beyond product offerings by incorporating educational workshops on healthy habits and directly supporting those with health conditions related to obesity through free product distribution. This initiative highlights Kuit's dedication to utilizing its resources and expertise to tackle major social challenges. Additionally, by encouraging the return and reuse of bottles, Kuit reduces environmental waste, demonstrating a comprehensive approach to sustainability that aligns with the principles of Business Sustainability 3.0. Kuit's proactive stance in leveraging its capabilities for broader societal benefit underscores its commitment to truly sustainable business practices. Making the bottles returnable also creates a positive impact on the environment. In two years of operation of the "Kuit para todos" program, Kuit's customers have contributed to removing over 4.1 tons of glass from landfills in Guadalajara, Jalisco, Mexico.

8. Conclusions

The case began in 2018 when the founders of Kuit, concerned about the health issues associated with excessive consumption of carbonated beverages and aware of the benefits of kombucha, decided to bring their project to life. Hence, Kuit Kombucha was founded, focusing on the production and commercialization of this beverage.

Throughout Kuit's life, the decisions made by its founders have been aimed at fulfilling their mission "to help people live a healthier and happier life, while promoting

sustainability and respect for the environment" (Kuit, 2024). With the idea of increasing their impact, the founders utilized frugal innovation to manage their technology, reduce production costs, make kombucha more accessible to a broader audience and promote better health.

Technological management has been a key factor in these achievements. After three years of research, the founders successfully implemented frugal innovation in their bioreactors, which is now their own patented technology called STMBEC. This innovation was incorporated into Kuit's production process, leading to a greater efficiency, as evidenced by a 34 % reduction in costs and standardization of the fermentation process. The transition from discontinuous to a semi-continuous system allowed for an increase in production volume of at least 300 %. This improved the quality of the product, providing greater health benefits to consumers.

Thus, technological management has not only enhanced the quality and quantity of Kuit Kombucha and improved the health of those who consume it, but it has also driven the "Kuit para todos" program as a business strategy to enable the triple impact of the company. This program invites customers to return empty bottles for reuse, which not only generates cost savings in production and allows the donation of 4 % of their production but also reduces the negative environmental impact by avoiding glass waste in landfills. These initiatives are the pillars that allow Kuit to achieve a triple impact as a socially committed company to its environment and position it as a BST 3.0 company.

Author's role:

MLSF: Conceptualization, Methodology, Investigation, Data curation, Writing – original draft preparation, Writing – review and editing.

CS: Investigation, Data curation and Writing – original draft preparation.

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