CASE STUDY

-Final competition-

Topic: Tea sack with functional products and microencapsulated probiotics

Team № 12

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I. Executive Summary

This case study explores the development of an innovative dual-step functional tea that combines tradition, sustainability, and advanced food technology. The primary objective was to create a shelf-stable infusion containing functional ingredients and viable probiotics, offering health benefits without requiring refrigeration. The final product features two biodegradable tea bags: one for hot infusion of functional ingredients, and another containing microencapsulated *Lactiplantibacillus plantarum* and upcycled brewer's yeast, added once the infusion cools to around 40 °C. The formulation supports gut health, immunity, and eco-conscious consumption.

Market analysis indicates strong consumer interest in probiotic, sustainable, and convenient formats. Financial projections show a 40–50% gross margin with a break-even point at 35,000–40,000 units. Despite challenges such as probiotic viability and user compliance with preparation steps, the product demonstrates strong commercial potential. This project highlights how rethinking traditional formats can address modern health and environmental concerns in functional food innovation.

II. Introduction

In recent years, consumer demands for healthy, sustainable and functional food products have grown significantly (Euromonitor International, 2023). In a context marked by climate change, resource scarcity, and increasing consumer awareness, innovation in food design must go beyond flavor or convenience. However, as we look toward innovation, we must not lose sight of traditional products, which continue to offer both cultural value and health benefits. Reimagining these traditional formats through new technologies and sustainable approaches allows us to respect their legacy while adapting them to modern needs.

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Imagen 1. Japanese tea ceremony at Japan Matsuri (Geaorges Seguin, 2010).

This project proposes the development of a tea with probiotics and functional ingredients, created with an ecological and circular mindset. It integrates ingredients known for their health benefits (Abuajah et al., 2015), like antioxidant, anti-inflammatory, and gut-health-promoting properties, some of these ingredients are ginger, goji berries or maqui berries. Additionally, this product incorporates probiotic microorganisms through microencapsulation techniques to ensure its viability (Gupta et al., 2023). Furthermore, we want to explore the upcycling of beer bagasse yeast, contributing to zero-waste strategies by giving value to brewing by-products. The product is designed to be consumed as a warm or cold infusion, providing a flexible and convenient format.

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The purpose of this case study is to explore the development of a food product that combines tradition, innovation, and sustainability. It aims to document the selection of functional ingredients, the application of microencapsulation techniques for probiotic delivery, and the integration of upcycled by-products within a biodegradable, plant-based tea bag format. The scope of the project includes not only the technical and nutritional aspects of the formulation, but also its environmental impact and potential to align with circular economy principles. Ultimately, this project seeks to demonstrate how rethinking traditional products through modern food design can lead to more sustainable and health-oriented solutions.

III. Market Analysis

The functional tea market is experiencing significant growth, driven by increasing consumer demand for healthy, sustainable, and convenient beverages and is expected to reach a market of US$ 279 billion by 2030 (Figure 1) (Gupta et al., 2024; Smedescu et al., 2024). The following survey (https://forms.gle/BdNLsFxXN8eYvxQ99) was used to establish the target market for this probiotic functional tea, which is composed of health-conscious consumers who prioritize gut health, immunity, and sustainable consumption. Lastly, older adults seeking natural remedies for digestion and inflammation represent a secondary audience. These consumer consumption trends are aligned with production trends in the tea market (Bermudez et al., 2024).

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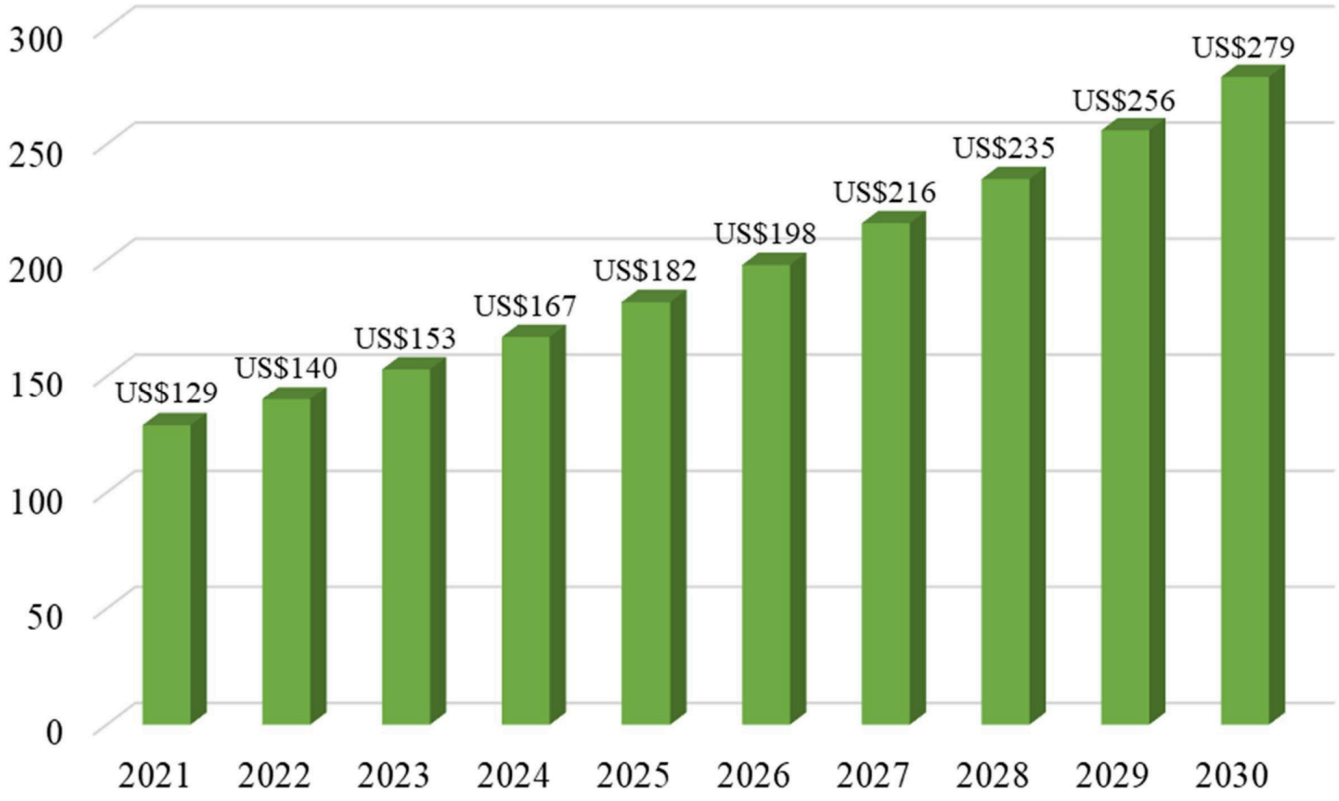

Figure 1. Functional beverage market size from the year 2021 to 2030, in billions of US$. (Gupta et al., 2024).

Currently, consumers have clearly defined preferences that guide their purchasing decisions. First and foremost, they actively seek health benefits, showing a particular interest in products containing probiotics, antioxidants, and anti-inflammatory properties. At the same time, sustainability has become a decisive factor, reflected in their preference for biodegradable packaging, recycled ingredients, and brands committed to the principles of the circular economy. Convenience also plays a crucial role, with ready-to-use formats, such as tea bags suitable for hot and cold infusions, that fit their busy lifestyles. Finally, they demand transparency and naturalness, opting for products with clean labels that guarantee minimal processing, natural ingredients, and complete traceability of components (Latif et al., 2023).

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The functional beverage market has several key competitors in different segments. Established brands such as Yogi Tea and Traditional Medicinals dominate the traditional functional tea space with their herbal blends, while leaders in probiotic beverages such as GT's Kombucha and Health-Ade compete in the fermented beverage category. In the tea sector, sustainability is a factor of growing importance (ISSD, 2024) and companies such as Pukka Herbs and Numi Organic Tea have gained recognition for their commitment to ethical sourcing and organic ingredients.

Current market trends reveal opportunities for innovation in functional beverages. Products that combine probiotics with prebiotic fibers are gaining traction for their gut health benefits. The upcycling movement is also growing, with brands using by-products like brewer's yeast to reduce waste and enhance nutritional value. Adaptogenic blends with stress-relieving ingredients such as ashwagandha and reishi mushrooms are on the rise, meeting demand for multifunctional, wellness-oriented products.

IV. Research and Development

The research and development process for this new food product focused on reimagining traditional tea through the integration of functional ingredients, sustainable practices, and innovative food technologies. Our objective was to create a shelf-stable, convenient beverage that supports gut health, boosts immunity, and appeals to modern health-conscious consumers.

The idea originated from kombucha, a fermented tea known for its probiotic content. However, kombucha often requires refrigeration and has a limited shelf life. We aimed to retain the health benefits of fermented beverages while eliminating their logistical constraints. This led us to design a two-step tea infusion system, where functional ingredients are combined with microencapsulated probiotics, allowing for room-temperature storage and controlled preparation.

To better understand market interest and product acceptance, we will engage in several feedback-gathering activities. Free samples will be offered at food fairs and innovation expos, where consumers will be encouraged to provide opinions on flavor, aroma, and overall appeal. In parallel, we will conduct online surveys targeting individuals of all ages with an interest in health, wellness, or plant-based diets. Participants will be asked about their preferences regarding probiotics, tea consumption habits, and

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packaging sustainability. However, market trends show a growing demand and trend for clean-label, eco-friendly products that support digestion and immunity, especially in convenient formats like tea bags.

Additionally, informal partnerships will be formed with local health food stores and small enterprises to test initial versions of the product and gather practical feedback on consumer interest, storage preferences, and brewing behavior.

The final product formulation will include a variety of carefully selected ingredients known for their health-promoting properties:

Functional ingredients:Ginger root, goji berries and maqui berries

Prebiotic-rich components: Black mulberry, sour cherry and blueberry

Sustainable components: Upcycled brewer's yeast

Probiotics: *Lactiplantibacillus plantarum** (microencapsulated)

All fruit and herbal components will be dried using low-temperature dehydration techniques to preserve antioxidants and bioactive compounds. The brewer's yeast, obtained from beer production by-products, will be cleaned, dried, and ground into a powder.

One of the major challenges was preserving probiotic viability without refrigeration. This will be achieved by applying microencapsulation, a protective method where probiotic cells are coated with natural carriers, specifically we used a spray-drying (Figure 2) process with a protective matrix of maltodextrin and gum arabic. This coating shields the bacteria from high temperatures and moisture until consumption.

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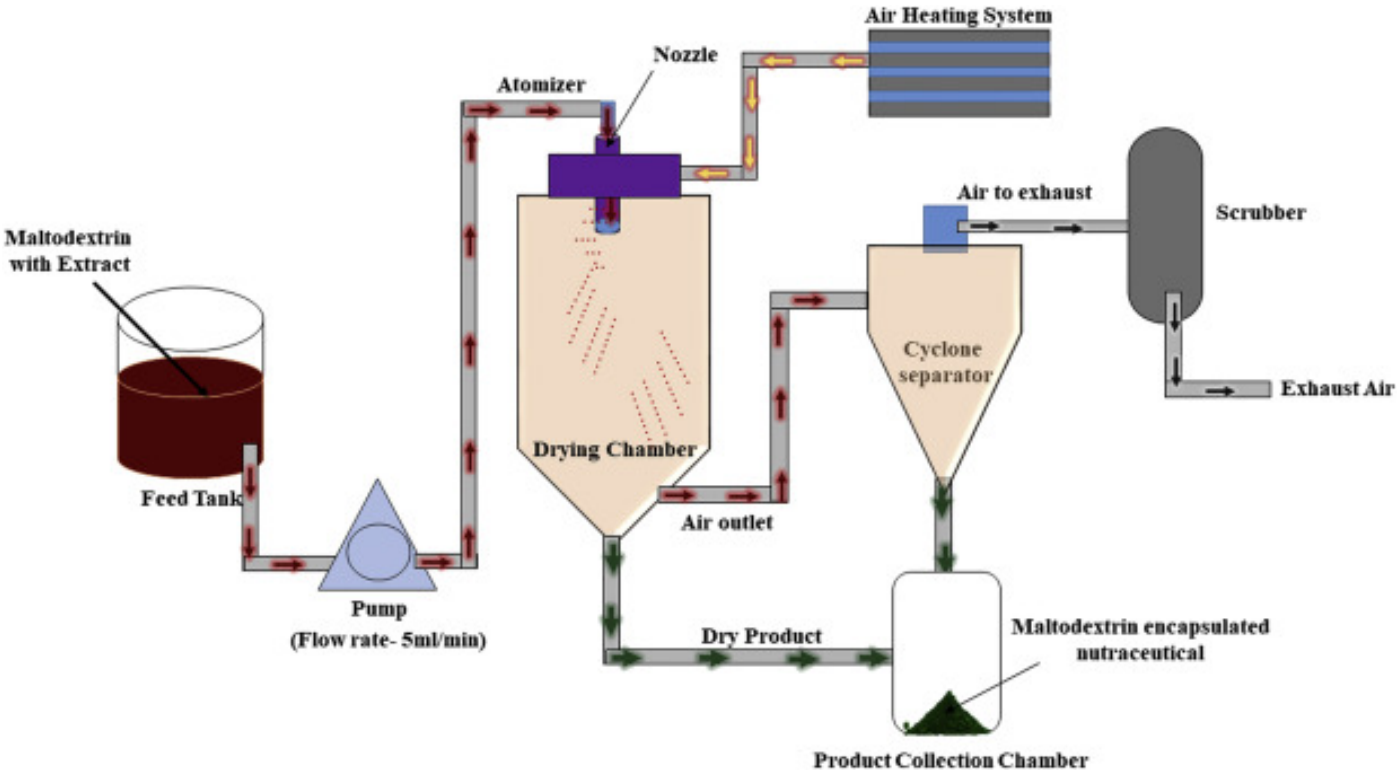

Figure 2. Illustration of spray drying process (Dubey et al., 2020).

To ensure optimal performance, the product was designed with two tea bags. The first contains the dried functional ingredients for hot infusion (to extract antioxidants and flavors), taking into account the effect of extraction on polyphenol content (Antony & Farid, 2022). The second, containing the probiotics and yeast powder, is added once the liquid cools to around 40 °C, a temperature that preserves probiotic viability.

This multi-phase process successfully integrate traditional herbal knowledge with emerging food technologies, resulting in a product that is not only functional and sustainable but also tailored to modern consumer expectations.

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V. Product Description

This innovative functional tea product is designed as a two-step infusion system (Figure 3) to optimize the delivery of bioactive compounds and ensure probiotics viability. The product consists of two separate biodegradable tea bags made from compostable plant-based materials. The first bag contains a selected blend of functional ingredients (ginger root powder, dried goji berries, and dried maqui berries) known for their antioxidant, anti-inflammatory, and gut health-promoting properties, and also includes prebiotics (black mulberry, sour cherry and blueberry) to boost gut health and probiotics effect. This bag is submerged in hot water, enabling the extraction of polyphenols, flavonoids, and other beneficial phytochemicals while delivering a balanced sensory profile.

Following an initial infusion period, once the temperature of the beverage decreases to approximately 40 °C, the second bag is introduced. This bag contains microencapsulated probiotic strains, specifically *Lactiplantibacillus plantarum*, as it has numerous probiotic properties and a great capacity to colonize numerous ecological niches (Fidanza et al., 2021), along with upcycled brewer's yeast powder, which serves as a nutrient-rich by-product from the brewing industry. The microencapsulation technique, using a spray-drying process with a protective matrix of maltodextrin and gum arabic, shields the probiotics from heat, oxygen, and moisture, maintaining their viability during storage at room temperature and ensuring effective colonization upon consumption.

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Figure 3. Two-step infusion process diagram.

The dual-phase preparation allows for flexible consumption, as the infusion can be enjoyed either warm or cold. Nutritional analysis estimates (Table 1) that this product contains 8–10 kcal, less than 0.5 g of sugars, approximately 1.5 g of carbohydrates, 1 g of dietary fiber, and 0.5 g of protein. Probiotic viability is guaranteed at a minimum concentration of 1×10^9 CFU/mL post-preparation (preparation in 200 mL).

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Table 1. Nutritional Information (per serving: 200 mL).

Nutrient	Amount
Energy	8–10 kcal
Carbohydrates	1.5 g
of which sugars	< 0.5 g
Dietary fiber	1 g
Protein	0.5 g
Fat	0 g
of which saturated	0 g
Salt	0 g
Probiotic content	**Probiotic strain**
≥ 1×10^9 CFU/mL	*Lactiplantibacillus plantarum*

What distinguishes this product from conventional functional teas and probiotic beverages is its pioneering two-step brewing process. This design overcomes the critical challenge of delivering live probiotics in a shelf-stable format without refrigeration. Unlike many probiotic foods that degrade under heat or require cold storage, this product ensures maximum probiotic survival through strategic timing of addition, combining convenience with scientific efficacy.

Furthermore, it embraces a sustainable ethos by incorporating upcycled brewer's yeast, reducing food industry waste and contributing to circular economy principles. This not only enhances the product's nutritional value but also aligns with the values of eco-conscious consumers.

Packaging is fully biodegradable, reinforcing environmental responsibility without sacrificing usability. The clean-label formula (free from artificial additives, preservatives, and added sugars) caters to today's demand for transparency and natural ingredients.

In essence, this product transforms the familiar tea-drinking ritual into a modern wellness experience. It appeals to health-conscious consumers who seek natural, functional beverages that support gut health and immune function. By seamlessly integrating tradition with innovation and sustainability, it positions itself as more than just a tea, it becomes a daily act of self-care and environmental mindfulness.

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This unique combination of health benefits, convenience, and eco-friendly design presents a compelling alternative in the functional beverage market, meeting the evolving needs of consumers who prioritize wellness and planetary health.

VI. Marketing and Promotion:

The launch of this innovative functional tea will be supported by a marketing strategy focused on its health benefits, sustainability, and convenience. The product will be positioned as a premium solution for wellness-conscious consumers, highlighting its unique combination of microencapsulated probiotics, functional ingredients, and a circular approach through the use of brewer's yeast.

The brand will adopt a minimalist design with natural tones and evocative names, such as “GutGlow Tea,” reinforcing its ecological identity with biodegradable packaging and transparent labels that highlight its key attributes, such as “1 trillion live probiotics” and “plastic-free.” The price will be aligned with its added value (€5–7 per box), with subscription options to build customer loyalty.

Distribution will combine online channels (e-commerce, Amazon) and specialized points of sale (organic stores, pharmacies), along with partnerships with wellness cafes. Promotional campaigns will include collaborations with health influencers, free samples at themed events, and educational content about its benefits, leveraging social media with hashtags such as #TeaThatCares.

To mitigate the complexity of the infusion process, the packaging will include clear visual instructions and a QR code with tutorials, transforming preparation into a mindful experience that reinforces its unique proposition.

Figure 4 shows a proposal for a promotional poster or flyer for the product that could be used at food fairs or to hand out to consumers.

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Figure 4. Promotional poster proposal.

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VII. Financial Analysis

The development and manufacturing of this innovative functional tea product involve a combination of advanced food technologies (such as microencapsulation), sustainable raw materials, and biodegradable packaging. Initial cost estimations suggest a production cost per unit ranging from €0.60 to €0.75, depending on sourcing, processing efficiencies, and packaging volumes. This includes raw materials (functional fruits, microencapsulated probiotics, and upcycled brewer's yeast), drying and spray-drying costs, and sustainable packaging.

The estimated retail selling price per unit is positioned between €1.50 and €1.80. This pricing reflects the product's added value in terms of functionality, convenience, and sustainability, while staying competitive within the functional beverage market. Based on these figures, the estimated gross margin per unit is approximately 40–50%.

Considering the increase in the consumption of functional beverages, as well as the interest of consumers in kombucha and organic teas (Mintel, 2023), it arises an initial production batch of 100,000 units is planned. Market research and consumer trend analysis indicate a high potential demand, with a projected first-year sales rate of around 65%. This translates to approximately 65,000 units sold in the first year, generating estimated revenues between €97,500 and €117,000.

With total production costs for the batch ranging from €60,000 to €75,000, the expected gross profit is estimated between €22,500 and €57,000. The break-even point is calculated at approximately 35,000 to 40,000 units sold. Given the current projections and market positioning, a return on investment (ROI) is expected within 1 to 2 years (Updata, 2025).

This financial outlook (Table 2) highlights the product's profitability and scalability. With increasing consumer demand for gut-health-supporting, sustainable, and convenient products, this tea offers an attractive opportunity for investors. Continued growth may be achieved by expanding distribution through health-focused retailers, leveraging digital marketing, and launching product variants targeting specific consumer segments.

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Table 2. Estimated Cost Structure and Revenue Forecast for Initial Production Batch

Category	Details (Adjusted)
Production cost per unit	€0.60 – €0.75
Estimated selling price per unit	€1.50 – €1.80
Estimated gross margin per unit	~40–50%
Initial batch size	100,000 units
Expected sales rate (first year)	0.65 (65% of batch)
Estimated units sold	65,000 units
Estimated revenue (first year)	€97,500 – €117,000
Estimated total costs (production)	€60,000 – €75,000
Estimated gross profit	€22,500 – €57,000
Break-even point	35,000 – 40,000 units
Estimated time to positive ROI	1 – 2 years

VIII. Challenges and Risks

The development and commercialization of this dual-step functional tea product present several technical and market-related challenges. A primary concern is ensuring the viability of the probiotic strains throughout the product's shelf life, especially under ambient storage conditions. Although microencapsulation via spray drying enhances probiotic stability, variations in temperature and humidity during storage or transport could still reduce viability. To mitigate this, packaging solutions with high barrier properties and desiccants should be used, and shelf-life testing under accelerated conditions is recommended.

Consumer compliance with the two-step preparation process is another potential obstacle. If users do not wait for the appropriate temperature before adding the probiotic bag, microbial efficacy may be compromised. This risk can be reduced through clear, intuitive instructions and visual aids on the packaging, as well as educational marketing that emphasizes health benefits and proper use.

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From a supply chain perspective, sourcing high-quality upcycled brewer's yeast consistently may pose difficulties due to seasonal or regional variability. Building partnerships with local breweries and implementing strict quality controls can help ensure a reliable supply.

Finally, regulatory requirements related to probiotic claims and novel ingredients may vary by country. Engaging with food law experts early in the development phase will help streamline approval and avoid market entry delays.

IX. Internationalization strategy

The "Tea Sack with Functional Products and Microencapsulated Probiotics" presents strong potential for international expansion due to the global rise in demand for functional beverages that promote gut health, sustainability, and convenience (Euromonitor International, 2023; Gupta et al., 2023). Scaling internationally would involve adapting product formulation, communication, and labeling to regional cultural, regulatory, and dietary contexts.

In Asia, where tea holds deep cultural and ceremonial significance, marketing should emphasize the fusion of tradition with modern probiotic science. In contrast, European and North American markets prioritize sustainability, clean labeling, and scientifically backed health claims (Latif et al., 2023; Smedescu et al., 2024). To comply with diverse regulations, the product must meet EFSA (Europe) and FDA (U.S.) standards on probiotic viability, strain safety, and functional claims. Accurate CFU labeling and allergen declarations will be essential for international credibility.

Religious and cultural factors also influence formulation: ensuring halal and kosher certification can broaden acceptance in Middle Eastern and Jewish markets, while avoiding alcohol or animal-derived ingredients supports inclusivity across diverse regions. Label transparency and sustainability messaging—highlighting biodegradable packaging and upcycled yeast—align with global consumer expectations for ethical production (Bermúdez et al., 2024).

Strategic partnerships with local distributors, wellness retailers, and e-commerce platforms will facilitate entry into new markets, while adapting flavors and ingredients (e.g., green tea, turmeric) could enhance regional relevance. This flexible, culturally sensitive approach positions the product as a globally scalable, eco-conscious functional beverage.

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X. Sustainability impact

The functional tea's lifecycle is designed with a strong focus on minimizing environmental impact, establishing a clear value proposition aligned with circular economy principles. A formal Life Cycle Assessment (LCA) will be initiated to quantify the environmental footprint across three main stages: raw materials, manufacturing, and end-of-life. The selection of plant-based ingredients naturally lowers the carbon footprint compared to animal-based alternatives. A cornerstone of the sustainability strategy is the integration of upcycled brewer's yeast. By utilizing this industrial by-product, the product actively contributes to waste reduction and enhances resource efficiency within the local supply chain. The strategy will prioritize the sourcing of local and seasonal functional ingredients whenever feasible, minimizing the impact associated with long-distance transportation. Strategies for reducing the overall carbon footprint will focus heavily on packaging and manufacturing. The use of compostable, plant-based materials for the two-step tea bags and the external packaging will eliminate non-recyclable plastic waste at the consumer level, addressing a major industry challenge. Furthermore, manufacturing operations will target a transition to renewable energy sources for the high-energy processes like low-temperature dehydration and spray-drying of the probiotics. Water usage will be monitored and optimized using closed-loop systems in the cleaning and processing of the yeast and functional ingredients. The transportation strategy will favor consolidating shipments and utilizing low-emission freight options. The resulting low complexity of the shelf-stable product further simplifies the supply chain, as it eliminates the high energy demands associated with refrigerated transport and storage. Through these actions, the product aims to achieve a significantly lower environmental impact relative to conventional functional beverages.

XI. Digital and technological integration

The development and market strategy of this functional tea is inherently linked to digital and technological integration, primarily to enhance transparency and the consumer experience. During the research and development phase, digital intelligence tools, such as data-driven trend analysis platforms, will be essential to validate the product's focus on gut health and upcycling, ensuring the final formulation aligns with predictive consumer demand and reduces commercial risk. For the market, digital channels will

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serve as the crucial link between the product's and the consumer. The packaging will feature a prominent QR code that links directly to a dedicated digital platform, providing key information that cannot be physically contained on the label. This platform will host a clear, visual video guide on the two-step infusion process, directly mitigating the risk of microbial efficacy loss due to user error (compliance). Furthermore, it will offer supply chain transparency through interactive maps detailing the ethical sourcing of the functional ingredients and the specific brewing partners for the upcycled brewer's yeast. Access to third-party testing data confirming the 1×10 9 CFU/mL viability post-preparation will also be provided, validating the health claim. In the distribution phase, smart inventory management systems will be utilized to optimize shelf-life, automatically flagging units approaching expiration to ensure the product reaching the consumer guarantees maximum probiotic potency.

XII. Make a consumer communication plan

Visual elements will highlight the product's natural origins and technological sophistication. To effectively reach health-conscious consumers who are seeking convenient and sustainable wellness products, our communication strategy will combine visual storytelling and clear, benefit-driven messaging across digital and physical platforms.

The product's packaging will have a clean and simple design with natural color tones like green and amber, to convey health and sustainability and accentuate the flavor of the product and what is made of. Icons will highlight key benefits as "Supports Gut Health", "Boosts Immunity","Shelf-Stable Probiotics" and "100% Biodegradable Packaging." Illustrations of berries, ginger roots, and tea leaves will emphasize natural ingredients, while a small infographic on the back will explain the two-step infusion system through simple visuals, reinforcing ease of use and innovation.

Textual Communication:

The line "Brew wellness, naturally" captures the essence of health and sustainability, it encapsulates the brand's promise of health, innovation, and environmental care and it conveys both the ritual of tea and the natural, functional benefits embedded in every package.

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Supporting messages will focus on:

· Functional Health: “Infused with probiotics and prebiotics to naturally support digestion, gut balance, and immune strength.”

· Sustainability: “Crafted with upcycled brewer’s yeast and packed in fully compostable tea bags — better for you and the planet.”

· Innovation: “Experience a pioneering two-step infusion that preserves live probiotics for maximum vitality and effectiveness.”

Channels and Engagement:

Social media campaigns will use short videos and infographics demonstrating the brewing ritual and explaining probiotic benefits. Collaborations with wellness influencers and nutrition experts will enhance credibility. Sampling events at food fairs and eco-markets will foster direct engagement and collect feedback.

This integrated communication approach builds trust through transparency, educates consumers on product functionality, and connects wellness with environmental mindfulness.

XIII. Conclusion

This case study demonstrates that it is possible to achieve the effective integration of tradition, innovation, and sustainability in the development of a dual-step functional tea. By combining antioxidant-rich plant ingredients with microencapsulated probiotics and upcycled brewer’s yeast, the product offers verified digestive, immune, and environmental benefits in a convenient, shelf-stable format. Technical challenges, notably probiotic viability, were successfully addressed using spray-drying and a temperature-controlled preparation protocol, while market analysis confirmed strong consumer demand for clean-label and eco-friendly products. To ensure a successful launch, the strategy emphasizes clear preparation instructions and consumer education on the two-step process, leveraging digital integration via a QR

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code for visual tutorials and supply chain transparency. For internationalization, the product's shelf-stable nature provides a logistical advantage, but global expansion will require rigorous adherence to regulatory compliance (e.g., Novel Food and viability standards) and cultural adaptation to secure certifications like Halal and Kosher. The Consumer Communication Plan will align these efforts by deploying the core message, "Brew wellness, naturally," using visual icons to highlight both functional claims 10^9 CFU/mL and sustainability benefits, thus transforming the consumption into a fully transparent and verifiable wellness experience. This product offers a compelling model for future food innovations that balance health, convenience, and environmental responsibility with comprehensive strategic planning.

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XIV. References

- Abuajah, C. I., Ogbonna, A. C., & Osuji, C. M. (2015). Functional components and medicinal properties of food: A review. *Journal of Food Science and Technology*, *52*(5), pp. 2522–2529. https://doi.org/10.1007/s13197-014-1396-5

- Antony, A., & Farid, M. (2022). Effect of temperatures on polyphenols during extraction. *Applied Sciences*, *12*(4), 2107. https://doi.org/10.3390/app12042107

- Bermúdez, S., Voora, V., Larrea, C., & Luna, E. (2024). *Tea prices and sustainability*. International Institute for Sustainable Development (IISD). https://www.iisd.org/publications/report/2024-global-market-report-tea

- Dubey, N. K., Singh, A. K., Dubey, R., & Deng, W. P. (2020). Nutraceutical encapsulation and delivery system for type 2 diabetes mellitus. In *Biopolymer-Based Formulations: Biomedical and Food Applications*, pp. 353–363. https://doi.org/10.1016/B978-0-12-816897-4.00015-1

- Euromonitor International. (2023). *Need states: Understanding the future of functional beverages*. https://www.euromonitor.com/need-states-understanding-the-future-of-functional-beverages/report

- Fidanza, M., Panigrahi, P., & Kollmann, T. R. (2021). *Lactiplantibacillus plantarum* – Nomad and ideal probiotic. *Frontiers in Microbiology*, *12*, 712236. https://doi.org/10.3389/fmicb.2021.712236

- Gupta, A., Sanwal, N., Bareen, M. A., Barua, S., Sharma, N., Olatunji, O. J., Nirmal, N. P., & Sahu, J. K. (2023). Trends in functional beverages: Functional ingredients, processing technologies, stability, health benefits, and consumer perspective. *Food Research International*, *170*, 113046. https://doi.org/10.1016/j.foodres.2023.113046

- Latif, A., Shehzad, A., Niazi, S., Zahid, A., Ashraf, W., Iqbal, M. W., Rehman, A., Riaz, T., Aadil, R. M., Khan, I. M., Özogul, F., Rocha, J. M., Esatbeyoglu, T., & Korma, S. A. (2023). Probiotics: Mechanism of action, health benefits and their application in food industries. *Frontiers in Microbiology*, *14*, 1216674. https://doi.org/10.3389/fmicb.2023.1216674

Project №: 2022-1-BG01-KA220-HED-000085089

- Mintel. (2023). *The future of global functional drinks trends*. https://www.mintel.com/insights/food-and-drink/the-future-of-global-functional-drinks-trends/

- Smedescu, D., Tudor, V., Smedescu, C., Panait, R., & Fintineru, A. (2024). Market trends in the European Union beverage industry. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, *24*(2). https://managementjournal.usamv.ro/pdf/vol.24_2/Art88.pdf

- Updata. (2025, mayo 7). *Investing in AI in the agri-food sector: What return on investment can you expect?* https://updata.ca/en/investing-in-ai-in-the-agri-food-sector-what-return-on-investment-can-you-expect/

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