CASE STUDY

Topic: Functional dairy product – traditional Bulgarian yogurt with added honey and bee pollen

Team No. 14

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Summary (150 words):

The developed case study offers a new functional dairy product - traditional Bulgarian yogurt with added honey and bee pollen. A detailed analysis of the target market, its characteristics and trends has been conducted. The target audience and its needs have been presented. The competition and the market for similar products have been analyzed. The study includes a description of the product, technological processes for its production, recipe and nutritional composition. A marketing strategy, pricing strategy, distribution channels, promotional activities and solutions for labeling, packaging and branding of the product have been proposed. A financial analysis of the costs of developing and producing the new food product and sales revenues has been presented, based on a conducted market study. The profitability and return on investment have been assessed. Potential challenges, risks and obstacles that could affect the success of the new product have been identified. Strategies for dealing with emergency situations related to these challenges have also been proposed.

Introduction (300 words):

Functional foods are an important segment of the modern food industry, representing approximately 10% of global production. They combine good taste with positive effects on human health, which makes them preferred by health-conscious consumers (Granato et al., 2020). Bulgarian yogurt, as a functional product, stands out for its nutritional value and richness in probiotics. Thanks to natural fermentation processes, it is not only a food product, but also a means of supporting digestive and immune health (Park, 2009). The traditional production technology and unique microbial culture make Bulgarian yogurt a suitable basis for developing new functional foods with added beneficial ingredients. Despite the proven benefits of Bulgarian yogurt, the market lacks sufficient innovative products that combine functionality with improved organoleptic properties. There is a need for new foods that meet the growing demand of consumers looking for healthy and natural products with proven positive effects on health. The idea of enriching yogurt with bioactive components such as honey and bee pollen stems from the desire to improve its functionality. These bee products are natural sources of antioxidants, enzymes, vitamins and prebiotics that contribute to improving health. They support the growth of beneficial intestinal flora, help reduce inflammation, improve metabolic activity and support overall protection against chronic diseases (Gómez-Ruiz et al., 2022). The combination of probiotics in yogurt and bioactive compounds in honey and bee pollen creates a product with potential synergistic effects. In addition to health benefits, such a product can

offer good organoleptic qualities, important for consumer acceptance. The improved taste, aroma and texture achieved by enrichment with bee products would encourage consumption and market penetration. The creation of this innovative functional product not only responds to the growing demand for natural and healthy foods, but also opens up opportunities for the development of new markets.

Market analysis (300 words)

The product launch approach focuses on creating a premium brand that meets the health needs and high expectations of modern consumers seeking value, quality and clear benefits. The combination of low raw material costs and high added value of the final product creates the potential for strong profitability. However, achieving sustainable success requires precise market positioning and clear communication of the product's benefits. Although bee pollen has limited popularity among the general public, it is seen as a valuable functional ingredient by health-conscious groups. Awareness of its benefits, proper use and safety is key to overcoming doubts related to allergic reactions or insufficiently known effects, which requires a targeted educational campaign. Traceability of raw materials is also important to build trust with consumers. This reinforces the perception of authenticity, sustainability and quality – critical elements in creating a premium brand (Gómez-Ruiz et al., 2022). The target audience includes health-conscious consumers aged 25 to 55 who are interested in balanced nutrition, natural ingredients and functional foods with a "clean label". They are willing to pay more for organic, locally produced products and pay close attention to composition and labeling. Transparency and ethical sourcing of ingredients are highly valued. Preferred shopping channels include organic food stores, farmers' markets, specialized online platforms and pharmacies (Euromonitor, 2023). Sales of functional dairy products are showing steady growth, with increasing demand for probiotic-rich yogurts, "clean label" formulas and value-added ingredients such as vitamins, antioxidants and natural prebiotics (Statista, 2024). The market for bee pollen is also expanding due to the growing awareness of its nutritional and therapeutic properties (MarketWatch, 2024). This creates an opportunity to position the product in the functional yogurt segment with plant and bee ingredients.

Research and Development (500 words)

The research and development process for the new functional product "Bulgarian yogurt enriched with honey and bee pollen" is fully based on validated scientific sources and includes innovative technology aimed at improving both the stability and bioavailability of the bioactive

compounds. To improve bioavailability , the pollen undergoes mechanical pre-treatment by cryogenic micronization, reducing the particle size to approximately 10 μm. This process destroys the exine layer, allowing the release of nutrients into the gastrointestinal tract (Morais et al., 2011; Rzepecka-Stojko et al., 2015). Micronized bee pollen powder is stabilized by combining it with raw, unflavored and non-thermally processed manna honey, which acts both as a prebiotic and a natural preservative due to its high osmotic pressure, low water content and enzymatic activity (Bogdanov et al., 2008). Manna honey is rich in phenolic compounds, organic acids and flavonoids, which interact with the bioactive components in the pollen, synergistically contributing to the functional and sensory qualities of the product (Alvarez-Suarez et al., 2010). The base of the product is traditionally fermented Bulgarian yogurt, prepared from standardized cow's milk with 3.6% fat, homogenized (60–65°C / 10–12 MPa) and pasteurized (90–95°C / 5 minutes). After cooling, the milk is inoculated with a starter culture containing *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus thermophilus* at a concentration of 2–5% (Tsigkrimani et al., 2023). After fermentation and cooling, the honey-pollen mixture containing 4% bee honey and 0.4% bee pollen was added under pressure with slow, continuous stirring to ensure homogeneity (Isik et al., 2019). The mixture was pre-aged for 24–48 hours in dark, tightly closed containers at 20–25°C. This step facilitates the diffusion of bioactive compounds and further fermentation without compromising the flavor profile of the final product (Gómez-Ruiz et al., 2022). In case of crystallization of the honey, it was carefully liquefied by ventilated air at 35–40°C to preserve its bioactive composition. The finished product is packaged and pre-cooled at 18–20°C before final cooling and storage at 5–8°C. A highly active starter culture is used under aseptic processing conditions to extend shelf life. Starter cultures with reduced acidophilic and thiolytic activity help to preserve flavour and quality during long-term refrigeration, allowing a shelf life of 1–2 months (Zhou et al., 2019). The levels of added ingredients are based on experimental data showing that optimal sensory effects are achieved with 0.4% bee pollen and up to 5% honey. These concentrations do not inhibit lactic acid fermentation and are associated with increased antioxidant activity and total phenolic content as measured by DPPH and Folin-Ciocalteu assays (Kroyer & Hegedus, 2001). There is currently no established production scheme that integrates cryogenic micronization of bee pollen, stabilization in a honey matrix, and addition of the mixture after lactic fermentation. Although these individual steps have been applied separately, their combination into a complete production is lacking, and although the use of honey as a carrier for bee pollen has been described in some patents, this practice is not widely adopted or part of an established production process.

Product description (500 words)

The proposed fermented milk product was developed in response to the growing demand for healthy, "clean label" products, combining traditional lactic acid fermentation with the proven benefits of apitherapeutic bioactive ingredients (Alvarez-Suarez et al., 2010; Komosinska-Vassev and al ., 2015).

The formula includes: 95.6% pasteurized cow's milk, a mixture of 4% honey, 0.4% micronized bee pollen and a starter culture of *Lactobacillus delbrueckii subsp . bulgaricus* and *Streptococcus thermophilus.*

Nutritional value per 100 g of product:

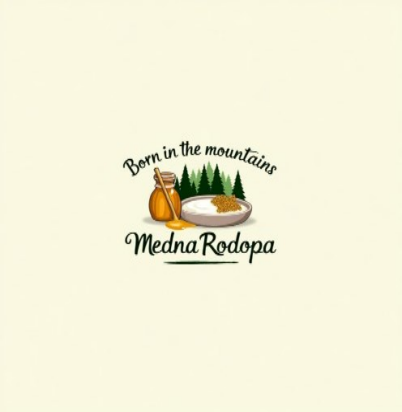
- Energy: 320 kJ / 76 kcal
- Fat: 3.4 g (of which saturated: 2.6 g)
- Carbohydrates: 7.9 g
- Protein: 3.2 g
- Salt: 0.2 g (all from naturally occurring sodium)

The product stands out with attractive sensory characteristics — a creamy yellowish color, derived from the natural pigments in honey and pollen. The aroma is clean and slightly sour, with floral and sweet nuances. The taste is fresh and slightly sour, complemented by a delicate natural sweetness and a subtle aromatic complexity. The texture is dense, smooth and homogeneous, with no signs of separation or graininess — indicators of effective emulsification and microbiological balance (Gómez-Ruiz et al., 2022).

The key unique advantage of the product lies in the optimized ratio and method of incorporating bee-derived ingredients. Although honey-fermented dairy products exist on the European market, the addition of micronized bee pollen as an integrated ingredient rather than a separate supplement is unprecedented (Isik et al., 2019). The product also offers high flexibility - consumers can choose how to consume it: directly with a spoon as a dessert yogurt, as a concentrated "shot" for targeted nutrient intake, or diluted with water in a ratio of 1:1 or 1:2 to create a refreshing probiotic drink with a slight natural sweetness and no added sugar. This diluted form is easily digestible and retains the functional benefits. This flexible use makes the product universally applicable in various everyday situations - from breakfast at home, energy support during sports, to light functional snacks in the office or meals after hospital. Furthermore, the ease of customizing the product with additives such as fruits, nuts or cereals increases its individual appeal. Thanks to these features, the product significantly expands its market potential, allowing successful positioning in different consumer segments. In this way, this functional yogurt becomes not only a food product, but also a multifunctional solution,

meeting modern needs for health, convenience and variety. The product has the potential to be developed into an organic version using certified organic milk, mandarin honey and bee pollen, in response to the growing demand for high-quality, organic foods . The product improves the intestinal microbiota, boosts immunity, reduces inflammation and supports metabolism. Mandarin honey acts as a natural preservative, while micronized bee pollen improves the absorption of nutrients. The use of mandarin honey and pollen from local producers promotes environmentally responsible practices and supports biodiversity. In this way, consumers not only choose functional food, but also indirectly contribute to preserving the natural balance and supporting sustainable farming communities.

Marketing and Promotion (300 words)



Product packaging: Opaque PET container with UV filter, capacity 250 g. Product name: MednaRhodopa – fermented milk product with honey and bee pollen.
Ingredients: Pasteurized cow's milk, a mixture of honey and micronized bee pollen (4.4%), starter culture: *Lactobacillus delbrueckii subsp. bulgaricus* , *Streptococcus thermophilus.*
Allergens: Contains milk and bee products. Not recommended for people allergic to bee pollen or honey.
Nutritional value per 100 g of product: Net weight: 250 g. Instructions for use: Ready for direct consumption. Can be eaten with a spoon, consumed as a "shot" after shaking the container or diluted with water in a ratio of 1:1 or 1:2 as a drink. Storage conditions: Store at a temperature between +2°C and +8°C. After opening, store Store in the refrigerator and consume within 3 days.
Manufacturer: Origin of main ingredients: Milk, Manuka honey and bee pollen Minimum shelf life: See the label on the cap/packaging.

The product packaging includes a QR code providing detailed information about:

• Functional benefits of the product

• The origin of the ingredients

• Production technology

• The environmental commitment of the product.

This positions the product as innovative and committed to sustainable nutrition. Distribution will be through specialty grocery stores , organic stores, online platforms and farmers markets, with plans to expand into pharmacy chains and functional and sports nutrition stores. Online sales will be supported by a dedicated website and partner e-stores.

Promotional activities include in-store tastings, discount campaigns, seasonal offers, participation in health and wellness fairs and festivals, as well as educational posts and videos on social media through influencers, nutritionists, and farming communities.

Financial analysis (300 words):

Table 1: Determining product pricing

	Purchase price, €/kg including VAT	Price for 250 g of finished product, €
Cow's milk	0.5	0.12
Honey from mango dew	15	0.15

Bee pollen	15	0.015
Sourdough	12.5	0.025
Packaging		0.037
Total costs for raw materials + packaging		0.347
Production costs (30%)		0.451
Operating expenses – marketing and logistics (20%)		0.541
Profit (30%)		0.703
VAT (20%)		0.844
Final price, €/250 g finished product		0.9

According to data from the National Statistical Institute (NSI) for 2024, the active population in Bulgaria aged 25–55 is approximately 2,800,000 people (NSI, 2024). It is estimated that 1% of this group are potential consumers, purchasing 4 packages per month, which equals 1,344,000 packages per year.

Indicator	**Value**
Price per package, excluding VAT	0.75 euros
Package price excluding VAT	0.541 euros
Estimated annual package sales	1,344,000 units

Annual profit = (0.75−0.541) × 1,344,000 0.209 × 1,344,000 = 280,896 euros

Table 2: Breakdown of investments

Component	Description	Quantity	Price (€)
Yogurt production line 200 kg/h	Automated aseptic line with UHT pasteurization,	1	525,000

	homogenizer, fermentation, CIP system and filling		
Heating vessel with stirrer 100 L	Stainless steel, water jacket, digital temperature control	3	60,000
Cryogenic grinding of bee pollen 5 kg/h		3	75,000
Honey dosing machine 10 kg/h	Automatic pressure spraying	1	30,000
Transfer pumps 10 kg/h	Stainless steel	3	19,500
Pipes and fittings	Stainless steel, complete set	full	40,000
Automation (PLC system)	Control of all components of the line	1 completed	65,000
Installation and assembly	Commissioning and setting up the equipment		55,000
Laboratory equipment			95,000
Total investment			965,000

* Prices are based on equipment supplier offers available in the period 2024–2025.

ROI = (Net Profit / Investment) × 100 = (280,896 / 965,000) × 100 = 29.11%

The financial analysis shows that the product is viable for market launch and growth, with potential to expand the product line and increase market share.

Challenges and risks : (200 words)

Timely identification and development of clear response strategies are crucial for the successful launch of the new product on the market. From a technological perspective, controlling the fermentation process and preserving the structure of the yogurt are key. To prevent the degradation of bioactive compounds, honey and bee pollen are added after fermentation is complete. Pilot tests ensure even distribution of additives and preservation of functional ingredients. Market challenges include limited consumer awareness of the benefits of bee pollen, higher price compared to regular yogurt, and competition. To address these issues,

information campaigns will highlight the uniqueness and health benefits of the product, positioning it in a specialized functional food segment. Financial and logistical risks include the need for investment and securing raw materials of consistent quality. To mitigate these risks, external financing opportunities will be sought and partnerships will be established with several certified suppliers of bee products. In case of prolonged low demand, the product could be transformed into a beverage or production could be focused on separate products - yogurt and honey-pollen mixture. In addition, variants with herbal extracts (e.g. white peppermint) could be developed to expand the product portfolio.

Conclusion : (150 words)

The presented functional dairy product – Bulgarian yogurt enriched with honey and finely processed bee pollen – offers a modern approach rooted in traditional recipes and innovative production methods. The careful selection of ingredients and the gentle processing technology preserve the biologically active components known for their health benefits. The combination of probiotics, antioxidants and natural sweetness meets the current demand for functional products with a clear origin and a clean label. Market analysis reveals strong consumer interest in balanced nutrition. The use of digital tools such as QR codes for tracking and additional information builds trust and emphasizes the transparency of production. The flexible consumption options of the product expand its applicability in various everyday situations. Economic parameters demonstrate good profitability, providing growth potential. The product successfully combines a scientific approach, tradition and innovation, forming a solid foundation for market breakthrough and sustainable growth.

Internationalization strategy (250 words)

"Medna Rodopa" is more than a functional dairy product - it is an authentic Bulgarian treasure and a symbol of the national farming heritage. Produced according to a traditional recipe with the unique probiotic strain *Lactobacillus bulgaricus* and enriched with honeydew honey and bee pollen, it carries the taste and spirit of the Rhodope Mountains around the world.

The global expansion strategy is based on a licensing model and partnerships with regional producers who apply the original technology and use local raw materials. This ensures compliance with national regulatory requirements, optimizes logistics, reduces carbon footprint, and stimulates the local economy and beekeeping.

The initial market focus covers Germany (organic products), Japan (fermented food traditions), UAE (premium nutrition) and India (growing demand for probiotics).

The product adapts to the cultural, religious and consumer characteristics of the target markets. In Arab countries, the emphasis is on halal certification, purity and natural origin. In Israel, the communication emphasizes traceability and authenticity, corresponding to kosher requirements. In Japan and South Korea, the product is positioned as a combination of the Bulgarian probiotic tradition and the Asian philosophy of harmony and wellness , where minimalism and healthy balance are valued . In Europe and India, the focus is on organicity , functionality and a healthy lifestyle.

“Medna Rodopa” is scaled not as a standard product, but as a range of locally adapted versions, each of which carries its own Bulgarian DNA, but speaks the language of the local market. Thus, its internationalization becomes not just an economic expansion, but a cultural mission that promotes Bulgaria as a source of health and authenticity.

Sustainability Impact (max . 300 words)

Medna Rodopa is designed as a functional food product that combines high nutritional value , environmental responsibility and social impact throughout its value chain - from raw material extraction to the end consumer.

1. Local production and short supply chains

The raw materials — milk, honey and bee pollen — are provided by certified Bulgarian farmers and beekeepers , which reduces transport emissions and supports the local economy. According to preliminary estimates, this model can reduce the carbon footprint by up to 40% compared to centralized supplies.

2. Support for biodiversity and beekeeping

Through partnerships with beekeepers, the product contributes to the conservation of bee populations — a key factor in ecosystem stability. Part of the proceeds are planned for educational programs and the protection of bee habitats , according to the principles of sustainable beekeeping.

3. Resource efficiency and low-energy production

The technology for post-fermentation addition of bee products allows the preservation of bioactive ingredients without intensive heat treatment. This leads to lower energy consumption , closed water cycles and waste minimization. The production is designed according to the “zero waste” principle , with by-products being recycled or utilized.

4. Sustainable packaging and digital traceability

The product comes in a UV-protected PET container that is 100% recyclable . The included QR code provides transparency through information on the origin of the raw materials, the production process and the environmental footprint, as well as instructions for proper recycling.

5. Socio-economic impact

The model stimulates the development of rural regions by supporting small farmers and beekeepers, promotes female entrepreneurship and creates jobs in sustainable sectors.

The estimated average carbon footprint per package is approximately 140 g CO_2 eq , which is 35–50% lower than conventional dairy products. This result positions “Medna Rodopa” not only as a food product, but as a sustainable solution , combining economic, social and environmental benefits.

Digital and Technological Integration (max. 250 words)

The product goes beyond the traditional understanding of a functional dairy product by integrating the full life cycle – from production and logistics to personalized consumer experience and marketing.

1. Personalized user experience

Each package contains a QR code that leads to NeuroTaste Profiler – a digital tool that analyzes the taste preferences, mood and lifestyle of the consumer. Based on this data, an individual taste profile is created with recommendations for optimal consumption. This approach increases engagement and creates a sense of uniqueness without the need for multiple product lines.

2. Transparency and sustainability through QR code

The QR code provides access to information on the origin of raw materials, production technology, ecological footprint and proper recycling. Additional materials such as videos, infographics and beekeeper stories strengthen consumer trust and the educational value of the product.

3. Automation and IoT control

The production process is fully digitalized through sensors and automated systems that monitor production parameters in real time. This ensures stable quality, minimizes technological losses, and facilitates rapid scaling through licensing partners.

4. Online marketing and digital channels

The marketing strategy uses:

- **Interactive website** with taste preference and mood tests;
- **Social networks** with influencers , nutritionists and wellness communities;

- **Personalized remarketing** through emails based on the user's taste profile.

5. Smart Logistics and Blockchain

Blockchain implementation ensures full traceability “from hive to fridge,” and the planned mobile app integrates data from wearables for sleep, activity, and mood to offer personalized consumption recommendations.

Technological integration transforms Medna Rodopa in a "smart product" that is both personalized, transparent and sustainable.

Consumer Communication Plan (max. 250 words)

Medna 's communication strategy Rodopa combines the functional benefits of the product with an emotional and digital user experience, creating engagement and loyalty through personalization, interactivity, and scientific justification.

Key messages:

- **Health:** probiotics , antioxidants and bioactives nutrients from honey and pollen.
- **Transparency:** clean label, QR code for traceability and local sourcing.
- **Nature:** "Made with Bulgarian milk, honey and bee pollen - symbols of the richness of our land."
- **Sustainability:** eco-friendly packaging, supporting biodiversity and reducing carbon footprint.
- **Heritage:** "Each package carries the taste of Bulgaria, from our mountains to your table."

Personalized User Experience – NeuroTaste Profiler

A QR code that leads to an interactive test that analyzes the user's taste preferences, mood, and lifestyle. The result is an individual taste profile with a recommendation for consumption.

Communication channels:

- **Digital:** Social Networks Partnerships with Wellness influencers and nutritionists, educational videos and blog posts.
- **Retail :** tastings, promotional stands and educational materials on site.
- **B2B:** licensing program with localized flavor profiles, marketing assets, and training.

Educational initiatives:

MednaRodopa is an interactive experience that connects the tradition of Bulgarian yogurt with modern technology and a personal user experience. Through the integration of QR codes, NeuroTaste Profiler , digital channels and influencers , each consumption becomes a

personalized discovery, adapted to mood, taste preferences and lifestyle. This approach combines transparency, science and sustainability, creating an emotional connection between brand and consumer that goes beyond traditional interaction. Each package is a gateway to health, taste and authenticity, setting standards for innovation, personalization and loyalty in the functional food category and probiotics , building trust and loyalty.

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