



PROCEEDINGS
BOOK 12th ICEEE–
2021

“Global Environmental Development & Sustainability: Research, Engineering & Management”

November 18 – 19, 2021 RKK – Óbuda University, Budapest, Hungary

ISBN: 978-963-449-256-6

www.iceee.hu

THE IMPORTANCE OF SUSTAINABLE DAIRY FUNCTIONAL FOOD PROCESSING

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Abstract *The functional food is one of the main directions of healthy lifestyle and sustainable food production, due to its positive influence on health because of the usage of raw materials of natural origin. Therefore, it attracted the interest of consumers and manufacturers concerning human healthy lifestyle and sustainable economic growth. In addition to this, the importance of supplying local food markets with healthy alternatives for consumers by small and medium enterprises (SMEs). For this purpose, our study will discuss the importance of functional food for better sustainability, especially in dairy functional food in the Hungarian market by reviewing previous studies and logical analysing for better comprehension and recommendations for SMEs in the Hungarian market.*

Keywords: *Sustainability, Functional Food, Dairy, SMEs, Healthy Food.*

INTRODUCTION

Functional food has become one of the main directions of a healthy lifestyle and sustainable food production due to its promising positive impact on health and its relationship with the use of natural ingredients [1–3]. Therefore, It has attracted great interest from consumers and manufacturers who are concerned about human welfare and sustainable economic development [4]. Not surprisingly, new socio-demographic trends (e.g., longer life expectancy, promotion of healthier lifestyles, better health care, etc.) supported the functional sector to become an increasingly attractive segment of the food industry with a rapidly growing market [5]. Many mid- and long-term developments in society, and socio-demographic trends in favor of functional food, have led to the belief that functional food represents a sustainable category in the food market [6,7].

High value-added functional foods have become the fastest growing area of the food industry. According to Euromonitor's estimate, the share of functional foods in the global food market has increased by 33 billion USD to 176.7 billion USD between 2000 and 2013, accounting for approximately 5% of the total food market [8]. The global market of functional foods is expected to cross \$192 billion by 2020 [9,10]. In line with global trends, the market share of functional foods faces explosive growth in Central and Eastern Europe as well, and research into the habits, expectations and attitudes of targeted consumer groups is of prime importance for the development of adequate regional marketing strategy. The growing importance of food product functionality was recognized even before the turn of the millennium by the food industry, which accelerated the development of new products. However, new products have a high market failure rate, because most of them have not been preceded by a deeper exploration of consumer demands [11]. Other ways to improve traditional food processing have increased over the past decade. In addition, the development of new dairy products is gaining attention due to the increase in the demand for palatable, healthy, well-made more sustainable products. Ultrasonic processing or sonication is a promising alternative technology in the food industry as it can improve

the technology and functional properties of dairy and dairy products [12]. In our globalized world the mindset and business practice of companies has changed, it is constantly changing. The instability of Global Markets, the Sustainability crisis, and the constant changes in Consumer Demand are few of the local and global challenges. Companies are facing tough times to stay and stay competitive. The secret of successful companies has many facets, one of which is a well-chosen competitive strategy. Most of the national companies use different types of strategies and practices to Adjust to the national capabilities [13]. In our research project mostly SMEs are involved, therefore the literature review will focus in this sector.

The spread of diet- and lifestyle-related diseases of civilization is continually increasing around the world, and obesity, hypertension, cardiovascular disease and diabetes carry severe personal, economic and social burdens on a global scale. Consequently, the role of disease prevention has become strategically important and a growing scale of consumer groups has realized that proper nutrition can beneficially influence their quality of life [14,15]. This new trend presents new challenges for the food industry: companies must develop and commercialize food products that, due to their health preservation values, are capable of preventing the spread of diseases of civilization. The increasing number of consumers requiring a special diet due to health problems or lifestyle decisions has opened up new opportunities for operators in the food chain. This could designate the directions for the development of products of the Hungarian food industry. Since functional food products can only be successful in the market if they meet consumer expectations.

LITERATURE REVIEW:

Functional Food

Functional foods are unprocessed or industrially processed natural foods that have beneficial health effects beyond their basic nutritional value when consumed regularly [16]. In addition to the aforementioned, the production of functional foods with the application of innovative technologies is becoming increasingly popular (e.g. juices, dairy, etc.) due to increasing government requirements and support to decrease high spending and the elimination of toxic chemicals and energy [17]. Every year the main trends regarding functional food products are announced. It is obvious that the specific items on this list vary from year to year. However, there is a constant message about the future of functional foods. This future depends on strong, proven evidence of the health-related and sustainability issues benefits of functional foods for consumers. In keeping with trends in the food industry, functional foods have become popular around the world as part of the daily diet [18]. These days, the importance of food has shifted from providing essential nutrients to sustain life and growth to preventing or even curing various forms of disease. Functional foods are intended to be consumed as part of the normal diet and contain biologically active components that reduce the risk of major diseases [19]. Another definition of functional food as 'foods similar in appearance to conventional foods that are consumed as part of a normal diet and have demonstrated physiological benefits and/or reduce the risk of chronic diseases beyond basic nutritional functions [20].' Food can be called a 'functional food' when it consists of a food component (whether a nutrient or not) that positively affects one or more predetermined functions in the human body [21]. It can also include foods from which a potentially harmful component has been removed by technology.

As the development of new functional components and the solution of technological challenges is a highly costly and risky matter, the analysis of consumer behavior influencing the purchase of products is paramount for manufacturers to avoid investment failure. Companies must therefore monitor changes in consumer attitudes towards functional foods and ensure that their newly developed products meet consumer expectations. Furthermore, it is recommending that functional food research and development departments, research and development departments of manufacturing companies, as well as their marketing experts, devote their resources to developing and communicating products that help prevent diseases that are most accepted by consumers. All this would also help to facilitate this view that the planned development of functional foods should focus on the prevention of a disease that consumers would like to prevent by consuming functional foods, which has been included as a basis for evaluating international or national grants.

In this way we can expect the consumption of functional foods to increase significantly and play a more important role in improving the health of society [22]. New food processing technologies are focused on the production of palatable, healthy, safe, nutritious and minimally processed food. The search for such alternative

processes has drawn attention to new food technologies, such as non-thermal technologies, in order to avoid changes in the taste or nutritional content of foods during production. High-intensity ultrasound (HIU) is a promising emerging technology, especially designed for economy, simplicity, and energy efficiency. HIU has attracted considerable interest in food science and technology due to its wide range of applications, either in processing or evaluation of products [23,24].

Dairy Functional Food

Functional dairy foods are innovative products in the dairy industry, and also the fastest growing segment of the dairy market [25,26]. Milk and dairy products are almost indispensable staple foods, which are an important source of most nutrients [27]. Although the first description of lactose sensitivity is from Hippocrates 400 BC, clinical symptoms have only been fully documented in the last 50 years [28]. Today, nearly 70% of the world's population suffers from hypolactasia, which often remains hidden and can lead to a lasting deterioration in quality of life [29]. Lactic acid bacteria in fermented dairy products can reduce the symptoms of lactose sensitivity, while they remain an important source of protein and calcium [30]. Increasing the widespread distribution, consumption and awareness of functional foods can contribute to enhance public health statistics [31]. Therefore, the development of lactose-free functional foods to meet the needs of consumers is one of the priority areas in the food industry today. Research shows that consumer behavior in Hungary is slowly changing, and a positive trend has emerged, but it will take time to develop a strong conscious consumer base about the importance of FF and its benefits for sustainability and healthy life [32].

Food fortification is one of the most important processes for improving the quality and quantity of nutrients in food. It can be a very affordable public health intervention. Due to the high consumption of dairy products such as yogurt, fortifying these products will effectively reduce or prevent diseases related to nutritional deficiencies. The use of a specific organism in a specific product relies on its probiotic and health promoting effects. *Bifidobacterium bifidum* and *Lactobacillus reuteri* were considered the most important probiotic bacteria for human health. Some probiotic effects attributed to these bacteria including improved lactose utilization, prevention of diarrhea, colon cancer, hypercholesterolemia, improved vitamin synthesis, calcium absorption and also showed anticarcinogenic activity [33,34]. Ingestion of probiotics usually induces the reduction of serum cholesterol, alleviation of lactose intolerance, reduction of indigestion, and other intestinal disorders [35]. It also reduces cancer risk and resistance to enteric pathogens and increases antihypertensive effects. The health beneficial activities of probiotics have been incorporated in Figure. 1

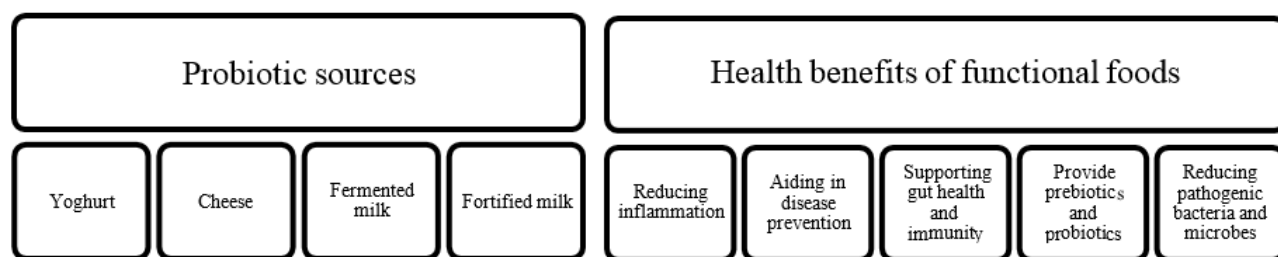


Figure 1. Health benefits of functional foods and dairy natural sources of probiotic [36][37]

Bioactive functional foods have occupied a promising position in modern food markets due to their role in combating oxidative stress and various biophysiological disorders. Yogurt is consumed as a functional food due to its high nutritional contents, and its health benefits can be enhanced by adding probiotic bacterial strains and bioactive compounds. Besides, fortifying yogurt with natural compounds will enhance the antioxidant properties that can help in utilizing natural resources [38]. Therefore, it could benefit from the development of a project and/or application of commercial industries for the production of bioactive peptides from fermented milk products, milk spoilage can be reduced to a greater extent and also a new industry in agricultural agriculture can be planned. An integrated initiative could provide employment opportunities to a wide range of people who can contribute to a country's GDP and national socio-economic development. Although the bioactive peptide has the potential to be used in the production of functional foods with health promoting properties, safety concerns should first be confirmed [38].

Small and medium enterprises

Milk production and processing is one of the main agro-food sectors in Hungary, and Hungarian milk sector plays an important role in the Central-European region. Among Member States which acceded the European Union as from 2004, Hungary has the second largest share (1.2%) from the total EU-27 milk production, after Poland (6%) [39]. In the case of agri-food SMEs, relevant and reliable information on a product's ingredients and production processes is needed so that companies can recall their products in case of food safety concerns [40]. Those food processing in SMEs which are adequately financed still lack qualified professional staff, only half of the SMEs prepare a business plan, a quarter of them does not even have a vision in writing, there is no brand building or marketing strategy [41].

Unfavourable tendencies of the profitability, efficiency and financial position of the Hungarian agricultural enterprises have started after the political changes, and the financial performance of the Hungarian agricultural enterprises have not improved significantly in the examined period (between 2002 and 2009) [42]. It was highlighted that there is a significant difference between Hungarian agricultural enterprises according to their size; the small sized enterprises (mostly family farms) are unable to develop and they are lagging behind the better-developed large agricultural companies [43]. analysed the difference between size categories of milk processing enterprises and results showed a much higher realized return on assets in the case of large companies compared to smaller ones [39]. However, dairy companies with Hungarian ownership could raise their financial performance and market share in the last few years [44].

According to the Eurostat database, 127 enterprises operated in milk processing sector in 2016, with a sample of (37 enterprises) covers 30% of the total population. SMEs are emphasized more due to the higher number of SME companies and higher market influence. The Hungarian SMEs sector has innovation shortage and shareholder communication is not conceptual and productive enough [45]. SMEs survival rate and business entry is different all over the world depending on the business environment. SMEs sector need different strategy approaches both in Hungary and internationally. Productivity discrepancies translate into unequal wages in the SMEs sector compared to large companies [46]. On the other hand, SMEs take much smaller share of the export than large companies. Most of the European SMEs (90%) are successful on the local market, typically within their own region [47].

Hungarian dairy industry shows a rather diverse picture. The majority of the dairy sector is not up-to-date and modern enough [48]. Despite growth and opportunities, challenges are expected for milk processing companies, one of the main problems could be the environmental sustainability environmental sustainability in the forthcoming period [49]. The length and the degree of complexity of food supply chains depend on the product and market characteristics [50]. One of the biggest problems is the high rate of stocks and receivables; the financing between creditors and receivers has many problems. Most of the agricultural enterprises have liquidity problems [42]. After analyzing the performance of the Hungarian agricultural enterprises and the food-processing sector, results show that most of the agricultural enterprises cannot take the advantages of several supports (e.g. tax allowances) because of their poor financial performance [51]. The advantages of the accession translated to expanded market, the co-financed investments and modernization programmes, the higher income level increased by the payments etc. But advantages could not be utilized by most of the farms [52]. According to the results of collected information concerning to the general market orientation is typical of the respondents, and few of them have particular information about their own product. Otherwise they believe that their market research activity is at the required level.

It shows that they are unaware of the lack of information and do not believe it is a barrier from the point of view of their market success. [53]. Managers say the biggest problems for them are selling their products. They claimed that the trading companies had stronger marketing positions and that they could not compete with foreign dairy products. According to company executives, they want to innovate different products but it costs more and are not well paid by the market. From a corporate point of view, it was shown that retail stores and wholesale stores (chains) are the main activities of daily product sales; direct marketing was marginally present. Consumers report that there is more demand for direct sales from companies. Processors should pay more attention to this type of application in the future. Direct selling can be developed in two ways in case of the companies. The first one is to run own shops in towns/villages, or even in markets. Secondly, online selling will prove to be an extremely good alternative of producers considering direct selling [48].

It is difficult to fulfil the new technological conditions for milk producing [54]. Research and development

costs have a negative impact on the innovation performance in the case of small and medium sized enterprises operating in the Hungarian food supply chain [55]. The results also indicate the sustainability challenges that dairy manufacturers have to face, and the authors implemented an energy consumption model[56]. The competitiveness of dairy manufacturers can be increased through cost reduction that is enabled by environmentally sound technologies [57].

Functional Food Customer Motivation

Over the past three decades, consumer behavior and buyers' habits in developed countries have changed radically. On one hand, the foods that contribute to maintaining life and reducing health caused by diseases of civilization are detriments to the growing aging societies, on the other hand with the development of health care more and more nutritional diseases have become apparent. It is understood that food and nutrition play a major role in treatment and prevention [58]. All of this creates new type of consumer expectations for the market, whether it be the price of special diet products or the willingness to pay extra cost.

Healthy behavior is a complex system that involves physical activity, mental health, hygiene, and avoiding harmful recreational drugs to supplement informed dietary choices, in addition to the awareness about environmental sustainability issues. In summary, according to the findings of the study, there is a significant relationship between lifestyle, healthy behavior, and demand for functional food products. According to most consumers. They eat dairy products as part of Their healthy and effective diet. When examining how well consumers know the producer and the brand and what the difference is between them, it became clear that people who consciously live healthy know the manufacturer and do not confuse them with the definition of brand/branding [48].

Today, consumers are increasingly looking for products that are safe and natural, have a generally recognized safe status and are manufactured using sustainable and/or environmentally sound technologies. For this reason, the term “functional food” is becoming increasingly popular in the social and scientific fields, so that the industry is continuously investing in the development of an industry that can offer products with additional benefits for the health of consumers [59].

Different surveys showed that consumer acceptance of functional foods is far from being unconditional, with one of the main conditions for acceptance pertaining to taste, besides, product quality, price, convenience and trustworthiness of health claims. As a rule, consumers seem to evaluate functional foods first and foremost as foods. Functional benefits may provide added value to consumers but cannot outweigh the sensory properties of foods. By purchasing functional foods in general consumers may achieve a modern and positive impression of themselves. These products provide consumers a modern way to follow a sustainable and healthy lifestyle, which differs from the conventionally healthy diet defined by nutrition experts. In general, the attitude both to functional foods and to their consumers is positive, so such a concept represents a sustainable trend in a multi-niche market [60]. For group tested in Hungary (n=195), assuring the low price and availability, they can be addressed with the issues of health and taste. Furthermore, people of this group are most likely to choose imported goods if those are cheaper than domestic ones. That is why they need to be oriented towards Hungarian products. It would be beneficial for producers to produce unique, functional products for this group, the ability to afford these products would not mean a problem to them. The disadvantage of this group is that their loyalty is hard to maintain, their demands need to be observed constantly [48]. Hungarian consumers are still more likely to be price sensitive [61].

On the basis on the review of the literature, it was shown that health benefits as well as motivation for use are the strongest positive determinants of functional food acceptance. Independent of socio-demographic factors, inadequate nutritional knowledge could limit functional food acceptance. It should be emphasized that health problems of family members increase consumers' interest in functional products. People who regard functional food as necessary products are perceived as innovative. Because of the complex nature of consumer motivations and expectations, proper strategy for functional food design, technological development and marketing is crucial. Simultaneously, effective educational programs should be implemented [62].

Consumers are aware of the risks of non-communicable diseases and they are worried about them, and depending on the disease, only a small group of the concerned is not willing to make a financial sacrifice to avoid them. Lifestyle changes are the most preferred methods for most of the diseases, such as for the prevention of cardiovascular diseases and unbalanced mood/apnoea and a high level of cholesterol, while

dietary supplements are chosen to prevent a weakened immune system [63]. It is important to point out that with several diseases, the smallest ratio of respondents chose dietary supplements. Further results indicate that consumers are the most concerned about cancer-related diseases. This is the only disease where, besides lifestyle changes, consumers consider taking medicaments as the best option. Main health problems people are most affected by and worried about compared to the acceptance of mitigation and prevention with functional foods are shown in Figure 2. Results include a group of respondents (n=1002) who would be willing to pay to prevent or mitigate these health problems, and also those who are concerned/worried, but would not like to spend money on it. The second group could also be a potential target group for product development due to their involvement. Moreover, the inclusion of foods with functional properties in diet can be carried out without further significant expenses, despite other solutions (dietary supplements, medicines, medical treatments) [64]. However, in another study concerned in lactose intolerance, more people choose not to consume dairy products when they are experiencing unpleasant symptoms and it is usually because of their lack of knowledge. Instead of legal definitions, consumers receive information about the functional properties of food through advertisements and labels [26]. Moreover, another results also show that in relation to disease prevention, the gender of the consumer does not have a significant effect on choosing functional foods [63]. Numerous literature sources [65–67] emphasize the important role of gender, age, and completed education as key demographic factors influencing the consumption of functional foods. Clear differences between men and women appear in the field of functional components, which are significantly more important for women than for men. Young consumers are more open to high-technology food processing.

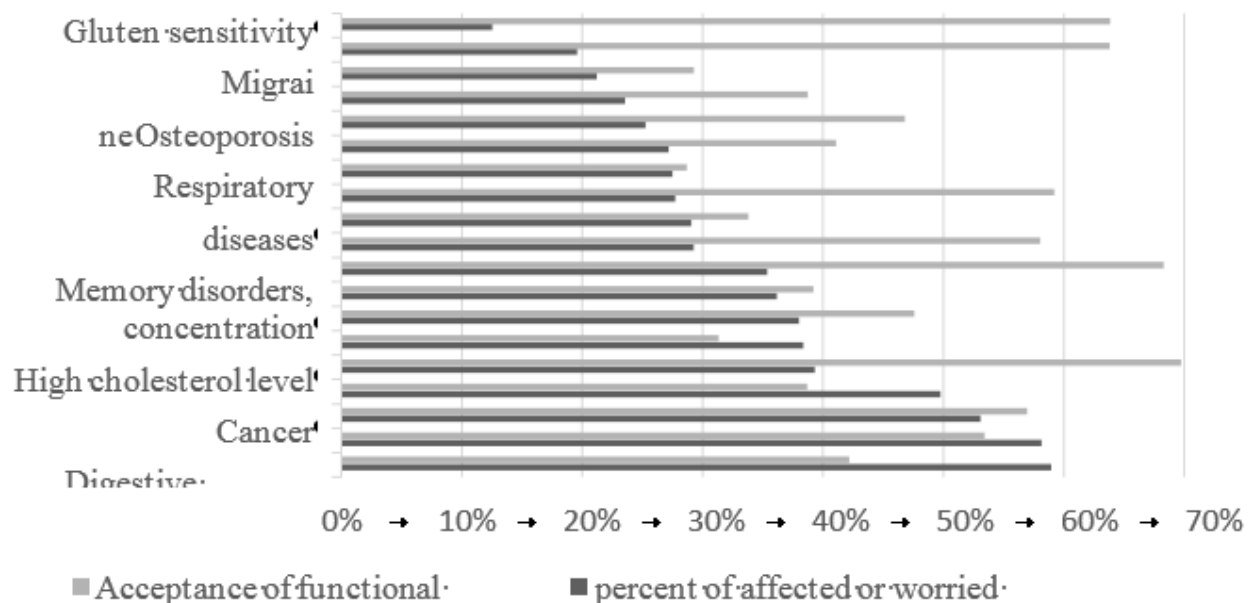


Figure 2. Assessing the worrisome/affecting health problems of Hungarian consumers and the suitability of functional foods to prevent or mitigate these problems [64]

Since health knowledge increases the interest in functional foods, while lack of health knowledge reduces it [68], Marketing specialists should use psychoactive techniques by providing information to help consumers visualize the health consequences of behaviors and lifestyles. Advertisers also need to pay attention to endorsers in advertising [69]. It is known that the perception of risk is lower for the consumer in functional food advertisements with negative message framing as well as in highly credible advertisements. This is why common aspects can be more effective in targeting rationally motivated consumer groups [69]. Consumers who consider themselves conscious consumers of local products are less familiar with milk producers near their hometowns. Improving local patriotism will create a potential market for dairy factories. For a small company with low capacity, the brand may not be enough to be recognized by local consumers. On the other hand, If it becomes known by the consumer, they are likely to search for or buy the product in the future. The

motivators of consumer choice of food do not include concern for health, and the pleasure of flavours and eating is much more pronounced. According to the recent findings, more than 50% of the Hungarian population are not willing to change or improve their eating habits and are not interested in following a healthy lifestyle [58,70]. The re-structuration of food consumption patterns in Hungary would serve both the public health, ecologic and sustainability and ecological goals [71]; moreover, it would mean a huge potential market for companies producing functional food if this large segment of non-health-conscious customers could be made motivated.

CONCLUSIONS AND RECOMMENDATIONS

Functional foods with application of innovative technologies with high added value are becoming increasingly popular and the fastest growing area of the food industry because of health issues or lifestyle decisions. After long research we can sum up the definition of functional food as food containing components that positively affects the human body by fortifying the food with extra nutrition or eliminate harmful components using innovation methods and technologies. Bioactive functional foods, Food fortification and Ultrasonic processing or sonication is a promising alternative technology in the food industry as it has potential to improve the technological and functional properties of milk and dairy products. That could designate the directions for product development of the Hungarian food industry. Since functional food products can only achieve market success if they meet the consumers' expectations.

We could find that the biggest problem of SMEs Managers is to sell their products, because retail companies have stronger bargaining positions and they cannot compete with cheap foreign dairy products, and consumers show a greater demand for direct selling as opposed to companies. That's why SMEs could succeed on the local market, typically within their own region after considering different strategy approaches. Besides that, Processors of dairy products need to pay more attention to this sort of consumer demand in the future. We could witness that direct selling could be developed and approached in two effective ways in the case of the SMEs. The first way is to run own shops in local markets and towns/villages; and the second way, using online sell which consider high potential as direct selling. However, development of new functional components and the solution of technological challenges are highly costly and risky business, and new products have a high failure rate on the market, because most of them were not preceded by a deeper exploration of consumer needs, and Hungarian SMEs sector has innovation shortage, and the dairy sector is not up-to-date and modern enough. That's why, it is recommended that functional food developmental research and manufacturing companies' research and development departments, as well as their marketing experts dedicate their resources to develop and communicate about products such as dairy functional food and its importance for sustainability and healthy life which could attract a large population of consumers. helping to attract consumer acceptance. And it would mean a huge potential market for companies producing functional food if this large segment of non- health-conscious customers could be made motivated.

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