International Journal of Scientific Engineering and Research (IJSER)
ISSN (Online): 2347-3878
SJIF (2024): 6.623

Sustainable Food Systems: The Role of AI and Microorganisms in Korean Fermented Foods

Sakshi Mohankumar Dongre[1], Aneri M. Patel[2]

[1]sakshidongre125[at]gmail.com

[2]patelaneri447[at]gmail.com

Abstract: ***Sustainable food systems are essential for addressing global challenges such as food security, environmental sustainability, and cultural preservation. This review explores the intersection of artificial intelligence (AI) and microorganisms in promoting sustainability within Korean fermented foods. Traditional fermentation methods, reliant on microbial communities, contribute to food preservation, nutritional enhancement, and reduced environmental impact. AI-driven innovations optimize fermentation processes, enhance microbial analysis, and improve food production efficiency. By integrating AI with microbial research, the food industry can achieve precision fermentation, predictive quality control, and resource-efficient production. This review highlights the synergistic role of AI and microorganisms in advancing sustainable food practices while preserving Korea's rich culinary heritage. Despite challenges such as technological adaptation and cost barriers, the adoption of AI presents significant opportunities for innovation in food sustainability. The study concludes that embracing AI-enhanced fermentation can foster resilient, efficient, and culturally significant food systems for future generations.***

Keywords: Sustainable food systems; Artificial intelligence in food; Microorganisms in fermentation; Korean fermented foods; Fermentation optimization; Food security and sustainability; Probiotics and health benefits

1. Introduction

Sustainable food systems have been increasingly recognized as a solution to some of the interlinked global challenges of the modern world, such as climate change, resource scarcity, and population growth. A sustainable food system ensures food security and nutrition while promoting and protecting future generations' economic, social, and environmental bases. Systems like these prioritize lower ecological impact, reduced food loss, and equitable access to wholesome food. They are critical to addressing increasing concerns about food security, environmental degradation, and cultural preservation.

Foods such as kimchi, doenjang (a type of fermented soybean paste), and gochujang (red chili paste) are native to Korean cuisine and are prime examples of sustainable foods that come from centuries-old practices and are still practiced today. These foods are not only part of nutritional health and food preservation but also reflect Korea's cultural heritage. Microorganism-driven fermentation processes improve food flavor, texture, and shelf life, lowering the dependence on not only chemical preservatives but also energy-expensive means of food preservation. In addition, by-products of fermentation can be reused, contributing to a circular economy and improving environmental sustainability. Traditional Korean fermented foods are very important to the diet and cultural identity of Koreans.

Artificial intelligence (AI) has become a transformative tool for optimizing processes and improving efficiency in modern food systems. When applied to the field of studying fermented foods and production, AI can model microbial interactions that can predict the fermentation process and optimize the use of resources. Moreover, using a range of

approaches, such as phosphorus-solubilizing microorganisms (PSM) and biofertilizers, plant growth-promoting microorganisms (PGPMs), and filamentous fungi, has the potential to promote more sustainable agricultural practices. Such biotechnological tools offer eco-friendly alternatives to chemical fertilizers, contributing to sustainable agricultural systems and productivity.

This review provides insights into the potential of AI and microorganisms to promote sustainable practices in Korean fermented foods. It discusses traditional innovation approaches and the application of available AI tools for sustainability innovation to overcome challenges and prepare for future research.

2. The Concept of Sustainable Food Systems

2.1 Characteristics and Importance of Sustainable Food Systems

Sustainable food systems are key to meeting the food needs of a rapidly expanding global population and, at the same time, safeguarding the health of the planet and its people in the long term. They include economic, social, and environmental sustainability, which together provide a basis for just, effective, and adequate food supply and utilization systems.

Economic Sustainability: The economic dimension of sustainability allows all food systems to be commercially feasible, whether for agricultural suppliers or for all consumers of the product. This includes providing better market access opportunities, reducing the wealth gap, and developing rural economies. The depletion of resources and prevention of food and food product waste would serve the purpose of sustaining economies and making them cost-effective in meeting the required level of food nutrients. Such systems also encourage and aim to introduce technological advancements, including the use of AI-powered systems, to improve efficiency and effectiveness.

Social Sustainability: Equity, inclusivity, and the well-being of all people engaged in and affected by the food system constitute the essence of social sustainability. It ensures access to adequate food, reasonable remuneration, and decent occupational conditions for the workforce while safeguarding cultural values and norms. Socially sustainable systems enhance food security and equity and promote and thereby reduce poverty, hunger, and malnutrition in disadvantaged communities. Moreover, the maintenance of food practices and knowledge enhances culture and social transmission across generations.

Environmental Sustainability: Environmental sustainability considers the pressing challenge of decreasing the environmental impact of current food systems. This includes the reduction of greenhouse gas emissions, water and soil preservation, and biodiversity conservation. Natural resources are conserved and enhanced for future use through the adoption of regenerative agriculture, agroecology, and sustainable fishing practices. Furthermore, sustainable food systems enhance the circular economy through nutrition cycling and food waste reduction, thereby conserving the environment and addressing climate change.

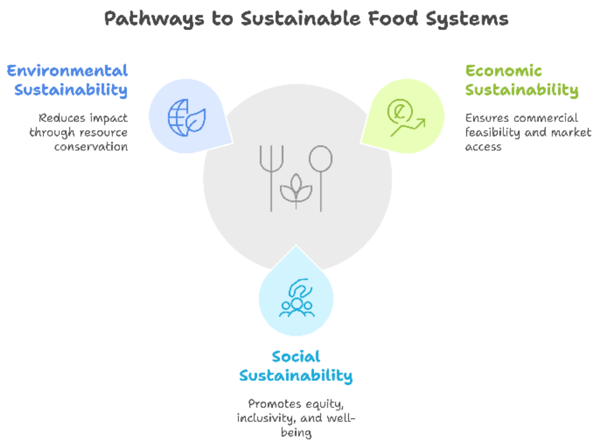

Figure 1: Pathways to Sustainable Food Systems

2.2 Global Challenges

Although the pursuit of sustainable food systems is essential, it is facing considerable global challenges. Climate change (for example) exacerbates resource scarcity, disrupts agricultural patterns, and diminishes crop yields. Rapid urbanization and population growth, however, amplify the pressure on food systems to produce more with fewer resources. Economic inequalities, in conjunction with market monopolies, hinder small-scale farmers from accessing both markets and technologies, which perpetuates a cycle of poverty.

Social barriers, including gender inequality and lack of education, further restrict participation in sustainable practices. Moreover, environmental degradation (such as deforestation, soil erosion, and water pollution) poses a threat to the long-term viability of agricultural systems. Balancing economic growth with environmental protection and social equity is indeed a formidable task because it requires careful consideration of numerous interrelated factors.

Solving these problems requires collaboration between the government, businesses, and society. By integrating new solutions, such as artificial intelligence, and implementing sustainable practices, food products can be adapted to meet the needs of people today and future generations, ensuring a strong and balanced global food supply.

3. Role of Microorganisms in Fermentation

In Korean cuisine, fermentation is a traditional method that transforms raw ingredients into flavorful and nutrient-rich dishes through the action of microorganisms. This biological process gives food distinctive textures, aromas, and health advantages, in addition to improving food preservation. The unique flavors and health benefits of Korean fermented foods, including kimchi, doenjang (soybean paste), gochujang (red chili paste), and makgeolli (rice wine), are well-known across the world.

3.1 Types of Microorganisms Involved

Molds, yeasts, and bacteria are among the microorganisms that drive the fermentation process, and each has a distinct function.

Molds: Aspergillus oryzae is used to ferment doenjang and ganjang (soy sauce), reducing complex proteins and carbohydrates to simpler molecules that enhance flavor and digestibility.

Yeasts: Saccharomyces species are frequently involved in the fermentation of rice wine, helping to produce alcohol and giving makgeolli its distinctive aroma.

Lactic acid bacteria (LAB), including Leuconostoc and Lactobacillus, are the main bacteria involved in kimchi fermentation. The production of lactic acid improves flavor and nutritional value while lowering pH and preventing microbial spoilage.

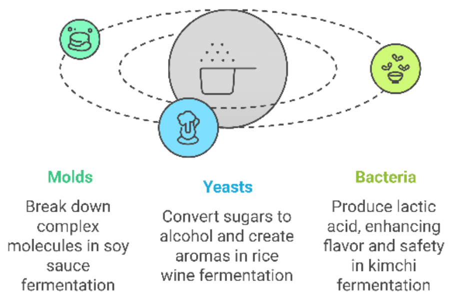

Figure 2: Microorganisms involved in Fermentation

3.2 Traditional vs. Controlled Fermentation Methods

Traditional fermentation depends on the environment, artisanal methods that have been passed down over the years, and natural microbial flora. Owing to differences in microbial populations and environmental conditions, this process can result in inconsistent flavors that are distinct and region-specific.

On the other hand, uniform starter cultures and well-watched conditions are used in controlled fermentation to guarantee scalability, safety, and consistency. To preserve traditional qualities and meet international food safety standards, controlled procedures are being increasingly adopted in commercial production.

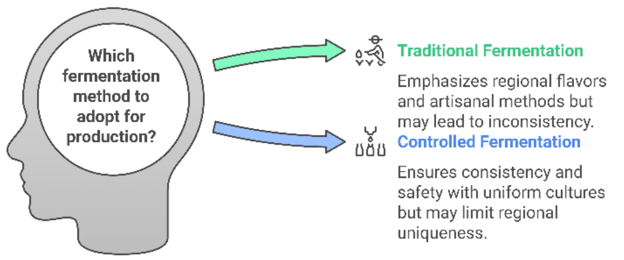

Figure 3: Traditional vs. Controlled Fermentation Methods

3.3 Nutritional and Health Benefits

Microbial activity in fermented foods results in an improved nutritional profile. Nutrient bioavailability increases when microorganisms convert complex macronutrients into simpler, easier-to-digest forms. For example, the fermentation of soybeans in doenjang increases the availability of amino acids and peptides while decreasing antinutritional elements such as phytic acid.

LAB contributes to the nutritional value of kimchi by producing vitamins, including folate and B12. The bioavailability of minerals, such as iron and zinc, which are vital for general health, can also be increased by fermentation.

3.4 Potential Health-Promoting Effects

Fermented foods contain live bacteria that promote gut health; they are well known for their probiotic qualities. A healthy gut microbiome is associated with improved digestion, increased immunity, and decreased inflammation. LAB strains found in kimchi and other fermented foods support this microbiome. Furthermore, bioactive substances, such as peptides and antioxidants, produced during fermentation may have antibacterial and anti-inflammatory properties.

According to previous studies, fermented foods may reduce the risk of obesity, heart disease, and several types of cancer if consumed regularly. For instance, probiotics in kimchi and capsaicin in gochujang have been linked to improved metabolic health and weight control.

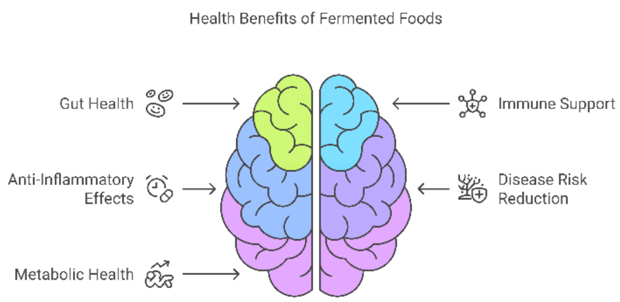

Figure 4: Health Benefits of Fermented Foods

4. Integration of Artificial Intelligence in Sustainable Food Systems

Artificial intelligence (AI) transforms the production, processing, and consumption of food through its integration into sustainable food systems. By utilizing cutting-edge computational techniques, AI promotes sustainability objectives throughout the food supply chain, increases efficiency, and reduces waste. The ability of technology to revolutionize traditional methods is demonstrated by its use in fermentation processes, especially in Korean food systems.

4.1 Applications of AI in Food Production and Fermentation Processes

Artificial intelligence (AI) is crucial in food production for optimizing agricultural methods, increasing crop yields, and promoting resource-efficient farming. In the realm of fermentation, AI applications include the identification of appropriate microbial strains, prediction of fermentation results, and automation of production operations. Machine learning algorithms examine extensive datasets from fermentation experiments to enhance processes and ensure consistency in flavor, texture, and nutritional content.

4.1.1 Monitoring and Optimizing Fermentation Conditions

AI-powered sensors and Internet of Things (IoT) devices provide real-time surveillance of fermentation parameters such as temperature, pH, humidity, and microbial activity. Through the collection and analysis of these data, AI systems can forecast and rectify deviations from optimal conditions, guaranteeing superior output. In kimchi production, AI systems may regulate temperature and salinity levels to ensure uniform flavor and texture throughout the batches. This minimizes waste and improves the scalability of conventional approaches while maintaining authenticity.

4.1.2 Predictive Analytics for Consumer Preferences and Market Trends

Predictive analytics driven by AI offers insightful information about market trends and customer behavior. Through the examination of data from social media, sales records, and online platforms, AI can detect new consumer preferences, including the growing desire for vegan-friendly or probiotic-rich meals. These insights enable producers to develop and modify their products to satisfy changing consumer demands. For example, AI has been used to assist in creating plant-based fermentation substitutes and low-sodium kimchi varieties to appeal to consumers who are concerned about their health and the environment.

4.2 Case Studies Showcasing AI Implementation in Korean Food Systems

Several creative initiatives showcase the successful integration of AI into the Korean food system, enhancing efficiency, quality, and sustainability. One prominent example is a leading kimchi manufacturer that has implemented AI-powered quality control systems to track the fermentation process. To produce high-quality kimchi with a constant flavor, texture, and quality in every batch, these technologies are used to examine environmental variables and microbiological activity. Similarly, AI is being utilized in makgeolli (Korean rice wine) manufacturing to precisely regulate alcohol concentration and aroma by adjusting fermentation conditions in real time, improving both efficiency and product consistency.

Beyond traditional fermented foods, AI is also driving innovation in plant-based alternatives. By analyzing consumer preferences, dietary needs, and nutritional profiles, AI has helped develop plant-based substitutes for classic Korean fermented foods, ensuring they retain their authentic flavors while catering to health-conscious and environmentally aware consumers. In addition, machine learning models are being applied to the aging process of fermented sauces like ganjang (soy sauce) and doenjang (soybean paste), optimizing enzyme activity and environmental conditions to maintain the perfect balance of umami flavors and nutritional value while reducing waste.

Furthermore, AI-driven research collaborations between Korean culinary institutions and technology developers are exploring personalized nutrition through fermented foods. These systems analyze individual dietary preferences, health conditions, and microbiome data to recommend customized probiotic-rich products that align with sustainability and wellness goals. These advancements highlight how AI is revolutionizing Korea's fermented food industry, ensuring both tradition and innovation thrive in a sustainable future.

5. Synergy Between AI and Microorganisms in Fermented Foods

The integration of artificial intelligence (AI) with microbiology is a revolutionary method to enhance the science and production of fermented foods. Combining AI's analytical process with the inherent capabilities of microbes can enhance precision, efficiency, and innovation in fermentation processes.

5.1 Enhancing the Understanding of Microbial Communities

Fermentation is primarily propelled by complex microbial ecosystems wherein bacteria, yeasts, and molds engage in dynamic and frequently surprising interactions. However, traditional microbiological techniques are limited in their capacity to examine these interactions on a large scale. Artificial intelligence (AI), especially machine learning and deep learning, can examine extensive datasets from metagenomics, transcriptomics, and metabolomics research to uncover patterns and connections within microbial communities.

For instance, AI algorithms may discern the precise functions of microbes in fermentation processes, including the synthesis of taste compounds, texture-altering enzymes, and bioactive peptides. This profound comprehension allows researchers to anticipate fermentation results, formulate optimum microbial consortia, and minimize trial and error in product development. AI aids in the discovery of previously unrecognized microbial species that may have innovative functions in fermentation.

5.2 AI-Driven Innovations Improving Quality and Safety

Through predictive analytics and real-time monitoring, AI-powered technologies are used to improve the safety and quality of fermented foods. For example, to ensure that ideal conditions are maintained throughout the process, AI systems with sensors may continuously monitor important fermentation factors, such as pH, temperature, and microbial activity.

One noteworthy innovation is the application of AI for early contamination or spoilage detection. By using machine learning models trained on historical data, companies can quickly reduce waste by identifying anomalies in environmental conditions or microbiological profiles.

AI-powered technologies enhance the sensory aspects of fermented foods in addition to their safety. For instance, algorithms that examine sensory data and customer feedback may direct the development of goods with improved flavor, texture, and fragrance. In Korean rice wine manufacturing, AI has been utilized to improve the fermentation processes, leading to better clarity, alcohol levels, and flavor balance.

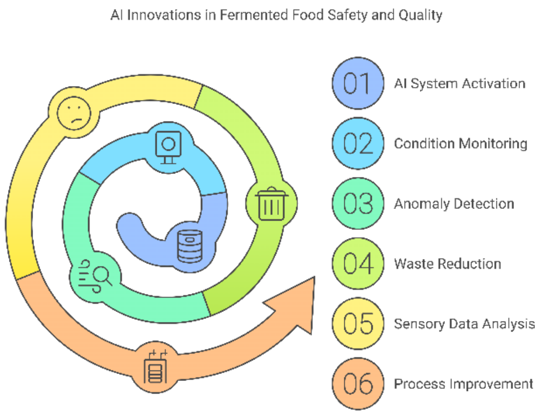

Figure 5: AI Innovations in Fermented Food Safety and Quality

The synergy between AI and microorganisms also facilitates personalized nutrition. By combining microbial research with AI insights, manufacturers can produce fermented foods that are specifically suited to the dietary demands and intestinal health of each consumer.

In addition to improving fermentation science, the application of AI to the study of microbes is tackling worldwide issues in safe, innovative, and sustainable food production.

6. Challenges and Opportunities

The integration of artificial intelligence (AI) into traditional food operations, particularly in fermented food production, poses a combination of challenges and opportunities. Although technical breakthroughs offer considerable advantages, obstacles must be overcome to fully realize AI's potential.

6.1 Barriers to Implementing AI in Traditional Food Practices

A primary obstacle to integrating AI into traditional food systems is resistance to adaptation. Numerous artisanal producers appreciate the cultural legacy and skills inherent in traditional fermentation techniques. The emergence of AI may be perceived as a threat to existing methods, resulting in hesitation in its use.

Another barrier is the lack of technical proficiency among small-scale producers. AI systems require expertise in data processing, programming, and the use of sophisticated technologies. In the absence of adequate training and assistance, these producers may have difficulty integrating AI into their workflows.

The cost is another major barrier. For small and medium-sized enterprises (SMEs), the initial outlay for AI technology, which includes sensors, software, and maintenance, may be expensive. Furthermore, it could take some time to see the return on investment (ROI), which makes it difficult for companies to defend their costs.

Concerns about data security and privacy are other problems. To safeguard sensitive data, reliable methods are required for data collection and analysis of fermentation operations. Producers may be unwilling to share data because they are afraid of intellectual property being stolen or misused.

6.2 Opportunities for Enhancing Sustainability through Technology and Traditional Knowledge

Despite these challenges, there are many opportunities to improve the sustainability of fermented food systems by using AI. To maximize resource use, AI can minimize waste and reduce energy consumption. For example, to reduce the chance of product spoilage, predictive algorithms can guarantee that fermentation activities occur under ideal conditions.

AI also makes it possible to monitor the environmental effects more effectively. Producers can identify opportunities for development and implement more sustainable practices by examining statistics on energy consumption, carbon emissions, and resource inputs. This brings traditional food production in line with contemporary sustainability objectives.

Moreover, AI can help to close the gap between innovation and tradition. AI can protect cultural heritage while increasing efficiency by digitizing traditional knowledge such as fermentation methods and recipes. This method guarantees that the essence of traditional practices is maintained, despite the integration of technology.

Innovation can also be fueled by partnerships between traditional food artisans and technologists. For example, century-old fermentation methods can be enhanced by AI-driven insights into microbial communities, resulting in the development of products with better nutritional profiles and health advantages.

Ultimately, developing collaboration, establishing trust, and offering easily accessible resources and training will be essential for the effective integration of AI into traditional food practices. By taking these actions, artificial intelligence (AI) can be a potent ally for building a creative and sustainable future for fermented food systems.

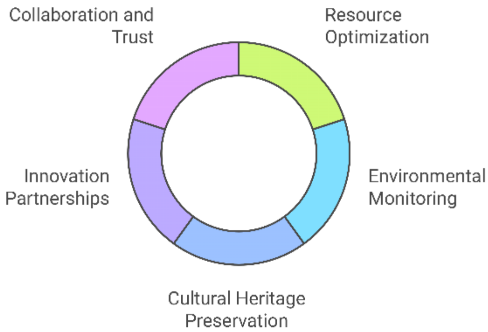

Figure 6: AI and Traditional Knowledge in Sustainable Fermentation

7. Policy Implications and Future Directions

The convergence of artificial intelligence (AI), microbial research, and sustainable food systems necessitates focused policy actions and innovative approaches. To fully realize the potential of these technologies in transforming food systems, policymakers must address integration challenges while promoting community involvement and education.

7.1 Recommendations for Integrating AI and Microbial Research into Sustainable Food Policies

Governments and international organizations should prioritize the integration of AI and microbiological research within sustainable food policies. Research and development (R&D) investments are essential. Financing interdisciplinary research investigating AI-derived insights into microbial ecosystems may result in advancements in fermentation science and sustainable agriculture.

Regulatory frameworks must evolve in response to technological change. Policies must guarantee the secure implementation of AI in food systems and prioritize data protection, transparency, and ethical considerations. Formulating standards for AI deployment, including protocols for sensor-based monitoring and predictive analytics, will enable manufacturers to embrace new technologies.

Subsidies and incentives can significantly encourage small-scale producers to use artificial intelligence. Financial assistance for purchasing cutting-edge machinery, training initiatives, and cooperative ventures can reduce entrance barriers and promote creativity. Additionally, policymakers should support public-private collaborations that unite traditional food artisans, food scientists, and AI developers.

Paper ID: SE25216134145 DOI: https://dx.doi.org/10.70729/SE25216134145

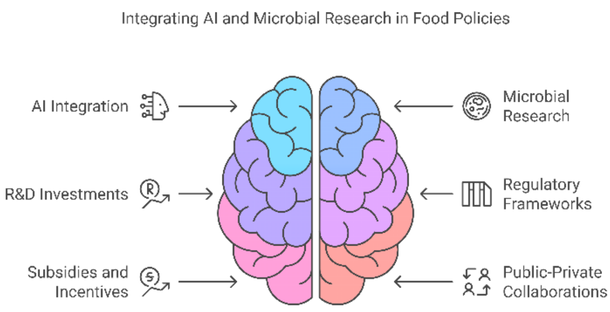

Figure 7: Integrating AI and Microbial Research in Food Policies

7.2 The Role of Education and Community Engagement in Promoting Sustainable Practices

Education is a key component of sustainable food policies. AI and fermentation science can be integrated into different levels of education to create a workforce capable of spearheading innovation. Universities and technical institutions should provide specialized courses that integrate AI applications in food systems with microbial research.

Initiatives for engaging in the community are also essential. Policymakers can support awareness-raising initiatives that emphasize the advantages of sustainable food practices and the contributions of technology. AI's ability to improve traditional techniques can be demythologized and demonstrated through workshops and training programs for farmers, artisanal producers, and consumers.

Collaboration is necessary for embracing innovation while preserving cultural heritage. AI-driven food systems should be developed and implemented through active community participation. Participatory techniques can guarantee that solutions are universally accepted and culturally sensitive by incorporating local knowledge into technological innovations.

Lastly, tackling global issues related to food security and sustainability requires international cooperation. Cross-border exchange of research findings, technological advancements, and best practices can hasten development and promote a more resilient global food system.

Governments and stakeholders can build a sustainable future where microbial research and artificial intelligence (AI) improve food systems while maintaining environmental and cultural integrity by coordinating policy with technology developments and encouraging an inclusive approach.

8. Conclusion

The investigation of AI and microbes in sustainable food systems demonstrates a revolutionary capacity to tackle global issues related to food security, environmental sustainability, and cultural preservation. This analysis emphasizes critical areas of synergy, particularly the contributions of AI in advancing microbial comprehension, refining fermentation processes, and promoting sustainable agriculture practices. Microorganisms are fundamental to fermentation, a process essential for the manufacture of traditional Korean cuisine and several global staples. By utilizing AI, these microbial populations may be comprehensively analyzed, monitored, and modified to yield superior, nutrient-dense fermented products. Furthermore, the incorporation of predictive analytics and real-time monitoring guarantees efficiency, uniformity, and safety in food manufacturing.

Challenges such as the substantial expenses of AI deployment, opposition to transformation, and deficiencies in technical understanding persist as key obstacles. Nevertheless, these obstacles can be alleviated through strategic regulations, financial incentives, and instructional initiatives that enable small-scale businesses and traditional artisans to embrace AI technologies. Crucially, cultivating partnerships among technologists, researchers, and local communities guarantees the preservation and enhancement of traditional knowledge through contemporary advances.

A comprehensive strategy for sustainable food systems—one that combines AI's technological innovations with established methods of microbial fermentation—is crucial for enduring success. In addition to guaranteeing the effective use of resources, this strategy fosters economic resilience, cultural heritage, and health.

The future of sustainable food systems depends on communities, scientists, and policymakers working together to welcome innovation while honoring tradition. Through the integration of sustainable practices and cutting-edge technologies, the global food system can meet the demands of an expanding population while reducing environmental effects and preserving cultural diversity for future generations.

References

[1] Dharaneedharan Subramanian, Heo Moon-Soo; (2016) Korean Traditional Fermented Foods—A Potential Resource of Beneficial Microorganisms and Their Applications https://doi.org/10.5352/JLS.2016.26.4.496
[2] Mohamed Mannaa, Gil Han, Young-Su Seo, Inmyoung Park; (2021) Evolution of Food Fermentation Processes and the Use of Multi-Omics in Deciphering the Roles of the Microbiota https://doi.org/10.3390/foods10112861
[3] Su-Jin Jung, Soo-Wan Chae, Dong-Hwa Shin; (2022) Fermented Foods of Korea and Their Functionalities https://doi.org/10.3390/fermentation8110645
[4] Yuli Zhang, Xue Zhu, Nan Wang, Xin Liu, Li Wang, Kang Ning; (2025) Synergy of traditional practices and modern technology: Advancing the understanding and applications of microbial resources and processes in fermented foods https://doi.org/10.1016/j.tifs.2025.104891
[5] Myung-Ji Seo; (2024) Fermented Foods and Food Microorganisms: Antioxidant Benefits and Biotechnological Advancements https://doi.org/10.3390/antiox13091120
[6] Ji Young Jung, Se Hee Lee, Jeong Myeong Kim, Moon Su Park, Jin-Woo Bae, Yoonsoo Hahn, Eugene L. Madsen, Che Ok Jeon; (2011) Metagenomic Analysis of Kimchi, a Traditional Korean Fermented Food https://doi.org/10.1128/AEM.02157-10

[7] Yuxin Jin; (2024) The Role and Future Prospects of Microorganisms in Fermented Food Production. https://doi.org/10.62051/m6z24b73

[8] Jayanta Kumar Patra, Gitishree Das, Spiros Paramithiotis, Han-Seung Shin; (2016) Kimchi and Other Widely Consumed Traditional Fermented Foods of Korea: A Review https://doi.org/10.3389/fmicb.2016.01493

[9] So Yoon Park, Miran Kang, Suk-Min Yun, Jong-Bang Eun, Bo-Sung Shin, Ho Hyun Chun; (2022) Changes and machine learning-based prediction in quality characteristics of sliced Korean cabbage (Brassica rapa L. pekinensis) kimchi: Combined effect of nano-foamed structure film packaging and subcooled storage https://doi.org/10.1016/j.lwt.2022.114122

[10] Jiaman Yuan, Donglin Ma, Yatao Yang, Yuzong Zhao, Haiwei Ren, Xiaogang Liu, Minghui Tan, Kuntai Li; (2025) A review and prospects: Multi-omics and artificial intelligence-based approaches to understanding the effects of lactic acid bacteria and yeast interactions on fermented foods https://doi.org/10.1016/j.ifset.2024.103874

[11] Seung-Min Yang, So-Yun Lee, Dae-Hyun Jung, Hae-Yeong Kim; (2024) Classification of Latilactobacillus sakei subspecies based on MALDI-TOF MS protein profiles using machine learning models https://doi.org/10.1128/spectrum.03668-23

[12] Shailesh Shiwajirao Sawant, Hye-Young Park, Eun-Young Sim, Hong-Sik Kim; (2025) Microbial Fermentation in Food: Impact on Functional Properties and Nutritional Enhancement: A Review of Recent Developments https://doi.org/10.3390/fermentation11010015

[13] Mohamed Mannaa, Gil Han, Young-Su Seo, Inmyoung Park; (2021) Evolution of Food Fermentation Processes and the Use of Multi-Omics in Deciphering the Roles of the Microbiota https://doi.org/10.3390/foods10112861

[14] S. Heo, Tao Kim, Hong-Eun Na, Ga-Yeong Lee, Junghyun Park, Hee-Jung Park, Do-Won Jeong; (2022) Safety Assessment Systems for Microbial Starters Derived from Fermented Foods https://doi.org/10.4014/jmb.2207.07047

[15] Solano-Aguilar, G., Kang, M., Schroeder, N., Lakshman, S., Vinyard, B., Ha, G., Kim, Y., Park, Y., Kim, H.-R., Yates, A., & Caballero, B. (2013). Effect of a Korean, 2010 dietary guidelines for Americans, and typical American diet on fecal microbiota composition of overweight adults. https://doi.org/10.1096/fasebj.27.1_supplement.1079.63