
Challenges, Opportunities, and Motivations of Students in Studying Food Technology Towards the Enhancement Program

Herbert Puhawan Rana

Laguna State Polytechnic University, Sta. Cruz, Philippines
ranaherbertp@gmail.com

Abstract

Opportunities, challenges, and motivation offer flexibility in developing the enhancement program. This be taken into consideration to address any gaps in the knowledge of the many aspects of food technology studies. Using a phenomenological method, the researcher explored the experiences and beliefs of the participants which was consists of eight (8) undergraduates students studying food technology. Purposive sampling was used to choose the participants. Codes and themes were used in the stud where Focus Group Discussion (FGD) were utilized to acquire responses and gather information. Based on the results of the study, three themes emerged concerning the challenges and opportunities: sustainability issues, technology advances and innovation and product development. Meanwhile, in motivation of the students, the results emphasized the innovation and product development which implies that creativity and innovation must adapt to the ever-changing learning. With an emphasis on the impact on student motivation and the need for adaptable instructional strategies, the study seems to highlight the connections among sustainability, technology, innovation, and the development of products. Thus, implementing comprehensive training intended to reaffirm the institution's commitment to improve the knowledge and skills of food technology students. The enhancement program offers the advancement and capability program in the Food Technology institutions that strive to offer excellent instruction ought to give food technology sector significant thought and support into real-life situations. This suggests that institution should concentrate on developing and improving their knowledge, abilities, and skills in the area of food technology.

Keywords: Challenges; Food Technology; Motivation; Opportunities

Introduction

Food technology is an interdisciplinary field that combines aspects of food science, engineering, and nutrition to develop innovative techniques and processes that improve the production, storage, and distribution of food and food products (Horton et al., 2017). As the global population continues to grow, the need for improved food production and distribution systems is on the rise (McClements, 2020). Food technology is a rapidly growing sector that is playing an increasingly important role in our society. The world's population is growing, and so is the need for food (Tripathi et al., 2019). The need for food is expanding, which makes food technology studies—which try to understand and improve food production, storage, and transportation—even more important (Siegnier et al., 2018). Additionally, the rising popularity of food science-based diets and lifestyles and the emergence of alternative food production methods have made food technology an increasingly important field of study (Corbo et al., 2014). As a result, there is a need to understand the challenges and opportunities and develop an enhancement program to prepare students for sustainability and innovative ways in food technology studies. Thus, it recommends that people in the food technology area should concentrate on developing and improving their knowledge, abilities and skills. Initiatives

that offer an enhancement program give students studying food technology additional chances to address obstacles and are inspired to work for greater results as they prepare for careers in the food sector.

Though local food might be a profitable investment when managed properly, the food industry and its goods still are unable to compete with modern food or international items. Thus, by encouraging and promoting cooperation between manufacturers, farmers, and producers in your community where a more competitive and diverse selection of products may emerge from a collaborative effort. Thus, promote government initiatives that will benefit regional producers and provide incentives for them. In order to offer food technologists a voice and help them be ready for any obstacle to advancing the quality of services in the field of food technology, the purpose of this study is to ascertain the opportunities, problems, and motivations faced by students pursuing a degree in food technology. Nonetheless, there is still more to learn about the potential and difficulties associated with studying food technology. The study aims to better support future studies, regulations, and practices by identifying and analyzing both opportunities and challenges facing food technology studies now. Studying the challenges and opportunities of food technology can have a significant socio-economic impact (George, 2015). It can help identify new and innovative ways to meet the demands of a growing population and create new sources of employment (Sima et al., 2020).

The growing demand for food production and the necessity to address global food security have made food technology research more and more significant in recent years. Food technology offers a plethora of opportunities and problems to examine in light of the introduction of new technologies and breakthroughs (McClements et al., 2021). As a result, enhancing food safety and quality is one of the major issues facing food technology. To ensure food safety and quality, new processing methods, quality control procedures, and regulations are needed (Albanie, 2017). Furthermore, new technologies like blockchain and digital food traceability have emerged as a result of the need for improved transparency and traceability in the food supply chain (Kamilaris et al., 2019). By offering a safe and transparent record of food production and distribution, these technologies can contribute to the improvement of food security and safety. Furthermore, the field of food technology is expanding and calls for a solid grasp of the science and technology underlying food processing and production (Mercer et al., 2015). This course helps equip students with the necessary skills to develop and manage modern food production systems. Additionally, the course covers topics such as food safety, nutrition, and food engineering (Rutland & Owen-Jackson, 2015). By understanding the challenges and opportunities of food technology, students can gain the knowledge necessary to work in the food industry and ensure that food products are safe and of the highest quality (Lillford & Hermansson, 2021). Furthermore, the course will help students develop a deeper understanding of the food industry, which can lead to more career opportunities.

Moreover, another challenge is the need for improved resource management. As to the current study, it was evident that the participants explored and shared the need for more equipment and resources. The efficient use of water, energy, and land resources is essential for sustainable food production (Namany et al., 2019). New technologies and innovations can help to improve resource management by reducing waste, increasing efficiency, and providing more efficient and sustainable production processes (Javaid et al., 2022). Finally, reducing food waste is another major challenge facing food technology. New developments in food packaging and storage technologies can help to reduce food waste by improving shelf life and increasing the amount of food that can be stored safely and efficiently. Additionally, new waste management technologies can help reduce the amount of food waste produced and recycled (Rashid & Shahzad, 2021). In

addition to addressing the adverse effects of food waste on the environment, such a comprehensive approach helps create an innovative and sustainable future.

Moreover, food technology is the use of methods, procedures, and ideas to create new food products or generate existing food products. The goal of food technology is to guarantee food supply, safety, and quality for consumers (Albanie, 2017; Singh et al., 2017). The goal of recent research has been to provide methods for raising the caliber and efficacy of studies on food technology. Furthermore, concentrating on creating novel solutions and technologies is one strategy to raise the caliber and efficacy of food technology research (Abecassis et al., 2018). Cutting-edge technology like big data analytics, artificial intelligence, and machine learning can be used to do this through promotion, creating linkages and networking.

Food safety, quality, and availability can all be evaluated and assessed by these technologies (Benke et al., 2018). Improving the quality and effectiveness of food technology studies is to focus on developing risk-based decision-making. This involves using data-driven tools and techniques, such as risk assessment and hazard analysis, to identify and mitigate potential risks associated with food production and distribution (Chin et al., 2020). By applying a risk-based approach, food producers and manufacturers can reduce the potential for foodborne illness and other risks associated with food production and distribution. In addition to developing innovative solutions and technologies, food technology studies can also be improved by focusing on applying sustainable practices.

Sustainable practices include using renewable resources, efficient production processes, and environmentally friendly packaging materials. Using sustainable practices can help reduce the environmental impact of food production while providing economic benefits to food producers (Lozano et al., 2015). Innovative ideas and innovative technologies have the power to boost food safety and quality, minimize food waste, and optimize resource management. Food technology plays a critical role in guaranteeing the worldwide availability of safe, nutritious, and sustainable food through research and development. Still, these approaches represent a small sample of the many available possibilities to raise the level and efficacy of studies in food technology. Through the application of sustainable practices, based on risk decision-making, and a focus on innovative problem-solving, food producers and manufacturers can align their operations with the latest quality and safety requirements. Also, the impact that food distribution and production have on the overall economy and society may be reinforced by these practices through identifying challenges, opportunities and motivations.

For university students and faculty, it can create an understanding of the food industry and its associated processes, allowing them to use their knowledge to create new products and services (Smigic et al., 2021). It can also help to understand better sustainability and the need for better food production and storage methods. Finally, studying food technology can help better understand the science behind food production and storage, allowing for a more efficient and safe use of resources (Singh et al., 2017). Food technology research still drives innovations that improve food quality, safety, sustainability, and innovation. By tackling global challenges facing the food industry and adapting to changing customer demands, these developments help strengthen the food distribution system overall. Moreover, food technology studies can also be improved by focusing on food production's social and economic impacts. These impacts include the effects of food production on local communities and the economic implications of food production and distribution. By examining the social and economic implications of food production, food producers and manufacturers can better understand the impact of their activities on society and the economy (Beske et al., 2014). As reiterated by Miller and

Tanner (2015) research helps to comprehend and lessen the effects and crosses national boundaries to promote global cooperation. Food technology studies provide a unique opportunity to explore food production and security challenges and opportunities.

This study adheres to develop an enhancement program focused on developing and increasing food technology studies' capacity to keep up with changes in the constantly evolving educational landscape. In addition, raising awareness of excellent support in the food sector seeks to provide people with the skills necessary to produce robust and creative food, serving as a testament to sustainable development. Food technology has demonstrated through experiments the need for an enhancement initiative to close learning gaps and elevate the program to the highest level of excellence in fostering personal growth and development.

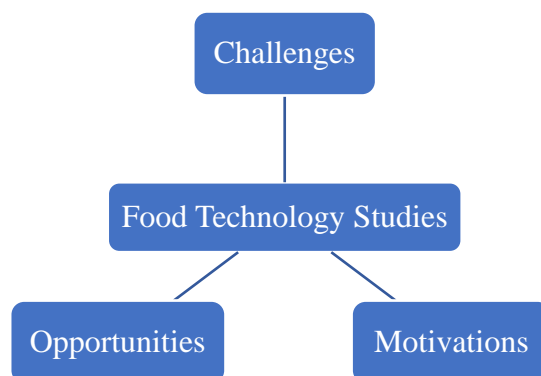


Figure 1. Change Impact on Motivation

Food technology must be thoroughly understood in order to meet the evolving expectations of customers who seek a wide range of convenient and varied food options. By adjusting to innovation and product development, investigating food technology provides opportunities to learn about cutting-edge techniques and procedures while experimenting with cooking in the rapidly changing world. The difficulties, prospects, and effects of food technology on people's motivation to learn and follow this professional path can all be further investigated in this study. The commitment to studying and adapting to new learning methods did not waver in the face of any challenge. The challenges acted as a means of creating avenues for the development of creativity and innovation. Therefore, this means that they wish to pursue a career that involves the influence of food technology and preparation, exploring an in-depth understanding on the challenges, opportunities and motivations toward enhancement program.

The study aims to determine the challenges and opportunities in food technology studies. Specifically, it sought to answer the following research questions: 1) What are the challenges and opportunities of food technology studies?. 2) What is the motivation of students in studying food technology?. 3) What enhancement program may be taken to improve the quality and effectiveness of food technology studies?

Method

The study used a qualitative research design employing a phenomenological approach to acquire deep understanding on the responses of the participants. The researcher sought to get a more profound comprehension of the challenges, opportunities and motivations that arise from sustainability, technological advancements, innovation, and developing products. Qualitative research methods employing focus group discussion was used to collect data and analyze the perspectives of experts in the field (Liamputtong, 2021). Focus group discussions was employed in the study which was participated by eight (8) undergraduate students taking food technology course. Purposive sampling was

used to choose the participants based on specific characteristics relevant to the research (Campbell et al., 2020). As the study needed to acquire and analyze the experiences and perceptions of the participants taking food technology, this will have a great benefit to the food industry. Codes and themes were utilized in the study and researcher analyzed the responses to create an emergent theme. Through a more thorough examination of participants' ideas and experiences, this approach is well-suited for examining the complex viewpoints and insights of needed in the study. To gather responses from the participants, the researcher employed Focus Group Discussion (FGD) to gain a thorough knowledge of the challenges, opportunities, and motivations in studying food technology. As reiterated by Nyumba et al., (2018), Focus group discussions (FGDs) are a valuable tool for examining participants' attitudes, beliefs, and perceptions about a specific idea, concept, or service, and it can learn more about the elements influencing participants' viewpoints. FGD was employed in a one-day meeting where all participants were available and given the Consent Form in participating the study. Audio-recording and taking notes were some strategies used during the FGD to acquire the responses of the participants. The researcher informed the participants that any information that will be shared during the discussions will remain private and confidential.

Interview guide questions was also employed to acquire profound knowledge of the phenomenon and it was validated by the experts. The data gathered and analyzed which can contribute to improve the result of the study. Additionally, Kallio et al. (2016) explained that an interview guide was used to extract details about the student's perspectives in the field of food technology as well as their opinions.

Results and Discussion

Immersion and real-world applications are examples of mobilizing and networking strategies that should be included in the utilization of learning in food technology. The food technology industry will be more capable to fulfill its demands and provide resources for increased support and networking in the pursuit of high-quality services and instruction as this study acquire a deep understanding of the challenges, opportunities, and motivations of students in studying food technology.

1. Challenges and Opportunities of Food Technology Studies

Based on the results of the study, three themes emerged in various challenges experienced by the participants and opportunities in studying food technology: sustainability issues, technology advances and innovation and product development.

a. Sustainability Issues

Opportunities arise from these challenges. Recognizing the difficulties makes it possible for knowledge to grow, making learning and teaching more adaptable. It also makes it possible to incorporate research-based teaching pedagogies in food technology, strengthening the learning culture. Food technology affects many facets related to food production, safety and processing serving a number of important functions in society (Siegrist & Hartmann, 2020). Sustainability issues are one of the challenges faced by students studying food technology since change involves a process of simultaneous, rapid relearning and unlearning. As shared by P1: "Food technology research and outcomes have been hindered by a lack of facilities and equipment"

Equipment shortages and concerns about food safety accompany the learning process. Keeping up with cutting edge technologies can present both opportunities and challenges in the food technology studies. Thus, innovation and produce development were always evident in preparing participants in the wide range of learning in food services and technology. As a result, sustainability concerns are not quickly addressed

because there is a growing need for attention and attention. This was strengthened by the study of Acciaro et al., (2014) research helps educate awareness and educational initiatives about the value of sustainable living. As shared by P5: “We can make a greater contribution to sustainability and development in our field of expertise by accumulating a wealth of information through food technology research.”

Technological developments in food processing frequently include automation and mechanical integration to optimize manufacturing procedures. This is suitable since it is essential to remain current on the changes that have taken place in order to keep ahead of trends and achieve the ideal level of sustainability in the food business. A greater understanding encourages behavioral shifts that lead to more sustainable behaviors for both individuals and communities. A number of novel approaches and technological advancements have surfaced to tackle the escalating issue of food technology (Nile et al., 2020). Moreover, addressing sustainability concerns can be aided by the development of sustainable methods. Participants were also hinted at being faced with obstacles, one of which is the advancement of technology. As added by P2: “Aside from the difficulties associated with ensuring food safety, producing enough food for everyone, and preventing food waste, food technology research also offers benefits such as creating environmentally friendly, nutritious food options and utilizing machinery to produce food more quickly”

According to Benke et al., (2018) these technologies can be used to examine and assess food safety, quality, and availability by developing risk-based decision-making is the key to raising the caliber and efficacy of food technology research. This suggests that introducing challenges pertaining to food technology into learning settings has several advantages for students' understanding of food technology that can lead to a world of opportunities toward changes. Furthermore, Giacalone and Jaeger (2023) highlighted how developments in food technology allow for innovative and practical food products that satisfy the wide range of dietary requirements and lifestyles seen in society. Roman et al. (2017) reinforced this by stating that technology advancements have increased the overall efficacy of food systems from farm to table, leading to a more reliable and sustainable food supply. Food technology offers chances for innovation to adjust food products, flavors, and compositions to evolving consumer preferences. Also, mentioned by P3: “In today’s world, food technology has a strong emphasis on the advancement of sustainable food production methods”

The development of ecologically friendly methods for food production is emphasized in food technology that entails sustainable sourcing. Miller and Tanner (2015) have emphasized that study crosses national boundaries to foster global cooperation while also aiding in understanding and mitigating potential repercussions. Undertakings in food technology offer a singular chance to investigate prospects and difficulties related to food production and security.

Food technology offers significant advantages while addressing a variety of issues facing the food industry. By recognizing the challenges and opportunities, it may gain a better understanding of the initiative's weaknesses and how to address its strengths in food technology. Additionally, it gives the food business a sense of flexibility and adaptability as it moves toward sustainable development.

b. Technology Advances

Keeping up with the rapid advancements in food technology presented a difficulty for the participants, as seen by their comments. Therefore, there are still gaps in food technology that need to be filled in a variety of areas, including food production, safety, and storage. It will be harder for businesses to stay on top of trends and maintain their ability to adapt to the unavoidable changes because of the challenges and these difficulties

present chances. As shared by P5: “The development of technology is one of the things that I believe will be very beneficial to students studying food technology because it is modern and primarily utilized by organizations and other entrepreneurs”

By acknowledging the opportunities could lead a way in acquiring more knowledge and allowing for more flexibility in teaching and learning as well as the use of research-based pedagogies in food technology to enhance the culture of learning. Moreover, challenges and opportunities paved way toward the drive on innovation (Appio et al., 2019). Consequently, challenges paved way in open opportunities. As shared by P3: “Food technology challenges improved each student's understanding of food, cooking, nutrition, and other topics through this, it enables students to make more creative, resourceful and aware on the trends in food preparation even though there is a lack of equipment and spaces”

As emphasized by Giacalone and Jaeger (2023), advances in food technology enable creative and useful food products that meet the diverse dietary needs and lifestyles of the society. In order to adapt food items, tastes, and compositions to growing consumer preferences, food technology presents opportunities for innovation. As mentioned by P6: “One of the biggest issues I see for students studying food technology is a lack of cooking supplies and a laboratory”

Students will be more equipped to adjust to the constantly shifting trends in the food sector if they are provided with appropriate tools and resources and have a positive attitude toward the curriculum. The food technology program and students are embracing this trend, thus technological advancements ought to be visible and provided to them. This was strengthened by Roman et al., (2017) technological developments have improved food systems' overall effectiveness from farm to table, resulting in a more robust and sustainable food supply if materials and resources were evident while studying. Educational institutions might strive to overcome the challenges by combining long-term initiatives aimed at improving facilities to address immediate needs. Institutions will become more cognizant of the domain in which they must recognize and grow because of opportunities and challenges. Finding its innovations and sustainable practices will make it possible to broaden our understanding of how to be adaptable and stay up to date with the food industry's trends, especially when it comes to food technology research.

2. Motivation of Studying Food Technology

By adjusting to innovation and product development, investigating food technology provides opportunities to learn about revolutionary processes and methods while experimenting with cooking in the rapidly changing world. Food technology must be thoroughly comprehended to meet the evolving expectations of customers who seek a wide range of convenient and varied food choices.

a. Innovation and Product Development

By recognizing its innovations and sustainable practices, it will enable to broaden the understanding of how to adapt to change and keep up with the food sectors trends, especially when it comes to food technology study. Studying food technology is essential to creating a sustainable future because it offers the information and resources needed to tackle difficult problems and promote progress in relation to food technology (Penfield et al., 2013). Many research projects on food technology will add significantly to the corpus of knowledge regarding the depth and scope of their understanding of the contemporary environment. Moreover, it focuses on education via technological advancements. Despite the difficulty, this offers a way forward for achievement and transformation. As shared by P4: “The use of food science and technology to enhance the nutritional content and flavor of food is something I observe in food technology students, especially when it

comes to the quick and simple ready-to-eat meals that are a big part of today's busy lives. In gentler production processes, high pressure or steam are better for preserving food flavor and nutrients”

Furthermore, the field of food technology is expanding and calls for a solid grasp of the science and technology underlying food processing and production (Mercer et al., 2015). Students who complete this course will be better prepared to design and oversee contemporary food production systems. Furthermore, included in the course are subjects like food engineering, nutrition, and safety (Rutland & Owen-Jackson, 2015). Students can acquire the information required to operate in the food industry and guarantee that food products are safe and of the highest quality by comprehending the potential and difficulties presented by food technology (Lillford & Hermansson, 2021). Additionally, the course will assist students in gaining a deeper comprehension of the food industry, which may open up additional job options. With the technological advancements, the school won't fall behind in timely and relevant new information in food technology studies. Also, added by P5: “Food technology studies help students learn about making food safely and healthily and it can work in food companies do research or help make food rules”

As notion by Chen et al., (2013), food technology research has significantly improved safety, effectiveness, and sustainability in food production, keeping, and delivery. This is also an opportunity for the food services sector to use advanced and contemporary technologies. Additionally, food technology research focused on progressing and advancing. As added by P8: “One of the better food technology techniques I saw for boosting food processing efficiency was the use of smart sensors. Smart sensors are devices with the capacity to measure and monitor several aspects of food products, such as moisture content, pH, texture, color, freshness, and temperature”

Due to the constant growth and extension of information, technological advancements in education are necessary. All food technology abilities and talents must be modified to meet the demands of the contemporary food safety, storage, and preparation environment. According to research efforts, foods with additional health advantages beyond basic nutrition are being developed (Mujtaba et al., 2019). The discovery and application of substitute substances result from research advances and alternative ways to promote transportation, safety, and storage (Bearth & Siegrist, 2016). Food technology drives advancements in food quality, safety, sustainability, and innovation. It was determined that emphasizing innovation and product development would be a beneficial strategy for raising teachers' and students' food technology proficiency. It cannot, therefore, be completed without the support of suitable locations and tools. Consequently, developing products that consider the culture of the organization itself is one way to innovate.

b. Program for Advancing Food Technology Studies

To further strengthen food technology studies as a foundry of knowledge, it is imperative that instructors and students write research about food technology and provide equipment and spaces in food technology for more focus and reliable outcomes. Based on the participant responses, the conclusion was made that the institution needed to stay current with and promote technological breakthroughs and innovation. Enhancement programs help people and companies stay current with emerging technologies, market trends, and best practices in rapidly evolving fields. As mentioned by P6: “Students must use what they learn in real-world settings in order for food technology courses to improve. New developments in the food business should also be covered in the classes. Additionally, working with actual food firms allows you to learn from them”

The conclusion reached from the responses provided by the participants was that the institution needed to keep up with and support innovation and technical advancements. Encouraging instructors and students to engage more in real-life situations and application practices about food technology is vital to further develop food technology as a foundry of knowledge. Enhancement programs assist both businesses and individuals in staying up to date with industry trends, new technologies, and best practices in quickly changing industries. This flexibility is essential to long-term success (Safdari, 2019). Enhancement programs are deliberately planned endeavors with the goal of bringing about constructive adjustments and improvements in a particular setting, ultimately assisting in the general development, efficacy, and prosperity of individuals. Added by P7: “In order to enhance food technology studies, educators and students should conduct more field research. They should also collaborate more to teach students about real-world food issues. By doing this, students will learn more effectively and be better equipped for careers in the food industry”

As a result of the results of the study, the enhancement program aims to improve the ability of food technology students to adapt to the rapidly changing local and international context. Simultaneously placing each person's readiness and significance about changes in technological advancements. Building capacity is necessary to improve academic and student research capacities in food technology. As mentioned by P1 and P2: “With the existence of initiatives like programs that will expand the readiness of a food technology, students can be prepared for a competitive and competent world that is individual”. “Establish a program for mentorship that connects experienced people with students studying food technology”

By encouraging the creation of teaching strategies centered on research, this project seeks to close the gaps in the availability of high-quality educational resources. It can provide academics and students with an awareness of the food business and related procedures, enabling them to apply their expertise to develop new goods and services (Smigic et al., 2021). Understanding improved sustainability and the necessity of better food production and storage techniques can also be beneficial. In conclusion, researching food technology can lead to a deeper comprehension of the science underlying food production and storage, enabling a safer and more effective use of resources (Singh et al., 2017). Furthermore, P3 shared: “As part of the enhancement program, students should be exposed to taking part in various symposiums, field trips, and culinary competitions. This will help them become more competent and self-assured, and they will be able to put their knowledge and talents to use in ways that will make the school proud”

In connection to the proposed enhancement program, adopting evidence-based methodology enables food technology research to cover a greater range of topics and enable a more thorough examination of their consequences. It aims to create awareness of exceptional service in the food industry among all individuals and to increase people's creativity and resilience, both of which will attest to sustainable development. The enhancement program should include opportunities for students to participate in various symposiums, field trips, and culinary competitions. Food technology should provide an enhanced program to eliminate learning gaps and raise the program's bar to the greatest level, enabling people to reach their full potential in all areas of life in related to food technology.

Conclusions

In the institution, improving individuals' capacities and abilities in both personal and professional contexts is a shared objective. Enhancing the research competencies of food technology faculty members and students requires capacity building. This will close

the gaps in access to high-quality educational services and result in more research-based teaching pedagogies. Studies on food technology will cover a broader range of topics and delve further into their effects thanks to the use of evidence-based methods. Real-life situations enable students to develop and engage them into more complex activities in relation to safety, storage and production. Through comprehensive instruction designed to strengthen the institution's dedication to writing, be able to generate more timely and pertinent research. Food technology writing studies might receive value and attention from the Enhancement Program which paved its way in the challenges and opportunities in food technology, which is dedicated in providing quality education and preparation in the food industry.

References:

- Abécassis, J., Cuq, B., Escudier, J., Garric, G., Kondjoyan, A., Planchot, V., . . . De Vries, H. (2018). Food chains; the cradle for scientific ideas and the target for technological innovations. *Innovative Food Science & Emerging Technologies*, 46, 7–17.
- Acciaro, M., Vanellander, T., Sys, C., Ferrari, C., Roumboutsos, A., Giuliano, G., . . . Kapros, S. (2014). Environmental sustainability in seaports: a framework for successful innovation. *Maritime Policy & Management*, 41(5), 480–500.
- Albanie, S. (2017). The role of food processing and appropriate storage technologies in ensuring food security and food availability in Africa. *Nutrition & Food Science*, 47(1), 122–139.
- Appio, F. P., Lima, M. a. M., & Paroutis, S. (2019). Understanding Smart Cities: Innovation ecosystems, technological advancements, and societal challenges. *Technological Forecasting and Social Change*, 142, 1–14.
- Bearth, A., & Siegrist, M. (2016). Are risk or benefit perceptions more important for public acceptance of innovative food technologies: A meta-analysis. *Trends in Food Science and Technology*, 49, 14–23.
- Benke, K. K., & Benke, G. (2018). Artificial intelligence and big data in public health. *International Journal of Environmental Research and Public Health*, 15(12), 2796.
- Beske, P., Land, A., & Seuring, S. (2014). Sustainable supply chain management practices and dynamic capabilities in the food industry: A critical analysis of the literature. *International Journal of Production Economics*, 152, 131–143.
- Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., . . . Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing*, 25(8), 652–661.
- Chen, Q., Anders, S., & An, H. (2013). Measuring consumer resistance to a new food technology: A choice experiment in meat packaging. *Food Quality and Preference*, 28(2), 419–428.
- Chin, H. H., Varbanov, P. S., Benjamin, M. F. D., & Tan, R. R. (2020). Asset maintenance optimisation approaches in the chemical and process industries – A review. *Chemical Engineering Research and Design*, 164, 162–194.
- Corbo, M. R., Bevilacqua, A., Petrucci, L., Casanova, F. P., & Sinigaglia, M. (2014). Functional beverages: the emerging side of functional foods. *Comprehensive Reviews in Food Science and Food Safety*, 13(6), 1192–1206.
- Giacalone, D., & Jaeger, S. R. (2023). Consumer acceptance of novel sustainable food technologies: A multi-country survey. *Journal of Cleaner Production*, 408, 137119.

- Horton, P., Banwart, S. A., Brockington, D., Brown, G. W., Bruce, R. D., Cameron, D. D., . . . Jackson, P. (2017). An agenda for integrated system-wide interdisciplinary agri-food research. *Food Security*, 9(2), 195–210.
- Javaid, M., Haleem, A., Singh, R. P., Suman, R., & Gonzalez, E. S. (2022). Understanding the adoption of Industry 4.0 technologies in improving environmental sustainability. *Sustainable Operations and Computers*, 3, 203–217.
- Kallio, H., Pietilä, A., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, 72(12), 2954–2965.
- Kamilaris, A., Fonts, A., & Prenafeta-Boldú, F. X. (2019). The rise of blockchain technology in agriculture and food supply chains. *Trends in Food Science & Technology*, 91, 640–652.
- Liamputtong, P. (2021). Qualitative research methods. In *Edward Elgar Publishing eBooks* (p. 192).
- Lillford, P. J., & Hermansson, A. (2021). Global missions and the critical needs of food science and technology. *Trends in Food Science and Technology*, 111, 800–811.
- Lozano, R., Ceulemans, K., Alonso-Almeida, M., Huisingh, D., Lozano, F. J., Waas, T., . . . Hugé, J. (2015). A review of commitment and implementation of sustainable development in higher education: results from a worldwide survey. *Journal of Cleaner Production*, 108, 1–18.
- McClements, D. J. (2020). Future foods: Is it possible to design a healthier and more sustainable food supply? *Nutrition Bulletin*, 45(3), 341–354.
- McClements, D. J., Barrangou, R., Hill, C., Kokini, J. L., Lila, M. A., Meyer, A. S., & Yu, L. (2021). Building a resilient, sustainable, and healthier food supply through innovation and technology. *Annual Review of Food Science and Technology*, 12(1), 1–28.
- Mercer, J. G., Johnstone, A. M., & Halford, J. C. (2015). Approaches to influencing food choice across the age groups: from children to the elderly. *Proceedings of the Nutrition Society*, 74(2), 149–157.
- Miller, S., & Tanner, K. D. (2015). A Portal into Biology Education: An Annotated List of Commonly Encountered Terms. *CBE- Life Sciences Education*, 14(2), fe2.
- Mujtaba, M., Morsi, R. E., Kerch, G., Elsabeé, M. Z., Kaya, M., Labidi, J., & Khawar, K. M. (2019). Current advancements in chitosan-based film production for food technology; A review. *International Journal of Biological Macromolecules*, 121, 889–904.
- Namany, S., Al-Ansari, T., & Govindan, R. (2019). Sustainable energy, water and food nexus systems: A focused review of decision-making tools for efficient resource management and governance. *Journal of Cleaner Production*, 225, 610–626.
- Nile, S. H., Venkidasamy, B., Selvaraj, D., Nile, A., Xiao, J., & Kai, G. (2020). Nanotechnologies in Food Science: applications, recent trends, and future perspectives. *Nano-Micro Letters*, 12(1).
- Nyumba, T. O., Wilson, K. A., Derrick, C. J., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. *Methods in Ecology and Evolution*, 9(1), 20–32.
- Patton, G. C., Sawyer, S. M., Santelli, J., Ross, D. A., Afifi, R., Allen, N. B., . . . Viner, R. (2016). Our future: a Lancet commission on adolescent health and wellbeing. *The Lancet*, 387(10036), 2423–2478.
- Penfield, T., Baker, M., Scoble, R., & Wykes, M. (2013). Assessment, evaluations, and definitions of research impact: A review. *Research Evaluation*, 23(1), 21–32.

- Rashid, M. I., & Shahzad, K. (2021). Food waste recycling for compost production and its economic and environmental assessment as circular economy indicators of solid waste management. *Journal of Cleaner Production*, 317, 128467.
- Román, S., Sánchez-Siles, L. M., & Siegrist, M. (2017). The importance of food naturalness for consumers: Results of a systematic review. *Trends in Food Science and Technology*, 67, 44–57.
- Rutland, M., & Owen-Jackson, G. (2014). Food technology on the school curriculum in England: Is it a curriculum for the twenty-first century? *International Journal of Technology and Design Education*, 25(4), 467–482.
- Safdari, S. (2019). Operationalizing L2 motivational self system: Improving EFL learners' motivation through a vision enhancement program. *Language Teaching Research*, 25(2), 282–305.
- Siegner, A. B., Sowerwine, J., & Acey, C. (2018). Does urban agriculture improve food security? Examining the nexus of food access and distribution of urban produced foods in the United States: A Systematic review. *Sustainability*, 10(9), 2988.
- Siegrist, M., & Hartmann, C. (2020). Consumer acceptance of novel food technologies. *Nature Food*, 1(6), 343–350.
- Sima, V., Gheorghe, I. G., Subić, J., & Nancu, D. (2020). Influences of the Industry 4.0 Revolution on the human capital Development and Consumer Behavior: A Systematic review. *Sustainability*, 12(10), 4035.
- Singh, T., Shukla, S., Kumar, P., Wahla, V., & Bajpai, V. K. (2017). Application of Nanotechnology in Food Science: Perception and Overview. *Frontiers in Microbiology*, 8.
- Šmigić, N., Lazarov, T., & Đjekić, I. (2020). Does the university curriculum impact the level of students' food safety knowledge? *British Food Journal*, 123(2), 563–576.
- Tripathi, A. D., Mishra, R., Maurya, K. K., Singh, R. B., & Wilson, D. W. (2019). Estimates for world population and global food availability for global health. In *Elsevier eBooks* (pp. 3–24).