ASEAN Journal of
Agriculture and Food Engineering

Journal homepage: https://ejournal.bumipublikasinusantara.id/index.php/ajafe

Safe Food Treatment Technology: The Key to Realizing The Sustainable Development Goals (SDGs) Zero Hunger and Optimal Health

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ABSTRACT

Food processing is a process of change that can affect the nutritional content of food. Safe technological innovations are needed to support the realization of sustainable development goals (SDGs) Zero Hunger and optimal health for the community. This study aims to determine the relationship between safe food processing and the achievement of SDGs of Zero Hunger and optimal health, using the literature review method. The results of the literature review focus on food processing technology to maintain the availability of safe and quality food for the community. In addition, this research can also provide insight into the need to maintain the nutritional value of food both before and after processing. The conclusion that can be obtained from this research illustrates the positive relationship between safe food processing and the achievement of SDGs Zero Hunger and optimal health.

ARTICLE INFO

Article History:
Submitted/Received 30 Aug 2023
First Revised 24 Oct 2023
Accepted 17 Dec 2023
First Available online 18 Dec 2023
Publication Date 01 Mar 2024

Keyword:
Food,
Health,
Processing,
SDGs,
Technology.

1. INTRODUCTION

Food processing technology plays a crucial role in maintaining the availability of safe and quality food for the public (Putri, 2023). Innovations in processing technology enable manufacturers to improve production efficiency, extend product shelf life, ensure food safety, and reduce the risk of contamination (Safirin *et al*., 2023). Advanced processing methods help maintain the nutritional value of food. Thus, consumers can enjoy food that is not only delicious but also nutritious (Safaruddin *et al.*, 2023).

Food safety is a concept that includes a series of measures and principles to ensure that the food consumed by the public is free from risks that could endanger human health (Juariyah & Faozen, 2022). It involves strict control from the beginning to the end of the food supply chain, from production, processing, and distribution, to consumption (Kuncorosidi & Mugies, 2022).

Key principles in food safety include strict monitoring of the quality of raw materials, good hygiene practices during the production process, and clear and informative labeling to guide consumers (Mela & Rizki 2023). Overall, food safety is not just about creating food that is free from contamination but also involves a collective responsibility to safeguard consumer health, support the sustainability of the food supply chain, and ensure the availability of safe and high-quality food to the public (Suhaedah *et al*., 2023).

Achieving the Sustainable Development Goals (SDGs) Zero Hunger is crucial to creating a hunger-free world (Putri & Karmini, 2023). PBB's 2030 Agenda, specifically the Zero Hunger SDGs, aims to eliminate hunger, increase food security, improve nutritional status, and promote sustainable agriculture. Achieving these goals requires global cooperation involving governments, non-governmental organizations, the private sector, and civil society. Providing better access to productive resources such as land, water, and agricultural technology is key to empowering smallholder farmers (Eskarya & Elihami, 2019). Holistic nutrition programs and innovative approaches in food supply chain management are also important elements to achieve the Zero Hunger SDGs.

This study aims to determine the relationship between safe food processing and the achievement of SDGs Zero Hunger and optimal health. By using the literature review method to obtain data from various sources of information.

2. METHODS

Sources of information were selected in the early stages of writing this paper by identifying appropriate criteria, including selecting sources from textbooks, conference documents, and scientific journals. The period used in this literature review was the last ten years relevant to this research. The literature search strategy was developed by using databases that best fit the scope of the search, constructing keywords that reflected the nature of the topic, and applying appropriate search limitations. Additional efforts were also made to research publications from alternative sources, such as books, government reports, and other non-traditional sources, to ensure the completeness and depth of the literature.

To determine the literature to be included, inclusion and exclusion criteria were described in detail, taking into account the year of publication, type of publication, and specific research methodology (Sejati *et al.,* 2023). The literature quality assessment process includes consideration of peer review status, journal impact, and author reputation by providing a solid basis for assessing the reliability and relevance of the information extracted from the selected documents.

DOI:
p- ISSN 2963-9093 e- ISSN 2961-9505

The data collection process was systematic, detailing how the material was collected, classified, and organized. At the analysis and synthesis stage, documents were organized based on key findings, trends were identified, and similarities and differences between the documents were sought.

3. RESULTS AND DISCUSSION

3.1. The Role of Food Processing Technology in Achieving the Zero Hunger SDGs.

The role of food processing technology is very important in achieving Sustainable Development Goals (SDGs), especially SDG 2 which targets Zero Hunger. With technological advances, the food production process can be optimized to improve efficiency and product quality (Aldillah, 2016). Such optimization can be through the application of advanced technologies such as automation and data management systems. Through automation, advanced machinery and equipment can replace the role of humans in carrying out processing activities, starting from the raw material separation stage to the packaging process. To increase productivity in efficiency, both time and labor efficiency. The benefits not only lie in time and labor efficiency but also in reducing the risk of human error.

Processing technologies are also able to reduce losses and spoilage (Safirin *et al.,* 2023). The use of these technologies utilizes innovative packaging techniques that can increase the product's resistance to environmental factors and reduce the risk of contamination. In addition, the use of carefully controlled storage technology can maintain temperature and humidity to maintain product quality, inhibit the spoilage process, be able to extend shelf life and maintain nutritional value.

Similarly, the implementation of an efficient supply chain management approach involves good cooperation from the production to distribution stages, ensuring that products reach consumers in the best possible condition and on time (Sinaga *et a*l., 2023). Supply chain management is also able to provide comprehensive visibility into the entire production process that will ensure more precise forecasting of human resources, goods, and equipment, thus facilitating faster and more accurate decision-making (Bantacut, 2018).

Technology plays an important role in ensuring that every stage of food production and distribution can be closely monitored (Setyoko & Kristiningrum, 2019). Integrated traceability systems use advanced information technology to enable more effective identification and tracking from product origin to end consumer (Utomo, 2020). By using technology, producers can respond quickly to potential food safety risks and ensure that products reaching consumers are safe for consumption (Alvina, 2023). This food safety traceability not only ensures product quality but also supports food supply chain transparency, thereby contributing to efforts to achieve the Zero Hunger goal of the sustainable development agenda.

Food processing technology plays an important role in improving nutritional quality by enabling innovations in the separation, purification, and addition of nutrients to foodstuffs. Through advanced processing methods, we can increase the nutritional value of food, retain nutrients during the production process, and create products with more optimal nutrient content. The use of technology also enables the development of more efficient processing methods to retain nutrients in raw food (Andriani *et al.,* 2022). For example, the use of low temperatures in preservation or drying processes can help retain the content of heat-sensitive nutrients (Ramadhia *et al.,* 2012). In addition, processing technologies can be used to break down complex molecules in food, increasing the availability of nutrients to the human body during digestion.

DOI:
p- ISSN 2963-9093 e- ISSN 2961-9505

By effectively utilizing food processing technologies, it can be expected that food production can be increased, losses can be minimized, and access to safe and nutritious food can be expanded, all of which will help achieve the Zero Hunger target in the SDGs.

3.2. The Importance of Maintaining the Nutritional Value of Food Products to Support Health and Wellbeing.

Nutritional value is key to the maintenance of human health and well-being. Food products are the main source of nutrients that we consume daily (Suryani & Ardian, 2020). Fulfillment of nutritional needs (nutrients) is a major factor in achieving developmentally appropriate outcomes. It is therefore important to understand and maintain the nutritional value of food products to support health and well-being. Every day, the body needs balanced nutrition consisting of carbohydrate, fat, protein, vitamin, and mineral intake. The intake of these nutrients can be obtained from the food consumed which is useful for brain development and physical growth (Malinda *et al*., 2022).

The principle of the "Nutrition Guide for Balanced Diet" agreed upon by the World Food Conference is believed to be able to overcome The Double Burden of Malnutrition (DBM) or the double burden of nutrition problems, both malnutrition and overnutrition (Sumanto *et al.,* 2020). The principle states that daily food consumption must contain nutrients in the type and amount (portion) that suit the needs of each person or age group. Food consumption according to this principle must pay attention to four basic principles, namely: food diversity, regular and measurable physical activity, personal hygiene and a well-maintained environment, and always maintaining ideal body weight.

The Indonesian Ministry of Health issued the General Guidelines for Balanced Nutrition with visualization in the form of a balanced nutrition tumpeng. The development of PGS (Balanced Nutrition Guidelines) in various countries has made country-specific adjustments. Balanced Nutrition Guidelines (Dietary Guidelines) are used in developed countries as guidelines for healthy eating and living for the community. In Indonesia, the Balanced Nutrition Plate is recommended for the development of balanced nutrition implementation in the community (Laswati, 2017).

Nutritional value in food products is the foundation of good health. Nutrients such as proteins, carbohydrates, fats, vitamins, and minerals are necessary for various bodily functions. Protein is an important building block in the body to build and repair tissues, while vitamins and minerals contribute to various body functions (Baihaki, 2017). The food consumed should contain nutrients that can help carry out three important functions for the body, namely: as a source of energy found in carbohydrates, proteins, and fats. Maintaining body tissues and growth found in proteins, minerals, and water. Regulating processes in the body: proteins, minerals, water, and vitamins (Rahmi, 2019). Adequate and balanced nutrition is the key to maintaining the energy the body needs, strengthening the immune system, and preventing various diseases.

In addition to safeguarding individual health, maintaining the nutritional value of food products also has a major impact on the overall well-being of society. Nutritional problems such as malnutrition and nutrition-related diseases can place a huge burden on a country's health system. They can lead to high mortality, disability, and high healthcare costs. According to Setiadi & Fifi (2020), the role of public health workers as promoters promoting health is very important in providing education to the community, especially mothers regarding children's nutritional intake. Good nutritional intake in children often cannot be fulfilled due to several factors.

DOI:
p- ISSN 2963-9093 e- ISSN 2961-9505

These include the mother's level of education, the mother's knowledge about nutrition and health, family socioeconomic conditions, availability of food, and the emotional relationships of other family members reflected in a habit (Numaliza & Herlina, 2018).

It is important to raise consumer awareness of the importance of choosing food products with high nutritional value. Savvy, nutrition-savvy consumers can contribute to an increased demand for healthy foods, encouraging manufacturers to focus more on the nutritional quality of their products. Consumers must be active in reading food labels, understanding nutritional values, and choosing healthy foods.

According to Dewi *et al*., (2023), The main purpose of nutrition labeling is to assist consumers in knowing whether there is a lack or excess intake of nutrients that can lead to nutritional problems and determine the choice of food ingredients to be consumed. Thus, it is safe for health. Every packaged food company must include food labels on the packaging in the form of calorie, fat, protein, sugar, and sodium content.

Apart from consumers, food producers also have a major role in maintaining the nutritional value of food products. Manufacturers must be committed to maintaining the nutritional quality of their products (Santoso, 2016). This includes maintaining the production and storage processes so as not to reduce the nutritional value. Manufacturers can also innovate by creating healthier food products, such as low-fat or low-sugar foods, without sacrificing flavor (Dewi *et al.,* 2022). They must also commit to following established guidelines and regulations regarding safe and nutritionally valuable food.

3.3. Innovations in Food Processing Technology that Maintain Food Safety

Innovations in food processing technology play an important role in maintaining food quality and safety. One of the most important technological advances is the discovery of new heat processing methods, such as ohmic heating, microwave, and high-pressure processing (Misra *et al.,* 2017). This is following the theory in the 2019 food chemistry book which shows that these methods not only improve the efficiency of food processing but also have the potential to significantly reduce the contamination level of pathogenic microorganisms.

(i) Ohmic heating is heating that generates heat directly in foodstuffs through the application of an electric field. The basic principle is that foodstuffs containing water, fat, and conductive salts can heat up through conduction. This process is effective because the heat is generated within the product, allowing for more even and faster heating.

(ii) Microwave technology involves the use of high-frequency electromagnetic waves to heat food. In this technology the water molecules contained in the food product absorb the microwave energy, thus causing heating. This process is often faster than conventional methods, as heating occurs internally. This can allow for better temperature control.

(iii) High-pressure processing involves applying high pressure to food to destroy pathogenic microorganisms and enzymes that can affect food quality and safety (Rozam, 2023).

Along with these advancements, nanotechnology has also become an important part of maintaining food safety through the development of advanced packaging materials. By using antibacterial nanoparticles incorporated into packaging, the level of protection against microbial growth in food can be increased (Prasetiowati, 2018). This is following Warsani (2022), which nanotechnology-based packaging not only has the potential to extend product shelf life but can also reduce the risk of contamination, which is often a major concern.

In addition to thermal processing, technological innovations in food processing also involve non-thermal processing methods. Techniques such as low-pressure, ultrasonic, and radiation

DOI:
p- ISSN 2963-9093 e- ISSN 2961-9505

processing. Low-pressure processing can be used to preserve the nutrients and sensory properties of food, while ultrasonic processing and cold radiation can help reduce the level of pathogenic microorganisms without affecting product quality (Sari *et al.,* 2016).

Innovation can also be seen in the use of molecular biology technology in food processing. Techniques such as PCR (Polymerase Chain Reaction) and other biomolecular detection methods are used to detect the presence of pathogens or other contaminants at the molecular level quickly and accurately (Nugroho *et al.,* 2021). This helps ensure food safety by providing a rapid response to potential contamination risks.

Through these innovations, food processing technology continues to evolve to maintain food safety by combining production efficiency, risk detection, and product quality.

3.4. Positive Impact of Safe Food Processing Technology on Public Health

Food has a vital role in maintaining a person's health, so it is also necessary to pay attention to whether the food contains optimal and complete nutritional value. Complete nutrients needed by the body include carbohydrates, vegetable and animal proteins, fats, minerals, and vitamins. Foods that have nutritional value can be processed with the right processing process, if not processed properly, the food will interfere with health. In addition, before consuming processed or non-processed foods, it is also necessary to ascertain whether the food is safe and free from sources of disease.

According to Andriyani (2019), good processing means that there is no damage to food caused by improper processing and the processing process must follow hygienic and sanitary principles according to Good Manufacturing Practices (GMP). Food serves as a source of energy and also plays a role in the chain of disease spread, so food sanitation is needed. Thus, it is not contaminated with disease-causing bacteria.

Food processing is the process of changing the original form into a form that can be consumed. Food processing includes heating, be it cooking, boiling, steaming, or roasting. Cooking that occurs in food is very influential on the nutritional value content of the food, which can reduce or even damage the nutritional content of food, such as vitamins and protein nutrients. On the other hand, the processing process can also provide benefits to the nutritional components of food, including increasing digestibility, availability of nutrients contained, and reducing various antinutritional compounds (Lamid *et al.,* 2015).

Safe and good food processing can influence public health, as in the results of Sudjatini's research (2020) showing that garlic in certain varieties processed by boiling still contains high antioxidants. In addition, soybeans that go through the boiling process can increase digestibility and protein availability. Isoflavones in soybeans also have the potential an anticancer (Failisnur *et al.,* 2015).

These benefits can be obtained if soybeans go through the boiling process, as the results of research (Utari, 2010 in Failisnur *et al.,* 2015) state that the double boiling process contains higher isoflavones than only boiling once, and the boiling process can contain higher isoflavones compared to steaming.

Food processing technology also plays a role in the health impact of consumption. The technology used needs to produce products that are not contaminated by harmful ingredients, be it from biological contamination (parasites, bacteria, viruses), chemical contamination (pesticides, growth hormones, insecticides), and physical contamination (metal pieces, stones, glass pieces) (Hariyadi, 2018).

Now, there are more and more innovations in food processing technology that can be applied to maintain food safety. The application of technology in food processing can help producers and the public to maximize the desired product quality results, create products

DOI:
p- ISSN 2963-9093 e- ISSN 2961-9505

with optimal nutrition, and increase the nutritional value contained. Thus, the application will meet the needs of the community's body, maintain the health of the body, and avoid unwanted diseases.

4.CONCLUSION

Food processing technology not only improves production efficiency but also plays an important role in maintaining the quality, safety, and nutrition of food products, which can contribute to achieving the SDGs' global goal of Zero Hunger. The importance of maintaining the nutritional content of food products is key to individual health and societal well-being to help maintain energy intake, boost the immune system, and prevent nutrition-related health problems. Continuous efforts in the development of food processing technologies are of key importance in ensuring the safety and quality of food products consumed by the public. Not only that, food processing technology also has an impact on public health by providing safer, higher quality, and nutritionally optimized products. Therefore, with food processing technology, people can maintain the quality, safety, and nutrition of food products, contribute to the achievement of the global goals of SDGs, especially Zero Hunger, and maintain public health through the provision of safe, high-quality products and optimal nutrition.

5. AUTHORS' NOTE

The authors guarantee that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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DOI:
p- ISSN 2963-9093 e- ISSN 2961-9505