



The Role of Food Technology in Health Architecture

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ABSTRACT

Global health is one of the priorities in Indonesia's G20 Presidency. Restructuring of the global health architecture is mentioned on the health sector's agenda. This can be achieved through adequate and quality food intake. Food sovereignty and security is a strategic issue to realize health. Food technology, which is an effort to provide quality, nutritious, and safe food for consumption, is the foundation for realizing health architecture. This can be realized if it is supported by food security and sovereignty. The competitiveness of Indonesian food products also still needs great attention. Quality improvement must still be fought to compete in the global market. Therefore, easy access to quality food and people's purchasing power are the pillars of global health, especially in preventing hunger and malnutrition. Future food trends that are dominated by healthy foods which are technology-oriented, especially functional foods, plant-based and animal-free food meat, food packaging, transparency and trust in food, and computerized technology in food are forms of health architecture. This paper contains the background to the need to build a health architecture; the competitiveness of Indonesian food products; nutritional problems and access to healthy diets; future food trends; as well as food technology and its role in health.

Keywords: *food technology, health architecture, hunger, malnutrition, healthy food*

1. INTRODUCTION

One of the priority issues in Indonesia's G20 Presidency is global health. The main agenda of the health sector is restructuring the global health architecture. Indonesia has encouraged strengthening global health resilience and helped the global health system be more inclusive, equitable, and responsive to crises. Global health is essential because the Covid-19 pandemic is the biggest challenge for the global community, so one way to do that is by building stronger global health architecture [21].

Since well before the Covid-19 pandemic, several major drivers have put the world off track to ending world hunger and malnutrition in all its forms by 2030. Now, the Covid-19 pandemic and related containment measures have made it significantly more challenging to achieve this goal. But they also have highlighted the need for deeper reflection on how to better address the major drivers that are resulting in the global food insecurity and malnutrition situation we are experiencing right now [30].

The Covid-19 pandemic has pushed consumers not only want more product delicious and healthy but also consider efforts to preserve the environment [21]. The pandemic has change how and where we spend, as well as what we eat. Consumers have adapted to the new normal, creating and shifting existing trends [8]. Food technology is directed to meet the demand for food with nutritional value and health benefits improvement, environmental sustainability, and ethical aspects [13].

A healthy generation will be built if supported by provision independent and sovereign in the food. In this context, it requires of proper understanding from the public about healthy food [12]. The efforts to meet food that needs independently and sovereignty should be pursued through means capable of advancing the general welfare, produce smart people, so that can contribute for the achievement of an increasingly dignified world.

The efforts to increase sovereignty food, building a healthy generation, and strengthened as a dignified nation, substantially intended to deliver critical evaluation of policies and implementation of the fulfillment of food needs independently; access and availability of food diverse, nutritionally balanced and safe for family; and then which can be strengthened food sovereignty, and strengthen dignity Indonesian nation in the world' view. Healthy diets have the potential to improve nutritional equity [8]. This is what's needed to build health architecture.

2. **INDONESIAN FOOD PRODUCTS COMPETITIVENESS**

As a lighter the idea of improvement competitiveness of Indonesian food and agricultural products presented some data, as well as a reflection of the competitiveness condition of food products and current agricultural products. For example, the issue of imports of industrial salt and sugar cane, soybean, corn, and beef. Though these commodities are domestically produced, however the quantity is insufficient, even the quality does not meet the needs of the locally food industry. Among them is industrial salt. The salt production in the country has not been able to fulfill standard, with a NaCl content of more than 97%. While society' salt only contain 81.1% to 86.91% [28]. Also, cane sugar products cannot be used by certain food and beverage industry because the impurities content does not meet industry standards. Partially domestic production of dry corn contaminated with mycotoxins at exceeding levels maximum permissible limit (50 ppb) for food as well as for animal feed [2]. That's the reality of our quality' food products.

Those situations faced the fact that the policy regarding food imports is still high during this time. Import of soybean, wheat flour, and products derived from milk also continued to increase. Fresh milk produced domestically besides the amount insufficient, it is also not entirely acceptable and used by the dairy industry because it does not comply standard as raw material. It shows that the production of fresh milk in the country is not competitive in terms of quality and price.

On the other hand, the commodity export which shows a fairly high competitiveness in international and domestic

trade is palm oil and spices. In this commodity, Indonesia has a comparative advantage, because supported by large production volumes and suitability for tropical conditions. However, the form of the exported commodity in part most of its still in the form of raw materials which have low value added; for example, some of them still in the form of crude palm oil (CPO) or spices in whole and raw condition. Besides they get in still simply technological inputs to diversify derivative products of these commodities, now faced with the challenge of producing commodity in a sustainable manner. Although that commodity has a comparative advantage, however development of global trade competition today and in the future needs excellence competitive advantage.

If that commodity not properly prepared and responded, they will be able to suffer the same fate with production and export of cocoa beans. Indonesian can only to become an exporter of cocoa beans as raw materials, while a large added value enjoyed by the chocolate industry in the destination country (importer). Even more concerning, in recent years, it turns out to meet the needs of the domestic chocolate processing industry have to import cocoa beans from other countries.

Food industry and other agricultural products also need a lot supply of fuel limited fossils, getting thinner groundwater reserves, and increased soil erosion [10]. If not noticed, this condition can threaten the ability to produce food sufficient which is needed by the increasing population in the long term. There have been major changes in the field of food and agriculture in the last ten years and next ten years to consider in devising new strategies to improve food security for every country.

First, climatic conditions that the patterns unpredictable and extreme, pest infestation, and more malignant disease. Second, improvement the proportion of the elderly population and consumers food that is increasingly concerned about its effects for their health, and there are demands increasingly specific food needs for individuals. Third, increase the income of residents who requires the provision of food that is increasingly diverse and food serving services that must be adapt to the demands of diverse lifestyles. Fourth, marketing and distribution of food expanding across national borders in

one sides open up new market share opportunities for certain products, but on the other hand also raises increasingly fierce competition with products that already available. Fifth, the disruption of the material supply chain fertilizer raw materials and cereal production as a result of the conflict between countries is still ongoing [25].

The challenge today and in the future is how to produce enough food and diverse to meet the needs especially in Indonesia, which has a large and continuous population increase. Meanwhile, the carrying capacity of the resources available natural resources tend to decrease or thinning. In the other hand, that can't be ignored the current conditions in which the resource is used water that is too high, water pollution that is already very widespread, and its greenhouse gas emissions must be decrease [24].

An alternative concept that can be taken to achieve a higher level of food sovereignty stable and sustainable in the future among other things, utilizing marginal land and idle land for productive farming, increase productivity of agricultural products, increase the supply of food along a safe supply chain, improve the efficiency of resource use, changing food consumption patterns in a positive direction healthier, and reduce agricultural yield losses and reduce the amount of food which ends up as waste [10]. By alternative, is expected to increase food availability up to 100% on a regular basis keeping the impact on the environment to a minimum [9].

If not managed properly, the efforts to increase food production can have an impact in a progressively worse burden on environment. Food production activities start from on farm to industrial processing and its distribution causes greenhouse gas emissions, requires the availability of clean water, and use increasing amounts of big energy [24]. The length of the production and distribution chain of food that has not been supported by infrastructure adequate and adequate supply chain management can result in food loss and food waste. It is not only impact on the heavy burden on the environment, but also make the selling price of the commodity food cannot compete [25].

3. NUTRITIONAL PROBLEMS AND ACCESS TO HEALTHY DIETS

In 2018, more than 95% Indonesian lack of consumption of vegetables and fruit. Average consumption of meat, vegetables and fruit in Indonesia much lower than the rest of the world, and the average country in ASEAN. SUSENAS data shows that the National Hope Food Pattern (Pola Pangan Harapan = PPH) score is still in the range of 80 to 90 in the last five years, despite the adequacy figure energy and protein per capita are relatively fulfilled. More far away, data disaggregation by income quintile recent years show that the score PPH in the lowest 20% group is only around between 50 to 60 which is highly marked low consumption of animal-based foods, vegetables and fruit, and nuts. Only 1% of society Indonesia is unable to meet the diet sufficiently calories, but almost 69.1% of people (2020) cannot afford a healthy diet [11].

The cost of obtaining a healthy diet is defined as the cost of a pool of six groups food (oils and fats, nuts, staple food sources of carbohydrates, fruits, vegetables, and food of animal origin) at a cost lowest that will meet the corresponding requirements with healthy food recommendations in each country. Globally, the average price of a healthy meal for a day per person is USD 3.54 in 2020 [30]. If a family spends more than 52% of his income for food, then gets categorized as unable to afford food healthy for their family.

The new challenge of malnutrition is hidden hunger, ie. in the form of micronutrient deficiencies, especially deficiency of iron, iodine, folic acid, zinc, vitamin A, and other micronutrients. Known as hidden hunger because often the signs are not visible, but in fact the impact is very large big. Micronutrients have been shown to be elements nutrition is important for increasing work productivity, intelligence and immunity [7]. Nationally, Indonesia can experience losses of more than 50 trillion rupiah per year from low work productivity just due to Iron Nutrition Anemia (Anemia Gizi Besi = AGB), not including health care costs due to deficiency severe micronutrients [11].

Food diversification, supplementation, and food fortification accompanied by hygiene and sanitation environment is an available solution for overcome the problem of micronutrient deficiencies. Role food

diversification in overcoming the problem this is certainly very important, but necessary long time to make it happen. Supplementation is also one effective solution, but requires cost and resource allocation large for its distribution as well as its scope often unequally distributed between regions. Fortification food has been effective in reducing hidden hunger, as well as cost effective [4].

Indonesia is considered as a country that has experience the double burden of malnutrition, and maybe also the triple burden of malnutrition, the biggest in the world. One in three Indonesian children considered stunted, a form of malnutrition. Meanwhile, in adulthood, the prevalence Obesity and all its complications coexists, such as diabetes mellitus, hypertension, and cardiovascular disease, the longer too getting bigger ([11][14].

Currently, stunting in toddlers is still a problem most discussed child health problems in Indonesia. WHO defines stunting as growth and developmental disorders as a result from malnutrition, recurrent infectious diseases and inadequate psychosocial stimulation (Stunting is the impaired growth and development that children experience from poor nutrition, repeated infection, and inadequate psychosocial stimulation) [30]. This definition with emphatically shows that the height that less than a certain lower limit value is not automatic shows a child experiencing stunting.

Equating stunting with short and consider it a deficiency problem nutrients, the risk of making us the wrong direction. Data Riskesdas from 2007 to 2018 shows that far more toddlers are short but fat, that is, in the prevalence range about 6-7% of all toddlers, than toddlers the underdog, which is only about 2-3% of the entire toddler population [11]. Similar information was also obtained from the IFLS survey (Indonesia Family Life-Survey), 5 repeated surveys implemented between 1997 and 2014, 6-7% toddlers experience stunting as well as being overweight body [15].

A short but not skinny toddler, maybe not stunted. Stunting management that are not on target, for example given to short toddlers who are not skinny, risky only will increase the prevalence of obesity along with all

accompanying complications later in life. Therefore, stunting management in toddlers have to be very careful, we certainly don't want to increase the burden of BPJS services for various chronic diseases related to obesity simply because we are misdirected in management stunting. The total number of children affected by stunting was 27% lower in 2020 than in 2000 and the prevalence rate of stunting also declined. Meanwhile, obesity has increased globally across all ages since 2000 [30].

So far, the high problem of stunting in Indonesia is considered due to low intake of protein and/or micronutrients. However, data The Total Diet Survey in 2014 shows that the average protein nutritional adequacy rate for Indonesian toddlers have reached 134.5% figure recommended nutritional adequacy, with ranges between 95% in Papua and 166.6% in DKI Jakarta. However, as in many other aspects in Indonesia, using only parameters on average, there is a risk of failing to photograph inequality distribution. Even though more than 50% of toddlers (54.2%), 120% protein adequacy rate has been met recommended, 23.6% of toddlers are still less than 80% protein adequacy figure, while approximately 22,1% is in the range of 80-120% protein adequacy [11].

4. FUTURE FOOD TRENDS

The global food industry trends always change as technology develops and consumer demands. Trends in food technology are evolve towards food choices sustainable and personalized. This includes protein sources new products, local food, nutraceuticals, and personalized nutrition. Concern towards environmental impact directing technology and the food industry to integrate practices to minimize food waste [5]. In 2022, the global food trend shifted to alternative sources of protein, including meat from the development of cell culture in laboratory which is the most significant trends [23].

There are predictions of five food trends globally in 2023, part of which is a continuation of the previous year's food trends; they are functional food, plant-based and animal-free food meat, food packaging, transparency and trust on food, and computerized technology in food. (1) Functional food. After the pandemic, consumers still

want it food and beverage products in addition to nutritious also provide unique health properties, the information about which can be easily known on the label, the list of ingredients listed on the label is a highlight of attention. Functional foods have bioactive ingredients that have been associated to restricting cholesterol absorption, which is a key element in lowering blood pressure (Egwumah et al., 2022). Consumers want healthy beverage products and increase immunity. For example, celery yogurt which has been shown to lower cholesterol levels and blood pressure (Rukmini et al., 2019a, 2019b). (2) Plant-based and animal-free food meat. Food of plant origin and meat non-animal origin has become popular in recent years, mainly because attention to change climate, ethical factors in practice livestock and health. The choice against widespread alternative protein, survey results shows about 52% of consumers declares itself flexitarian ie flexible - combines alternative proteins of animal origin and plant origin in their diet [22]. Several product companies plant-based and animal free meat already developed a few years ago, and in 2023 is expected to increase.

(3) Food packaging. For few decades, food companies have used plastic because this material is cheap and the most practical. With current advances tackling climate change, consumer perspective has shifted; they want companies to produce green. Companies tend to switch using edible and biodegradable packaging, even smart packaging [25]. (4) Transparency and trust on food. Consumers want to know exactly where food products come from, companies which one to make, and what ingredients just used. Use new technologies such as block-chain and traceability helps companies improve its performance and reputation by tracking product origins and quality more carefully to increase consumer confidence [1]. (5) Computerized technology in food. The food industry is developing more processing methods well, update that technology there is. Progress continues, food processing technology computerized has underpinned and strengthening automation as part integral to the food processing industry [25].

5. FOOD TECHNOLOGY AND ITS ROLE IN HEALTH

Food Technology is the science that studies all processes of processing food ingredients so that they become food that is healthy, has high nutritional value, and safe for consumption [13]. Although accessing to safe food is very important for food security, but deep its implementation by many food policy makers unaware of this relationship [4]. The food contaminated with pathogens or chemicals, can interfere with the absorption of nutrients, exacerbate malnutrition, and affect growth and development in children. Malnutrition can increase a person's susceptibility to infections, including diarrhea. There is a strong relationship between gastrointestinal disease and disorders growth in children, including its relation to stunting. In fact, diarrhea is identified as the biggest single cause of stunting, and even mild diarrhea can have an impact long term on child development and adult health [8].

In Indonesia it is estimated every year cases of diarrhea occur around 10 million to 22 million cases and requires a maintenance fee of 4.7 to 16.7 billion USD ([12]). Health problems due to consumption of unsafe food is often the case on highly nutritious foods, such as fresh vegetables or animal products that are high in protein, because these foods are susceptible to contamination. Animals contain the pathogen, including strains of *E. coli* or *Salmonella*, which can be transferred to food during slaughter or harvesting. This risk is especially severe in regulatory areas less stringent food production and handling, and consumers and food handlers have very limited access to clean water sources and adequate food storage. Infrastructure limited cold chain and supply chain longer may increase the likelihood survival and growth of pathogens in food. Amidst the Covid-19 pandemic, some food supply chains are disrupted, and a market survey in several countries by EatSafe found that the freshest fruits and vegetables most affected. Therefore, it is very important to ensure that the traditional market for safe nutritious food needs to be supported during pandemic can continue to maintain food security especially for low-income consumers [3].

Disturbance prevention food safety is shared responsibility throughout the food chain, including consumers, manufacturers, processors, seller, and even transporters and farmers. On the locally level, improve

food safety practices by stakeholders (such as farmers, traders, and consumers) can help reduce health problems due to unsafe food. Those communities thus making them healthier and economically sustainable [26]. Give incentives for governments to upgrade the system food safety over time will also be a very strategic and impactful improvement area, especially if the system is focused back to domestic consumer needs, not just fulfilling requirements food safety of trading partners' abroad [25].

Non-communicable and degenerative diseases also need great attention. The prevalence of hypertension, diabetes, vascular disorders, is now being suffered by increasingly in young peoples. In general, the disease is due to the activity of free radicals in the body. Therefore, consumption of food sources of antioxidants or food products containing antioxidants can inhibit it. For example, making a microemulsion containing ascorbic acid can inhibit the oxidation of VCO [16][17][18], so that VCO can be consumed safely. Another example is sausages made with fat from oleogel which is formulated from porang glucomannan, so consumers don't have to worry about increasing their cholesterol levels [29].

6. CONCLUSIONS AND RECOMMENDATIONS

Through the G20 Presidency, Indonesia has pushed for strengthening global health and helping the global health system to become more inclusive, equitable and responsive to crises. Since before the Covid-19 pandemic, various efforts to overcome world hunger and malnutrition have been made by various countries. Easy access to quality food and its affordability is the key to realizing food security and sovereignty. Ultimately, it becomes the foundation for creating health architecture. As a result of Covid-19, consumers not only need delicious food, but also healthy ones. Therefore, future food trends will be dominated by functional food, plant-based food and animal-free food meat, as well as computerized technology in the food industry. In this case, developments in the field of food technology are urgently needed to provide food that is needed by the community, which not only prioritizes taste, but also

practical aspects of its use and health benefits. Food Technology has an important role in reducing food loss, increase food diversity, improve food security, and increase the nutritional value of food. Food technology contributes to the provision of quality, nutritious, and food safety for consumption. This is very important in realizing the health architecture.

REFERENCES

- [1] Adjoian, T., Dannefer, R., Willingham, C., Brathwaite, C., & Franklin, S. (2017). Healthy Checkout Lines: A Study in Urban Supermarkets. *Journal of Nutrition Education and Behavior*, 49(8), 615-622.e1. <https://doi.org/10.1016/j.jneb.2017.02.004>
- [2] Badan Standarisasi Nasional. (n.d.). *Standar Nasional Indonesia Jagung Bahan Baku Pakan*.
- [3] Broers, V. J. V., de Breucker, C., van den Broucke, S., & Luminet, O. (2017). A systematic review and meta-analysis of the effectiveness of nudging to increase fruit and vegetable choice. *European Journal of Public Health*, 27(5), 912-920. <https://doi.org/10.1093/eurpub/ckx085>
- [4] Bucher, T., Collins, C., Rollo, M. E., McCaffrey, T. A., de Vlieger, N., van der Bend, D., Truby, H., & Perez-Cueto, F. J. A. (2016). Nudging consumers towards healthier choices: A systematic review of positional influences on food choice. In *British Journal of Nutrition* (Vol. 115, Issue 12, pp. 2252-2263). Cambridge University Press. <https://doi.org/10.1017/S0007114516001653>
- [5] Cheung, T. T. L., Gillebaart, M., Kroese, F. M., Marchiori, D., Fennis, B. M., & de Ridder, D. T. D. (2019). Cueing healthier alternatives for take-away: A field experiment on the effects of (disclosing) three nudges on food choices. *BMC Public Health*, 19(1). <https://doi.org/10.1186/s12889-019-7323-y>
- [6] Egwumah, O., Girgih, A., & Joshua, V. (2022). Managing Hypertension: The Role of a Food Scientist and Nutritionist. *Alq J Med App Sci*, 5(2), 353-367. <https://doi.org/10.5281/zenodo.6812235>
- [7] Ensaff, H. (2021). A nudge in the right direction: The role of food choice architecture in changing populations' diets. *Proceedings of the*

- Nutrition Society*, 80(2), 195–206. <https://doi.org/10.1017/S0029665120007983>
- [8] Falbe, J., White, J. S., Sigala, D. M., Grummon, A. H., Solar, S. E., & Powell, L. M. (2021). The potential for healthy checkout policies to advance nutrition equity. *Nutrients*, 13(11). <https://doi.org/10.3390/nu13114181>
- [9] Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., Mueller, N. D., O'Connell, C., Ray, D. K., West, P. C., Balzer, C., Bennett, E. M., Carpenter, S. R., Hill, J., Monfreda, C., Polasky, S., Rockström, J., Sheehan, J., Siebert, S., ... Zaks, D. P. M. (2011). Solutions for a cultivated planet. *Nature*, 478(7369), 337–342. <https://doi.org/10.1038/nature10452>
- [10] Holden, N. M., White, E. P., Lange, M. C., & Oldfield, T. L. (2018). Review of the sustainability of food systems and transition using the Internet of Food. *Npj Science of Food*, 2(1). <https://doi.org/10.1038/S41538-018-0027-3>
- [11] Kementerian Kesehatan Indonesia. (2021). *Profil Kesehatan Indonesia Tahun 2020*. <https://www.kemkes.go.id/downloads/resources/download/pusdatin/profil-kesehatan-indonesia/Profil-Kesehatan-2021.pdf>
- [12] On, S. L. W., & Rahayu, W. P. (2017). Estimates for the burden and costs of foodborne diarrhoeal illness in Indonesia. *Asia-Pacific Journal of Food Safety and Security*. <http://apjfs.wix.com/apjfs>
- [13] Perhimpunan Ahli Teknologi Pangan Indonesia. (2020). *Perspektif Global Ilmu dan Teknologi Pangan* (F. Kusnandar, W. P. Rahayu, A. M. Marpaung, & U. Santoso, Eds.; 1st ed.). Penerbit IPB Press.
- [14] Popkin, B. M., Corvalan, C., & Grummer-Strawn, L. M. (2020). Dynamics of the double burden of malnutrition and the changing nutrition reality. In *The Lancet* (Vol. 395, Issue 10217, pp. 65–74). Lancet Publishing Group. [https://doi.org/10.1016/S0140-6736\(19\)32497-3](https://doi.org/10.1016/S0140-6736(19)32497-3)
- [15] Rachmi, C. N., Agho, K. E., Li, M., & Baur, L. A. (2016). Stunting coexisting with overweight in 2·0–4·9-year-old Indonesian children: Prevalence, trends and associated risk factors from repeated cross-sectional surveys. *Public Health Nutrition*, 19(15), 2698–2707. <https://doi.org/10.1017/S1368980016000926>
- [16] Rukmini, A. (2016). Inhibitory Effect of Ascorbic Acid Microemulsion on Photo-Oxidized Virgin Coconut Oil. In *AGROTECH* (Vol. 1, Issue 1).
- [17] Rukmini, A., Lestari, L. A., & Ratnaningtyas, A. (2019a). The effect of celery yoghurt intervention on lipid profile of wistar rat fed high oxidized fat. *10th Asian Conference of Lactic Acid Bacteria*.
- [18] Rukmini, A., Lestari, L. A., & Ratnaningtyas, A. (2019b). The effectiveness of celery yoghurt in suppressing cardiovascular disease of rats fed with high salt and high oxidized fat diet. *116th ASEAN Food Conference*.
- [19] Rukmini, Raharjo, S., Hastuti, P., & Supriyadi, S. (2012a). Antiphotooxidative Effect of Ascorbic Acid Microemulsion in Virgin Coconut Oil. *Journal of Food Science and Engineering*, 2(4). <https://doi.org/10.17265/2159-5828/2012.04.003>
- [20] Rukmini, A., Raharjo, S., Hastuti, P., & Supriyadi, S. (2012b). Formulation and stability of water-in-virgin coconut oil microemulsion using ternary food grade nonionic surfactants. In *International Food Research Journal* (Vol. 19, Issue 1).
- [21] Shan, Z., Wang, F., Li, Y., Baden, M. Y., Bhupathiraju, S. N., Wang, D. D., Sun, Q., Rexrode, K. M., Rimm, E. B., Qi, L., Tabung, F. K., Giovannucci, E. L., Willett, W. C., Manson, J. E., Qi, Q., & Hu, F. B. (2023). Healthy Eating Patterns and Risk of Total and Cause-Specific Mortality. *JAMA Internal Medicine*. <https://doi.org/10.1001/jamainternmed.2022.6117>
- [22] van Gestel, L. C., Adriaanse, M. A., & de Ridder, D. T. D. (2021). Who accepts nudges? nudge acceptability from a self-regulation perspective. *PLoS ONE*, 16(12 December 2021). <https://doi.org/10.1371/journal.pone.0260531>
- [23] van Gestel, L. C., Kroese, F. M., & de Ridder, D. T. D. (2018). Nudging at the checkout counter—A longitudinal study of the effect of a food repositioning nudge on healthy food choice. *Psychology and Health*, 33(6), 800–809. <https://doi.org/10.1080/08870446.2017.1416116>
- [24] von Braun, J., Afsana, K., Fresco, L. O., & Hassan, M. H. A. (2023a). Food Systems: Seven

- Priorities to End Hunger and Protect the Planet. In *Science and Innovations for Food Systems Transformation* (pp. 3–9). Springer International Publishing. https://doi.org/10.1007/978-3-031-15703-5_1
- [25] von Braun, J., Afsana, K., Fresco, L. O., & Hassan, M. H. A. (Eds.). (2023b). *Science and Innovations for Food Systems Transformation*. Springer.
- [26] Vos, M., Deforche, B., van Kerckhove, A., Michels, N., Geuens, M., & van Lippevelde, W. (2022). Intervention strategies to promote healthy and sustainable food choices among parents with lower and higher socioeconomic status. *BMC Public Health*, 22(1). <https://doi.org/10.1186/s12889-022-14817-y>
- [27] Weimer, K., Ahlström, R., & Esteves, F. (2022). The Effect of Nudging in Promoting the Consumption of Organic Fruits and Vegetables. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.720606>
- [28] Wibowo, A. (2020). Potential of Developing Indonesian National Standards (SNI) for Iodine Salt Products to Increase Competitiveness. *PPIS*.
- [29] Widarta, I. W. R., Rukmini, A., Santoso, U., Supriyadi, & Raharjo, S. (2022). Optimization of oil-in-water emulsion capacity and stability of octenyl succinic anhydride-modified porang glucomannan (*Amorphophallus muelleri* Blume). *Heliyon*, 8(5). <https://doi.org/10.1016/j.heliyon.2022.e09523>
- [30] World Health Organization. (2022). *World Health Statistics 2022*. <http://apps.who.int/bookorders>.

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