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Laws and Regulations Regarding Food Waste Management as a Function of Environmental Protection in a Developing Nation

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Abstract

Food availability with poverty reduction is among the main objectives of the Sustainable Development Goals (SDGs) 2030. A proper food waste management system is needed worldwide to ensure environmental sustainability and reduce food waste. For that purpose, along with devising laws and regulations, their strict implementation is a prerequisite. More specifically, food waste management is among the prime agendas in developing nations where resources are scarce with continuous population growth. Hence, the prime focus of the current study is a developing nation Indonesia where food waste comes at the first position with a total amount of 40.3% food waste yearly. It causes several environmental issues, including pollution (aquatic, soil, air, etc.), the greenhouse effect, poverty, and global warming. Therefore this research highlights the history of environmental protection laws, the importance of food waste management, and existing laws and regulations regarding food waste management globally and more specifically in Indonesia. For this purpose, a legal normative research methodology has been adopted by focusing on primary and secondary legal materials. The findings suggested that in Indonesia, there are several laws and regulations regarding environmental protection and the packaging of food items. However, no implicit laws or rules are formulated to manage food waste. Therefore, it is suggested that government should pay attention to amending the existing laws regarding environmental production and packaging of food items to deal with waste management implicitly. Also, implementing those laws is mandatory to extract their benefits to facilitate the masses and achieve prosperity in the country.

Keywords: Environmental protection laws; Food waste management; Resource protection; Sustainability; Developing nations

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1. Introduction

Waste management plays a vital role in reducing the adverse effect of waste on human life that protects the environment and natural resources (Dhir et al., 2021). Due to the disastrous impact of wasted materials, i.e., food and plastic electronic(e-waste) waste, on human health and the environment, waste management has become a fundamental challenge globally (Van Schoubroeck et al., 2023). The research reports the excessive use of e-waste in emerging economies due to low purchasing power (Mansoor et al., 2022). Likewise, the issues and problems created by plastic waste have been highlighted by many scholars (Kamaruddin et al., 2022). In contrast, the prime focus of the current study is food waste and its impact on human health and the environment. In addition to the scholarly debates, government bodies are also taking the initiative to devise and implement strict rules and regulations to protect society and the environment (Liu et al., 2021). Considering the significant role of government initiatives at macro levels in devising environmental laws, regulations, and policies, the current study discusses all the existing food waste management laws and regulations. It also highlight the need for the amendments in those laws based on the practical evidence and the need for community participation to develop a sustainable economy (Lin & Guan, 2021).

Food is a basic human need comprising of anything extracted from livestock, fishery, lforestry, plantation, agriculture, water etc. It also includes processed and unprocessed drinks that humans consume, including food, raw materials that are addictive, and all the ingredients used to produce the beverages and other food items (Daher et al., 2021). With an increase in population, the demand for food worldwide is increasing. Research also reports that by 2050 this demand will increase by 50-100%. Simultaneously in accordance with the Food and Agricultural Organization (FAO) worldwide, 720-811 million people are the victims of food scarcity (Khan, 2022). Moreover, the COVID-19 pandemic has worsened the existing scarcity of food (Bidisha et al., 2021). Simultaneously, in contrast to developing nations, the developing nations face more drastic conditions of limited availability of food affecting human health and overall social and economic development (Mehroliya et al., 2021).

During the food supply chain, almost one-third of annual human food production is either lost or wasted. This food waste occurs at different levels, including manufacturing, production, consumption, and retail levels (Puriwat & Tripopsakul, 2021). Following FAO consumers, food services or retailers' actions cause food waste, resulting in a decrease in the quality or quantity of food (Deng et al., 2021). At the same time, the food supply chain results in food loss based on their actions and decisions. Consumers are also regarded as the most prominent food waste actors in developed nations (Lin & Guan, 2021). In contrast, developing nations face the issue of food waste at the manufacturing and agricultural practices stages. Regardless of whether developed or developing nation, food waste is a significant issue worldwide. It contributes drastically to most of the earth's crises, including pollution, biodiversity loss, climate change, global warming etc. (van der Werf et al., 2021). As stated earlier, food waste is not only the result of unsustainable consumption patterns at the household level, but food services and retailers also play a vital role in this waste. Hence, the main aim of the current paper is to highlight all the causes and consequences of food waste and the laws and regulations existing in the developing nation context. More specifically, the current study deals with a developing nation, Indonesia, to have a detailed look at the issue caused by food waste

and the laws and regulations available, along with recommendations for the amendments of existing laws and regulations.

Indonesia is a highly populated nation. Following the 2020 census data, its population reached 270.2 million individuals in contrast to 2010 with 203.6 million people (Karuniawati et al., 2021). This reflects a drastic increase in the Indonesian population within 10 years. Following the Directorate of Waste Management, Ministry of Environment and the Forestry Republic of Indonesia, among the total waste in Indonesia, including all categories, food waste comes at the first position with a total amount of 40.3% food waste, plastics (17,1%), wood (14,1%), paper (11,9%) (Cahyadi & Widyastuti, 2022). In accordance with the Ministry of National Development Planning, the most prominent food waste or loss in Indonesia includes wheat, rice, grains, etc. Simultaneously, vegetables impart the most insufficiently processed food causing a loss of 62.8% of the total domestic supply (Ngwasiri et al., 2022). This waste and loss results in environmental issues and the donation of natural habitat and resources by impacting 7.29% of the average greenhouse gases in Indonesia (Panda et al., 2020).

The above-mentioned statistics provide the base for the policymakers in Indonesia to implement PJMN 2020-2024 to extract the benefits and commitments towards Sustainable Development Goals (SDGs) 2030. It also makes it compulsory for the Indonesian government to devise and implement food waste management policies and regulations. For this purpose, there is a continuous need for public participation and support, financial investment, and policy-based commitments at the government levels. Moreover, to protect the environment, government regulations play an important part in adapting digital technologies and improving the food supply chain to augment the initiatives taken for food waste management (Johansson Sevä & Kulin, 2018). Likewise, to preserve the natural resources for the coming generations and manage food waste to ensure environmental sustainability, the Indonesian Ministry of the Industrial Sector took initiatives to start the green industry paradigm (Limaho et al., 2022). This green industry paradigm deals with protecting resources to reduce the potential issues of e-waste, plastic waste, food waste etc. (Du et al., 2021).

Regardless of several efforts by the local communities and administrative bodies to protect their environment and natural resources, government-level policies and procedures need amendments and strict implementations worldwide (Budihardjo et al., 2022). Thus based on the intrusion of the government in developing nations to minimize food waste and the problem caused by this waste can improve the socioeconomic development of the whole region (Khan et al., 2021; Sewak et al., 2021; Sharma et al., 2021). In this context, with the emergence of the green industry paradigm to reduce waste production and manage solid waste while preserving natural resources for the coming generations, several developed nations devised strong environmental laws (Ahmed et al., 2022). Moreover, several studies have highlighted food waste issues in developing nations. However, research is scarce regarding the detailed description of laws and regulations available in developing nations regarding food waste management and Environmental Protection (Budihardjo et al., 2022; Liu et al., 2021; Yang & Zhu, 2022). Therefore, to bridge this gap in the literature regarding waste management and environmental protection, more specifically in developing nation context the current study aims to;

- highlight the environmental laws' development history globally and in Indonesia

- present a detailed description of food waste management in Indonesia
- Present and explain in detail the food waste management laws and regulations in Indonesia that further protects the environment and natural resources
- provide detailed recommendations and implications for developed and developing countries to focus on the issue caused by food waste and add the importance of food waste management to protect the environment and natural resources

2. Method

The current study relied upon the normative legal research methodology: a qualitative research approach using legal documents to analyze the data (Sehnálek, 2022). It comprises secondary legal material. The secondary data includes legal material comprising the regulation, laws, legal theories, court decisions, books, public policies, journal publications, and then formation available in digital libraries. Whereas the tertiary legal material comprised of the industry policies, laws, and regulations linked with the food preservation and availability of organic food protects the environment and ensures their quality of life. Moreover, a legislative inventory was conducted to organize, assess, and analyze the association between legal materials and food waste management in Indonesia. Additionally, being a member of Southeast Asian Nations (ASEAN) (Kamaruddin et al., 2022), the relevant instruments from ASEAN As legislative inventory are also considered as a source of information and data from the current study.

3. Literature Review

Globally environmental laws initiated developed from the 1960s -1970s. In Stockholm, Sweden, the first international conference to discuss environmental issues was held in 1972 (Paglia, 2021). This conference encouraged many countries worldwide to take initiatives to protect the environment after realizing the drastic impacts of unsustainable consumption patterns and the deterioration of natural resources (Oliveira, 2023). It further resulted in the formulation of laws and regulations to improve the living standards of human beings by reducing environmental destruction and depletion and handling environmental sustainability issues, including global warming and different types of waste, including electronic plastic and food waste. (Sundström, 2021). Moreover, the German Federal Government established an environmental plan in 1970 and a comprehensive environmental program in 1972, With several amendments in 1976 (Hussein & Thabet, 2021). Likewise, following article 180 of the 1989 Criminal Code, environmental provisions were formulated by the Canadian Criminal Code (Maruf, 2021).

Sustainable food management is a prerequisite to reducing food waste and its linked influence on human life. It helps to reduce the destruction of natural resources, sustainable production and manufacturing, consumption sales and disposal of waste materials (Erasmus et al., 2021). The right to food for everyone is regulated in the constitution of the Republic of Indonesia in 1945. Besides creating a developed and prosperous economy, the fundamental rights of human beings need to be protected and insured (Hawari & Tanawijaya, 2022).

4. Results and discussion

4.1 Environmental Protection laws

At the same time, in 1969 United States initiated the formulation of laws and regulations concerning Environmental Protection under the National Environmental Policy Act (NEPA) (Rowe & Finley, 2021). Whereas in the 1978 constitution, environmental regulations were presented by China, which was amended in 1982 (Akhtar, 2022). Additionally, the Netherlands government presented the environmental laws named "Wet Algemene Bepalingen Milieuhygiene (Act on General Provisions for Environmental Health)" on January 13 1979, and were later amended on January 18, 1990, to facilitate the masses and protect the environment worldwide. Moreover, the environmental protection process was expedited by establishing Environmental Law Protection Act was expedite in 1986 after the incidents of the distraction Union Carbide plant in India on December 23, 1984 (Del Rio et al., 2022).

Furthermore, Indonesia is a developing nation, and laws for protecting and managing the environment and national resources exist. For instance, Article 33 paragraph (3) of the 1945 Constitution deals with Environmental Protection and preserving natural resources in the country. It states, "earth, water and the natural resources contained therein are controlled by the state and used for the greatest prosperity of the people, and in Indonesia itself." Moreover, considering the significance of aquaculture and marine life in Indonesia, the Environmental Protection laws were amended to protect aquatic life from exploitation and destruction under the maritime law of Indonesia (Purwendah et al., 2022). This law explicitly states the protection of marine areas, gas, oil, and water resources in Indonesia. Also, concerning preserving natural resources and protecting the environment, Indonesia established bilateral terms with neighbouring countries in 1969 with the establishment of Law no. 1 of 1973. This law ensures that continental self-provisions are followed by all the neighbouring countries involved in establishing law under a joint treaty (Sulaiman et al., 2019).

Later to protect aquatic life from offshore oil activities, in 1974, laws were devised to punish the individuals, groups, or organizations involved in such activities. It further reflects the active participation of the Indonesian government in protecting marine life and the aquatic environment with several environmental laws linked with aquaculture and marine life protection till the 1970s. However, at the end of the 1980s, overall, Environmental Protection was the main concern of the Indonesian government. Therefore, several laws and regulations were devised (Lee et al., 2022). For instance, Law no. 4 of 1982 focuses on the fundamental environmental provisions that state, "The protection of the State against the impact of activities outside the territory of the State that cause environmental damage and pollution." This law was later amended as Law No. 23 of 1997, stating: "The protection of the Unitary State of the Republic of Indonesia against the impact of businesses and/or activities outside the territory of the State that cause environmental pollution and/or destruction," followed by "Law no. 23 of 2009 concerning the Protection and Management of the Environment".

Moreover, the transitional provisions of "Article 124 and 125 of Law no. 23 of 2009 concerning Environmental Protection and Management" state that; "at the time this

law comes into force, all laws and regulations which are implementing regulations of Law Number 23 of 1997 concerning Environmental Management (State Gazette of the Republic of Indonesia of 1997) Number 68, Supplement to the State Gazette of the Republic of Indonesia Number 3699) shall remain valid as long as it does not conflict with or has not been replaced by a new regulation based on this Law." Finally, "Article 3 of Law no. 23 of 2009" explicitly deals with environmental protection in Indonesia, ensuring natural resource protection with the vision of quality life safety and health facilities for individuals. It further ensures the establishment of socioeconomic development of the whole country following the SDGs and protecting the environment from human footprints to preserve it for future generations (Affandi et al., 2021).

Furthermore, the Indonesian government's commitment towards environmental protection and the climate change impact on the economy has been reflected after the issuance of "Law No. 17 of 2004 concerning the Ratification of the Kyoto Protocol to the United Nations Framework Convention on Climate Change". Decaying waste emits methane gas, which drastically impacts the greenhouse effect, ultimately destroying the environment as a major source of climate change worldwide. Similarly, considering the geographical position of Indonesia, it is most vulnerable towards these climate changes, which further influence water scarcity, the spread of different human and plant diseases, decline in food production and supply, biodiversity extinction, sinking of small islands and rising sea levels (Abubakar et al., 2022). This further calls for not only having environmental laws and regulations along with food waste management but also the implementation of those laws and regulations is mandatory to attain sustainability standards in the country.

4.2 Food Waste Management

Most of the developed nations have already established their networks to manage food, more specifically, the western economies. Likewise, many developed nations in the Asian region have defined rules and regulations for food waste management comprising different factors (Ngwasiri et al., 2022). These factors include creating awareness regarding the issues of food waste and its management system, achieving international and national goals to develop a sustainable economy, dealing with economic and social-cultural constraints, and recognizing the importance of nutrient extraction from food (Cahyani et al., 2022). Globally, waste management has entered into a new paradigm of minimizing waste via a well-managed system to ensure the sustainability of natural resources to preserve them for the coming generations (Lin & Guan, 2021).

Food waste has been given the top priority in the waste management system based on the significance of food worldwide to sustain human health and natural order of things (Brennan et al., 2021). For that purpose, a systematic flow of production, consumption, recycling, reuse, and disposal has been considered. On the other hand, there are no specific patterns for managing food waste because different nations use different systems as per the needs and requirements of the area and citizens (Deng et al., 2021). However, the intrusion of digital technologies has made the food waste management system more vigilant and effective. Simultaneously, environmental and technological factors are the most prevalent factors influencing the food supply chain

and the adoption of digital technologies to prevent food waste and loss worldwide (Ngwasiri et al., 2022).

Besides, justice, sustainability, equity benefits, security, resilience, independence, sovereignty etc., are the most prevalent factors affecting the food administration and prevention of waste in most parts of the world (van der Werf et al., 2021). It is also very important to sustainably present food production and consumption efficiently and effectively by using natural resources to sustain those resources for future use and ensuring the welfare and well-being of the community and whole nation. This further reflects that manufacturers and suppliers should carefully consider the principle of sustainability to ensure food available to the masses in the current era and in the future (Deng et al., 2021). Likewise, it is the prime responsibility of the consumers to use the food with minimal waste and preserve it for future use. Simultaneously, considering the SDGs, the environmental, social, and economic aspects must be ensured while discussing food waste management to attain its objectives of sustaining the natural order of things worldwide.

4.3 Government Regulation and Laws in Indonesia on Food Waste Management

The main motive of the government in Indonesia remains the reduction of poverty and unemployment and the improvement of health to attain the well-being and welfare of society and the whole nation (Siburian, 2022). Although, Article 28C paragraph (1) and 28I paragraph (4) implicitly present the right to food for everyone in the country. However, despite the utmost significance of food waste management, the 1945 constitution does not contain any article particularly mentioning the protection of food or its management. Article 28C Paragraph (1) of the 1945 Constitution states: "Everyone has the right to develop themselves through fulfilling basic needs, has the right to obtain education and acquire knowledge from science and technology, art and culture, to improve the quality of his life, and for the welfare of mankind."

At the same time, Article 28I Paragraph (4) of the 1945 Constitution demonstrates: "the protection, promotion, enforcement and fulfilment of human rights are the responsibility of the state, especially the government". Additionally, related to food waste management, the 1945 Constitution explains the citizen's right to have a healthy and sound environment. The same is asserted in Article 28H paragraph (1): "Everyone has the right to live in physical and spiritual prosperity, to live, and to have a good and healthy living environment and have the right to obtain health services". Simultaneously, Article 28I paragraph (4) Explains human rights protection that includes a healthy and good environment and the right to food for all citizens. Considering these articles, it is the government's prime responsibility to provide a healthy and good environment to all the citizens along with the provision of food, which also presents the dire need to implement these articles to develop a sustainable and prosperous society.

In addition, "Article 1 of the Presidential Regulation of the Republic of Indonesia Number 97 of 2017 concerning National Policies and Strategies on Management of Household Waste and Household-Type Waste" demonstrate the routine activities and use of different commodities results in household waste. It also includes food waste. Regardless of this article regarding household waste, no specific provision is available

in the law regarding food waste generated at any level. On the other hand, multiple routine activities result in food waste that might come from the grocery market, vegetables, processed and unprocessed food items and expired food resulting from excessive buying (Lin & Guan, 2021). Also, a potential amount of food is wasted during the packaging process. All this food waste requires proper management at various levels to attain sustainability standards.

Moreover, plastic bags are used by most organizations for packaging purposes. They are made of Sponge bonds and contain 62% polypropylene (plastic), a non-biodegradable material that cannot be disposed of, resulting in soil pollution (Goel et al., 2021). The Indonesian government took initiatives to protect the environment from these plastic materials via "Regulation of the Minister of Environment and Forestry Number P.75/MENLHK/SETJEN/KUM.1/10/2019" by limiting the producers from using this material for the packaging of food. Moreover, "Article 4 paragraph (1) of the Regulation of the Minister of Environment and Forestry Number P.75/MENLHK/SETJEN/KUM.1/10/2019" deals with the road map of reducing waste by the manufacturers. It limits the use of packaging material for goods which are non-biodegradable and causes soil pollution. In the absence of direct laws and regulations regarding food waste management in Indonesia, the Environmental Protection laws and the regulations of the Ministry of environment and forestry regarding limiting the producers and manufacturers from using plastic for the packaging of food are important initiatives to indirectly manage the food waste and maintain the standards of sustainability by protecting natural resources in Indonesia.

5. Conclusion and recommendations

Considering the significance of the environmental protection and sustainability of natural resources, the current study aims to highlight the importance of food waste management in light of laws and regulations. Food waste management is important to deal with the scarcity of food and enhance human health and quality of life, protecting an area's environment and socioeconomic development. In this context, there are laws protecting aquaculture and agriculture. Simultaneously, laws and regulations are available regarding the packaging of food items to bind the producers and manufacturers to use sustainable packaging patterns and avoid the plastic material that can contaminate the environment and destroy natural resources creating soil pollution. Using plastic in packaging material also results in global warming based on releasing dangerous gases into the environment. Applying a legal normative research methodology and relying upon the primary and secondary data in terms of legal materials, the current study analyzed the environmental laws' development history worldwide and in the context of Indonesia. A detailed description of laws and regulations available for protecting the environment and dealing with food items has also been presented.

After a detailed review of the availability of laws and regulations regarding environmental protection and food waste management, it was found that although there are ample laws for protecting the environment in Indonesia, however, no law or regulation implicitly deals with food waste management. Therefore it is concluded that the available laws, i.e., "Article 124 and 125 of Law no. 23 of 2009 concerning Environmental Protection and Management", "Law Number 23 of 1997 concerning

Environmental Management, State Gazette of the Republic of Indonesia of 1997) Number 68, Supplement to the State Gazette of the Republic of Indonesia Number 3699) and "Article 3 of Law no. 23 of 2009" can be applied and amended in terms of food waste management in Indonesia. Additionally, "Article 1 of the Presidential Regulation of the Republic of Indonesia Number 97 of 2017 concerning National Policies and Strategies on Management of Household Waste and Household-Type Waste", "Regulation of the Minister of Environment and Forestry Number P.75/MENLHK/SETJEN/KUM.1/10/2019" by limiting the producers for using this material for packaging of food, and "Article 4 paragraph (1) of the Regulation of the Minister of Environment and Forestry Number P.75/MENLHK/SETJEN/KUM.1/10/2019" by limiting the manufactures for using this material for packaging of food can be considered as a base for the food waste management.

Moreover, along with devising implicit food waste management laws, the government and regulatory authorities must implement laws and regulations to minimize food waste. As Indonesia is a developing nation and is highly populated with limited resources, therefore, to reduce the poverty level, more specifically in rural areas, the government should take initiatives in terms of stringent measures towards individuals and/or groups causing food wastage and involved in hoarding activities to deprive the citizens of basic food availability. Likewise, there is a need to spread awareness at regional, national, and international levels using traditional and digital media for the issues and problems created by food waste to encourage people to use food sustainably and consume organic food to not only improve their health conditions but also sustain the national resources and reserve the food items for the use of masses. Additionally, to encourage organizations to produce sustainable food with minimized wastage and use organic materials for packaging purposes, government authorities should provide incentives and subsidies. This can be a starting initiative at the production level, which can be extended to the consumption and disposable levels to create a sustainable society and preserve natural resources, more specifically food items to benefit the socially deprived groups and ensure the availability of food to all the citizens to bring the prosperity of the nation.

In terms of protecting the environment and minimizing food waste as a prerequisite for sustainable development and environmental protection all over the globe, there is a continuous need to devise and implement laws and regulations along with several measures at national and international levels. For that purpose, the governments of developed and developing economies should focus on establishing green industries, where production, manufacturing, packaging, selling, and delivering processes should be executed sustainably without contaminating the environment and reducing waste at all levels. To implement these strategies, the government, local communities, and organizations should play their role equally.

6. Implications

At the government level, defined laws and regulations should be introduced and implemented with strict adherence to those laws. These laws should not only impose the penalties for noncompliance, but also physical punishments must be imposed to ensure the sustainable use of natural resources with care and concern.

Additionally, administrative, criminal, and civil sanctions should be imposed for environmental protection to bind the organizations to produce sustainable products with no food waste. Simultaneously, production and manufacturing quality must be ensured following environmental standards at regional and national levels during the allotment of licenses to the manufacturers and producers of food and other such items. As already stated that in Indonesia, unfortunately, no food waste management laws exist. However, several articles in Environmental Protection laws and packaging of product laws for producers and manufacturers must be amended to include the implicit articles regarding food waste management on a priority basis. This will further encourage individuals, groups and organizations to take care of natural resources and buy and use the food following their requirements. It will also create awareness among individuals regarding the consequences of food waste for socially disadvantaged groups creating a scarcity of food and resulting in health issues and human deaths due to the unavailability of food.

Moreover, the available Environmental Protection laws should be implemented with strict adherence. For this purpose, the regulatory authorities, especially Police Department, must play their role in incentivizing and punishing irresponsible individuals for destroying and contaminating the environment. Additionally, heavy charges should be imposed on the individuals for their careless attitude towards the environment and exploiting natural resources. Moreover, responsible society members can be encouraged to report the violators of environmental regulation regulations and laws to the lawmaking authorities to maintain discipline in society and protect their environment. Likewise, law implementation departments can force citizens to follow environmental regulations and laws and make them responsible for their actions towards the environment by making them realize that the environment around them is public property rather than their personal space.

In addition to these strict measures, a sense of responsibility among the individuals should be developed to make them socially responsible by creating awareness via different mediums.

7. Limitations

More specifically, nowadays digital world, social media can be utilized by social organizations, government bodies, and policymakers to spread awareness regarding the consequences of food waste. This awareness can initiate social responsibility among the masses to discontinue their irresponsible use of food. Additionally, it is not only the responsibility of the individuals to protect their environment, but also the societies and organizations should be made responsible for their consumption and production patterns to protect the food waste and take care of their environment to sustain it for the next generations.

Moreover, government organizations should encourage manufacturers and producers of food to use sustainable packaging and production patterns. For that purpose, leverages and subsidies should be provided to producers/manufacturers of food items. This can further encourage organizations to engage in sustainable production patterns. Also, it can enhance the competition among food producers to improve the standards and quality of the food, ultimately improving human health and protecting the environment from unsustainable food items. Consumers can also

be encouraged to use organic food and buy the same quantity they require rather than storing the extra food. The extra food storage can also lead to the expiry of that food, which is a bigger source of waste. Finally, to manage the food at local, national, and international levels, all the actors, including producers, suppliers, consumers, and government bodies, should join together, resulting in socioeconomic development and prosperity of the nation.

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