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FOOD SECURITY IN INDONESIA: ACHIEVING SDG TARGET 2.2 - END ALL FORMS OF MALNUTRITION

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Abstract:

Food security is an important aspect of people's well-being and is always the main agenda of every government worldwide. Food insecurity will undermine human rights and become a prelude to universal health, nutrition, and development problems. According to the Global Report on Food Crises (GRFC), nearly 282 million people in 59 countries experienced high levels of acute hunger in 2023 due to the war in Ukraine, supply chain disruptions, and the ongoing economic fallout from the COVID-19 pandemic. Extreme climate change and skyrocketing fertilizer prices further weaken the world's unprecedented food security situation. Malnutrition is still a significant health problem in Indonesia. The purpose of this study is to assess the food security in Indonesia. This study assesses the actors of Indonesian food security agencies, policies to improve food security and sustainable nutrition, and national food security performance. It provides implications and future direction for the Indonesian government. The sampling technique used is purposive sampling. The data source used is in the form of reports and articles from 2020-2022. Among the primary documents refer are Global Food Security Index 2022, Global Food Security Index 2022, and Food Security and Vulnerability Atlas (FSVA). The findings suggest that the government seeks to improve food security through programs to improve food availability, access, and quality. Seeing the complexity of the food problem, multi-pillar changes are needed to transform the food system in Indonesia.

Keywords:

Food Security, Future Directions, Assessment, Indonesia

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Introduction

The issue of food insufficiency is a global issue. The lack of necessities such as cooking oil, wheat flour, eggs, and others is of great concern to the public, and some people make panic purchases when rumors spread that the goods will be out of supply and the prices are getting more expensive (Alonso et al., 2018). The increasing price of goods will burden the low-income group. This problem occurs not only in Indonesia but all over the world. Land for agricultural activities is becoming more limited due to unsustainable clearing of forest areas, potentially damaging the environment, resulting in soil erosion and further affecting drinking water quality (Nugroho et al., 2022). Global warming can threaten agricultural practices through sea level rise that causes land reduction and saltwater infiltration, stress on water supplies, significant changes in peak temperatures that can reduce crop yields, and increase the frequency of natural disasters (Prosekov & Ivanova, 2018). Food security is the state in which all people constantly have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (Manikas et al., 2023). Food security is not just about having enough food; it includes gaining access to nutritious, safe, and culturally acceptable food. It includes acquiring food through different means, including production, trade, and distribution, and using and preserving food effectively (Marwanto & Pangestu, 2021). Food security also includes survival and recovery from uncertainties, such as natural disasters or economic crises, without affecting access to food or nutrition (Lin et al., 2023).

In Indonesia, various incidents of crop failure due to extreme weather are increasingly common (Yuliani et al., 2025). One of the most worrying cases was when the frost in Kuyawage, Lanny Jaya Regency, Papua, destroyed the community's agricultural land and caused crop failure. The Regional Disaster Management Agency (BPBD) recorded that around 500 heads of families suffered from hunger, and some even lost their lives. Global temperature rises, resulting in unpredictable weather conditions. Due to extreme rain, the shallot farmers in Brebes must be willing to lose the opportunity to harvest almost 50 percent of what they should harvest. The same is the case with chili farmers, almost in all regions of Java and Sumatra, who suffer losses due to extreme rains (Syarifudin et al., 2024).

Crop failure due to extreme weather is becoming more common in Indonesia. Extreme climate change increases the probability of natural disasters such as floods, earthquakes, landslides, and droughts (Gundersen et al., 2021). Indonesia is affected by natural disasters such as volcanic eruptions and frequent flooding. Previously, the World Bank has found that a large part of poor people's income was spent on buying food (Mottaleb et al., 2022). Society must bear more costs to supply carbohydrates, protein, and fiber (Yusriadi et al., 2024). Meanwhile, the surge in food prices has never really brought prosperity to farmers (Rozi et al., 2025). Farmers suffered losses due to suboptimal harvests. Meanwhile, they still must bear the higher production costs. The situation that befell the people of Lanny Jaya and several other regions in Indonesia is a portrait of a food crisis. Globally, in 2021, there are 828 million people affected by hunger, or 46 million more than the previous year and 150 million more than in 2019 (Mekouar, 2021).

According to the Food and Agriculture Organization (FAO) (2022), the number of people affected by hunger has hardly changed since 2015, even though its portion experienced a surge in 2020 and continued to increase in 2021, becoming 9.8 percent of the world's population. While 11.7 percent of the global population (924 million) experience severe food insecurity, over the last two years, there has been an increase of 207 million.

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Unfortunately, hunger and food insecurity are followed by high food waste (Nisa & Lubis, 2025). According to the UN, a third of the world's food production for human consumption is wasted annually - an average of 1.3 billion tons. If you look at the value of wasted food loss, it amounts to US$680 billion from industrialized countries and US$310 billion from developing countries (FAO, 2022). In Indonesia, according to the National Development Planning Agency (Bappenas), around 23-48 million tons of food was wasted from 2000-2019, or equivalent to 115-184 kilograms per capita per year. Economic losses are estimated at 213-551 trillion per year, or around 4-5 percent of gross domestic product (GDP). Food lost and wasted in Indonesia is dominated by grains, such as rice, corn, wheat, and other related products. Almost all food produced inefficiently is vegetables, where the total wasted reaches 62.8 percent of the total domestic supply of vegetables in Indonesia (Syarifudin et al., 2024). The situation above shows the failure of the food system - how food is produced, processed, transported, and consumed - which is currently applied (Sutardi et al., 2022). In addition, this poor food system hurts the environment and an increase in the temperature of the Earth's surface.

Therefore, there is an urgent need to develop innovative adaptation practices into development policies. Thus, this study aims to assess Indonesia's food security. Specifically, this study aims to determine the actors of Indonesian food security agencies, assess policies to improve food security and sustainable nutrition, evaluate the national food security performance based on global and national measures, and provide recommendations for strengthening Indonesian food security.

Literature Review

The Concept of Human Security

Human security is a concept that places human security as the objective of security policy, whether at the national or international level (Acharya, 2001). By placing human security as an objective, the concept of human security has chosen a different approach from mainstream security concepts in international relations studies that place the 'state' as the central unit of analysis (Adger et al., 2014). Many definitions have been issued to explain the concept of human security, including those of the United Nations Development Programme (UNDP), the Council of Human Security (CHS), and others. Alkire (2003) explains the concept of human security as "a condition of existence" where it encompasses the basic needs of everyone, such as access to basic needs, self-esteem or dignity, the right to participate in society, and democratic rights, whether at the domestic or international level. Therefore, the issues discussed also generally include conventional and non-conventional issues such as ecology, human rights, and social development (King & Murray, 2001). UNDP (1994) defines human security as encompassing two aspects that are critical to every individual's life, namely, first, freedom from chronic threats such as hunger, disease, and oppression, and second, protection from unexpected disasters/calamities that affect daily life, whether at home, at work or in society (as cited in Tadjbakhsh & Chenoy, 2007). Although the list of threats to human security is long, UNDP has classified these threats into seven components, namely i) economic security, ii) food security, iii) health security, iv) environmental security, v) personal security, vi) community security, and vii) political security (as cited in Tadjbakhsh & Chenoy, 2007).

Food Security from a Human Security Perspective

In discussing the concept of food security from a human security perspective, several basic ideas must be understood. First, the concept of human security acknowledges the importance of food production and availability at the national and global levels. However, the real focus

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should go beyond the traditional conceptual discussion of food security by focusing on the importance of food to individuals or people (Papargyropoulou et al., 2025). This approach is in line with the recommendation of UNDP (1994) to assess the issue of threats outside the traditional security framework that is too narrow and exclusive to regional security by giving more emphasis to individual security (as cited in Tadjbakhsh & Chenoy, 2007). Second, the concept of human security sees food security assurance from a different perspective, not just about security, but more than that as part of an element of social justice that is the right of every individual. According to CHS (2003), human security protects human freedom from critical threats or adverse conditions and builds their strengths and aspirations (as cited in Ogata & Cels, 2003). It means the need to create systems that support the survival and dignity of individuals and their lives in balance.

Therefore, removing people from the danger of hunger and starvation and ensuring food security for the long term requires a very systematic approach (Pellizzoni et al., 2025). This is where the debate about the importance of human development and human rights arises to meet the objective of human security. Human security cannot be embodied without mentioning human rights, and its effects cannot be imagined without sustainable development (Qazi & Al-Mhdawi, 2025). The third is food, which is part of everyone's physiological needs. The definition of food security by the World Food Summit (1996) leads to the same meaning, namely, food as a physiological need to enable everyone to "live actively and healthily" (as cited in Shaw, 2007). Because meeting food needs is a prerequisite for a perfect life, the concept of human security sees it as one of the basic elements that must be protected (Moussa et al., 2025). This view is, in fact, in line with Article 25 of the Universal Declaration of Human Rights (UDHR), which explains the right of every individual to enjoy a decent standard of living, including in terms of food (Shaw, 2007).

Background of Food Security in Indonesia

Indonesia, officially the Republic of Indonesia —also called the Unitary State of the Republic of Indonesia, is the world's largest archipelagic country. It is between mainland Southeast Asia, Australia, and the Indian and Pacific Oceans (Anderson, 2024). The capital and administrative center of Indonesia is Jakarta. Indonesia borders Malaysia on Borneo, Papua New Guinea on Papua Island, and Timor Leste on Timor Island. Other neighboring countries include Singapore, the Philippines, Australia, the Indian territory of the Andaman and Nicobar Islands, and Palau. With 17,504 islands, Indonesia is the world's largest archipelagic country (Anderson, 2024). With an estimated population of 279 million in 2023, it is the world's fourth-most populous country and the largest Muslim-majority country. Indonesia is a republic with a directly elected parliament and president.

Indonesia faces significant challenges in meeting the food needs of its people (Rozaki, 2021). Rapid population growth has the potential to increase food demand drastically. However, during this growth, the food supply is often unable to respond to the ever-increasing level of demand (Rozi et al., 2025). Various factors, such as climate change, the destruction of agricultural land due to urbanization, and technological limitations in the agricultural sector, are worsening this situation (Marwanto & Pangestu, 2021; Yuliani et al., 2025). In this context, food security is becoming increasingly urgent and relevant. Therefore, food technology innovation is an important solution to overcome this challenge (Nugroho et al., 2022). The government of Indonesia has included food security in the National Development Agenda for 2022-2024 by prioritizing programs to increase the availability, access, and quality of food consumption (Rozaki, 2021). The fiscal policy taken by the government through the 2022 State

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Budget with the theme of Accelerating Economic Recovery and Structural Reform also includes food security as a development priority agenda and encourages economic growth. The government of Indonesia is making various efforts to maintain food security through four strategies. First, related to affordability in terms of increasing people's access to food, the government encourages digitalization from the market and cooperation with SOEs to distribute food from surplus areas to deficit areas (Hakim et al., 2021).

Second, the government maintains food availability by maintaining the supply of food stocks through increasing domestic productivity and substituting activities that depend on other countries (Dwiartama et al., 2023). Third, related to improving food quality and safety, the government implements Good Agricultural Practices and Good Handling Practices, fulfills Indonesia's National Standards (SNI), and Sanitary and Phytosanitary (SPS) fulfillment, which will continue to be maintained. Fourth, the last thing that is no less important is maintaining the resilience and sustainability of natural resources, for example, through the determination of protected rice fields or the control of rice field land conversion, cultivation diversification, the use of organic fertilizers, and the maintenance of irrigation networks (Dwiartama et al., 2023). The food estate development program is carried out on a corporate basis so that farmers are grouped in cooperatives or *gapoktan*. This is intended to make it easier to provide access to assistance, financing, and other facilities provided by the government and in collaboration with state-owned enterprises and the private sector (Dwiartama et al., 2023).

The Global Food Security Index (GFSI) states that Indonesia's food security has improved in the last five years (Ariani & Suryana, 2023). Indonesia needs an additional 200 thousand hectares of land. The world's population continues to increase while the size of planet Earth does not change. The need for the quantity and quality of food continues to grow while the agricultural area shrinks. The source of uncertainty is the availability of land in the food system's sustainability. The World Food Organization (Food and Agriculture Organization/FAO) has long highlighted the problem of land availability for food security. At the global level, FAO projects the need for agricultural land to reach 5.4 billion hectares in 2030 from the current condition of 5.1 hectares (Canton, 2021).

Various scenarios are offered so that land use becomes more optimal. The reason is that the opening and expansion of agricultural land must pay attention to many aspects, such as environmental problems and ecosystem disruption. Undoubtedly, the issue of conversion of productive agricultural land is a scourge that haunts the food security of many countries in the world, including Indonesia. The government is very serious about the problem of ensuring the availability and access of food for the community. Despite the shrinking of agricultural land, a report from the GFSI states that Indonesia's food security has improved in the last five years. The score increased from 50.7 in 2015 to 53.2 in 2017 and 62.6 in 2019. Indonesia's ranking also continued to rise from position 75 (2015) to 68 (2017) and 62 in 2019 from 113 evaluated countries (Sukereman et al., 2022). The board measures the index by looking at several things. First, affordability or the ability of consumers to buy food; second, availability or supply sufficiency; and third, the risk of supply disruption (Aryani et al., 2021). In addition, the index measures the country's capacity to distribute food, factors related to quality, and food security. Their assessment ignores food sources, regardless of whether food is produced by farmers in the country or imported. Therefore, Singapore occupies the first level of the GFSI. Even though we know the neighboring country has all the limitations of agricultural resources. For Indonesia, the increase in the index reflects improvements in procurement, purchasing power, distribution of goods, or the quality of available food (Aryani et al., 2021).

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Responding to the food issue, the Ministry of Agriculture of Indonesia has prepared four strategies to maximize agricultural sector production. First, doing extensification on swamp land. Second, local food should be prepared as a substitute for the staple food that relies on rice. Third, forming food pantries in each region, starting from villages, sub-districts, districts, and provinces (Sutardi et al., 2022). Lastly, a food estate should be created in several places with modern farming. The country still needs an expansion of 200,000 hectares of land to increase food supply, especially during the Covid-19 pandemic. Specifically for the food estate, the government has prepared two locations, in Central Kalimantan and North Sumatra (Marwanto & Pangestu, 2021). In Central Kalimantan, the area covers Kapuas Regency and Pulang Pisau Regency. In the two districts in Central Kalimantan, 148,000 hectares of rice fields are already irrigated. In this land, according to the plan, rice will be planted. The two districts also have 622,000 hectares of unirrigated land (Marwanto & Pangestu, 2021). According to the plan, the land will be developed for industrial crops such as cassava and corn and supporting land for animal husbandry. Next, in North Sumatra, especially Humbang Hasundutan Regency. The food granary project in Humbang Hasundutan is being prepared with around 30,000 hectares of land to be managed for the next three years. This year, an integrated cluster covering an area of 1,000 hectares is being worked on in the district as a national example (Sutardi et al., 2022).

Methodology

This study applies secondary sources in answering the research questions by identifying supporting documents such as past studies, newspaper reports, publications, and official government reports to obtain comprehensive study results. The data source used is in the form of reports and articles from 2020-2022. Secondary data analysis is performed on existing data without needing interviews, surveys, observations, and other specific data collection techniques. The researchers also perform a collection method with a literature study approach, namely by collecting data from reference journals related to the research topic. An article search was obtained from the Google Scholar database with the keyword of food security in Indonesia. The screening and eligibility process was used in this study to obtain articles that met the study's requirements, scope, and objectives. Data searches were used by focusing on several keywords and combined using the following Boolean Operator technique: TITLE-ABS-KEY ("food security" OR "keamanan makanan" OR " ketahanan pangan") AND ("Indonesia"). Next, the database showed 14 articles related to the study and the keyword Boolean Operator Technique. However, no inclusion or exclusion was made in the database search because the total number of findings was only 20 articles. Among the primary documents refer are Global Food Security Index 2022, Global Food Security Index 2022, and Food Security and Vulnerability Atlas (FSVA). This study also added a systematic literature analysis approach using Atlas.ti to develop themes for analyzing the literature. The collected literature is uploaded as a document in the Atlas.ti program. The literature is then coded according to category coding. Category coding is based on discussing ideas, concepts, or any information in the literature.

Findings

Actors or Indonesia Food Security Agencies

It was recorded in 2020 that 8.34% of Indonesian people experienced food shortages, an increase of 0.71% from the previous year (Waluyo & Kharisma, 2023). Based on data from the Global Food Security Index (GFSI), the condition of food security in Indonesia in 2021 was declared weaker than the previous year because Indonesia's food security index score data in

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2020 reached the level of 61.4 while in 2021, the index decreased to 59.2 (Dermoredjo et al., 2024). Indonesia's food security requires synergy between all these actors to achieve the desired goals. Cooperation between government, non-government actors, civil society, and international institutions is essential to ensure sufficient, safe, and nutritious food is available to all Indonesians (Ariani & Suryana, 2023). Further management efforts are needed from the whole. Government actors include the Ministry of Agriculture, the Food Security Agency, the Ministry of Trade, the Ministry of Environment and Forestry, the Ministry of Social Affairs, and Local Governments. Meanwhile, non-governmental actors include the Food Guard, non-governmental organizations (NGOs), the private sector, and industrial companies (Jamaludin, 2022).

Policies to Improve Food Security and Sustainable Nutrition

Realizing sustainable food security is a necessity. The definition based on Law Number 18 of 2012 concerning Food formulates food security as a condition for the fulfillment of food for the state and individuals, which is reflected in the availability of sufficient food, both in quantity and quality, safe, diverse, nutritious, equitable and affordable and not contrary to the religion, beliefs, and culture of the community, to be able to live a healthy, active and productive life sustainably (Fortin, 2022). There are three keywords from the philosophy of food security, namely food adequacy and nutrition in terms of (1) quantity, (2) quality, and (3) sustainability for everyone.

The legal basis for this is also stated in the Food Law. Namely, the implementation of food is carried out to meet basic human needs that provide benefits in a fair, equitable, and sustainable manner based on food sovereignty, independence, and food security (Article 3). Furthermore, Article 4, it is detailed that the implementation of food aims to 1) improve the ability to produce food independently, 2) provide a variety of food and meet the requirements of safety, quality, and nutrition for public consumption, 3) realize the level of food sufficiency, especially staple foods at reasonable and affordable prices according to the needs of the community, 4) facilitate or increase access to food for the community, especially food-vulnerable people and nutrition, 5) increasing public knowledge and awareness about safe, quality and nutritious food for public consumption (Fortin, 2022). The content of this article implies that the government is responsible for food availability, food access, and quality food utilization/consumption, and these three aspects are dimensions of food security.

Efforts to achieve food security are explicitly and implicitly stated in the *2020-2024 Rencana Pembangunan Jangka Menengah Nasional Tahun (RPJMN)*. The GFSI indicator is explicitly used to measure performance achievement to increase food consumption availability, access, and quality. Efforts to accelerate the handling of poverty, stunting, and food insecurity will undoubtedly have a very positive effect on achieving the target of reducing the number of food-insecure vulnerable areas. Currently, the number of districts/cities that are prioritized 1-3, or areas vulnerable to food insecurity, is 14%; the National Food Agency targets that in 2024 the districts/cities that are prioritized 1-3 will be 12% or a maximum of 62 districts/cities. To achieve this goal, it is necessary to make efforts to coordinate, synergize, and synchronize the implementation of various programs as discussed in the field, one of which is by focusing on the target beneficiaries in districts/cities or regions that are still included in priorities 1-3 according to FSVA.

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Policy to Improve the Provision and Management of Food Data

From the GFSI analysis, Indonesia is still weak in two dimensions of food security, namely the quality and safety dimensions of food and the dimensions of natural resources and resilience, so Indonesia's GFSI score is relatively low (Rozaki, 2021). Certain variables from these four dimensions must be recorded for future improvement. However, for specific indicators, it is suspected that the data and information obtained by the EIU Team to compile the GFSI Indonesia score value is not as accurate as previously described. Meanwhile, based on the Food Security and Vulnerability Atlas (FSVA) results, Indonesia is already in a food security position. However, at the level of disaggregation, there are still districts and cities that are considered food vulnerable or vulnerable to food and nutrition insecurity events.

Therefore, policies to improve national food security and nutrition address problems that cause low food security performance, especially in vulnerable food-insecure areas, as identified in the FSVA. For practical implementation, based on learning from GFSI, efforts to improve food security and nutrition are carried out by handling several elements of the four dimensions of food security that have low scores while maintaining and even improving the performance of food security indicators or sub-indicators that have been assessed as suitable. Learning from FSVA, efforts to improve national food security are carried out by focusing on priority districts/cities 1-3 (vulnerable to food insecurity) while continuing to develop food security and nutrition in other regions.

There are 58 variables of data and information needed to measure global food security in the GFSI version. Judging from the type of variables, the data and information needed to compile GFSI indicators sourced from various ministries and agencies in Indonesia can even be obtained from community organizations. The National Food Agency, as an institution that directly handles national food security, can play a role in managing the availability of this data in an integrated manner. In the organizational structure of the National Food Agency, there are three echelons whose task is to handle three dimensions of food security: food availability, food access, and consumption and food safety. This structure aligns with the food system concept, which the EIU Team also uses to compile GFSI indicators.

Food Diversification Policy Based on Local Resources and Wisdom

The need for staple foods, especially carbohydrate source foods, cannot only depend on rice. Suppose you only rely on rice as a source of carbohydrates. In that case, it is feared that food security will be fragile, significantly since the population of Indonesia is still growing, so food needs will also increase. Therefore, people must strive to consume more diverse staple foods by utilizing local foods such as tubers, sago, and corn. The policy of diversifying food production also responds to anticipating climate change and reducing productive rice fields. Local food can grow on dry land and is easy to cultivate long-term or across generations. Local food cultivation, such as sweet potatoes, cassava, and other tubers, can also be planted in the yard and carried out by women or housewives (Yuniarti et al., 2022). On the other hand, rice plants need enough water, especially during the vegetative period, in order to grow optimally. Therefore, rice planted on paddy fields generally produces higher productivity than in dryland agroecosystem conditions.

The policy of accelerating the diversification of food consumption must still be a priority to meet the community's food needs. This policy evaluation needs to be carried out comprehensively to find weak points, why diversification is still slow, and what the leverage points are to accelerate the achievement of diversification. Diversification based on local food

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is not only for staple foods but also means diversity for all foods that source protein, vitamins, and minerals (Maman et al., 2021). Consumption pattern guidelines to meet the needs of diverse and balanced nutrition (B2SA) can be used to assess the quality of food consumption based on the concept of PPH. They can be used as a means of socialization and campaigns to achieve food security and sustainable nutrition.

This resource-based and local wisdom food consumption model must become a pattern of eating habits and community behavior at various levels in a sustainable manner (Ariani & Suryana, 2023) so that it will not only increase the value of food quality scores but will also have an impact on human health and improve environmental resources (Suhartini et al., 2022). Policies towards healthy and environmentally friendly food consumption must be carried out comprehensively, massively, and long-term. Considering that various factors cause food consumption behavior, changing food consumption patterns must be carried out jointly and continuously, involving the government, parliament, business actors, universities, the media, and the community (penta helix) with policies and programs that are implemented sustainably.

Environmentally Friendly Food Security and Nutrition Policies

The government's political commitment to adapt and mitigate climate change and improve the environment as part of sustainable development has been outlined in the 2020-2024 RPJMN. Improving the environment takes a relatively long time. Therefore, environmental improvement programs must be carried out continuously by prioritizing problems that must be addressed immediately and with a precise locus (Cahyani et al., 2022). Indonesia already has various regulations related to environmental and natural resource management, such as Law Number 32 of 2009 concerning Environmental Protection and Management, and various derivative regulations, such as Government Regulation Number 82 of 2001 concerning Water Quality Management and Water Pollution Control and regulations set by the Ministry of Environment and Forestry (Cahyani et al., 2022). The next step is to strengthen the implementation of these various rules. The Ministry of Environment and Forestry's policy is to improve the environment through three main programs, namely waste, water resources, and land. The National Action Plan for waste by controlling waste on land and at sea through the issuance of regulations and movements to control and manage waste, especially household and industrial waste.

The policy of improving environmental quality is carried out by preventing and restoring pollution/damage and strengthening institutions and law enforcement in the field of natural resources and the environment. Sustainable groundwater and raw water management can be achieved through the acceleration of the supply of raw water from protected water sources, increasing integration in drinking water supply, and using technology in raw water management (Karjoko et al., 2022). Low-carbon development policies through sustainable energy development and land restoration, green industry development, and rehabilitation of coastal and marine ecosystem areas. The effectiveness of these policies and programs requires active community participation so that programs set by the government can be easily implemented and produce maximum outputs and outcomes, which ultimately can increase the score of natural resources and environmental dimensions in GFSI. The successful implementation of this policy to improve environmental quality will ensure the development of a more resilient and sustainable food system, which will ultimately contribute to the achievement of community and national food security and nutrition.

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In preserving natural resources, especially land, efforts to reduce food loss and waste (FLW) are necessary. The volume of food loss and waste globally and nationally is enormous, estimated to be about one-third of food production. The results of the Bappenas study reported that the volume of FLW in Indonesia in 2000-2019 reached 115-184 kg/capita/year, or economic loss reached 4-5% of GDP and had an impact on the total greenhouse gas emissions that were quite large (as cited in Saliem et al., 2021). This effort to reduce the volume of FLW can reduce the pressure on the need for land expansion (clearing) for agricultural businesses or exploitative use of land, including the excessive use of chemical inputs to increase food production. In this regard, it is time for the government to issue regulations that regulate the provision of incentives and disincentives for food business actors and consumers who lose and waste food (Anderson et al., 2021). Housewives play a vital role in changing the food consumption behavior of their family members. Therefore, in every K/L program involving women, such as the Sustainable Food Yard, it is necessary to add the topic of food waste and food safety.

Policy to Accelerate the Handling of Vulnerable Areas with Food Insecurity

The inequality of infrastructure development between regions results in development in the Eastern Region of Indonesia (KTI) not being as good as development in the Western Region of Indonesia (KBI). This is one of the causes of economic inequality between the two regions, which impacts the difference in the people's welfare and food security level (Anjani & Prasetyo, 2024). This is also why most of the priority category 1-3 districts are in the KTI, especially in Papua and West Papua Provinces.

KTI has vast natural resource potential but has not been optimally developed. Alleviation and prevention of food-vulnerable areas in KTI, especially in Papua and West Papua Provinces, can be carried out through the construction and development of road and health infrastructure such as health centers/auxiliary health centers, clean water facilities, educational facilities, irrigation networks for agriculture (Anjani & Prasetyo, 2024). The construction of road facilities will increase the smooth flow of goods and services, reduce food prices, facilitate food supply, and increase population mobility to get jobs. The availability of these facilities also provides guarantees to farmers because water is an important means for planting, especially seasonal crops (Sayyidina et al., 2023). This facility also provides a guarantee for the public to get better access to health.

Although the government and local governments must realize national and regional food security, preventing and alleviating food and nutrition insecurity is a shared responsibility. Each level of government (central, provincial, and district/city) is obliged to be responsible for the food security of their respective regions according to their scope of responsibility based on the level of government administration. The government must also be able to integrate food security policies with other national development policies, such as economic policies through economic growth and equity. Considering that the causes of food and nutrition insecurity problems are very diverse and complex with a broad perspective, the policies that are prepared can be single by combining food policies and nutrition policies so that it is hoped that food and nutrition problems will be solved together (Hendardi & Ariani, 2020).

National Food Security Performance: Global Measure

The data used to evaluate global food security is sourced from the Global Food Security Index (GFSI) 2021 and 2022 publications. The evaluation is an index with score values and rankings from 113 countries analyzed. This index is a dynamic quantitative and qualitative comparison

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model built from 58 indicators/sub-indicators that measure food security in the analyzed countries (Allee et al., 2021). There are four dimensions of food security used in the calculation of the GFSI index, namely: 1) food availability with 21 indicators, 2) food affordability with 13 indicators, 3) food quality and safety with 15 indicators, and 4) natural resources and resilience with 27 indicators (Allee et al., 2021).

The GFSI 2021 publication reported that Ireland occupied the highest food security score (84.0%), or rank 1, while the lowest score (34.7), or rank 113, was given to Burundi. Indonesia is ranked 69th with a score of 59.2, below neighboring countries Malaysia, Thailand, and Vietnam (Economist Impact, 2021). When compared to the member countries of the Association of Southeast Asian Nations (ASEAN) analyzed (eight countries), Indonesia's food availability and food affordability dimensions are ranked 3rd and fourth. In contrast, the food quality and consumption, natural resources, and resilience dimensions are ranked 8th or lowest. This means that food consumption quality, natural resources, and resilience in Indonesia are still concerning and need serious handling from the government and other stakeholders. In 2021, during the COVID-19 pandemic, which began in early 2020, the impact of the pandemic on people's lives and the economy was felt in almost all countries in the world. The economic slowdown reflected in the value of gross domestic product (GDP) and declining economic growth has been experienced by ASEAN countries due to the COVID-19 pandemic, with varying degrees (Chong et al., 2021).

Policies to maintain the stability of food availability through various efforts to increase food production, build government food reserves, especially rice, and maintain smooth food distribution through marketing expansion with digital platforms have a positive impact on the dimensions of food availability and food affordability (Poudel & Gopinath, 2021). Regarding food availability, Indonesia's score is 63.7, higher than the Philippines and Vietnam, even with Thailand. Similarly, the food affordability score is relatively high at 74.9, higher than that of the Philippines, Viet Nam, Myanmar, and Laos. Indonesia's food quality, safety, natural resources, and resilience are shortcomings. These two dimensions have the lowest scores compared to other countries in the Southeast Asian region.

Food security in Indonesia experienced an increase in 2022, but if we look further back, the level is still lower than in 2018 - 2020. The index score puts Indonesia's food security in 2022 in the moderate category (score 55-69.9 points). Indonesia is ranked 63 out of 113 countries (Economist Impact, 2022). In the last 10 years, Indonesia's best GFSI was recorded in 2018. Within the Asia-Pacific region, it ranks 10th out of 23 countries. It performs best in the Affordability pillar, with a score of 81.4; its weakest performance is in the Sustainability and Adaptation pillar, with a score of 46.3 (Economist Impact, 2022).

National Food Security Performance: National Measures

In order to evaluate the achievement of food security and nutrition development, *Badan Ketahanan Pangan* (BKP), Ministry of Agriculture of Indonesia, has compiled a Food Security and Vulnerability Atlas (FSVA) Map. The preparation of the National FSVA with the district/city analysis locus followed up with the preparation of the FSVA at the provincial level with the sub-district locus and at the district/city level with the village/sub-district locus (Budiawati et al., 2021). The focus of the discussion in this study is on the national FSVA. Therefore, the most minor analysis is on the district/city area as a proxy to get an overview of food security at the national level.

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The FSVA is compiled based on three dimensions or pillars of food security, namely food availability, food access, and food and nutrition utilization, with nine indicators to measure vulnerability to chronic food insecurity. Based on this, the indicators used in compiling the FSVA in 2021 are shown in Table 1. The FSVA 2021 analysis covers 416 districts and 98 in Indonesia. Based on the composite index of nine indicators results, districts/cities are classified into six groups based on the level of food vulnerability. Regencies/cities that are in priority 1, 2, and 3 are food-vulnerable areas with classifications of very vulnerable (priority 1), vulnerable (priority 2), and somewhat vulnerable (priority 3). Regencies/cities in priorities 4, 5, and 6 are food security areas with classifications of moderately resistant (priority 4), resistant (priority 5), and very resilient (priority 6). FSFA 2021 concluded that there are 70 districts (16.8%), including priorities 1-3 (food vulnerable), with details of 28 priority one district, 17 priority two districts, and 25 priority three districts (Ministry of Agriculture of Indonesia, 2021). Meanwhile, there are 346 districts (83.2%) in Indonesia, including priority 4-6 (food security), with details of 37 priority four districts, 90 priority five districts, and 219 priority six districts (very resistant).

Table 1: Indicators of Vulnerability to Chronic Food Insecurity and Nutrition at the District/City Level According to FSVA (2021)

Dimensions of Food Security	No.	Indicators
Food Availability	1.	Normative consumption ratio per capita to net production of rice, corn, sweet potato, and cassava, as well as local government rice stocks
Food Access	2.	Percentage of the population living below the poverty line
	3.	Percentage of households with a proportion of food expenditure more than 65%
	4.	Percentage of households without access to electricity
	5.	The average length of schooling for girls is over 15 years old
Food Utilization	6.	Percentage of households without access to clean water
	7.	The ratio of population per health worker to population density
	8.	Percentage of toddlers with substandard height (stunting)
	9.	Life expectancy at birth

Source: Ministry of Agriculture of Indonesia (2021)

Most food-vulnerable districts are in the Eastern Region of Indonesia (KTI) and archipelagic districts. Priority 1 districts are spread across Papua Province (19 districts), West Papua (6 districts), Maluku, Riau, and West Sumatra, one district each. As a unique autonomous region (Otsus), Papua receives relatively large APBD funds with its use, mainly for education and health services. In 18 years (2002-2019), the Special Autonomy fund nominally increased by 8.9% annually. For 2019, the Special Autonomy funds received by Papua Province (Rp5.9 trillion) are equivalent to the total Regional Revenue and Expenditure Budget (APBD) for two Maluku island provinces, namely Maluku Province (Rp3.2 trillion) and North Maluku (Rp2.7 trillion). The budget amount is equivalent to the East Nusa Tenggara Provincial Budget (IDR 5.8 trillion). With the additional budget in the framework of Special Autonomy, Papua should be able to improve infrastructure development and people's welfare. However, based on the

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FSVA study, this has not significantly impacted. This may be due to the high difficulty related to the condition of local development resources.

Based on the scores of indicators from the three dimensions of food security, the causes of food vulnerability in the region are 1) the high ratio of consumption per capita to net availability per capita, 2) the high percentage of the population living below the poverty line, 3) the high ratio of population per health worker to population density, 4) the high number of households without access to clean water, and 5) the high prevalence of stunting children under five. The average ratio of normative consumption to food production in priority 1-3 food-vulnerable areas is 4.63, which means that the food needs are four times the region's ability to produce food. Meanwhile, the proportion of poor people in food-insecure areas (21.65%) is almost double that of food-insecure areas (11.41%). Likewise, the population ratio to health workers in food-vulnerable areas is very high compared to food-insecure areas, at 24.5% and 3.89%, respectively. However, the stunting prevalence rate in these two regions is quite close, namely 28.36% in food-vulnerable areas and 27.84% in food-insecure areas. In detail, the average values of each indicator for food-vulnerable and food-secure districts are presented in Table 2. The results of the FSVA analysis on 98 cities in Indonesia show that four cities (4%) are still considered food insecure (priorities 1-3), with a breakdown of one city in priority one and three cities in priority 3. The four cities are Aceh, North Sumatra, South Sumatra, and Maluku. Meanwhile, the urban area with food security status (priority 4-6) is quite large, namely 96% (94 cities), with details of six cities in the priority four categories; 16 cities are included in priority 5, and 71 cities are in priority 6.

Table 2: Average Value of Food Vulnerable Priority Districts and Food Security Priority Groups According to FSVA (2021)

No.	Indicators	Priority 1 – 3 (food vulnerable)	Priority 4 – 6 (food security)
1.	Consumption of food availability	4.63	0.85
2.	Poverty rate	21.65	11.41
3.	Food expenditure >65%	33.03	29.96
4.	Electricity access	15.42	1.74
5.	Access to clean water	51.71	31.50
6.	Life expectancy	65.79	69.60
7.	Population per health worker	24.50	3.89
8.	Girls' schooling length >15 years	7.37	8.21
9.	Stunting in toddlers	28.36	27.84

Source: Ministry of Agriculture of Indonesia (2021)

The leading cause of a city entering a food-vulnerable area is the relatively high prevalence of stunted children under five and the poor population. The average percentage of stunted children under five in food-vulnerable cities is 28.95%, while in food-secure cities it is 20.21%. The percentage of people living below the poverty line in food-vulnerable cities is 16.40%, while in food-insecure cities it is 6.56%. The average value of each indicator for cities with food vulnerability and security status can be seen in Table 3.

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Table 3: Average Value of Vulnerable Priority Cities and Food Security Priority Groups According to FSVA (2021)

No.	Indicators	Priority 1 – 3 (food vulnerable)	Priority 4 – 6 (food security)
1.	Poverty rate	16.40	6.56
2.	Food expenditure >65%	22.57	13.31
3.	Electricity access	0,91	0.10
4.	Access to clean water	32.78	11.46
5.	Life expectancy	66.85	72.28
6.	Population per health worker	1.15	0.17
7.	Girls' schooling length >15 years	9.51	10.52
8.	Stunting in toddlers	28.95	20.21

Source: Ministry of Agriculture of Indonesia (2021)

The position of national food security based on the results of the FSVA 2021 analysis can be concluded that most (86%) regions in Indonesia are food insecure. This performance achievement is the result of the national development policy listed in the 2019-2024 *Rencana Pembangunan Jangka Menengah Nasional* (RPJMN), whose implementation is carried out by various ministries and agencies, by involving relevant stakeholders, namely the private sector, academics, and the community. The scope of development includes, among others, the development of basic infrastructure, the improvement of sanitation and environmental quality, the increase in food production and productivity, the development of the regional economy for job creation, and the increase of community income. In addition, to improve food affordability, the government implements policies to maintain the stability of strategic food supply and prices, programs to improve nutrition and public health, and food social assistance programs for low-income communities. The FSVA maps districts/cities identified based on priority status, food security, and vulnerability in the Indonesia altas. A complete picture of all regions by food security and vulnerability category based on FSVA 2021 is presented in Figure 1. The Food Security & Vulnerability Composite Index is an index used to group districts/cities into food security status priorities, updated using the weighting method adopted from the Global Food Security Index (GFSI) to refine the method used in previous atlases. The weight of each indicator in the composite analysis using the average weighted assessment is set by the experts. This method produces scores in each district/city, which are further grouped into one of 6 composite groups: very vulnerable, vulnerable, quite vulnerable, quite strong, strong, and very strong.

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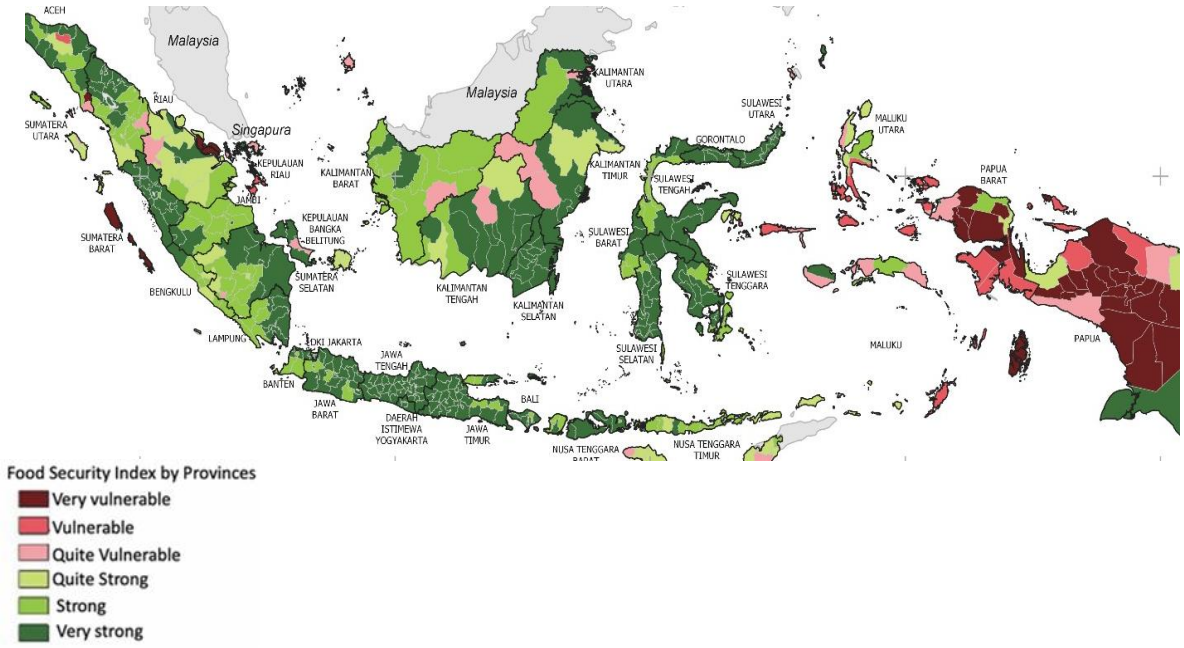
Figure 1: Indonesia's Food Security and Vulnerability Atlas (2021)



Source: Rozaki (2021)

Discussion

The food security strategy must undoubtedly be based on the National Food Security Policy Direction, which cannot be separated from the mandate stated in the preamble to the 1945 Constitution, the fourth paragraph, namely, "to form a government of the state of Indonesia that protects the entire Indonesia nation and all of Indonesia's bloodshed and to promote public welfare, educate the life of the nation, and participate in implementing a world order based on independence, lasting peace, and social justice."

Then this statement was reaffirmed by a statement in Article 33 of the body of the 1945 Constitution (after the Fourth Amendment), which reads as follows: Paragraph (1), "The national economy is arranged as a joint venture based on the principle of kinship"; Paragraph (2), "The branches of production that are important to the state and that control the state controls the livelihood of the people"; Verse (3), "The earth and water and the natural resources contained in it are controlled by the state and used for the greatest prosperity of the people"; Paragraph (4), "The national economy is organized based on economic democracy with the principles of togetherness, efficiency, justice, sustainability, environmental insight, and by maintaining a balance of progress and national economic unity"; Paragraph (5), "Further provisions regarding the implementation of this article are regulated in the law."

Based on the mandate in Article 33 of the 1945 Constitution (after the fourth amendment), Law No. 41 of 2009, Government Regulation No. 68 of 2002, and Government Regulation No. 11 of 2011 state that the national food security policy is not only directed to achieve food availability, but also directed to achieve affordability, independence, sovereignty, quality, and

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food safety. In fact, in the 2009-2014 Rencana Pembangunan Jangka Menengah Nasional (RPJMN), it is stated that the priority of national food security for the period from 2010 to 2014 is to: (1) increase the availability and handling of food insecurity, (2) improve the distribution system and stabilize food prices, and (3) increase the fulfillment of consumption needs and food safety.

Based on the policy direction, the main goal of the national food security strategy is to achieve availability, independence, sovereignty, competitiveness, and accessibility of the population to food in order to achieve a prosperous society and national resilience. This effort to increase availability, independence, and competitiveness (Swa Sembada Pangan) must have become a national commitment. The national food security strategy that emphasizes the availability, independence, access to the population, and food sovereignty can have consequences for the national development strategy based on the resource and knowledge-based strategy by prioritizing the agriculture, plantation, and fisheries sectors in a broad sense. Priority is given to on-farm and off-farm to increase the added value of national food products so that the competitiveness of national food products will increase. The success of the national food security strategy will be primarily determined by (1) the attractiveness of the agricultural sector, (2) the availability of land, (3) quality human resources, (4) the availability of carrying capacity, and (5) technology.

Therefore, the priority that must be made in the national food security strategy is to increase the attractiveness of the agricultural sector through efforts: first, increasing the exchange rate of farmers and fishermen. The role of Bulog and Dolog here is vital. The role of Bulog and Dolog in national and regional food security programs is necessary, with some modifications to be more transparent and accountable (Azis & Azis, 2022). The tasks of Bulog and Dolog are adapted to the will of the assigning party, both the central government and the local government. Through stabilizing food product prices, it is hoped that Bulog can keep food prices from falling lower than the floor price, thereby harming farmers or higher than the ceiling price, thus harming low-income consumers. Second, the availability of agricultural land should be increased. The government and local governments need to implement Law No. 41 of 2009 concerning the Determination of Sustainable Land Conversion and Government Regulation of the Republic of Indonesia No. 1. Year 2011 concerning the Determination of the Transfer of Sustainable Agricultural Land Functions. This Law and Government Regulation need to be followed up by Regional Regulations that concretely determine agricultural lands that should not be converted. Each city district should update the Regional Regulation on Spatial Planning by determining how much agricultural land (especially technical irrigation land) should not be converted. In these provisions, sanctions should be included for the violating person/party.

Third, improving the quality of agricultural human resources through formal and informal education channels. The government needs to revitalize agricultural schools at the junior and senior high school levels, of course with a guarantee of decent jobs for its graduates (Rose et al., 2021. Fourth), the agriculture, plantation, livestock, and forestry reform that President Susilo Bambang Yudhoyono once launched needs to be seriously implemented. The policy direction is already in place; the implementation rules are also available; it is just a matter of seriousness in implementation that has not been carried out.

Fifth, the application of technology certainly needs to be carried out to increase the productivity of the agricultural sector. Narrow-land agriculture will certainly not provide maximum usability without a touch of technology. However, because the technology is expensive and

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difficult for individual farmers to bear, it is recommended that farmers build strategic alliances in a cluster. Companions can be taken from undergraduates who are interns or by taking advantage of the Real Work Lecture and TNI Village Entry (TMD) program.

Sixth, in terms of consumption, there is a need for intervention to change behavior in the community because the decision to regulate community consumption is closely related to community behavior patterns (Jensen & Orfila, 2021). The development of various food ordering platforms and various food purchasing facilities provides convenience for the public in buying food but also increases the tendency of food waste due to the convenience obtained. Some steps that the community can take to reduce food waste include: adopting a sustainable diet, buying only what is needed, consuming imperfect food, storing food well, understanding food labels, storing food in small quantities, storing food waste, composting food waste, appreciate food, and consume local products (Wang et al., 2021). With the proper intervention, these measures can encourage a more massive change in community behavior. Therefore, further studies are needed to find the most appropriate intervention for the local community so that the efforts can be more targeted in selecting media channels, the main target of behavioral change, and incentives for consumers (Shupler et al., 2021).

Seventh, at the level of agricultural production, the government can focus on agricultural products that are the most wasted during the production process, namely horticultural products, especially vegetables, fruits, and grains (Sekaran et al., 2021). Intervention can begin by developing standard standards for calculating food loss on the production side. Currently, there are Food Loss and Waste (FLW) Protocols developed by the United Nations Food and Agricultural Organization (FAO) and other international organizations that are members of the steering committee for FLW Protocols. The various available calculation methods certainly need to be tested in the Indonesian context, especially for horticulture and vegetables, to have sufficient data at the micro level and to identify the most appropriate reduction interventions for agricultural products. Standard calculation standards make it easier for stakeholders to find problems and determine strategies to overcome the food shortage problem (Kuiper & Cui, 2021).

Eight, the following transformation is encouraging multi-party cooperation in a collaboration platform. The complexity of existing food problems requires the expertise and involvement of many parties with various backgrounds and job focuses. Indonesia has a law related to the management of food, namely Law No. 18 of 2012, which mandates that the management of the food system in Indonesia must involve community participation in a coordinated and integrated manner. Explicitly, the law mandates community involvement in the planning process, the development of food production, and partnership synergy in creating a national food proposal. For example, synergy and multi-party collaboration are needed in the current policy context to make food-related planning an integrated policy (Smyth et al., 2021). In addition, as a coalition, Koalisi Sistem Pangan Lestari (KSPL) also encourages collaboration between 12 main partners who each have a different focus and background, namely CIFOR-ICRAF, CIPS, EntreVA, GAIN Indonesia, Garda Pangan, IBCSD, KRKP, Parongpong, SYSTEMIQ, WRI Indonesia, Humanist and Social Innovation Foundation, and KEHATI Foundation.

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Conclusion

Food security is a state where all people constantly have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food security also includes the ability to withstand and recover from shocks, such as natural disasters or economic crises, without compromising food access or nutrition. Food security is, therefore, an essential aspect of people's well-being and is consistently high on the agenda of every government in the world. Food insecurity undermines human rights and is a prelude to global health, nutrition, and development problems. The purpose of this study is to assess the food security in Indonesia. This study assesses the actors of Indonesian food security agencies, policies to improve food security and sustainable nutrition, and national food security performance. It provides implications and future direction for the Indonesian government. The sampling technique used is purposive sampling. The data source used is in the form of reports and articles from 2020-2022. The findings suggest that the government seeks to improve food security through programs to improve food availability, access, and quality. Seeing the complexity of the food problem, multi-pillar changes are needed to transform the food system in Indonesia. Theoretically, the study supports the view of food security as a part of human security, where all people always need physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and dietary preferences for an active and healthy life. The study results show that serious steps must be taken to correct the growth imbalance, especially in the food sector. If not given attention, it can lead to the emergence of more serious threats to human security. A serious, concrete, and comprehensive form of policy is necessary to overcome the various problems currently experienced by the agricultural sector, especially the food sector. The existence of a specific long-term policy proves the government's priority to overcome problems involving food security in Indonesia. These findings highlight the importance of considering geographical and historical context in designing contemporary food security strategies and policymaking. Drawing lessons from the past, this article offers insights for addressing current and future food security challenges, emphasizing the need for resilient and sustainable agricultural practices that can withstand external shocks. This study further proposes several approaches to guarantee human security from the aspect of food security. Firstly, Indonesia needs to create a concrete and long-term food security policy involving the development of the food sector in this country. It must consider the needs of the growing population in this country and the uncertain political, economic, and global climate. Secondly, balanced and sustainable development must be strengthened. Unbalanced development will only result in losses to countries that are rich in resources to be utilized for the well-being and security of humans. This approach can guarantee the use of resources with optimal benefits and preserve existing resources for future generations. Considering the various issues regarding food security that are generally discussed internationally, it is appropriate that a comprehensive policy be created and implemented in Indonesia. Historical experience has shown that human well-being that is affected from the point of view of food security will only lead to instability that can threaten the security of a country. One limitation that has been faced throughout the research process is that the sample articles and documents in this study may not reflect Indonesia's current food security situation (2024-2025). Thus, future research is encouraged to examine the current food security year.

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