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MORALITY BEFORE KNOWLEDGE

Strategic transformations for realizing food security in Indonesia

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ABSTRACT

Background: Indonesia is experiencing a significant conversion of agricultural land. Along with increasing development activities, economic growth, and population expansion, the demand for land has risen sharply. Meanwhile, land availability remains essentially unchanged. This discrepancy has led to various conflicts of interest, ultimately resulting in the widespread conversion of agricultural land to non-agricultural uses. Climate change and the demographic transition within the agricultural sector also pose new challenges to achieving food security. This policy paper examines Indonesia's food security policy strategies, with a particular focus on the sustainability of the national food system. **Methods**: The approach used in the preparation of this policy paper is qualitative with a literature review as its primary method. **Findings:** The findings includes an analysis of the existing conditions, the challenges faced, and strategic policy recommendations to achieve sustainable food security. **Conclusion**: Indonesia has made progress in food and nutrition security, yet it continues to face challenges such as climate change, demographic transitions, and urbanization. To address these issues, transformative strategies are needed, including sustainable agriculture, youth empowerment, and the development of technology-based urban farming systems. **Novelty/Originality of this article:** This policy paper presents a novel integrative approach by combining climate adaptation, youth empowerment, and urban agriculture as a unified strategy to achieve sustainable food security in Indonesia. It distinguishes itself by using a system thinking framework to analyze food security challenges and formulate cross-sectoral policy recommendations that address environmental, demographic, and urbanization pressures simultaneously.

KEYWORDS: agricultural land conversion; climate change adaptation; sustainable food security; youth empowerment in agriculture; urban farming systems.

1. Introduction

Conceptually, food is a basic human need that must be met at all times and plays a vital role in the life of a nation. Food security, on the other hand, is defined as a condition in which all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs for an active and healthy life (Poudel & Gopinath, 2021). Data indicate that over the past few decades, pressure on natural resources and ecosystems has intensified in line with the growing demand for food due to the increasing global population. In 2021, 828 million people worldwide were affected by hunger—46 million more than in 2020 and 150 million more than in 2019, prior to the COVID-19 pandemic. More than half of those affected by hunger in 2021 lived in Asia, while more than one-third resided in Africa (Boni et al., 2022).

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Given this situation, food security has emerged as a strategic issue that attracts global attention, including in Indonesia. Currently, Indonesia ranks 63rd out of 113 countries in the Global Food Security Index (GFSI). Within the Asia-Pacific region, it ranks 10th out of 23 countries. Indonesia performs best in the affordability pillar with a score of 81.4, while its weakest performance is in the sustainability and adaptation pillar, with a score of 46.3. According to the 2018 Global Hunger Index (GHI), the level of hunger and undernutrition globally is categorized as serious, including in Indonesia, which recorded a GHI score of 21.9—placing the country in the "serious" category of hunger (Hadi et al., 2019). These data demonstrate Indonesia's strength in ensuring food affordability for consumers, particularly through strong food safety nets and food security programs. However, on the other hand, the country still faces fundamental challenges, particularly in its capacity to create a sustainable and secure food system (Economist Impact, 2022).

The complexity of food security positions it as a cross-sectoral issue that involves dynamic interactions among social structures, economic mechanisms, political interests, and environmental systems. In practice, the political dimension often has a significant influence in shaping food policy frameworks (Suryana, 2014). The sustainability of food systems has evolved into a critical topic that commands serious attention in various global forums and intergovernmental meetings. Growing concerns about food security in food-insecure regions of the world highlight the inadequacy of sectoral approaches in addressing agricultural challenges (Bhaduri et al., 2018).

The importance of food security to national sovereignty is a fundamental aspect that cannot be separated from the existence and progress of a nation. Food security serves as a key pillar in maintaining national stability, as it is directly related to the survival and well-being of the population. In the context of national security, adequate food availability prevents over-dependence on other countries and simultaneously strengthens Indonesia's bargaining power in international relations. When a country can meet its domestic food needs, it gains greater autonomy in adopting policies that prioritize national interests. The aspect of sustainability is also crucial, as food security must ensure the availability of food not only for the present generation but also for future generations through environmentally friendly and climate-adaptive agricultural practices.

In the context of national development, food security functions as a driver of economic growth in the agricultural sector and a key enabler for achieving sustainable development goals. Strengthening the food security system requires a comprehensive approach that encompasses production, distribution, and consumption. This includes the development of agricultural infrastructure, modernization of production systems, strengthening of supply chains, and public education on healthy and sustainable consumption patterns. Thus, food security not only guarantees national sovereignty in political and economic terms but also supports the realization of a healthy, productive, and prosperous society.

To realize food security that supports national sovereignty, strong commitment from all stakeholders is essential. This involves investment in agricultural research and development, institutional strengthening, human resource development, and effective partnerships among the government, private sector, and civil society. Only through a holistic and sustainable approach can Indonesia build a resilient food security system that supports national sovereignty in the long term. The objective of this policy brief is to analyze the current food security policies, identify the challenges and opportunities involved, and formulate alternative policy strategies for sustainable food security in Indonesia.

2. Methods

The approach used in the preparation of this policy paper is qualitative, focusing on an in-depth understanding of the phenomena, context, or relationships among components within a system. Data collection was conducted through a literature review sourced from academic journals, official government websites, and international organization websites. Policy analysis was carried out using a system thinking framework to identify the interconnections among various aspects influencing the development of food security in

Indonesia, including regulations, institutions, technology, environment, social, and economic factors.

In addition to literature review, this policy paper also employed comparative policy analysis to examine best practices from other countries facing similar challenges in agricultural land conversion and food system sustainability. This comparative dimension enriches the contextual understanding of Indonesia's policy landscape and highlights adaptive strategies that could be localized. Furthermore, a thematic synthesis was used to categorize and interpret findings according to major themes such as land use governance, climate resilience, urban agriculture, and youth involvement in food systems, ensuring that the analysis remains holistic and policy-relevant.

3. Results and Discussion

3.1 Achievements in food security

Indonesia has made notable progress in increasing the production of various food commodities. Between 2013 and 2019, corn output experienced significant growth, nearly doubling from 18.5 million tons to 33 million tons annually. In contrast, sugar production declined during this period, while the outputs of soybeans and beef showed little to no improvement. On a more positive note, the domestic supply of protein from non-beef sources exhibited an upward trend. For example, fish availability grew by approximately 15% from 2014 to 2018, averaging an annual increase of 3.6%. Egg production also rose steadily, increasing by around 2.6% per year from 2015 to 2019, moving from 1.9 million tons to 2.4 million tons. Furthermore, chicken meat production saw a sharp increase, growing at an average annual rate of 16% between 2013 and 2019, with total output rising from 1.5 million tons to 3.5 million tons (Arif et al., 2020). However, despite the increases in fish availability and egg and chicken meat production, the government still faces challenges in ensuring diverse food availability. A diversified agricultural production system is needed to achieve this goal.

Food access has improved over recent years. The average daily calorie consumption rose from 2,004 kcal per capita in 2015 to 2,165 kcal per capita in 2018 (Badan Ketahanan Pangan, 2019). The 2018 Food Security and Vulnerability Map shows that the number of districts/cities classified as “food secure” increased between 2015 and 2018 (Badan Ketahanan Pangan, 2019). Nevertheless, more than 20 million Indonesians remain at risk of hunger. According to the Central Statistics Agency (BPS), the prevalence of undernourishment, defined as "calorie intake below the minimum dietary energy requirement," dropped from 16.5% in 2011 to 7.9% in 2018. The number of undernourished people declined from 39.8 million in 2011 to 21 million in 2018.

Dependence on imports remains very high, as reflected in the import data of strategic commodities such as soybeans reaching 2.8 million tons per year, corn 1.2 million tons, and sugar 3.7 million tons. This situation indicates the suboptimal capacity of domestic production to meet national food needs. This condition is exacerbated by the fact that soybean self-sufficiency only reached 38%, indicating vulnerability in food security. The socioeconomic dimension of food security is further complicated by the reality of farmer poverty. Based on BPS data from September 2023, there are 10.14 million poor farmers, equivalent to 25.42% of the total farming population. This situation illustrates the structural pressures on the national food production base, where those closest to the production process actually experience economic marginalization. Comprehensively, Indonesia’s food condition presents a paradox between the great potential of agricultural resources and the complexity of structural challenges. A systemic, innovative, and sustainable approach is required to transform the national food ecosystem towards genuine food sovereignty.

3.2 Emerging challenges in food security

3.2.1 Climate change

The agricultural sector faces substantial challenges as a result of climate change, including shifts in rainfall patterns, more frequent and severe extreme weather events, rising temperatures, and sea level rise. In the Indonesian context, disruptions in the onset of the rainy season have created major obstacles for farmers in determining the appropriate time to begin planting, which in turn has had cascading effects on harvesting schedules and overall crop productivity. Meanwhile, irregular rainfall or more intense precipitation leads to droughts or floods. As a result, crop failures become inevitable, especially when water management is inadequate. Increased temperature and humidity can adversely affect plant physiology. Higher temperatures and humidity also contribute to the emergence of pests and plant diseases. Furthermore, sea level rise due to global warming has impacted agriculture and fisheries in coastal areas through seawater intrusion and aquifer salinization. Rising sea levels also increase pressure on ecosystems, affecting the fisheries sector and causing damage to forest and coastal ecosystems.

3.2.2 Demographic transition in the agricultural sector

Indonesia's food production is increasingly constrained by demographic shifts within the agricultural sector. One major issue is the declining number of farmers. While the total number of agricultural households rose from 26.1 million in 2013 to 27.7 million in 2018, the number of rice farming households fell from 14.1 million to 13.2 million during the same period (BPS, 2014). Another pressing concern is the aging farming population. In 2013, 38.2% of farmers were between 25 and 45 years old, but by 2018, this share had declined to 34.8%. In contrast, the proportion of farmers aged 45 and above increased from 60.8% to 64.2% over the same timeframe (BPS, 2014). In a country like Indonesia, where agricultural mechanization and research remain underdeveloped, age plays a critical role in shaping productivity. Older farmers generally exhibit lower productivity levels compared to their younger counterparts (Susanti et al., 2016).

The challenge of generational renewal in the agricultural sector cannot be attributed solely to rural youth's lack of interest in farming. Evidence from a systematic study conducted in 12 rice-producing villages across West Java, Central Java, and South Sulawesi indicates that many young people are, in fact, interested in pursuing farming as a livelihood (Akatiga & White, 2015; Nugraha & Herawati, 2014). However, the realization of this interest is hindered by limited opportunities. One of the most significant obstacles is inadequate access to agricultural land, particularly among youth from economically disadvantaged farming families with minimal landholdings. To address the declining number of farmers and the aging demographic within the sector, it is imperative to improve youth access to land and strengthen the availability of financial services tailored to aspiring young farmers.

3.2.3 Urbanization

Over the past twenty years, Indonesia has undergone rapid urbanization, with the urban population expanding at a pace that far exceeds overall population growth. Between 2000 and 2010, while the national population rose by 17%—from 204 million to 238 million—the number of people living in urban areas surged by 39%, increasing from 85 million to 118 million (Firman, 2016). By 2015, more than half of the population was living in urban settings. This swift urban expansion, along with population growth, poses risks to food availability by accelerating the loss of agricultural land. As observed in many countries, urbanization has become a key driver of farmland conversion in Indonesia. Government interventions to curb this trend have largely been unsuccessful. A significant obstacle is the large disparity in land value between agricultural and residential uses, particularly in peri-

urban zones, which places immense pressure on farmers to sell or repurpose their land in the face of expanding urban development (Rondhi et al., 2019). As a result, the rate of agricultural land conversion—especially on Java Island—remains alarming. Without the enforcement of effective and targeted policy interventions, this ongoing trend threatens to undermine the long-term sustainability of Indonesia's food security (Rondhi et al., 2019).

3.3 Strategic policy recommendations

3.3.1 Agricultural innovation and technology

To address the challenges posed by climate change threatening food security, the government needs to promote the transformation of the agricultural sector towards sustainability. Priority policies include the development of environmentally friendly technologies, such as water-efficient irrigation, the use of superior seed varieties resistant to extreme weather conditions, and crop diversification to minimize the risk of crop failure. Additionally, technology-based early warning systems should be expanded to provide real-time weather information to farmers, enabling them to anticipate climate changes. The government also needs to strengthen climate adaptation programs, such as critical land conservation, reforestation, and the implementation of ecosystem-based agricultural practices. Through these measures, the agricultural sector is expected to become more resilient to the impacts of climate change while maintaining productivity and food sustainability.

3.3.2 Youth development and innovation in agricultural higher education

To achieve sustainable food security in Indonesia, strategies are needed to encourage the participation of the younger generation in agriculture through education, training, and access to modern technology. Young people must be made aware that agriculture is not only a traditional sector but also an innovative and promising field. The government can facilitate agriculture-based entrepreneurship programs supported by capital and technology-driven training. Additionally, it is important to strengthen the role of universities in Indonesia as centers for research and development in the agricultural sector by prioritizing research focused on improving productivity, efficiency, and sustainability. Collaboration between higher education institutions, industry players, and farmers should also be enhanced to generate innovative solutions relevant to local challenges. This strategy is expected to foster farmer regeneration while strengthening an agricultural ecosystem that is adaptive to changing times.

3.3.3 Development of urban agriculture systems

Rapid urbanization demands innovative strategies to maintain food security in urban areas and their surroundings. The government needs to promote the development of technology-based urban farming systems, such as hydroponics, vertical farming, and aquaponics, which enable food production on limited land. Furthermore, efforts to control the conversion of agricultural land into residential or industrial areas must be strengthened through strict regulations and incentives for landowners to continue using their land productively. Improvements in logistics and transportation infrastructure are also necessary to reduce post-harvest losses during distribution from production areas to urban consumption centers. This approach can strengthen food security amid urbanization pressures while fostering better connectivity between rural and urban regions.

4. Conclusions

Indonesia has recorded significant progress in improving food security and nutrition. Food access has increased, and malnutrition rates have declined across all age categories.

However, several multidimensional issues have emerged. Despite these improvements, food availability and dietary diversity still need enhancement. For many poor and vulnerable populations, price remains a major barrier to improving food access. Indonesia faces new challenges in achieving food security, including climate change, demographic transitions, and urbanization.

To address these food security challenges, a comprehensive transformation strategy is required. In response to climate change, the government needs to promote sustainable agriculture through environmentally friendly technologies, water-efficient irrigation systems, the use of climate-resilient seeds, and the development of integrated early warning systems. To tackle demographic transitions, policies should focus on attracting youth to the agricultural sector by providing vocational training, access to financing, and modernization of agricultural technologies such as digitalization and mechanization to make the sector more competitive and innovative. Meanwhile, urbanization demands the development of technology-based urban farming systems, strict regulation to control agricultural land conversion, and improved efficiency in food distribution through integrated logistics infrastructure. These three approaches are expected to create sustainable, adaptive, and inclusive food security.

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