

GREEN ECONOMY STRATEGY AS A PILLAR OF TRANSITION TOWARD INDONESIA'S FOOD SECURITY: A LITERATURE REVIEW

Amanda Archangela^{1*}

^{1*}Program Studi Teknologi Hasil Pertanian, Fakultas Pertanian, Universitas Sam Ratulangi, Manado, Indonesia

amandaarchangelak@gmail.com

(*) Corresponding Author

amandaarchangelak@gmail.com

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ABSTRACT

Food security is one of Indonesia's strategic development issues, facing complex challenges such as climate change, land degradation, and fluctuations in global food prices. The green economy is considered a potential framework for transitioning toward food security by emphasizing resource efficiency, renewable energy, and inclusive governance. This study aims to examine the concepts and strategic approaches of the green economy in supporting the transition toward national food security in Indonesia. The method employed is a systematic literature review of 15 scientific articles published over the past decade, retrieved from Scopus and Google Scholar databases, with relevance criteria focusing on green economy and food security. The findings indicate that green economy strategies in the food sector encompass sustainable agriculture, efficient resource management, renewable energy utilization, food technology innovation, and the strengthening of community-based food governance. However, several challenges remain, including limited access to green technologies for smallholder farmers, weak policy consistency, and regional adaptation disparities. This study concludes that the green economy is not merely a conceptual framework but also a practical strategy for achieving national food security, contributing significantly to the integration of ecological and social perspectives in food policy.

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INTRODUCTIONS

The agricultural sector in Indonesia faces increasingly complex challenges: meeting the food needs of a growing population while maintaining environmental sustainability. According to data from the Central Bureau of Statistics (BPS) (2023), the agricultural sector contributes 13.28% to the national Gross Domestic Product (GDP)

(Dinas Pertanian & Perkebunan Aceh, 2023), yet paradoxically, it is also the second-largest emitter of greenhouse gases after the forestry sector. In this context, the implementation of green economy strategies is regarded as a critical solution to ensuring sustainable food security in Indonesia.

The potential for applying the green economy in agriculture is considerable, although it still encounters numerous structural and technical barriers. Nurkarim (2024) found that the implementation of green economy strategies in East Java increased agricultural productivity by 23% while simultaneously reducing carbon emissions by 15%. However, Rahardjo et al. (2023) reported that only 35% of farmers in Magelang Regency consistently apply sustainable agricultural practices. This condition is further exacerbated by data from the Ministry of Agriculture (2023), showing that the rate of agricultural land conversion still reaches 96,887 hectares per year, while soil quality degradation due to conventional farming practices has affected approximately 25% of total productive land. If left unaddressed, this issue could erode national food production capacity in the long term.

The implementation of green economy strategies in agriculture can be pursued through four main pillars identified in recent literature. First, the integration of digital technology, as evidenced by Juanda et al. (2023), who demonstrated that precision farming can increase water use efficiency by up to 30% and reduce chemical fertilizer use by 25%. Moreover, the adoption of blockchain technology in food supply chains has been shown to reduce food loss by 15%. Second, the strengthening of local institutions, as Yusriadi (2025) found that agroforestry-based farmer groups in North Luwu experienced a 40% increase in income compared to conventional farmers, emphasizing the crucial role of social capital in adopting sustainable agricultural practices. Third, green economic incentives, as the Ministry of Finance (2023) reported that budget allocations for sustainable agriculture programs account for less than 15% of the total agricultural budget. Susanto et al. (2024) recommended expanding fiscal incentives for farmers adopting environmentally friendly practices. Fourth, farmland protection, as shown by Widhiyastuti et al. (2023), who reported that the Sustainable Food Agricultural Land Protection (LP2B) policy in Sleman successfully reduced the rate of land conversion from 3.2% to 1.8% per year.

The benefits of implementing green economy strategies in agriculture have proven significant for both the food and environmental sectors. Comprehensive analyses indicate a 20–30% increase in agricultural productivity, a 15–25% reduction in greenhouse gas emissions, a 25–40% increase in farmers' income, and a 10–15% reduction in food loss and waste. Pawlak and Kołodziejczak (2020), in their study of developing countries, found that investments in sustainable agriculture yielded a two- to threefold higher return on investment compared to conventional practices over the long term. Thus, adopting green economy strategies is not merely an environmental approach but also an economically advantageous strategy.

Based on various research findings, several policy recommendations can be proposed. First, green fiscal policy, which includes allocating at least 25% of the agricultural budget to sustainable programs, providing tax incentives for companies supporting green food supply chains, and offering green subsidies to farmers implementing environmentally friendly practices. Second, integrated regulation, which entails strengthening LP2B enforcement through consistent law implementation, harmonizing cross-sectoral policies (agriculture, environment, and trade), and developing certification standards for sustainable food products. Third, capacity building, which includes farmer training programs, the establishment of regional green economy innovation centers, and the facilitation of technology and knowledge transfer. Fourth, monitoring and evaluation, involving the development of integrated monitoring systems, the establishment of measurable performance indicators, and the implementation of periodic evaluations of policy execution.

From the foregoing discussion, it can be concluded that the transition toward a green food system is not only feasible but has become an urgent necessity for Indonesia. Empirical evidence demonstrates that green economy strategies can address food security challenges while maintaining environmental sustainability. Comprehensive, consistent, and evidence-based implementation will ensure the realization of sustainable, resilient, and equitable food

security for present and future generations. The success of this transition requires strong political commitment, multi-stakeholder synergy, and the courage to adopt evidence-based innovations. With the right momentum and lessons drawn from successful local initiatives, Indonesia has a strong opportunity to emerge as a global leader in applying the green economy to achieve food security.

Although several studies have explored food security and sustainable development, there remains a lack of research explicitly linking green economy strategies as a key pillar in Indonesia's transition toward national food security. Therefore, this study aims to review scientific literature on the potential and challenges of implementing green economy strategies to strengthen national food security. The study is expected to provide a comprehensive understanding of the potential, challenges, and implementation strategies of the green economy in achieving a sustainable food system.

METHOD

This study employed a qualitative research design using a literature review approach by examining relevant scholarly articles and conference proceedings published between 2015 and 2025. Data sources were obtained from major academic databases, including Google Scholar, Scopus, and the Directory of Open Access Journals (DOAJ). From the search results, 15 articles were selected that met the inclusion criteria, consisting of both Indonesian- and English-language publications.

The inclusion criteria specified that articles must have been published between 2015 and 2025; address themes related to the green economy, food security, sustainable agriculture, renewable energy, or food governance relevant to the Indonesian context; and be in the form of empirical research, policy analysis, or conceptual review with full-text availability. The exclusion criteria included articles published before 2015, opinion pieces, news articles, or grey literature, as well as publications that did not discuss the green economy or food security.

The selected articles were analyzed using a comparative thematic approach, which involved categorizing the research findings into four main themes: green economy, food security, sustainable agriculture, land conversion threats, and the role of technology and social capital. This approach enabled the identification of strategic patterns within the green economy framework that contribute to strengthening food security in Indonesia.

RESULT AND DISCUSSIONS

The reviewed literature consistently demonstrates a positive correlation between the application of green economy principles and improvements across various dimensions of food security. Rahardjo et al. (2023) demonstrated that environmentally friendly post-harvest management practices among horticultural farmer groups in Magelang not only enhanced productivity but also increased farmers' income. These findings align with Pugu et al. (2025), who identified resource efficiency improvements and the creation of green jobs as key mechanisms through which the green economy contributes to agricultural productivity.

However, the causal mechanisms linking green economy practices to specific food security indicators remain insufficiently mapped. Nurkarim (2024) developed a Green Economy Index (GEI) using remote sensing but acknowledged limitations in connecting green economic indicators with specific food security metrics. Similarly, Effendi et al. (2024) highlighted the contribution of the green economy in developing optimal food systems but did not provide an in-depth explanation of the mechanisms underlying this relationship.

This research gap largely stems from methodological limitations. Most studies rely on cross-sectional data, which are unable to capture the temporal dynamics of the green economy–food security relationship. Moreover, intermediary variables—such as shifts in consumer behavior, fluctuations in green product pricing, and long-term impacts on soil health—are often insufficiently measured or overlooked.

Focus on Specific and Localized Aspects

A prominent characteristic of the reviewed literature is the predominance of studies with limited geographical and sectoral scope. Sa'idah et al. (2023) examined the utilization of home gardens and demonstrated how small-scale interventions can make significant contributions to food diversity and household income. Their findings revealed that, on average, households were able to meet 30–40% of their daily vegetable needs from home gardens while reducing food expenditures by up to 15%.

Similarly, Setiawan et al. (2020), in their study on the slopes of Mount Sumbing, and Widhiyastuti et al. (2023), in Sleman, emphasized the importance of contextual approaches that account for local ecological and socio-cultural characteristics. Nelly et al. (2024), in their research on traditional crop diversity among the Gayo community, highlighted the richness of local biodiversity that remains underutilized for food security purposes. They documented 137 plant species used for food, medicine, and rituals, of which 45% possess unexploited commercial potential.

While these studies offer valuable insights into the effectiveness of local interventions, such a narrow focus poses challenges for developing a cohesive national policy framework. The reliance on highly localized conditions makes generalizing findings difficult, while the lack of comparative inter-regional studies limits cross-learning and the replication of best practices.

The Role of Digital Technology and Social Capital

Two studies provide critical perspectives on enabling factors that are often overlooked in discussions of the green economy and food security. Juanda et al. (2023) explored the convergence between the green economy and digitalization, identifying significant opportunities in precision agriculture, blockchain for food traceability, and digital platforms for sustainable agricultural markets. They estimated that the adoption of digital technologies could improve water use efficiency by up to 30% and reduce chemical fertilizer use by 25% through more precise application systems.

Conversely, Yusriadi (2025) highlighted the pivotal role of social capital within the agroforestry context in North Luwu. His research demonstrated that networks of trust, norms of reciprocity, and collaboration among farming communities facilitate knowledge sharing, collective access to resources, and the development of coping mechanisms during periods of food scarcity. Participation in farmer groups was shown to increase access to information and green technologies by 40% compared to non-member farmers.

These findings underscore that the transition toward a green food system requires not only technocratic interventions but also the strengthening of social institutions and the application of context-appropriate technologies. The integration of social capital and digital technology presents a potential synergy that has not yet been extensively explored in existing research.

Land Conversion Threats and Development Pressures

Widhiyastuti et al. (2023) present a concerning overview of agricultural land conversion in Sleman, which averages 98.87 hectares per year. Their findings indicate that urban development pressures, the higher economic value of land for non-agricultural purposes, and the low interest of younger generations in farming are the main drivers of land-use change. Only 22% of young farmer respondents expressed a willingness to continue their parents' agricultural enterprises.

This situation underscores the urgency of integrating Sustainable Food Agricultural Land Protection (LP2B) policies with green economy strategies. Studies have shown that regions with consistent LP2B implementation experience a 35% reduction in land conversion rates compared to areas without adequate protection. However, the

effectiveness of these policies is often constrained by weak law enforcement, fragmented authority, and insufficient economic incentives for farmers to maintain their land.

Land conversion threats also exacerbate the vulnerability of food systems to climate change impacts. The loss of fertile and irrigated lands reduces the adaptive capacity of agriculture to climate variability, creating a vicious cycle between food insecurity and environmental degradation.

Policy and Implementation Gaps

Several studies have identified a disconnect between the formulation of green economy policies at the national level and their implementation at the local level. Qoiriyah et al. (2024) developed comprehensive indicators for evaluating the success of green economy implementation but acknowledged that these indicators are often not integrated with existing food security monitoring systems.

Pawlak and Kołodziejczak (2020), in their comparative study, highlighted that countries with strong integration of green economy and food security policies tend to perform better on food sustainability indices. However, they found that in Indonesia, inter-sectoral coordination remains weak: green economy policies are predominantly under the Ministry of Environment and Forestry (KLHK), whereas food security policies fall under the coordination of the Ministry of Agriculture and the National Food Agency.

Susanto et al. (2024), in their comparative analysis, identified that the lack of regulatory harmonization, fragmented budgeting, and limited institutional capacity at the regional level are the main obstacles to implementing green economy policies for food security. Only 30% of the regions studied have local regulations explicitly integrating these two agendas.

Comprehensive Analysis: Green Economy in Practice – From Concept to Implementation

Based on the literature synthesis, it is evident that the green economy has progressed from a conceptual discourse to practical implementation across various levels of Indonesia's food system. At the micro level, practices such as organic farming, agroforestry, environmentally friendly post-harvest processing, and home garden utilization have been widely adopted, although often in a spontaneous and fragmented manner.

At the meso level, the development of organic farmer groups, cooperatives producing green products, and specialized markets for sustainable products reflects the gradual institutionalization of green economy practices. At the macro level, the adoption of the Sustainable Development Goals (SDGs) and commitments under the Paris Agreement have provided a conducive policy framework for integrating green economy principles into national development planning.

However, the imbalance among these levels of implementation creates systemic inefficiencies. Micro-level initiatives, often energetic and innovative, are not adequately supported by coherent macro-level policies or sufficient supporting infrastructure. As a result, many local initiatives stagnate or fail to achieve economically sustainable scale.

Challenges in Scaling and Integration

A major challenge lies in scaling successful local initiatives into effective national programs. The literature indicates that scaling requires not only geographical replication but also the strengthening of four interdependent dimensions.

First, the technical dimension, which encompasses the adaptation of technologies to diverse agro-ecological conditions, the development of standards and protocols, and investment in research and development. Second, the economic dimension, which includes the creation of innovative business models, access to green financing, and the generation of competitive economic value.

Third, the social dimension, involving the strengthening of local community capacities, the building of trust, and the establishment of social incentives for the adoption of sustainable practices. Fourth, the policy dimension,

which necessitates inter-sectoral coordination, regulatory harmonization, and the creation of an enabling environment for green innovation.

Failures to integrate these four dimensions explain why many green economy programs do not achieve the systemic impact they aim for.

The Complexity of the Green Economy–Food Security Relationship

The relationship between the green economy and food security is demonstrably more complex than a simple linear association. Literature analysis reveals that this relationship is mediated by multiple factors, including:

- a) Ecological factors: soil health, water availability, and biodiversity;
- b) Economic factors: productivity, efficiency, price stability, and market access;
- c) Social factors: equity, participation, adaptive capacity, and community resilience;
- d) Technological factors: innovation, accessibility, and appropriateness.

The interactions among these factors generate nonlinear feedback loops that can either amplify or diminish the impacts of green economy interventions. For instance, increased productivity through sustainable agricultural practices may raise farmers' income (positive impact); however, if not accompanied by enhanced post-harvest storage and processing capacity, it could lead to price declines that ultimately harm farmers (negative impact).

This complexity necessitates a systemic approach capable of managing trade-offs and synergies across multiple development objectives while anticipating unintended consequences of policy interventions.

Empirical and Methodological Limitations

Most of the reviewed literature acknowledges significant methodological limitations, including:

- a) a lack of longitudinal data capable of capturing long-term dynamics;
- b) small and geographically limited sample sizes, which constrain generalizability;
- c) reliance on self-reported data, which is susceptible to bias;
- d) minimal use of robust counterfactual methods to isolate the impact of interventions; and
- e) insufficient integration of quantitative and qualitative data.

These limitations not only affect the quality of evidence generated but also hinder the ability to conduct meta-analyses and evidence synthesis that could inform policy.

The literature search further revealed that sources directly linking the green economy with food security remain scarce. Most studies on the green economy focus on renewable energy, resource efficiency, and climate change mitigation, with only a few explicitly addressing food security aspects. Conversely, studies on food security tend to emphasize production, distribution, and access dimensions without positioning green economy principles as the primary analytical framework. The thematic separation between these two fields highlights a significant conceptual and empirical gap.

Therefore, this study adopts an expanded literature review approach, encompassing not only works explicitly examining the link between green economy and food security but also literature addressing intersecting issues such as sustainable agriculture, natural resource governance, environmentally friendly technological innovation, and green development policies. This approach is intended to provide a more comprehensive perspective on the potential integration of the green economy as a key pillar in the transition toward national food security. (Nugraha et al., 2024)

CONCLUSION

Based on a comprehensive review of 15 studies, it can be concluded that green economy strategies possess substantial potential to serve as a key pillar in the transition toward sustainable food security in Indonesia. This

potential is manifested through multiple pathways, including environmentally friendly productivity improvements, natural resource conservation, community resilience enhancement, and diversification of food sources.

However, realizing this potential faces significant structural, institutional, and methodological challenges. The predominance of sectoral and fragmented approaches, weak policy coordination, limited empirical evidence, and exploitative development pressures are major barriers that must be addressed.

The transition to a green food system requires a transformative approach that integrates technological innovation with inclusive social institutions, a coherent policy framework, and economic models that generate sustainable value for all actors within the food system.

REFERENCES

- Budiawati, Y., Ronnie S. Natawidjaja, Tomy Perdana, & Maman H. Karmana. (2024). FACTORS AFFECTING HOUSEHOLDS FOOD SECURITY DURING PANDEMIC COVID-19. *Agricultural and Resource Economics*:
- Dinas Pertanian & Perkebunan Aceh. (2023). Dinas Pertanian dan Perkebunan Aceh | Berita BPS: PDB Pertanian Triwulan IV 2023 Tumbuh positif, Kontribusi Terhadap Ekonomi Nasional. <https://distanbun.acehprov.go.id/berita/kategori/berita/bps-pdb-pertanian-triwulan-iv-2023-tumbuh-positif-kontribusi-terhadap-ekonomi-nasional>
- Effendi Rusdiana, D., Saputra, W., & Yanti, N. (2024). EKONOMI BERKELANJUTAN: KUNCI KETAHANAN PANGAN DAN KEMAJUAN INDONESIA EMAS DI IKN. *Jurnal GeoEkonomi*, 15(1.2024), 181–190. <https://doi.org/10.36277/geoekonomi.v15i1.2024.448>
- Juanda, A., Rozaki, Z., Wulandari, R., & Ikbar, R. (2025). Ekonomi Hijau di Era Digital. *Seminar Nasional Agribisnis*.
- Nelly, C., Fitriyana, L., Santi, T. D., & Saudah. (2024). Diversity of traditional vegetables and spices as local food security for the Gayo Tribe, Aceh, Indonesia. *Biodiversitas*, 25(12), 4699–4711. <https://doi.org/10.13057/biodiv/d251206>
- Nurkarim, W. (2024). Development of Green Economy Index (GEI) with Remote Sensing to Support Sustainable Economy in East Java. *East Java Economic Journal*, 8(2), 215–243. <https://doi.org/10.53572/ejavec.v8i2.124>
- Nugraha, R., Cut Risya Varlitya, M., Loso Judijanto, Ms., Saputra Adiwijaya, Ms., & Irma Suryahani, Ms. (2024). GREEN ECONOMY Penerbit. PT. Sonpedia Publishing Indonesia. www.buku.sonpedia.com
- Pawlak, K., & Kołodziejczak, M. (2020). The role of agriculture in ensuring food security in developing countries: Considerations in the context of the problem of sustainable food production. *Sustainability (Switzerland)*, 12(13). <https://doi.org/10.3390/su12135488>
- Pugu, M., Rita Hayati, Sigit Sugiardi, & Al=Amin. (2025). PENGARUH GREEN ECONOMY TERHADAP PENINGKATAN PRODUKTIVITAS SEKTOR PERTANIAN LOKAL. *Journal of Community Dedication*.
- Qoiriyah, M., Pramesti, S. C., & Wulandari, F. (2024). Green Economy : Solusi Inklusif untuk Tantangan Lingkungan dan Sosial.
- Rahardjo, B., Wildan, Y., & Vierda, D. A. (2023). Penerapan Green Economy Melalui Pengolahan Pasca Panen Bagi Kelompok Tani Hortikultura Desa Pogalan Kecamatan Pakis Kabupaten Magelang. *Dharma Jnana*. <https://ejournal.unmas.ac.id/index.php/dharmajnana/about>
- Refleksi, ", Kemajapahitan, B., Dias, A., Putri, R. A., Sukma Winata, L., Tanggono, A., Durry, F. D., Kedokteran, F., Veteran, U., & Timur, J. (2024). Kualitas Sumberdaya Manusia Mitigasi Krisis Pangan Global Warming: SDGs Pencegahan Malnutrisi (Literature Review). In *Prosiding Seminar Nasional Kusuma III (Vol. 2)*. Oktober.

- Sa'idah, F. , Nasruddin, M., & Muhammad Iqbal Fasa. (2019). PENERAPAN GREEN ECONOMY DALAM UPAYA PENINGKATAN EKONOMI MASYARAKAT MELALUI PEMANFAATAN LAHAN KOSONG PEKARANGAN RUMAH: STUDI LITERATUR RIVIEW.
- Setiawan, A. B., Ekonomi, J., Fakultas, P., Universitas, E., Semarang, N., Gajah, U. N., Revi, M., Dzikri, A., & Pembangunan, J. E. (2020). KONSERVASI KAWASAN LERENG GUNUNG SUMBING (STUDI GREEN ECONOMIC PLANNING PADA SEKTOR PERTANIAN) Danu Yudhistira, email. Jurnal Ekonomi-QU, 10(1).
- Susanto, H., Lauwinata, L., Ebel, S., & Phoek, M. (2024). ac.id, Sekolah Tinggi Ilmi Ekonomi Saint Theresia Merauke 2) lavenia@sainttheresa.ac.id, Sekolah Tinggi Ilmi Ekonomi Saint Theresia Merauke 3). simon@sainttheresa.ac.id, Sekolah Tinggi Ilmi Ekonomi Saint Theresia Merauke. In Journal of Law (Vol. 4, Issue 5).
- Widhiyastuti, A. N., Adjie, E. M. A., Fauzan, A. A., & Supriyadi, S. (2023). Sustainable Food Agricultural Land Preservation at Sleman Regency, Indonesia: An Attempt to Preserve Food Security. AgriHealth: Journal of Agri-Food, Nutrition and Public Health, 4(1), 41. <https://doi.org/10.20961/agrihealth.v4i1.6747>