

Challenges of Green Economy Implementation in Food Security

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Abstract: This study aims to analyse the implementation of a green economy in supporting environmental sustainability and food security in Boven Digoel Regency, South Papua Province. The research highlights key challenges, including climate change, environmental pollution, and biodiversity loss, all of which significantly impact local food security. A qualitative case study approach was employed, utilising data collected through interviews, observation, and document analysis. The findings indicate that while green economy initiatives have been introduced, their effectiveness remains limited due to critical barriers, particularly in access to appropriate technology, infrastructure, and institutional support. The study emphasises the importance of enhanced collaboration among government institutions, the private sector, and local communities to foster sustainable food systems and environmental conservation. Moreover, integrating local wisdom and community participation is essential for achieving long-term resilience. This research contributes valuable insights to the theoretical and practical development of green economy strategies at the regional level, offering a framework for addressing environmental and food-related challenges in similar contexts.

Keywords: Green Economy; Food Security; Environmental Sustainability; Sustainable Development; Institutional Support; Long-Term Resilience; Community Participation; Theoretical and Practical Development.

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1. Introduction

Economic growth and environmental sustainability are often perceived as two conflicting aspects of development. In many cases, increased production and consumption can lead to environmental damage [15]. However, with a green economy approach, both can be integrated to create a balance that supports sustainable development. The green economy focuses on practices that reduce negative environmental impacts while promoting economic prosperity. Through technological innovation and efficient resource management, the green economy seeks to create a sustainable and inclusive system [17]. This approach offers solutions to the challenges faced by modern society. Food security is a crucial issue in the context of economic growth and environmental sustainability. With a growing population, the need for sufficient and sustainable food is becoming increasingly urgent [7]. A green economy approach can help ensure that food production is not only efficient but also

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environmentally friendly [19]. In this context, this study aims to analyse how economic growth can contribute to environmental sustainability without compromising food security.

This analysis is crucial for understanding the dynamics at play and identifying suitable solutions to achieve this goal. This study is expected to provide policymakers, academics, and practitioners with new insights for formulating strategies that support the green economy. Thus, food security can be achieved sustainably, maintaining a balance between economic and environmental needs. This research will provide in-depth data and analysis on the relationship between economic growth, environmental sustainability, and food security. It is hoped that the results of this research can serve as a reference for efforts to create a more sustainable and balanced future. Food security is now a critical issue amid increasing global threats, including climate change, pollution, and accelerated biodiversity loss [13]. The world faces major challenges in maintaining environmental sustainability, which affects food production and distribution. Concepts of green economy and sustainable development, economic, environmental, and socio-cultural issues of food security, and environmental economic valuation to support income generation and economic growth. Sustainable development through a green economy is seen as a solution that can address these environmental concerns.

However, there are still obstacles, such as inefficient resource management, that need to be addressed to ensure the livestock subsector's economy can continue to develop in a more environmentally friendly manner [11]. The global challenges of ensuring food security, preserving the environment, and promoting community development have reached critical levels. Local agriculture is emerging as a solution by prioritising sustainable practices and reducing food miles to create a greener future [2]. Despite supporting a green economy, numerous barriers exist to achieving sustainable food security [16]. Various theories try to link the economy and the environment. However, there are still practical challenges that have not been fully answered on the ground, especially regarding policy implementation—research results [14]. The implementation of a green economy often faces various obstacles in achieving sustainable food security. Many theories attempt to explain the relationship between the economy and the environment, but have not been able to fully address the practical challenges faced in the field. This study aims to analyse the relationship between economic growth and environmental sustainability through the green economy approach. This approach focuses on an environmental economic assessment that considers social and ecological aspects in food security development [20].

The research also aims to provide an overview of how the application of green economy principles can contribute to the sustainability of food security in the face of climate change and environmental degradation challenges. Through this analysis, it is expected to identify effective strategies to support economic growth without compromising environmental sustainability. The urgency to find a solution to the problem of food security in the midst of global environmental change is that a sustainable green economy approach can be key in harmonising economic growth and environmental sustainability. Analysing the relationship between the economy and the environment will contribute to the development of more comprehensive policies to support sustainable food security, especially in Indonesia. It is hypothesised that implementing a green economy can effectively strengthen food security while protecting the environment.

2. Review of Literature

Sustainable Development Goals (SDGs): The Sustainable Development Goals (SDGs) are global objectives designed to address the challenges of sustainable development by 2030. The SDGs comprise 17 goals that aim to enhance the quality of human life while maintaining environmental sustainability. These goals include poverty eradication, improved education, access to clean water and sanitation, protection of marine and terrestrial life, and action on climate change mitigation. The SDGs emphasise a balance between economic growth, environmental protection, and social justice to create a better world for future generations. The implementation of the Sustainable Development Goals (SDGs) in the context of environmental economics plays a crucial role in supporting global food security. SDG 2, which focuses on ending hunger and promoting sustainable agriculture, is strongly linked to the implementation of environmental economics. Through sustainable agricultural practices that support the conservation of natural resources, such as soil and water, farmland productivity can be maintained, supporting sustainable food production. In addition, SDG 12, which emphasises sustainable consumption and production, encourages efficient and responsible resource management, including reducing food waste and maximising the use of natural resources. By adopting a circular economy approach, food production systems can become more efficient, thus supporting food security.

Climate change, as stipulated in SDG 13, is a significant threat to food security. The implementation of an environmental economy that emphasises mitigation and adaptation measures to climate change, such as agroforestry and forest conservation, can help reduce greenhouse gas emissions and improve food system resilience. In addition, SDG 15, which focuses on the conservation of terrestrial ecosystems, emphasises the importance of maintaining biodiversity as the basis for a sustainable food system. An environmental economy that conserves forests and other ecosystems helps protect natural resources essential for food production. Furthermore, food security strengthened through environmental economics also has a positive impact on poverty alleviation (SDG 1) and reducing inequality (SDG 10). By increasing access to sustainable agricultural practices and

fair markets for smallholders and people experiencing poverty, food security can be enhanced, which in turn reduces poverty and social inequality [12].

Sustainable Development materialises in three main pillars: economic, social, and environmental. The economic pillar includes inclusive, productive, and sustainable growth, with a focus on job creation and poverty alleviation [2]. The social pillar emphasises human well-being, encompassing gender equality, human rights, and quality education for all. The environmental pillar encompasses the sustainable management of natural resources, the prevention of overexploitation, and the preservation of biodiversity. These three pillars are integrated to ensure that development is not only focused on economic growth, but also on environmental protection and enhancing the quality of life. The integration of the SDGs in the implementation of environmental economics provides a strong foundation to support food security. Through a sustainable approach to natural resource management, food production and consumption, and climate change mitigation and adaptation, the goal of achieving global food security can be more effectively achieved. The synergy between the various SDGs not only strengthens food security but also promotes a more equitable and sustainable development society.

2.1. Green Economy in Food Security

The Green Economy is an economic approach that focuses on sustainable growth, minimising negative impacts on the environment [5]. The concept emphasises that human well-being and social justice can be enhanced through economic growth that reduces environmental risks and ecological scarcity. The Green Economy development model emphasises sustainability by considering the balance between economic growth, environmental sustainability, and social welfare. This approach emphasises that economic development must be carried out without damaging the environment and paying attention to social justice [3]. This model challenges the traditional economic paradigm by demanding the integration of economic, ecological, and social aspects in every development decision. The goal is to create sustainable prosperity, where economic growth is not at the expense of the environment and society.

In the Green Economy, the main focus is on sustainable and environmentally friendly business practices. Energy efficiency and the wise management of natural resources are prioritised to minimise negative impacts on the environment and maintain sustainable ecosystems. By prioritising resource conservation and energy efficiency, the green economy aims to reduce environmental risks while ensuring sustainability for future generations. This approach offers solutions to maintain the balance between economic growth and environmental sustainability. Green Economy policies and programs, including renewable energy, energy efficiency, waste management, and the implementation of a circular economy. These approaches encourage innovation in clean technologies, more efficient production and consumption, and the transition to a more circular economic model. Another manifestation is the shift from a linear economy, where products are discarded after use, to a circular economy that maximises resource reuse through recycling and waste reduction efforts. The Green Economy also involves fiscal policies that support green businesses and investments in projects that consider both social and environmental impacts.

The concept of Food Security, which plays a crucial role in supporting food security, relies on the implementation of Environmental Economics by ensuring that natural resources are managed sustainably. Food security, which involves access to sufficient, safe, and nutritious food, is highly dependent on the health of the environment from which food is produced [8]. The environmental economics approach emphasises the wise management of soil, water, and other ecosystems, which are critical to sustaining agricultural productivity over the long term. Through the implementation of sustainable agricultural practices, such as agroforestry, efficient water management, and the use of renewable energy, environmental economics helps to reduce negative impacts on ecosystems while increasing food production yields. In addition, the environmental economy encourages the use of technologies and innovations that support sustainable food production, such as the development of more adaptive agricultural systems to climate change. The risks faced by the agricultural sector due to environmental degradation and climate change can be minimised, thus ensuring food security.

In addition, the eco-economy promotes efficient waste management through a circular economy approach, where waste from one process is reused as input for another, thereby reducing dependence on new natural resources. With these efforts, the eco-economy not only supports food security today but also ensures its sustainability for future generations. Food security is promoted through various programs that focus on increasing local food production, improving the management of natural resources, and ensuring more equitable food distribution. Governments in many countries are implementing policies that support sustainable agriculture, food diversification, and increased access to efficient agricultural technologies. Other manifestations include the development of food systems that are resilient to climate change, capacity building for smallholder farmers, and improved access to local and global markets. Improved food security is also manifested in various initiatives that support healthy and sustainable food consumption, including public education programs on the importance of nutrition and food safety.

3. Method

This research employs a qualitative approach, utilising a case study method, to understand the phenomenon of food security within the context of global issues such as climate change, pollution, and biodiversity loss. Food security is closely tied to the Indonesian government's policies on waste management and its transition to a circular economy approach. This case study was chosen because it allows for an in-depth investigation of relevant units of analysis, i.e., organisations or agencies involved in food security and environmental sustainability. As such, the research explains how the local context and national policies relate to environmental and food issues. This research follows the steps outlined by Susanto et al. [6] to conduct a review that aims to contribute original work, distinct from existing literature reviews. It is done to identify gaps in the literature to justify or act as a basis for the researcher's work. Academic databases, specifically Google Scholar and ProQuest, were searched for secondary data in this study, which consists of relevant literature related to food security and green economy issues, supporting the empirical analysis in this study. The participants of this research are the main informants who are directly involved in the policy and implementation of food security and environmental sustainability programs in Boven Digoel Regency. These informants are the Head of the Food Security Office, the Head of the Agriculture and Horticulture Office, the Head of the Cooperatives, Small and Medium Enterprises, Industry and Trade Office.

The Head of the Environment and Defence Office was chosen because they have responsibilities and an in-depth understanding of policies and programs in the fields of food security and environmental management, ensuring that the information provided is highly relevant to this research. The data collection process in this study was conducted through several stages, including in-depth interviews with informants, observation of practices, and collection of documentation related to food security policy and implementation. Interviews were conducted in a semi-structured manner to enable more in-depth data collection on the research subjects. Observation was used to understand how the policies were implemented in the field. Meanwhile, documentation was used to collect written evidence that supports the primary data and provides a holistic perspective on the implementation of food security in the research area. The data analysis technique employed in this study follows the stages of data reduction, data presentation, conclusion, and data verification [10]. This process is carried out carefully to ensure that the data collected can provide a comprehensive picture of the case under study. To ensure the validity of the data, this study used credibility, dependability, transferability, and confirmability techniques. The data were analysed on a case study basis, and the results were interpreted within a broader theoretical framework to make a scientific contribution to the study of food security and environmental sustainability.

4. Result and Discussion

The discussion results are organised based on the research results section, based on the research variables, research findings, and challenges in the implementation of answering the challenges of green economy implementation in food security, which are arranged as follows (Table 1).

Table 1: Research findings and implementation challenges in the green economy and sustainable development

Research Variables	Research Findings	Challenges in Implementation
Green Economy Policy	Green economy policy support is still limited to the normative level and has not been fully integrated into regional policies.	Regulatory barriers, compliance with regulations, inconsistency in implementing regulations, and a lack of coordination between central and local governments in implementing green economy policies.
Sustainable Agriculture Development	The development of sustainable agriculture requires increased capacity of local farmers and environmentally friendly technologies.	Limited infrastructure and access to environmentally friendly technology for farmers, economic factors, and limited human resources
SDGs Implementation	The implementation of the SDGs in the context of a green economy still faces challenges in terms of funding and coordination between related parties.	Limited funding and a lack of private sector participation in implementing SDG programs.

4.1. Green Economy and Regulation

Green economy policies and regulations play a crucial role in promoting the implementation of a green economy, particularly in the agricultural sector. Government support, realised through policies that promote green economy practices, reflects a commitment to sustainable development [18]. These policies can take the form of incentives for the use of environmentally friendly technologies, subsidies for farmers who adopt sustainable practices, and educational and training programs for farmers.

The effectiveness of these policies largely depends on how they are formulated and implemented, taking into account farmers' needs and local conditions, as well as their economic welfare, in addition to environmental aspects. Compliance with regulations is a challenge that arises from farmers' lack of awareness and understanding of the importance of sustainable practices. To address this, a combination of sanctions for violators and incentives for those who comply is needed. Regulations must also be well socialised and accompanied by adequate technical support to enable farmers to shift to more sustainable practices.

Social and economic factors, such as access to resources and information, also affect farmers' level of compliance with regulations. Therefore, the government needs to ensure that these regulations do not burden smallholders but instead support them in achieving independence and sustainability. Additionally, regulations should serve not only as a regulatory tool but also as a means of empowerment, assisting farmers in implementing green economy practices in the agricultural sector. In terms of the Green Economy, the interview results show that the local government and related agencies have been trying to encourage green economy practices through programs such as waste management and efficient resource utilisation. These initiatives include the use of environmentally friendly technologies in the agricultural industry and better waste management. The government also encourages community and private sector participation in implementing the green economy, although the main challenge remains the lack of knowledge and technology among local communities.

The explanation of the research results related to the Green Economy reveals that, although concrete efforts have been made to encourage sustainable economic practices, their implementation still faces obstacles. Some waste management and renewable energy programs are still in the early stages of implementation and require greater support from the central government and donor agencies. On the other hand, local communities still need more in-depth education on the long-term benefits of the green economy, especially in daily practices that impact the environment. The relationship between data on the green economy and reality reveals that, although there is great potential in implementing the green economy in Boven Digoel Regency, limited resources and technology are the primary obstacles to its implementation. Although the government has initiated the initial steps in implementing a green economy, its sustainability remains highly dependent on the active participation of the community and the private sector. This suggests the need for further efforts to build local capacity and support a more effective transition to a green economy.

4.2. Sustainable Agriculture Development

In the effort to develop sustainability, the biggest challenge lies in the dependence of economic development on the exploitation of natural resources. Boven Digoel Regency has significant agricultural and plantation potential, particularly in oil palm plantations, making its economic activities highly dependent on the exploitation of these resources. However, this dependence often ignores aspects of environmental protection and preservation. As a result, significant environmental problems have arisen, including water and air pollution, soil degradation, forest fires, forest destruction, and the conversion of agricultural land for other uses. The impact of this environmental degradation not only damages ecosystems but also threatens the productivity of natural resources on which many people depend for their livelihoods [6]. When natural resource productivity declines, the people who depend on these resources are directly affected, which in turn exacerbates poverty in these areas.

This challenge becomes even more complex as efforts to maintain or increase economic productivity often clash with the need to preserve the environment. Implementing the green economy concept in Indonesia, therefore, requires a holistic approach that not only focuses on economic growth but also considers the sustainability of natural resources and the welfare of its people. Interview results on food security indicate that the government of Boven Digoel Regency is focusing on local food diversification and increasing agricultural productivity through the use of environmentally friendly technologies. The challenge is to ensure equitable food distribution across the region, particularly in remote areas that are difficult to access. The government works with private organisations and local communities to ensure that everyone has access to sufficient and safe food, despite challenges related to infrastructure and resources.

4.3. Green Economy Challenges in the Implementation of Sustainable Development Goals (SDGs)

The results of interviews with informants indicate that the implementation of the Sustainable Development Goals (SDGs) in Boven Digoel Regency primarily focuses on fulfilling basic needs, particularly in terms of food security. Local government programs focus on food diversification and the application of environmentally friendly agricultural technology. Additionally, the government is working to increase public awareness about the importance of sustainable practices, particularly in natural resource management. The challenges of the green economy in sustainable development can be described as follows (Figure 1).

The main challenge faced is limited access to technology and infrastructure, particularly in remote areas that are difficult to reach, hindering the implementation of the SDGs [4]. Resulting in information delays, the same issue is experienced in the Boven Digoel District. Infrastructure limitations, such as inadequate transportation, hinder access to education, health, and

other essential services in these remote areas. Limited health facilities exacerbate malnutrition and increase the risk of disease. This causes delays in achieving SDGs targets related to the health and well-being of local communities. Human capital, as evidenced by low educational levels and a lack of skills training, hinders the development of human capital. This lack of education and training hinders community participation in development activities, resulting in a decline in the quality of the local workforce and, consequently, reduced competitiveness and productivity across various sectors. Poverty and economic inequality in remote areas pose significant challenges to achieving equitable welfare [2]. A lack of economic investment and limited employment opportunities make it challenging for communities to overcome prolonged poverty. In addition, dependence on the informal sector and lack of adequate infrastructure slow down development efforts in remote areas, deepening economic and social inequality.

GREEN ECONOMY CHALLENGES

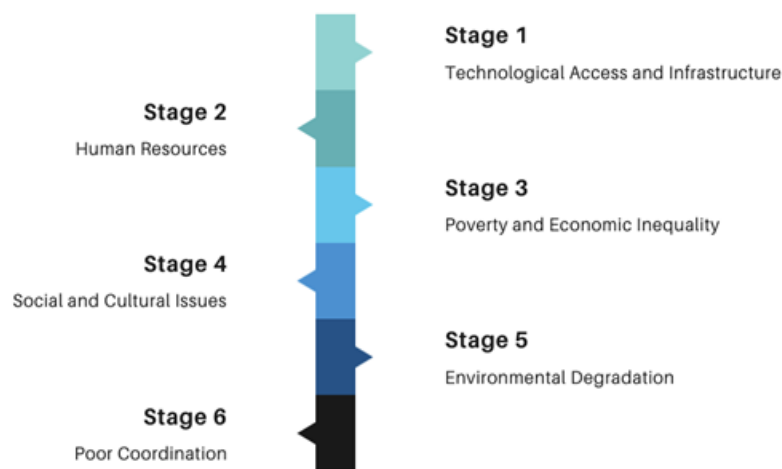


Figure 1: Stages of challenges in implementing a green economy

Social issues and the cultural diversity of indigenous peoples often lead to resistance to the implementation of SDGs programs, especially if the programs do not consider local values. In addition, social inequality exacerbates the situation by limiting certain groups' access to basic services, such as education and health, hindering the equitable achievement of sustainable development goals. Environmental degradation due to unsustainable exploitation of natural resources hinders the achievement of SDGs related to ecosystem preservation and climate change mitigation. It also threatens the health of local communities through degradation of air, water, and soil quality, and exacerbates the impacts of natural disasters due to uncontrolled climate change. Poor coordination between the local and central government slows down program implementation. Lack of synergy in planning and compliance with regulations during the implementation of SDG programs leads to inefficiency in achieving targets, and limited funding is a significant obstacle to the development of infrastructure, health, and education. The lack of financial support hinders the local government's efforts to promote sustainable development in Boven Digoel.

The implementation of the SDGs demonstrates that the government has made various efforts to enhance food security through training and collaboration with various stakeholders [1]. Although there are challenges related to food distribution and technology, these efforts have yielded positive long-term impacts. Public awareness of the importance of sustainability has also started to increase, although there are still gaps in terms of access to supportive infrastructure. The relationship between the description and explanation of the data on the SDGs shows that the government's efforts to support food security amid global challenges, such as climate change and pollution, are quite relevant to the reality on the ground. However, despite efforts to diversify food and better manage resources, access, and infrastructure issues remain major obstacles. This suggests that implementing the SDGs requires a more strategic and sustainable approach, especially in less developed regions. Social and economic support is crucial in the implementation of a green economy in the agricultural sector. The availability of financing and financial incentives enables farmers to invest in environmentally friendly technologies, facilitating the transition to sustainable practices [9]. In addition, support from local communities and organisational networks provides knowledge exchange, training, and advocacy that strengthen farmers' ability to implement and maintain sustainable agricultural practices. With the right financial support and strong social networks in place, the transition to a green economy in the agricultural sector will be more effective and sustainable.

5. Conclusion

This research demonstrates that the implementation of the Green Economy in Boven Digoel Regency plays a crucial role in supporting food security amid global challenges, including climate change, pollution, and environmental degradation. Although the government has made various efforts through food diversification and the application of environmentally friendly technology, significant challenges still exist, especially in terms of infrastructure, access to technology, and community education. The implementation of the SDGs in Boven Digoel, particularly those related to food security, has shown progress; however, gaps remain in access to and the quality of services that support sustainable development. The most significant challenge is the limited availability of adequate resources and infrastructure, which hinders the accelerated implementation of the proposed programs. On the other hand, the implementation of the Green Economy in the region is still in its early stages, with a focus on more efficient resource management and the use of environmentally friendly technologies. Nonetheless, these efforts require stronger support from the central government as well as greater participation from the community and private sector to ensure long-term sustainability.

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