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Achieving Sustainable Food Security Through a Green Economy Concept in South Central Timor Regency

Mewujudkan Ketahanan Pangan Berkelanjutan Melalui Konsep Ekonomi Hijau di Kabupaten Timor Tengah Selatan

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Abstract

This article describes that economic development tends to lead to the exploitation of natural resources. The environment that is increasingly damaged is gradually beginning to be felt by the world community. The agricultural sector is an important sector in human survival. The agrarian sector plays a role in maintaining and improving the community's economy. The influence of the green economy on the sustainability of life is still in a long debate. The purpose of this study is to find out the influence of green economy in an effort to realize sustainable development and food security in South Central Timor Regency, East Nusa Tenggara. The research design applied is a type of quantitative research. This research method is applied to examine certain samples by collecting research instrument data and statistical data analysis with the aim of validating the hypothesis that has been determined. The results of the study revealed that the application of green economy principles has a significant effect on the Sustainable Development variables in South Central Timor. And the application of green economy principles also has a significant effect on the variables of Food Security in South Central Timor.

Kata Kunci:

Ekonomi Hijau; Pengelolaan pasca panen; Pembangunan Berkelanjutan; Ketahanan Pangan

Abstrak

Artikel ini mengulas bahwa pembangunan ekonomi cenderung mengarah pada eksploitasi sumber daya alam. Lingkungan yang semakin rusak secara bertahap mulai dirasakan oleh masyarakat dunia. Sektor pertanian merupakan sektor penting dalam kelangsungan hidup manusia. Sektor agraria berperan dalam menjaga dan meningkatkan ekonomi masyarakat. Pengaruh ekonomi hijau terhadap keberlanjutan kehidupan masih dalam perdebatan panjang. Tujuan dari penelitian ini adalah untuk mengetahui pengaruh ekonomi hijau dalam upaya mewujudkan pembangunan berkelanjutan dan ketahanan pangan di Kabupaten Timor Tengah Selatan, Nusa Tenggara Timur. Desain penelitian yang diterapkan adalah jenis penelitian kuantitatif. Metode penelitian ini diterapkan untuk menguji sampel tertentu dengan mengumpulkan data instrumen penelitian dan analisis data statistik dengan tujuan untuk memvalidasi hipotesis yang telah ditentukan. Hasil penelitian mengungkapkan bahwa penerapan prinsip ekonomi hijau berpengaruh signifikan terhadap variabel Pembangunan Berkelanjutan di Timor Tengah Selatan. Dan penerapan prinsip

ekonomi hijau juga berpengaruh signifikan terhadap variabel Ketahanan Pangan di Timor Tengah Selatan.

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INTRODUCTION

Background of the Problem

Sustainable development is a global agenda that aims to balance economic growth, environmental sustainability, and social welfare. In the context of Indonesia, efforts to achieve sustainable development are increasingly urgent, especially in areas that have geographical and climate challenges such as South Middle East (TTS) Regency and East Nusa Tenggara (NTT). The region is known for its *semi-arid* climate conditions, limited water availability, and high levels of food vulnerability.

One of the globally promoted approaches to achieve sustainable development is the *green economy*, which is an economic system that relies on resource efficiency, low carbon emissions, and is socially and economically inclusive (United Nations Environment Programme (UNEP), 2011a). *The green economy* is believed to be able to be a solution for underdeveloped or food-vulnerable areas because it encourages sustainable agricultural practices, natural resource conservation, and economic diversification based on local ecosystems.

The application of green economy principles, such as agroforestry, the use of renewable energy, and environmentally friendly agricultural practices, can increase food security, both in terms of food availability, access, and stability (W.H.O., 2017). According to Iskakov & Akhmetzhanov, (2021), *the green economy* through integrated agriculture can increase food security. *Green economy* in agriculture encourages the development of small and medium enterprises (SMEs) in rural areas, creates local jobs and increases public access to quality food, *green economy* in the agricultural sector can increase food security Muhamad et al., (2023). In the context of TTS Regency, where most of the population depends on the agriculture and livestock sectors, this approach is particularly relevant. However, the implementation of the green economy at the local level still faces challenges such as low ecological literacy, technological limitations, and suboptimal policy support (Bappenas, 2021).

This research is important to see the extent to which the concept of green economy has been implemented in TTS Regency and how it contributes to two main aspects: sustainable development and food security. Given that NTT is one of the provinces with the lowest food security index in Indonesia (BKP, 2022), an in-depth analysis of environment-based development strategies that are adaptive to local conditions is needed.

By understanding the relationship between *the green economy*, sustainable development, and food security, it is hoped that the results of this research can provide input for local governments, civil society organizations, and development actors in designing more effective, contextual, and sustainable interventions.

Economic development tends to lead to the exploitation of natural resources. The environment that is increasingly damaged is gradually beginning to be felt by the world community. The agricultural sector is an important sector in human survival. The

agrarian sector plays a role in maintaining and improving the community's economy (Wahyudi & Syahbudin, 2018). Development programs on an international, national and local scale should always place the agricultural sector as the focus of development with the aim of supporting the economic growth and food of the community for the creation of common prosperity (Sjamsir, 2017).

Borel Saladin & Turok, (2013) in their research stated that *the green economy* has the potential to provide substantive and transformative changes towards sustainable development goals. *Green economy* is a development approach that focuses on achieving sustainable economic growth while reducing negative impacts on the natural environment. Shafter et al., (2021) stated in their research that the implementation of *green economy* management in developing countries, such as Libya, requires a movement towards a clean and safe environment and an improvement in living standards to restore ecological balance and reduce the gap between the rich and the poor.

The green economy can be an investment in environmentally friendly technologies and practices, as well as shifting the economy from one based on fossil resources to one that is sustainable and low-carbon. Green *economy* practices in agriculture can reduce water and soil pollution, deforestation, and greenhouse gas emissions, all of which contribute to climate change and biodiversity decline. This service is motivated by the phenomenon that post-harvest management provides added value to agricultural products. It is hoped that post-harvest processing can bring economic improvement to farmers. Nugrahapsari & Hutagaol, (2021) explained that increasing national food production will overcome nutritional problems, and farmers can prosper through horticultural development. In the *Sustainable Development Goals document*, there are several points that are directly related to sustainable development, namely SDG 1: Percentage of the population living below the poverty line, SDG 4: Average school year, SDG 7: Proportion of renewable energy to total energy, SDG 13: Action on climate change (e.g., mitigation and adaptation policies). This SDG'S point can be an indicator in measuring the extent of sustainable development practices.

The implementation *of the green economy* is not only helpful in sustainable development, but also serves to help the community in maintaining food security, especially family and individual food security. Food security according to Law Number 18 of 2012 concerning Food is "The condition of food fulfillment for the state and individuals, which is reflected in the availability of sufficient food, both quantity and quality, safe, diverse, nutritious, equitable, and affordable and does not contradict the religion, beliefs, and culture of the community, to live a healthy, active, and productive life in a sustainable manner". In his explanation, it was stated that food implementation needs to pay attention to three things, namely (i) the availability of food based on the optimal use of local resources, (ii) the affordability of food from physical and economic aspects by the entire community, and (iii) the use of food or consumption of food and nutrition for a healthy, active, and productive life. The division of pillars in food security based on the Indonesian Food Law is *availability*, *accessibility*, and *stability*.

Food security consists of several subsystems. Mulyo et al., (2015) said that food security is viewed from the macro level, both national/regional, related to aspects of food *availability*, food *distribution* and food *consumption*. Meanwhile, viewed from the micro/household level (*objects side*), it is related to three main aspects, namely food *availability*, access to food (*food accessibility*), and food absorption (*food utilization*).

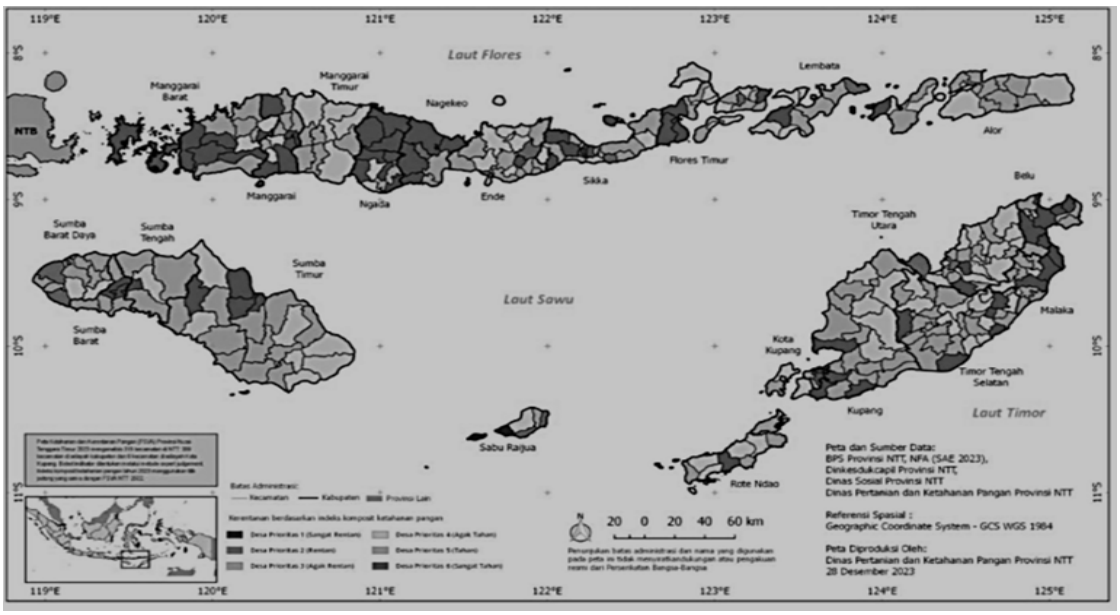


Figure 1. Food Security Map in NTT
Source: (Dinas Pertanian dan Ketahanan Pangan Provinsi NTT, 2023)

Studies related to *the Green economy* are generally associated with sustainable development (Ali, Anufriev, & Amfo, 2021; Kasztelan, 2017; Mikhno, Koval, Shvets, Garmatiuk, & Tamošiūnienė, 2021; Ospanova, Popovychenko, & Chuprina, 2022). Currently, sustainable development is a global achievement target that each country collectively wants to achieve through the SDGs (*Sustainable Development Goals*) program. Thus, discussing the concept and existence of *the Green economy* needs to continue to be carried out in an effort to achieve sustainable development. Sustainable development means that current development does not reduce the ability of future generations to build and meet their living needs (Kasztelan, 2017). In short, development does not damage the preservation of nature.

Several researchers have conducted research to explore information on how the economy grows by applying the concept of *Green Economy*. BorelSaladin & Turok, (2013) in their research stated that *the green economy* has the potential to provide substantive and transformative changes towards sustainable development goals. Meanwhile, Panjawa et al., (2023) stated that *the green economy* through integrated agriculture can increase food security.

Many studies have tried and formulated to measure inclusive green growth and determine its shaping indicators. *The Green Growth Knowledge Platform (2016) uses natural assets, resource efficiency and decoupling, risk and resilience, economic opportunities and efforts, and inclusivity as* its founding indicators. *The World Economic Forum* (2017) uses GDP per capita, employment rate, labor productivity, healthy life expectancy, average household income, poverty rate, Gini income, Gini wealth, adjusted net savings, dependency ratio, public debt, and GDP carbon intensity. Research from the United Nations Economic and Social Commission for Asia and the Pacific, (2014) used equitable distribution and access, structural transformation, eco-efficiency, investment in natural capital, and planetary boundaries as shaping indicators in the inclusive calculation of green growth. Some of these studies have various shortcomings because the indicators used are not comprehensive in accommodating important indicators to describe inclusive green economic growth (ESCAP, 2014).

Population growth and dynamic development situation encourage seriousness from all parties in overcoming food and nutrition problems and encouraging efforts to reduce vulnerability community against food insecurity. Globally, Indonesia is ranked 63 out of 113 country based on *the 2022 Global Food Security Index* (GFSI) released by the Economist Intelligence Unit. On a national scale, as many as 3 districts in NTT are included in the vulnerable priority based on Indonesia's 2021 Food Security and Vulnerability Map (FSVA) produced by the Food Security Agency, namely Southwest Sumba, Alor and Sabu Raijua. Therefore, efforts to improve resilience conditions in NTT need to be continued.

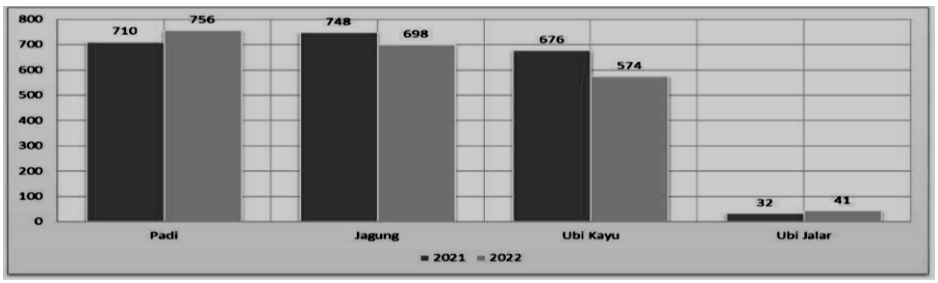


Figure 2. Agricultural commodity production in East Nusa Tenggara (NTT)
Source: Central Statistics Agency (BPS) (In thousands of tons).

From the picture above, it shows that in general, rice production in NTT Province has increased compared to 2021, rice production increased from 710 thousand tons in 2021 to 754 thousand tons in 2022. Corn production decreased from 748 thousand tons in 2021 to 698 thousand tons in 2022. In addition, the production of the main tubers, namely cassava, also decreased from 676 thousand tons in 2021 to 574 thousand tons in 2022, while sweet potatoes experienced an increase in production, namely from 32 thousand tons in 2021 to 41 thousand tons in 2022.

Table 1. Production of Main Cereals and Tubers by Regency/City, 2022 (tons)

No.	Regency/City	Rice	Maize	Cassava	Sweet Potato
1	West Sumba	30.180	9.569	4.538	612
2	East Sumba	52.284	24.611	18.639	1.139
3	Kupang	61.255	40.829	8.448	730
4	South Central Timor	15.616	40.737	50.131	1.692
5	North Central Timor	25.924	44.548	53.828	614
6	Belu	23.239	48.980	40.279	1.073
7	Alor	3.556	26.916	35.751	1.885
8	Lembata	1.733	5.685	3.019	258
9	East Flores	7.517	18.426	37.026	528
10	Sikka	11.346	29.416	67.922	3.525
11	Ende	21.882	11.961	45.217	2.518
12	Ngada	48.062	21.062	18.563	1.443
13	Manggarai	88.359	4.979	6.246	1.354
14	West Manggarai	28.835	7.868	2.781	1.023
15	East Manggarai	124.087	6.978	43.946	10.673
16	Central Sumba	24.187	19.347	4.640	1.034
17	Southwest Sumba	49.435	99.832	57.189	6.142
18	Nagekeo	27.527	11.499	3.809	629
19	East Manggarai	77.979	6.860	13.335	2.372
20	West Manggarai	7.205	8.038	61	150
21	Sabu Raijua	50.236	8.685	6.921	1.012
22	Malaka	1.568	1.141	497	
23	Nusa Tenggara Timur	756.050	698.023	574.413	41.194

Source: Central Bureau of Statistics (BPS) of East Nusa Tenggara Province, 2022.

South Central Timor Regency responds to market needs and opportunities by directing attention and policy forms towards the direction of agricultural development. The agricultural sector is a guarantor for food needs and the development of the regional economy and the welfare of the community in general and farmers in particular are the focus of attention in development. This is in line with data obtained from the Central Statistics Agency of South Central Timor Regency, that almost 46% of the Gross Regional Domestic Product (GDP) of South Central Timor Regency is from the Agriculture, Forestry, and Fisheries Sector.

However, the contribution of agriculture, forestry and fisheries has not been able to raise the Economic Growth Rate of South Central Timor Regency. The economic growth rate of South Central Timor and NTT is still far below the National Economic Growth. It is recorded that in 2023, the Economic Growth of South Central Timor and NTT will be 3.21% and 3.52%, far below the National Economic Growth of 5.05%.

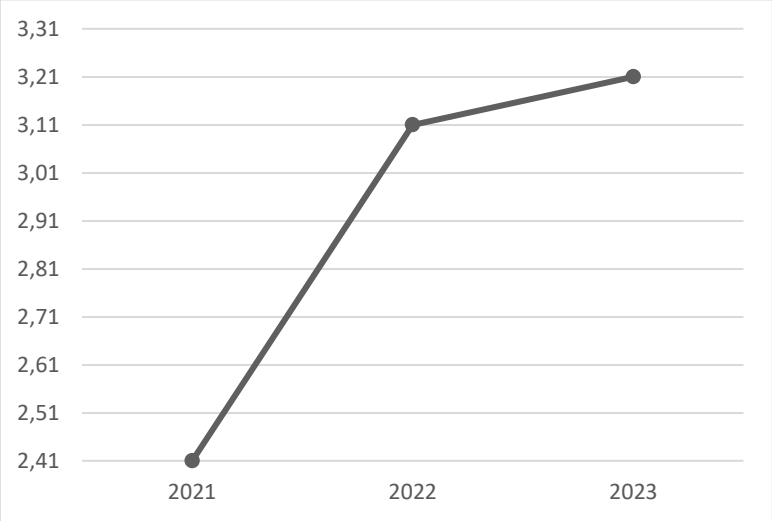


Figure 2. Economic Growth Rate
Source: GRDP South Central Timor, 2021-2023

Post-harvest processing can support the implementation of *the green economy* in agriculture through the correct process and packaging of agricultural products so that it can reduce waste, and can reduce energy consumption and carbon emissions, as well as create added value from the resources used. Product damage will increase at the time of delivery, Irmeilyana et al., (2021) said that horticultural crops are only marketed directly to collectors to be brought to the market, due to the perishable nature of the product. The impact of economic growth also needs to be measured for the community in the future. As reported in the Brundtland Report, economic growth will be an excessive burden on the earth in the future (Hajian & Kashani, 2021). Measuring the economic impact on the environment is very important, considering that the environment has provided various resources that can support the production of goods and services for the community.

Identification of the Problem

Rapid economic development often neglects environmental sustainability, which can lead to irreversible environmental damage. In Indonesia, particularly in the South Central Timor (TTS) and East Nusa Tenggara (NTT) regencies, the agricultural sector plays a crucial role in supporting the community's economic livelihoods, especially as the majority of the population relies on it. However, despite this sector's enormous potential, significant challenges arise in terms of food security, particularly related to sufficient food availability, equitable access, and a stable food supply. One solution being

considered to address this issue is the implementation of a green economy, which is expected to minimize environmental damage and increase food security in a more sustainable and environmentally friendly manner.

Research Question

Based on the background and problem identification above, several research questions can be formulated as follows:

1. How can the application of green economy principles influence sustainable development in South Central Timor Regency?
2. To what extent can the application of green economy principles in post-harvest management improve food security in South Central Timor Regency?

Objective and Benefit Research

Research Objectives

This research aims to explore the relationship between the application of green economy principles and two important aspects: sustainable development and food security. Specifically, the first objective is to analyze the impact of the application of green economy principles on sustainable development in South Central Timor Regency. The second objective is to assess how the application of green economy principles in post-harvest management can improve food security in this region, with the hope that the results of this research can provide more integrated solutions to address food security issues.

Research Benefits

The benefits of this research are quite extensive, both theoretically and practically. Theoretically, this research contributes to the development of knowledge in the field of green economy and food security, particularly in the context of regions with environmental and social challenges such as South Central Timor Regency. From a practical perspective, this research is expected to provide policy recommendations for local governments in designing more sustainable development strategies, emphasizing the importance of a green economy. Furthermore, this research also provides useful information for farmers and communities in improving their food security through more efficient and environmentally friendly natural resource management, which in turn can improve their quality of life.

THEORITICAL AND CONCEPTUAL FRAMEWORK

Theoritical Framework

The theoretical framework in this research is based on two interrelated key concepts: the Green Economy and Sustainable Development. These two concepts serve as the basis for analyzing how the application of green economy principles can contribute to food security and sustainable development, particularly in South Central Timor Regency.

Green Economy

A green economy is an economic system focused on achieving sustainable development through more efficient use of natural resources, reducing carbon emissions, and creating more inclusive socio-economic opportunities. As a development approach, a green economy seeks to reduce negative impacts on the environment through changes in production and consumption systems, with the aim of creating a balance between economic progress and environmental sustainability.

According to the United Nations Environment Programme UNEP, (2011), a green economy aims to maximize efficiency in the use of natural resources while minimizing negative impacts on ecosystems and communities. Green economy principles also encourage a transition from dependence on non-renewable natural resources to the use of more environmentally friendly and renewable resources. In the agricultural context, this principle includes the adoption of environmentally friendly technologies, such as agroforestry, sustainable agriculture, and renewable energy, which are expected to reduce environmental damage caused by intensive agricultural activities.

Directly, a green economy has the potential to support food security, particularly by managing natural resources more efficiently. Applying green economy principles to agricultural management in South Central Timor Regency, which faces challenges related to food security, can reduce environmental damage, improve the quality of agricultural products, and ultimately increase the availability and access to sustainable food for local communities.

Sustainable Development

Sustainable development is a concept that aims to meet the needs of the present generation without compromising the ability of future generations to meet their own needs (Hajian & Kashani, 2021). Sustainable development focuses not only on economic growth but also on social and environmental aspects, which must be balanced for long-term sustainability. In the context of South Central Timor Regency, sustainable development requires an approach that integrates economic growth with environmental conservation and improved social welfare. Economic development based on agriculture, the dominant sector in the region, must be implemented sustainably, considering the potential environmental damage caused by environmentally unfriendly agricultural activities. Therefore, wise and environmentally friendly management of natural resources is crucial for ensuring that the agricultural sector not only provides economic benefits but also supports ecosystem sustainability and future food security.

Sustainable development integrated with green economy principles aims to create a balance between economic growth, environmental preservation, and social justice. In this regard, environmentally friendly agricultural management will support food security, create sustainable jobs, and reduce negative impacts on the environment.

Food Security

Food security is a condition where every individual, at all times, has physical, social, and economic access to sufficient, nutritious, safe, and nutritious food that meets their needs for a healthy and active life (W.H.O., 2017). Food security encompasses three interrelated pillars: food availability, food accessibility, and food stability.

1. Food Availability: This refers to the amount of food that can be produced or is available in a region to meet consumption needs. Food availability can be influenced by efficient and environmentally friendly agricultural production factors, which are directly related to the implementation of green economy principles.

2. Food Accessibility: Refers to a community's ability to obtain sufficient food, both physically (access to markets) and economically (ability to purchase food). In this context, efficient and environmentally friendly management of natural resources, such as through a green economy, can increase community access to affordable, quality food.
3. Food Stability: Refers to the ability to maintain consistent food availability without disruption caused by external factors such as natural disasters or economic crises. Applying green economy principles to sustainable agriculture can reduce food production instability caused by environmental degradation or climate change.

Conceptual Framework

The conceptual framework in this study connects three main concepts: Green Economy, Sustainable Development, and Food Security. The application of Green Economy principles, such as natural resource efficiency, carbon emission reduction, and the adoption of environmentally friendly agricultural technologies, can support Sustainable Development by ensuring that agricultural processes and post-harvest processing are not only economically profitable but also environmentally sustainable. These green economy principles are expected to create sustainable jobs, reduce dependence on fossil fuels, and encourage the use of renewable energy in the agricultural sector, ultimately improving people's quality of life.

Meanwhile, through the implementation of a more efficient green economy in natural resource management, Food Security can be better achieved. In this regard, a green economy plays a crucial role in increasing food availability through sustainable agricultural practices that can increase productivity without damaging the environment. Furthermore, a green economy can also improve food accessibility by creating a more efficient food distribution system and maintaining food stability by ensuring a continuous and high-quality food supply. Thus, these concepts are interconnected and contribute to achieving sustainable development and food security in South Central Timor Regency.

This conceptual framework demonstrates that the implementation of an integrated green economy in agricultural management and post-harvest processing has the potential to significantly contribute to achieving sustainable development that supports food security. Therefore, this study aims to explore the extent to which a green economy can be implemented in South Central Timor Regency, as well as its impact on food security and sustainability in the region.

METHODOLOGY

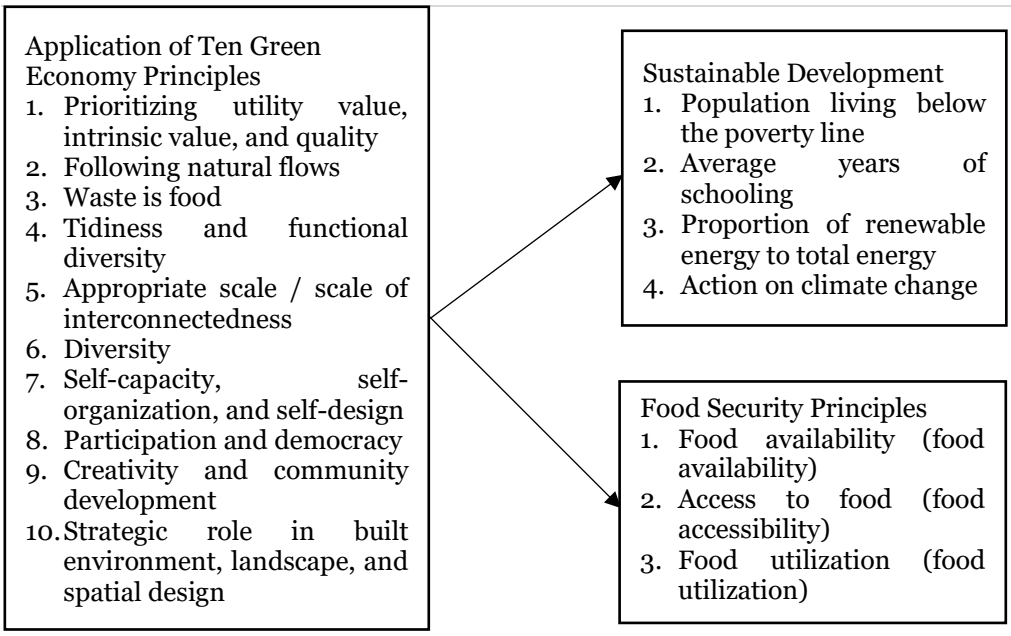
The research design applied is a type of quantitative research. This research method is applied to examine certain samples by collecting research instrument data and statistical data analysis with the aim of validating the hypothesis that has been determined. Which in this study has two dependent variables and one independent variable. The dependent variables applied in this study are the improvement of Sustainable Development and Food Security. Meanwhile, the independent variable applied in this study is the application of ten principles of the green economy. The type of research for data collection applied is quantitative data and the source of the data obtained is in the form of primary data in the form of responses and perceptions of respondents (subjects) of the research.

The application of *the green economy* concept in the development of Farmers' Post-Harvest Product Processing aims to realize sustainable development and food security. The indicators of these variables are as follows:

1. Sustainable Development: a. Residents live below the poverty line b. Average school year c. Proportion of renewable energy to total energy d. Action on climate change	3. The application of ten principles of the green economy. a. Prioritize use value, intrinsic value, and quality b. Following the flow of nature c. Garbage is food d. Neat and diversity of functions e. Relevance scale / relevance scale f. Diversity g. Self-ability, self-organization and self-design h. Participation and democracy i. Creativity and community development j. Strategic role in the built environment, landscape, and spatial design
2. Principles of Food Security a. Food *availability* b. Food *accessibility* c. Food *utilization*	

The population in this study is Farmers, Farmer Groups and Government in Kapan Village, South East Central Regency, NTT. The criteria for respondents in this study were determined using the *Rule of Thumb approach method*. With the selection of respondents who are considered to have high relevance to the research objectives. This criterion ensures that respondents have an understanding and experience of the *green economy*.

Sample	Criterion	Number of Samples
Farmer	Actively manage land for at least two years Have knowledge related to agricultural processes	30
Farmer Group	Farmer groups that are actively becoming farmer organizations that help farmers in solving farmers' problems Minimum of two years of work experience.	30
Processor or Government	Small business actors who use processed agricultural products Have been in operation for at least one year Being in the supply chain of the research area	30



RESULT AND DISCUSSION

Evaluation of Measurement Models (Outer Model)

Evaluation of measurement models to test the validity and reliability of indicators that measure constructs or latent variables. The evaluation of the measurement model was carried out by checking *the convergent* and *discrete validity* of the indicators as well as *the Composite reliability* and *Cronbach's Alpha* for the indicator blocks.

Convergent Validity

Convergent validity is used to validate the indicator against its variables which are reviewed from the *loading factor value*. *The rule of Thomb* used, namely the *loading factor* value for confirmatory research must be > 0.70 then it is declared valid. *The Rule of Thomb* used, namely the loading factor value for *exploratory research* between 0.60-0.70, is still acceptable (valid) (Ghozali & Latan, 2020).

Table 2. Outer Loading Inspection Results

	X. Green Economy	Y1. Sustainable Development	Y2. Food Security
X.1	0,730		
X.2	0,780		
X.3	0,727		
X.4	0,775		
X.5	0,830		
X.6	0,900		
X.7	0,863		
X.8	0,733		
X.9	0,805		
X.10	0,762		
Y1.1		0,932	

Y1.2		0,943	
Y1.3		0,864	
Y2.1			0,984
Y2.2			0,986
Y2.3			0,987

Source: Data processing results (2025)

Table 2. shows that all indicators that measure the three variables studied (*Green Economy*, Sustainable Development, and Food Security) have *an outer loading* value greater than 0.60. This means that all items used are valid indicators as a measure of the three variables studied (*Green Economy*, Sustainable Development, and Food Security).

The final check of *convergent validity* is to look at the *Average Variance Extracted* (AVE) value. The use of *average variance extracted* (AVE) as a criterion for *convergent validity* testing is calculated as the average root *of standardize loading factor* divided by the number of indicators. In *confirmatory* and *exploratory research*, *the average variance extracted* (AVE) value must be greater than 0.50. This level or higher indicates that the average construct explains 50% or more of the variance of its indicators (Hair, Hult, Ringle, & Sarstedt, 2022).

Table 3. AVE Examination Results

	AVE
X. Green Economy	0,628
Y1. Sustainable Development	0,748
Y2. Food Security	0,972

Source: Data processing results (2025)

In Table 3. Indicates that the AVE value of each variable has met the value of > 0.50. This means that it can be concluded that each variable in this study is able to explain the value of the indicators that measure the latent variable.

Discrinimat Validity

Discriminant validity; is done to ensure that each concept of each latent variable is different from the others. The discriminant validity examination *used the results of the* Fornell-Larcker Criterion, Rule Of Thomb *on AVE, a* good discriminant validity is shown from the square root of AVE of each construct greater than the correlation between constructs in the model. (Ghozali & Latan, 2020).

Table 4. Fornell-Larcker Criterion Examination Results

	X. Green Economy	**Y1. Sustainable Development**	**Y2. Food Security**
X. Green Economy	0,793		
Y1. Sustainable Development	0,698	0,865	
Y2. Food Security	0,539	0,695	0,986

Source: Data processing results (2025)

Table 4. shows that the Fornell-Larcker Criterion value shows that the correlation value between constructs has a larger square root AVE than the correlation value between other latent variables and the load value of all latent variables > 0.7. This means that it can be concluded that the model has good discriminant validity.

Reliability Test

According to Ghozali & Latan, (2020), a reliability test is carried out to test the reliability of a construct. This test is carried out to prove the accuracy, consistency and accuracy of the instrument in measuring constructs. The rule of Thomb used is if the composite reliability value and Cronbach's alpha are above 0.7 (Ghozali & Latan, 2020).

Table 5. Composite Reliability and Cronbach's Alpha Inspection Results

	Composite Reliability	Cronbach's Alpha
X. Green Economy	0,952	0,934
Y1. Sustainable Development	0,916	0,884
Y2. Food Security	0,989	0,985

Source: Data processing results (2024)

In Table 5. It shows that the composite reliability value of the four latent variables has been above 0.70 and Cronbach's alpha of the four latent variables has been above 0.70 so that it can be said that the block of reliable indicators measures the variables.

Structural Model (Inner Model)

After testing the validity and reliability of the evaluation of the Measurement Model (*Outer Model*), the next step is to analyze the influence between latent variables called the structural model (*inner model*). *The inner model* can be evaluated with a Coefficient of Determination R^2 (R-Square), *Predictive Relevance* Q2 (Q-Square), and *Goodness of Fit* (GoF)

R-square (R2)

R2 testing is used to see how much independent variables are able to explain dependent variables. The greater the R2 value, the greater the influence of exogenous latent variables on endogenous variables. In this study, 2 (two) dependent variables were used which were influenced by other variables, namely credit lending strategies and *non-performing loans*. according to Ghozali & Latan (2020), the R2 value was 0.75 (strong model), 0.50 (moderate model), and 0.25 (weak model). In some research contexts, the R2 value of 0.10, and even lower, is considered satisfactory.

Table 6. R-square Examination Results

	R-Square
Y1. Sustainable Development	0,482
Y2. Food Security	0,282

Source: Data processing results (2025)

In Table 6. shows that internal factors have an R2 (R-Square) value of 0.482, including the moderate model, which also means that the green economy variable is able to explain the sustainable development variable of 48.20%, the remaining 51.80% is explained by other variables outside the model. Meanwhile, external factors have an R2 (R-Square) value of 0.282, including a weak model, which also means that the *green economy variable* is able to explain the food security variable of 28.20%, the remaining 71.80% is explained by other variables outside the model.

Q-Square Predictive Relevance

Stone-Geisser Q-square test for predictive relevance and t-test and significance of structural path parameter coefficients. Q-square measures how well the observation value is produced by the model as well as its parameters. A Q-square value greater than 0 (zero) indicates that the model has a predictive relevance value, while a Q-square value of less than 0 (zero) indicates that the model lacks predictive relevance. The calculation of Q-Square is carried out with the formula:

Q2 = 1 - (1-R21) (1-R22)

Where :

Q2 = 1 - [(1-0.482) (1-0.282)]

Q2 = 1 - [(0.518) (0.718)]

Q2 = 1 - 0.372

Q2 = 0.628

From the Q2 results above, a value of 0.628 was obtained, which shows evidence that the model has *good predictive relevance* because the value obtained is more than 0 (zero).

Goodness of Fit (GoF)

Goodness of Fit (GoF) is used to describe the overall feasibility level of the model. The GoF value is obtained from the square root of the average variance extracted (AVE) multiplied by the average value of R2 of the model. A model is said to be good if the GoF value is above 0.38 (Hair et al., 2022). For the formula Gof is as follows:

$$\mathbf{Gof} = \sqrt{\overline{\mathbf{AVE}} \times \overline{\boldsymbol{R^2}}}$$

Where is the average of AVE while the average of R-Square$\overline{AVE}\overline{R^2}$. The calculations for searching for GoF are outlined as follows:

Table 7. AVE and R-Square Average Examination Results

	AVE	R-Square
X. Green Economy	0,628	
Y1. Sustainable Development	0,748	0,482
Y2. Food Security	0,972	0,282
Average	0,783	0,382

Source: Data processing results (2025)

$$GoF = 0.547\sqrt{0,783x\ 0,382}\sqrt{0,299}$$

From the results above, it can be stated that the model is fit because the GoF value of 0.547 is above 0.38. From the R^2, Q2, and GoF tests that have been carried out, it can be seen that the model formed is robust, so hypothesis testing can be carried out.

Hypothesis Testing

Hypothesis testing was carried out using *the bootstrapping resampling* method. This method allows for free distribution data, does not require normal distribution assumptions, and does not require large samples (minimum sample of 30 is recommended).

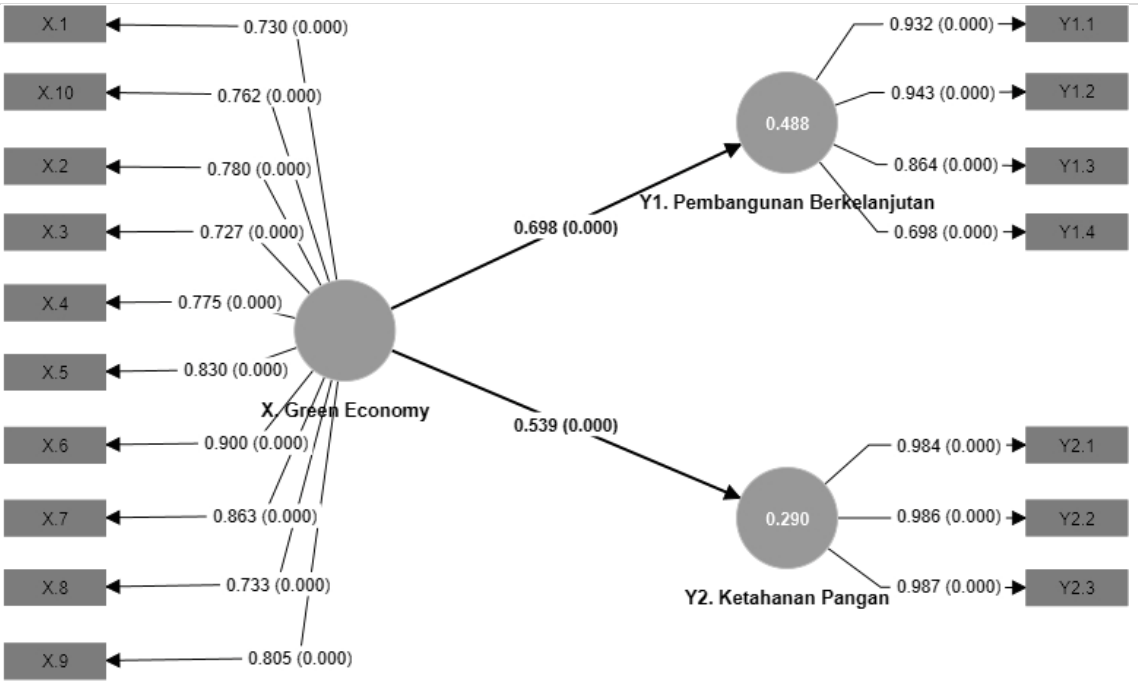


Figure 3. Bootstrapping Results

The test is carried out with *a t-test*, if a p-value *of ≤ 0.05 (alpha 5%) is obtained, then it is concluded to be significant, and vice versa.*

Table 8. Hypothesis Testing Results

No.	Relationships between Variables	Path Coefficient (Bootstrapping)	T-Statistics	P Values	Note
1	X. Green Economy -> Y1. Sustainable Development	0,698	10,765	0,000	H1 accepted
2	X. Green Economy -> Y2. Food Security	0,539	6,549	0,000	H2 accepted

Source: Data processing results (2025)

This table shows the results of a structural model analysis that examines the relationship between the Green Economy variable (X) and two dependent variables, namely Sustainable Development (Y1) and Food Security (Y2), using the bootstrapping method. Each row in the table provides information on the path coefficient, T statistic, and P value for each relationship tested, as well as whether the proposed hypothesis is accepted or rejected. The results of the hypothesis testing can be explained as follows:

1. The influence of the green economy has been proven to have a positive and significant effect on sustainable development. This result is shown by the path coefficient with a positive value of 0.698 with T-statistic = 10.795 (T-statistic > 1.96) and P-values = 0.000 (P-values < 0.05), Based on this hypothesis 1 is declared accepted.
2. The influence of the green economy has been proven to have a positive and significant effect on food security. This result is shown by the path coefficient with a positive value of 0.539 with T-statistic = 6.549 (T-statistic > 1.96) and P-values = 0.000 (P-values < 0.05), Based on this hypothesis 2 *is declared accepted.*

Limitation

This study's limitations include several factors that may influence the results and interpretation. First, the limited data available in South Central Timor Regency, particularly regarding the variables of green economy, food security, and sustainable development. Second, the assumptions underlying the analysis may not fully reflect the dynamic conditions on the ground, given the limited time and resources available. Furthermore, there is potential bias in the collection or interpretation of information, particularly regarding community and farmer perceptions of the green economy. Methodological constraints may also affect the validity and generalizability of the findings, particularly due to the limited sample size. Therefore, the results of this study should be interpreted with caution and with these limitations in mind.

Contribution

This article makes a significant contribution to the development of knowledge on the application of a green economy to the agricultural sector, particularly in the post-harvest context of South Central Timor Regency. This research presents empirical evidence on how green economy principles can contribute to the achievement of sustainable development goals and food security in the region. Furthermore, this research offers a more holistic approach by linking green economy theory with local agricultural practices, which is particularly relevant for regions dependent on the agricultural sector. Another contribution of this article is the development of alternative policies focused on increasing farmers' capacity to implement a green economy, which is expected to improve their quality of life and reduce environmental damage. These findings can serve as an important reference for the government and policymakers in designing green economy-based policies to support food security and sustainable development.

CONCLUSION AND RECOMENDATION

Conclusion

Based on the analysis and presentation of the Implementation of *the Green Economy* Concept of Processing Farmers' Post-Harvest Crops in an Effort to Realize Sustainable Development and Food Security in South Central Timor Regency, East Nusa Tenggara, this study can be concluded as follows:

1. The Effect of the Application of Green Economy Principles on Sustainable Development

   Based on the analysis and presentation, the variable of the application of green economy principles to Sustainable Development has a significant effect on the variable of Sustainable Development in South Central Timor.

2. The Effect of the Application of Green Economy Principles on Food Security

   Based on the analysis and presentation, the variable of the application of economic principles has a significant effect on the variable of Food Security in South Central Timor.

The results of this study are in line with research conducted by Kinda (2020) which researched Food Security in Africa in 35 SSA countries during 2001–2015. Meanwhile, in Indonesia, a similar study has been conducted that examines green economy programs in increasing the productivity and quality of life of local farmers. In addition, research conducted by Budi et al. (2023), states that with increased consumer awareness, we can create an environment where agriculture and the natural environment can go hand in

hand and contribute positively to each other, supporting global food security. According to the study's findings, incorporating green economy programs into agricultural practices can improve the quality of agriculture, farmers' green economic skills, and farmers' collective responsibility for environmental conservation.

Recomendation

Based on the findings of this study, several key recommendations can be made to support the implementation of a green economy to achieve sustainable development and food security in South Central Timor Regency, East Nusa Tenggara. First, the local government and relevant institutions need to increase farmer capacity through education and training on green economy principles, including environmentally friendly post-harvest processing techniques and the use of efficient technology. This aims to enhance farmers' understanding of sustainable natural resource management and improve the productivity and quality of agricultural products. Furthermore, it is crucial for the government to strengthen policies that support the implementation of a green economy in the agricultural sector, such as providing incentives for farmers who adopt environmentally friendly technologies and improving infrastructure that supports market access for sustainable agricultural products.

Further recommendations include encouraging the diversification of natural resources and the use of renewable energy in agricultural processes and post-harvest processing. The government should advocate for more sustainable use of local resources to reduce dependence on fossil fuels and minimize environmental impacts. Collaboration between local governments, civil society organizations, the private sector, and farmers also needs to be strengthened to design and implement sustainable development policies. Establishing partnerships between farmers and local entrepreneurs to develop environmentally friendly agricultural products and improve post-harvest processing capacity will foster more inclusive regional economic growth. Finally, to ensure the successful implementation of a green economy, it is crucial for local governments to regularly monitor and evaluate implemented policies to assess their impact on food security and sustainable development, and make improvements where necessary. These recommendations are expected to provide a foundation for better policies to create sustainable food security and more environmentally friendly economic development in South Central Timor Regency.

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