

INCREASING ECONOMIC GROWTH THROUGH GREEN AGRICULTURE IN INDONESIA

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ABSTRACT

Economic growth is the primary condition of economic development. With growth, investment, increased employment opportunities, and equity are possible. Many factors are interconnected and affect economic growth. However, rapid economic growth in Indonesia has also caused environmental damage. This study aims to study the factors that affect the level of environmental pollution in Indonesia and the factors that have the most significant influence. This study used a multiple regression model. The results showed that the GDP variable (X1) and rice production variable (X2) had a significant simultaneous relationship with environmental pollution (Y), with an F value of 3.694 and a significance level of 0.032. The t-test results show that rice production (X2) has a significance value of 0.039, or below 0.05. indicates that rice production in Indonesia contributes significantly.

Keywords: Pesticides; Chemical fertilizers; Economic growth; Environmental pollution.

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INTRODUCTION

Data from Trading Economic 2023 shows that Indonesia is one of the developing countries with rapid economic growth. According to official data from the World Bank, Indonesia's Gross Domestic Product (GDP) will reach 1,319.10 billion dollars in 2022, which is 0.59% of the global economy. Investing, increasing employment opportunities, and achieving equity are possible with economic growth. According to (Priyagus, 2017), many factors are interconnected and affect economic growth. However, Indonesia's economic progress has also caused environmental damage. Important information worth noting is that only economic growth at high-income levels can reduce pollution (Priyagus, 2017). As long as economic growth remains low, environmental damage will still occur. It is still being determined whether Indonesia's growth has been sufficient to achieve high-income levels. Indonesia's economy is heavily dependent on agriculture. The agricultural sector is responsible for emissions of greenhouse gases such as methane gas (CH₄) and nitrous oxide gas (N₂O), which contribute to global warming and climate change. This raises the problem between rapid economic development and sustainable environmental protection. Rapid economic growth is essential to improve people's welfare and reduce poverty. However, on the other hand, increasingly severe environmental damage can threaten the existence of humans and other living things on Earth. As a result, this study aims to analyze the challenges between Indonesia's economic development and environmental damage and find solutions to these

challenges. The purpose of this study is to determine whether Indonesia's environmental pollution variable (Y) is influenced by the GDP variable (X1) and rice production variable (X2).

Economic growth means the value of goods and services an economy produces increases over time. Some can use Gross Domestic Product (GDP) to measure economic growth. Economic growth means the economy can produce better goods and services. Increased investment, technology, and better human capital, among others, are ways this growth can be achieved. Economic growth benefits include increasing people's incomes, increasing employment opportunities, improving welfare, and reducing poverty. Economic growth has increased the production of goods and services, per capita income, investment levels, employment opportunities, and wages.

As environmental damage has spread worldwide, the urge to take urgent action to reduce the threat of global warming has also increased. This is due to an unjustified diversion from the much more severe environmental problems facing developing countries. Limited resources do not drive growth and possible economic damage caused by climate change. Urban air pollution and lack of access to safe drinking water and sanitation are far worse causes of population well-being in today's developing countries. They should be prioritized over the interests of future generations. Thus, the concept of "sustainable" growth cannot be used (Divita, 2004, 2006a, 2006b; García-Barragán et al., 2018; García et al., 2017; Pati et al., 2006; Vita, 2007) Restrictions on energy consumption and control of carbon emissions are some of the environmental policies that help the growth (Kardung et al., 2021; Sharaai et al., 2019).

METHODS

The research methodology employed in this study is quantitative research. Quantitative research is an approach that utilizes numerical data to collect and analyze information (S. Sangadji et al., 2022). This method is grounded in the philosophy of positivism, which asserts that truth can be achieved through objective observation and measurement (Sangadji, 2023). Moreover, the selection of quantitative methodology is justified by the use of a ratio scale in this research. Secondary data accessed from the Food Agriculture Organization (FAO) spanning from 1990 to 2022 serves as the dataset. Environmental pollution data (Y) is approximated using CO2 emission data. Economic growth (GDP) in millions of dollars is represented as variable X1, and rice production as X2. Subsequently, multiple regression analysis is applied for further investigation.

For example, this model is built: The model of environmental damage in Indonesia is as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$$

Description:

Y = environmental pollution (kg) with CO₂eq/kg product

X1 = Gross Domestic Product (US Dollar)

X2 = Rice production (ton)

e = Error.

RESULTS AND DISCUSSION

The data analysis in this research utilizes SPSS Version 23 application. Several analyses were performed to achieve a good fit. The Results and Discussion section reveals that economic growth in Indonesia, represented by Gross Domestic Product (GDP) (X1) and rice production (X2), can contribute to environmental degradation. The increase in rice production may lead to larger land usage, heightened pesticide and fertilizer application, and excessive water consumption. This can result in deforestation, water and soil pollution, as well as the loss of biodiversity. Economic growth is identified as the sole factor in this study, apart from economic growth itself. The rise in economic activity may trigger an uptick in the consumption of natural resources and energy, as well as the production and consumption of food items. Consequently, this can lead to increased greenhouse gas emissions, environmental pollution, and a decline in the availability of natural resources. The results from the regression model analysis are as follows.

Table 1. ANOVA Simultaneous Test of Environmental Pollution in Indonesia

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	37,00	2	18,00	3,694	.032 ^b
Residual	24,00	48	50,10		
Total	27,00	50			

a. Dependent Variable: Environmental Pollution

b. Predictors: (Constant), GDP, Produksi

ANOVA is a statistical method used to test the difference between two or more averages. The results showed that the ANOVA analysis had a significant correlation with the dependent variables (Y), GDP (X1), and Production (X2). There are 37.00 squared regression, 24.00 quadratic residuals, and 27.00 squared total. With a significance level of 0.032, the F value is 3.694. This shows that the variables X1 (GDP) and X2 (Production) have a significant correlation with environmental pollution (Y). To determine if there is a statistically significant difference between the mean of two or more groups, ANOVA is used to divide the total variation of the data set into variations within groups and between groups. Next, the F test determines whether the variation between groups is more significant than within the group. Table 1.1 shows the actual effect of variable GDP (X1) and rice production (X2) on environmental pollution in Indonesia.

Rice farming requires water and energy, so it is necessary to streamline both. It is hoped that efficiency will reduce the excessive use of natural resources and adverse environmental impacts. One of the components of production is rice. Since pesticides damage the environment and human health, there must be efforts to reduce and replace them with more environmentally friendly pest control technologies. In rice cultivation, rice husks contain volatile organic matter, which can pollute the environment. If not appropriately managed, water-borne rice husks can produce methane gas, which pollutes the air, and burnt rice husks can produce sulfuric acid, which pollutes the soil and air. Thus, it can be said that environmental pollution is a side effect of rice production (Amrillah et al., 2018; Divita, 2004, 2006a, 2006b; García-Barragán et al., 2018; García et al., 2017; Irvan et al., 2014; Pati et al., 2006; Vita, 2007).

To reduce the dependence of the Indonesian people on rice, it is necessary to increase food diversification and reduce dependence on rice. The community should also be

encouraged to protect the environment. They are increasing public awareness about protecting the environment and health through education and campaigns. Yield shrinkage often occurs in rice production, and an effort is needed to reduce it. Efforts can be made by reducing yield shrinkage during harvesting, threshing, drying, storage, and transportation. This effort can reduce rice damage and the negative impact caused by rice production on the environment. Government policies implemented in Indonesia are also expected to increase rice production (Anugrah & Wardana, 2008). To reduce yield shrinkage at harvest time, the Directorate General of Food Crops developed a sustainable, healthy rice cultivation solution, the Implementation of the Rice Intensification System (SRI) (Kasim & Rozen, 2009).

Table 2. Partial Test on Environmental Pollution in Indonesia

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	12.552.	2.728.		4.600	.000
1 Produksi	80.478	37.562	.289	2.120	.039
GDP	.000	.000	.177	1.298	.200

a. Dependent Variable: Environmental Pollution

The analysis results show that rice production has a significance value of 0.039 below 0.05. This shows that rice production in Indonesia significantly impacts pollution in Indonesia—one of the reasons why rice cultivation in Indonesia requires excessive use of pesticides and chemical fertilizers. Excessive use of chemical pesticides and fertilizers can pollute the environment, harm human and animal health, and pollute soil, water, and air. Rice production requires much water. Excessive water use can lead to deterioration in water quality and drought in areas that need water. Fossil fuels such as gasoline and diesel are needed to power the agricultural machinery used to produce rice. The use of fossil fuels can cause air pollution and greenhouse gas emissions. This is very dangerous because it will impact climate change (Elias et al., 2019; Lal, 2018; Paminto et al., 2022)

Rice production causes environmental damage due to unsuitable land use, such as soil erosion and degradation. With population growth, the function of paddy fields is changed to non-agricultural land, such as housing or industry. This can lead to decreased rice production and environmental damage, such as deforestation and land degradation. Environmental pollution in Indonesia is not influenced by Gross Domestic Product (GDP). Because the result of the significance value shows that there is a value of 0.2 above 0.05. the reason is that GDP does not take into account environmental costs. The costs incurred to repair environmental damage caused by economic activities are called ecological costs. These environmental costs are not factored into GDP, so GDP does not reflect the negative impact caused by economic activity on the environment.

GDP does not consider the value of natural resources, which are one of the factors of production that are important for economic activity. However, the value of natural resources is not considered in GDP, so GDP does not reflect the impact of economic

activity on the availability of natural resources. GDP also does not consider the quality of the environment, which is an essential factor affecting people's well-being. However, environmental quality is not taken into account in GDP. In addition, broader indicators than GDP are needed to measure economic activity's impact on the environment. This indicator must consider the environmental quality, cost, and value of natural resources. Some indicators that can be used to measure the impact of economic activities on the environment are the Environmental Performance Index and the Environmental Sustainability Index.

CONCLUSIONS

The research findings underscore the significant impact of Gross Domestic Product (GDP), denoted as X_1 , on environmental pollution in Indonesia, represented by Y . Within the examined variables, rice production emerges as the predominant factor influencing environmental pollution in the country. This underscores the intricate relationship between economic activities, as gauged by GDP, and the environmental repercussions faced by Indonesia. The study substantiates the pivotal role of the agricultural sector, particularly rice production, in contributing to environmental degradation. Consequently, policies aimed at mitigating environmental pollution must consider the multifaceted influence of GDP, with special attention to the dynamics of rice production.

The correlation between GDP and environmental pollution highlights the urgency of adopting sustainable practices within economic development. Policymakers should focus on implementing measures that not only foster economic growth but also prioritize environmental conservation. The study's findings provide valuable insights for stakeholders, guiding them toward a holistic approach to sustainable development that balances economic prosperity with environmental preservation. As Indonesia navigates its developmental trajectory, addressing the environmental impact of GDP, especially through strategic interventions in the agriculture sector, becomes imperative for fostering a harmonious coexistence between economic advancement and ecological well-being.

Building on the conclusions drawn from the current research, future investigations should delve deeper into the nuanced interplay between specific components of Gross Domestic Product (GDP), such as investment, consumption, and government spending, and their distinct contributions to environmental pollution in Indonesia. Additionally, exploring the potential mitigating effects of technological advancements and sustainable agricultural practices on the identified environmental stressors, particularly within the context of rice production, could offer targeted solutions. Furthermore, a comparative analysis with other developing nations facing similar challenges may provide a broader perspective, facilitating the formulation of context-specific policies. This prospective research can aid policymakers in devising more effective and tailored strategies for achieving a sustainable balance between economic growth and environmental preservation, ensuring Indonesia's developmental trajectory aligns with global goals for ecological well-being.

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