

Research Article

The Role of the Agricultural Sector in Sustainable Development: Analysis of Data Availability and Achievement of Sustainable Development Goal Indicators for Goal 2 (Zero Hunger) -- Case Study of Madiun Regency and Madiun City

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Abstract.

This research aimed to identify the role of the agricultural sector in achieving the sustainable development goals (SDGs). One of the SDGs related to the agricultural sector was Goal 2, zero hunger. Before assessing the extent of the agricultural sector's role by measuring the achievement level of indicators in Goal 2, another challenge in evaluating sustainable development progress was data availability. This study employed a case study approach in two areas: Madiun District and Madiun City. The research findings revealed that in Madiun District, out of the 11 indicators in Goal 2, 4 indicators lacked data. In terms of achievement levels, five indicators were achieved and two were not achieved. In contrast, Madiun City had data for each indicator, with eight indicators achieved and three not achieved. The research concluded that data availability for development indicators at the municipal government level was significantly better compared to the district level. The urgency of data availability lies in obtaining an overview of sustainable development achievement in a region and determining future steps through policies and strategic measures, particularly in supporting sectors like agriculture.

Keywords: sustainable agriculture, sustainable development goals, SDGs assessment

1. Introduction

The long-term development goals of countries worldwide in 2030 was agreed upon within the framework of sustainable development goals [1]. The achievement of sustainable development goals was based on the realization of four pillars of development: social, economic, environmental, and legal and governance development. The 17 SDGs goals constitute the overall objectives of sustainable development grouped into these



four foundations of development. The role of the agricultural sector is crucial in the pursuit of sustainable development goals in 2030, particularly in ensuring sufficient food availability for all (zero hunger), aligning with SDGs 2. The agricultural sector plays a significant role in sustainably supplying food, especially in densely populated regions such as city centers and urban areas [1]. Achieving sustainable development goals by considering the development of the agricultural sector will help realize a sustainable food system through aspects of food production to attain SDGs by 2030.

SDGs 2 aims to end hunger and promote sustainable agriculture, and according to FAO (2016), SDGs 2 is a key element in driving the overall achievement of SDGs [2]. SDGs 2 consists of indicators that explain the attainment of aspects of food security, including food availability, nutritious and nourishing food, and consumption patterns in line with health standards. These three aspects of food security are directly related to the food production system, involving the agricultural sector. Understanding rural-urban linkages also plays a crucial role in comprehending the position of the agricultural sector within the framework of a sustainable food security system [3].

The agricultural sector, along with the education and health sectors, constitutes vital sectors in realizing multidimensional sustainable development, particularly in the realm of social development [4]. The development of the agricultural sector is an integral part of the social development dimension due to the interconnection between human needs and the environmentally sustainable equilibrium. Ideally, this equilibrium ensures that the environment can continually provide favorable conditions over the long term to develop a sustainable agricultural sector whose outcomes can be utilized by humans. Furthermore, the agricultural sector can also be considered a part of the dimension of sustainable economic development as the primary source of livelihood for communities, especially in rural areas [5].

The terminology of sustainable agriculture and agricultural development provides a clear picture of the urgency of the existence of SDGs as a globally agreed-upon development planning framework. Sustainable agriculture discusses various conditions and environmental impacts caused by agriculture in both general and specific terms, simultaneously understanding the environmental conditions that can influence agricultural development [6]. Sustainable agriculture is linked to at least 6 SDGs, namely goals 1, 2, 12, 13, 14, and 15, proving that the role of agriculture with sustainable principles is imperative [7]. SDGs have a framework that can accommodate the realization of sustainable agriculture and sustainable development because there are social SDGs and environmental SDGs. Social SDGs focusing on meeting global consumption and

ending poverty require the role of agricultural development, while environmental SDGs ensure that development in the agricultural sector adheres to sustainable principles by considering ecosystem aspects, biodiversity, and environmental health.

One of the challenges in realizing the role of agricultural sector development for achieving SDGs is the uncertainty factor, such as climate change and natural disasters, which can contribute to the decline in agricultural land productivity and the availability of agricultural land over time [7]. Other factors, such as the human resource capacity of farmers, including limited access to capital, information, and technology, can also impede the exponential growth of the agricultural sector in reaching SDGs 2 (zero hunger) due to a lack of resilience, adaptation, and mitigation against changes and global challenges in the agricultural sector [8].

The agricultural sector, in the context of the food system, faced significant challenges during the COVID-19 pandemic, where the food supply chain became longer due to restrictions on access from the point of food production to consumers, especially in densely populated areas. This situation has also affected food security in many countries worldwide, consequently impeding the achievement of SDGs 2 [9].

Various challenges and the role of the agricultural sector in achieving sustainable development goals can be initiated by analyzing the interim achievement of SDGs indicators in a region. This is crucial to identify which indicators have not yet achieved their targets and how the agricultural sector plays a role in responding to them. It is also essential to identify SDGs indicators that lack data, as data availability is crucial for monitoring the extent of SDGs achievement in a region and determining the direction and policy strategies to achieve indicator targets. This research has conducted an analysis of the achievement and data availability of SDGs indicators, especially goal 2 (zero hunger), in identifying the contribution of the agricultural sector to the achievement of sustainable development goals.

2. Material and Methods

In the first stage, an initial identification of the list of SDGs indicators within the social pillar was conducted, specifically goals 1 through 5, in accordance with the SDGs metadata document issued by the Indonesian government and regulated in Presidential Regulation No. 59 of 2017 on the implementation of sustainable development goal achievement. The second stage involved identifying government agencies that are

authorized and possess data related to SDGs indicators. The third phase involved conducting a data inventory through Focus Group Discussions (FGD) and in-depth interviews with both Madiun Regency and Madiun City government agencies. The FGD process commenced by establishing a forum that convened various cross-sectoral agencies overseeing agriculture, healthcare, and social services within the governmental frameworks of Madiun City and Regency. These discussions aimed to gather diverse insights and information from stakeholders engaged in formulating and overseeing Sustainable Development Goals (SDGs) indicators. The insights gleaned from these FGDs formed the basis for identifying the needs and obstacles encountered in advancing sustainable development goals. Subsequently, in-depth interviews were undertaken to validate SDGs indicator data with key stakeholders within each pertinent government entity after the FGDs' completion.

The fourth stage involved analyzing the achievement of sustainable development on SDGs indicators by comparing them with the targets set for each SDGs indicator outlined in Presidential Regulation No. 59 of 2017. This included determining the achievement of SDGs indicators categorized into three groups: indicators that have reached the target, indicators that have not reached the target, and indicators without available data. The subsequent stage involved presenting the achievement results by comparing between Madiun Regency and Madiun City, with a specific focus on SDGs 2 indicators to analyze their relevance to the agricultural sector.

3. Results

The discussion of the results begins with an examination of the social pillar of SDGs achievement between Madiun Regency and Madiun City. Subsequently, a more detailed explanation is provided regarding the attainment of the social pillar of SDGs based on the goals set by both Madiun Regency and Madiun City. Following that, the analysis narrows down to the data on the achievement of SDGs 2, encompassing each indicator from both Madiun Regency and Madiun City, while simultaneously exploring the correlation between the achievement of each indicator and the role of the agricultural sector. The use of case studies in Madiun Regency and Madiun City is employed to facilitate a comparative analysis of SDGs achievement and to introduce additional variations in information related to the attainment of SDGs indicators in these two distinct regions. See Figures 1–4 below.

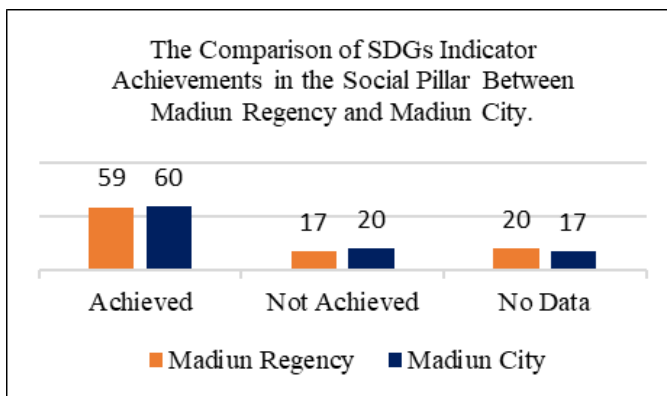


Figure 1: SDGs achievement in the social pillar: Madiun Regency and Madiun City.

The achievement of sustainable development goals in the social pillar in Madiun Regency reveals that out of 96 SDGs indicators, 59 achieved, 17 not achieved, and 20 indicators no data, making their achievement unmeasurable. Meanwhile, in Madiun City, social pillar SDGs attainment is slightly better, with only 17 out of 97 indicators no data. The remaining 60 indicators were known to have reached their targets, while 20 had not. The comparison of achievements between the two regions was not significantly different; however, indicators that had not reached their targets and those without data were more prevalent in Madiun Regency compared to Madiun City.

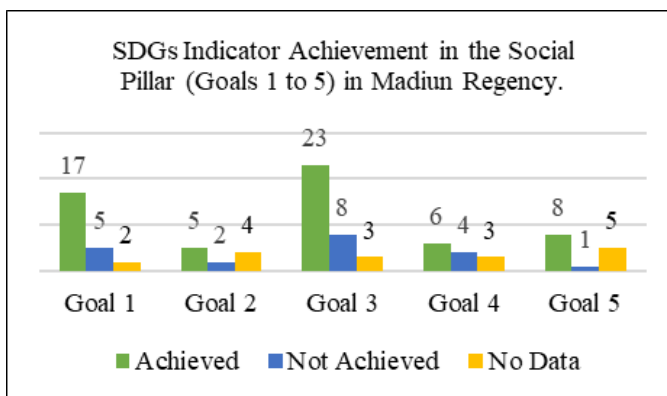


Figure 2: SDGs achievement in the social pillar (Goals 1 to 5): Madiun Regency.

Based on the level of achievement in the social pillar in Madiun Regency, when viewed based on goals, it is evident that SDGs 1 and 3 had a higher level of attainment compared to SDGs 2, 4, and 5. This indicates that progress in sustainable development related to poverty alleviation (SDGs 1) and good health (SDGs 3) has been successful in Madiun Regency. However, overall, the number of indicators that achieved their targets is higher than those that did not reach their targets in the social pillar, encompassing goals 1 through 5.

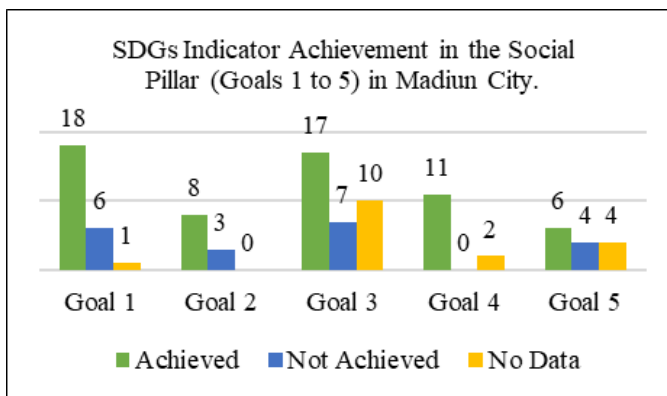


Figure 3: SDGs achievement in the social pillar (Goals 1 to 5): Madiun Regency.

Based on the level of achievement in the social pillar in Madiun City, when viewed based on goals, it shows results similar to Madiun Regency. It is evident that SDGs 1, 3, and 4 had a higher level of attainment compared to SDGs 2 and 5. Interestingly, SDGs 4 achieved 100% attainment because other indicators lacked data, preventing a comprehensive analysis of their achievement. This illustrates that progress in sustainable development related to poverty alleviation (SDGs 1), gender equality (SDGs 3), and educational equality (SDGs 4) has been successful in Madiun City. Additionally, overall, the number of indicators that achieved their targets is higher than those that did not reach their targets in the social pillar, encompassing goals 1 through 5.

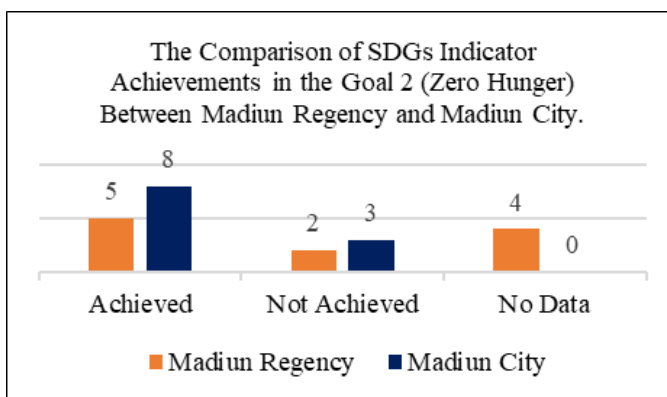


Figure 4: SDGs achievement in goal 2: Madiun Regency and Madiun City.

The comparison of SDGs 2 achievement between Madiun Regency and Madiun City indicates that the availability of SDGs data in Madiun Regency remains a concern when assessing the government’s commitment to SDGs attainment. The absence of data on SDGs indicators represents a stagnant condition, as there are no measurable benchmarks for achievement. This absence makes it more challenging to measure and determine SDGs achievement targets in the future. The role of the agricultural sector in contributing to SDGs 2 achievement may also be hindered due to the lack of a clear

understanding of what can be achieved and the appropriate strategic steps to reach indicator targets, both in the short and long-term leading up to 2030.

Madiun Regency has four indicators without available data, contrasting with Madiun City, which has data for each indicator, allowing for the measurement of achievement status. This also highlights a data availability gap between city and regency levels, with urban areas tending to have more comprehensive and up-to-date data. Based on the achievement of SDGs 2 in Madiun Regency, five out of eleven indicators have reached their targets, while in Madiun City, eight out of eleven targets have been achieved (Table 1).

SDGs 2 globally comprises 8 targets ranging from 2.1 to 2.5 and 2a to 2c, generally focusing on food security, sustainable agriculture, and the marketing of agricultural products. However, this discussion only utilizes SDGs 2 indicators for three targets: 2.1, 2.2, and 2.3, in line with the implementation efforts of SDGs in Indonesia at both the regency and city levels, as outlined in Presidential Regulation No. 59 of 2017. Target 2.1 addresses food security for the poor and vulnerable population, target 2.2 focuses on meeting nutritional needs in vulnerable societal segments, and target 2.3 aims to enhance agricultural productivity and income for the poor and vulnerable population engaged in the agricultural sector.

The role of the agricultural sector in target 2.1 is related to producing a sufficient and accessible distribution of agricultural products, especially for the poor. This is evident from the indicators within target 2.1, which include the prevalence of food consumption inadequacy, food vulnerability, and malnutrition prevalence. The agricultural sector plays a crucial role in achieving sustainable food security, measured by the decreasing inadequacy and vulnerability to food shortages in the community.

Meanwhile, in target 2.2, the role of the agricultural sector is crucial in maintaining the quality and standards of agricultural products as the primary source of nutrition for women, pregnant mothers, adolescents, and the elderly. Therefore, the achievement of indicators in target 2.2 is measured by the reduction of anemia in pregnant women, increased exclusive breastfeeding for infants under 6 months, and improvements in the quality of food consumption and fish consumption levels. Similarly, in target 2.3, the role of the agricultural sector in enhancing the productivity of agricultural products contributes to the achievement of indicators related to increasing the added value of agriculture.

TABLE 1: The achievement of SDGs indicators in goal 2: Madiun Regency and Madiun City.

SDGs Indicator in Goal 2		Target*	Status**	
No. Indicator	Indicator		Madiun Regency	Madiun City
2.1.1*	Prevalence of Undernourishment	Decreased.	n/a	NA
2.1.1.(a)	Prevalence of malnutrition (underweight) in children under five years old.	Decreased to 17%.	A	A
2.1.2*	Prevalence of the population experiencing moderate or severe food insecurity, based on the Food Insecurity Experience Scale.	Decreased.	n/a	A
2.1.2.(a)	Proportion of the population with calorie intake below the minimum threshold of 1400 kcal per capita per day.	Decreased to 8.5%.	n/a	A
2.2.1*	Prevalence of stunting in children under five years old.	Decreased.	A	A
2.2.1.(a)	Prevalence of stunting in children under two years old.	Decreased to 28%.	A	A
2.2.2*	Prevalence of malnutrition (weight/height) in children under five years old, categorized by type.	Decreased.	A	NA
2.2.2.(a)	Prevalence of anemia in pregnant women.	Decreased to 28%.	NA	A
2.2.2.(b)	Percentage of infants under six months receiving exclusive breastfeeding.	Increased to 50%.	A	A
2.2.2.(c)	The quality of food consumption measured by the Pattern of Expected Food Score (PPH) and the level of fish consumption.	Increased to: PPH score 92.5; fish consumption rate 54.5 kg per capita per year.	NA	NA
2.3.1*	Agricultural Value Added divided by the number of agricultural workforce (in Indonesian Rupiah per worker).	Increased.	n/a	A

Information:

* In accordance with Presidential Regulation of the Republic of Indonesia Number 59 of 2017

** Based on data from 2016 to 2020

A = target achieved

NA = target not achieved

n/a = no data

The results of the analysis of SDGs 2 indicators in Madiun Regency indicate that indicators lacking data include indicator 2.1.1*, which is the prevalence of inadequate food consumption, indicator 2.1.2.(a) Proportion of the population with a minimum calorie

intake below 1400 kcal/capita/day, indicator 2.1.2* Prevalence of the population with moderate or severe food vulnerability, and indicator 2.3.1* Agricultural Value Added divided by the number of agricultural sector workers. This will undoubtedly complicate the efforts of the Madiun Regency government in achieving these indicators, given the lack of a clear understanding of the current conditions and the level of achievement of these indicators. Meanwhile, the indicators that have not been achieved are in target 2.2, indicating that the role of the agricultural sector in fulfilling the main source of nutrition for the community still needs improvement through the enhancement of the quality and standards of agricultural products.

In SDGs 2, Madiun City has not yet achieved the targets for indicators 2.1.1*, 2.2.2*, and 2.2.2.(c), which are related to the prevalence of inadequate food consumption not considered to have decreased, as well as the prevalence and quality of food consumption figures. The role of the agricultural sector in this context is to pay attention to ensuring sufficient access to food consumption for the people in Madiun City, especially in strengthening rural-urban linkages, where the supply of agricultural products tends to be produced outside the urban areas.

4. Discussion

The agricultural sector is closely linked to the achievement of SDGs goal 2, but indirectly it also interrelates with goal 6 concerning water and sanitation management, energy (goal 7), environmental technology (goal 9), urban development (goal 11), sustainable production and consumption (goal 12), and climate action (goal 13). This reference is based on the concept of sustainable agriculture and the complex and inter-connected framework of the food system, which involves elements of human, technology, environment, and regional morphology [9].

On the other hand, the agricultural sector can have both positive and negative impacts on the environment [10]. This means that if associated with the efforts of the agricultural sector to achieve SDGs goal 2 by transforming into intensive and high-productivity farming, it can, on the flip side, lead to environmental issues such as genetic pollution, water pollution, and land degradation, which, in turn, will hinder the achievement of SDGs in other goals, such as goal 13 (climate action) and goal 15 (terrestrial ecosystems).

Furthermore, there is often an inherent contradiction between strategies to achieve SDG targets in environmental aspects and SDGs in socio-economic aspects, where the

agricultural sector is expected to contribute to social development while simultaneously needing to consider environmental sustainability [11]. Therefore, a comprehensive study is required for the formulation of strategies and policy directions for the agricultural sector towards achieving SDGs before the implementation of programs or activities [12].

The role of extensive interdisciplinary research is crucial to understand the complexity of interactions within agricultural systems, such as the food system, biodiversity, climate change, and socio-economic interactions, as well as the role of stakeholders. This is necessary to navigate the direction of sustainable development in the agricultural sector within the context of achieving the SDGs by 2030 [12].

5. Conclusion

The research findings revealed that in Madiun District, out of the 11 indicators in Goal 2, 4 indicators lacked data. In terms of achievement levels, 5 indicators were achieved and 2 indicators were not achieved. In contrast, Madiun City had data for each indicator, with 8 indicators achieved and 3 indicators not achieved. The research concluded that data availability for development indicators at the municipal government level was significantly better compared to the district level. The urgency of data availability lay in obtaining an overview of sustainable development achievement in a region and determining future steps through policies and strategic measures, particularly in supporting sectors like agriculture.

In conclusion, the agricultural sector plays a pivotal role in attaining SDG Goal 2 while influencing various other goals indirectly. However, pursuing intensive and high-productivity farming practices to achieve SDGs may lead to environmental repercussions, posing challenges to goals such as climate action and preservation of terrestrial ecosystems. The inherent contradiction between socio-economic development and environmental sustainability necessitates a comprehensive approach in formulating strategies and policies for the agricultural sector's contribution to SDGs. Extensive interdisciplinary research is indispensable for understanding the intricate dynamics within agricultural systems and aligning them with the broader objectives of sustainable development by 2030. Thus, concerted efforts and informed decision-making are imperative to ensure that the agricultural sector effectively contributes to the holistic achievement of the SDGs while mitigating adverse environmental impacts.

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