

Rice Productivity Trends and Food Security Implications in Indonesia: Evidence from Agricultural Statistics 2025

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Abstract

Rice remains the cornerstone of Indonesia's food security strategy and plays a vital role in supporting national economic development and agricultural sustainability. Understanding recent productivity trends is essential for evaluating the country's capacity to achieve long-term food self-sufficiency objectives. This study aims to examine changes in rice harvested area, production, and productivity in Indonesia using official national agricultural statistics. The research employed a quantitative descriptive approach based on secondary data obtained from Agricultural Statistics 2025 published by the Ministry of Agriculture. Trend analysis was conducted using national rice production indicators from 2020 to 2024. The results indicate that harvested area declined from 10.657 million hectares in 2020 to 10.046 million hectares in 2024, while rice production decreased from 54.649 million tons to 53.143 million tons during the same period. Despite the contraction in harvested area, national rice productivity remained relatively stable, reaching 52.90 quintals per hectare in 2024, suggesting improvements in cultivation efficiency and technological adoption. These findings imply that productivity enhancement has partially offset reductions in cultivated land, thereby supporting Indonesia's food security objectives. The study highlights the importance of innovation-driven agricultural policies, sustainable land management, and productivity-oriented interventions to strengthen national food resilience amid increasing pressure on agricultural resources.

Keywords: Rice Productivity, Food Security, Harvested Area, Agricultural Statistics, Indonesia

1. Introduction

Rice constitutes the primary staple food for the majority of Indonesia's population and plays a central role in national food security, rural livelihoods, and agricultural economic stability [4], [5], [18]. As one of the most strategic commodities in Indonesia, rice is not only important as a source of daily caloric intake but also as a key indicator of agricultural performance and food system resilience [5], [11], [18]. Stable rice production is therefore essential to maintaining food availability, controlling food price fluctuations, and supporting the welfare of farming communities [4], [5], [11].

In the context of national development, the Indonesian government has placed food self-sufficiency as one of its major strategic priorities through various agricultural development programs and strategic policies [1], [6]. The agricultural development agenda for 2024–2029

emphasizes the need to strengthen domestic food production capacity through productivity improvement, infrastructure development, technological innovation, and sustainable resource management [1], [16], [17]. This policy direction reflects the increasing importance of reducing dependence on external food supply while ensuring that national agricultural systems remain adaptive to changing demographic, environmental, and economic conditions [4], [6], [17].

Despite its strategic importance, Indonesia's rice sector continues to face several structural challenges that may threaten long-term production sustainability [8], [10], [14]. The availability of agricultural land is under pressure due to land conversion, urban expansion, and competing land uses, while climate change has increased the frequency of droughts, floods, and irregular rainfall patterns that directly affect rice cultivation [8], [10], [14]. At the same time, population growth continues to increase food demand, requiring higher production from increasingly limited agricultural resources [4], [6]. These conditions indicate that maintaining rice production through land expansion alone is becoming increasingly difficult and economically less feasible [16], [17].

Consequently, productivity improvement has become a critical factor in sustaining national rice production and ensuring long-term food security [9], [15], [17]. Higher yield per unit of harvested area can compensate for declining agricultural land while maintaining adequate rice supply for the growing population [16], [17]. Improvements in seed quality, irrigation systems, mechanization, farmer capacity, and climate-adaptive farming practices have been widely recognized as effective approaches to increasing agricultural productivity [7], [9], [15]. Therefore, monitoring trends in harvested area, production, and productivity is essential for evaluating the effectiveness of agricultural development policies and determining whether Indonesia's rice sector remains capable of supporting sustainable food security objectives [1], [2], [3].

This study aims to analyze recent trends in rice harvested area, production, and productivity in Indonesia using official data from Agricultural Statistics 2025 published by the Ministry of Agriculture [1]. By examining national rice production indicators during the 2020–2024 period, this study provides an empirical overview of the recent performance of Indonesia's rice sector and evaluates its implications for national food security [1], [2], [3]. Unlike previous studies that primarily focused on local case studies or specific determinants of rice production [8]–[15], this research utilizes comprehensive national statistical data to identify recent production trends and provide evidence-based policy recommendations. The findings are expected to contribute to data-driven agricultural planning, strengthen productivity-oriented development strategies, and support Indonesia's long-term rice self-sufficiency goals [4], [16], [17].

2. Materials and Methods

This study was conducted using a systematic methodological framework to examine recent trends in rice productivity and evaluate their implications for national food security in Indonesia [1], [4]. The research methodology encompasses the selection of an appropriate research design, the use of reliable secondary data sources, the identification of key analytical variables, and the application of statistical techniques to interpret changes in rice production performance over time [1], [19]. By adopting a structured approach, the study seeks to provide an objective and evidence-based assessment of Indonesia's rice sector using official national statistics [1], [2].

The following subsections describe the research procedures in detail, including the research design, data sources, variables and units of analysis, and methods of data analysis. These methodological components were carefully selected to ensure the reliability, validity, and consistency of the findings while facilitating the interpretation of long-term production trends [1], [19]. Furthermore, the chosen approach supports the formulation of policy-relevant conclusions regarding productivity enhancement and sustainable food security strategies based on empirical



statistical evidence [4], [17].

2.1 Research Design

This study employed a descriptive quantitative research design based on secondary data analysis [1], [2]. The design was chosen because the main purpose of the study is to examine rice productivity trends in Indonesia using numerical data from official statistical sources [1]. Rather than testing an experimental treatment, this research focuses on describing patterns, changes, and tendencies in rice harvested area, paddy production, and productivity over a specific period [1], [3].

A descriptive quantitative approach is appropriate for studies that aim to provide an empirical overview of agricultural performance [19]. In this study, the approach enables the use of measurable indicators to explain how Indonesia's rice sector has developed from 2020 to 2024 [1]. Through this design, annual changes in harvested area, production volume, and yield can be systematically observed and compared [1], [2].

The study relied entirely on secondary data because the required information was already available in the official publication *Agricultural Statistics 2025* [1]. Secondary data analysis allows the research to use nationally standardized data that have been compiled and validated by relevant government institutions [1], [2]. This is important because national agricultural statistics provide broader coverage and greater comparability than primary data collected from a limited field location [2], [3].

This research did not involve field experiments, household surveys, or direct observation of farming practices. Instead, it focused on interpreting existing statistical records to understand national rice production performance [1]. The use of official data is suitable for identifying macro-level trends and for discussing policy implications related to food security, productivity improvement, and sustainable agricultural planning [4], [17].

Overall, the research design provides a structured basis for analyzing the relationship between harvested area, paddy production, and productivity [1]. By applying descriptive quantitative analysis, the study is able to explain whether changes in rice productivity have contributed to maintaining production stability despite changes in harvested area [1], [19]. This design also supports the formulation of evidence-based conclusions regarding Indonesia's food security strategy [4], [17].

2.2 Data Source

The data used in this study were obtained from *Agricultural Statistics 2025*, published by the Ministry of Agriculture of Indonesia [1]. This publication serves as an official statistical reference for agricultural development in Indonesia. It presents agricultural data compiled from multiple government institutions and related data producers [1], [2]. The use of this source ensures that the analysis is based on nationally recognized and standardized information. Therefore, the dataset is considered appropriate for examining rice productivity trends at the national level [1].

Agricultural Statistics 2025 contains a wide range of agricultural indicators covering upstream agribusiness, on-farm agribusiness, downstream agribusiness, and supporting services [1]. For this study, the relevant data were taken from the on-farm agribusiness section, particularly the food crops subsection [1]. This subsection provides information on paddy and secondary crops in Indonesia [2]. The selected data include harvested area, paddy production, and rice productivity, which are directly related to the research objective of evaluating rice production performance [1], [2].

The publication compiles data from several official institutions, including the Ministry of Agriculture, Statistics Indonesia, and agricultural offices across Indonesia [1], [2]. Such institutional collaboration improves the reliability and coverage of the dataset. The data are presented in a consistent time-series format, allowing comparison across years [1]. This consistency is important



for identifying trends and changes in rice production indicators [19].

The period analyzed in this study covers the years 2020 to 2024 [1]. This five-year period was selected because it represents the most recent statistical series available in Agricultural Statistics 2025 [1]. The period also provides sufficient information to observe changes in harvested area, production, and productivity over time [2]. By using recent data, the study reflects the current condition of Indonesia's rice sector and supports evidence-based policy analysis [4].

All data used in this study were treated as secondary data and were not modified beyond analytical processing [1]. The figures were reorganized into tables to support interpretation and comparison. Harvested area was expressed in thousand hectares, paddy production in thousand tons, and productivity in quintals per hectare according to the original statistical publication [1]. The use of standardized units improves data consistency and facilitates comparison across years [19].

2.3 Variables and Units of Analysis

The analysis in this study focused on three main variables related to rice production performance: harvested area, paddy production, and rice productivity [1], [5]. These variables are widely recognized as the primary indicators for evaluating agricultural production systems and food crop performance [5]. Together, they provide a comprehensive assessment of both production capacity and production efficiency [4].

The first variable was harvested area, measured in thousand hectares [1]. Harvested area refers to the total area of rice fields harvested within a given year and reflects the physical scale of rice cultivation [2]. Changes in harvested area may indicate land expansion, land conversion, or changes in cropping intensity [1]. Therefore, this variable is important for evaluating the availability of agricultural land for rice production.

The second variable was paddy production, measured in thousand tons [1]. Paddy production represents the total output of dry unhusked rice produced during a specific year [2]. Because rice is the principal staple food in Indonesia, this variable directly reflects national food availability and agricultural production performance [4], [11].

The third variable was rice productivity, measured in quintals per hectare [1]. Productivity indicates the average yield produced from each hectare of harvested land and reflects production efficiency rather than production quantity alone [9], [15]. Higher productivity allows greater production despite limited agricultural land, making it an essential indicator for evaluating sustainable food production [17].

The unit of analysis in this study was the national rice production system of Indonesia during the 2020–2024 period [1]. The research did not examine individual farmers or specific regions but instead focused on national aggregate statistics [2]. This approach enables broader policy interpretation regarding productivity trends and national food security [4], [17].

2.4 Data Analysis Method

Time-series analysis was applied to examine changes in rice production indicators from 2020 to 2024 [1], [19]. This method enables the identification of annual trends in harvested area, paddy production, and productivity [19]. Through time-series analysis, changes in production performance can be systematically evaluated using comparable annual observations [1].

Descriptive statistics were used to summarize the main characteristics of the data [19]. Harvested area, production, and productivity values were organized into tables to facilitate comparison across years [1]. This approach simplifies numerical interpretation while preserving the original information contained in the official statistics [1].

Percentage change analysis was employed to quantify increases or decreases in each production indicator over time [19]. This analysis provides a clearer understanding of the magnitude



and direction of annual changes in harvested area, production, and productivity [1]. Consequently, the analysis supports objective evaluation of recent trends in Indonesia's rice sector [2].

Finally, the statistical results were interpreted in relation to national food security [4], [11]. The analysis examined whether improvements in productivity could compensate for declining harvested area and sustain national rice production [9], [15]. The findings were then used to formulate policy recommendations concerning productivity enhancement, sustainable land management, and long-term rice self-sufficiency in Indonesia [16], [17].

3. Results

This section presents the findings of the analysis based on official rice production statistics in Indonesia for the period 2020–2024 [1], [2], [3]. The results focus on changes in harvested area, paddy production, and rice productivity to provide a comprehensive overview of the performance of the national rice sector [1], [5]. By examining these indicators over time, the study aims to identify key trends and evaluate the extent to which productivity has contributed to maintaining production under changing agricultural conditions [4], [17].

The presentation of the results is organized into three main subsections. The first subsection discusses national trends in harvested area and paddy production, followed by an analysis of rice productivity performance. The final subsection examines the implications of these findings for Indonesia's food security, highlighting the importance of productivity-oriented strategies in supporting sustainable agricultural development and long-term rice self-sufficiency [4], [11], [17].

3.1 National Trends in Harvested Area and Rice Production

The official statistics reveal a gradual decline in harvested area over the last five years [1], [2], [3]. Total harvested area decreased from 10,657 thousand hectares in 2020 to 10,046 thousand hectares in 2024, indicating a reduction of approximately 611 thousand hectares during the observed period [1]. Paddy production also declined from 54,649 thousand tons in 2020 to 53,143 thousand tons in 2024 [1]. These trends suggest that Indonesia's rice sector experienced pressure from declining harvested area, although production remained relatively stable at the national level [4], [11].

Table 1. National rice harvested area and production in Indonesia (2020–2024)

Year	Harvested Area (ha)	Production (tons)
2020	10,657	54,649
2021	10,412	54,415
2022	10,453	54,749
2023	10,214	53,981
2024	10,046	53,143

Table 1 presents the national trends in harvested area and paddy production in Indonesia during the 2020–2024 period [1]. The data indicate a gradual decline in harvested area from 10,657 thousand hectares in 2020 to 10,046 thousand hectares in 2024. Likewise, paddy production decreased from 54,649 thousand tons to 53,143 thousand tons over the same period [1]. Although both indicators followed a downward trajectory, the decline occurred gradually rather than abruptly, suggesting that the rice sector remained relatively stable despite changes in cultivated land availability [4], [17].

A closer examination of the data shows that harvested area and production experienced a slight increase in 2022 compared with 2021 before continuing their downward trend in 2023 and 2024 [1]. This pattern indicates that annual rice production is influenced by multiple factors



beyond land availability, including productivity improvements, technological adoption, and agricultural management practices [7], [9], [15]. The relatively moderate decline in production compared with the reduction in harvested area suggests that productivity gains have helped sustain national output [9], [15]. Overall, the figures demonstrate the importance of enhancing production efficiency to support Indonesia's long-term food security and rice self-sufficiency objectives [4], [11], [17].

3.2 Rice Productivity Performance

Despite the decline in harvested area, national rice productivity remained relatively stable during the observed period [1]. In 2024, average rice productivity reached 52.90 quintals per hectare, indicating that Indonesia was still able to maintain a relatively efficient level of rice production [1]. This condition suggests that production performance was not determined solely by the size of harvested area but also by productivity improvement [9], [15]. Instead, productivity played an important role in sustaining national paddy output and supporting agricultural resilience [4], [17].

Rice productivity reflects the average yield obtained from each hectare of harvested land [5]. Therefore, productivity is an important indicator for assessing the efficiency of the rice farming system [9], [15]. When harvested area declines, productivity becomes increasingly important because higher yield per hectare can help reduce the impact of land reduction on total production [16], [17]. In this context, stable productivity provides evidence that rice farming practices continued to contribute positively to national production resilience [4], [11].

The relatively stable productivity level may be associated with several supporting factors, including the use of improved seed varieties, better crop management, irrigation support, mechanization, and farmer adaptation to changing environmental conditions [7], [9], [15]. Although the data used in this study do not directly measure each of these factors, the productivity outcome indicates that production efficiency was maintained [1]. This is important for Indonesia because the availability of agricultural land continues to face pressure from land conversion and competing land uses [8], [10], [14].

The 2024 productivity figure also shows that the decline in harvested area did not lead to a proportional decline in paddy production [1]. While harvested area decreased from 10,657 thousand hectares in 2020 to 10,046 thousand hectares in 2024, production only declined from 54,649 thousand tons to 53,143 thousand tons [1]. This pattern suggests that yield performance helped moderate the negative effect of reduced harvested area [9], [15]. Therefore, productivity improvement can be viewed as a key mechanism for maintaining national rice production stability [16], [17].

Overall, rice productivity performance has important implications for Indonesia's food security strategy [4], [11]. As opportunities for expanding agricultural land become more limited, increasing productivity per hectare will become more critical for sustaining rice supply [16], [17]. Policies that strengthen seed quality, irrigation systems, mechanization, extension services, and climate-resilient farming practices are needed to maintain and improve future productivity [7], [9], [15]. Thus, productivity-oriented agricultural development should remain a central component of Indonesia's long-term rice self-sufficiency and food security agenda [4], [17].

3.3 Implications for Food Security

The observed trends suggest that Indonesia's food production system is increasingly dependent on productivity enhancement rather than land expansion [4], [11], [17]. Harvested area contracted by approximately 611 thousand hectares between 2020 and 2024, while total paddy production decreased by only about 1.5 million tons [1]. This indicates that production decline was relatively moderate compared with the reduction in harvested area. Such a pattern reflects the



important contribution of productivity in sustaining national rice output [9], [15].

From a food security perspective, the ability to maintain production under declining harvested area is highly significant [4], [5]. Rice remains the main staple food for most Indonesians, so any major disruption in rice production may affect food availability and price stability [4], [18]. Stable production performance helps reduce the risk of supply shortages and strengthens the resilience of the national food system [11], [12]. Therefore, productivity improvement should be viewed as a strategic component of food security policy [4], [17].

The findings also imply that Indonesia cannot rely solely on land expansion to increase rice production [16], [17]. Agricultural land faces continuous pressure from urbanization, infrastructure development, industrial activities, and environmental degradation [8], [10]. Under these conditions, the efficient use of existing agricultural land becomes increasingly important. Higher productivity per hectare can help compensate for limited land availability and support long-term production stability [9], [15].

Productivity-oriented strategies may include the use of superior rice varieties, improved irrigation systems, mechanization, balanced fertilizer application, and better pest and disease management [7], [9], [15]. In addition, climate-adaptive farming practices are needed to reduce the impact of rainfall variability, drought, and extreme weather events [8], [10], [14]. Strengthening farmer capacity through extension services is also essential to ensure that technological innovations are effectively adopted at the farm level [7], [15]. These measures can improve production efficiency and contribute to more sustainable rice farming systems [16], [17].

Overall, the trends observed in this study highlight the need for a stronger policy focus on sustainable intensification [16], [17]. Food security should not only be understood as increasing total production, but also as improving the efficiency, stability, and resilience of the production system [4], [11]. By prioritizing productivity enhancement, Indonesia can better manage the challenges of declining harvested area and increasing food demand [9], [17]. This approach is essential to support national rice self-sufficiency and strengthen long-term food security [1], [4], [17].

4. Discussion

The findings demonstrate that Indonesia's rice sector has shown resilience despite reductions in harvested area during the 2020–2024 period [1], [2]. Although harvested area declined from 10,657 thousand hectares to 10,046 thousand hectares, paddy production decreased only moderately [1]. This indicates that the decline in cultivated land did not directly result in a proportional decline in production. Such a pattern suggests that productivity performance has played an important role in maintaining national rice output [9], [11], [15].

Stable productivity levels indicate that improvements in farming efficiency may have helped compensate for shrinking harvested area [9], [15]. Factors such as improved seed quality, better irrigation management, mechanization, and more effective crop management practices may have contributed to this condition [7], [9], [15]. Although this study does not directly measure those factors, the observed production pattern suggests that rice farming systems have become more efficient [9]. This finding is important because productivity improvement is increasingly necessary in the context of limited agricultural land availability [16], [17].

These results are consistent with the Ministry of Agriculture's strategic emphasis on food self-sufficiency through productivity improvement rather than extensive land expansion [1]. The national agricultural development direction places strong emphasis on sustainable intensification, modernization, and improved agricultural infrastructure [1], [16], [17]. This policy orientation is relevant because expanding rice cultivation areas is becoming more difficult due to land conversion, urbanization, and environmental pressures [8], [10], [14]. Therefore, increasing yield per unit area



becomes a more realistic and sustainable strategy for maintaining food supply [16], [17].

Nevertheless, continued declines in harvested area may pose long-term risks if productivity growth stagnates [4], [8]. If yield improvements are unable to compensate for future land reductions, national rice production may become more vulnerable to supply shocks [4], [11]. This condition could affect food availability, market stability, and household food access, particularly because rice remains the main staple food in Indonesia [4], [5], [18]. Therefore, the stability observed during the study period should not reduce the urgency of strengthening long-term productivity strategies [17].

Future policies should prioritize irrigation modernization, digital agriculture, climate-resilient farming systems, and the dissemination of superior rice varieties [7], [9], [15]. Strengthening agricultural research, extension services, and farmer capacity is also essential to ensure that technological innovations are effectively adopted at the farm level [7], [9], [15]. In addition, sustainable land management is needed to protect productive rice fields from excessive conversion [8], [10]. By combining productivity enhancement with land protection and technological modernization, Indonesia can strengthen its rice sector and support long-term national food security [4], [16], [17].

5. Conclusion

Analysis based on Agricultural Statistics 2025 indicates that Indonesia experienced a gradual decline in harvested rice area between 2020 and 2024 [1]. The harvested area decreased from 10,657 thousand hectares in 2020 to 10,046 thousand hectares in 2024 [1], [2]. During the same period, paddy production also declined from 54,649 thousand tons to 53,143 thousand tons [1]. However, the decline in production was relatively modest compared with the reduction in harvested area, indicating that production performance remained relatively resilient [1], [11].

The findings show that national rice productivity remained relatively stable, reaching 52.90 quintals per hectare in 2024 [1]. This indicates that productivity played an important role in maintaining production performance despite decreasing harvested area [9], [15]. Stable productivity suggests that improvements in farming efficiency, crop management, and production technology may have helped reduce the negative impact of land contraction [7], [9], [15]. Therefore, productivity improvement can be considered a key factor in sustaining national rice output and strengthening agricultural resilience [4], [17].

This study also highlights that Indonesia's food security strategy should not rely solely on land expansion [4], [17]. As agricultural land faces increasing pressure from conversion and competing uses, productivity per unit area becomes more important [8], [10], [14]. Enhancing yield performance is essential to maintain rice availability and support national food self-sufficiency [4], [11], [17]. This finding reinforces the need for productivity-oriented agricultural development as a long-term national strategy [16], [17].

Future food security policies should prioritize technological innovation, sustainable agricultural practices, and resource optimization [7], [9], [17]. Improvements in irrigation systems, seed quality, mechanization, fertilizer management, and climate-resilient farming practices are needed to strengthen rice production [7], [9], [15]. In addition, farmer extension services and research support should be enhanced to ensure effective adoption of agricultural innovations [7], [15]. These measures are important for sustaining productivity gains and strengthening Indonesia's long-term food security [4], [17].

Overall, the study concludes that Indonesia's rice sector remains relatively resilient but faces important structural challenges [1], [4]. The gradual decline in harvested area should be addressed through stronger land protection and sustainable intensification strategies [16], [17]. Maintaining



and improving productivity will be essential to ensure stable rice production in the future [9], [15]. Such efforts will support Indonesia's long-term food security and rice self-sufficiency goals while enhancing the sustainability of the national agricultural system [4], [16], [17].

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