

Analysis of Indonesian Sugar Production Consumption and Import Trends in 2010-2024

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Article Info

Article History:

Received August 21, 2026

Revised September 8, 2026

Accepted: October 9, 2026

Keywords:

Sugar, Production, Consumption, Import, Trend Analysis.

Abstract

This study aims to analyze the trends of sugar production, consumption, and imports in Indonesia during 2010-2024 and project its development in 2025-2030. This study uses a quantitative descriptive method with a time series approach. Data analysis was carried out using the least square linear trend method (Least Square Method) based on secondary data obtained from the Central Statistics Agency (BPS), Trade Map, and various other supporting sources. The results of the study show that sugar production in Indonesia tends to decline during the observation period. Meanwhile, household sugar consumption also shows an increasing trend, along with the volume of sugar imports which shows a trend that continues to increase. The results of the projection until 2030 show that sugar production is expected to continue to decline, while sugar consumption and imports are projected to continue to increase. This condition indicates that national sugar needs have not been optimally met by domestic production, so dependence on imports is still relatively high.

Introduction

The introduction contains a research background that explains the context and urgency of the topic being studied. This section must describe the problems faced, research gaps, and relevant previous efforts or research as the basis for the development of the study. The author needs to include adequate literature citations to strengthen the scientific argument. In addition, the introduction should explain the problem-solving approach used, the purpose of the research, and the hypothesis (if the research is quantitative). The description is compiled systematically and flows from general to specific. Indonesia is an agrarian country where the agricultural sector is considered important because 25% of agricultural products can support economic growth and contribute to national GDP (Azzahra & Irawansyah, 2025). One of the commodities that has a high selling value is sugar. Sugar is an important commodity whose main function is used as a sweetener, either for household consumption or industrial raw materials (Hadi, 2024).

Apart from being a sweetener for food and industry, sugar is a source of calories because it contains simple carbohydrates that are also important for daily life (Damayanti et al., 2025). Sugar is classified as one of the nine staples needed by the community along with rice, milk, meat, eggs, and cooking oil in accordance with the decree of the Minister of Industry and Trade in number 114/MPP/Kep/2/1998 article 1 (Mudzofar & Bowo, 2020). Sugar is divided into white crystal sugar (GKP), refined sugar, and raw sugar according to its designation. GKP is used for household consumption, refined sugar as a raw material for the food and beverage industry, while raw sugar is used in the food, beverage, and pharmaceutical industries. (Puspitosari & Surono, 2020).

The sugar industry in Indonesia has experienced fluctuating development from time to time (Azrimultiya et al., 2025). At the beginning of the 20th century, the sugar industry reached its heyday with high productivity levels. However, since 1994, national sugar production has

tended to decline, affecting the ability to meet domestic needs (Heryanto & Suryatmana, 2020). There are many influences as well as factors both internal and external that make the national sugar production rate decrease from year to year. According to Rismawan et al., (2026) the shift in sugarcane production land to marginal land, inadequate technology, national sugar policies and highly distorted international trade are factors in the sugar problem in Indonesia. Indonesia's sugar production in 2024 will only reach 2,465,514 tons and will increase again in 2025 to 2.67 million tons (BPS, 2024). The decline shows that the national sugar production capacity still faces various challenges (Amaliya et al., 2025).

Sugar is one of the strategic commodities. Sugar is not only used to meet household consumption needs, but also as the main raw material for various industries, especially food and beverages (Sembiring & Widyastutik, 2023). The high demand for sugar has caused the amount of national consumption to reach 7 million tons over the past five years. National sugar consumption was recorded at 7.45 million tons, then increased to 7.60 million tons and 7.80 million tons, before dropping to 7.50 million tons and increasing again to 7.60 million tons from 2020 to 2024. This condition is influenced by many factors. Factors that affect the rate of sugar purchases are the number of populations, income, purchase price, and number of family members (Batubara & Rozaini, 2023).

Indonesia still imports sugar to meet domestic needs. This condition occurs because national sugar production has not been able to meet the demand from household consumption and the needs of the food, beverage, and pharmaceutical industries (Sitohang, 2022). Limited domestic production capacity causes the national sugar supply to not be met optimally, so Indonesia is still dependent on sugar imports as an effort to maintain the availability of supply and meet market needs (Sinuraya et al., 2024). Long-term dependence on imports has the potential to reduce national food self-sufficiency and increase vulnerability to fluctuations in international market prices, exchange rate changes, and global supply disruptions. (Fauzin, 2021). The highest import volume occurred in 2022 which reached 6,007,603 tons, an increase of 9.58% compared to 2021. On the other hand, sugar imports experienced the largest decline in 2023, which was 15.62% to 5,069,455 tons. Nevertheless, import volume increased again by 4.81% in 2024 to 5,313,529 tons. The high volume of imports shows that national sugar needs still cannot be met by domestic production, so Indonesia still depends on sugar supplies from abroad to meet consumption and industrial needs (Mudzofar & Bowo, 2020).

Although various studies on the Indonesian sugar sector have been carried out, most of the research still focuses on aspects of production, consumption or, most of the research still focuses on aspects of production, consumption, or imports separately. Studies related to the simultaneous development of the three variables with a long-term perspective are still relatively limited. An integrated analysis is needed to understand the dynamics of the balance between the availability and demand of national sugar and the level of dependence on sugar imports. Therefore, this study aims to analyze the trends of Indonesian sugar production, consumption, and imports during the period 2010-2024 and project its development in 2025-2030.

Method

Research Design

This study employs a quantitative descriptive approach using time-series data to analyze the trends in sugar production, consumption, and imports in Indonesia. The Least Squares Method is applied to identify historical patterns and estimate the direction of future trends in these three variables. This method determines a trend line by minimizing the sum of the squared

differences between the actual and estimated values. The analysis covers the period from 2010 to 2024, comprising 15 years of observations.

Data Sources and Variables

This study uses secondary data on national sugar production, consumption, and import volumes in Indonesia from 2010 to 2024. The data are collected from official sources, including Statistics Indonesia (Badan Pusat Statistik/BPS), the Ministry of Agriculture of the Republic of Indonesia, the Ministry of Trade of the Republic of Indonesia, the World Bank, and Trade Map. Additional information is obtained from relevant books and previous research articles to support the theoretical and empirical discussion. To ensure data consistency and facilitate replication, the authors should specify the source, unit of measurement, operational definition, and classification used for each variable. In particular, sugar consumption should be clearly defined to indicate whether it represents household consumption or total national consumption, including industrial demand.

Data Analysis Method

The data are analyzed using the Least Squares Method to determine the trends in Indonesian sugar production, consumption, and imports over the 2010–2024 period. This method estimates a linear trend equation by minimizing the sum of the squared deviations between observed data and estimated trend values. The resulting equation is used to describe the direction and magnitude of changes in each variable over time. The application of this method requires assigning time scores (XXX) to each observation according to the length of the study period. Since the study covers 15 years, an odd number of observations, the middle year, 2017, is assigned a time score of zero. The other years are assigned consecutive integer values, ranging from -7 to $+7$ for 2010 to 2024.

Least Squares Trend Equation

The linear trend equation used in this study is expressed as follows:

$$Y = a + bX$$

where Y represents the estimated value of sugar production, consumption, or imports; a is the intercept, representing the estimated value of Y when $X = 0$; b is the trend coefficient, indicating the average change in the variable for each one-year increase; and X represents the time score assigned to each year of observation.

For a time series with an odd number of observations and time scores centered at zero, the intercept and trend coefficient can be calculated using the following equations:

$$a = \frac{\sum Y}{n} \quad b = \frac{\sum XY}{\sum X^2}$$

where n represents the number of observations, Y denotes the actual annual data, and X denotes the assigned time score. The intercept a represents the average value of the observed data over the study period, while the coefficient b indicates the direction and magnitude of the linear trend. A positive value of b indicates an increasing trend, whereas a negative value indicates a decreasing trend. A coefficient close to zero suggests that the variable has little linear change over the observation period.

Trend Estimation and Interpretation

After calculating the intercept and trend coefficient, the estimated values for sugar production, consumption, and imports are obtained by substituting the corresponding time scores into the

linear trend equation. The estimated trend values are then compared with the historical data to identify the general development patterns of each variable. The results are interpreted to determine whether Indonesian sugar production, consumption, and imports exhibit increasing or decreasing trends during the study period. If the authors intend to project trends beyond 2024, the extrapolation period and forecast years should also be explicitly stated. The interpretation should acknowledge that the Least Squares Method captures linear historical patterns and does not, by itself, account for changes in government policy, market prices, weather conditions, or other factors that may influence future sugar production, consumption, and imports.

Result and Discussion

Indonesian Sugar Production Trends

Sugar is one of the strategic food commodities that has an important role in meeting the needs of the community and supporting various industrial activities. National sugar demand is influenced by population growth, the development of the food and beverage industry, and changes in people's consumption patterns (Silalahi, 2024). High productivity is needed to meet the high demand for sugar from both household and industrial consumers. The development of sugar production in Indonesia from 2010-2024 has experienced a fluctuating increase. Data on the development of corn production can be seen in Figure 1.



Figure 1. Sugar Production Trends in Indonesia in 2010-2024

Based on the results of trend analysis using the least square method, a trend equation of $Y = 235,441.35 - 9840.7X$ was obtained. The value of constant (a) of 235,441.35 tons indicates the average sugar production during the study period. Meanwhile, the value of trend coefficient (b) of -9840.7 tons per year shows that sugar production has a decreasing trend from year to year. A negative trend coefficient indicates that sugar production is expected to decline by an average of 9,840.7 tonnes per single time. When compared to previous research conducted by Heryanto and Suryatman (2020), the production trend is still stable and has decreased. Where in 2019, GKP's productivity was only around 2,227,051 tons. Meanwhile, in 2024 the production figure will also only reach 2,465,514 tons.

Production problems in the Indonesian sugar industry occur in both the on-farm and off-farm subsystems. The decline in production can be caused by the narrowing of sugarcane production land as the main raw material for sugar production, as well as the low yield of sugarcane causing sugar crystals to decrease (Puspitosari et al., 2019). In addition, factory management, raw materials, lack of labor, and technology that has not been properly managed are factors

why Indonesia's sugar production is still not optimal (Amin et al., 2024). Competition in obtaining sugarcane supplies from farmers has prompted some sugar mills to accept sugarcane from areas outside the ideal distance between the mill and the sugarcane fields. This condition causes increased transportation costs and extends transportation time. As a result, the quality of sugarcane can decrease because the milling process is not carried out in the optimal time after harvesting, thus affecting a decrease in price yield (Sinuraya et al., 2024). The development of Indonesia's sugar production in the coming year can be predicted by knowing the trend of sugar production. Estimated sugar production will be carried out over the next six periods, namely in 2025-2030. The development of sugar production in Indonesia over the next six periods is presented in Table 1.

Table 1. Estimated Sugar Production in Indonesia in 2025-2030

Year	a	b	<i>Sugar production trends (tons)</i>
2025	235.441,35	-9840,7	227.568,79
2026			226.584,72
2027			225.600,65
2028			224.616,58
2029			223.632,51
2030			222.648,44

Source : *Processed Secondary Data, 2026*

The projection results show that Indonesia's sugar production in the 2025-2030 period is expected to continue to decline. Based on the results of trend analysis in Table 1. A constant value (a) of 235,441.35 tons was obtained, which reflects the average sugar production during the 2010-2024 period. Meanwhile, the value of trend coefficient (b) of -9840.7 tons per year shows that sugar production is estimated to decrease by an average of 9840.7 tons every year. Thus, national sugar production is projected to decrease gradually from 227,568.79 tons in 2025 to 222,648.44 tons in 2030. The projection indicates that domestic sugar production capacity still faces challenges, so efforts to increase productivity are needed to meet national sugar needs in the future.

Indonesian Sugar Consumption Trends

Sugar consumption is one of the important indicators in describing the level of community needs and the development of the industrial sector that uses sugar as the main raw material. As a strategic food commodity, sugar has a very important role in meeting household consumption needs and supporting industrial activities, especially the food, beverage, and various other processed products industries. The level of sugar consumption tends to change over time, which is influenced by various factors, such as population growth, increase in community income, changes in consumption patterns, and the development of the industrial sector that continues to increase the demand for sugar. Along with this increasing need, national sugar consumption also tends to increase, so adequate supply availability is needed to maintain a balance between demand and supply. If the increase in consumption is not balanced with the ability of domestic sugar production, there will be a supply deficit that has the potential to increase dependence on sugar imports.

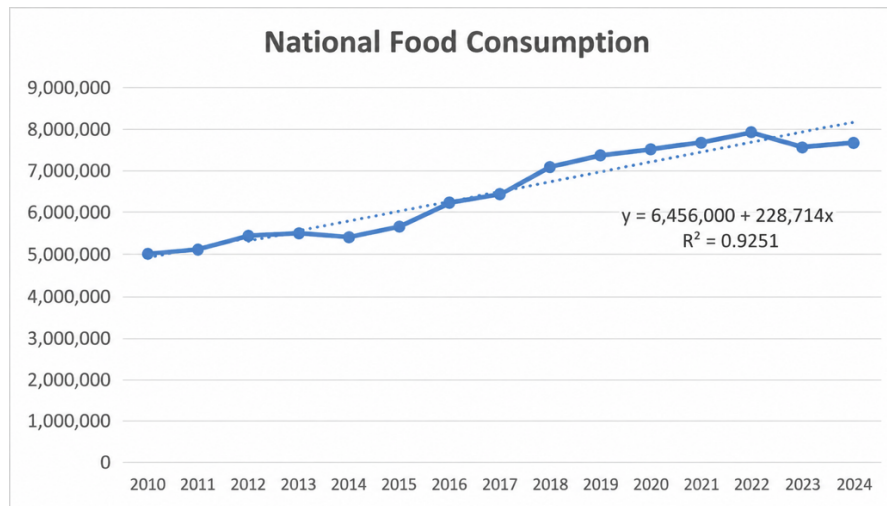


Figure 2. Indonesia's Sugar Consumption Trends in 2010-2024

Based on the results of trend analysis using the least square method, the equation of sugar consumption trends in Indonesia is obtained, which is $Y = 6,456,000 + 228,714x$. The value of constant (a) of 6,456,000 tons indicates the value of sugar consumption at the midpoint of the observation period. Meanwhile, the value of the trend coefficient (b) of 228,714 tons per year with a positive value indicates that sugar consumption in Indonesia tends to increase during the period 2010–2024. The value of the coefficient shows that sugar consumption is estimated to increase by an average of 228,714 tons with each addition of one period. The results of trend analysis show that the level of sugar consumption in Indonesia tends to increase from year to year.

According to Sriwidayanti *et al.*, (2024) the increase in national sugar consumption will occur due to the influence of several important factors, such as population growth, increasing income levels, and changes in people's tastes. Consumer income has a significant effect on the level of sugar demand, when a household's income is high, the demand for sugar will also increase. Conversely, when a household's income decreases, the demand for sugar also decreases (Batubara and Rozaini, 2023). In addition, the purchase price and the number of members is also important factors in the degree of influence of increasing demand for sugar by consumers. The development of Indonesia's sugar consumption in the coming year can be predicted by knowing the trend of sugar consumption. Estimated sugar consumption will be carried out for the next 6 years, namely in 2025-2030. The development of sugar consumption in Indonesia over the next 6 years is presented in Table 7.

Table 2. Estimated Sugar Consumption in Indonesia in 2025-2030

Year	a	b	Sugar consumption trends (ton)
2025	6.456.000	228.714	8.285.712
2026			8.514.426
2027			8.743.140
2028			8.971.854
2029			9.200.568
2030			9.429.256

Source : Processed Secondary Data, 2026

The projection results show that Indonesia's sugar consumption in the 2025-2030 period is expected to continue to increase. Based on the results of trend analysis in Table 2. A constant

value (A) of 6,456,000 tons was obtained, which reflects the average sugar consumption during the 2010-2024 period. Meanwhile, the value of trend coefficient (b) of 228,714 tons per year shows that sugar consumption is estimated to increase by an average of 228,714 tons every year. Thus, national sugar consumption is projected to increase gradually from 8,285,712 tons in 2025 to 9,429,256 tons in 2030. During this period, sugar consumption is estimated to increase by 13.80%. The projection shows that national sugar demand is expected to continue to increase in the coming period. This condition indicates the need to increase domestic sugar production to be able to keep pace with consumption growth so that dependence on sugar imports can be minimized.

Indonesian Sugar Import Trends

Sugar imports are one of the efforts made to meet national sugar needs when domestic production cannot meet demand. In addition to functioning to meet the needs of household consumption, sugar imports also play an important role in ensuring the availability of raw materials for various industrial sectors, especially the food, beverage, pharmaceutical, and other processing industries that use sugar as one of the main raw materials. The level of sugar imports in Indonesia is influenced by various factors, including the development of domestic sugar production, the increase in public consumption needs, the growth of demand from the industrial sector, changes in sugar prices in the international market, as well as government policies related to trade, import control, and food security.

When domestic sugar production is unable to keep up with the increase in demand, imports become an alternative to maintain supply availability and prevent a shortage of sugar in the domestic market. However, the continuous increase in imports can also show that Indonesia is still highly dependent on sugar supplies from abroad. Data on the development of Indonesia's sugar imports during the period 2010–2024 is presented in Figure 3.



Figure 3. Indonesian Sugar Import Trends in 2010-2024

Based on the results of trend analysis using the least square method, the equation of sugar import trends in Indonesia is obtained, which is $Y = 4,126,342.23 + 279,004.4x$. The value of constant (a) of 4,126,342.23 tons indicates the value of sugar imports at the midpoint of the observation period. Meanwhile, the value of trend coefficient (b) of 279,004.4 tons per year with a positive value indicates that sugar imports in Indonesia tend to increase during the period 2010–2024. The value of the coefficient shows that sugar imports are estimated to increase by

an average of 279,004.4 tons with each addition of one period. The results of trend analysis show that sugar imports in Indonesia tend to increase from year to year.

The increase in sugar import trends can be caused by the high demand for national sugar, especially from the industrial sector which continues to increase from year to year. If the increase in demand is not balanced by adequate domestic sugar production, there will be a deficit between the demand and availability of sugar. This condition encourages the government to meet supply shortages through imports. If the problem of domestic production continues without effective improvement efforts, the volume of sugar imports has the potential to increase every year (Aulia, 2024). In addition, the price difference between imported sugar and domestic sugar is also a factor that affects the increase in imports, because imported sugar generally has a lower price so that it is more in demand by consumers and industry players. Therefore, the right import policy is needed so that national sugar needs can be met without increasing excessive dependence on imported sugar (Nurjannah, 2015).

The development of Indonesia's sugar imports in the coming year can be predicted by knowing the trend of sugar imports. It is estimated that sugar imports will be carried out for the next 6 years, namely in 2025-2030. The development of sugar imports in Indonesia over the next 6 years is presented in Table 3.

Table 3. Estimated Sugar Import in Indonesia in 2025-2030

Year	a	b	<i>Sugar import trend (ton)</i>
2025	4.126.342,23	279.004,4	6.358.377,61
2026			6.637.382,02
2027			6.916.386,43
2028			7.195.390,84
2029			7.474.395,25
2030			7.753.399,66

Source: Processed Secondary Data, 2026

The projection results show that Indonesia's sugar imports in the 2025-2030 period are expected to continue to increase. Based on the results of trend analysis in Table 3. A constant value (A) of 4,126,342.23 tons was obtained, which reflects the average sugar imports during the 2010-2024 period. Meanwhile, the value of trend coefficient (b) of 279,004.4 tons per year shows that sugar imports are estimated to increase by an average of 279,004.4 tons every year. Thus, national sugar imports are projected to increase gradually from 6,358,377.61 tons in 2025 to 7,753,399.66 tons in 2030. The projection shows that sugar imports are still expected to be one of the main sources in meeting national sugar needs. Therefore, policies are needed that can increase domestic sugar production and reduce dependence on imports to realize food independence.

Structural Challenges in Domestic Sugar Production and Increasing Consumption

The development of Indonesia's sugar sector reflects the challenges of maintaining a balance between domestic production capacity and the growing demand for sugar. One important issue is the structural limitation of the domestic sugar industry, particularly in the agricultural and processing subsystems. Sugar production depends not only on the availability of sugarcane plantations but also on the productivity of cultivated land, the quality of raw materials, and the efficiency of sugar mills. Mehdi et al. (2024) identified limitations in sugarcane cultivation and yield as factors associated with production constraints, while Molin et al. (2024) highlighted

the importance of production management and supply-side conditions. These findings indicate that strengthening domestic sugar production requires improvements across the entire production chain rather than interventions focused exclusively on increasing harvested area.

At the agricultural level, the availability and quality of sugarcane are important considerations in determining the efficiency of sugar production. Competition for sugarcane supplies and the distance between plantations and processing facilities can increase transportation costs and affect the time available for processing after harvest. Sinuraya et al. (2024) discussed challenges related to sugarcane procurement and processing efficiency in the national sugar industry. Such conditions illustrate the importance of coordination between farmers, plantation managers, and sugar mills. Improvements in cultivation practices, access to appropriate technology, and the use of suitable sugarcane varieties could support productivity enhancement. However, the effectiveness of these measures depends on local production conditions, farmers' access to resources, and the operational capacity of processing facilities.

On the demand side, sugar consumption is influenced by both household requirements and industrial activities. Population growth, income changes, purchasing power, and consumer preferences may contribute to changes in household demand, while the food and beverage industry requires sugar as an input for various processed products. Batubara & Rozaini (2023) identified household income, purchase prices, and family size as relevant factors in sugar demand. The coexistence of household and industrial demand makes national sugar planning more complex because the requirements of these market segments may differ in volume, quality, and intended use. Consequently, a clearer distinction between household consumption and total national sugar demand, including industrial use, is essential for assessing the adequacy of domestic production and determining future supply requirements.

The interaction between production constraints and consumption growth has important implications for the long-term development of Indonesia's sugar industry (Tegegn & Dhont, 2023; Solomon et al., 2024; Utama & Yasa, 2026). Increasing domestic production requires sustained improvements in agricultural productivity, raw-material availability, and processing efficiency, while consumption patterns must be monitored to support realistic supply planning. A production strategy that does not account for changing demand may be insufficient to address the broader challenges of the sugar sector. Conversely, demand estimates that do not distinguish household and industrial requirements may lead to inaccurate assessments of national supply needs. Therefore, an integrated approach connecting agricultural development, industrial modernization, and reliable demand information is necessary to strengthen the domestic sugar supply system and support progress toward greater sugar self-sufficiency.

Import Dependence and the Dynamics of National Sugar Supply

Sugar imports play an important role in Indonesia's domestic supply system because national production does not always meet the requirements of household consumers and industrial users. Imported sugar can supplement domestic availability and provide raw materials for industries that depend on a consistent supply. In this context, imports should be understood not only as an indicator of limited domestic production but also as part of the mechanism through which national demand is accommodated. The discussion by Sitohang (2022) on the prospects for Indonesian sugar self-sufficiency and the analysis by Mudzofar & Bowo (2020) on the determinants of sugar imports provide relevant perspectives for understanding the relationship between domestic supply capacity and external sourcing. The challenge for policymakers is to maintain adequate availability while gradually strengthening the capacity of the domestic industry.

Several factors may influence the volume of sugar imports, including domestic production, consumption requirements, industrial demand, international market prices, exchange rates, and government trade policies. When domestic supplies are insufficient, imports can help prevent shortages and maintain the availability of sugar for different users. However, the scale and timing of imports require careful consideration because domestic production is subject to seasonal and operational conditions, while import decisions are also affected by international market developments. A mismatch between import planning and actual domestic requirements may complicate supply management (Puzyrova et al., 2022; Esfandabadi et al., 2022; Gray, 2025). Therefore, decisions concerning import quantities should be supported by reliable assessments of production, consumption, inventories, and expected market demand rather than relying exclusively on historical import patterns.

Dependence on international supplies also creates potential vulnerabilities for the domestic sugar market. Changes in international prices, exchange rates, and global supply conditions may affect import costs and the availability of imported sugar. These risks are particularly relevant when domestic production cannot respond quickly to changes in demand. Fauzin (2021) discussed the broader relationship between food import regulation and food sovereignty, highlighting the policy relevance of managing external dependence. Nevertheless, imports should not automatically be regarded as detrimental to national food security, because they can serve as an important supply instrument when domestic production is insufficient. The central policy consideration is how to balance the immediate need for reliable supplies with longer-term efforts to develop a more productive and competitive domestic sugar industry.

A more coordinated approach to sugar import management would connect trade decisions with domestic production programs and demand projections. Import planning should consider the availability of domestically produced sugar, the requirements of household and industrial users, and changes in market conditions (Popescu, 2022; Al Azam et al., 2023; Odijie, 2024). At the same time, measures to improve the competitiveness of domestic producers could gradually reduce the structural pressures that contribute to import dependence. Such coordination requires consistent data, transparent policy criteria, and regular evaluation of the effects of trade decisions on producers, processors, and consumers. Rather than pursuing import reduction as an isolated objective, policy should aim to maintain supply stability while creating conditions that allow domestic production to contribute more effectively to national sugar requirements.

Policy Implications, Forecasting Considerations, and Future Research

The findings have implications for the formulation of policies intended to strengthen Indonesia's sugar sector. First, domestic production development requires a comprehensive strategy covering sugarcane cultivation, raw-material procurement, processing technology, and factory management. Improving the availability of suitable planting materials and supporting the adoption of more efficient cultivation practices may contribute to higher productivity. In parallel, modernization of sugar mills and improvements in processing operations could help increase the efficiency with which available sugarcane is converted into sugar (Kabeyi & Olanrewaju, 2023; Molin et al., 2024; Que et al., 2024). These interventions should be supported by coordination among farmers, processing companies, and relevant government institutions so that improvements in agricultural production are accompanied by adequate processing capacity and reliable market access.

Second, sugar-sector planning should integrate production targets with a clear assessment of national demand. Household consumption and industrial requirements should be identified separately where the data allow, because these categories may differ in their development and supply requirements (Klyuev et al., 2022; Williams et al., 2023; Evenett et al., 2024). More

consistent data on production, consumption, imports, and inventories would improve the assessment of supply adequacy and provide a stronger basis for determining import requirements. Furthermore, policy evaluations should consider the effects of production and trade measures on different stakeholders, including sugarcane farmers, sugar mills, industrial users, and consumers. This broader perspective is important because policies designed to improve one part of the supply chain may have limited effectiveness if other constraints remain unresolved.

Third, the projections presented in this study should be interpreted as estimates based on historical linear trends rather than definitive predictions of future conditions. The Least Squares Method provides a straightforward way to describe the general direction of change, but it does not explicitly incorporate changes in government policy, technological development, weather conditions, international prices, or other factors that may alter future production and trade patterns. In addition, the reliability of the projections depends on the consistency and accuracy of the underlying data, as well as the operational definitions applied to the variables. Future applications of this method should therefore ensure that data sources, measurement units, variable definitions, and forecasting procedures are clearly documented. These steps would improve transparency and make the estimates easier to evaluate and reproduce.

Finally, further research could extend the present analysis by investigating the factors associated with changes in sugar production, consumption, and imports. Econometric or multivariate time-series approaches could help assess the relationships among domestic production, demand, prices, exchange rates, and government policies, provided that suitable data are available. Comparisons between alternative forecasting methods could also establish whether the projected trends remain robust under different analytical assumptions. In addition, research distinguishing household sugar consumption from industrial demand could provide a more detailed understanding of the sources of national demand growth. These extensions would help move beyond descriptive trend identification toward a more comprehensive explanation of the dynamics of Indonesia's sugar sector and provide stronger empirical support for policies aimed at improving domestic production capacity and managing import dependence.

Conclusion

Based on the results of trend analysis, sugar production in Indonesia during the period 2010–2024 shows a decreasing trend and is projected to continue to decline until 2030. On the other hand, sugar consumption shows an increasing trend and is expected to continue to increase in the projection period, so that the national sugar demand is getting bigger. On the other hand, sugar imports also show a trend that continues to increase until 2030 because of the suboptimal domestic production capacity to meet national demand. This condition shows that the gap between sugar production and consumption is still quite large, so Indonesia's dependence on imported sugar supply is expected to remain high in the coming years. Based on the results of the research, the government and sugar industry players need to increase the productivity and efficiency of the national sugar sector through the application of more modern cultivation technology, the use of superior sugarcane varieties, and the modernization of sugar factories so that domestic production can increase and be able to meet national needs. In addition, the sugar import policy needs to be carried out in a more measurable manner while still paying attention to domestic production conditions so that dependence on imported sugar can be reduced, and national food independence can be realized.

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